ANNUAL REPORT
2024-2025

BANGLADESH ATOMIC ENERGY COMMISSION

ANNUAL REPORT
July 2024 – June 2025

Bangladesh Atomic Energy Commission

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Acronyms

AAS	Atomic Absorption Spectrometer
AERE	Atomic Energy Research Establishment
AFSI	Agriculture and Food Systems Institute
ASME	American Society of Mechanical Engineers
ASNC	American Society of Nuclear Cardiology
AUI	Amity University of India
BAEC	Bangladesh Atomic Energy Commission
BAERA	Bangladesh Atomic Energy Regulatory Authority
BAS	Bangladesh Academy of Sciences
BCIL	Biotech Consortium India Limited
BCS	British Computer Society
BCSSGAI	British Computer Society Specialist Group on Artificial Intelligence
BEIS	Bangladesh Electronics and Informatics Society
BES	Bangladesh Entomological/Endocrine Society
BFSA	Bangladesh Food Safety Authority
BIM	Bangladesh Institute of Management
BMPA	Bangladesh Medical Physics Association
BNCDF	Bangladesh Non-Communicable Diseases Forum
BMU	Bangladesh Medical University
BSU	Bangladesh Society of Ultrasonography
BTF	Bangladesh Trade Facilities
BTS	Bangladesh Thyroid Society
CUET	Chittagong University of Engineering & Technology
DGHS	Directorate General Health Service
DMCH	Dhaka Medical College Hospital
FAO	Food & Agricultural Organization
FEES	Faculty of Earth & Environmental Science
FNCA	Forum for Nuclear Cooperation in Asia
GSB	Geological Survey of Bangladesh
IAEA	International Atomic Energy Agency
IPDIF	Integrated Professional Development Initiations Forum
JAEA	Japan Atomic Energy Agency
JMC	Jordanian Medical Council
KAERI	Korea Atomic Energy Research Institute
KOICA	Korea International Cooperation Agency
MI	Molecular Imaging
MoI	Ministry of Industries
MoPA	Ministry of Public Administration
MoST	Ministry of Science and Technology
NMS	New Medicine Society
SNMA	Society of Nuclear Medical Association
XRF	X-ray Fluorescence
ZSB	Zoological Society of Bangladesh

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Introduction

Bangladesh Atomic Energy Commission (BAEC) was established in February 1973 through Presidential Order 15 (PO-15) with the mandate of promoting the peaceful applications of nuclear energy in Bangladesh. Over the years, BAEC has grown to become the country's largest organization dedicated to scientific and technological research, particularly in the field of nuclear energy. The Commission's goal-oriented research and development (R & D) programs span physical sciences, biological sciences, engineering, and nuclear power. These programs are carefully aligned with national priorities, ensuring that the outcomes directly contribute to socio-economic development in key sectors such as food and agriculture, industry, energy, healthcare, and environmental protection.

BAEC provides a range of notable services, including monitoring radioactivity in imported food items to safeguard public health and the environment; promotion of radiation safety culture; modern nuclear medicine for the general population, particularly underserved communities; sterilization of medicines and medical equipment; food safety and security; food preservation and processing; development of high-quality polymer materials; chemical analysis of industrial products for quality control; assessment of food and environmental samples to prevent pollution; and industrial non-destructive testing (NDT) and material evaluation services. BAEC has undertaken the significant challenge of implementing the Rooppur Nuclear Power Project (RNPP), recognizing it as one of its highest-priority initiatives

Research and development activities are carried out through BAEC's various institutes and centers, all of which are equipped with state-of-the-art laboratories and facilities. Major infrastructure includes the 3 MW BTRR, 3 MV Tandem Accelerator, 3 MV Van de Graff Accelerator, two Co-60 gamma irradiators, Central Radioactive Waste Processing and Storage Facilities, Radioisotope Production Laboratory, Radioactivity Testing and Monitoring Laboratory, air particle monitoring facilities, and a beach sand minerals processing pilot plant. In addition, advanced nuclear apparatus and scanning systems are available at the National Institute of Nuclear Medicine and Allied Sciences (NINMAS) and multiple Institutes of Nuclear Medicine and Allied Sciences (INMAS) across the country.

Apart from its research and development initiatives, the organization actively engages with numerous international partners, particularly the International Atomic Energy Agency (IAEA), to facilitate technology transfer and strengthen human resource development. It ensures full compliance with international obligations concerning nuclear safeguards and the non-proliferation of nuclear weapons, while also coordinating with other global organizations such as RCA, Non-RCA, FTC, and FNCA. BAEC undertakes comprehensive planning, development, and execution of various projects, including special research and development programmes. The information management system of BAEC is used to process and disseminate data to a broad spectrum of stakeholders, while maintaining a vital link between the government, the public, and the media. Moreover, full compliance with all safety, security, and safeguards obligations under international treaties, agreements, protocols, and conventions related to nuclear and radioactive materials is ensured by BAEC.

This report presents a comprehensive overview of BAEC's research, development, and service activities in nuclear science and technology conducted between July 2024 and June 2025. It highlights the organization's continued commitment to leveraging nuclear technology for the nation's socio-economic progress, public health, and environmental sustainability.

RESEARCH & DEVELOPMENT AND SERVICE ACTIVITIES

I. PHYSICAL SCIENCES

ATOMIC ENERGY CENTRE (AEC), DHAKA

Chemistry Division, AECD

Objective

The objective of this Division is to make significant contribution towards the scientific advancement and the socio-economic development of Bangladesh through different R&D programs of Bangladesh Atomic Energy Commission and unique and invaluable analytical services to potential individuals or group of entities from state level to end users. The Chemistry Division of Atomic Energy Centre, Dhaka is recognized both nationally and internationally as one of the leading Research Hubs in the field of Chemistry with particular focus on Analytical Chemistry. As we have entered the new millennium, the demand for quality assured chemical analysis in samples of different description is ever increasing. Rising up to that demand, the laboratories in the Chemistry Division has been making significant contribution towards the scientific advancement and the socio-economic development of Bangladesh through different R&D programs and unique and invaluable analytical services to potential individuals or group of entities. Technical services in the form of chemical analysis of materials, analytical services for diagnostic purpose and consultant/expert services in special cases are provided regularly with care and utmost precision. The division has also been working in collaboration with other peer groups from universities, medical institutes and research organizations. In addition to that, it often provides academic and professional trainings to research students and professionals through specific programs. Along with all of these, the chemistry division is a regular participant in coordinated research programs under IAEA/RCA framework and a constant winner of research projects under MOST special grant programs, particularly in the field of environmental pollution, food safety, nuclear analytical techniques in material analysis and environmental studies.

1. R&D work(s)

Advanced Analytical Chemistry

1.1 Assessment of Heavy Metal Contamination in Green Mussel (*Perna viridis*) and Pacific Oyster (*Crassostrea gigas*) from Cox's Bazar, Bangladesh and their Potential Impact on Human Health.

Y. N. Jolly,J. Kabir, S. Akter, S.Hossain, K. M. Mamun and Samia Islam*

To assess heavy metal contamination in green mussel and Pacific oyster from Cox's Bazar and evaluate associated human health risks.A total of 14 bivalve samples were collected from Cox's Bazar and analyzed using Energy Dispersive X-ray Fluorescence (EDXRF) spectroscopy to assess heavy metal contamination and associated human health risks. Standard preparation procedures were followed, and metal concentrations were measured in both flesh and shell tissues. Significant interspecies and inter-tissue variations were observed. *Crassostrea gigas* exhibited higher levels of iron (Fe: 638.71±43.04mg/kg) and copper (Cu: 212.18±57.64mg/kg), while *Perna viridis* showed elevated zinc (Zn: 130.76±15.97mg/kg) and selenium (Se: 3.09±1.01mg/kg). Toxic metals like mercury (Hg) and lead (Pb) were detected, though within safe limits. However, THQ for mercury exceeded 1.0 in both species, and HI values (1.6197 for *P. viridis*, 6.0793 for *C. gigas*) indicated potential non-carcinogenic health risks. Carcinogenic risk values for arsenic and chromium remained below the USEPA threshold. The findings suggest a need for regular monitoring due to elevated levels of mercury and copper, and offer essential baseline data for ecological risk assessment and coastal resource management in Bangladesh.

*Department of Fisheries and Marine Science, Noakhali Sciences and Technology

1.2. Contamination Status and Health Risk Assessment of Heavy Metals in Soil, Plant and Water Samples Around the Vicinity of Madhabdi Dyeing Industry of Narsingdi.

Y.N. Jolly, S. Sumi*, J. Kabir, S. Akter, S. Hossain, K. M. Mamun.

Madhabdi upazila of Narsingdi are highly polluted by heavy metals and metalloids The objective of this study will help to assess the recent status of heavy metals pollution of soil, waste water and plants inareas of Madhabdi upazila surrounded by dyeing industries, it's impacts and possible health risk assessment. From the

study area, 10 soil samples from surfaces soil (0-30cm), 7 water samples including industrial effluents and 5 edible plant samples are collected. The main purpose of this research is to find out the source, concentrations and transformation of metals from dyeing industrial areas including inland water and various edible and inedible plants as well as obtaining the exposure scenario and carcinogenic and non-carcinogenic risks of consumption by the locality of Madhabdi upazila surrounding by dyeing industries which may affect adversely in human health and environment of the entire area. Metals (As, Pb, Zn, Cu, Cr, Fe, Mn) in the samples were determined using ED XRF techniques after prerequisite sample preparation steps in the lab. This research work is continuing.

1.3 Commitment to Excellence: Analytical Chemistry Laboratory (ACL) Maintains ISO/IEC 17025:2017 Accreditation to Ensure Quality Analytical Services for Heavy Metal Determination in Diverse Matrices

T. R. Choudhury, M. N. E. Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, S. Sultana, S. B. Quraishi

The primary objective of the Analytical Chemistry Laboratory (ACL) in maintaining ISO/IEC 17025:2017 accreditation is to ensure the highest standards of accuracy, precision, and reliability in the measurement of heavy metals across a broad spectrum of matrices. The Analytical Chemistry Laboratory (ACL) is accredited to analyze a wide range of samples, including food items such as milk, vegetables, animal feed, meat, drinking water and spices; environmental samples like water, soil, and sediment; and biological samples such as urine. Since its initial accreditation in March 2015, ACL has demonstrated a steadfast commitment to excellence and quality in analytical services. Through continuous improvement and strict adherence to international standards, the laboratory has consistently delivered accurate and reliable test results, reinforcing the trust and confidence of its stakeholders. In 2024, the Bangladesh Accreditation Board (BAB) conducted its third reassessment of the laboratory. Following a successful audit in July 2024, the laboratory's accreditation was renewed, with a new certificate valid until 28 February 2027. This milestone reaffirms ACL's ongoing dedication to upholding the rigorous requirements of ISO/IEC 17025:2017. Regular audits and surveillance assessments will continue throughout the accreditation cycle to ensure sustained compliance and continuous enhancement of the laboratory's quality management system. This rigorous evaluation framework strengthens the laboratory's reputation for high-quality analytical performance and supports its mission to deliver credible and precise data to support public health, environmental monitoring, and food safety initiatives.

1.4 Participation in Proficiency Testing for the Determination of Total Concentration of Trace Elements in IAEA-MESL-2024-ILC-TE-SEDIMENT Sample Organized by International Atomic Energy Agencicy (IAEA)

T. R. Choudhury, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, S. Sultana, S. B. Quraishi

The Analytical Chemistry Laboratory (ACL) of Chemistry Division is an ISO/IEC 17025:2017 accredited laboratory. According to the standards, in order to maintain the laboratory accreditation, it is mandatory to participate in the proficiency testing (PT) at least once in a year organized by any internationally recognized standard/reference laboratory and secure satisfactory results that ensure the quality of analyses, validity of the methods used and performances of analysts as well as instruments. Therefore, the main objective of this program was to meet the criteria set by the ISO/IEC 17025 standard in order to maintain the laboratory accreditation. Analytical Chemistry Laboratory has participated in proficiency testing (PT) namely 'IAEA-MESL-2024-ILC-TE-SEDIMENT' by International Atomic Energy Agencicy (IAEA)for the analysis of Pb, Cd, Cr, Cu, Co, Ni, Fe, Mn, Zn, Hg and As in sediment. The laboratory has secured satisfactory results for the quantification of trace elements quantified by different forms of Atomic Absorption Spectrophotometry (AAS) technique. The results indicate the capability of the laboratory to provide quality data for the quantification of trace elements in different sediment samples.

1.5 Participation in Proficiency Testing for the Determination of Toxic Elements (Arsenic, Cadmium, Mercury and Lead) in Cosmetic Cream Organized by Asia Pacific Metrology Programme (APMP)

T. R. Choudhury, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, S. Sultana, S. B. Quraishi

To assess and enhance the analytical capabilities of the laboratory through participation in the Proficiency Testing (PT) program organized by the Asia Pacific Metrology Programme (APMP) for the accurate determination of toxic elements—Arsenic (As), Cadmium (Cd), Mercury (Hg), and Lead (Pb)—in cosmetic

cream, in alignment with international quality standards and regulatory requirements. The Analytical Chemistry Laboratory has participated in the proficiency testing (PT) program titled 'APAC T114 – Toxic Elements (Arsenic, Cadmium, Mercury, and Lead) in Cosmetic Cream,' organized by the Asia Pacific Metrology Programme (APMP). The laboratory has completed the analysis of the assigned sample for As, Cd, Hg, and Pb, and the analyzed values have been submitted to the organizing body. The final PT results are currently awaited.

1.6 Participation in Proficiency Testing for the Determination of Cadmium, Lead, Nickel, Selenium, Arsenic, Antimony, Mercury, Cobalt, Vanadium, Chromium, Molybdenum, Tin, Beryllium in Surface Water (sw022c04) Organized by Fapas, Fera Science Ltd.

T. R. Choudhury, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, S. Sultana, S. B. Quraishi

To evaluate and verify the laboratory's analytical performance and technical competence through participation in the Proficiency Testing (PT) program for the determination of trace elements—Cadmium, Lead, Nickel, Selenium, Arsenic, Antimony, Mercury, Cobalt, Vanadium, Chromium, Molybdenum, Tin, and Beryllium—in surface water (SW022C04), organized by FAPAS, Fera Science Ltd., in accordance with international quality assurance practices. The analysis of the surface water sample for the specified trace elements has been completed, and the results have been successfully submitted to FAPAS, Fera Science Ltd. The laboratory is currently awaiting the proficiency testing outcome.

1.7 Microwave-Based Sensor for Cadmium Detection Utilizing Bacterial Inhibition: A Step Toward Non-Contact Heavy Metal Detection

T. R. Choudhury, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, S. Sultana, N. Tasnim, *, A. Habib*

The objective of this study is to develop a novel, non-contact, and cost-effective sensor platform for detecting heavy metal contamination, specifically cadmium (Cd^{2+}), by integrating microwave split ring resonator (SRR) technology with bacterial inhibition sensing using *Escherichia coli*. This approach aims to enable real-time, label-free monitoring of toxic metal-induced physiological changes in bacteria, providing an alternative to conventional detection methods. We have successfully developed and tested a microwave-based biosensor utilizing a split ring resonator (SRR) positioned near an agar plate immobilized with *E. coli*. The sensor exhibits a high sensitivity of 0.2 dB/(μg/mL) and achieves over 95% bacterial growth inhibition at 5 μg/mL $CdCl_2$ concentration, with a detection limit of 0.51 μg/mL—significantly lower than those reported for similar biosensors. The system is low-cost (under $5), cleanroom-free, and reusable. Validation against atomic absorption spectroscopy (AAS) using spiked environmental water samples (3 μg/mL Cd^{2+}) showed strong agreement in measured concentrations. Future work will focus on enhancing sensor performance using genetic engineering and synthetic biology approaches for multi-metal detection with even lower detection thresholds.

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1.8 Advanced Arsenic(III) Removal Using Nanostructured Bi-Metallic Biochar: A Sustainable Water Purification Strategy

T. R. Choudhury, M. S. H. Sajib*, S. R. Khan, M. N. E. Alam, M. A. Maksud, M. N. Amin*, S. B. Quraishi

The objective of this study is to develop a cost-effective and efficient adsorbent for the removal of toxic arsenic (As III) from contaminated water. By utilizing sugarcane bagasse-derived biochar impregnated with manganese (Mn) and aluminum (Al), the study aims to enhance the adsorption capacity and catalytic performance of biochar for arsenic remediation in both groundwater and wastewater systems. A novel Bagasse-Mn-Al composite was synthesized by impregnating sugarcane bagasse biochar with manganese and aluminum. The composite demonstrated significantly higher As(III) removal efficiency (89.53%) within 65 minutes under optimal conditions (400 μg/L initial As(III) concentration, pH 2–2.5, and 0.625 g/L dosage) compared to the raw biochar. The maximum adsorption capacity of the composite reached 54.945 mg/g, outperforming many low-cost metal-impregnated biochars reported in the literature. Characterization results revealed that hydroxyl (•OH) radicals played a crucial role in the removal process, primarily through oxidation and complexation mechanisms. The Bagasse-Mn-Al composite also showed excellent catalytic

activity and easy separation from aqueous solutions. These promising findings underscore its potential for practical application in treating both arsenic-contaminated groundwater and industrial wastewater.

*Department of Applied Chemistry and Chemical Engineering, University of Dhaka, Dhaka 1000, Bangladesh

1.9 Synthesis and Characterization of Calcium Alginate Graphene Oxide and its Application for Removal of Heavy Metals from Industrial Effluents

T. R. Choudhury, M. S. Faruki*, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, A. Salam*

The objective of this study is to synthesize and characterize a calcium alginate–graphene oxide (CA–GO) composite and evaluate its efficiency in removing heavy metals from industrial effluents. By combining the high surface area and functional groups of graphene oxide with the biocompatibility and gel-forming ability of calcium alginate, the study aims to develop an effective, eco-friendly adsorbent for the remediation of toxic metals in contaminated wastewater. Calcium Alginate-Graphene oxide (CA-GO) composite has been synthesized for the adsorption of heavy metals. Graphene oxide is prepared from commercial graphite powder and reacted with sodium alginate and calcium chloride to form the beads of CA-GO composite. The developed composite was characterized by FTIR, elemental analysis, SEM, XRD analysis, and Raman spectroscopy. Moreover, the effect of pH, adsorbent dosage, contact time, and initial concentration of metal ions on the adsorption capacity were will be investigated through batch experiments. The research is currently in progress.

*Department of Chemistry, University of Dhaka, Dhaka 1000, Bangladesh

1.10 Characterization and Application of Graphene Oxide-Based Composite for the Removal of Cr^{3+} , Pb^{2+} , and Cd^{2+} Ions from Wastewater

T. R. Choudhury, N. Nazrul*, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa,K H. Maria*

The development of advanced and efficient materials for the removal of heavy metal ions from contaminated water has become a pressing need. In this context, graphene oxide (GO)-based nanocomposites have gained significant attention as promising candidates for water purification Graphene oxide possesses a large specific surface area, rich oxygen-containing functional groups (such as hydroxyl, epoxy, and carboxyl groups), and excellent mechanical and chemical properties. These characteristics enable it to act as an ideal platform for the adsorption and immobilization of heavy metal ions. Furthermore, GO can be easily functionalized or combined with various materials—such as metal oxides, polymers, and nanoparticles—to form nanocomposites with tailored properties and enhanced performance. The versatility of GO-based nanocomposites allows for the design of efficient, selective, and recyclable adsorbents capable of capturing toxic metal ions even at low concentrations. Such materials hold great promise for application in wastewater treatment plants, industrial effluent management, and even portable water purification devices. It is now under development process at laboratory.

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1.11 Status of EDXRF Method Validation and Quality Control in the Chemistry Division of Atomic Energy Centre, Dhaka, Bangladesh.

*S. Akter, Y. N. Jolly, J. Kabir, S. Hossain, K. M. Mamun and M J Abedin

To evaluate and document the current practices of method validation and quality control in Energy Dispersive X-ray Fluorescence (EDXRF) analysis within the Chemistry Division of the Atomic Energy Centre, Dhaka, with the aim of ensuring analytical accuracy, precision, and reliability in elemental analysis of various sample matrices. The Chemistry Division of the Atomic Energy Centre, Dhaka, has actively engaged in validating and implementing quality control measures for Energy Dispersive X-Ray Fluorescence (EDXRF) spectrometry. The division employs the EDXRF system for elemental analysis across environmental and industrial applications. Rigorous quality control procedures, including calibration with certified standards and verification using multi-elemental reference materials, ensure the accuracy and reliability of analytical results. These efforts contribute to high analytical standards, enhancing the credibility of research findings in environmental monitoring and pollution assessment.

1.12 Synthesis and Characterization of Mn-Doped ZnO Nanoparticles for Spintronic Applications

A. R. M. Tareq, R. Sultana, M. F. Ehasan, M. Afroz*, A. K. M. Atique Ullah, S. Chowdhury* and S.M. A. Z. Chowdhury*

This research aims to synthesize $Zn_{1-x}Mn_xO$ nanoparticles of different Manganese doping levels using a cost-effective co-precipitation method as the morphology, particle size, energy band gap, and magnetic behavior varies with the change in doping concentration and to explore the potential of Mn-doped ZnO as a promising dilute magnetic semiconductor (DMS) for future spintronic and optoelectronic applications. Structural analysis using X-ray Diffraction (XRD) revealed a decrease in crystallite size with increasing Mn content, alongside changes in lattice parameters, bond length, and macrostrain. Dynamic Light Scattering (DLS) confirmed particle dispersion characteristics, including hydrodynamic diameter and polydispersity index (PDI). Optical properties assessed by the energy band gap from UV spectroscopy showed blue-shift with the increase of Mn content because of the quantum confinement effect. As the Mn % increased, the optical band gap energy reduced from 3.24eV to 2.58eV in contrast to undoped ZnO (3.33eV), which is explained by sp-d interaction. From the Fourier Transform Infrared Spectroscopy (FTIR) analysis the existence of Zn-O and Mn- O bonds as well as the effective incorporation of varying Mn doping concentrations in the ZnO lattice are observed. Magnetic properties were thoroughly investigated with a Vibrating Sample Magnetometer (VSM) to measure saturation magnetization (Ms), coercive field (Hc), remanent magnetization (Mr), and magnetization per Mn^{2+} ions, thereby providing a holistic understanding of how manganese doping influences these critical characteristics of ZnO nanoparticles. The morphology, size distribution, and crystal structure at the nanoscale, ongoing Transmission Electron Microscopy (TEM) experiments are being conducted on the synthesized Mn-doped ZnO nanoparticles.

*Department of Electrical and Electronic Engineering, University of Chittagong, Chittagong, Bangladesh

1.13 Responses Toward Structural, Optical and Magnetic Properties of Fe Doped ZnO by Co – Precipitation Method

A. R. M. Tareq, R. Bhuiyan*, R. Sultana, M. F. Ehasan, S. Chowdhury*, A. K. M. Atique Ullah and S.M. A. Z. Chowdhury*

This study aims to synthesize iron (Fe)-doped zinc oxide (ZnO) nanoparticles using the wet chemical co-precipitation method, with compositions of $Zn_{1-x}Fe_xO$ ($0 < x \leq 0.05$) to investigate how Fe doping affects the structural, optical, and magnetic properties of ZnO under controlled reaction conditions (pH, temperature, and time). Fe-doped ZnO nanoparticles were successfully synthesized using a low-cost co-precipitation technique. X-ray Diffraction (XRD), Fourier-Transform Infrared Spectroscopy (FTIR), UV–Visible Spectroscopy, and Physical Property Measurement System (PPMS) were used to characterize the materials. The primary examination shows how varying Fe doping concentrations influence these characteristics and to establish the relationship between Fe incorporation and the resulting material properties. Using the co-precipitation method, single-phased Fe3+ doped ZnO was produced effectively. The Fe3+ doped ZnO nanoparticles' wurtzite structure is similar to that of ZnO, according to the XRD analysis. Additionally, the chemical investigation showed that ZnO contained Fe3+. After synthesizing nanosized particles with different nanostructures, it was discovered that the lattice experienced tensile strain as a result of the dopant substitution and that the size of the crystallites decreased as the concentration of Fe doping increased. UV-Vis spectroscopy studies revealed that when the concentration of Fe doping increased, the band gap blue shifted. According to the FTIR spectra, the absorption peak at about 477 cm-1 for undoped and Fe doped ZnO powders verifies the formation of ZnO at 866 cm-1. Fe doping greatly improves ZnO nanoparticles' magnetic behavior. Higher Fe concentrations resulted in an increase in magnetization saturation (Ms), suggesting the presence of ferromagnetic interactions.

*Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Chittagong, Chittagong

1.14 Removal of Organic Pollutants of Seawater using Synthesized Magnetite Iron Nanoparticles

A. R. M. Tareq, S. Alam*, R. Sultana, M. F. Ehasan, A. K. M. Atique Ullah and F. T. Zohura*

The objective of the present study is to synthesize magnetite (Fe_3O_4) nanoparticles via the co-precipitation method and apply them for the removal of organic pollutants, specifically synthetic dyes and polycyclic aromatic hydrocarbons (PAHs) from seawater. This study also aims to assess the reusability of Fe_3O_4 nanoparticles for sustainable water treatment applications. The study ultimately seeks to explore eco-friendly nanotechnology solutions to support marine ecosystem protection and pollution management. $FeCl_3$ and

$FeCl_2.4H_2$ salts, along with NaOH and NH_4 OH, were used in the co-precipitation synthesis of magnetite nanoparticles. The optimized conditions for nanoparticle formation were found to be a 1:2 molar ratio of $FeCl_3$ and $FeCl_2.4H_2$,a reaction temperature of 70°C, and a pH range of 9–11. Successful synthesis was confirmed using UV-Visible Spectrophotometry, where the surface plasmon resonance (SPR) peak was observed near 391nm, indicating the presence of Fe_3O_4 nanoparticles. Characterization of the synthesized nanoparticles was further carried out using X-ray diffraction (XRD), Vibrating Sample Magnetometer (VSM) and Transmission Electron Microscopy (TEM) to determine their elemental composition, crystalline structure, particle size, and surface morphology. The hydrodynamic behavior and dispersion stability were also visually assessed. To evaluate pollutant removal efficiency, Gas Chromatography–Mass Spectrometry (GC-MS) and High-Performance Liquid Chromatography (HPLC) were employed to detect and quantify residual PAHs. UV-Visible Spectrophotometry was used to monitor dye concentration and calculate percentage decolorization, demonstrating the nanoparticles' adsorptive capacity. Initial reusability tests have also been performed to assess the functional longevity of the Fe_3O_4 nanoparticles across multiple cycles of pollutant removal.

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1.15 Monitoring Microplastics in the Marine Waters of the Bay of Bengal

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This study investigates microplastic contamination in the surface waters of the Bay of Bengal, focusing on the coastal region of Cox’s Bazar, Bangladesh. The objective is to assess the presence, abundance, and distribution of microplastics, as well as to classify particles by shape, size, color, and polymer type using Fourier-Transform Infrared Spectroscopy (FTIR). Sampling was conducted at 20 coastal stations, with two replicates per site, yielding 40 water samples. Surface samples were collected using a Manta net (333µm mesh) and subsurface samples with a Huskisson water sampler. The Manta net was towed for 15–20 minutes at ~2 knots per station. All samples were preserved in clean, dark, and cool conditions following International Atomic Energy Agency (IAEA) protocols.In the laboratory, microplastics were isolated through filtration, digestion, density separation, and microscopic analysis. Particles were categorized by physical traits: shape (fiber, fragment, film, bead), color, and size. Preliminary results confirmed microplastic presence in all samples, with fibers and fragments being most prevalent. Color patterns suggest textile and plastic packaging as major sources. FTIR analysis is ongoing, with polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET) likely to be the dominant polymers. This baseline data will contribute to regional marine pollution assessments and support future mitigation strategies.

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1.16 Monitoring of Microplastics (MP) in Environmental Marine Pollution: A Study of Sediment from Cox’s Bazar Sea Beach.

A. R. M Tareq, R. Sultana, M. F. Ehasan, M. S. Hossain*

Plastic pollution in the marine environment has become a significant concern globally, with microplastics (MPs)—particles smaller than 5 mm—emerging as a persistent and hazardous pollutant. They are found across marine matrices, including seawater, sediments, and marine biota. Sediments act as a long-term sink for MPs, especially in high-traffic and recreational zones like Cox’s Bazar, the world’s longest sea beach. This study aims to detect, quantify, and characterize microplastics from sediment samples collected across 17 sampling points along Cox’s Bazar Sea Beach. To detect and quantify microplastics in beach sediment. A total of 85 sediment samples were collected from 17 sampling stations along the intertidal zone of the Cox’s Bazar-Teknaf Marine Drive, with five replicates taken from each station. The sample collection and preparation were followed by IAEA protocol. Stereo microscope was use for the identification of microplastics (MP) with shape, Color and size then selected particles analysed by ATR- FTIR spectroscopy. The findings demonstrate significant microplastic contamination in the sediment of Cox’s Bazar Sea Beach. Fibers were most dominant, indicating strong input from fishing nets, synthetic textiles, and ropes. Sites closer to human activities, such as tourism and coastal markets, show higher contamination levels. Polymer analysis further confirms the anthropogenic origin of the MPs. The triplicate sampling at each site helped ensure the reliability of data and capture local variation. Spatial analysis indicates a correlation between human activity density and MP abundance

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1.17 Environmental Risk Assessment and Source Identification of the Trace Elements in the Lower Meghna Estuarine Sediment: A Case Study Around Hatiya Island

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Estuarine river sediment plays a crucial role in transferring metals (loids) to aquatic ecosystems and the surrounding environment of the estuarine islands. River sediment samples were collected from eight selected locations from the west Shabajpur Channel and Hatiya Channel of the Meghna estuarine river system on the northern coast of the Bay of Bengal. Geochemical and mineralogical assessments of these sediments were examined to understand the metals' source and to evaluate the contamination level and environmental risk from the Meghna estuarine river system. Trace elements like Lead (Pb), Chromium (Cr), Vanadium (V), Antimony (Sb), Zinc (Zn), Iron (Fe), Manganese (Mn), Strontium (Sr), Arsenic (As), along with some major elements like Potassium (K), Calcium (Ca), Sodium (Na), Aluminum (Al) was determined by Electron Dispersive X-Ray Fluorescence (ED-XRF) techniques. The mineralogical assessment was done by analyzing diffraction peaks with an X-ray Diffractometer. The ranges of trace elements in sediment (mg/kg) followed the decreasing trend: Ca (90124- 156546) > K (25716-34784) > Fe (25056 - 34407) > Al (25771 - 30293) > Mg (8656 - 14273) > Na (8893 - 10595) > Mn (1693- 2616) > Sr (381 - 492) > V (40.2- 95.6) > Zn (30.7- 60.0) > Cr (20.6- 54.9) > Ce (29.2- 56.3) > Pb (7.58 - 17) > As (8.1- 13.9) > Sc (5.8- 9.3) > Th (3.2- 7.5), Yb (1.3 - 2.7) > Sb (0.65- 0.98). The contamination level and ecological risk were evaluated using the Geo-accumulation Index (Igeo); Contamination Factor CF); Enrichment Factor (EF); and Pollution Load Index (PLI). Only As and Mn showed moderate contamination levels among all elements. Due to the redox-sensitive and exchangeable nature of the As and Mn, the potential mobility and bioavailability trend are relatively higher than other metals, triggering the accumulation of As and Mn in the lower reach in estuarine sediment from the upper flood plain area. After analyzing diffractogram peaks, the result reveals the dominance of minerals such as Quartz, K-Feldspar, Oligoclase, Goethite, Illite, Kaolinite/ Chlorite, Smectite, Anatase in the lower Meghna estuarine system having their origin in the upper and middle catchment area. More detailed investigation and monitoring are required on transfer factors, sources, and levels of As and Mn to the ecological environment of the lower Meghna River system.

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1.18 Bioavailability and Risk Assessment of Metal ((loid)s from the Sediment of the Meghna Estuary using a Modified BCR Sequential Extraction Technique

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Estuaries absorb heavy metals from both natural and human activities, leading to significant environmental and health issues. This research focuses on the Meghna River estuary in Bangladesh, located in the northern part of the Bay of Bengal. Sediment samples were taken from four sites around an offshore island called Hatiya. A three-step modified BCR sequential extraction method was used to determine the potential mobile fractions, chemical forms, associated risks, and bioavailability of metalloids (As, Cu, Zn, Hg, Mn, Fe) at three different temperatures (10°C, 25°C, and 45°C). The extraction process yielded water-soluble, ion-exchangeable, and carbonate-bound fractions, which were measured with ICP-OES. The sediment's pH indicated alkalinity, and the samples contained very high organic matter, likely influencing metal leachability. Results showed that the highest leaching of Mn, Cu, and As occurred at 45°C. Both very low and very high temperatures acted as thresholds for Cu leaching. Fe release was not significantly affected by temperature, suggesting temperature is not the main factor controlling iron and titanium bioavailability across the sampling sites. Zn leaching was prominent at around 25°C, indicating this as a potential threshold. Element speciation revealed that most elements were mainly bound to the carbonate fraction. Mn and Zn were primarily associated with the acid-soluble fraction regardless of temperature. Correlation analysis showed positive relationships between temperature and levels of Mn (0.64) and Cu (0.42).

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1.19 Synthesis of Non-Metal (N, P, B, C) Dopped HDA Nanomaterial for the Removal of Radionuclide from Simulated Aquous Waste Solution

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In order to develop an effective process for the removal of radionuclides from contaminated waste aqueous solution (Simulated), several novel nanomaterials has been synthesized for this study. In this work, an organic-inorganic framework-based nanomaterial of titanium dioxide modified with hexadecyleamine (HDA) has been synthesized. Then non-metal (N, C, P, B) dopped was used to incorporate on it to invrease the efficiency of the synthesized nano materials. The developed nanomaterials were applied to the simulated aquous waste solution of several toxic metals and radionuclides in different concentration range. The synthesized NP was characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) with energy-dispersive X-ray diffraction (EDX), and Fourier-transform infrared spectroscopy (FT-IR). These methodological approaches demonstrated their capacity to synthesize crystalline and aggregated NP. The NP were found to have a significant surface charge which indicated the higher adsorption power. The doping of N, P, B, and C could induce the formation of M-NM sites and enhance the basicity of the solution, which can promote the adsorption It was applied the simulated waste solution by varing pH, temperature, concentration of adsorbet and adsorbant, and contact time. The optimization of all the controlling parameters and adsorption mechanism with efficiency now under study.

1.20 Optimizing β-Phase Content in PVDF Membranes via Modification of Dope Solution with Citric Acid/Nano-TiO2 using Nonsolvent-Induced Phase Separation Method

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The morphology of Poly (vinylidene fluoride) (PVDF) membranes prepared via the nonsolvent-induced phase separation (NIPS) method was modulated by altering the dope solution with citric acid (CA) and titanium dioxide nanoparticles (nano-TiO2) to optimize the β-phase content regarding adsorption application. The morphology of Poly (vinylidene fluoride) (PVDF) membranes prepared via the nonsolvent-induced phase separation (NIPS) method was modulated by altering the dope solution with citric acid (CA) and titanium dioxide nanoparticles (nano-TiO2) to optimize the β-phase content. Three series of dope solutions were prepared in dimethyl acetamide (DMAc): (i) TONx series contained 0.0–10% citric acid, (ii) Mx series contained 0.0–0.4% nano-TiO2, and (iii) TAx series contained 5% CA and 0.0–0.40% nano-TiO2. A field emission scanning electron microscopy (FESEM) study revealed that CA enhances pore opening, and nano-TiO2 transforms the sponge-like uneven porous structures into a compact, relatively regular honeycomb structure in the PVDF membranes. The combined effect of CA and nano-TiO2 in the dope solution made the channels and chambers of the membrane well organized, and the walls of the channels transformed from solid fibrils to cross-woven nanofiber-like entities. Porosity initially peaked at 84% in the TAx series, gradually decreasing to 72% with increasing nano-TiO2 concentrations. X-ray diffraction (XRD), Fourier-Transformed Infrared Spectroscopy (FTIR), and Differential Scanning Calorimetry (DSC) revealed the presence of a combined relative amount of the β- and γ-polymorphs of 84% in a neat PVDF membrane, 88% in an Mx, and 96% in a TAx series membrane, with the β-PVDF constituting nearly the entire portion of the combined polymorphs. The presence of 96% electroactive polymorph content in the PVDF membrane is noteworthy, highlighting its potential adsorption applications.

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1.21 Green Synthesis of Ag-doped CuO Nanoparticles using *Azadirachta indica* Leaf Extract: Characterization and Application in Dye Reduction

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The objective of the present study is to synthesize Ag-CuO nanocomposites using *Azadirachta indica* (neem) leaf extract as a bioreductant and capping agent to explore the effects of silver doping on the physicochemical properties and dye degradation performance of CuO nanoparticles. The leaf extract of *Azadirachta indica* was successfully utilized to synthesize Ag-doped CuO nanoparticles. The synthesis was performed under optimized conditions and the optimum $AgNO_3$ concentration for nanoparticles was found to be 5 mM. A distinct color change from greenish to brownish black indicated formation of Ag-CuO nanocomposite. For pure CuO

nanoparticles, a strong absorption peak was observed at 240 nm, with an estimated optical bandgap of 2.8 eV, indicating strong absorption in the UV region. Upon doping with silver nitrate ($AgNO_3$), the Ag–CuO nanoparticles exhibited additional absorption peaks at 288.5, 277.5, 285, and 275 nm, which correspond to the CuO nanoparticles, and at 394, 435, 446, and 464 nm, corresponding to the formation of Ag nanoparticles. These data were obtained for varying $AgNO_3$ concentrations of 1, 5, 10, and 50 mM. Dynamic Light Scattering (DLS) analysis confirmed the uniformity of particle size distribution through the polydispersity index. X-ray diffraction (XRD) patterns confirmed the monoclinic phase of CuO and showed additional peaks corresponding to metallic silver (Ag), indicating successful doping and good crystallinity. From the Scanning Electron Microscopy (SEM) analysis the sample exhibiting favorable morphology was used for the photocatalytic degradation of methylene blue dye, contributing to the treatment of environmental wastewater.

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Food Chemistry

1.22 Assessing the Impact of Toxic Metals on Human Health: An Examination of Migration from Ready-to-Eat Food Packaging Materials in Dhaka, Bangladesh

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This study aimed to evaluate the migration behaviour of both total chemicals and toxic metals (Pb, Cr, Cd) from various food-contact materials (FCMs) into three commonly used food simulants—aqueous, ethanol, and acetic acid—with the goal of identifying material-specific risks and informing regulatory standards. Migration tests were conducted using 24 different packaging items representing a range of plastic types and manufacturing qualities. Simulant-specific migration levels were quantified for total chemical content and toxic metals. Correlation analyses were performed to assess consistency and predictive relationships between different simulants and migration types. Total chemical migration ranged from <1 mg/kg to >65 mg/kg, with several items—particularly those made from multilayer or low-barrier plastics—exceeding the BFSA regulatory limit of 60 mg/kg. Migration was highest in the acetic acid simulant, due to its ability to solubilize polar and hydrolyzable compounds. Ethanol also induced high migration, particularly from materials likely containing lipophilic or non-crosslinked substances. Aqueous simulants showed the lowest migration overall. Toxic metal analysis revealed high levels of lead (Pb) and chromium (Cr) in acetic acid, with Pb concentrations up to 2.529 mg/L in some samples—exceeding the BFSA's provisional threshold. Ethanol simulant also exhibited elevated Pb levels, while aqueous simulant resulted in comparatively lower but still concerning concentrations. Cadmium (Cd) was sporadically detected at low levels. Strong correlations were observed between Pb and Cr migration in ethanol and acid simulants (Pb: $r \approx 0.85$–0.88; Cr: $r \approx 0.78$), suggesting consistent release mechanisms in aggressive media, whereas correlations with total chemical migration were weak ($r = -0.14$ to 0.23).

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1.23 Exploration of Toxic Metal Content and the Environmental Health Challenges Associated with the Decomposition of Ready-to-Eat Food Packaging Materials in Dhaka, Bangladesh

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A comprehensive research that specifically looks into the types of materials used in packaging RTE foods, their degradation process, the migration of heavy metals, and their subsequent environmental and health risks, especially in cities like Dhaka, where the challenge of waste management is more pronounced. With the growing popularity of ready-to-eat (RTE) food in Dhaka city, the volume of packaging waste is increasing rapidly. This study analyzed 40 RTE food packaging samples for the presence of heavy metals—Lead (Pb), Chromium (Cr), and Cadmium (Cd). The results revealed that Pb concentrations were up to 45 times higher than the WHO safety limits. Fate modelling indicated that approximately 50% of these metals accumulate in soil, 30% in water, and 20% in the atmosphere. These contaminants enter the food chain through crop absorption and water pollution, posing serious risks to public health. The study identifies RTE packaging waste as a critical but largely unregulated source of environmental pollution in Dhaka. Immediate policy interventions—including bans on Pb and Cr-based additives, promotion of eco-friendly packaging alternatives, and development of sustainable waste management systems—are urgently recommended.

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1.24 Feasibility of Indoor Based Seaweed Culture under Different Salinity Conditions as an Initial Step of Seed Bank and Nursery Establishment of Ulva Lactuca.

Y.N. Jolly, J. Kabir, S. Akter, K. M. Mamun and Ramzan Ali*

To evaluate the feasibility of indoor-based seaweed culture of *Ulva lactuca* under varying salinity conditions as a preliminary step towards establishing a seed bank and nursery system for sustainable cultivation and resource management. Ulva lactuca also known as sea lettuce is a green macroalgae of the genus Ulva (Chlorophyta) that grows in marine water and contains vitamins, minerals, cellulose, protein, and ulvan, which are utilized in high-value foods, cosmetics, medicines, and fertilizers. The present study focuses on the production rate of Ulva lactuca biomass under different salinity conditions at the Hatchery of Coastal Biodiversity, Marine Fisheries, and Wildlife Research Centre, CVASU, Cox's Bazar, Chattogram. An annual experiment was carried out from October 2023 to November 2024 with monthly sampling. The impact of various media, such as PES (Provassoli's Enriched Seawater), BF (Basfoliar), VS (Von stosch), PES+VS, PES+BF, VS+BF were investigated and out of these, VS was the best media to enhance the biomass production. Growth responses were also measured at different nutrient levels (1, 1.5, 2, 2.5, 3, 3.5 ml/L) and the best growth was recorded at 1.5 ml/L. Furthermore, the salinity treatments (5, 10, 15, 20, 25 and 30 ppt) were also included and the highest production of biomass was obtained at 25 ppt in aquarium-based culture where 12:12 light dark (LD) photoperiod was maintained.

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1.25 Bioaccumulation and Health Risk Assessment of Trace Elements in Commercially Important Fishes from the Rabnabad Channel of the Bay of Bengal

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To assess trace element concentrations in *Pterygoplichthys pardalis*, evaluate its nutritional value for aquafeed, analyze contamination risks through health indices, and determine its suitability as a sustainable feed ingredient. Trace element contamination in aquatic ecosystems poses significant ecological and public health risks due to the bioaccumulation of toxic metals in fish and subsequent exposure to humans through consumption. This study assessed the concentrations, bioaccumulation patterns, and human health risks of eleven trace elements e.g. chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co), nickel (Ni), copper (Cu), zinc (Zn), arsenic (As), selenium (Se), mercury (Hg), and lead (Pb) in six commercially important fish species (*Labeo bata, Acanthopagrus latus, Arius gagora, Setipinna phasa, Otolithoides pama,* and *Polynemus paradiseus*) from the Rabnabad Channel, a vulnerable estuarine system along the southern coast of Bangladesh. Analytical results revealed interspecies variation, with Fe (23.045–41.099 ppm) and Zn (9.71–15.581 ppm) exhibiting the highest concentrations. The overall order of bioaccumulated elements, based on their maximum concentrations across species, was: Fe > Zn > Cu > Mn > Cr > Se > As > Hg > Co ≈ Ni ≈ Pb. The Metal Pollution Index (MPI) values ranged from 0.96 to 1.87, indicating low cumulative contamination, whereas Individual Metal Bioaccumulation Index (IMBI) values suggested relatively higher accumulation in *A. latus* and *O. pama*. Human health risk assessments based on estimated daily intake (EDI), target hazard quotient (THQ), hazard index (HI), and total carcinogenic risk (TCR) models showed on or minimal health risks. Although THQ and HI values remained below 1, indicating minimal non-carcinogenic risk, the higher values in children. Carcinogenic risk assessment revealed that TCR values for Cr and Ni were within acceptable ranges (10^{-6} –10^{-4}), but again higher in children.

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1.26 Trace Element Bioaccumulation in Invasive Suckermouth Catfish (*Pterygoplichthys pardalis*) from Bangladeshi Rivers: Nutritional Potential and Contamination Risks for Aqua Feed.

Y. N. Jolly, S. Akter, J. Kabir, S. Hossain K. M. Mamun and N.Ibn Manowar*

This study investigates the trace element concentrations, nutritional value, and contamination risks of the invasive sucker mouth catfish (*Pterygoplichthys pardalis*), a non-native species now established in major rivers of Bangladesh including the Buriganga, Payra, and Pagaria. Despite its ecological resilience, *P. pardalis* disrupts local ecosystems by competing with native fish for food and habitat. Wild specimens were collected from these rivers and analyzed for trace elements—chromium (Cr), manganese (Mn), iron (Fe), copper (Cu), zinc (Zn), arsenic (As), mercury (Hg), and lead (Pb)—using Energy Dispersive X-ray Fluorescence (EDXRF) spectroscopy. The results revealed notable bioaccumulation of mercury and arsenic,

raising concerns over its safety as an aquafeed ingredient without proper contamination management. Metal Pollution Index (MPI) and Target Hazard Quotient (THQ) assessments indicated that most trace metals were within safe limits; however, arsenic and mercury levels posed potential non-carcinogenic and carcinogenic risks for both adults and children. While *P. pardalis* presents promising ecological and economic potential as an alternative protein source in aquaculture, further research is necessary to ensure food safety and to develop strategies for reducing harmful metal accumulation. This study highlights the need for balanced ecological management and health risk assessment when considering the use of invasive species in aquafeed production.

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1.27 Assessment of Heavy Metal Contamination in Commercially Important Marine Fish from Cox's Bazar, Bangladesh: Implications for Food Safety and Public Health

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To assess the levels of heavy metal contamination in commercially important marine fish from Cox's Bazar, Bangladesh, and to evaluate the potential health risks associated with their consumption. This study assessed concentrations of ten heavy metals (Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Hg, and Pb) in three commercially important marine fish species—*Acanthopagrus datnia* (Datina), *Pennahia aneus* (Sada Poa), and *Parastromateus niger* (Kala Chanda)—collected from three major fish markets in Cox's Bazar, Bangladesh. A total of 27 muscle tissue samples were analyzed using Energy-Dispersive X-ray Fluorescence (EDXRF). Iron (Fe) and zinc (Zn) were predominant, while toxic metals such as arsenic (As), mercury (Hg), and lead (Pb) exceeded recommended safety limits in several samples. Metal Pollution Index (MPI) values ranged from 1.81 to 2.65, indicating low to negligible contamination overall. Human health risk assessment using Estimated Daily Intake (EDI), Target Hazard Quotient (THQ), Hazard Index (HI), and Carcinogenic Risk (CR) revealed non-carcinogenic risks below critical thresholds, but CR values for As and Cr exceeded permissible limits, suggesting potential long-term carcinogenic risks. Multivariate analyses (PCA and HCA) identified common contamination sources, likely from anthropogenic activities. These findings highlight the need for ongoing monitoring and policy actions to safeguard seafood safety and public health in coastal Bangladesh.

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1.28 Assessment of Groundwater Quality of a Tannery Industrial Estate of Dhaka, Bangladesh.

Y. N. Jolly, S. Akter, J. Kabir, S. Hossain K. M. Mamun and Jakia Sultana*

The objective of this study is to assess the physicochemical properties and heavy metal contamination levels in groundwater from the Tannery Industrial Estate of Dhaka, Bangladesh, in order to evaluate its suitability for drinking and domestic use, and to identify potential health and environmental risks associated with industrial pollution. This work explored the toxicological effect of heavy metal in ground water of a Tannery Industrial Estate of Dhaka, Bangladesh and appraisal the groundwater aptness as drinking and irrigation water. The results revealed the worthiness of water for drinking and irrigation purposes as the physicochemical properties (pH, EC, salinity, and TDS), cations (Na^+ , K^+ , $Mg2^+$, and $Ca2^+$), and anions (F^- , Cl^- , SO_4 2^- , and NO_3 $^-$) were found within the permissible level propounded by various authorities. Among the analyzed heavy metals (As, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sr, and Zn), Hg (> 0.05) in both wet and dry seasons, and As (> 0.1) only in the wet season exceeded the permissible limit according to WHO (2017), which consequently influenced the groundwater evaluation indices. Seasonal variation was present prominently in all the evolution methods, and values were higher in the dry season compared to the wet season. The groundwater was irrigation-suitable, although the total hard ness (TH) of groundwater was high (TH > 300). During both seasons, Hg and Ni were the most significant contributors to the non-carcinogenic and carcinogenic health risks through dermal exposure, respectively, whereas As contributed most through ingestion exposure. Children were more vulnerable to health risks than adults; also, both age groups faced a higher risk during the wet than the dry season, primarily due to ingestion rather than dermal exposure. This study presents the first data on the trends of heavy metal concentrations in groundwater from the Tannery Industrial Estate of Dhaka, Bangladesh and their associated health risk, thus providing foundational information for future research.

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1.29 Assessing the Viability and Impacts of Introducing Seaweed Cultivation in Shrimp Farming Ghers/ponds in Coastal Regions of Bangladesh.

Y. N. Jolly, J. Kabir, S. Akter, S. Hossain K. M. Mamun and Joy Talapatra*

To assess the viability of introducing seaweed cultivation in shrimp farming ghers/ponds in the coastal regions of Bangladesh, and to evaluate its environmental, economic, and social impacts on sustainable aquaculture practices. The Bangladesh's coastal shrimp farms, covering approximately 170,000 hectares, frequently face high salinity levels (>10 ppt) and viral outbreaks, especially from October to March. Integrating seaweed farming into these ponds offers a promising approach to enhance sustainability by improving water quality and providing habitat for beneficial microorganisms. This study explored the feasibility of cultivating *Gracilaria* sp. within shrimp farming systems in Ukhiya, Bangladesh, using three culture methods: floating long-line, floating net (hapa net), and broadcast systems. Nine seaweed culture plots were established across three shrimp ponds, with monthly monitoring of water quality parameters such as temperature, salinity, pH, dissolved oxygen, turbidity, total alkalinity, nitrate, ammonia, phosphate, and total suspended solids. Growth performance was evaluated through partial harvesting every 30 days, measuring daily growth rate (DGR) and biomass yield. The hapa net system showed the highest growth, achieving a maximum DGR of 3.61 g/day and biomass yield of 0.62 kg/m², outperforming the floating long-line and broadcast systems. The findings indicate that seaweed cultivation in shrimp ponds is a viable strategy to improve aquaculture sustainability in coastal Bangladesh by enhancing water quality, creating habitats, and promoting carbon sequestration. Successful implementation, however, depends on a thorough understanding of biological and environmental factors, alongside strong collaboration with local communities and experts to ensure economic viability and long-term sustainability.

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1.30 Assessment of Toxic Metal Contamination in the Poultry Industry of Bangladesh: Sources, Dietary Exposure, and Toxicological Risks

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The primary objective of this study is to evaluate the presence and potential sources of toxic heavy metals and essential trace elements in poultry products and feed in industrial areas around Dhaka, Bangladesh. The study aims to assess dietary exposure and toxicological implications for consumers, thereby contributing to food safety and public health risk mitigation. To date, 45 real samples of poultry meat, eggs, and feed have been collected from five heavily industrialized zones near Dhaka. Advanced analytical techniques, including GF-AAS, HG-AAS, and F-AAS, have been employed to detect toxic metals such as Pb, Cd, Cr, As, and Ni, alongside essential elements like Mn, Cu, and Zn. Elevated levels of several metals—particularly Cr, Ni, and Pb—were identified in both poultry products and feeds, suggesting feed as a significant contamination source. The mean concentrations of most toxic elements exceeded the maximum allowable limits, raising serious toxicological concerns. Dietary risk assessments indicated notable health risks from Cr, Pb, and Ni exposure, underscoring the urgent need for regulatory oversight and intervention to ensure food safety

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1.31 Assessment of Heavy Metal Contamination in the Marine Ecosystem of ISRA Site, Cox's Bazar, Bangladesh: Implication for Guitarfish and its Prey

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This study aims to assess heavy metal contamination (Pb, Cd, Hg, As, Zn, Cu, Cr) in water, sediment, and marine organisms at the Isra Site in Cox's Bazar. It focuses on evaluating the accumulation of these metals in guitarfish (*Rhinobatidae*) tissues, their prey species, and the potential for bioaccumulation and biomagnification, while also identifying pollution sources and associated ecological risks. Water sample processing is currently underway in the laboratory. A total of 33 samples were collected from various stations and preserved with HNO_3 at 4°C. In the lab, samples were filtered (Whatman 41) and pre-treated with nitric acid before undergoing preconcentration on a hot plate at 110°C. The first batch of 16 samples and the second batch of 17 samples were processed over six days. Preconcentrated samples (25mL) have been stored in vials, and the next phase of analysis is scheduled to begin shortly. The study is ongoing.

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1.32 Investigation of Heavy Metal Levels in Salt from Various Sites in Cox's Bazar District, Bangladesh

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To evaluate heavy metal contamination in edible salt collected from saltpans and salt production areas in Cox's Bazar, Bangladesh, and assess potential human health risks through exposure and pollution indices. The study aims to assess dietary exposure and toxicological implications for consumers, thereby contributing to food safety and public health risk mitigation. A total of 27 salt samples were analyzed for 15 heavy metals using atomic absorption spectroscopy. Strontium (Sr), aluminum (Al), and zinc (Zn) were detected at the highest concentrations, with significant spatial variation across sampling sites. Health risk assessment revealed elevated non-carcinogenic (THQ, HI) and carcinogenic (CR) risks, particularly from Al, Sb, Cd, As, and Cr, indicating serious health concerns associated with salt consumption from the study area.

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1.33 Seasonal Bioaccumulation of Chromium in Gracilaria Tenuistipitata and Ulva Lactuca: Implications for Marine Bioremediation

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This study investigates the bioaccumulation of chromium (Cr) in two ecologically and economically important seaweed species—Gracilariatenuistipitata and Ulvalactuca—under controlled laboratory conditions during winter and pre-monsoon seasons. The main objectives were to assess Cr uptake at varying concentrations and to evaluate nutrient uptake behavior in relation to environmental parameters. It showed species-specific and seasonal variations in Cr accumulation. Ulvalactuca consistently exhibited higher bioaccumulation factors (BAF) than Gracilaria, with peak Cr uptake at 25 ppm and 100 ppm doses. For example, Ulva recorded a BAF of 0.193 at 25 ppm in winter and 0.142 at 100 ppm, while Gracilaria showed lower values (0.067 and 0.061, respectively). Both species showed dose-dependent uptake with Ulva demonstrating stronger bioremediation potential. The study highlights the promising role of these seaweeds—particularly Ulvalactuca—in mitigating Cr contamination in marine environments and calls for regular monitoring to prevent ecological and health risks.

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1.34 Physicochemical Characterization and Risk Assessment of Arsenic and Mercury in Soil, Water, Oryza Sativa, and Rice from Savar, Bangladesh

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To determine soil - water physicochemical properties and the concentration of As and Hg in the soil, water, plants (Oryza sativa) and rice in the Savar region; To evaluate the accumulation of arsenic and mercury in rice grains and their potential transfer from soil and water; To examine the potential health risks. All the samples were prepared and analyzed (As analysis in progress) in Analytical Chemistry Laboratory, Chemistry Division Atomic Energy Centre, Dhaka. 60 samples were collected for soil, water, plant (Oryza sativa) and rice from 5 different places; from each sample site contain 3 different sampling locations. 15 samples of soil; 15 of water; 15 of plant (Oryza sativa); 15 of different rice samples were collected. The physicochemical parameters of soil were within the ranges sated by FAO and DoE; except the pH 7.68. The correlation coefficient relationships validated the physicochemical behavior in soil; dissolved salts drived conductivity and reduced resistivity. In irrigation water the Arithmetical mean of both salinity (12.16 g/L) and TDS (13.57 g/L) were beyond the permissible limits (< 2 for both). EC, Salinity, TDS showed near-perfect positive correlations ($r^2 \approx 0.99$); contrary EC, Salinity, TDS have strong negative correlations with Resistivity ($r^2 \approx -0.98$), implying the fact that higher conductivity/salinity/TDS corresponds to lower resistivity.

1.35 Triple Burden of Street Food Consumption in Dhaka: Heavy Metals, Microbial Contamination, and Mental Stress Among Urban Consumers

T. R. Choudhury, N. J.Mim*, M. N. E. Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa

Street food is a daily dietary component for many in Dhaka due to affordability and convenience. However, food safety concerns are rising due to potential chemical and microbial contamination. This study aimed to assess heavy metal and microbial contamination in popular street foods and explore their association with consumer stress levels. A total of 105 samples from 15 common street foods were collected across Dhaka and analyzed for 10 heavy metals using atomic absorption spectrophotometry. Microbial contamination was assessed through standard plate counts. Additionally, a cross-sectional survey involving 326 respondents used the PSS-10 scale to evaluate food habits and stress levels. Cadmium in Singara and lead in Piaju exceeded Codex limits. The non-carcinogenic hazard index and carcinogenic risk surpassed safe levels. High microbial loads were found in Egg Khichuri and Velpuri, including E. coli contamination. Greater street food intake, especially among females, was significantly linked to higher stress levels. The study reveals a serious public health concern combining heavy metal toxicity, microbial contamination, and elevated stress among street food consumers. Urgent interventions in food safety regulation, public education, and mental health monitoring are recommended.

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1.36 Assessment of Toxic and Beneficial Heavy Metals in Soil, Water, *Oryza Sativa*, and Rice: Health Risk Evaluation in an Industrial Area of Savar, Bangladesh

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This study aimed to assess the concentrations of toxic (Pb, Cd, Cr, Ni) and beneficial (Fe, Zn, Cu, Co, Mn) heavy metals in soil, water, plants, and rice using AAS. It further aimed to evaluate soil contamination using Pollution Load Indices (Single PLI, Nemerow PLI, Geo-Accumulation Index), analyze metal transfer through Plant Transfer Factor (PTF), and estimate human health risks via Estimated Daily Intake (EDI) and Carcinogenic Risk (CR) from rice consumption. This study analyzed the concentrations of both beneficial and toxic heavy metals in soil, water, plant (*Oryza sativa*), and rice samples, using Atomic Absorption Spectroscopy (AAS). A total of 60 samples were collected from five locations (each with three sub-sites), and all samples were prepared and analyzed at the Analytical Chemistry Laboratory, Chemistry Division, Atomic Energy Centre, Dhaka. Soil samples showed elevated levels of Pb and Cd, with Nemerow PLI identifying Mirertake, Jadurchar, and Jaynabari as highly polluted. Cd, Pb, and Ni were major pollutants based on Igeo. Cu had the highest PTF (2.28). Rice contained Pb, Cd, and Cr above safe limits, and EDI values for Pb and Cr exceeded recommended thresholds. Carcinogenic risks were significant for Cr (0.01599) and Cd (0.0061), indicating unsafe rice due to toxic metal accumulation linked to industrial contamination.

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1.37 Trace Metal Contamination in Small Indigenous Fish Species (SIS) from Kaptai Lake, Bangladesh: Implications for Food Safety and Human Health.

S. Akter Y. N. Jolly, J. Kabir, S. Hossain, K. M. Mamun and T. Tabassum*

The primary objectives of this study are to determine trace metal concentrations in small indigenous fish species (SIS) from Kaptai Lake, assess food safety risks by comparing with international standards, and evaluate potential human health risks Fish samples from Kaptai Lake were analyzed for trace metals including arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), and zinc (Zn) using the Energy Dispersive X-ray Fluorescence (EDXRF) technique. The measured metal concentrations were compared with World Health Organization (WHO) permissible limits to evaluate food safety. Health risk assessments, including Estimated Daily Intake (EDI), Target Hazard Quotient (THQ), and Carcinogenic Risk (CR), were conducted to determine the potential impact of consuming these fish on human health. This work is in progress.

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1.38 Phytochemicals Profiling of *Ziziphus mauritiana* (Boroi Pata) Leaf Extract using GC-MS

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This study was conducted to identify the phytochemical constituents present in the ethanolic extract of *Ziziphus mauritiana* (Boroi)leaves using Gas Chromatography-Mass Spectrometry (GC-MS), with a focus on compounds that may have reduced agent and caping agent for nanoparticles synthesis, pharmaceutical, aromatic, or industrial applications. Fresh leaves of *Ziziphus mauritiana* were collected, thoroughly washed, air-dried, and pulverized. The powdered sample was extracted using ethanol through a soxhlet extractortechnique. The ethanolic extract was subjected to GC-MS analysis. The instrument conditions were optimized for accurate compound detection, and identification was based on matching mass spectra with entries in the NIST GC-MS database. A total of 24 different compounds were identified in the leaf extract of *Ziziphus mauritiana*. These include fatty acids, esters, aromatic compounds, hydrocarbons, aldehydes, alcohols, and heterocyclics. Some of the compounds are known for their antioxidant, antimicrobial, flavoring, and cosmetic properties. The phytochemical profiling of *Ziziphus mauritiana* leaf extract confirms the presence of a diverse array of bioactive compounds. Notably, 2-Hexadecen-1-ol (10.45%), Cetene (9.49%), and Methanamine (6.14%) were found in significant proportions. These compounds possess valuable pharmacological, antioxidant, and cosmetic properties, supporting the plant's traditional uses in herbal remedies and indicating potential for industrial applications in pharmaceuticals, perfumery, food additives, and cosmetics.

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1.39 Impact of Environmental Pollution on Food Safety: A Comprehensive Study of Heavy Metals Contamination in Dhaka Street Foods.

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The primary objective of this study was to evaluate the levels of metal contamination in Fuchka (a popular street food) and accompanying tamarind water, and to assess the potential environmental and human health risks associated with their consumption. Samples were collected from various vendors, and concentrations of key heavy metals—such as Lead (Pb), Cadmium (Cd), Chromium (Cr), and Iron (Fe)—were analyzed using standard methods. Health risk assessments, including Estimated Daily Intake (EDI), Target Hazard Quotient (THQ), and Hazard Index (HI), were calculated to estimate non-carcinogenic risks to consumers. Findings revealed that Pb and Cd levels in several samples surpassed WHO/FAO permissible limits, suggesting potential health hazards. Deterministic risk assessments showed THQ and HI values >1, indicating significant non-carcinogenic risk, particularly with frequent consumption. Probabilistic outputs from the Monte Carlo simulation reinforced these concerns, revealing a high probability (>70%) of HI exceeding the safe threshold. Sources of contamination likely include polluted water, environmental deposition, and inadequate hygiene practices. The integration of simulation modeling strengthens the robustness of the health risk assessment, highlighting the urgent need for regulatory interventions, vendor hygiene training, and continuous monitoring to mitigate toxic exposure.

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Atmospheric and Environmental Chemistry

1.40 Performance Evaluation of Different Textile Effluent Plants in Bangladesh

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The textile industry significantly contributes to Bangladesh's economy but is a major source of environmental pollution, especially through untreated wastewater. This study assessed the performance of Effluent Treatment Plants (ETPs) in Gazipur, Narsingdi, and Ashulia, focusing on heavy metal contamination. Water samples from five ETPs (both inlet and outlet) were analyzed for metals such as Cr, Mg, Pb, Cd, Ni, and Hg. While most samples met WHO, ZDHC, DoE, and USEPA standards, elevated levels of Cr, Ni, and Hg in both inlet and outlet waters revealed treatment inefficiencies. Pollution indices indicated generally low contamination, but cadmium showed the highest pollution index (2.154 at I-5). Factory 3 had the highest treatment efficiency (12.9%), while Factory 4 had the lowest (-85.3%). The heavy metal evaluation index

ranged from 2.762 to 6. 265. Health risk assessments showed that THQ and HI values exceeded safe limits, particularly for arsenic and nickel, indicating potential non-carcinogenic and carcinogenic risks. Children were more vulnerable, with the highest hazard levels recorded at site I-1. Nickel posed the greatest carcinogenic risk. The study underscores the need for more effective ETPs and stricter regulatory enforcement to minimize health and environmental risks associated with textile wastewater in Bangladesh.

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1.41 Holistic Risk Assessment of Heavy Metal Contamination in Coastal Zones Under Diverse Anthropogenic Pressures in a Developing Nation

Y. N. Jolly,J. Kabir, S. Akter, S. Hossain K. M. Mamun and Tareque Bhuiyan*

To evaluate risk assessment of heavy metal contamination in coastal zones under diverse anthropogenic pressures in a developing nation**.** Growing concerns over heavy metal contamination in coastal environments are linked to increasing anthropogenic pressures. This study assessed the levels, sources, and risks of eight heavy metals (As, Cd, Cr, Fe, Mn, Ni, Pb, Zn) in sediments from coastal zones impacted by aquaculture, tourism, power generation, and industry. Fe and Mn were most abundant due to natural origins, while Zn and Cr dominated among trace metals. Cd showed significant enrichment, indicating localized pollution. Although metal concentrations were lower in some areas, industrial and tourist zones exhibited the highest ecological risks. Risk indices (EF, PERI, mHQ, RI) identified Cd and Cr as key threats. Human health assessments revealed Cr (carcinogenic) and Fe (non-carcinogenic) posed the greatest risks, particularly for children near the sea beach. The study underscores the urgent need for stricter regulations, effective waste management, and regular environmental monitoring.

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1.42 Effectiveness of Artificially Planted Mangroves on Remediation of Metals Released from Ship-Breaking Activities

Y. N. Jolly,J. Kabir, S. Akter, S. Hossain , K. M. Mamun and Shima Akter*

The study investigated the extent of potentially toxic metal contamination and assessed the phytoremediation efficiency of three planted mangrove species—Avicennia marina, Bruguiera gymnorhiza, and Excoecaria agallocha—in reducing pollution levels. The results indicated that the mean concentrations of elements in the sediment of the area followed a descending sequence: Fe (27,136.67 ± 929.57 mg/kg) > Ti (3371.53 ± 228.08 mg/kg) > Sr (198.59 ± 37.43 mg/kg) > Zr (159.49 ± 22.35 mg/kg) > Rb (159.11 ± 17.63 mg/kg) > Cu (82.73 ± 5.01 mg/kg) > Zn (61.29 ± 2.42 mg/kg). The comprehensive assessment of pollution indices, encompassing enrichment factor (EF), contamination factor (CF), pollution load index (PLI), and geo-accumulation index (Igeo), elucidated a low to medium contamination level, particularly regarding Cu, primarily attributed to anthropogenic sources. Correlation analysis and principal component analysis (PCA) unveiled the influence of anthropogenic activities on heavy metal distribution. Evaluating the phytoremediation potentiality via bioconcentration factor (BCF) and translocation factor (TF) revealed limited metal accumulation in plant tissues, yet TF values exceeding 1 demonstrated efficient metal translocation from roots to aerial parts. Remarkably, Excoecaria agallocha exhibited the greatest phytoremediation potential, effectively translocating metals such as Cu and Zn to aerial parts (TF > 1). Thus, the intricate interplay between mangrove species and their environmental setting emerges as pivotal in curbing heavy metal transfer to neighboring estuarine and marine ecosystems

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1.43 Assessment of Heavy Metal Contamination in Blue Swimming Crab (*Portunus pelagicus*) and Mud crab (*Scylla olivacea*) from Cox's Bazar, Bangladesh, and their Potential Impact on Human Health

Y. N. Jolly,J. Kabir,S. Akter S. Hossain K. M. Mamun and Ainun Nahar*

This study investigated the accumulation of ten trace metals—chromium (Cr), manganese (Mn), iron (Fe), nickel (Ni), copper (Cu), zinc (Zn), arsenic (As), selenium (Se), mercury (Hg), and lead (Pb)—in two economically important crab species: the blue swimming crab (*Portunus pelagicus*) and the mud crab (*Scylla olivacea*), collected from Boro Bazar in Cox's Bazar, Bangladesh**.** A total of 14 crab samples were analyzed using Energy Dispersive X-ray Fluorescence (EDXRF) to determine trace metal concentrations in flesh and

shell tissues. Significant interspecies and tissue-specific variations were observed. *Portunus pelagicus* showed higher levels of arsenic (26.04±7.00mg/kg), lead (2.91±0.32mg/kg), and mercury (2.91±0.33mg/kg), while *Scylla olivacea* had elevated copper (40.58±6.86mg/kg) and zinc (211.54±10.68mg/kg). Shells accumulated more Mn and Fe, but toxic metals were concentrated in edible flesh. Although most Estimated Daily Intake (EDI) values were within safe limits, THQ values for arsenic and mercury exceeded thresholds. Hazard Index (HI) values indicated notable non-carcinogenic risks, and carcinogenic risk assessments for lead and arsenic surpassed USEPA limits. These findings highlight potential health risks and emphasize the need for regular monitoring and pollution control in coastal regions.

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1.44 Petrography and Geochemistry of the Dupi Tila Formation: Implications for Depositional Environment and Tectonics.

Y. N. Jolly, J. Kabir, S. Akter, S. Hossain, K. M. Mamun and Ummae Habiba Sultana*

To analyze the mineralogical and geochemical characteristics of detrital sandstones and associated soils from the Dupi Tila Formation in the Sylhet Trough, with the aim of determining sediment provenance, depositional environment, and weathering history. This study focuses on soil samples collected from Dupi Gaon (Jaintiapur) in the Sylhet Trough, Bangladesh. Detailed analyses were conducted using field observations, X-ray diffraction (XRD), X-ray fluorescence (XRF), petrography, and heavy mineral separation techniques. Field characteristics revealed variable soil colors and moderate softness with thicknesses ranging from 15 cm to 4 m. XRF results showed high concentrations of SiO_2, Al_{23}, and Fe_2O_3, with consistently elevated levels of Zr and Cu. XRD and petrographic analysis identified quartz as the dominant mineral, along with muscovite, biotite, rutile, and magnetite. Heavy minerals such as zircon, garnet, goethite, and rutile were also observed. The results suggest a felsic igneous source, moderate to high chemical weathering, and an insitu origin of the sediments, providing valuable insights into the geological history and sediment transport processes of the Dupi Tila Formation.

1.45 Bioavailability and Toxicity of Heavy Metals and Microplastics in Shellfish (Meretrix lyrata): A Preliminary Study in the Bay of Bengal

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Microplastics (MPs) and heavy metals (HMs) pollution pose significant environmental threats by accumulating in marine species, leading to potential health risks for marine life and humans consuming contaminated seafood. However, limited research has been conducted on the bioavailability and toxicity of MPs and HMs in the marine biota of the Bay of Bengal, Bangladesh. In this study, the bioavailability of some HMs (i.e., Ni, Pb, Cd, and Cr) and MPs in a common marine shellfish (Meretrix lyrata) of the Bay of Bengal having nutritional and economic importance, and their human health risks due to the consumption of M. lyrata mussels has been evaluated. The mean concentrations of Ni, Pb, Cd, and Cr in the samples were determined spectrophotometrically and found as 5.54, 45.65, 0.51, and 33.51mg/kg, respectively, which are higher than the maximum permissible limit set by different national and international guidelines.

1.46 Optimization of Green Silver Nanoparticles as Nanofungicides for Management of Rice Bakanae Disease

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Rice bakanae, a devastating seed-borne disease caused by Fusarium species requires a more attractive and eco-friendly management strategy. The optimization of plant-mediated silver nanoparticles (AgNPs) as nanofungicides by targeting Fusarium species may be a rational approach. In this study, Azadirachta indica leaf aqueous extract-based AgNPs (AiLAE-AgNPs) were synthesized through the optimization of three reaction parameters: A. indica leaf amount, plant extract-to-$AgNO_3$ ratio (reactant ratio), and incubation time. The optimized green AgNPs were characterized using ultraviolet–visible light (UV–Vis) spectroscopy, field emission scanning electron microscopy (FESEM) with energy dispersive X-ray (EDX) spectroscopy, transmission electron microscopy (TEM), dynamic light scattering (DLS), and powder X-ray diffraction (XRD) techniques.

1.47 Impact of COVID-19 on Urban Environment in Developing Countries: Case Study and Environmental Sustainability Strategy in Bangladesh

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As of 2023, Bangladesh stands as the seventh most populous nation globally, confronting challenges arising from limited resources and rapid urbanization. The emergence of the COVID-19 pandemic has led to unprecedented disruptions on a global scale, necessitating a detailed examination of its effects, particularly within urban environments. This study meticulously scrutinizes the repercussions of COVID-19 on the urban environment, focusing specifically on Dhaka City. In this comprehensive exposition, we explore the multifaceted impact of the COVID-19 outbreak, spanning environmental and non-environmental aspects like urban water quality, air quality, municipal waste management, and noise pollution. We analyze urban environmental data across distinct timeframes, employing the Indicators, Impact, and Strategy (IIS) framework for environmental improvement and urban sustainability.

1.48 Characterization, Source Identification and Hazard Index Assessment of Ingested Microplastics in farmed tilapia Oreochromis Niloticus

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Plastic pollution is ubiquitous in marine and freshwater environments. Tilapia Oreochromisniloticus is one of the most important cultured fish species in South Asia. However, limited research has been conducted on the impact and hazard risk assessment of microplastic (MP) pollution on tilapia. This study characterized ingested MPs and identified potential sources of MPs in the gastrointestinal tracts (GTs) of farmed tilapia and their health risk assessment. GTs of 36 fish samples were collected from 12 tilapia fish farms in the Noakhali District, Bangladesh. A total of 199 MPs particles were extracted from all fish samples. Mean MPs abundance in tilapia GTs did not significantly vary among fish farms ($F = 1.464$, $p = 0.209$). The highest MPs numbers were 8 to 10 MPs/GT in tilapia collected from Farm 2, while the lowest MPs numbers were 3 to 5 MPs/GT from Farm 9. This study revealed that fibres were the dominant form.

1.49 "Microplastic Seasoning": A Study on Microplastic Contamination of Sea Salts in Bangladesh

M.S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, M.A.M. Siddique, A. Uddin, M.S. Hossain, S.M.A. Rahman, G. Kibria, G. Malafaia

This study investigated microplastics (MPs) in commercial sea salts from Bangladesh. The presence of MPs in the 18 sea salt brands was 100%, where the mean MPs abundance was 471.67 MPs/kg, ranging between 300 and 670 MPs/kg. The maximum number of MPs in the 300–1500 μm size class was significantly higher than the 1500–3000 μm and 3000–5000 μm size class. The most dominant color was black. Fibers and foams were the dominant shapes. The highest number of MPs was 41%, obtained from coarse salt grains. Four types of polymers were mainly identified from the analyzed samples: PP, PE, PET, and PA. The mean polymer risk index value among these sea salts was 539 to 1257. The findings of this study can be helpful for consumers, salt industries, and policymakers to be aware of or reduce MP contamination levels in sea salts during production and consumption.

1.50 Pollution Status and Ecological Risks of Metals in Surface Water of a Coastal Estuary and Healthrisk Assessment for Recreational Users

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Since the areas close to the Sundarbans mangrove estuary, which is one of the most dynamic and productive ecosystems in the world, are very suitable for urban and industrial activities, the coastal areas of this ecosystem are constantly exposed to metal contamination. In this study, we analyzed the levels, spatial distributions, sources, pollution status, ecological risks, and health risks for recreational users of 16 metals in surface water collected from 18 sampling sites in the Sundarbans estuary. Considering the mean values of metals, Sr (2523 μg/L), Al (1731 μg/L), B (1692 μg/L), and Fe (1321 μg/L) were the most abundant metals in the coastal waters of the estuary, while Cd (0.977 μg/L), Ni (3.11 μg/L), Cu (5.98 μg/L), and Cr (9.77 μg/L) were the less abundant metals. All metals except Zr had coefficient of variation (CV) values over 35%, suggesting strong variability.

1.51 Smart Prediction and Optimization of Air Quality Index with Artificial Intelligence

M.S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, M. Mubeen, S. He, L. Wang, X. Zhang, B. Ahmed, Z. He, Y. Han

Air pollution, a critical environmental issue, necessitates urgent action. It originates from both human activities, like industrial emissions and vehicle pollution, and natural events such as sandstorms, leading to increased atmospheric pollutants such as sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ammonia ion (NH_4^+), black carbon, ozone, and fine particulate matter ($PM_{2.5}$). Leveraging China's extensive air quality monitoring data, artificial intelligence (AI) was used in this study to enhance air quality prediction and management. The study aims to utilize the vast air monitoring data more effectively by developing advanced air quality assessment methods and AI models. An AI-based method presented in this study was applied to train extensive air quality data, enabling an intelligent air quality index (AQI) that swiftly and accurately reflects air quality status, to assess impacts on sensitive groups, and to predict future trends.

1.52 Potential Toxic Elements in Surface Water of Mokosh Beel, Gazipur, Bangladesh: Ecological and Human Health Risk Assessment for Recreational users

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Mokosh Beel, a significant wetland in Bangladesh, is increasingly impacted by industrial effluents, leading to potential ecological and human health risks. This study evaluates the surface water quality of Mokosh Beel by analyzing both physicochemical parameters (pH, DO, EC, TDS, and salinity) and the concentrations of potential toxic elements (PTEs) (i.e., Mn, Cu, Ni, Pb, As, Cd, Co, Cr, Sb, and Zn). The findings reveal that most water quality parameters, except pH, exceeded local and international guidelines, indicating poor water quality. Among the PTEs, Mn (269.13 μg/L), Cr (33.20 μg/L), and Pb (71.47 μg/L) surpassed recommended safety limits. The spatial distribution analysis identified Mn and Pb as the primary pollutants based on the single-factor pollution index.

1.53 Incorporating Source Apportionment and Health Risk Assessment of Heavy Metals from Indoor Dust of an Industrial Area in Dhaka, Bangladesh

M.S. Rahman, M. A. Mottalib Sarkar, M. Hasan, S. Akhter, Y.N. Jolly, T.R. Choudhury, K.M.A. Hussain, S.M.M. Rahman, R. Islam, B.A. Begum

A total of 45 deposited dust samples were collected from the preselected 15 households near an industrial area at Savar, Bangladesh. The concentrations of metals were measured by EDXRF spectroscopy and was found at the following trend: Ca > Fe > K >Ti>Mn>Zr>Sr>Rb> Zn > Cu >Pb> Co. The average concentrations of Cu, Zn, Zr, and Pb were found to be higher than that of the soil background values set by Chinese Environmental Protection Administration (CEPA) and the upper continental crust (UCC), while the average concentrations of K, Ti, Fe, and Rb were found to be higher than that of the background values and lower than that of UCC. Alternately, %RSD for some toxic metals (i.e., Fe, Co, Zn and Pb) in the dust samples were ranged broadly (%RSD: 33.54–86.88%), which indicates that these trace metals might be present in indoor dust samples due to anthropogenic sources.

1.54 Tracing Sources-Oriented Ecological Risks of Metal (Loid)S in Sediments of Anthropogenically-Affected Coastal Ecosystem from Northeast Bay of Bengal

M.S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, A.R.M.T. Islam, M.N. Uddin, M.F.R. Joy, R. Proshad, T. Kormoker, A.H. Anik, M.A.B. Siddique, M.A. Alshehri

The current study focused on thirty-nine locations in the four islands (i.e., St. Martin, Moheskhali, Kutubdia, and Sonadia) and beach (Innani Beach) along the northeast Bay of Bengal to quantify sources-orientated ecological risks of metal(loid)s. The mean concentrations of As, Mn, Cr, Cd, and Pb are 4.8, 8.7, 1.6, 1.1, and 2 times higher than average shale volume (ASV) values. Key findings revealed that Mn, Cr, Cd, Pb, and As exceed safe levels, particularly on St. Martin and Moheshkhali islands, where tourism and coal mining intensify contamination. Ecological indexes showed moderate to considerable contamination levels, suggesting diverse impacts on aquatic life. Positive matrix factorization (PMF) model-based Nemerow integrated risk index (NIRI) indicated that mixed and coal mining sources posed a moderate risk for 10.26 % and 5.13 % of sediment samples, respectively.

1.55 Trace Element Contamination in Water and Sediment in an Estuarine Ecosystem Connected to The Bay of Bengal: A Preliminary Assessment of Ecological and Human Health Risks

M.S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, A. Ghosh, K.D. Karmaker, M. Hasan, M. Rahman, N.J. Shimu, M.S. Islam, M.S. Hossain, Z. Ismail

The research, focusing on the analysis of nine trace elements, namely As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, and Zn, completely analyzed their quantities in both water and sediment inside the RabnabadChannel. Samples were collected during the post-monsoon and analyzed by ICP-OES following acid digestion. The mean concentrations of elements in water and sediments are as follows: Fe >Mn>Pb> Cu > Ni > Zn > Cr > As>Cd, and Zn > Fe >Pb>Mn> As>Cu > Cr > Ni > Cd. To understand the state of ecological and human health risk, several indices were incorporated. Health risk assessment revealed that children posed higher risk than adults. PERI, TRI, and Igeo indices for water sediment indicate a significant ecological risk. Moreover, Mn and Pb exhibit elevated HPI values and contribute substantially to contamination factors.

1.56 Potential Health Risks Associated with Biochar from Production to Field Application

M.S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, S. Mia, S.Y. Bristy, K. Jindo, M.N.H. Munna, M.M. Rahman, K. Uddin, S. Kasim

Biochar remains one of the most researched topics in the last decade for its multifaceted potential benefits, e.g., climate change mitigation, soil fertility improvement, and environmental remediation. However, the biochar production and application did not follow the same pace as the literature did. The less adoption of this technology in the fields may include a high price involved in biochar production, and less availability of biomass for pyrolysis, while it also carries potential risks. Despite the extensive literature on biochar, biochar production, and application risks have yet to be studied adequately. Here, we provide a comprehensive overview of the health risks associated with biochar from production to field application. Our synthesis showed that the major health risks are exposure to pathogens and heavy metals during biomass collection; sorting, heat, and smoke exposure during production.

1.57 Optimization of Green Silver Nanoparticles as Nanofungicides for Management of Rice Bakanae Disease

M.S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, Q.S.A. Jahan, Z. Sultana, M.A. Ud-Daula, M. Ashikuzzaman, M.S. Reja, M.M. Rahman, A. Khaton, M.A.K. Tang, H.M. Faruquee, S.J. Lee, A.T.M.M. Rahman

Rice bakanae, a devastating seed-borne disease caused by Fusarium species requires a more attractive and eco-friendly management strategy. The optimization of plant-mediated silver nanoparticles (AgNPs) as nanofungicides by targeting Fusarium species may be a rational approach. In this study, Azadirachtaindica leaf aqueous extract-based AgNPs (AiLAE-AgNPs) were synthesized through the optimization of three reaction parameters: A. indica leaf amount, plant extract-to-AgNO3 ratio (reactant ratio), and incubation time. The optimized green AgNPs were characterized using ultraviolet–visible light (UV–Vis) spectroscopy, field emission scanning electron microscopy (FESEM) with energy dispersive X-ray (EDX) spectroscopy, transmission electron microscopy (TEM), dynamic light scattering (DLS), and powder X-ray diffraction (XRD) techniques.

1.58 Assessment of Surface Water Quality and Heavy Metal Contamination in Meherpur District, Bangladesh

M.S. Rahman,M. M. Hasan, M. A. Mottalib Sarkar, S.M. Samrat, S. Akter, Jamal Uddin

This study evaluates surface water quality and heavy metal contamination in Meherpur District, Bangladesh, focusing on public health and ecological risks. Thirty water samples were collected from rivers, ponds, and lakes, and analyzed for physicochemical parameters (pH, temperature, turbidity, DO, TDS, BOD) and six heavy metals (Cd, Cr, Cu, Ni, Pb, Zn) using ICP-MS following APHA methods. Most metal concentrations were within safe limits; however, lead (Pb) exceeded the reference dose in some samples, indicating potential health concerns (HRI > 1). The Pollution Load Index (PLI) identified one polluted site, while the Potential Ecological Risk Index (PERI) showed low risk at 13 sites and moderate risk at 2. Although overall water quality in Meherpur is good, early signs of contamination at certain sites warrant continuous monitoring and effective water management to safeguard environmental and human health.

1.59 Evaluation of Groundwater Quality and Pollution Sources Distribution in Jashore Sadar using Multivariate Statistical Analysis

M.S. Rahman,M. M. Hasan, M. A. Mottalib Sarkar, M. H. Prince, Suvodoy Baida Noyon

This study evaluated groundwater quality in Jashore Sadar by analyzing 30 samples from various land-use zones during the 2025 dry season. Using ICP-OES, concentrations of heavy metals (Cd, Cr, Cu, Ni, Pb, Zn) and physicochemical parameters were measured and compared with WHO and national standards. Pollution was assessed through multiple indices including WQI, HPI, MEI, PLI, EWQI, and GWRI. Results showed 56.7% of samples were good quality, while 26.7% exceeded heavy metal pollution thresholds, mainly due to cadmium and lead, which surpassed limits in over 90% of samples. Although 80% of the area had low pollution, some localized zones showed moderate contamination. Multivariate analyses identified pollution sources as both natural (iron-rich geology) and anthropogenic (industrial effluents and agrochemical runoff), with cluster analysis revealing spatial patterns linked to land use.

1.60 Ecological and Human Health Risks of Heavy Metals in Bagerhat Shrimp Aquaculture: A Multivariate Approach

M. S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, M. S. A. Emon, A. Sultana, and R. Islam

A total of 20 water and 20 shrimp samples were collected randomly from shrimp farms in Bagerhat. Water samples were collected in pre-cleaned plastic bottles, while shrimp samples were washed and homogenized for analysis. Heavy metals including Ag, Al, As, B, Ba, Cd, Co, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Zn and Zr were analyzed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) in Atomic Enegy Centre. Pollution Load Index (PLI) values indicated heavy to extreme pollution in both water and shrimp samples. Ecological risks were evaluated using the Potential Ecological Risk Index (PERI), and human health risks were assessed via USEPA models, accounting for ingestion, inhalation, and dermal exposure. Multivariate statistical techniques such as PCA and Cluster Analysis identified potential anthropogenic sources of contamination, including feed inputs and agricultural runoff. Children were found to be more vulnerable to health risks due to higher exposure pathways.

1.61 Heavy Metal Contamination in Atmospheric Deposited Dust from Residential Areas Adjacent to Low and High Traffic Zones and their Health Risk Implications

M.S Rahman, M. M. Hasan, M. A. Mottalib Sarkar and Nazifa Nawyal

Fine atmospheric dust from residential sunshades and walls showed significantly higher Cr, Ni, Cu, Zn, Co, Ba, and Ti levels in high-traffic areas. Pollution indices (EF, Igeo, CF) indicated moderate to high Cd, Pb, Cu, Zn, Ni, and Cr contamination in both zones. Health risk assessments revealed elevated non-carcinogenic (HI: 4.44 in children) and carcinogenic risks (total CR: 6.34×10^{-6}), mainly via Pb and Cr ingestion. Source analysis (PCA, HCA, Pearson) linked metals to traffic, industrial wear, and paint. Wind and spatial maps showed highway dust transport into homes. The study recommends buffer zones and dust barriers to control urban heavy metal pollution. These pollutants pose a serious threat to child health in densely populated neighborhoods. Continuous monitoring and public awareness are essential for effective risk reduction. Urban design must prioritize environmental safety alongside infrastructure growth.

1.62 Heavy Metal Pollution and Risk Assessment in Water and Sediment of a Transboundary Aquatic System: Kalindi Canal and Titas River, Bangladesh

M. S. Rahman, M. M. Hasan, M. A. Mottalib Sarkar, Z. S. Teasa, M. A. Salam

A total of 54 samples (27 sediment and 27 water) were collected from 27 sites along the Kalindi Canal and Titas River to assess heavy metal pollution using ICP-OES at the Atomic Energy Centre, Dhaka. Pollution indices (Igeo, CF, PLI) revealed moderate to considerable contamination, with PLI >1 in 93% of the sites. PERI and TRI indicated significant ecological risk, particularly near the canal–river confluence. Water quality analysis showed metal concentrations exceeding WHO guidelines, with HPI and Nemerow's Index classifying 93% of water samples as unsafe for drinking. Health risk assessment (CDI, HQ, HI, TCR) highlighted ingestion of contaminated sediment as the primary exposure route, posing serious non-carcinogenic and carcinogenic risks, especially to children. Some water samples also showed elevated localized health risks. Multivariate analyses (PCA, HCA, Pearson) linked the contamination to geogenic

sources, industrial activities, and transboundary inflows via the Kalindi Canal. The study underscores the urgent need for pollution control strategies and sustainable watershed management to protect both environmental and public health.

1.63 Elemental Analysis and Potential Health Risk of Indoor Dust in the Vicinity of Barapukuria Coal Mine, Bangladesh

M. S. Rahman,M. M. Hasan, M. A. Mottalib Sarkar, R. Tabassum, M. A. Salam

Indoor dust samples (≤74 μm) were collected, processed, and analyzed for trace metals using ICP-OES. Results showed varying elemental concentrations influenced by proximity to the Barapukuria coal mine. Elevated toxic metals like As, Pb, and Cd were found near mining and transport routes, linked to coal combustion, road dust, and resuspension. Some distant areas also showed high contamination, likely from atmospheric transport. Source analysis (PCA, HCA) identified coal emissions, crustal materials, vehicular sources, and indoor activities as major contributors. The findings suggest that both outdoor and indoor environments contribute to dust contamination. This underscores the complexity of exposure pathways for residents near mining areas. Overall, the study emphasizes the urgent need for targeted mitigation strategies and regular monitoring to reduce health risks.

1.64 Climate Change Implications for Metal and Metalloid Dynamics in Aquatic Ecosystems in the Kirtankhola River of Bangladesh

M.S. Rahman,M. M. Hasan, M. A. Mottalib Sarkar, M. S. Shefa, AKM A. A. Biswas, and A.Siddiqua

Water samples were collected between November and December 2024 and analyzed at the Atomic Energy Commission. Elevated EC and TDS levels at downstream sites indicated possible seawater intrusion linked to climate variability. Trace metals such as Fe, Mn, and Ni exceeded permissible limits in most sites, with pollution indices (HPI, HEI, Cd, NPI, WQI, and EWQI) classifying water quality from good to very poor—especially at downstream sites S9 and S11. Over 16% of samples were unsuitable for drinking and domestic use. Multivariate statistical tools (PCA and Spearman correlation) attributed contamination to both natural processes and anthropogenic sources such as industrial discharges, diesel combustion, and agricultural runoff. Ecological risk assessment highlighted Cd and Ni as major threats to aquatic ecosystems, while health risk models and Monte Carlo simulations confirmed significant long-term exposure risks for children, especially from cadmium, suggesting a carcinogenic potential. These findings underscore the need for integrated climate-adaptive pollution mitigation in the Kirtankhola River basin.

1.65 Spatial Distribution and Ecological Risk Assessment of Potentially Toxic Elements in Topsoils of Coastal Mangrove Floodplains in Bangladesh

T. R. Choudhury, R. Sultana *, M. N. E Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa, S. Sultana,S. B. Quraishi

The objective of this study is to investigate the concentration, spatial distribution, and ecological and health risks of potentially toxic elements (PTEs) in topsoils of the coastal mangrove floodplain in KoyraUpazila, Bangladesh. The research aims to provide baseline data to support environmental monitoring and risk management in this ecologically sensitive region.A total of 60 soil samples were collected from three subdivisions within Koyra Upazila. The samples were digested using a mixture of HNO_3 and $HClO_4$ (4:1) and analyzed by Atomic Absorption Spectroscopy (AAS) using a Varian AA240 FS system. The studied PTEs—Zn, Cr, Pb, Ni, Cd, and Hg—revealed varying concentrations, with Zn showing the highest average levels and Hg the lowest. Statistical distribution analysis indicated skewed data for some metals, influenced by both natural and anthropogenic factors. Pollution indices (Igeo, PLI, NIPI) and PERI results suggest overall low to moderate contamination, with localized pollution of Pb and Zn. Health risk assessments flagged potential non-carcinogenic and carcinogenic risks for children, especially in central and southern zones. Comparison with international soil quality standards confirms that most PTEs are within acceptable limits, emphasizing natural origin but warranting continued monitoring and localized mitigation.

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1.66 Innovative Approaches to Pollution Assessment in Northern Bangladesh: Spatial Mapping and Source Identification of Metal (loid)s in Diverse Soil Types

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The study aims to assess soil pollution risks from heavy metals in Chilmari Upazila, northern Bangladesh, by applying advanced modeling techniques to map contamination zones, identify spatial patterns, and trace pollution sources. The goal is to evaluate environmental resilience and inform strategies for soil quality improvement and sustainable land use. Using the static environmental resilience (Pi) model, geostatistical methods, and self-organizing maps (SOM), pollution hotspots and spatial distributions of metal(loid)s were successfully identified. A total of heavy metals, including Cr, Pb, and As, were found to exceed background levels, particularly in agricultural and industrial soils. Over 70% of sites were contaminated, with notable co-contamination of Pb and Cr. Statistical analysis (one-way ANOVA) revealed strong correlations between metal concentrations and human activities. Positive Matrix Factorization (PMF) attributed pollution sources to lithogenic (43%), agrochemical (41%), and industrial effluents (16%). SOM revealed distinct spatial groupings of metal(loid)s (Pb-Zn, Cr-Cu-Ni, and Co-Mn-As), aligning with PMF findings. The results underscore the urgent need for pollution control policies, industrial emission reductions, and targeted remediation to protect soil health and food security in the region.

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1.67 Decoding Phytoplankton Quality in the Waterways of the Sundarbans Mangrove Forest of Bangladesh

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This study aims to assess the ecological health of the Sundarbans mangrove waterways in Bangladesh by developing a comprehensive Leveraging phytoplankton as bioindicators, the study integrates multivariate ecological parameters—including phytoplankton diversity, heavy metal contamination, and physicochemical factors—to evaluate water quality and ecosystem condition across estuarine zones. Field investigations were conducted at 24 sampling stations along the Pashur River and its estuaries in Bagerhat, Khulna, and Satkhira. Thirty-two variables were analyzed, including ten heavy metals, eight phytoplankton indices, eight physicochemical, and four nutrient parameters. Diatoms dominated the phytoplankton community (93.38%), with Chlorophyta, Charophyta, and Dinoflagellates also present, indicating high biodiversity in estuarine areas and ecological stress in upstream regions. Pollution levels were moderate, as shown by HEI (6.24) and NPI (1.65) in Satkhira and Bagerhat, respectively. Multivariate analyses (RDA and CCA) identified temperature, pH, nitrate, redox potential (ORP), and metal contamination as key drivers for Diatoms, while ammonia and phosphate influenced Chlorophytes and Charophytes. A novel PQI was constructed using Principal Component Analysis (PCA), revealing significant spatial variability—poor quality in upstream (20%) and downstream (18%) regions, and good quality (76%) in estuarine zones, with localized degradation linked to pollution and limited water flow. This PQI framework offers a robust tool for monitoring estuarine ecosystem health, identifying pollution hotspots, and guiding sustainable management in mangrove-rich regions worldwide.

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1.68 Comparative Assessment of Heavy Metal Contamination and Hazards in the Chilai Canal Ecosystem, Gazipur

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To assess the transfer of heavy metals from urban effluents to soil and leafy vegetables, and evaluate the associated health risks to humans through consumption of metal-contaminated plants. Leafy vegetables (*Amaranthusdubius* and *Basellaalba*) were grown using water and soil from the Chilai Canal in Gazipur. Metal concentrations (Pb, Cd, Cr, Cu, Ni, As) were measured using AAS. Results showed elevated metal levels in polluted soils and vegetables—above WHO limits—indicating significant translocation of metals from soil and water to edible parts. Health risk indicators exceeded safe thresholds, suggesting serious long-term health risks from consuming these vegetables regularly.

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1.69 Comprehensive Assessment of Water Quality in the Turag River using Physicochemical Indicators and Pollution Index Approaches

T. R. Choudhury, M. N. E.Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa,S. Sultana

The Turag River, flowing through northern Dhaka and Gazipur, is under increasing environmental stress due to rapid industrialization, particularly in the Tongi area under the Bangladesh Master Plan of 1959. This study aimed to evaluate the river's pollution status and assess potential health impacts on nearby residents. Water samples from 20 locations were collected during both dry and wet seasons. Physicochemical and heavy metal analyses revealed that most parameters were within acceptable limits; however, lead (Pb) levels exceeded safety thresholds, with elevated iron (Fe) levels during the dry season. Dissolved oxygen (DO) levels were critically low, indicating unsuitability for aquatic life or domestic use. Pollution indices such as HEI, HPI, SPI, and NPI revealed the river to be moderately to highly polluted, especially in the dry season. The Health Index confirmed poor water quality in both seasons. Although the Sodium Absorption Ratio (SAR) indicated the water is suitable for irrigation and rooftop gardening, overall contamination (as shown by Contamination Degree) presents significant environmental and public health concerns.

1.70 Comparative Assessment of Physical Parameters and Heavy Metal Pollution in Buriganga River Water Across Two Seasons

T. R. Choudhury, M. N. E. Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa,S. Sultana

The Buriganga River, flowing past the southwestern edge of Dhaka, plays a vital role in the city's environmental and economic landscape. This study aimed to conduct a comparative analysis of the river's surface water quality across two distinct seasons—dry and wet—to evaluate seasonal variations in pollution levels. A total of 16 water samples were collected from different locations along the river during the dry and wet seasons. Heavy metals (Pb, Cr, Cd, Cu, Zn, Ni, Co, Fe, Mn, Na, K, Ca, Mg) were analyzed using Atomic Absorption Spectrometry (AAS), while physicochemical parameters were assessed through standard analytical methods. Dissolved oxygen (DO) levels were consistently below the acceptable range for irrigation and drinking purposes in both seasons, particularly in the dry season. Biological oxygen demand (BOD) levels significantly exceeded safe limits in all samples, indicating high organic pollution. Chemical oxygen demand (COD) was also found above permissible levels, especially in the dry season, suggesting poor water quality unsuitable for aquatic life or domestic use. Among heavy metals, Pb and Cd were present at alarming concentrations during the dry season. Overall, the findings indicate that the Buriganga River is in a critically polluted state—especially during the dry season—posing serious environmental and public health risks.

1.71 Assessment of Heavy Metal Concentration in Sediments and Fish Species of the Maheshkhali Channel: Sources, Distribution and Ecological Impact

T. R. Choudhury, M. N. E. Alam, M. A. Maksud, S. R. Khan, L. N. Lutfa

The objectives were to evaluate the potential ecological risks to the channel's ecosystem using indices such as the Geoaccumulation Index (Igeo), Potential Ecological Risk Index (PERI), and Contamination Factor (CF), and to assess the human health risks from fish consumption through estimated daily intake (EDI), Target Hazard Quotient (THQ), and carcinogenic risk analyses. Sediment analysis revealed a decreasing metal concentration trend of Mn > Ni > Fe > Zn > Pb > Cu > Cr > Cd, with Mn and Ni exhibiting the highest values. Statistical analyses (PCA and Pearson correlation) indicated that anthropogenic activities are a major contributor, particularly influencing Ni and Cu levels, resulting in moderate to high ecological risks for these metals. In native fish samples, heavy metal concentrations were low and within safe limits; the calculated EDI and THQ values were below thresholds for non-carcinogenic risk (all THQs < 1), and carcinogenic risks for Cd and Pb were negligible, suggesting that the consumption of these fish species is safe for human health.

1.72 Investigation of Soil Properties Under Different Agricultural Land uses in Mymensingh District of Bangladesh.

S. Akter Y. N. Jolly, J. Kabir, S. Hossain, K. M. Mamun and N. Jahan*

This study was based on primary data obtained through comprehensive physical and chemical analyses of soil samples collected from various agricultural land-use systems in the Tangail and Mymensingh districts of Bangladesh. The investigated soil parameters included pH, electrical conductivity (EC), total dissolved solids (TDS), salinity, and the concentrations of essential nutrients such as available sodium (Na), phosphorus (P),

zinc (Zn), iron (Fe), manganese (Mn), silicon (Si), exchangeable potassium (K), calcium (Ca), and magnesium (Mg), as well as trace elements including titanium (Ti), nickel (Ni), strontium (Sr), and lead (Pb). Soil pH varied significantly across land-use types, ranging from slightly acidic to moderately alkaline (5.5 to 6.5), while EC and salinity ranged from ~35 µS to ~230 µS, and TDS from ~130 to 131.25 mg/L. Results showed declining levels of nutrients such as P (3.50–23.20 µg/g), Zn (3.27–3.60 µg/g), Mn (21.12–57.90 µg/g), B (0.17–0.60 µg/g), K (0.18–0.30 meq/100g), and Ca (5.75–9.10 meq/100g), while Fe (248.22–161.10 µg/g) and Mg (2.07–1.80 meq/100g) levels increased. Total nitrogen remained relatively unchanged (~0.12%). Notably, Zn, Fe, Mn, and Mg were found above optimum levels, indicating a potential risk of over-fertilization. Meanwhile, nutrients below optimum levels could limit crop productivity. These findings highlight the importance of providing farmers with updated knowledge on soil nutrient status to promote balanced fertilizer use. Moreover, region-specific agricultural technologies and policies should be developed to support sustainable resource management, improve crop yields, and prevent long-term soil degradation.

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1.73 Heavy Metal analysis in Water Samples of Saint Martin Island, Bangladesh.

S. Akter Y. N. Jolly, J. Kabir, S. Hossain, K. M. Mamun and S. Chowdhury*

To determine the heavy metal concentrations and distribution in surface water of Saint Martin Island. Assess contamination levels and potential health risks. Identify anthropogenic sources of pollution. This study investigates the concentration and distribution of selected heavy metals in surface water around Saint Martin Island, Bangladesh. Energy Dispersive X-ray Fluorescence (EDXRF) spectroscopy was employed to analyze the samples. This study analyzed trace elements (As, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sr, and Zn) in water samples. The research assesses contamination levels, evaluates potential ecological and health risks, and identifies likely anthropogenic sources of pollution. Further works are in progress.

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1.74 Heavy Metal Analysis in Sediment Samples of Saint Martin Island, Bangladesh.

S. Akter Y. N. Jolly, J. Kabir, S. Hossain, K. M. Mamun and P. Mistry *

To determine the concentrations of heavy metals (e.g., Ca, V, As, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sr, Zn, Sr, Ti and Th etc.) in surface sediment samples from Saint Martin Island using EDXRF. To assess the contamination levels and evaluate potential ecological and human health risks based on sediment quality guidelines and pollution indices. To identify possible anthropogenic sources contributing to heavy metal accumulation in the coastal sediment environment. This study investigates the concentration and spatial distribution of selected heavy metals in sediment samples collected from the coastal region of Saint Martin Island, Bangladesh. Energy Dispersive X-ray Fluorescence (EDXRF) spectroscopy was utilized to analyze 14 trace elements, including Ca, V, As, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sr, Zn, Ti, and Th. The research aims to assess contamination levels, evaluate potential ecological and human health risks, and identify possible anthropogenic sources contributing to metal pollution. The study is currently ongoing.

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1.75 Assessment of the Radioactivity and Heavy Metal Contamination in Tobacco Products and Radiation dose due to Smoking in Bangladesh.

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This study assessed the levels of naturally occurring radionuclides and toxic heavy metals in tobacco products available in Bangladesh and estimated the radiation dose to smokers. Gamma-ray spectrometry (HPGe) and X-ray fluorescence (SSD detector) were used to measure radioactivity and elemental concentrations. The mean activity concentrations of ^238U, ^232Th, and ^40K were below global limits; however, the annual effective dose (3.77 mSv/y) and excess lifetime cancer risk (ELCR) exceeded international safety thresholds. Heavy metals such as Cd, Pb, and Cr showed elevated cancer risk, and essential elements like K and Ca were present in high amounts. Gross alpha and beta activities were also measured. The findings reveal that chronic tobacco smoking poses significant radiological and toxicological health risks, particularly in densely populated countries like Bangladesh, emphasizing the need for regulatory action and public health awareness.

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1.76 Interaction Determination of Polycyclic Aromatic Hydrocarbons in Ambient Air of Dhaka, Bhola, and Comilla Using GC-MS Technique

Md Saiful Islam, Abdus Salam and Md Shohel Rana

To ascertain the amount of polycyclic aromatic hydrocarbons (PAHs) in ambient air particulate matter, high-volume air sampler has been used to collect air samples from three different parts of Bangladesh: Comilla (semi-urban), Bhola (coastal), and Dhaka (urban). Gas Chromatography–Mass Spectrometry (GC-MS) would be used to examine the collected samples in order to determine the specific PAH components, measure spatial variability, and study the possible sources and health effects of PAH pollution. Samplesare being collected from the mentioned sampling areas over eight months period (since November 2024). The collected samples have been stored in the refrigerator at 4^0C. Samples were extracted using DCM and/acetone: hexane mixture and were preconcentrated by gentle nitrogen flow. Samples are now being analyzed by GC-MS/MS technique to quantify the investigated PAHs molecules.

1.77 Evaluation of Heavy Metal Concentrations in Ambient Particulate Matter using ICP-MS: A Case Study of Dhaka, Bhola, and Comilla

Md Rakibul Omar, Abdus Salam and Md Shohel Rana

Determining the concentration of heavy metals present in ambient air particulate matter collected over a 24-hour period using high-volume samplers from three distinct locations in Bangladesh—Dhaka (urban), Bhola (coastal/rural), and Comilla (semi-urban), samples were analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) to determine the spatial variation and potential sources of heavy metal pollution, and to assess their implications for air quality and public health. Sampling has been done in three locations in Bangladesh: Dhaka, Comilla, and Bhola since November 2024 which were kept in the refrigerator at 4^0C. Afterward, 70% HNO_3 was used to digest the filter paper, and it was left overnight to finish the process. The solution was heated to 120 degrees Celsius for an hour in the following day. After adding 2 mL of H_2O_2 to the solution, it was heated for one to two hours until there were only 1-2 mL of solution left in the beaker. The stock solution was then put in a jar after being filtered using Whatman 42 filter paper to make it 25ml volume by deionised water. 1 ml of the stock solution was transferred to the falcone tube, making it 10 ml, after being filtered using a disk filter. And the solutions were tested in the ICP-MS. Currently, data are being analyzed to correlate the spatial distribution of PAHs molecules in the subjected areas.

1.78 Marine Environmental Organic Pollution: An Assessment of Polycyclic Aromatic Hydrocarbons (PAHs) in Sediments of Cox's Bazar Sea Beach

A. R. M. Tareq, M. S. Islam*, M. F. Ehasan, R. Sultan, A. K. M. Atique Ullah and M. A. Salam*,

As part of Bangladesh's commitment to developing a sustainable blue economy, this study was initiated to assess organic pollution—specifically polycyclic aromatic hydrocarbons (PAHs)—in the surface sediments of Cox's Bazar Sea Beach. The aim was to determine contamination levels, identify pollution sources, and evaluate potential ecological and human health risks, supporting national environmental protection strategies and Sustainable Development Goal (SDG) 14.A total of 34 surface sediment samples were collected from 17 intertidal stations along the Cox's Bazar–Teknaf Marine Drive. PAH analysis using Gas Chromatography-Mass Spectrometry (GC-MS) revealed total PAH concentrations ranging from 89.27 to 2348.91 ng/g dry weight, indicating spatial variability in pollution levels. Key pollutants included Naphthalene, Chrysene, Anthracene, and Benzo(a)pyrene. Ecological risk assessment showed severe risk from Naphthalene, with Risk Quotients exceeding safety thresholds. Health risk assessments indicated that children face significantly higher exposure and non-carcinogenic risks (Hazard Index = 104.02) compared to adults. Carcinogenic risk from Benzo(a)pyrene also exceeded acceptable limits, particularly for children (2.00E-04). Source apportionment using Pearson correlation, diagnostic ratios, Principal Component Analysis (PCA), and cluster analysis identified both petrogenic (oil-related) and pyrogenic (combustion-related) sources. Stations S6 and S9 emerged as pollution hotspots requiring immediate attention. The findings emphasize the urgent need for targeted coastal pollution control strategies and strengthen the case for environmental policy integration to preserve marine ecosystems.

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1.79 Identification and Quantification of Phenolic Precursors in Brown Carbon Emissions from Biomass and Mosquito Coil Combustion

A. R. M. Tareq, M. F. Ehasan, R. Sultana, M. H. Shakil*, and A. Salam*

This investigation focuses on identifying and quantifying the phenolic compounds in brown carbon (BrC) emissions from biomass and mosquito coil combustion—key contributors to atmospheric organic aerosols. The study also explores the relationship between phenolic content and the optical behavior of BrC. Fine particulate matter (PM) was collected from the combustion emissions of biomass and mosquito coils at three urban locations in Dhaka. The chemical analysis of these samples was conducted using Gas Chromatography–Flame Ionization Detection (GC-FID) to identify and quantify eight target phenolic compounds: Phenol, 2-Methylphenol, 3-Methylphenol, 2,4-Dimethylphenol, 2-Methoxyphenol, 2,4,6-Trichlorophenol, 2-Hydroxyphenol, and 4-Nitrophenol. The dominant phenolics were phenol, 2-methoxyphenol, 2,4,6-trichlorophenol, 2-hydroxyphenol, and 4-nitrophenol. Phenol content ranged from 5.6% to 16.3%, with softwood showing the highest levels. Leaves produced the most 2-hydroxyphenol (35–40.8%) and 4-nitrophenol (19.4–49.7%). These phenolic compounds correlated with increased optical activity, confirming their role as BrC precursors. The study concludes that hardwood combustion emits fewer harmful phenols, making it a cleaner fuel source, while leaves and coils contribute significantly to BrC formation and atmospheric pollution.

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1.80 Comparative Analysis of Groundwater and Tap Water Quality in Dhaka City, Bangladesh: Evaluating Indices, Corrosion Potential, Human Health Risk Assessment, and Pollution Source Appointment

M. N. E. Alam, T. N. Ariyan*, A.Khaleque*, M. A. Maksud, S. R. Khan, L. N. Lutfa, T. R. Choudhury, S. B. Quraishi

Dhaka being one of the most densely populated metropolitan megacities of the world, situated in a developing country, is no different. In this study, the ultimate goal was to assess the Comparative Analysis of Groundwater and Tap Water Quality of Dhaka city, Bangladesh. In this study, cumulatively, 35 samples were collected from separate locations of Dhaka city. Heavy metal (Fe, Mn, Cd, Co, Cr, Ni, Cu, As, Hg, Zn, and Pb) concentrations were determined using Atomic Absorption Spectrometer (AAS) and physico-chemical parameters were measured using Muti-parameter (pH, DO, EC, TDS, Salinity), Thermometer, (Temperature), Turbidity meter (Turbidity) and Titrimetric method (Cl-, Total hardness, Total alkalinity, Ca and Mg) and UV-spectrophotometer (SiO2 and SO42-). In this study, it was found that amongst the assessed heavy metals, Hg (1.18±0.007 ppb) concentration was found at an alarming amount. Mn and Fe were also a matter of concern. The analyzed indices alluded that tap water and ground water of Dhaka city was in the range of very poor (HPI: 95.66, WQI: 84.69), moderately affected or polluted (MI: 2.61, SPI: 0.96) to slight pollution (Pij: 2.61 and NPI: 1.41) and healthy but not tasty (THI: 10.77, 1.8). Throughout the sampling sites, Matuail, followed by Jurain, were found to be the most hazardous ones.

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1.81 Assessment of Health Risk due to Soil Pollution by Polycyclic Aromatic Hydrocarbons in the Vicinity of Brick Kiln of Cumilla District

R. Sultana, M. F. Ehasan, and A. R. M. Tareq

Polycyclic aromatic hydrocarbons (PAHs) are toxic, carcinogenic organic compounds generated mainly by incomplete combustion of organic matter. In Bangladesh, brick kilns serve as significant sources of PAHs due to the burning of coal, wood, and other fossil fuels. This study focuses on assessing the concentration of PAHs in soils near brick kilns in Cumilla District and evaluating potential human health risks associated with exposure. Twenty soil samples were collected from different sites near brick kilns in Cumilla. Dichloromethane and acetone was used to extract Polycyclic Aromatic Hydrocarbons from the samples and analyzed using Gas Chromatography–Mass Spectrometry (GC-MS). The concentration of PAHs (µg/kg) were found Naphthalene 0.011– 0.039, Acenaphthene 0.010 – 0.023, Fluorene 0.013– 0.046, Phenanthrene 0.033 – 0.049, Anthracene 0.044 – 0.060, Pyrene 0.012 – 0.044, Benzo(a) anthracene 0.009 – 0.033, Chrysene 0.041 – 0.148, Benzo(e)pyrene 0.004 – 0.013 and Benzo(a) pyrene 0.010 – 0.035. The recovery effecency is 67-102%. To estimate the health risk, the Toxic Equivalency Factors (TEFs) were used, focusing on the

carcinogenic PAHs. The Benzo(a) pyrene equivalent concentration (BaPeq) was calculated for high-risk compounds using standard TEFs. Although the absolute concentrations are relatively low, the presence of carcinogenic PAHs like Benzo(a)pyrene and their cumulative toxic equivalency suggest a chronic health risk for populations exposed over long durations, particularly through dermal contact, ingestion, or inhalation of dust particles. The study confirms measurable levels of carcinogenic PAHs in soil around brick kilns in Cumilla. Though current concentrations are low, prolonged exposure could contribute to increased cancer risk. Regular monitoring, improved kiln technology, and soil remediation strategies are recommended to mitigate long-term health impacts.

1.82 Identification of Sources of Fine and Coarse Particulate Matter in Dhaka, Bangladesh

M. A. Mottalib Sarkar, M.M. Hasan and M.S. Rahman

To understand the contribution of possible pollution sources, compositional data for both the coarse and fine fractions samples collected between December 2021 and February 2022 have been analyzed using Positive Matrix Factorization (PMF). The results were compared with the previous source apportionment results. Conditional Probability Function (CPF) plots were developed for each source using local wind data to explore the directionality of local sources. Back trajectory ensemble methods were used to identify potential source regions and pathways of transboundary transport of PM2.5 apportioned sources. The Potential Source Contribution Function (PSCF) domain extended around the receptor site in Dhaka (23.73°N, 90.39°E). The PSCF results are compared to the conditional probability function (CPF) analyses that use 6 hour average local wind directional data to determine the likely directions for the sources. Both PSCF and CPF help to identify the potential source locations, but on different distance scales. These analyses demonstrate that coarse particles are dominated by local sources.

1.83 Status of Fine Particulate Matter in Dhaka City and Estimation of the Respiratory Deposition Doses

M. A. Mottalib Sarkar, M.M. Hasan and M.S. Rahman

This study investigated PM2.5 levels in Dhaka, averaging 70.41 ± 59.08 μg/m³—seven times higher than the WHO guideline of 10 μg/m³. Seasonal patterns showed peak concentrations in winter (142 ± 60.40 μg/m³) and lowest in monsoon. Annual averages from 2017 to 2020 remained consistently high. Five-day backward air mass trajectories were computed using the HYSPLIT-4 model with meteorological data from the Global Data Assimilation System. Long-range source regions were identified using CWT, PSCF, and SQTBA methods. Health impacts were assessed using the Multiple Path Particle Dosimetry Model (MPPD), which estimated PM2.5 deposition in the head, trachea-bronchial, and pulmonary regions of the respiratory tract. The findings indicate significant air pollution and associated health risks in Dhaka.

1.84 Study on the Change of Air Pollution by Fine Particulate Matter with the Variance of Climate in Dhaka.

M. A. Mottalib Sarkar, M.M. Hasan and M.S. Rahman

To detect the transport pathway of air masses and the presence of specific emission sources that enhance the pollution over receptor sites, Back trajectory clustering and the potential source contribution function (PSCF) are employed in the present study respectively. Concentration weighted trajectory analysis using the 5-day back trajectory (by HYSPLIT-4 model) is also employed in the present study to discover the impact of transboundary pollution. Air mass trajectory analysis with HYSPLIT-4 model showed that the long range transport especially from the north and northwesterly countries e.g., Afghanistan, Pakistan, Nepal and various province of India may be appreciably contributed to the PM2.5 concentrations at the study area apart from local emission sources. Hence there was a huge pollution during winter season. Bangladesh and its neighboring countries need to implement necessary measures, such as enhancing the environmental monitoring system and encouraging sustainable industrial and transportation practices, to reduce regional emissions. This study will assist policymakers in developing strategies to mitigate air pollution in the South Asian region.

1.85 Study on the Variation of PM 2.5 and BC in Dhaka in Response to Climate Variability

M. A. Mottalib Sarkar, M. M. Hasan and M. S. Rahman

This study evaluates the seasonal variation of PM2.5 and Black Carbon (BC) concentrations in Dhaka during the winter seasons of 2022 and 2023, highlighting a significant decline from 47.95 μg/m³ in 2022 to 15.75

μg/m³ in 2023. The BC/PM2.5 ratio (0.07–0.27) indicates a substantial contribution of BC to fine particulate pollution. The research also investigates the impact of meteorological conditions, such as low temperature and high humidity, on pollutant concentration levels. Advanced trajectory modeling techniques—Back Trajectory Clustering, PSCF, and Concentration-Weighted Trajectory (CWT) analysis using HYSPLIT-4—were used to trace the origins and transport pathways of pollutants. Findings reveal that transboundary air masses from countries including Afghanistan, Pakistan, Nepal, and India significantly influence Dhaka's air quality, in addition to local sources. These insights emphasize the urgent need for regional collaboration to mitigate cross-border air pollution and support evidence-based policymaking for sustainable air quality management in South Asia.

1.86 Tracing Pollution Pathways: Computational Insights into Long-range Transport and Seasonal Dynamics of PM2.5 in Dhaka

M. A. Mottalib Sarkar, M. M. Hasan and M. S. Rahman

This study investigates PM2.5 pollution in Dhaka throughout 2020 using advanced trajectory-based modeling techniques to trace pollutant sources and transport pathways. Utilizing the HYSPLIT-4 model alongside Global Data Assimilation System meteorological data, the research applies Concentration Weighted Trajectory (CWT), Potential Source Contribution Function (PSCF), and Simplified Quantitative Transport Bias Analysis (SQTBA). Seasonal trends show peak PM2.5 concentrations during winter (94.5 μg/m³), primarily due to biomass burning and atmospheric stagnation. Lower levels were observed in summer, with meteorological factors like rainfall and temperature contributing to pollutant dispersion. Correlation analysis revealed PM2.5 has negative associations with temperature, humidity, and rainfall, and slight positive correlation with wind direction. Source analysis identified Myanmar and Northeastern India as major contributors during post-monsoon, Pakistan and Nepal during pre-monsoon, and the Bay of Bengal during monsoon. These findings emphasize the importance of regional cooperation and the utility of computational tools for effective air pollution management strategies.

1.87 Trajectory Based Analysis for the Probalistics Estimation of Long Range Transport of Air Particulates using NOAA Data

M. M. Hasan, M. A. Mottalib Sarkarand M. S. Rahman

The average PM2.5 concentration was 70.41 ± 59.08 μgm-3 which is seven times of the World Health Organization recommended limit of 10 μgm-3. Seasonal variations of PM2.5 shows the following pattern: winter 142 ± 60.40 > Post-monsoon 70.46 ± 45.17 > Pre-monsoon 60.03 ± 38.95 > Monsoon 29.08± 16.07 μgm-3 respectively. Temporal variation shows that PM2.5 concentrations were 69.32 ± 57.81 (2017) ,73.55 ± 64.20 (2018), 71.85 ± 57.66 (2019) and 67.12 ± 56.01 (2020) μgm-3 respectively during the four year. In this research work, five day backward trajectories arriving at the center of Dhaka were computed by the HYSPLIT-4 model. The meteorological data with a resolution of 1° × 1° was obtained from the Global Data Assimilation System of the US National Centers for Environmental Prediction. Long range sources were spotted by the Concentration Weighted Trajectory (CWT) method, Potential Source Contribution Function (PSCF) and Simplified Quantitative Transport Bias Analysis (SQTBA) method.

1.88 Multi-Seasonal Transboundary Source Mapping of Fine Particulate Pollution in Dhaka using Probabilistic Trajectory-Receptor Methods

M.M. Hasan, M. A. Mottalib Sarkarand M.S. Rahman

This study investigated sources and transport pathways of $PM_{2.5}$ in Dhaka (March 2019–February 2020). Annual average $PM_{2.5}$ (23.82 ± 20.28 μg/m³) and black carbon (7.08 ± 2.89 μg/m³) exceeded Bangladeshi and WHO standards, peaking in winter. Chemical analysis of 90 $PM_{2.5}$ samples identified 18 trace metals. Positive Matrix Factorization indicated >54% of $PM_{2.5}$ mass originated from anthropogenic sources (brick kilns, biomass burning, soil/road dust, motor vehicles). Back-trajectory analysis revealed 41.4% of trajectories originated from north of Bangladesh (Turkmenistan, Iran, Afghanistan, Pakistan, and parts of India), significantly elevating winter $PM_{2.5}$ via long-range transport. Transboundary biomass burning in the Indo-Gangetic Plain substantially impacts Dhaka's air quality.

1.89 Long Term Variations in Particulate Matter and Black Carbon Mass Concentrations in Dhaka City: An Assessment of Temporal Variation, Chemical Characterization and Contributing Sources

M. M. Hasan, M. A. Mottalib Sarkar and M. S. Rahman

PM sampling was performed using a GENT sampler, which collects samples in two size fractions: $PM_{2.5}$ and $PM_{2.5-10}$. Seasonal variations of $PM_{2.5}$ and BC were also studied. It has been observed that in winter both $PM_{2.5}$ and BC has maximum concentrations and the mean concentrations were measured to be 60 µgm for $PM_{2.5}$ and for BC it was 9.5 5 µgm. During this sampling period the maximum PM, and BC concentration was found to be 222.17 µgm and 9.12 µgm respectively. To identify the trace metals in $PM_{2.5}$ a total no of 128 fine samples were analyzed for mass, black carbon (BC) and elemental 5 compositions. Data on the concentrations of 17 elements (Na, Mg, Al, Si, S, Cl, K, Ca, Ti, V, Mn, Fe, Ni, Cu, Zn, Br, and Pb), black carbon and mass were available for data analysis. Source apportionment of the trace elements in $PM_{2.5}$ was done by using Positive Matrix Factorization (PMF) technique. The identified sources include brick kilns, soil dust, road dust, motor vehicle, fugitive Pb, Zn source, Biomass burning and sea salt sources. Among them, Brick kiln contributes the highest followed by road dust and motor vehicle. It was found that more than 49.5% of the fine particle mass comes from anthropogenic sources such as brick kilns, biomass burning, and motor vehicles.

1.90 Chemical Characterization, Seasonal Variations and Source Apportionment of Trace Metals in Ambient Fine Particulate Matter in Dhaka City: A Comparative Study Between the Semi Residential and Industrial Area

M. M. Hasan, M. A. Mottalib Sarkar and M. S. Rahman

The aerosol masses of the fine fractions were determined by weighing the filters before and after exposure using a microbalance (METTLER Model MT5) and $PM_{2.5}$ samples were analyzed by an EEL-type Smoke Stain Reflectometer to measure Black carbon (BC). The trace elements in $PM_{2.5}$ samples were analyzed by using a Thermo Scientific ARL QUANT'X energy dispersive X-ray fluorescence spectrometer (ED-XRF). Data on the concentrations of 18 elements (Na, Mg, Al, Si, S, Cl, K, Ca, Ti, V, Mn, Cr, Fe, Ni, Cu, Zn, Br, and Pb), black carbon, and mass were available for source identifications. Source apportionment was done by using both the multivariate statistical techniques principal component analysis (PCA) and positive matrix factorization (PMF 5.0) methods. This study revealed that the possible sources at the study area are brick kilns, soil dust, road dust, motor vehicle, fugitive Pb, biomass burning and sea salt sources.

1.91 Non-Destructive Determination of Plutonium Isotopic Composition by Gamma Spectroscopy

M. M. Hasan, M. A. Mottalib Sarkar, Peter Karpius, David Lacey and M. S. Rahman

This study utilizes a passive gamma-ray nondestructive assay (NDA) technique to analyze the isotopic composition of plutonium, focusing on the accurate determination of the 240Pu effective fraction. Four certified reference PuO_2 samples from CBNM were measured using a high-purity germanium (HPGe) detector at the IAEA Seibersdorf laboratory. The effect of varying shielding thickness on gamma spectra quality was assessed. Spectral data were processed using two advanced isotopic analysis software tools—FRAM and MGA—while visualization was performed through InterSpec. By analyzing characteristic energy peaks, particularly 239Pu (203.50 keV) and 241Pu (208.00 keV), burn-up indicators were identified. The comparative analysis between measured isotopic compositions and declared values validated the accuracy of the technique. The primary outcome was the calculation of the 240Pu effective fraction, a key safeguard parameter in nuclear material verification. The study confirms the reliability of passive gamma spectroscopy as a powerful method for nuclear safeguards and plutonium characterization.

1.92 Characterization of Optical Properties of Water-Soluble Brown Carbon (BrC) from Biomass and Mosquito Coil Combustion Sources

M. F. Ehasan, R. Sultana, M. H. Shakil*, A. Salam*and A. R. M. Tareq

Brown carbon (BrC) is an important light-absorbing component of atmospheric aerosols, primarily emitted from biomass burning and mosquito coil combustion. This study aims to assess the optical properties of water-soluble BrC derived from different fuel types, with the goal of understanding their impact on atmospheric radiative forcing and identifying cleaner combustion sources. This study examined the

combustion of fourteen biomass materials (hardwood, softwood, and leaves) alongside eight coil brands to produce fine smoke particles. Samples were collected from three distinct locations in Dhaka, Bangladesh. The optical properties of water-soluble brown carbon (BrC) in biomass material and smoked coils using UV-visible spectrophotometer at a wavelength of 365 nm. Specifically, it assesses the absorption coefficients ($b_{abs-365}$), mass absorption efficiency (MAE), absorption angstrom exponent (AAE), and refractive index ($k_{abs-365}$). The results indicated that $b_{abs-365}$ ranged from $1.83\pm0.28\times10^4$ Mm^{-1} to $8.37\pm3.24\times10^4$ Mm^{-1}, with mosquito coils exhibiting higher values compared to other biomass sources, while leaves demonstrated the lowest values. The AAE values varied from 4.34±1.02 to 6.24±0.62, again showing that the coils had larger values than the other samples. The reflective index and MAE spanned from 0.18 to 0.40 and 0.65 m^2/g to 1.39 m^2/g, with the coils also displaying higher measurements. Overall, hardwood combustion showed the lowest BrC optical properties, indicating its suitability as a cleaner fuel alternative.

*Department of Chemistry, University of Dhaka, Dhaka

1.93 Assessment of Polycyclic Aromatic Hydrocarbons (PAHs) in Different fume Generated in Biomass Burning

M. F. Ehasan, R. Sultana, M. H. Shakil*, A. Salam*and A. R. M. Tareq

This study targeted to analyze the fine smoke particle that produces from biomass burning and mosquito coil combustion to assess the concentration levels of different PAHs namely Naphthalene (NaP), Acenaphthene (Ace), Fluorene (FL), Phenanthrene (Phe), Anthracene (Ant), Pyrene (Pyr), Benzo(a) Anthracene (BaA) and Chrysene (Chry). Biomass samples, hard wood (mixed wood, bamboo), soft wood (jute sticks, rice straw, sugarcane bagasse, and corn straw), leaves and mosquito coils were collected from different sources. All biomass samples were burned in closed chamber, after sufficient combustion the air sample was collected in pre-treated quartz filter paper and then the filter papers undergo for extraction process. Mixture of dichloromethane and ethyl acetate were used to extract Polycyclic Aromatic Hydrocarbons (PAHs) from the quartz filter paper. The extracted solution was analyzed with Gas Chromatograph coupled with Mass Spectrometry detector Detector (GC-MS). The results reveal that amongst all the PAHs the presence of Cryseneis most and the average Concentration is 21.81333. And Benzo(e)pyrene having the lowest average Concentration and that is 2.548492.

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Design and Development

1.94 Design and Development of a Database Entitled “ACLM 2023” for the Information Management of Received Samples in Analytical Chemistry Laboratory, Chemistry Division and Urine & Serum Analysis Report Generating System

M. A. Maksud, M. N. E.Alam, S. R. Khan, L. N. Lutfa, S. Sultana, T. R. Choudhury, S. B. Quraishi

Due to ISO 17025 accretidation there are a vast number of samples is received for analysis in Analytical Chemistry Laboratory, Chemistry Division, Atomic Energy Centre Dhaka. It is so tough to manage the information of these received samples in a manual process using Register Book only. So, an electronic database entitled “ACLM 2023” had to develop to manage the sample information as well as generate the analysis report.**“**ACLM 2023” is actually merged two individual Microsoft Access database entitled “ACL Management” and “ACL Reporting” with user friendly interface to manage the sample information and generate the urine & serum sample analysis report respectively. Multiuser access feature through intranet is available in these database. Since it is made for own use at own workplace, no maintenance costs are required. Because multiple users can use ACLM 2023 through intranet, there is no need to rent a server. Using ACLM 2023 the APA Report, monthly report, annual report, income report, urine and serum analysis report generation of the Analytical Chemistry Laboratory is now through clicking the mouse button only. ACLM 2023 is working with data from more than 3,000 samples so far and generated about 3,000 urine and blood serum reports.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Workshop on Harmonisation and Standardisation for Marine Algal and Toxin Surveillance Sampling, Toxin Analysis, and Quality Control Standards.	10-16 March, 2025	Varadero, Cuba	1
2.	Mext the Nuclear Researchers Exchange Program FY-2024	24 September- 21 December, 2024	Hirosaki University, Japan	1

2.2 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	86th training programme of NITUB on the use, maintenance and trouble shooting of Atomic Absorption Spectroscopy	30-12-2024 to 04-01-2025	ACL, Chemistry Division, AECD	12

2.3 Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the person	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Yeasmin Nahar Jolly	Ecological and Health Risk Assessment of Heavy Metal Contaminated Soil Affected by Anthropogenic Activities.	International Conference on Electronics and Informatics	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AECD, Dhaka
Dr. Md. Safiur Rahman	Tracing Pollution Pathways: Computational Insights into Long-range Transport and Seasonal Dynamics of PM 2.5 in Dhaka	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi, Rajshahi
	Source-specific health risk assessment of dust bound heavy metals with the special emphasis on arsenic contamination: A case study in the capital city of Bangladesh	2nd International Conference on Recent Advances in Chemistry	Bangladesh Chemical Society	Jauary 31 - February 01, 2025	Jagannath University, Dhaka
Jamiul Kabir	Ecological And Health Risk Assessment of Heavy Metal Contaminated Soil Affected by Anthropogenic Activities.	International Conference on Electronics and Informatics	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AECD, Dhaka
T. R. Choudhury,	Uncovering Microplastics: New Perspectives on Occurrence, Characteristics,Risk Assessment, and Pathways to Sustainable Solutions	International Conference on Electronics and Informatics	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AECD, Dhaka

	Health risk assessment of potentially toxic elements in edible fish: implications for food security and climate change in coastal islands of Bangladesh	International Workshop on Climate Change Challenges and Sustainable Development in the Global South	The Chinese Academy of Sciences (CAS) and The World Academy of Sciences (TWAS)	June 23-26, 2025	Beijing, China
Dr. Shirin Akter	Ecological And Health Risk Assessment of Heavy Metal Contaminated Soil Affected by Anthropogenic Activities.	International Conference on Electronics and Informatics	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AECD, Dhaka
Konica Jannat Fatema	Evaluation of Surface Water Quality and Suitability for Agricultural Irrigation Purposes as well as Health Risk Aspect: A Case Study of Buriganga River.	International Conference on Electronics and Informatics	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AECD, Dhaka
A. R. M. Tareq	Effect of alkaline conditions on the phytosysthesis of Silver Nanoparticles (AgNPs) using Ziziphus Mauritiana Leaf Extracts	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	RU
	Analysis of volatile Phenol and some Phenolic derivatives in the surrounding aquatic system of Rooppur Nuclear Power Plant	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	RU
Dr. Sushmita Hossain	Environmental Risk Assessment and Source identification of the trace elements in the lower Meghna estuarine sediment: A case study around Hatiya Island	International Conference on Electronics and Informatics-2024	Bangladesh Electronics Society	28-29 December, 2024	AECD, Dhaka
K. M. Mamun	Ecological And Health Risk Assessment of Heavy Metal Contaminated Soil Affected by Anthropogenic Activities.	International Conference on Electronics and Informatics	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AECD, Dhaka
Engr. Ronia Sultana	Assessment and Mitigation of Soil Pollution by Brick Kilns in Cumilla District: Health Risk Analysis and Potential of Vegetation for Bioaccumulation	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	RU
	Assessment of chlorinated phenols: 2, 4, 6-trichlorophenol in atmospheric fine particulate matter of Dhaka city using GC-FID	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	RU
Md. Abdul Mottalib Sarkar	Study on the Variation of PM 2.5 and BC in Dhaka in Response to Climate Variability	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi, Rajshahi
	Transforming knowledge: A three month learning experience in MEXT programme in Japan	AECD Seminar	AECD	03 February 2025	AECD

Md. Mehedi Hasan	Non-Destructive Determination of Plutonium Isotopic Composition by Gamma Spectroscopy	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi, Rajshahi
	Statistical methodologies for tracing and modeling air pollution sources	AECD Seminar	AECD	26 June 2025	AECD
Md. Fahim Ehasan	Atmospheric Brown Carbon (BrC): Assessment of Polycyclic Aromatic Hydrocarbons (PAHs) in Air of Dhaka City	International conference on Electronic and Informatics 2024,	Bangladesh Electronic and Informatics society	28-29 December 2024	AECD
	Assessment of some carcinogenic polycyclic aromatic hydrocarbons (PAHs) in surrounding area of Rooppur Nuclear Power Plant (RNPP)	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	RU

2.4 Organize Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Stakeholder insights: Providing Services Aligned with ISO 17025 Accreditation in Analytical Chemistry Laboratory (ACL)	23-12-2024	AECD Auditorium	48

3. Project Work (ADP/FNCA/RCA/TC/CRP/S&T etc)

3.1 NCP of **IAEA/TC RAS-1030 :** Using Radioisotope Techniques and Computational Fluid Dynamics Simulation for Troubleshooting and Optimizing of Industrial Processes

3.2 Focal point of PAHs component for the IAEA Inter Regional Project "Strengthening Ocean Health for Sustainable Development: A Global Approach Using Nuclear and Isotopic Techniques (**INT7022**)"

3.3 Team Member of **IAEA/Non-RCA RAS 7038**: "Monitoring the Marine Environment for Enhanced Understanding of the Abundance and Impact of Marine Plastic Pollution"

4. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Revenue income (BDT)
1.	Certification of purity and weight of Gold and Silver Medal Crest/Objects	254	5,63,000.00
2.	Determination of Arsenic (As) in human scalp hair sample for the diagnosis of Arsenicosis Disease	141	1,41,000.00
3.	Determination of heavy/trace metal in Soil samples	15	33,600.00
4.	Determination of heavy/trace metal in Sediment samples	4	8,000.00
5.	Determination of heavy/trace metal Matrix Composite	3	3,000.00
6.	Determination of heavy/trace metal in Fertilizer samples	2	4,000.00
7.	Determination of heavy/trace metal in Pumpkin Seeds	1	1,300.00
8.	Determination of heavy/trace metal in Blood samples	70	2,66,000.00
9.	Determination of Copper and Zinc in urine sample	2998*	23,74,400.00

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Revenue income (BDT)
10.	Determination of Copper and zinc in serum sample	15	22,500.00
11.	Determination of heavy/trace metal in water	15	1,06,000.00
12.	Determination of Lead in milk	4	8,000.00
13.	Determination of Lead in coffee	1	2,000.00
14.	Determination of Lead, Cadmium, Chromium and Mercury in Natural Home Remedy	1	8,500.00
15.	Determination of heavy/trace metal in Hair Pack	**	8,500.00

Electronics Division, AECD

Objective

Electronics division has been providing services through repair and maintenance of various types of scientific, medical, analytical and nuclear instruments belonging to all divisions of AECD. The division also provides the repair and maintenance of Computer, Intercom, CCTV and Solar pumping systems of AECD. Besides, the division has contributed to research and development works in the fields of Embedded system, PC based system, Machine learning, Robotic system and Electrical gas discharge system to facilitate advanced electronics based research activities at AECD. This division is also engaged in manpower development through training, research collaboration etc. The major programmes of the Division are as following:

- Repair, Maintenance and Installation of electronics systems
- Training and Manpower Development
- Development of Advanced Electronics based system
- Applications of Robotics in Nuclear Establishments

R & D Work(s)

1.1 IoT Based Nuclear Security System for Nuclear Facilities

M. A. A. Mamun, M. A. Rahman, S. Sattar and M. T. Khatun

Nuclear facilities play an essential role in powering economies, advancing scientific research, and providing vital medical treatments. Nuclear facilities are critical infrastructures that require the highest level of security. However, traditional security measures, while effective to a certain extent, are often limited in their ability to provide real-time monitoring and rapid response to security threats. The advent of the Internet of Things (IoT) technology offers a transformative solution to enhance the security of nuclear facilities. By leveraging interconnected devices, sensors, and advanced analytics, an IoT-based nuclear security system can provide continuous monitoring, early threat detection, and automated response capabilities. The object of this work is to develop an IoT-based nuclear security system for nuclear facilities in Bangladesh.

This work presents the potential to address critical security challenges and strengthen the overall safety posture of nuclear installations. By integrating IoT devices and sensors, such as radiation detectors, motion sensors, and access control systems, with robust communication networks and data processing capabilities, this system will enable security personnel to detect, assess, and respond to security incidents in real time. Moreover, the development of an IoT-based nuclear security system allows effective detection and alerts for unauthorized access, intrusions, or anomalous activities within the secured areas. By employing this cutting-edge security solutions, the nuclear facilities can enhance its resilience against emerging security threats and safeguard for the benefit of present and future generations.

1.2 Pulsed Power Generator for Atmospheric Pressure Plasma Jet

M. A. A. Mamun, M. A. Rahman, S. Sattar, M. Begum and A. Hatta

Atmospheric pressure plasma jet (APPJ) has attained significant attention in various fields, including materials processing, biomedical applications, and environmental remediation, due to their unique characteristics and ability to operate under ambient conditions. The generation of APPJ by flowing gas in a dielectric tube wrapped with tube-shaped electrodes needs of pulses (several microseconds) with a high

voltage (several kV) and a high repetition rate (several kHz). Therefore, in an APPJ system, the power supply is considered to one of the significant components, as it plays a key role on the discharge characteristics of the APPJ. The objective of this work is the design, development, and optimization of a pulsed power generator for atmospheric pressure plasma jet (APPJ).

In recent times, pulsed generators are becoming more attractive owing to control the generation of non-thermal plasmas and their chemical and physical properties. Pulsed generators can deliver high instantaneous power with respect to low average power, offer fast rise time and high repetition rate, which are advantageous to control the production of high electron density and more active plasma species. The developed pulsed power generator aims to provide precise control over pulse duration, frequency, and amplitude, enabling enhanced plasma characteristics and performance. The generator incorporates advanced circuitry and high-voltage components to achieve efficient energy transfer and high repetition rates. Experimental results demonstrate that optimized pulse parameters significantly improve the stability and uniformity of the plasma jet, leading to increased ionization and excitation of gas molecules. The performance of the APPJ is evaluated through a series of tests, focusing on parameters such as plume length, temperature distribution, and reactive species generation. The findings indicate that the developed pulsed power generator can effectively enhance the operational efficiency of APPJs, contributing to their wider adoption in industrial and research for future innovations in plasma technology.

[*]Graduate School of Engineering, Kochi University of Technology, Japan

1.3 Soil Quality Monitoring System for Smart Agriculture

M. A. A. Mamun, M. A. Rahman, S. Sattar, M. T. Khatun, M.Begum, F. Rahman[*] and A. Mustafi[*]

Agriculture continues to serve as a cornerstone of global sustainability since its inception. Despite its significance, the sector continuously faces numerous challenges and obstacles over time. Agricultural productivity is largely influenced by soil quality. Factors such as moisture content, humidity, temperature, and nutrient composition of soil profoundly influence crop growth and health. Traditional methods of soil analysis often involve labor-intensive sampling and testing, which are time-consuming and may not provide real-time feedback. To address these issues, we are focusing on implementing a smart agriculture system using Internet of Things (IoT) and automation technologies to enhance decision-making and resource management. The primary objective of this work is to implement an automated soil monitoring system utilizing IoT method for smart agriculture that leverages real-time data to enhance farming practices.

In this work, soil quality monitoring system for smart agriculture using Internet of Things (IoT) and automation technologies has been presented. Utilizing the NodeMCU ESP8266 microcontroller for automated irrigation and other field operations, the system incorporates sensors such as the NPK sensor for soil nutrient analysis, the DHT11 for temperature and humidity measurement in the area, and the soil moisture sensor for water level monitoring. This microcontroller fetches the data from sensors and then transmits it via Wi-Fi to Firebase. A mobile application or the attached screen then provides access to the information. This system allows the farmers to monitor their field soil quality on their phones and enables them to make decisions. The system successfully distinguished between soil samples from different land areas, identifying variations in nitrogen, phosphorus, and potassium levels. Through continuous monitoring of critical soil and climatic parameters and maximizing the use of resources, this proposed project aims to revolutionize traditional agricultural practices, improving productivity and sustainability in the farming sector.

[*]Department of Electrical and Electronics Engineering (EEE), University of Dhaka.

1.4 Simultaneous Localization and Mapping (SLAM) of an Autonomous Mobile Robot (AMR) using LiDAR

M. A. Rahman, M. A. A. Mamun, S. Sattar and M. Begum

Autonomous mobile robots are becoming more prominent in recent times because of their relevance and applications to the world today. Autonomous mobile robots are emerging in different sectors such as industry, agriculture, military, medicine, education, research, etc. to improve services and daily activities. An autonomous mobile robot is a robot that is designed and engineered to deal with its environment on its own and work for extended periods without human intervention. Autonomous robots use sophisticated sensors,

artificial intelligence, machine learning, and computing for path planning to interpret and navigate their environment. The present work aims to implement a mapping method to create a map for an autonomous robot to navigate an unknown environment independently.

Simultaneous localization and mapping (SLAM) is a method that applies a sophisticated algorithm to allow the vehicle to map out unknown environments. Two technology components are used to achieve SLAM: sensor signal processing and pose-graph optimization. The map information is further used for path planning and obstacle avoidance tasks. In this work, the LiDAR SLAM method is proposed for mapping an unknown indoor environment among the various SLAM methods such as visual SLAM, LiDAR SLAM, multi-sensor SLAM, etc. LiDAR SLAM, or Light Detection and Ranging Simultaneous Localization and Mapping, is a process that relies on LiDAR sensors and enables robots or autonomous systems to build a map of an unknown environment. Various LiDAR SLAM algorithms (LOAM, LeGO-LOAM, PIN-SLAM, etc.), along with LiDAR sensor data acquisition and preprocessing, have been studied. This is an ongoing work.

1.5 Path Planning with A* Algorithm for Robots

S. Sattar, M. A. Rahman, M. T. Khatun, M.U. Safia and M. A. A. Mamun

Path planning is one of the most popular research works for mobile robots, which is very important for the implementation of autonomous navigation in robots, and A* algorithm is the most representative among heuristic search algorithms. The objective of the work is to study the A* algorithm and its parameters for mobile robot path planning. Heuristic search refers to the establishment of heuristic search rules in the search process, in order to measure the distance relationship between the real-time search location and the target location, so that the search direction is the direction of the target location first, and finally achieve the effect of improving the search efficiency. The basic idea of A* algorithm is as follows: the estimation function f(x) of the current node x is introduced, and the estimation function of the current node x is defined as: f (x)= g(x)+h(x) Where g(x) is the actual distance from the starting point to the current node x (which can be replaced by the distance between two points in the code); H (x) is the minimum distance estimated from node x to the end point. This optimal strategy will be compared with other algorithms to find out the algorithm's feasibility.

1.6 Development of Smart Water Quality Monitoring System for Environmental Monitoring

M. T. Khatun, M. A. Rahman, S. Sattar, M. U. Safia and M. A. A. Mamun

Water is a fundamental necessity for all forms of life, and existence without it is unimaginable. However, water pollution has become one of the most critical forms of environmental contamination today. Human health and the well-being of ecosystems largely depend on the quality of water consumed from various sources. Water quality is defined by several parameters, including its chemical, biological, and radiological characteristics. Any significant deviation or imbalance in these parameters can lead to serious health issues in humans and also disrupt the ecological equilibrium among different species. To maintain a healthy environment for humans and other living organisms, it is essential to develop an efficient system that can detect and monitor water quality in real-time.

In this research work, a low-cost, efficient water quality monitoring system has been designed and implemented. The system utilizes an Arduino microcontroller as the central unit and incorporates four key sensors (pH sensor, turbidity sensor, temperature sensor, and TDS sensor) to monitor various aspects of water quality. The pH sensor measures the acidity or alkalinity of the water, the turbidity sensor detects the presence of suspended particles, the temperature sensor monitors the current thermal condition, and the TDS sensor determines the concentration of dissolved substances in the water. Each sensor collects data related to its specific parameter and sends it to the Arduino in the form of electrical signals. The microcontroller is pre-programmed to analyze these signals and compare the results with predefined standard values stored in its code. If any reading falls outside the acceptable limits, the system activates an alarm. The output is displayed on an LCD screen. When a parameter exceeds the safe threshold, a warning message is shown on the display and also sent to the user's mobile device to ensure timely notification. This system has been successfully tested in a laboratory environment and the results have been found satisfactory. The monitoring system is now functioning effectively and is ready for real-world applications.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Organize Training/Fellowship/Workshop/Meeting

Title of the program	Date	Place	Number of participants
Industrial Attachment Training program	02-07-2024 to 12-09-2024.	ED, AECD	53

3. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the Participant	Title of Oral/poster presentation	Title of the event	Organizer	Date	Place
M. A. A. Mamun	Development of a Pulse Power Generator for Atmospheric Pressure Plasma Jet	International Conference on Electronics and Informatics 2024 (ICEI2024), Bangladesh	Bangladesh Electronics and Informatics Society	28-29 December, 2024	Atomic Energy Centre Dhaka
M. T. Khatun	Development of an Arduino Based Air and Sound Quality Detection System for Environmental Monitoring	International Conference on Electronics and Informatics 2024 (ICEI2024), Bangladesh	Bangladesh Electronics and Informatics Society	28-29 December, 2024	Atomic Energy Centre Dhaka

4. Service rendered

Sl. no.	Name of service provided	Number of service
1.	Scientific, Nuclear and Analytical Instruments	03
2.	Computer (System Unit with software installation)	23
3.	Computer Monitor	06
4.	Printer	08
5.	Microwave Oven	01
6.	TV	01
7.	Converter (Eddy current Machine)	01
8.	Intercom System (Line & Set)	07
9.	Digital Attendance	07
	Total	57

Experimental Physics Division

Objective

Experimental Physics Division (EPD) of Atomic Energy Centre, Dhaka (AECD) is involved in research and development activities in both fundamental and applied fields of science and technology. EPD concentrates in the field of thin film technology as the amount of material needed in thin films is drastically reduced compared to bulk materials; and thereby, to bring down the cost in technological issues. The members of Division are devoted to study of preparing, characterizing and developing some technologically important photo voltaic thin film materials and is therefore, economically advantageous for photovoltaic (PV) applications like as solar cell. Recognizing the aforementioned situations and to address them, the EPD Division has set its aims to develop and characterize the solar energy materials and advanced materials in thin film form for photovoltaic, optoelectronic and nuclear detector applications.

1. Research and Development Works

1.1 Synthesis and Characterization of Undoped Zinc Selenide and Al Doped Zinc Selenide by Thermal Evaporation Technique

K. M. A. Hussain, T. Faruqe, J. Parvin, F. T. Z. Toma and S. Ahmed

Analysis of structural, optical, elemental and electrical properties of ZnSe and Al doped ZnSe thin films. Undoped, and 1%, 1.50%, 2%, 2.5% Al doped ZnSe Thin film were prepared by thermal evaporation technique. ZnSe thin films of thickness 500 nm & substrate temperature S_T = 250^{0}C & annealing temperature A_T =230^{0}C with annealing time 1 hour is prepared by thermal evaporation method. Optical properties were characterized by UV-VIS-NIR spectroscopy. The most important parameter optical band gap estimated on this research work. Structural parameters such as crystallite size, stress, strain, dislocation density was obtained from the XRD data using different models. Elemental measurement was observed by FTIR. ZnSe films thickness were calculated and synthesis and Analysis of the parameters are going on.

1.2 Optical Properties of ZnSe and Ag doped Thin Films using Thermal Evaporation Technique

K. M. A. Hussain, T. Faruqe, J. Parvin, F. T. Z. Toma and S. Ahmed

Analysis of optical properties of ZnSe and Ag doped ZnSe thin films. Undoped and 1%, 1.50%, 2%, 2.5% Ag doped ZnSe. Thin film were prepared by thermal evaporation technique. ZnSe thin films of thickness 500 nm & substrate temperature S_T = 250^{0}C & annealing temperature A_T =230^{0}C with annealing time 1 hour is prepared by thermal evaporation method. Optical properties were characterized by UV-VIS-NIR spectroscopy. The most important parameter optical band gap estimated on this research work. Structural parameters such as crystallite size, stress, strain, dislocation density was obtained from the XRD data using different models. XRD data confirmed the structure of the synthesized thin films which is in accordance with the SEM image. Particle Size and strain were estimated using Debye-Scherrer. Average size of the particles was found to be in the range of nm. The size distribution of nanoparticles were also observed from SEM images. Elemental measurement was observed by FTIR. ZnSe films thickness were calculated and synthesis and Analysis of the parameters are going on.

1.3 Deposition and Characterization of SnS_2 Thin Films by Spin Coating Deposition Technique

K. M. A. Hussain, T. Faruqe, J. Parvin, F. T. Z. Toma, S. Ahmed and J. A. Jahan

To observe the SnS_2 thin films and also measure the parameters of the samples.

Tin di-sulfide (SnS_2) thin films were synthesized by Spin coating method. SnS_2 thin films are deposited on glass substrate. Thin films were prepared at room temperature for 1500 rpm/30sec & annealing temperature A_T = 100^{0}C, 400^{0}C for 15 min. Annealing temperature significantly influenced crystallinity and surface roughness of the thin films in spin coating method. These films may be a good candidate for suitable application in various optoelectronic devices. One research article is published on this work.

1.4 Deposition and Characterization of Fe Doped SnS_2 Thin Films by Spin Coating Deposition Technique

K. M. A. Hussain, T. Faruqe, J. Parvin, F. T. Z. Toma and S. Ahmed

To observe the Fe doped SnS_2 thin films and also measure the parameters of the samples. Tin di-sulfide (SnS_2) thin films were synthesized by Spin coating method. SnS_2 and Fe (0%, 5%, 7%, 9%) doped SnS_2 thin films are deposited on glass substrate. Thin films were prepared at room temperature for 1200 rpm/30sec & annealing temperature A_T = 100^{0}C, for 15 min. After repeating 3 times again annealed at 450^{0}C/1hour. Annealing temperature significantly influenced crystallinity and surface roughness of the thin films in spin coating method. The structural optical, elemental, and optical information were investigated by X-ray Diffraction (XRD), FTIR, UV-VIS-NIR spectroscopy, respectively. These films may be a good candidate for suitable application in various optoelectronic devices. Analysis of the parameters is going on.

1.5 Synthesis of Mn doped ZnSe Thin Film by Thermal Evaporation Method

K. M. A. Hussain, T. Faruqe, J. Parvin, F. T. Z. Toma, S. Ahmed and Q. Zaman

Analysis of structural, optical, elemental and electrical properties of Mn doped ZnSe thin films. 1%, 1.5%, 2%, 2.5% Mn doped ZnSe Thin film were prepared by thermal evaporation technique. ZnSe thin films of thickness 500 nm & substrate temperature S_T = 250^{0}C & annealing temperature A_T =230^{0}C with annealing

time 1 hour is prepared by thermal evaporation method. Optical properties were characterized by UV-VIS-NIR spectroscopy. The most important parameter optical band gap estimated on this research work. Structural parameters such as crystallite size, stress, strain, dislocation density was obtained from the XRD data using different models. Elemental measurement was observed by FTIR. ZnSe films thickness were calculated and synthesis and Analysis of the parameters are going on.

1.6 Investigation of the Structural, Morphological and Optical Properties of ZnCdS Thin Film thin Films by Chemical Bath Deposition Method

K. M. A. Hussain, T. Faruqe, J. Parvin, F. T. Z. Toma, S. Ahmed and Q. Zaman

To observe the effect of ZnCdS Thin Film thin film and measure the parameters of this films. The effects of undoped and Sn doped concentrations on the optical, structural and morphological properties of CdSe films are observed. The thin films of ZnCdS Thin Film have been grown on glass substrates using CBD at 80^0C temperature for 1 hours with annealing temperature 200^0C & time 1 hour. From X-ray diffraction patterns it was found that cubic phases preferred orientation along 111 plane. Thickness of all samples were measured and found near nm range. The optical transmittance, absorbance and band gap of these films were determined using UV-VIS-NIR Spectrometry. It was also observed that the band gap decreases with increasing Sn doping concentration. FTIR spectra confirmed the successive formation of ZnCdS thin film samples.

1.7 Synthesis and the Structural Analysis of $Cd_{0.6}Zn_{0.4}S$ Thin Film using Chemical Bath Deposition (CBD) Technique

T. Faruqe, K. M. A. Hussain, J. Parvin, F. T. Z. Toma, S. Ahmed and Q. Zaman

To observe the effect of $Cd_{0.6}Zn_{0.4}S$ Thin Film thin film and measure the parameters of this films. The structural and optical properties of CBD deposited $Cd_{0.6}Zn_{0.4}S$ thin films have been studied by varying the processing parameters and ratio of the starting Precursors in order to better understand the growth conditions. The $Cd_{0.6}Zn_{0.4}S$ thin films were prepared on glass substrate by CBD from a bath containing. The structural analysis was performed by XRD. The deposited $Cd_{0.6}Zn_{0.4}S$ thin film was a cubic phase with small nano crystalline grains. The film was deposited at 80° C for 1 hours. After sintering the film at 100°C for 10 minutes and the thickness of the film was obtained 100 nm. These studies have allowed us to establish a standard set of conditions for the fabrication of homogeneous and continuous very thin $Cd_{0.6}Zn_{0.4}S$ films in laboratory.

1.8 Investigation of the Effect of the Annealing Temperature on as Prepared CdS Nano Powder and Commercial Nano Powder Synthesized by Chemical Precipitation Technique

T. Faruqe, F. T. Z. Toma, K. M. A Hussain, J. Parvin, and S. Ahmed

To observe the CdS Nano particles also measure the parameters of the samples. Cadmium Sulfide (CdS) nano particles are synthesized by chemical precipitation method. Cadmium Chloride and Thiourea are used as the precursor materials. Ammonia water & distilled water are used as solvent. The samples are annealed at 100°C, 300°C and 500°C for 1 hour. Transmission electron microscopy (TEM), Energy–dispersive X-ray spectroscopy (EDAX), and X-ray diffraction pattern (XRD) are used to study the morphologies, distribution, and crystallinity of the as prepared and commercial CdS nano powders and to calculate the values of their sizes. The results indicate that the CdS are formed with Hexagonal structure and the particle size varies with the Cd^{+2} ions. Synthesized nano particles show structural properties after annealing. The particles are in high degree of crystallization. The XRD results reveal that the annealing effect has increased the crystalline size of the CdS nanoparticles. TEM demonstrates that the average sizes of spherical cadmium sulfide nano particles at annealing temperature of 100°C, 300°C and 500°C respectively. In this research CdS has been studied due to its potential technological applications infield effect transistors, solar cells, photovoltaic devices, light emitting diodes, photo catalysis, photoluminescence, infrared photo detector, environmental sensors, biological sensors etc.

1.9 Effects of Gamma Irradiation on Structural and Optical Properties of $BaTi_{0.5}Fe_{0.5}O_3$ Ceramic Composite Material for Storage Device Applications

F. T. Z. Toma, K. M. A Hussain, T. Faruqe, J. Parvin, and S. Ahmed

To observe the $BaTi_{0.5}Fe_{0.5}O_3$ composite Material and also measure the parameters of the samples. The effect of gamma irradiation on hydrothermally synthesized $BaTi_{0.5}Fe_{0.5}O_3$ composite materials has been investigated.

Barium Titanate synthesized by solid state reaction method and all the samples pre-sintered and sintered at 800°C, 1200 °C/3 h. Gamma irradiation was carried out at room temperature from 0, 25, 50, 75 kGy to a maximum dose and source being used as ^{60}Co gamma radiations. Optical properties were characterized by UV-VIS-NIR spectroscopy. The most important parameter optical band gap estimated on this research work. Structural parameters such as crystallite size, stress, strain, dislocation density was obtained from the XRD data using different models. Elemental and Morphological measurement was observed by FTIR and SEM. Other Characterization and Analysis of the parameters are going on.

1.10 Synthesis and Characterization of Cu Doped CdS thin Films by Spin Coating Technique

T. Faruqe, F. T. Z. Toma, K. M. A Hussain, J. Parvin, and S. Ahmed

To observe the Cu doped CdS thin films and also measure the parameters of the samples. Undoped CdS and 5%, 7%, 9% Cu doped CdS thin films are deposited on glass substrate at r. p. m = (2000, 5000)/30 sec & Annealing temperature 150℃ for 30 minute and 1 hour. UV measurements of these films were completed and Phase analysis of the doped and undoped were done by XRD. SEM, confirmed the morphological structure of the films. These films may be a good candidate for suitable application in various optoelectronic devices. Analysis of the parameters is going on.

1.11 Synthesis and Characterization of CdS Single Crystal by Chemical Bath Deposition Technique

F. T. Z. Toma, K. M. A Hussain, M. T. Chowdhury, T. Faruqe, J. Parvin, and S. Ahmed.

Synthesis and growth of Cadmium Sulfide (CdS) single crystal produced by very easy and low cost Chemical Bath Deposition technique. In this study single crystal of CdS were grown up in room temperature and from aqueous solution by CBD technique at 60℃ temperature for 2 hours using Cadmium Cloride ($CdCl_2$), Ammonia water (NH_4OH), Thiourea [$CS(NH_2)$] and Distilled water as solvents respectively. It was observed that the Cadmium Cloride and Ammonia water form a complex species of $[Cd(NH_3)_4]_2$ to slow release of Cd^{2+} metal ion mode in crystal. Structure analysis of CdS single crystal was carried out by X-ray diffraction technique. Scanning Electron Microscopy (SEM) was used to Characterized the surface morphology and EDX (a analysis tool of SEM) used for elemental analysis which confirmed all the element present in the CdS single crystal. The FTIR spectrum confirms the existence of Cadmium Sulfide compound and water molecules in the samples. In this observation CBD method producing dispersive and crystalline CdS single crystals in the aqueous phase would have important applications because it provides hydrophilic crystals and is environmentally friendly. Others measurement and analysis of the parameters are going on.

1.12 Study of Thyroid Disease in Pregnancy: A Review Research Work

F. T. Z. Toma, K. M. A Hussain, M. T. Chowdhury, T. Faruqe, J. Parvin, and S. Ahmed.

These Review research work highlight the complexities involved in thyroid disorder detection strategies and suggest potential benefits in targeted treatment interventions following screening in specific risk groups.

Pregnancy-related thyroid conditions, the second most prevalent endocrine disorders following diabetes, demand effective management to mitigate adverse consequences for both mother and fetus. Thyroid disease is associated with obstetric and child development complications, necessitating consideration from clinical and scientific viewpoints. This review consolidates current knowledge on thyroid disease in pregnancy, encompassing management, physiological changes, pathological functions, diagnosis, and treatment. Physiological alterations include thyroid stimulation by hCG, placental expression of deiodinases, and increased thyroid vascularity. Hypothyroidism, occurring in 0.6% of pregnancies, poses risks if untreated. Hyperthyroidism, affecting 0.2%, demands careful diagnosis due to TSH suppression in early pregnancy. Adverse outcomes include preterm labor, low birth weight, and impaired neurodevelopment. Post-delivery, monitoring and adjusting levothyroxine are essential, and anti-thyroid drug risks must be considered. Fetal and neonatal outcomes, influenced by maternal TRAb levels, require vigilance. Iodine's role in pregnancy, especially deficiency implications, underscores the importance of monitoring and supplementation. Postpartum care includes thyroid function tests and addressing postpartum thyroiditis, impacting 8% of women. Breast feeding with anti thyroid drugs requires cautious consideration, ensuring minimal impact on neonatal thyroid function. Screening for thyroid disorders during pregnancy remains debated, with case-finding limitations. Despite inconclusive evidence, levothyroxine supplementation may be considered for

TPO Ab-positive euthyroid pregnant women with a history of miscarriage. Effective management, early diagnosis, and tailored care contribute to improved maternal and fetal health, emphasizing the need for continued research and evidence-based guidelines. One research review article is published on this work.

1.13 Effect of Stabilizer Content in Different Solvents on the Synthesis of ZnO Nanoparticles using the Chemical Precipitation Method

F. T. Z. Toma, K. M. A Hussain, M. T. Chowdhury, T. Faruqe, J. Parvin, and S. Ahmed.

Analysis of optical & structural properties of ZnO Nano powder. Zinc Oxide (ZnO) nanoparticles (NPs) have been synthesized by a simple chemical precipitation method. The effect of monoethanolamine (MEA) content in different solvents on ZnO NPs synthesis and their structural properties has been investigated. The NPs synthesized by using isopropanol (IPA) with 15 ml MEA as a stabilizer under the most favorable conditions (deposition time, t_d = 120 min, temperature = 60 °C) showed good structural properties. Synthesized NPs exhibited beneficial structural properties after annealing. The hexagonal wurtzite crystal structure of ZnO NPs was verified by XRD. Different models were used to calculate structural parameters such as crystallite size, strain, stress, and energy density for all the reflection peaks of XRD corresponding to ZnO lying in the range $2\theta = 15^0$-80^0. The crystallite size of the ZnO nanoparticles was found to be 50-60 nm. FTIR and EDX confirmed the presence of ZnO NPs in the samples. SEM micrograph of all the samples revealed that the grain sizes decrease gradually with the increase of the amount of MEA. UV-Visible diffuse reflectance spectroscopy results provide evidence that the ZnO NPs possess broader absorption bands, together with high band gap energy. The ZnO NPs synthesized with IPA solvent have the highest transmittance and band gap energy of 3.3eV. According to DLS data, various content of MEA stabilizer in solvent affects the hydrodynamic size of ZnO NPs. One research review article is published on this work.

1.14 Exploring the Influence of Iron Doping on Structural, Morphological and Optical Properties of Chemical Bath Deposited Cadmium Selenide thin Films for Optoelectronic Applications

F. T. Z. Toma, K. M. A Hussain, M. T. Chowdhury, T. Faruqe, J. Parvin, and S. Ahmed

This research contributes to the advancement of knowledge in the field of semiconductor materials by providing valuable insights into the synthesis and characterization of Fe-doped CdSe thin films. By elucidating the relationship between doping concentration and film properties, we aim to pave the way for the development of enhanced semiconductor materials for a variety of technological applications.

This research investigates the structural, morphological, and optical properties of Cadmium Selenide (CdSe) thin films deposited via the Chemical Bath Deposition (CBD) Technique, focusing on the impact of Iron (Fe) doping. Using Cadmium Chloride (CdCl2) and Ferrous chloride (FeCl2) as precursor materials, the research investigates how Fe doping affects the structural and photoelectric characteristics of the films. Employing various characterization methods including X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Fourier-Transform Infrared Spectroscopy (FTIR), and UV–Vis NIR spectroscopy, the study provides a comprehensive analysis of the films. XRD analysis confirms the formation of a cubic structure with a predominant orientation along the (111) plane, consistent with XRD peaks. Additionally, XRD data reveals the degradation of thin films post-annealing. Crystalline size and strain are determined using the Debye-Scherrer and Wilson formulae, while lattice constant and Size-strain plots are derived from X-ray line broadening. The average crystallite size ranges from 12 to 21 nm. Optical band gaps are found to be 2.25 eV, 2.91 eV, 2.87 eV, and 2.85 eV for the samples. Interestingly, a decrease in crystal size with increasing doping concentration correlates with a reduction in bandgap. This investigation offers valuable insights into the fabrication and characterization of CdSe thin films, particularly highlighting the impact of Fe doping on their structural and optical properties. Overall, this study provides valuable insights into the fabrication and characterization of CdSe thin films, emphasizing the importance of precise doping control for tailoring material properties and advancing their applications in photovoltaic and optoelectronic devices. One research article is published on this work.

2. Manpower Development (Organized Training/Fellowship/Workshop/Meeting)

2.1 Training Course Organized

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Nuclear Engineering training program	09-02-2025 to 20-02-2025	EPD, AECD	2

3. Attended in Training/Fellowship/Workshop/Meeting

3.1 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Industrial Training Program	20-08-2023 to 14-11-2023	EPD, AECD	10

4. Collaboration Work/MOU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house Project, Universities etc):

4.1 Project work: Ministry of Science and Technology (MOST), GoB project "Modernization of laboratories and Enhancement of Service Capacity of 3 Divisions (Chemistry Division, Health Physics Division, Experimental Physics Division) of Atomic Energy Center, Dhaka. Bangladesh Atomic Energy Commission"

Project year: 2021-25

Office order no- 39.00.0000.014.14.057-21-255; Date: 13-12-2021

Grant amount: 5093.00 Lac Taka only

Project Director: Dr. Kazi Md. Amjad Hussain
Head and Chief Scientific Officer
Experimental Physics Division
Atomic Energy Centre, Dhaka

4.2 Collaboration Work

The Division has good collaboration with teachers and research students of

- Department of Physics and Department of Electrical and Electronic Engineering, University of Dhaka, (PhD Thesis, M.S Thesis,).
- Physics Department, Dhaka University of Engineering & Technology (DUET). (M.Phil. thesis).
- Physics Discipline, Khulna University. (B.Sc. report/ M.S. thesis).
- Department of Electrical and Electronic Engineering, University of Chittagong (M.S. thesis)
- Department of Glass and Ceramic Engineering (BUET).
- Materials Science of Semiconductor Processing Journal -as a reviewer.
- Physica B: Physics of Condensed Matter Journal as reviewer.

Every year students carry out their thesis work in the laboratories of the Division. Their works are also supervised in a close co-operation

5. Repair & Maintenance, Renovation Works, etc

Modernization of laboratories and Enhancement of Service Capacity of 3 Divisions (Chemistry Division, Health Physics Division, Experimental Physics Division) of Atomic Energy Center, Dhaka. Bangladesh Atomic Energy Commission

Health Physics Division, AECD

Objective

The objective of Health Physics division is to protect life, property and environment from undue radiation hazard through: (a) Population exposure control (b) Occupational exposure control and (c) Radiation protection. Radiation and radioactivity in environmental samples & imported/exportable foods (except Chittagong Port) and individual Monitoring Services (IMS) of occupational workers are being monitored as per requirement of the NSRC rules 1997 and BAER Act-2012. This division is one of the most important Technical Support Organization (TSO) of Rooppur Nuclear Power Plant (RNPP). Health Physics division has been provided nuclear and radiological emergency services in case of any incident or accident.

1. R& D Work(s)

1.1 Pioneering Radiometric Evaluation and Health Hazard Assessment of Soil and Water Samples Near the TRIGA Mark-II Research Reactor in Bangladesh

S. Yeasmin, M.M. Mahfuz Siraz, Z. Hossain, M.S. Rahman, S.K. Das*

This pioneering study offers a thorough assessment of both natural and potential anthropogenic radionuclide concentrations in 50 soil and 50 water samples collected near the TRIGA Mark-II research reactor-Bangladesh's first and only operational research reactor. The activity concentrations in soil samples ranged from 19±1-41±4 Bq/kg for ^{226}Ra, 33±3-63±3 Bq/kg for ^{232}Th, and 340±29-510±46 Bq/kg for ^{40}K. In water samples, the corresponding ranges were 1.01±0.10-3.70±0.37 Bq/l, 1.70 ± 0.17-2.80 ± 0.28 Bq/l, and 39±3-62± 6 Bq/l, respectively. Crucially, no artificial radionuclides were detected in any of the samples, indicating an absence of radioactive contamination originating from the reactor. Although some soil samples exhibited outdoor absorbed dose rate, outdoor effective dose, and gamma representative level index values above global averages, all other radiological hazard indicators-including radium equivalent activity, indoor annual effective dose and external and internal hazard indices for both soil and water samples-remained well within the safety limits set by international standards. Overall, the findings suggest that the surrounding environment of the TRIGA Mark-II reactor does not currently present significant radiological risks to nearby populations.

*Department of Physics, Jagannath University, Dhaka, Bangladesh.

1.2 Radiometric Hazard Assessment of Soil and Water Samples Adjacent to Bangladesh's First Nuclear Power Plant Before Commissioning: Insights into Human Health and Environmental Radiological Dynamics

S. Yeasmin, M.M. Mahfuz Siraz, M.S. Rahman, S.K. Das*

The current study provides a comprehensive examination of both natural and anthropogenic activity concentrations found in soil and surface water samples near the Rooppur nuclear power plant (RNPP), the first of its kind under construction in Bangladesh. The investigation covers a range of activity concentrations including ^{226}Ra, ^{232}Th, and ^{40}K in fifty soil and fifty water samples, revealing values ranging from 18 to 38, 18–51, and 310–560 Bq/kg for soil, and 2.1–6.1, 2.1–5.5, and 67–115 Bq/kg for water, respectively. Although outdoor absorbed dose rate, outdoor effective dose, and gamma representative level index values in some soil samples exceed global averages, other radiological hazard parameters such as radium equivalent activity, annual effective dose, external and internal hazard indices, and lifetime carcinogenic risk for both soil and water samples consistently remain below safety thresholds established by international organizations. These findings indicate that the soil and water samples collected from the vicinity of the RNPP do not pose significant radiological hazards to the nearby populations.

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1.3 Continuous Radiation Monitoring at Indoor Places of AECD Campus using Thermoluminescent Dosimeter

M. S. Rahman, S. Yeasmin, M. Begum, M.M.M. Siraz, S. Pervin, M. M. Hassan, S. Hossain, N. Hassan, N. Sultana, Z. Hossain

Indoor radiation was measured at 20 locations of AECD campus using thermoluminescent dosimeters. The indoor radiation dose rate varied from 267-411 µSv/month with an average of 315 µSv/month. The annual effective dose of the population due to the indoor gamma radiation was also calculated and it was varied from 1.122 – 2.566 mSv.

1.4 Study on Outdoor Gamma Radiation of SOMCH Campus by In-Situ Method

M. S. Rahman, S. Yeasmin, M. Begum, M.M.M. Siraz, S. Pervin, M. M. Hassan, S. Hossain, N. Hassan, N. Sultana, Z. Hossain

In-Situ Environmental gamma-ray dose rate was measured at 32 locations of SOMCH campus using real-time environmental radiation measuring device (GAMMA-SCOUT GmbH & Co. KG). This device meets all European CE standards as well as the American "FCC 15 standard". All the locations were marked out using global positioning system (GPS). The dose rate varied from 0.075-0.210 µSv/h at outdoor locations around the SOMCH campus. The annual effective dose of the population due to the environmental gamma radiation was also calculated and it was varied from 0.079-0.397 mSv.

1.5 Study on Outdoor Gamma Radiation of SBMCH Campus by In-Situ Method

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In-Situ Environmental gamma-ray dose rate was measured at 32 locations of SBMCH campus using real-time environmental radiation measuring device (GAMMA-SCOUT GmbH & Co. KG). This device meets all European CE standards as well as the American "FCC 15 standard". All the locations were marked out using global positioning system (GPS). The dose rate varied from 0.066-0.290 µSv/h at outdoor locations around the DMCH campus. The annual effective dose of the population due to the environmental gamma radiation was also calculated and it was varied from 0.075-0.455 mSv.

1.6 Study on Outdoor Gamma Radiation of Bangladesh Medical College and Hospital Campus by In-Situ Method

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In-Situ Environmental gamma-ray dose rate was measured at 32 locations of Bangladesh Medical College and Hospital campus using real-time environmental radiation measuring device (GAMMA-SCOUT GmbH & Co. KG). This device meets all European CE standards as well as the American "FCC 15 standard". All the locations were marked out using global positioning system (GPS). The dose rate varied from 0.105-0.207 µSv/h at outdoor. The annual effective dose of the population due to the environmental gamma radiation was also calculated and it was varied from 0.199-0.339 mSv at outdoor.

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1.7 Study on Outdoor Gamma Radiation of BRB Hospital Limited Campus by In-Situ Method

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In-Situ Environmental gamma-ray dose rate was measured at 32 locations of BRB Hospital Limited, Panthapath, Dhaka campus using real-time environmental radiation measuring device (GAMMA-SCOUT GmbH & Co. KG). This device meets all European CE standards as well as the American "FCC 15 standard". All the locations were marked out using global positioning system (GPS). The dose rate varied from 0.070-0.350 µSv/h at outdoor. The annual effective dose of the population due to the environmental gamma radiation was also calculated and it was varied from 0.254-0.497 mSv at outdoor.

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1.8 Study on Outdoor Gamma Radiation of Green Life Medical College and Hospital Campus by In-Situ Method

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In-Situ Environmental gamma-ray dose rate was measured at 32 locations of Green Life Medical College and Hospital campus using real-time environmental radiation measuring device (GAMMA-SCOUT GmbH & Co. KG). This device meets all European CE standards as well as the American "FCC 15 standard". All the locations were marked out using global positioning system (GPS). The dose rate range, mean, annual effective dose will be calculated. Excess life-time cancer risk (ELCR) on public will be estimated based on the real-time dose rate.

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1.9 A Method Validation of the IAEA Proficiency Test on Natural Radionuclides Activities in Spiked Water, Sediment, Bauxite and Contaminated Surface Sample

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The aim of this study is to monitor and demonstrate the performance and analytical capability of the participating laboratories and to identify gaps and problem areas where further development is needed. As contributors to such a network, the Environmental Radiation and Radioactivity Monitoring (ERRM) Laboratory of Health Physics Division has participated in the IAEA-TERC-2024-01 worldwide proficiency test organized by International Atomic Energy Agency (IAEA). This PT was focused on the determination of anthropogenic and natural radionuclides in water, bauxite, sediment, and simulated contaminated surface samples. The measurement of radionuclide activity concentrations in different environmental matrices by gamma spectrometry ZnS scintillation counter. The radioactivity measured on spiked water was 18.35, 9.6 and 12.64 Bq/kg for H-3, Ra-226 and Sr-90 respectively. The radioactivity measured on sediment was 261, 990 and 300 Bq/kg for Ac-228, K-40 and Ra-226 respectively. The radioactivity measured on bauxite was 107.54, 79.0, 107.54, 79.0, 79.0 and 44.71 Bq/kg for Ac-228, Bi-214, Pb-212, Pb-214, Ra-226 and Tl-208 respectively. The radioactivity measured on surface sample was 14.8 and 1.903 Bq/kg for Cs-134 and Sr-90 respectively. Measured value of gross alpha was 23.38 Bq/kg and gross beta was 41.63 Bq/kg for the surface sample.

1.10 Synthesis and Characterization of Ce-doped and Undoped LiZnBO3 (LZB) Phosphor for Dosimetry Applications

A. K. M. M. Rahman, S. Hossain, Z. Hossain, and S. Yeasmin

The pristine LZB was synthesized by the solid-state reaction (SSR) technique. The structural properties of the synthesized composites were investigated by X-ray diffraction (XRD) and Fourier Transform Infrared (FT-IR) measurements. The magnetic hysteresis (M-H) loop was characterized using Vibrating Sample Magnetometry (VSM) to distinguish its magnetic characteristics and alterations. A clinical Linear Accelerator (LINAC) was used to irradiate the samples with both electron (6 MeV) and X-ray photon beam (6 MV), with a dose range of 0.5 Gy to 8 Gy for both beams. The experiment was designed to study low to medium-dose thermoluminescence (TL) response for LZB. The irradiated samples were readout for TL signal using a Harshaw-3500 TL reader. This study explores the dosimetric potentials of pristine LZB phosphor for medical application.

1.11 Study of Structural, Thermoluminescent (TL) and Kinetic Properties of LiF by Mn and Cu Doping for Dosimetry Applications

A. K. M. M. Rahman, S. Hossain, Z. Hossain, and S. Yeasmin

The LiF phosphor was synthesized via chemical co-precipitation method and doped with various percentages of Mn and Cu successfully. X-ray diffraction (XRD) analysis confirmed crystallite sizes of 29–39 nm which is well matched with Transmission Electron Microscopy (TEM) and Energy-Dispersive X-ray Spectroscopy (EDX) data. To evaluate TL properties, samples were irradiated using a clinical 6 MV X-ray Linear Accelerator (LINAC) at 0.5–10 Gy doses. The irradiated samples were readout for TL signal using a Harshaw-3500 TL reader. The findings underscore the potential of 0.01 mol% Mn and 0.01 mol% Cu-doped LiF in dosimetric applications.

1.12 Synthesis, Structural Features and Thermoluminescene (TL) Traits of LiF:Ti and LiF:Ti, Cu for Radiation Dosimetry Applications

A. K. M. M. Rahman, S. Hossain, Z. Hossain, and S. Yeasmin

The LiF phosphor was synthesized via chemical co-precipitation method and doped with various percentages of Ti and combination of Ti and Cu successfully. X-ray diffraction (XRD), Fourier-transform infrared (FT-IR) spectroscopy, glow curve analysis, and kinetic parameter determination were used to establish the structural integrity of the synthesized phosphors, chemical bonding nature and luminescent characteristics, respectively. Thermoluminescence (TL) measurements were made by irradiating the samples with LINAC 6 MV photon beams for doses 0.5 to 10 Gy. The irradiated samples were readout for TL signal using a Harshaw-3500 TL reader. The improved TL sensitivity and dose linearity suggest LiF: Cu, Ti-doped phosphors can be utilized for medical dosimetry.

1.13 Exploring the Effects of Zn doping on the Structural and Thermoluminescence Behavior of Lithium Magnesium Borate (LMB)

A. K. M. M. Rahman, S. Hossain, Z. Hossain, and S. Yeasmin

The successful synthesis of LMB doped with different concentrations of Zn was achieved using the solid-state diffusion method, followed by a systematic investigation of its structural characteristics using X-ray Diffraction (XRD), revealing the monoclinic crystal structure. Additionally, Transmission Electron Microscopy (TEM) verified the material's crystallinity. Fourier Transform Infrared Spectroscopy (FTIR) revealed the presence of various functional bands of B-O and Zn2+ in the material, which confirmed the successful formation and the doping of LMB. Furthermore, this study investigated the Thermoluminescence (TL) properties of the Zn-doped LMB material under irradiation doses in the range of 8 Gy to 36 Gy delivered from a ^{60}Co source. TL measurements revealed two distinct glow peaks in Zn-doped LMB. The samples showed the highest sensitivity at low doses with a reliable sublinear dose response. Doping LMB with Zn significantly enhances its TL characteristics, indicating its potential application in industry, and medical dosimetry.

1.14 Exploring Dysprosium Doped Lithium Strontium Borate (LSB) Based Phosphor for Dosimetry Application

A. K. M. M. Rahman, S. Hossain, Z. Hossain, and S. Yeasmin

Lithium Strontium Borate (LSB), doped with varying levels of the rare earth element Dysprosium (Dy), was prepared using the solid-state synthesis technique. All samples were analyzed under identical conditions to characterize their structural, elemental and thermoluminescence (TL) properties. The structural and elemental properties of the materials were analyzed using X-ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR), and Scanning Electron Microscopy - Energy Dispersive X-ray Spectroscopy (SEM-EDX) respectively. XRD analysis revealed that both LSB and Dydoped LSB were synthesized with high purity, displaying a monoclinic structure. Additionally, FTIR analysis confirmed the presence of functional groups in the samples. All the prepared samples were irradiated under identical conditions using a Linear Accelerator (LINAC) with an X-ray photon beam, delivering doses between 0.5 Gy and 10 Gy at 6 MV. The TL intensity for 0.9 mol% LSB:Dy was nearly eighteen times greater than that of undoped LSB. In addition, linearity and sensitivity were also enhanced by doping the LSB samples with Dy. The results indicated an increasing trend in the frequency factor corresponding to a rise in activation energy. These findings confirm the potential of LSB phosphor for developing efficient radiation dosimeters, with Dy doping significantly enhancing its thermoluminescence properties.

1.15 Thermoluminescence Characteristics of Tailor-made Synthesized Materials for Radiation Dosimetry

A.K.M. Mizanur Rahman, M. Rifat-Ul Islam*, Md. Raghib Rahat*, Md. Kamruzzaman*, S. Hossain, Z. Hossain, S. Yeasmin

The materials also undergo structural analysis through Raman, SEM and EDX. A ceramic material, $LiCaPO_4$, exhibits remarkable TL properties after post LINAC irradiation, characterized by consistent peaks at 200 °C and 240 °C for both photon and electron energies with 3% fading in 28 days. A glass-like material, $LiZnBO_3$, exhibits sub-linearity and heightened sensitivity, with matching peaks at 160 °C and 240 °C. Another synthesized material, $LiSrBO_3$ showcases significant sensitivity along with enhanced deep trap intensity and stability enabled by Dy doping. Through meticulous adjustment of dopant concentrations and synthesis conditions, the investigation strives to optimize TL reactivity and stability of these materials, thereby paving the way for their practical integration in diverse scientific and industrial sectors.

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1.16 Survey of Background Radiation Levels Throughout Bangladesh

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During this reporting period, measurement of background radiation level has been carried out regularly in and around Dhaka city on monthly basis as a part of this work. In this study, Gamma Scout (w/Alert, Digital Survey meter) was used with Global Positioning System (GPS) for pointing the location. The average

background radiation level was found from (0.17 to 0.25) μSvh^{-1}. It is observed that there is no change in background radiation level from the data of previous years.

1.17 Workplace Monitoring of Different Radiation Facilities of Atomic Energy Centre Dhaka

S. Yeasmin, J. Ferdous, M. Begum, M.M.M. Siraz, S. Pervin, S. Hossain, N. Hassan, N. Sultana, Z. Hossain, and A. Joydha

Five divisions of AECD, viz. Non-Destructive Testing (NDT), Accelerator Facilities Division (AFD), Material Science Division (MSD), Chemistry Division and Health Physics Division (HPD) of AECD have been using radioisotopes and radiation producing equipment for research & development works. Radiation monitoring has been done on monthly basis in and around the above-mentioned divisions by using Gamma Scout (w/Alert, Digital Survey meter). The radiation levels in front of isotope storeroom (corridor) of HPD, Source room (corridor) of HPD, NDT Source storeroom and in front of door of NDT source room were found (0.65 - 2.15) μSvh^{-1}, (0.29 – 0.67) μSvh^{-1}, (0.49 – 4.39) μSvh^{-1} and (0.31-0.53) μSvh^{-1} respectively. The control panel of AFD, XRD room of MSD and EDXRF room of Chemistry division were found around background level. No major change in dose level was observed.

1.18 Measurement of Radioactivity in Rain Water

S. Yeasmin, J. Ferdous, M. Begum, M.M.M. Siraz, S. Pervin, S. Hossain, N. Hassan, N. Sultana, Z. Hossain, and A. Joydhar

During the reporting period, eighteen rain water samples were collected from AECD campus Dhaka and Tongi. The activity concentration of natural radionuclides ^{238}U, ^{232}Th, and ^{40}K were determined by Gamma Spectrometry System consists of High Purity Germanium (HPGe) detector. The radioactivity range of ^{238}U series, ^{232}Th series and ^{40}K was within the acceptable limit. Artificial radionuclide was not found.

1.19 Radioactivity Concentration of Different Food Samples Imported from SAARC and other Countries

S. Yeasmin, J. Ferdous, M. Begum, M.M.M. Siraz, S. Pervin, S. Hossain, N. Hassan, N. Sultana, Z. Hossain, and A. Joydhar

Total twenty four imported food samples were collected from different local markets in Mirpur, Dhaka. Different Food samples such as Anchor Beans, Dabli, Ginger, Garlic, Rice, Red Wheat, White Wheat, Lentils, Chhola, Palm Oil and Soybean oil were imported from different countries such as Australia, China, India, Pakistan, Maldives, Malaysia and Nepal. The samples were processed following the standard procedures provided by IAEA and analyzed for gamma emitting radionuclides. The radioactivity range of ^{238}U series, ^{232}Th series and ^{40}K was within the acceptable limit. Artificial radionuclide was not observed.

1.20 NORM Assessment of Drilling Mud Samples of Begumganj Gas Field

M. Begum, M.M.M. Siraz, and S. Yeasmin

To determine the radionuclides and their activity concentration in drilling mud samples of a gas field. Total fourteen drilling mud samples from the Begumganj Gas Field have been collected for radiological risks assessment. A high-resolution HPGe detector (p type, Model no. GCD-30185) has been used in this study where, the energy peak at 1.33 MeV corresponding to 60Co exhibits an energy resolution of 1.67 keV at full-width half-maximum (FWHM) with a relative efficiency of 30%. As the part of environmental radioactivity monitoring program, environmental samples have been analyzed using gamma spectrometry system for radiological risks assessment. Total 7 radiological hazard indices: radium equivalent activity, gamma representative level index, external absorbed dose rate, annual effective dose rate, external hazard index, internal hazard index and excess lifetime cancer risk (ELCR) will be assessed for the mentioned samples, where data analysis are in progress. As incorporation of naturally occurring radioactive materials originated from gas abstraction activities can pollute more so monitoring is necessary in and around gas-field areas.

1.21 Radiological Risks Assessment in the Industrial Area Beside the Branch of Bangshai River, Bangladesh

M. Begum, M.M.M. Siraz and S. Yeasmin

The objective of this study is to examine radiological risks of the industrial area beside a river of Bangladesh. Different soil and sediment samples from an industrial area beside the branch of Bangshai River have been

analyzed for radiological risks assessment by using gamma spectrometry system with a relative efficiency of 30%. The average radioactivity concentrations for ^{226}Ra, ^{232}Th and ^{40}K in soil and sediment samples of this industrial area have been found 22±3.7 Bqkg^{-1}, 41±8.3 Bqkg^{-1} and 400±20.6 Bqkg^{-1} respectively. Only the average value of ^{232}Th is higher than corresponding world average value of 30 Bqkg^{-1}, which may be due to geological formation variation or due to industrial influence. Assessing total seven radiological hazard indices of these samples, it has been concluded that the area is almost free from radiological risks. The values of only three radiological hazard indices have been found around their corresponding recommended values. Such as, absorbed dose rate values have been found around the recommended value for absorbed dose rate which is 55 ηGyh^{-1}.

1.22 Environmental Pollution Analysis due to Natural Gas Production Activity of Srikail Gas Field, Bangladesh

M. Begum, M.M.M. Siraz, and S. Yeasmin

Because of integration of NORMs originated from gas production activities can contaminate the nearby environment, so monitoring is essential in and around gas-fields. As the part of environmental radioactivity monitoring program, soil, water and sediment samples from the Srikail Gas Field area have been collected for radiological risks assessment. A high purity Germanium (HPGe) gamma detector has been used in this work where, the energy peak at 1.33 MeV corresponding to 60Co exhibits an energy resolution of 1.67 keV at full-width half-maximum (FWHM) with a relative efficiency of 30%. Different radiological hazard indices, like radium equivalent activity, gamma representative level index, external absorbed dose rate, annual effective dose rate, external hazard index, internal hazard index and excess lifetime cancer risk (ELCR) will be assessed for the radiological risks assessment, where data analysis are in progress.

1.23 Radiological Impact of Ship-breaking Operations and Container Depot Explosions on Sitakunda Coast, Chattogram, Bangladesh: Implications for Public Health

M.M. Mahfuz Siraz, Araf Mahmud*, Khondokar Nazmus Sakib* and Selina Yeasmin

Thirty soil samples from shipbreaking yards and nearby areas, including a recent explosion site, were meticulously analyzed for the first time. The results unveiled notable levels of radionuclides, with activity concentrations of ^{226}Ra ranging from 13 ± 1 to 37 ± 3 Bq/kg (mean: 22 Bq/kg), ^{232}Th from 21 ± 2 to 47 ± 4 Bq/kg (mean: 35 Bq/kg), and ^{40}K from 220 ± 19 to 590 ± 55 Bq/kg (mean: 438 Bq/kg). The highest recorded values for the outdoor absorbed dose rate (66.85 nGy/h) and annual effective dose (0.48 mSv) exceed internationally recognised safety thresholds. While most of the values of the radiological hazard index lie within the safety limits, some values exceeded the allowable limits set by UNSCEAR. The inquiry results could contribute to enhancing the existing radioactivity database in Bangladesh, establishing a foundational reference for monitoring radioactivity in ship-breaking yards and its impact on the coastal environment with the ultimate goal of decreasing population exposure to the lowest possible extent for ship-breaking workers and local inhabitants in those areas.

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1.24 A Pioneering Study of Natural Radioactivity in Sand from Char Lands Along the Padma River Near the Rooppur Nuclear Power Plant of Bangladesh: Implications for Public Health

M.M. Mahfuz Siraz, Wayez Bin Zahid*, Afroza Shelley*, Nazneen Sultana and Selina Yeasmin

This study presents the first detailed assessment of radioactivity in 36 sand samples from four charlands along the Padma River near the Rooppur Nuclear Power Plant (RNPP) in Bangladesh. The activity concentrations ranged from 13 to 132, 17–132, 220–640 Bq/kg for ^{226}Ra, ^{232}Th and ^{40}K, respectively with some ^{226}Ra and most ^{232}Th values exceeding global average levels. The elevated ^{232}Th levels are primarily attributed to the region's geological composition, the natural presence of heavy minerals, the redistribution of radioactive materials via sediment transport, and local geochemical conditions. Although a few outdoor absorbed dose rates exceeded global averages, most radiological hazard indicators were within safe limits. Except for one sample with elevated values, the sand samples generally pose no significant radiological risk to the local community or environment.

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1.25 Assessment of Soil Radioactivity and Associated Health Risks in the Haripur Gas Field, Bangladesh

M.M. Mahfuz Siraz, Musfik R. Fahim*, Zulfiqar Hasan Khan*, Mahbuba Begum and S. Yeasmin

This study investigates the radioactivity levels in surface soil from the Haripur gas field. 21 soil samples were analyzed using a high purity germanium (HPGe) detector. The activity concentrations of ^{226}Ra, ^{232}Th and ^{40}K in the soil samples were found to range between 11–19, 20–38, and 280–500 Bq kg^{-1}, respectively. All ^{226}Ra values and the majority of ^{232}Th and ^{40}K values fell within the global average levels for soil, which are 35, 30, and 400 Bqkg$^{-1,}$ respectively. Radiation hazard indices were found to be below the internationally accepted safety limits set by organizations such as the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the International Commission on Radiological Protection (ICRP), indicating that the soil poses no significant radiological risks for construction and agricultural applications.

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1.26 Pioneering Study of Radioactivity in Soil Near the Payra 1320 MW Thermal Power Plant, the Largest Coal-Fired Thermal Power Plant in Bangladesh

M.M. Mahfuz Siraz, Ashik Reza*, Mohammad Khan*, Mahbuba Begum, Nazneen Sultana and S. Yeasmin

A pioneering study has been performed using a high purity germanium detector by analysing 30 soil samples collected from distances of 50, 600, 1200, and 3000 metres in the periphery of the largest 1320 MW CFTPP, Payra, Bangladesh. The activity concentrations of ^{226}Ra, ^{232}Th and ^{40}K ranged from 19–32, 31–90, and 420–870 Bq/kg, respectively, with most of the samples show ^{232}Th and ^{40}K levels above global averages. Elevated levels of ^{232}Th and ^{40}K in soil around Payra thermal power plant stem from natural minerals, granitic rocks, ash disposal, coal combustion residues, and environmental factors. Radiological hazard indices, including dose rates and cancer risk, exceed global averages, indicating unsafe radiation exposure for coal miners and locals.

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1.27 Pioneering Study of Radioactivity and Radiological Hazard in Soil Surrounding the Bhola 225 MW Combined Cycle Power Plant, Bangladesh

M.M. Mahfuz Siraz, Madhurja Sarker*, Md. Jafor Dewan* and S. Yeasmin

This pioneering study marks the first assessment of radioactivity in soil neighboring the Bhola 225 MW Combined Cycle Power Plant (CCPP) in Bangladesh, which utilizes natural gas and high-speed diesel (HSD).Twenty soil samples collected from the Bhola CCPP revealed average activity concentrations of ^{226}Ra at 33 ± 3 Bq/kg (range: 27 to 65 Bq/kg), ^{232}Th at 46 ± 4 Bq/kg (range: 39 to 54 Bq/kg), and ^{40}K at 539 ± 48 Bq/kg (range: 470 to 630 Bq/kg. While the radium equivalent activity and some hazard indices are within recommended limits, several radiological parameters exceeded established safety thresholds.

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1.28 Evaluating the Radioactivity and Health Risks in Oil and Gas Production Areas: Insights from Titas Gas Field, Bangladesh

M.M. Mahfuz Siraz, Tasnia Haque* and S. Yeasmin

This pioneering study investigates radioactivity levels in surface soil from the Titas Gas Field area in Bangladesh by a High Purity Germanium (HPGe) detector, In surface soil, the activity of ^{226}Ra, ^{232}Th, and ^{40}K varied from 18–41 Bq/kg, 28–62 Bq/kg, and 280–600 Bq/kg, respectively. The estimated of radiological risk reveals that some indices exceed recommended limits, hence pose a concern for public health. The study recommends periodic monitoring, public awareness campaigns, remediation efforts, and long-term management strategies to protect environmental and public health.

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1.29 Determination of Radioactivity in Environmental Samples Collected from the 32 km Radial Distances of Rooppur Nuclear Power Plant

S. Pervin, N. Sultana, S. Banik, J. Ferdous, A. Joydhar, S. Yeasmin

To prepare baseline data of environmental radiation and radioacitivity monitoring around the Rooppur Nuclear Power Plant (RNPP) site, different environmental samples were collected from the 32 km radial distance of RNPP. The sampling was conducted in 17-30 January, 2022. Total 92 samples (surface water = 44, bottom water = 14, sediment = 14, aquatic vegetation = 12 and air samples =8) were collected from the 32 km radial distance of RNPP. Among these samples 85 samples were processed following the standard procedures as International Atomic Energy Agency (IAEA) guidelines. After preparation all the samples, only ten samples are counted by using high-purity germanium (HPGe) detector. The work is in progress.

1.30 Measurement of Activity Concentration of ^{226}Ra, ^{232}Th and ^{40}K in Soil Samples and Associated Health Hazard Assessment using Gamma Ray Spectrometry System

S. Pervin, T. Akhter, K.F. Kakolee, S. Yeasmin

A total of 48 soil samples were collected from 12 upazilas of Tangail district and analyzed using gamma-ray spectrometry, employing a high-purity germanium (HPGe) detector. The measured mean activity concentrations of ^{226}Ra, ^{232}Th and ^{40}K in soil samples were found 43.63 ± 0.16 Bq/kg, 25.63 ± 0.15 Bq/kg and 451 ± 0.15 Bq/kg, respectively.

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1.31 A Study of Natural and Artificial Radionuclides in Wheat Flour Samples using Gamma Ray Spectrometry System

S. Pervin, M. A. Rahman, K. Hossen, S. Yeasmin

This research is aimed at determining the natural and artificial radionuclides in wheat flour samples from Dhaka city.Twenty wheat flour samples were collected from various markets of Dhaka city. The study was performed by using high purity germanium detector. The range of activity concentration of ^{226}Ra, ^{232}Th and ^{40}K in wheat flour samples were found 1.5 ± 0.22 to 4.1 ± 0.24 Bq/kg with an average of 2.51 ± 0.12 Bq/kg from1.6± 0.11 to 5.5 ± 0.24 Bq/kg with an average of 3.18 Bq/kg, and 100 ± 0.10 Bq/kg to133 ± 0.12 Bq/kg with an average 120.9 Bq/kg. The result showed that the natural activities of ^{226}Ra, ^{232}Th and ^{40}K in soil samples did not exceed UNSCEAR recommended levels and compare with the data available in other parts of the world. The annual effective dose was found below the 1mSv/y.

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1.32 Determination of Natural Radionuclides in Soil Samples using High Purity Germanium Detector

S. Pervin, N. Sarker, M.M. Haider, S. Yeasmin

This research is aimed at determining the natural radionuclides in urban soil samples of Dhaka city. Thirty urban soil samples were collected from various locations of Dhaka city. The study was performed by using high purity germanium detector. The average activity concentrations of the radionuclides ^{226}Ra, ^{232}Th and ^{40}K were found 24.20 ± 0.13 Bq/kg, 52.03 ± 0.13 Bq/kg, and 352.3 ± 0.09 Bq/kg, respectively. The mean value of radium equivalent activity (Ra_{eq}) was found 125.74 Bq/kg, which was below world average limit of 370 Bq/kg. The estimated outdoor and indoor annual effective dose rates were found 0.071 mSv/y and 0.342 mSv/y, respectively—both below the worldwide recommended limit of 1 mSv/y.

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1.33 Assessment of Radiological Health Hazard Due to Natural Radionuclides in Fish Samples using Gamma Ray Spectrometry System

S. Pervin, Shahin, K. Hossen, S. Yeasmin

To measure the natural and artificial radionuclides, total twenty fish samples were collected from various locations of Patuakhali district. The study was performed by using high purity germanium detector. For the dry fish, the average activity concentration of ^{226}Ra, ^{232}Th and ^{40}K were found to be 4.09±0.18 $Bqkg^{-1}$, 4.72±0.17 $Bqkg^{-1}$ and 269.5±0.01 $Bqkg^{-1}$, respectively which were less than the world average value. The

result showed that the natural activities of ^{226}Ra, ^{232}Th and ^{40}K in fish samples did not exceed UNSCEAR recommended levels and compare with the data available in other parts of the world.

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1.34 Determination of Natural Radionuclides in Milk Powder Samples using Gamma Ray Spectrometry Syst

S. Pervin, N. Shefa, K. Hossen, S. Yeasmin

Milk is an essential component of human nutrition, especially for infants and children. Besides, milk is a critical indicator of contamination within the food chain as it can provide a strong vector of radionuclides and heavy metals from the environment to humans. Therefore, the assessment of radioactivity levels in milk is a crucial element within this process. A high-resolution gamma-ray spectrometer was applied to measure the activity concentration of natural and artificial radionuclides ^{226}Ra, ^{232}Th and ^{40}K, and ^{137}Cs in 20 brands powdered milk consumed in Bangladesh. The activity concentration of ^{226}Ra ranged from 7–10 Bq/kg, ^{232}Th ranged from 7–10 Bq/kg, and 40K from 140–165 Bq/kg. The result showed that the natural activities of ^{226}Ra, ^{232}Th and ^{40}K in milk powdered samples did not exceed UNSCRE recommended levels and compare with the data available in other parts of the world. No ^{137}Cs radionuclide was found.

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1.37 Investigation of Natural and Artificial Radionuclides in Soil Samples using Gamma Ray Spectrometry System

S. Pervin, M. Jewel, K. Hossen, S. Yeasmin

Twenty soil samples were collected from various locations of Payra Thermal Power Plant, Patuakhali, Bangladesh. All the collected samples were prepared according to standard procedure by International Atomic Energy Agency (IAEA) guideline. The measurement was performed using gamma ray spectrometry system by high purity germanium detector. The average of activity concentration of ^{226}Ra, ^{232}Th and ^{40}K in investigated soil samples are found 25.26±.149 (Bq/kg), 33.7±.162 (Bq/kg) and 402.5±.125 (Bq/Kg) which were less than the world average value. No artificial radionuclide was found in these investigated samples.

*Department of Biochemistry and Food Analysis, Patuakhali Science and Technology University, Bangladesh

1.38 Study and Investigation of the Trend of Radiation Exposure among the Occupational Workers Throughout Bangladesh

S. Hossain, A. K. M. M. Rahman, M. Hassan, J. Ferdous, M. M. M. Siraz, S. Pervin, N. Sultana, N. Hassan, Z. Hossain, M. S. Rahman and S. Yeasmin

To understand the complete situation of the effectiveness of radiation protection practices in the workplaces, especially in the medical, industrial, research and other related fields where ionizing radiation is used. The occupational radiation exposures for 13826 workers were investigated in the fields of radiotherapy, diagnostic radiology, nuclear medicine, industrial radiography, research institutes, and other places throughout Bangladesh in 2024-25 by using thermoluminescent dosimeter (TLD). A Harshaw TLD reader (Model 4500) was used to measure the effective dose on a quarterly basis throughout the year. The database was prepared and recorded on the basis of the value of personal dose equivalent (Hp (10)).

1.39 Background Radiation Survey in the 32 km Radial Distances of Rooppur Nuclear Power Plant in 1st Quarter of 2023

N. Hassan, M.M. Mahfuz Siraz, S. Pervin, N. Sultana, Z. Hossain, A. Joydhar, J. Ferdous & S. Yeasmin

To prepare baseline data of environmental background radiation around the Rooppur Nuclear Power Plant (RNPP) site, background gamma radiation monitoring was performed in the 32 km radial distances of RNPP. The radiation survey work was conducted in 02-13 January, 2023.The equipment used for the measurement of radiation dose Level is Radiation Survey Meter (Gamma-Scout). This is the fourth (winter 3nd time) survey on background gamma radiation dose level survey and its distribution around RNPP. The dose at the gonad level (1 m above the surface) varied from 0.051 to 0.230 µSv/h.

1.40 Determination of Radioactivity in Environmental Samples Collected from the 32 km Radial Distances of Rooppur Nuclear Power Plant in 1st Quarter of 2023

N. Hassan, M.M. Mahfuz Siraz, S. Pervin, N. Sultana, Z. Hossain, A. Joydhar, J. Ferdous & S. Yeasmin

To prepare baseline data of environmental background radiation around the Rooppur Nuclear Power Plant (RNPP) site, total 87 environmental samples (Surface water 44, sand and sediment-19, aquatic vegetation-04, for radon measurement -20 surface water) were collected from the 32 km radial distance of RNPP. All samples were processed following the standard procedures as International Atomic Energy Agency (IAEA) guidelines. After preparation, samples will be measured by using high-purity germanium (HPGe) detector with relative efficiency of 30%. The work is in progress.

1.41 Assessment of Gross alpha/Beta Activity in Various Water Samples Collected from Different Regions of Bangladesh

N. Sultana, M.M. Mahfuz Siraz, N. Hassan, M. Begum, S. Pervin and S. Yeasmin

The aim of this study is to measure the activity of gross alpha and gross beta in various water samples which are used in multidisciplinary purposes. Forty surface water samples were collected randomly from different locations of Bangladesh. The gross alpha and gross beta activity in water samples are measured by using Zinc sulfide (ZnS) scintillation detector. All samples were collected and prepared according to the EPA 900 method. Till now eighteen samples were measured by the detector. Among the measured sample minimum detected alpha activity is 0.0014 Bq/L, beta activity is 0.0127 Bq/L and maximum alpha activity is 0.0122 Bq/L, beta activity is 0.0213 Bq/L. Further work is in progress.

1.42 Measurement the Gross Alpha Beta Activity of Hatirjheel Lake Water

N. Sultana, M.M. Mahfuz Siraz, M. F. Kabir, N. Hassan, S. Pervin and S. Yeasmin

The aim of this study is to measure the activity of gross alpha and gross beta in surface water samples collected from Hatirjheel lake, Dhaka. Fifteen surface water samples were collected randomly from different locations of Hatirjheel lake, Dhaka. Bangladesh. The gross alpha and gross beta activity in water samples were measured by using Zinc sulfide (ZnS) scintillation detector. All samples were collected and prepared according to the EPA 900 method. Till now ten samples were measured by the detector. Among the measured sample minimum detected alpha activity is 0.0005 Bq/L, beta activity is 0.1182 Bq/L and maximum alpha activity is 0.0063 Bq/L, beta activity is 0.4241 Bq/L. Further work is in progress.

1.43 Determination the Real-time Gamma dose and Gross Alpha Beta Activity of Surface Water Collected from Dhanmondi Lake

N. Sultana, M.M. Mahfuz Siraz, M. F. Kabir, N. Hassan, S. Pervin and S. Yeasmin

The aim of this study is to measure the real-time gamma dose monitoring and measuring the activity of gross alpha and gross beta in surface water samples collected from Dhanmondi lake, Dhaka. Ten surface water samples were collected randomly from different locations of Dhanmondi lake, Dhaka. Bangladesh. Real-time gamma dose were monitored by using GAMMA SCOUT (model no: 071017) and the gross alpha/beta activity in water samples were measured by using Zinc sulfide (ZnS) scintillation detector. All samples were collected and prepared according to the EPA 900 method. Eight samples were measured by the detector. The ranged of real-time gamma dose rates were 0.094 to 0.113 µSv/h. Among the measured sample the ranged of alpha activity is 0.0018 to 0.0045 Bq/L, and the ranged of beta activity is 0.0780 to 0.1913 Bq/L. Further work is in progress.

2. Manpower Development (Training /Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no	Title of the program	Date	Place	Number of participants
1.	Regional Training Course on Development and Implementation of Academic Program for Medical Physics Education	05-09 August, 2024	Beijing, China	01
2.	Regional Workshop on Workplace Monitoring Regulatory provisions and technical service capacity	26–30 August, 2024	Malaysia	01

Sl. no	Title of the program	Date	Place	Number of participants
3.	Instructor Training Course (ITC) on Environmental Radioactivity Monitoring	04-26 September, 2024	JAEA, Japan	01
4.	50th Understanding Training Course on ISO/IEC 17025:2017.	24 – 26 September, 2024	Ministry of Industries, Dhaka.	01
5.	Regional Workshop on Evaluation and Finalization of the Joint IAEA / CIRP Regional Intercomparison Exercise on Individual Monitoring for External Exposure	24 – 28 November, 2024	Kuwait	01
6.	Advanced Instructor Training Course on Environmental Radioactivity Monitoring	27 November 2024 - 06 December 2024	Tokaimura, Japan	01
7.	International Conference on Electronics and Informatics- 2024	28-29 December 2024	Atomic Energy Centre Dhaka	06
8.	National Conference on Physics-2025	6-7 February 2025	University of Rajshahi, Rajshahi	03
9.	The Role Based User Training on Bangladesh National Single Window System.	24-25 February, 2025	Bangladesh Computer Council (BCC), Agargaon, Dhaka	04

2.2 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Seminar on Harnessing New Thermoluminescent Materials for Radiation Dosimetry Application	11-15 February 2024	Atomic Energy Centre, Dhaka	42

3. Oral/Poster Presentation in Seminar/Symposium/Conference: (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Selina Yeasmin	Measurement the activity of gross alpha/beta on surface water collection from near rnpp construction site	International Conference on Electronics and Informatics- 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Evaluation of gross alpha/beta activity in pond water from aere campus	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	University of Rajshahi, Rajshahi
M.S. Rahman	Estimation of radiological risk on worker & public from radiological facility using Thermoluminescent dosimeters	International Conference on Electronics and Informatics- 2024	Bangladesh Electronics and Informatics Society	28–29 December 2024	Atomic Energy Centre Dhaka
A.K.M. Mizanur Rahman	A comparative study of thermoluminescence behavior of tailor-synthesized materials for radiation dosimetry	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	University of Rajshahi, Rajshahi

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
	An exploration of the evolution of structural and thermoluminescent characteristics in LiF crystals modified with Ti for radiation dosimetry	National Conference on Physics-2025	Bangladesh Physical Society	06 – 07 February 2025,	University of Rajshahi, Rajshahi
Mahbuba Begum	Gas-well core assessment of titas gas field for radiation hazard from NORM	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Radioactivity level assessment of imported foodstuffs collected from local market	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024,	Atomic Energy Centre Dhaka
	Environmental impact assessment of fenchuganj and saldanadi gas fields of Bangladesh using EDXRF method	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Assessment of Heavy Metals and Different Elements Concentration in Gas-Well Core Samples of Fenchuganj and Shahbazpur Gas Fields	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Assessing the Industrial Area Beside the Branch of Bangshai River for Radiological Risks	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Assessing the Elemental Distribution Through Environmental Indicators of Shahbazpur Gas Field by EDXRF Method	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
Shahadat Hossain	Exploring Dysprosium doped Lithium Strontium Borate phosphor for dosimetry application	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Rare earth doped phosphor: new material for passive radiation dosimetry	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
Nazia Hassan	Background Radiation Survey in the 32 km Radial Distances of Rooppur Nuclear Power Plant	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
	Quantification of Natural and Artificial Radioactivity in Rainwater Samples Collected from AECD and Tongi	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Real-time Radiation Monitoring at Outdoor of Bangabandhu Sheikh Mujib Medical University (BSMMU) Campus and Evaluation of Radiation Risk on Worker & Public	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Real-time Radiation Monitoring at Outdoor of Dhaka Medical College Hospital (DMCH) Campus and Evaluation of Radiation Risk on Worker & Public	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
Nazneen Sultana	Determination of Radon Activity Concentration in Surface Water of the Padma River near the Rooppur Nuclear Power Plant, Bangladesh	International Conference on Electronics and Informatics – 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre Dhaka
	Assessment the activity of gross alpha-beta on water samples collected from different region of Bangladesh	National Conference on Physics-2025,	Bangladesh Physical Society	06 – 07 February 2025	University of Rajshahi, Rajshahi

4. Organize Stakeholder Meeting

Sl. no	Title of the program	Date	Place	Number of participants
01.	Stakeholder meeting on Overall Activities of Health Physics Division, AECD	27 January 2025	Atomic Energy Centre, Dhaka	94

5. Project Work (ADP/FNCA/ RCA/ TC//CRP/ S&T etc.)

To Implement radiation protection program, HPD has been working in collaboration with IAEA, JAEA (Japan) as well as government of Bangladesh in different projects such as IAEA/RCA, IAEA/Non-RCA, IAEA CRP, ITC followed by FTC, ADP etc.

Collaboration Project with MOST, GOB & IAEA:

- RAS/9093 -Strengthening Technical Services in Occupational Radiation Protection in Compliance with the International Basic Safety Standards
- Special Research Allocation Project: 2024-2025 under MOST, GOB

To enhance knowledge on radiological science the senior scientists of HPD have been delivering theoretical lectures in the field of Health physics & Radiation Protection in the following areas:

- MD course in Nuclear Medicine (NINMAS)

6. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/service	Revenue income (if any) Tk.
1.	Imported and Exportable Food Samples	901	56,41,807/-
2.	Gross Alpha and Gross Beta Service Provided	19	180000/-
3.	Individual Monitoring Service	14942	4,503,696/-
In total income			**1,03,25,503/-**

Materials Science Division, AECD

Objective

Since its inception, Materials Science Division (MSD), Atomic Energy Centre Dhaka (AECD), has been pursuing cutting-edge research on advanced materials on the most dynamic frontiers of nanotechnology, biotechnology, and information technology. In the last year, scientists of this division conducted extensive research on different advanced materials for electronic, magnetic, biomedical, water treatment, nano fertilizer, nuclear, and Thermoluminescence dosimetry applications. While there was success in removing heavy elements like chromium, lead, cadmium, and arsenic from wastewater, there was also success in obtaining a similar yield of Boro rice with a 50% reduction of urea by transforming it to nano urea. We achieved the development of a contrast agent for magnetic resonance angiography/imaging through polysaccharide/ferrite nanohybrid. MSD, AECD, developed various phosphors for thermoluminescence dosimetry applications last year. The division also developed novel carbonaceous materials such as functionalized carbon nanotubes, reduced graphene oxides, and composites with ceramic oxides for electronic and biomedical applications.

1. R& D Works

1.1 Spatio-Temporal Variation of Microplastics Concentration in Urban Surface Water Bodies

S. Manjura Hoque, M.M.Hoque, M. N.I. Khan, M. Al-Mamun, H.N.Das, R. Rashid,M.R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, N. Begum, M.M. Billah*

The objective of the research work is to study of the Spatio-Temporal Variation of Microplastics Concentration in Urban Surface Water Bodies Microplastic (<5mm) contamination in freshwater bodies surrounding Dhaka had attracted greater attention in recent years. Although various research had been being carried out on microplastic pollution in these ecosystems, the majority concentrated on the presence and characterization of microplastics. None of the studies actually explored the temporal variability, resulting a gap in comprehending their temporal distribution at various locations of the river. Besides investigating the occurrence and characterization of microplastic particles in the water samples this research offered a comparative examination of spatial and temporal variations in a chiefly non flowing urban water body, Hatirjheel Lake, and a flowing one, the Buriganga river. Surface water samples were collected and systematically processed to isolate possible microplastic particles, which were then evaluated microscopically. The polymer type was identified using ATR-FTIR Spectroscopy, Raman Spectroscopy and XRD was used for further characterization. Microplastics of various forms, colors and sizes were detected in all the sampling location from both water bodies. XRD analysis indicated that microplastic particles have the capacity to absorb various types of chemicals/drugs. Both Buriganga River and Hatirjheel Lake was found to be polluted as Pollution Load Index(PLI) of the water bodies were found to be 5.28 and 3.65 respectively.

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1.2 Structural, Morphological, Magnetic and Transport Properties of $Ba_{0.5}Li_{0.1}Gd_{0.1}Sr_{0.3}Zr_xTi_{1-x}O_3$

S. Manjura Hoque, M.M.Hoque, M. N.I. Khan, M. Al-Mamun, H.N.Das, R. Rashid, M.R.Hasan, A. Parveen, A. A. Begum, K. H. Fakir, N. Begum, A. H. Zulkarnine*

The objective of the work is to study of the Structural, Morphological, Magnetic and Transport Properties of $Ba_{0.5}Li_{0.1}Gd_{0.1}Sr_{0.3}Zr_xTi_{1-x}O_3$. In this research various ferroelectric $Ba_{0.5}Li_{0.1}Gd_{0.1}Sr_{0.3}Zr_xTi_{1-x}O_3$(with x=0.00,0.05and 0.10) ceramics have been synthesized by the standard solid-state reaction technique and calcined at 800°C for 5 hours. The structural, Microstructural, complex initial permeability, dielectric properties, electric modulus, ac conductivity of the samples have been investigated thoroughly. All the samples are formed distorted tetragonal perovskite structure. Microstructural and quantitative analysis are performed by Field Emission Scanning Electron Microscope and Energy Dispersive X-ray spectroscopy respectively. The bulk density and theoretical density with increasing Zr content. The initial permeability of the samples increased with the increasing Zr contents due to increasing grain diameter. The dielectric constant decreases with increasing frequency. This phenomenon can be explained by the Maxwell-Wagner model. From the ac conductivity measurements, it is observed that the AC conductivity increases with increasing frequency due to small polaron hopping which can be explained according to Jonscher's power law.

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1.3 Synthesis and Characterization of Mg and V co-doped ZnO Nanoparticles for Photovoltaic Applications

S. Manjura Hoque, M. N.I. Khan, M. Al-Mamun, H.N. Das, R. Rashid, M.R. Hasan, A. Kumar, A. Parveen, A. A. Begum, K. H. Fakir, N. Begum, T.H. Ujjal & F. Islam*

The objective of the work is Synthesis and Characterization of Mg and V co-doped ZnO Nanoparticles for Photovoltaic Applications. The advancement of photovoltaic technology paved the way for new materials synthesis and its doping effect on the electrical and optical properties. This research presents a method to produce Zn1-xMg0.02VxO nanoparticals through sol-gel processing while changing x values between 0 and 0.0075. Different techniques were used to examine the obtained nanoparticle. Different analysis including X-ray diffraction(XRD), scanning electron microscopy(SEM), transmission electron microscopy(TEM), and energy dispersive X-ray spectroscopy(EDS)in addition to UV-vis spectrophotometer were performed to study the structural, morphologicaland optical properties of all the samples. X-ray diffraction combined with transmission electron microscope analysis proved that the Mg and V ions inserted into the crystal structures of wurtzite ZnO nanoparticles. The structural properties revealed wurtzite material structure alongside crystallite dimensions of 25 nm and a vanadium-related secondary phase was detected. The research discusses particle formation techniques and presents analysis against modern studies. The co-doping of V-Mg nanoparticles resulted in better photovoltaic performance.

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1.4 Febrication, Characterization, Gas sensing Performance: Nickel Doped Zinc Ferrite Thin Films Synthesized by Spray Pyrolysis Deposition Technique

S. Manjura Hoque, M.N. I. Khan, M. Al-Mamun,H.N. Das,R. Rashid, A. Kumar, A. Parveen, A. A.Begum, N. Begum, N. Anjum *

The objective ofthe work is to Febrication, Characterization, Gas sensing Performance: Nickel Doped Zinc Ferrite Thin Films Synthesized by Spray Pyrolysis Deposition Technique. Nanocrystalline ferrite thin films of $Zn_{1-x}Ni_xFe_2O_4$ were successfully synthesized using the spray pyrolysis method on glass substrates at the temperature of 400°C to investigate their structural, morphological, optical, and magnetic properties and gas-sensing performance. X-ray diffraction analysis confirmed the formation of a cubic spinel structure in Ni-doped $ZnFe_2O_4$ thin films. The size of the particle was found to vary with increasing Ni concentration. No secondary phases were detected, indicating the phase purity of the synthesized films. By measuring in the 4000-300 cm-1 range, FTIR analysis confirmed the formation of the spine ferrite structure. The thickness of Ni-doped $ZnFe_2O_4$ thin films, measured using a Raman spectroscopy microscope exhibited a variation with increasing Ni doping. The magnetic parameters like saturation magnetization, remanence magnetization, and coercivity were obtained from theM-H loops. Saturation magnetization increases with the increase of Ni doping concentration andthe maximum saturation value at x=0.6 is 67.36 emu/cc and 325.46 emu/cc for 300k and 5krespectively. Due to their tunable band gap properties, Ni-Zn spinel ferrite thin films offer potential

applications in magnetic and electronic devices. The gas-sensing properties of thin films were investigated by analyzing their resistance behavior under varying gas concentrations. The sensing performance of Ni-doped $ZnFe_2O_4$ thin films revealed that $NiFe_2O_4$ and $Zn_{0.6}Ni_{0.4}Fe_2O_4$ compositions exhibited the highest response toward (NH_3, CO_2)gases. The combined findings suggest that Ni-doped $ZnFe_2O_4$ thin films are promising candidates for applications in optoelectronics, magnetic devices, and gas sensors

*Department of Physics, University of Chittagong

1.5 Investigation of Structural, Optical and Gas Sensing Properties of Magnesium Doped Zinc Oxide Thin Films Synthesized by Spin Coating Method

S. Manjura Hoque, M. N. I. Khan, M. Al-Mamun,H.N. Das, A. Kumar, A. Parveen, A. A. Begum, M.A. Hossain , N.Begum, N. Islam, S. A. Chowdhury *

The objective of the work is to Investigation of Structural, Optical and Gas Sensing Properties of Magnesium Doped Zinc OxideThin Films Synthesized by Spin Coating Method. Spin coating method has been successfully used to synthesize pure zinc oxide and 1%, 2%, 3%, 5%, 8%, 15%, 30% Mg-doped ZnO thin films. Structural, optical and gas sensing properties of films were investigated byusing X-ray diffraction, Fourier-transform infrared spectroscopy, Raman Spectroscopy Microscope, UV-Visible Spectroscopy and gas sensing measurements respectively. XRD analysis of undoped and Mg doped ZnO thin films exhibited polycrystalline wurtzite structure and average grain size values showed smaller grain sizes (12.588 nm to 9.875 nm) with increase inMg dopant compared to pure ZnO thin films. FTIR spectra confirmed the presence of Zinc oxide(Zn-O) bonds at 417.97 cm^{-1} which is shifted to higher frequency 476.16cm^{-1} with increase inMg doping concentration provided evidence for the successful incorporation of Mg ions. Raman spectroscopy microscope analysis revealed thickness was in the range between 466.667 nm to580.645 nm. UV-Visible Spectroscopy revealed shift in absorption edge towards lower wavelength with respect to undoped ZnO and a significant increase in the bandgap energy from 3.279 eV to 3.542 eV with rising Mg concentration. 15% Mg doped ZnO showed selectivity and highest response at room temperature towards ammonia gas among ammonia, ethanol, methanol gas and corresponding response and recovery times were 11.188 sec and 47.882 sec respectively at 300 ppm ammonia. These findings provide valuable insights into advantages for optoelectronic applications and the gas sensing mechanisms of pure ZnO and Mg doped ZnO thin films, offering promising potential for advancements in gas sensor technology.

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1.6 A Comprehensive Study on Multifunctional Properties of Mn-Doped Zn Fe_2O_4 Thin Films Synthesized by Chemical Bath Deposition Method

S. Manjura Hoque, M. N. I. Khan, M. Al-Mamun, H.N. Das, A. Kumar, A. Parveen, A. A. Begum, M.A. Hossain N. Begum, N. Islam,R. Zim *

The objective of the work is to A Comprehensive Study on Multifunctional Properties of Mn-Doped Zn Fe_2O_4 Thin Films Synthesized by Chemical Bath Deposition Method Manganese –doped $ZnFe_2O_4$ thin films were successfully synthesized using the chemical bath deposition (CBD) method and systematically analyzed for their structural, morphological, optical, magnetic and gas sensing characteristics. X-ray diffraction confirmed the incorporation of Mn^{2+} into the $ZnFe_2O_4$ latice, leading to lattice expansion, structural distortions and strain-induced modifications. Raman spectroscopy provided insights into grain growth and microstructural variations. Optical analysis using UV-Vis spectroscopy demonstrated an increase in absorbance at lower wavelengths and a significant decrease in transmittance. Magnetic Characterization like saturation magnetization, remanent magnetization and coercivity have been done by Physical Property Measurement System(PPMS) Gas sensing investigations for NH_3 and CO_2 across multiple concentrations revealed enhanced sensing response with Mn incorporation. These findings establish Mn-doped $ZnFe_2O_4$ thin films as highly promising materials for advanced technological applications. The tunable structural, optical, magnetic and gas sensing properties make these films ideal for next generation gas sensors, magneto optical devices, spintronic applications and optoelectronic systems, contributing to environmental monitoring, energy conversion and smart sensing technologies.

*Department of Physics, University of Chittagong, Chittagong

1.7 Dysprosium-Doped Ni-Zn-Cu Ferrites: Insights into Structural, Magnetic and Electrical and Behavior

S. Manjura Hoque, M. Al-Mamun, H.N. Das, A. Parveen, A. A. Begum, K. H. Fakir, N. Begum, Rezowanur Islam*

The objective of the work is to study of the Dysprosium-Doped Ni-Zn-Cu Ferrites: Insights into Structural, Magnetic and Electrical and Behavior. This research investigates the impact of Dy^{3+} doping on the structural, electrical and magnetic properties of $Ni_{0.40}Zn_{0.45}Cu_{0.15}Dy_xFe_{2-x}O_4$ ferrites (where x=0.00,0.02,0.04,0.07, 0.10,0.12 and 0.15). The samples were synthesized by the conventional solid-state reaction method and sintered at 1200°C for 3 hours. X-ray diffraction patterns confirmed that all the synthesized sample exhibit a single a single-phase cubic spinel structure with sharp peaks indicating good crystallinity. Lattice parameter and porosity were calculated. Fourier Transform Infrared(FTIR) spectra showed a preference for Dysprosium ions at octahedral sites, with primary absorption band (v1) at 555-568 cm^{-1}(tetrahedral sites) and secondary bands (v2) at 374-400cm^{-1}(octahedral sites). Saturation magnetization decreased with increasing Dy concentration, attributed to surface spin effects and cation distribution over the sub-lattices. Cole-Cole plot with a single semicircle suggested the dominance of grain resistance. Due to low magnetic coercivity and a large utility zone these ferrite are suitable for EMI filters and suppressors to mitigate unwanted electromagnetic noise, as well as high –frequency circulators and isolators for controlling signal flow and preventing reflection.

***** Department of Physics, University of Dhaka

1.8 Preparation of Zinc Ferrite Nanoparticles by Co-Precipitation Method and Coated with Chitosan for MRI Contrast of Barium and Treatment of Cancer by Hyperthermia

S. Manjura Hoque, M. Al-Mamun, H. N. Das, A. Parveen, A. A. Begum, K. H. Fakir, N. Begum, S. S. Moyeem *

The objective of the work is preparation of Zinc Ferrite Nanoparticles by Co-Precipitation Method and Coated with Chitosan for MRI Contrast of Barium and Treatment of Cancer by Hyperthermia. In this study, zinc ferrite nanoparticles were synthesized using the Co-precipitation method and subsequently coated with chitosan. The average crystallite size of he zinc ferrite magnetic nanoparticles was determined to be 19.4nm calculated using the Scherrer equation, with a lattice parameter of 8.42948 Å. X-ray diffraction analysis confirmed the presence of a single-phase structure. Fourier-transform infrared spectroscopy identified the functional groups present in both the coated and uncoated nanoparticles, confirming the successful formation of zinc ferrite. The coated nanoparticles exhibited superparamagnetic properties. Dynamic light scattering measurements provided insights into hydrodynamic diameter and polydispersity index of the coated particles. Hyperthermia tests indicated that the nanoparticles are suitable for thermotherapyeutic applications in cancer treatment. additionally MRI results, conducted on a rat, were satisfactory, demonstrating the potential of the synthesized zinc ferrite particles as a contrast agent for imaging a and as a therapeutic agent in cancer treatment.

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1.9 Development of Fe_3O_4 Magnetic Nanoparticles with Correlation between SLP and Tmax attained by RF-induction Heating for Different pH-controlled Particle Sizes

S. Manjura Hoque,M. Al-Mamun, H. N. Das, A. Parveen, A. A. Begum, K. H. Fakir, N.Begum, R. C. Alina *

The objective of the work is to Development of Fe_3O_4 Magnetic Nanoparticles with Correlation between SLP and Tmax attained by RF-induction Heating for Different pH-controlled Particle Size. A large category of magnetic nanoparticles including ferrite nanoparticles are of significant interest in biomedical applications due to their structure-dependent characteristics This study focuses on the synthesis and dextran coating of iron (II,III) oxide, or Fe_3O_4 nanoparticles for use in hyperthermia-induced cancer cell destruction. The specific loss power of hyperthermia is contingent upon the nanoparticles structural, and magnetic properties which can be tuned by the synthesis method. Fe_3O_4 nanoparticles were synthesized using the co-precipitation method from $Fecl_2$ and $Fecl_3$ solutions where the particle size was controlled by the pH of the solutions. The XRD pattern indicated that the sample was crystalline and nanoparticles with different sizes in the range of 6-17 nm were formed. The nanoparticles were then coated with dextran to enhance their biocompatibility and stability. The functional groups and bonding interactions were determined by FTIR

analysis. The distribution of particle size and shape was investigated from the TEM images. Physical Properties Measurement System was used to determine magnetic parameters such as saturation magnetization, coercivity and remanance. The coated nanoparticles were applied in a hyperthermia process to cultured cancer cells, where an alternating magnetic field induces localized heating, targeting cancerous tissues.

* Department of Physics, University of Dhaka

1.10 Investigation of Structural and Morphological Properties of Mo-doped Vanadium Disulfide Nanoparticles at Various Doping Concentration

S. Manjura Hoque, M.N.I. Khan, M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan,A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum, M. K. Hamid *

The objective of the work is to Investigation of structural and morphological properties of Mo-doped Vanadium Disulfide nanoparticles at various doping concentration. In recent years two-dimentional layered transition metal dichalcogenides (TMDs) have attracted great scientific interest in electrochemical energy storage & optoelectronics research. Vanadium disulfide(VS_2) is an important material in hydrothermal method in TMDs family. Mo-dopedVS_2 nanosheets were synthesized by hydrothermal method. Vanadium atom was substituted with molybdenum atom ($V_{1-x}Mo_xS_2$)with varying concentration x=0%, 3%, 5%, 7%, 9%.Where Ammonium metavandate (NH_4VO_3), Thioacetamide (C_2H_5NS) and Ammonium molybdate tetrahydrate $(NH4)_6Mo_7O_{24}.4H_2O$) were used as source of V^{4+} ions, S^{2+} ions and Mo6+ ions respectively. The crystal phase information was collected by X-ray diffraction (XRD) and it shows the formation of crystalline structure. Using FTIR spectra the surfacechemical bonds were analyzed. Absorption peaks around 522cm^{-1} and 980 cm^{-1} confirmed the stretching vibration of S=V=S. Other peaks also confirmed the substitution of vanadium atom with molybdenum atom. Field Emission Scanning Electron Microscopy (FESEM) showed the Mo atomsin layered VS^2 NPs. These findings strongly support the idea of using Mo-doped Vs^2 in electrochemical energy conversion and optoelectronics which encourages further research in this field.

*Department of Physics, University of Dhaka

1.11 Synthesis and Characterization of (1-x)$K_{0.5}Na_{0.5}NbO_{3-x}Bi_{0.85}Ba_{0.15}Fe_{0.975}Al_{0.025}O_3$ Heterostructure as a Potential Piezocatalyst

S. Manjura Hoque, M. N. I. Khan, F. M. Kamal,M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K.H. Fakir, A. Hossain, N. Begum,Z. Begum, M. K. Uddin *

The objective of the work is to Synthesis and Characterization of (1-x)$K_{0.5}Na_{0.5}NbO_{3-x}Bi_{0.85}Ba_{0.15}Fe_{0.975}Al_{0.025}O_3$ Heterostructure as a Potential Piezocatalyst. This research aims to develop advanced (1-x)$K_{0.5}Na_{0.5}NbO_{3-x}Bi_{0.85}Ba_{0.15}Fe_{0.975}Al_{0.025}O_3$[(1-x)KNN-x BBAFO]based piezo –activated catalysts which can be used for both hydrogen production and wastewater treatment. The synthesis involves employing solid-state sintering for KNN and sol-gel methods for BBAFO, followed by solid-state sintering for KNN-BBAFO heterostructure development. Hybrid nanoparticles with varying BBAFO content will be prepared and characterized using XRD, SEM and UV-vis techniques to analyze their structural and morphological properties. Band alignment of these materials will be investigated to enhance the piezocatalytic effect. The piezocatalysis mechanism leverages the materials ability to generate an electric charge under mechanical stress, facilitating redox reactions. This unique capability enables the breakdown of water molecules for hydrozen production and the degradation of organic pollutants in wastewater.

*Department of Materials and Metallurgical Engineering, BUET

1.12 Degradation of Organic Dyes from Waste Water using Magnetic Polymer-Supported Palladium Nanocatalyst

S. Manjura Hoque, M. N. I. Khan, F. M. Kamal, M. Al-Mamun H. N. Das, R. Rashid, M. R. Hasan, A. Parveen,A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum, S. Samy *

The objective of the work is to Degradation of Organic Dyes from Waste Water Using Magnetic Polymer-Supported Palladium Nanocatalyst. A magnetic polymer-supported nanocomposite is a hybride material that combines magnetic nanoparticles with a polymer matrix. These materials typically involve the incorportation of magnetic nanomaterials into a polymer matrix. The resulting composite exhibits unique properties, such as magnetic responsiveness, mechanical strength and versatility for a wide range of applications. In this

research magnetic polymer-supported palladium nanocatalysts, named Fe_3O_4/P(S-HEMA)/Pd was synthesized for the efficient degradation of dyes in wastewater, offering a promising solution to environmental pollution. Firstly Fe_3O_4 nanoparticles were prepared by co-precipitation of $Fe^{2+}$and Fe^{3+}. Then P(S-HEMA) was added with the magnetic particle and Fe_3O_4/P(S-HEMA) was prepared using V-50 as initiator. After that $PFCl_2$ was added to the emulsion to get Fe_3O_4/P(S-HEMA/Pdd(II) and lastly Fe_3O_4/P(S-HEMA)/Pd was reduced by $NaBH_4$ to get Fe_3O_4/P(S-HEMA)/Pd nanocomposite. The synthesized particles were characterized by Fourier Infrared Spectroscopy(FTIR), X-ray Diffraction (XRD), Vibrating Sample Magnetometry (VSM) and Transmission Electron Microscopy(TEM).

* Department of Chemistry Begum Rokeya University, Rangpur

1.13 Electrochemical Detection of Heavy Metal using Novel Magnetic Fe_3O_4 Nased Nanocomposite

S. Manjura Hoque, M. N. I. Khan, M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq &M. F. Mahmud *

The objective of the work is to Electrochemical Detection of Heavy Metal Using Novel Magnetic Fe_3O_4 Nased Nanocomposite. This research focused on the wastewater treatment processes with an emphasis on nanoscale materials. For this purpose, magnetically active P(S-DVB-AA)/Fe_3O_4 composite particles were synthesized. The synthesized particles were characterized by Fourier Infrared Spectroscopy(FTIR) , X-ray Diffraction (XRD), Vibrating Sample Magnetometry (VSM) and Transmission Electron Microscopy(TEM). The electrochemical response of the materials was checked by applying differential pulse voltametry in anaqueous solution of sodium arsenate, and the nanomaterial fabricated electrode showed a higher electrical response towards arsenic than that of the bared electrode and thus the material is predicted to detect heavy metal from the wastewater.

* Department of Chemistry Begum Rokeya University, Rangpur

1.14 Fabrication and Characterization of CuO Coated Magnetic Polymer Nanocomposites for the Detection of Biomolecules by Electrochemical Approach

S. Manjura Hoque, M. N. I. Khan,M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq &M. A. Shyed *

The objective of the work is to Fabrication and Characterization of CuO Coated Magnetic Polymer Nanocomposites for the Detection of Biomolecules by Electrochemical Approach. In this research CuO coated magnetic poly(lauryl methacrylate-divinyl benzene-metthacrylic acid) nanocomposite abbreviated as P(LMA-DVB-MAA)/Fe_3O_4-CuO nanocomposites wwere prepared in two steps. First, P(LMA-DVB-MAA) copolymer were prepared by suspension copolymerization of poly(lauryl methacrylate-divinyl benzene-metthacrylic acid. Next P(LMA-DVB-MAA)/Fe_3O_4-CuO nanocomposite particles were prepared by the coprecipitation method. The surface morphology of the nanocomposites particles were confirmed by Fourier Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Vibrating Sample Magnetometry (VSM) and Transmission Electron Microscopy (TEM). The FTIR spectra confirmed that the presence of Fe-O and Cu-O bond in the surface of the final composite particles. VSM data illustrated the lower value of magnetization (Ms) of CuO coated magnetic polymer nanocomposite particles than Fe_3O_4-CuO nanocomposite particles which illustrated the randomly distributions of Fe_3O_4 and CuO in the surface of non magnetic polymer. Finally the composite particles were applied for the detection of glucose and vancomycin electrochemically.

*Department of Chemistry Begum Rokeya University, Rangpur

1.15 Magnetically Responsive Synthetic Polymer Modifird Bio-composite Particlesfor the Separation of Dyes from Wastewater

S. Manjura Hoque, M. N. I. Khan, M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq &R. Amin *

The objective of the work is to Magnetically Responsive Synthetic Polymer Modifird Bio-composite Particles for the Separation of Dyes from Wastewater. Magnetic particles are now frequently studied to remove dye from water aas they can be easily separated by external magnetic field. Also their efficiency can be significantly increased by modifying and functionalizing them with synthetic polymers. In this work, microcrystalline cellulose was prepared from raw jute cellulose called microcrystalline jute cellulose (MCJC).

Then in the presence of MCJC, MCCJC/Fe_3O_4 composite particles were prepared by co precipitation method. This bio-composites were modified with copolymer of glycocidyl methacrylate (GMA) and methacrylic acid (MAA) by free radial polymerization with V-50 initiator in water medium. The final composite particles named MCJC/Fe_3O_4/P(MAA-GMA) were characterized with FTIR, XRD, VSM, TGA, TEM etc. to confirm its shape and morphology. Finally, the synthesized particles were applied for the separation of methylene blue dye from wastewater. The particles worked best at slightly basic pH around 8. The obtained data showed that the adsorption process follows Langmuir isotherm and Q_{max} is 195.61 mg^{-1} .

*Department of Chemistry Begum Rokeya University, Rangpur

1.16 Designation and Preparation Experimental Set up of Spray Pyrolysis, Spin Coating and Gas Sensing Devices to Synthesize of Ferrite Nanoparticles and Thin Films form Gas Sensor Applications

S. Manjura Hoque, M. N. I. Khan, M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq &Dinesh Kumar Chaudhury *

The objective of the work is to Designation and Preparation Experimental Set up of Spray Pyrolysis, Spin Coating and Gas Sensing Devices to Synthesize of Ferrite Nanoparticles and Thin Films form Gas Sensor Applications. Current progress: In this research work Experimental set up of Spray coating , spin coating and Gas sensing device for fabrication of thin films for gas sensing application were completed. The synthesis of $Mg_xZn_{1-x}Fe_2O_4$ nanoparticles by hydrothermal method and $Mg_xZn_{1-x}Fe_2O_4$ (x= 0-0.5) films by spray pyrolysis technique were done. Characterized $Mg_xZn_{1-x}Fe_2O_4$ nanoparticles by XRD, FTIR, UV and PPMS successfully.

*Department of Physics, Amrit Campus Tribhuvan University, Kathmundu, Nepal

1.17 Li-ion Conductivity in Ga Doped $Li_{0.33}La_{0.56}TiO_3$ Solid Electrolyte for All Solid-State Li-ion Battery

S.Manjura Hoque, M. N. I. Khan, M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq, M. N. Mahfuz &A. F. Nura *

The objective of the work is to investigateLi-ion Conductivity in Ga Doped $Li_{0.33}La_{0.56}TiO_3$ Solid Electrolyte for All Solid-State Li-ion Battery. This study investigates the impact of Gallium (Ga) doping on the electrochemical performance of $Li_{0.33}La_{0.56}TiO_3$ (LLTO) as a solid electrolyte for all Solid-state lithium ion batteries. Ga-doped LLTO (Ga-LLTO) samples with varying Ga content were synthesized using a conventional solid-state reaction method. Characterization was done by X-ray diffraction(XRD), scanning electron microscopy(SEM) and energy dispersive x-ray(EDX). Electrochemical properties were investigated by electrochemical impedance spectroscopy (EIS) and cyclic voltametry(CV).Dielectric property was investigated by impedance analyzer. XRD analysis confirmed the tetragonal perovskite structure of the samples.

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1.18 Effect of Bi Substitution on the Structural, Magnetic and Magnetocaloric Properties of $La_{0.65}Ba_{0.35-x}Bi_xMnO_{3-\delta}$

S.Manjura Hoque, M. N. I. Khan, M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq, M. R. Shikder *

The objective of the work is to effect of Bi substitution on the structural, magnetic and magnetocaloric properties of $La_{0.65}Ba_{0.35-x}Bi_xMnO_{3-\delta.}$ The effects of Bi substitution on the structural, microstructural, magnetic and magnetocaloric properties of $La_{0.65}Ba_{0.35-x}Bi_xMnO_{3-\delta}$(here x=0.00,0.05,0.10 and 0.15) are reported in this study. The X-ray diffraction pattern indicates that the crystal structure of the studied samples is in a rhombohedral structure with R3c space group. The average grain size increases from 0.112±0.04 to 1.443±0.8323μm as the content of Bi increases from x=0.10, which has been ascribed to the larger grain size and higher density of the sample. The complex magnetic permeability measurement indicates that the initial permeability is tuned with Bi-content. The Curie temperature has decreased from 298 to 214 K with increasing Bi content, which attributed to the weakening of the double interaction. Interestingly, above T_c, the samples do not exhibit a fully paramagnetic nature but a short-range ferromagnetic cluster, known as the Griffith phase (GP) has been observed. The value of magnetic susceptibility exponent in Griffith phase

region, λGP (=0.739±0.04) and temperature range of GP (=44.86%) are higher for x-0.15 indicating a stronger A-site disorder in the sample.

*Department of Physics, BUET

1.19 Modifying the Multifunctional Properties of Zn-Mg Ferrite through Silver Doping: Structural, Optical and Magnetic Insights

S. Manjura Hoque, M. N. I. Khan , M. Al-Mamun, H. N. Das, R. Rashid, M. R. Hasan, A. Parveen, A. A. Begum, K. H. Fakir, A. Hossain, Z. Begum, N. Begum,M.R. Haq, S. Kundu *

The objective of the work is to modifying the multifunctional properties of Zn-Mg ferrite through silver doping: structural, optical and magnetic insights. In the current paper, a detailed study on structural optical and magnetic properties of $Zn_{0.5}Mg_{0.5}Ag_xFe_{2-x}O_4$ (x= 0.00, 0.05,0.10,0.15,0.20) is reported. Ag-doped Zn-Mg ferrite(ZMAF) samples in this work were prepared via hydrothermal method, and the optimum sintering temperature to obtain good material performance was determined to be 500°C. The powder XRD patterns confirmed the nanocrystalline, single-phase formation and spinel-cubic structure of all samples. A non-linear growth of lattice parameter (a) and crystalline size (D) was found due to interaction between micro strain as a result of Ag doping. The crystalline size was found in the range of 12.47-16.81nm. TEM images showed agglomerated nanoparticles with average particle sizes of 25.62nm to 18.66 nm, respectively. FTIR spectral analysis confirmed the presence of two characteristic vibrational stretching modes around 700cm^{-1} and 400cm^{-1}. UV-Vis optical analysis revealed an increase in absorbance and a significant reduction in energy band gap from 2.28eV to 0.89 ev with Ag^+ doping. The M-H data of the ZMAF samples had been taken for 5K, 50K, 100K, 200K and 300K. The highest value of saturation magnetization was found at 5K for x-0.00 was 81.93 emu/g. Ms decreased with doping concentration as well as measuring temperature, Remanent magnetization (Mr) and Coercivity showed random pattern increased with Ag doping concentration but decreased with measuring temperature, ZFC-FC was carried out between 6K and 400K. The study reveals super paramagnetic nature of the ZMAF samples.

*Department of Physics, BUET

2. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
S. Manjura Hoque	Nanohybrides with Extremely Small Dimensions in the Range of 5 to 15 nm as Contrast Agents for MR Angiography	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
S. Sourav, S. Alam, R.Rashid, A. Kumar, M.N.I. Khan and H.N. Das	Super Quick Microwave Irradiation: An Unconventional Method of Growing ZnO Nanorods	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.M. U. Anik, S. Akter, and S. Manjura Hoque,	Holmium Doping in Bismuth Ferrite: A Comprehensive Characterization properties Analysis Synthesis by Sol-Gel Auto Combustion	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
S. Kundu, M.M.R. Bhuiya, B. Neher, H.N. Das, A. Kumar, M.K. Alam, M.N.I. Khan and R. Rashid	Modifying the Multifunctional Properties of Zn-Mg Ferrite through Silver Doping: Structural, Optical and Magnetic	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
S. Hossain, T. Hamid, A. Rahman, Y.N. Jolly, S. Akhter, J. Kabir, K. M. Mamun, H.N. Das and S. M. Hoque	Environmental Risk Assessment and Source Identification of Trace Elements in the Lower Meghna Estuarine Sediment: A Case Study Around Hatiya Island	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
R.Bhuiyan, M.Afroz, A.K.M. Ullah, R.Sultana, F.Ehasan, H.N. Das, R. Rashid, T. Faruqe, K.M.A. Hossain,	Optical and Magnetic Properties of Fe-Doped ZnO Nanoparticles synthesized by Co-precipitation Method	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
A. Nushrat, M.M.R. Bhuiyan, R. Rashid and M.N.I. Khan	Study of Geometrical Frustration in Mfe_2O_4 (M=Co, Mn, Ni, Zn)	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.I.Sumon, J. Podder, S.F. U. Farhad and H. Das	Structural, Morphological and Optical Characteristics of Mn-doped Co_3O_4 Thin Film Electrodes for Energy Storage Devices: An Experimental and Theoretical Approach	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M. Faruque, M. Rifat-Ul-Islam, AK.M. M. Rahman, M. Al-Mamun and M. Kamruzzaman,	Investigation of the Development of Structural and Thermoluminescent properties of LiF by Ti and Ti-Cu Doping for Dosimetric Application	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M. Rifat-Ul-Islam, M. Faruque, S. A. Islam, AK.M. M. Rahman, M. Al-Mamun and M. Kamruzzaman,	Exploring the Effects of Mn Doping on the Structural and Thermoluminnescent properties of LiF	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.N. Uddin, S. Alam, R. Rashid, A. Kumar, , M.N.I. Khan and H.N. Das,	One-Step Ultrasound-Assisted Synthesis and Optimization of Cubic Magnetite Nanoparticles	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M. Ohiduzzaman M.N.I. Khan H.N. Das, and K.A. Khan,	Biosynthesis of Silver Nanoparticles from Fig Extract: Structural Analysis, Antibacterial Properties and Bioelectricity Generation	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M. Afroz, R.Bhuiyan, A.K.A. Ullah, S. R. Sultana, F. Ehasan, H.N. Das, R. Rashid, T. Faruque, K.M.A. Hossain, A.K.M.F. Kibria, S. Chowdhury and A. R.M. Tareq	Synthesis of Mn-doped ZnO Nanoparticles Using Co-precipitation Method: Structural Optical and Magnetic Properties	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
S.S.Sarna, S. Alam, R. Rashid, A. Kumar, M.N.I. Khan and H.N. Das	A Comprehensive Study on the Synthesis and Characterzation of Spherical Silver Nanoparticles via Ultrasonic Irradiation	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
U.Maktum, S. Akter amd S. Manjura Hoque	Synthesis And Characterization of Multifunctional Properties of $Bi_{0.90}Ho_{0.10}FeO_3$ With Variation of Sintering Temperature	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
A. H. Zulkarnine, S.M. T. Farhan, P. Chakraborty, M.R. Hasan, R. Rashid, M.K. Alam, and A.A. Momin	Structural and Morphological Properties of BLGSZT Ceramics	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M. Faysal, Z. Hasan and M.N.I. Khan	Influence of Ce doping in Structural, Electronic, Optical and Mechanical Properties of $Ba_{1-x}Ce_xTiO_3$ Pervskite from Frist-principal Investigation	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.A. Haque, M.A.S. Akanda, R. Rashid, M. R. Sarkar and M.S. Ullah	Structural and Magnetic Properties of $(La_{1-x}Dy_x)_{0.65}Ba_{0.35}MnO$	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M. Hossain, J.U. Ahmed, R. Rashid, A. Kumar, M.K. Alam and M.N.I. Khan	Properties Investigation of Mo-Substituted Ni-Zn Ferrites Using Solid-State Synthesis Techniques	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.A. Hossain, H.K. Rouf, M.K. Alam, R. Rashid, and M.N.I. Khan	Influence of Ti-Substitution on Structural and Optical Properties of Mn-Ni-Zn Ferrite by Solid State Reaction Method	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
A.R. Bhuiyan, H.K. Rouf, M.K. Alam, R. Rashid, and M.N.I. Khan,	Synthesis and Structural Characteractics Elucidation of Sr –droped Ba1-xSrxTi1.92Co.08O3 Perovskite	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
S.S.Haque, S. Manjura Hoque and F. Gulshan	Synthesis and Characterization of $MgFe_{2-x}Cr_xO_4$ Nanoparticles to Develop High Quality Bulk Ferrites	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
R. Zim, N. Anjum, S.A. Chowdhury, S. Akter, D.K. Chaudhury, S. E. Hoque and S. Manjura Hoque ,	Enhanced Structural, Optical and Gas-Sensing Properties of Nanocrystalline Mn-Zn Ferrite Thin Films Syntnesized via Chemical Bath Deposition	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
R. Zim, N. Anjum, S.A. Chowdhury, S. Akter, D.K. Chaudhury, S. E. Hoque and S. Manjura Hoque	Improvent of Structural and optical characteristics by Cr doping in Zn-Al $(ZnAl_{0.2}Cr_xFe_{1.8-x}O_4$ Spinel Ferrites)	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
N. Anjum, R. Zim, S.A. Chowdhury, S. Akter, D.K. Chaudhury, S. E. Hoque and S. Manjura Hoque	Synthesis and Characterization of $Zn_{1-x}Ni_xFe_2O_4$ Ferrite Thin Films by Spray Pyrolysisn Deposition Technique	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
R. Zim, N. Anjum, S.A. Chowdhury, S. Akter, D.K.	Synthesis and Characterization of $Zn_{1-x}Ni_xFe_2O_4$ Ferrite Thin Films by Spray Pyrolysisn	International Conference on Electronics and	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Chaudhury, S. E. Hoque and S. Manjura Hoque ,	Deposition Technique	Informatics			
F.S.Siddique, K.G.Sinha, S.I. Safin, S. Hossain, A.K.M. M. M. Rahman and M. Al-Mamun	Exploring Dysprosium Doped Lithium Strontium Borate Based Phosphor for Dosimetry Application	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.N.I. Khan, M.R. Hasan, R. Rashid and A.T.M. K. Jamil ,	Structural and Magnetic Properties of $Mn_{0.3}Ni_{0.4}La_xFe_{(2-x)}O_4$ Spinel Ferrites	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
M.R. Hasan, R. Rashid and M.N.I. Khan	Synthesis and Characterization of Structural and Electrical Properties of Mn Doped Barium Titanate Ceramic	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
A. Kumar, M.A. Kayes, H.N.Das, M.M. Haque and S.Manjura Hoque	A Hystological Study on the Effects of Synthesized HAP on the Eruption of Rat Incisors	International Conference on Electronics and Informatics	Bangladesh Electronics Society	28-29 December 2024	Atomic Energy Centre Dhaka
Ikhtiar Hossain, S.S. Rashid, M.M. Islam, R. Rashid, M.R. Hasan, H.M. Walinullah, M. Rana, M.N.I. Khan	Studies and Characterization of CoFe2O4 Nano Composite Synthesized by Sol-Gel Auto Combustion Method in Different Sintering Temperature	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi
M. Helaluzzaman, M. Abdullah-Al Mamun, M.M. Haque, M.K.R. Khan, M.S.I. Sarker	Effect of Annealing Temperature on Structural, Morphological and Magnetic Properties of Co-Nb Substituted $SrFe_{12}O_{19}$Synthesized by Sol-Gel Method	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi
Rokeya Bhuiyan, Mohrin Afrooz, A.R.M. Tareck, A.K.A. Ullah, Ronia Sultana, Fahim Ekhsan, Hazinavayan Don, Rimi Rashid, Tania Faruque, A. Hossain, Sabuj Chowdhury	Responses Towards Structural, Optical and Magnetic Properties of Fe Doped ZnO by Co-precipitation Method	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi
Nilufa Anjum, Rahimana Nazmin Zim, Sumaiya Alam Chowdhury, Shahida Akhter, Dinesh Kumar Chaudhary, Sheikh Manjura Hoque	A Comparative Comprehensive Study on the Multifunctional Properties of Nickel-Doped Zinc Ferrite Thin Films	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
S.S. Rashid, M.M. Islam, I. Hossain, H.M. Waliullah, M.Rana, k. Sayma, M.R. Hasan, R. Rashid and M.N.I Khan	Synthesis and Characterization of Nickel Ferrite Nanoparticles Sintered in Different Temperatures by Sol-Gel Auto Combustion Method	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi
S. A. Chowdhury, N. Anjum, R. Zim, S. Akhter, Dinesh Kumar Chaudhury, Sheikh Manjura Hoque.	Synthesis amd Industrial Utilization of Magnesium Doped Zinc Oxide Thin Films	National Conference on Physics-2025	Bangladesh Physical Society	06-07 February 2025	University of Rajshahi
Dr. Engr. Sheikh Manjura Hoque	From Lab to Impact: What the Materials Science Division Offers to Stakeholders	Seminar on Bridging Science and Society: Services and solutions from Atomic Energy Centre, Dhaka for National Development	Atomic Energy Centre, Dhaka	18 June 2025	AECD Auditorium Atomic Energy Centre, Dhaka

3. Service Rendered

Sl. no.	Name of service provided	No. of samples	Revenue income (BDT)
1.	Providing analytical services to different universities and different organization	512	786,600/-

Medical Physics Division, AECD

Objective

Medical Physics Division in Atomic Energy Centre, Dhaka was established in 2014. The objective of this division is to provide academic lead in research, training as well as service in the field of medical physics. This division is doing research work with the collaboration of various Universities in the fields of nuclear medicine, diagnostic radiology, radiotherapy, and radiation protection. This division is providing the necessary support to build skilled professionals in science and technology in the field of medical physics that can lead the research and innovation and adapt knowledge to the existing conventional situations. This division is also been engaged in development activities from the very beginning with the ADP projects entitled "Establishment of Institute of Nuclear Medical Physics (2013-2018)" and "Establishment of PET/CT & Cyclotron facility at INMAS Mymensingh and Chattogram and Cyclotron facility at Institute of Nuclear Medical Physics (INMP), Savar", BAEC (2018 to till now). This division has organized two training programs in collaboration with INMP as part of their training activities entitled "Radiation Oncology & Physics", 15 April to 14 May 2018 (one month) and "Specialized Course on Medical Physics", October 2019 - September 2020 (one year).

The prime objectives are:

- To develop qualified medical physics professionals by organizing training courses on the Medical Physics aspect.
- To provide medical physics expert services in hospitals all over the country to ensure quality cancer treatment.

- Commissioning, Setup, Calibration, Acceptance testing, QA/QC, research and development work in the field of medical physics.
- To facilitate research work leading to MS/ MPhil/ PhD degrees and post-doctoral research works with the affiliation of different Universities.

1 Research and Development Work

1.1 Algorithm Validation for Treatment Planning Systems in Lung Region

R. Khatun, S. Akter, A. N. Monika and L. Sharmin*

The anatomy of the lung region has a particular challenge due to its complicated structure and existence of air pockets, which causes dose inhomogeneity during treatment. So, precision and accuracy in treatment planning and dose delivery are of great importance in radiation therapy practices because effectively elimination of tumor and protect healthy tissue from unwanted radiation presents a significant challenge. The present study is based on calculating the dose in the lung region using the Anisotropic Analytical Algorithm (AAA) and determining the percentage deviation through practical measurement using a heterogeneous IMRT Thorax phantom.

The percentage deviation between the calculated and measured doses of 3D conformal radiation therapy (3D CRT), intensity-modulated radiation therapy (IMRT), and volumetric modulated arc therapy (VMAT) plan for 6 MV were 0.30%, 2.5%, and 0.15%, respectively. For 10 MV beams, the deviations were 0.20%, 0.01%, and 1.41% respectively. For both of the energies, the deviation was less than the acceptable limit. The results demonstrate good agreement between calculations and measurements within a 3% tolerance for the lung region.

* Dept. of Nuclear Engineering, University of Dhaka.

1.2 Characterization of the RL Response of Si (Ge) Fibers for Radiotherapy Beam Profile Dosimetry

R. Khatun, S. Akter, A. N. Monika and M. M. Alam*

Accurate radiation dose measurement in both target and non-target tissues is essential in modern external beam radiotherapy. In dosimetry systems, the goal is to deliver the maximum dose to the targeted cells while ensuring minimal exposure to the surrounding normal cells. Among various medical dosimetry systems like thermoluminescence (TL), optically stimulated luminescence (OSL), and radioluminescence (RL), the RL system offers a real-time monitoring system. This study aims to the characterization of the Ge-doped probe in making beam profile measurements using the myDoz® RL/OSL dosimetry system and comparing its accuracy with a CC-13 ion chamber.

The RL readout mechanism enabled instantaneous dose and dose-rate readings. The results showed high consistency and close agreement with the CC-13 ion chamber, with beam profiles displaying uniform central dose, sharp penumbra, and strong symmetry. Larger fields exhibited increased flatness due to photon dispersion. Moreover, the dose distribution out-of-field may still cause low-dose exposure to normal tissues. Overall, Ge-doped fibers demonstrated excellent real-time, high-resolution performance, making them promising alternatives to traditional dosimeters. Future research should focus on clinical implementation and system optimization for advanced radiotherapy methods.

* Dept. of Physics, Jahangirnagar University, Savar, Dhaka

1.3 Dosimetric Evaluation of Computed Tomography (CT) Scanner using Computed Tomography Dose Index (CTDI) Phantom

S. Akter, R. Khatun and A. N. Monika

The purpose of this study is to evaluate dosimetric verification of CT machine using CTDI phantom.

The CT scanner produces a huge amount of dose for scanning the body. The use of CT scanner is increasing day by day so for safety issue dosimetric evaluation and image quality evaluation of CT scanner are required. The dosimetric evaluation can be made by using CTDIvol which can be calculated by using specialized device known as a CTDI phantom. The CTDI phantom is a cylindrical-shaped device which consists of three parts: Pediatric Head, Adult Head, and Adult Body phantom. The scan was taken by for various phantoms. IBA pencil ionization chamber DCT10 was used to measure the dose at different positions inside the phantom and data were collected using IBA MagicMax Universal software. Report of AAPM Task Group 96 and 111

formalisms were used to determine dose estimation. By comparing the experimental with the machine data we observed that it was within the acceptable limit of ±20%.

1.4 Standardization and Calibration of Neutron Detector

S. Akter, R. Khatun and A. N. Monika

The purpose of the study is to standardize the neutron detector because the accuracy of neutron detection and its application depend on the proper characterization of neutron radiation fields.

The studies were performed at Secondary Standard Dosimetry Laboratory, Atomic Energy Research Establishment, BAEC. In the present study neutron calibrator (NI-03) consisting of ^{241}Am-Be and $^{252}C_f$ source were used. For investigating neutron detector BERTHOLD 6411D (Nr 1089) was used. The dosimetric quantities of the source were investigated by experimental measurement and theoretical calculations. The neutron doses were measured by the detector with varying source to detector distance with a gap of 10cm ranging from 30cm to 200cm. Several correction factors are included in the measurement of the dose such as such as geometrical correction factors, air scattering correction factors, room scatter correction factors.

1.5 Optimizing FDG Production and Synthesis with Cyclone 18/9 MeV IBA Cyclotron for Improved Image Quality

T. A. Biman and AFM. M. Rabbani

This is a pioneer approach to correlate image quality (PET Image) with production parameters (cyclotron production variables) followed by the synthesis and radio-pharmaceutical purities. This work was formulated to get optimal parameters for production, synthesis and thus find the application impact on molecular imaging.

In molecular imaging, there is established correlation between resolution and sensitivity; thus as, if resolution goes high then sensitivity goes down and vise-versa. On the other hand, parameters for cyclotron production enhance the highest yield of production with impurities which may effect on molecular imaging. So, the research questionnaire is to get optimal parameters and thus get betterment on image quality. This study was carried out with more than 200 batches of production of FDG, followed by molecular imaging and been assessed the optimization of production, synthesis, radio-pharmaceutical purities and image quality at NINMAS, using Cyclone 18/9 MeV IBA Cyclotron.

*Police Staff College, Mirpur, Dhaka

1.6 A Comparison Study of Small Field Dosimetry using Ionization Chamber and Razor Diode

A. N. Monika, R. Khatun and S. Akter

Small volume of megavoltage photon beams is highly required in stereotactic radiotherapy and stereotactic body radiotherapy. This makes small field dosimetry study very essential. IBA Razor Nano chamber and Razor diode have been used for this study.

Ionization chambers are used in dosimetry study for their stable response. Calibration facility from standard laboratories makes their uses most acceptable and reliable tool for study. Ionization chambers are commercially available, can be used either primary or reference dosimeter. On the other hand, semiconductor technology and semiconductor devices make history with its compact design and rapid response. Diode detectors are available in a variety of volume ranges. With very small volume and high sensitivity, diode chambers are also established in small field dosimetry study. This study was conducted for three small field i.e. 4x4 cm^2, 3x3 cm^2 and 2x2 cm^2 with 6 MV photon beam, where source to surface distance (SSD) was 100 cm, dose rate was 400 MU/min. Identical shape of PDD curves were found using these two chambers with a very little shift.

2. Seminar/Symposium/Conference/Workshop Attended

Name of the person	Title of the event	Organizer	Date	Place
Dr. Rajada Khatun	19th SFO BICC 2024	Oncology Club	13-14 December 2024	Radisson Blu Water Garden Hotel, Bangladesh

Name of the person	Title of the event	Organizer	Date	Place
	4th International Conference on Medical Physics in Radiation Oncology and Imaging	BMPS and BRAC University	13-15 February 2025	Dhaka, Bangladesh
	Bridging Science and Society: Services and Solutions from Atomic Energy Centre, Dhaka for National Development	Atomic Energy Centre, Dhaka	8 June 2025	Atomic Energy Centre, Dhaka
Shirin Akter	19th SFO BICC 2024	Oncology Club	13-14 December 2024	Radisson Blu Water Garden Hotel, Bangladesh
	International Conference on Electronics and Informatics 2024	Bangladesh Electronics and Informatics Society	28-29 December 2024	Atomic Energy Centre, Dhaka.
	4th International Conference on Medical Physics in Radiation Oncology and Imaging	BMPS and BRAC University	13-15 February 2025	Dhaka, Bangladesh
	Bridging Science and Society: Services and Solutions from Atomic Energy Centre, Dhaka for National Development	Atomic Energy Centre, Dhaka	8 June 2025	Atomic Energy Centre, Dhaka
Ashrafun Nahar Monika	4th International Conference on Medical Physics in Radiation Oncology and Imaging	BMPS and BRAC University	13-15 February 2025	Dhaka, Bangladesh
	Bridging Science and Society: Services and Solutions from Atomic Energy Centre, Dhaka for National Development	Atomic Energy Centre, Dhaka	8 June 2025	Atomic Energy Centre, Dhaka

3. Training Course Organized and Seminar Arranged

Arrangement of Seminar

- "Measurement of Photo-Neutron Dose from Medical Liner Accelerator in Radiotherapy and Associated Risk of Secondary Cancer", 30 December, 2024, Department of Biomedical Physics & Technology, University of Dhaka.
- "Application of Medical Physics in Cancer Management", 26 December, 2024, Auditorium, Atomic Energy Centre, Dhaka.

4. Collaboration Work

Medical Physics Division gives up the necessary support of the Annual Development Project (ADP) of the Ministry of Science of Technology (MOST) entitled as the "Establishment of PET/CT & Cyclotron facility at INMAS Mymensingh and Chattogram and Cyclotron facility at Institute of Nuclear Medical Physics (INMP), Savar", BAEC.

Non-Destructive Testing Division

Objective

Non-Destructive Testing (NDT) Division has been working as an excellent centre for R & D, acquisition & dissemination of knowledge and technology on NDT in the country. Since its inception, NDT Division has been working with right earnest to develop and promote the science and practice on NDT and its industrial application in Bangladesh having the objective of reducing foreign dependency and to make Bangladesh self-reliant on NDT technology for facilitating its socio-economic development.

Considering the present industrial needs NDT Division has taken up the following programs:

- Research & Development on NDT techniques those are useful to our industries
- Render valuable NDT services and consultancy to the local industries
- Training and Certification to develop expertise and proficiency of local NDT practitioners to meet international standard

1. R&D Work(s)

1.1 Development of Technical Working Procedures of NDT Methods

M. S. Alam, M. A. Habib and S. C. Dey

To control & maintain the quality of industrial products & to assure reliability to the users, it is required to use NDT applications in all stages of processes for the uninterrupted operation of the industrial components. Considering the demands of the industries & to make these industries benefit & productive, NDT Division is continuing its application based R&D programs. For this purpose the details technical working procedures of both conventional & advanced NDT methods like Radiographic, Ultrasonic, Magnetic Particle, Liquid Penetrant & Remote Visual Inspection have been developed to solve various technical problems exists in industries.

Depending on the geometry, dimension, orientation of the components, service condition, anticipated defect nature in the component and applicable codes & standards, the working procedures were developed for the inspection of different equipment used in various industrial sectors viz. Gas Processing Plant, Refrigerator manufacturing etc.

1.2 Corrosion Evaluation and Wall Thickness Measurement in Insulated Pipes by Tangential Radiography

M. S. Alam, M. A. Habib and S. C. Dey

The scope of this work is to evaluate the corroded zones and to measure wall thickness of insulated pipes in order to make a correlation directly in assessing the remaining life time of power plants, petroleum and petrochemical industries etc. without removing specially insulations from the metal part so that the cause of accident due to fire & leaks, low production or unpredictable shutdown of plants can be minimized. An attempt has been taken to develop a standard protocol for method validation to be utilized to determine remaining wall thickness of the pipe creating grooves of different depths on the external surface.

1.3 Development of Eddy Current Testing Technique for Heat Exchanger Tube

M. S. Alam, M. A. Habib, S. C. Dey and D. Das

Eddy Current Testing Method has been using as a quality control tool for the inspection of numerous engineering components particularly the ferro-magnetic and non-ferromagnetic Heat Exchanger Tubes, Feed Water Heater Tubes, Condenser Tubes, Air Conditioner Tubes etc. of Petrochemical Industries. A program on the above topic has been taken whose objective is to interpret the signals arising from different known defects and finding the better response of a defect at a particular frequency by utilizing Multi Frequency Eddy Current Testing Equipment – MS 5800 with Multiview 6.0R software.

Few experiments have been performed with the MultiScan MS 5800 Multi Frequency Eddy Current equipment having options to use 4 frequencies simultaneously. For this investigation, Stainless Steel tube having artificial defects of different volumes was analyzed experimentally. Data of amplitude and phases of repeated responses from various types of defect signals were collected and analyzed as an attempt to minimize the deviation of the signals emerged with respect to particular defect.

1.4 Digital Industrial Radiographic Method for Industrial Practices

M. S. Alam, M. A. Habib, S. C. Dey and D. Das

The scope of this work is to make the digital image of an object onto the imaging plate by the ionizing radiation and processing the image with the aid of appropriate computer facility in order to enhance their contrast & spatial resolution and to sharpen and smoothen their edge definitions for analysis of object structures.

Tangential Radiography Technique utilizing Gamma source were applied to take the radiographic image of wall thickness of Pipes on Image Plate (IP). The scanned digital images were analyzed to assess the remaining wall thickness of pipe by adjusting different parameters available in the I See! Software.

1.5 Quality Assessment of Concrete by Ultrasonic Pulse Velocity Testing Technique

M. S. Alam, M. A. Habib and S. C. Dey

Ultrasonic pulse velocity tests have a great potential for quality control of concrete, particularly for assessing uniformity, the presence of void, flaws, crack etc. along with the correlation of strength estimation. A program has been taken with the scope of measuring the ultrasonic pulse velocity of concrete using direct, indirect and semi-direct method to assess the quality of concrete and to measure the depth of crack in concrete by using CT 1.1 Ultrasonic Pulse Velocity (UPV) meter.

CT 1.1 Equipment has been used to take several trial data by direct method to check the performance of the equipment including adjustment of various parameters and behavior of the received signal from available concrete blocks. The obtained data is being analyzed to understand the property of the received signal. Achievement of skill on this technique and interpretation of signal by analyzing trial data will develop our skill and lead us to implement the future plan regarding R & D, application, organization of training etc. to make this technique beneficial for the end users of this country.

1.6 Ground Penetrating Radar for Buried Object Detection in Concrete and Soil

M. S. Alam, M. A. Habib, S. C. Dey and D. Das

Ground-penetrating radar (GPR) is a non-destructive testing technique that utilizes electromagnetic waves to inspect and evaluate subsurface structures in concrete and soil.A program has been taken with the objective to detect and interpret signals obtained from known buried objects in shallow depth of soil and concrete samples by obtaining reflected signals from those objects using the GPR antenna and processing the obtained signals by respective operational software.

Familiarization of the operation of the GPR equipment including the parameters of various functions is going on to develop proficiency of the personnel to adopt this newly introduced technique/technology in this division. Besides, an attempt has taken to collect data utilizing GPR equipment to understand the behavior, nature and property of the emerged signal from the samples. As a consequence of this, samples have been preparing to collect and interpret the signals for the GPR equipment. Development of expertise through the mentioned initiatives will lead to implement the future plan regarding R & D, application, training etc. for the exploration of this technique in the country.

2. Manpower Development (Training/Fellowship/Workshop/Meeting/Seminar)

2.1 Attend in Training/Fellowship/Workshop/Meeting/Seminar

SI. no.	Title of the program	Date	Place	Number of participants
1.	Regional Training Course on Certification in Residence Time Distribution and Column Scanning Techniques	01 to 12 July 2024	Scaly, France	01
2.	Training Workshop on Non Destructive Examination, In service Inspection and On-Line Monitoring for Research Reactors	04 to 08 November 2024	Vienna, Austria	01
3.	AECD – BSNDT –SAJ National Workshop on “Internal Imaging Of Material by Phased Array Ultrasonic Testing (PAUT)”	19 April 2025	AECD, Dhaka	03
4.	Technical Meeting on the Tool Kit for Safety Assessment	02 to 05 June 2025	Vienna, Austria	01
5.	Seminar on “Bridging Science and Society: Services and Solutions from Atomic Energy Centre, Dhaka for National Development”	18 June 2025	AECD, Dhaka	03

2.2 Organize Training/Fellowship/Workshop/Meeting/Seminar

SI. No.	Title of the program	Date	Place	Number of participants
1.	86th National Training Course on Liquid Penetrant Testing Level-2	22 September – 09 October 2024	NDT Division, AECD, Dhaka	12
2.	87th National Training Course on Foundation Course on NDT	01 – 19 December 2024	NDT Division, AECD, Dhaka	18
3.	88th National Training Course on Radiographic Testing Level-2	05 January – 12 February 2025	NDT Division, AECD, Dhaka	12
4.	89th National Training Course on Foundation Course on NDT	13 – 30 April 2025	NDT Division, AECD, Dhaka	17
5.	AECD – BSNDT – SAJ National Workshop on "Internal Imaging Of Material by Phased Array Ultrasonic Testing (PAUT)"	19 April 2025	AECD, Dhaka	91
6.	90th National Training Course on Foundation Course on NDT	18 May – 03 June 2025	NDT Division, AECD, Dhaka	17

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Md. Saiful Alam	Ultrasonic Testing and it's Imaging technology Phased Array Ultrasonic Testing (PAUT)	AECD – BSNDT –SAJ National Workshop on "Internal Imaging of Material by Phased Array Ultrasonic Testing (PAUT)"	BSNDT	19 April 2025	AECD
Md. Saiful Alam	Present status and activities of NDT Division	Seminar on "Bridging Science and Society: Services and Solutions from Atomic Energy Centre, Dhaka for National Development"	AECD	18 June 2025	AECD

4. Project Work (ADP/FNCA/RCA/TC/CRP/S&T etc.)

NDT Division has been actively participating in all IAEA/RCA Program on NDT for Asia & Pacific region. The objective of this project is to maintain a uniform quality level of standard so that the certification scheme can be recognized and harmonized mutually among the RCA member states. As a part of this activity the following mentioned project has been continuing by this Division:

IAEA/ RCA RAS-1029: Enhancing Regional Capabilities in Advanced Non-Destructive Testing Techniques for Improved Safety and Inspection Performance in Industries.

5. Practical Demonstration for University Students

- Within this reporting period, NDT Division of BAEC arranged Practical Session on different NDT methods to the program "Industrial Training Session" for 22 students of Level – 3/Term – 2 of Department of Nuclear Science and Engineering, Military Institute of Science and Technology (MIST) from 12 – 15 May 2025 to provide application based knowledge on NDT methods as a part of their curriculum activities.
- Arrangement of demonstration of NDT facilities for 60 students of Level 3, Term 2 of Department of Materials and Metallurgical Engineering, Bangladesh University of Engineering and Technology to familiarize with the different NDT techniques as a part of the Course MME 316 Material Characterization.

6. Internship Program on Industrial Training for University Students

BAEC has collaboration with different universities to extend R & D program to attain sustainability and to promote technology in the country. Within this reporting period NDT Division of BAEC has conducted two weeks long Internship Program on Industrial Training as a part of the curriculum activities for 3 B.Sc. students of 3rd year, Department of Nuclear Engineering, University of Dhaka from 09 – 20 February 2025 to provide familiarization and application based knowledge on NDT methods.

7. Bangladesh Society for Non-Destructive Testing (BSNDT)

Creating awareness on the benefits of Non-Destructive Testing technology is essential to ensure quality and safety in various industries. Keeping this in view, NDT Division has taken active role in forming a common platform for BSNDT to exchange information among the increasing number of NDT practitioners. Thus, BSNDT was formed in 1990 and has been nurtured since then by this Division. As a part of its continual support, the NDT Division has helped BSNDT to organize 03 council meetings (89th to 91st) of BSNDT & 01 Workshop on AECD- BSNDT –SAJ National Workshop on "Internal Imaging Of Material by Phased Array Ultrasonic Testing (PAUT)", 19 April 2025 during this tenure.

8. Service Rendered

One of the objectives of this Division is to render NDT services and consultancy to the local industries in both Government and Private sectors using different NDT methods e.g. Radiographic, Ultrasonic, Eddy Current, Magnetic Particle, Dye Penetrant Testing, Remote Visual Inspection for checking various industrial components.

The following industrial organizations received services rendered by NDT Division during this period

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Revenue income
1.	Calibration of Ultrasonic Thickness Gauge and Electromagnetic Yoke ofInnovative Engineering Services	04	8,000/-
2.	Calibration of Ultrasonic Thickness Gauge, Ultrasonic Flaw Detector and Electromagnetic Yoke of Radiant Engineering Training Services and Inspection Ltd.	03	7,000/-
3.	Digital Industrial Radiographic Testing of different Tubes of Chevron Bibiyana Gas Processing Plant (Muchai Compressor Station, Moulavibazar Gas Plant) through Bangladesh Industrial X-ray	56	50,400/-
4.	Calibration of Ultrasonic Flaw Detector, Ultrasonic Thickness Gauge, Permanent magnetic Yoke, Electromagnetic Yoke, Industrial Radiographic Film Densitometer and Light Meter of Bangladesh Industrial X-ray	20	37,400/-
5.	Calibration of Ultrasonic Flaw Detector and Ultrasonic Thickness Gauge of Western Marine Services Ltd.	02	5,000/-
6.	Calibration of Ultrasonic Flaw Detector, Residual Field Indicator, Electromagnetic Yoke, UV Black Light and Hardness Tester of Q&T Industrial Inspection Company	10	20,000/-
7.	Calibration of Ultrasonic Flaw Detector, Thickness Gauge, Electromagnetic Yoke and Hardness Tester of Bangladesh Bureau of Inspection & Service	05	12,000/-
8.	Calibration of Ultrasonic Flaw Detector and Electromagnetic Yoke of Engineering Inspection Services of Bangladesh Ltd.	02	5,000/-
9.	Calibration of Ultrasonic Thickness Gauge of Fleet Marine	01	2,000/-
10.	Calibration of Ultrasonic Flaw Detector and Ultrasonic Thickness Gauge of PEB Steel Alliance Ltd.	02	5,000/-
11.	Calibration of Ultrasonic Flaw Detector of Bay-Tech NDT & Engineering Services	01	3,000/-

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Revenue income
12.	Calibration of Ultrasonic Flaw Detector of Sonargaon Steel Fabricate Ltd.	01	3,000/-
13.	Calibration of Ultrasonic Flaw Detector, Ultrasonic Thickness Gauge and Electromagnetic Yoke of Marine NDT & Engineering Works	04	9,000/-
14.	Calibration of Ultrasonic Flaw Detector & Ultrasonic Thickness Gauge of Solution NDT & Inspection Services	03	7,000/-
15.	Dye Penetrant Testing of welding joints of tubes of Rangs Electronics at NDT Division	17	2,000/-
16.	Calibration of Ultrasonic Flaw Detector of Industrial Engineering Services (IES)	02	6,000/-
17.	Calibration of Ultrasonic Flaw Detector and Electromagnetic Yoke of Confidence Infrastructure Ltd.	02	5,000/-
18.	Industrial Videoscope Inspection of Compressor Section of Gas Turbine of 335 MW CCPP, Siddhirganj, Narayanganj of Electricity Generation Company of Bangladesh Ltd.	01	50,000/-
19.	Calibration of Ultrasonic Thickness Gauge of Bureau Veritas (Bangladesh) Private Ltd.	01	2,000/-
20.	Digital Radiographic Testing of Welding Joints of Test Pieces of BUET	03	2,000/-

Accelerator Facilities Division, AECD

The objectives of this Division are (a) management of the 3 MV Van de Graaff Accelerator and its associated sub-systems (b) irradiation and analysis of spectrum data for elemental assessment of environment samples (c) utilization of 'Gamma Spectroscopy Setup' for the detection & analysis of radiological substances in different foodstuff & environment samples.

Accelerator Facilities Division of the Atomic Energy Centre, Dhaka operates and maintains the 3 MV Van de Graaff Accelerator and its associated sub-systems, which is capable of producing and accelerating proton beam in the range of nano to micro-amperes. The proton beam & associated facilities are being utilized for the irradiation of different samples. This division has also been developed a 'Gamma Spectrometry' system using existing HPGe detector, Lead shielded chamber, spectroscopy amplifier, MCA and with other associated electronic circuitries. Gamma spectrometry data acquisition setup is being used for the detection and analysis of radiological substances, their activities in various specimens of the earth surface and the products.

1. R&D Work(s)

1.1 Management of the 3 MV VDG Accelerator and 'Gamma Spectrometry' System

Joynal Abedin, M. Mahfuzur Rahman, Lokman Hossain

The main objective is to keep the accelerator and 'Gamma spectrometry' data acquisition setup operational, to detect & analyze of radiological substances accumulated in different samples for research purpose.

'Gamma spectrometry' setup of Accelerator Laboratory of AECD is being applied for detection & analysis of radiological substances accumulated in different types of fuel like diesel, octane, coal, kerosene, and other specimens like soil, water, medicinal plants, vegetables, foodstuffs collected from the environment and the products. Imported & locally produced raw materials and their products are also taken under gamma experiment. Normally, collected samples are preserved in vacuum desiccators for the protection of further contamination. Samples are being taken under experiments separately; emitted gamma energy lines from different radionuclides are collected, and analyzed using controlling software Genie-2000. The accelerator is not taken under operation due to lack of manpower. Vacuum pumping system, chiller for water cooling circulation and gas drying system are essential for accelerator operation. Each of the sub-systems needs at least two technically skilled manpower.

The students of different universities have been done their thesis experiments for PhD, MPhil and MS degrees using 'Gamma Spectroscopy' data acquisition setup of VDG Accelerator laboratory.

1.2 Elemental Analysis of Chewing Sticks Collected from Local Area of Bangladesh using PIXE Technique

Joynal Abedin, M. M. Rahman, Lokman Hossain

Assessment of elemental concentration in different chewing sticks collected from Jahangirnagar University area, Savar. Different types of chewing sticks samples are collected from different locations of J.U area, dried fully, grounded as fine powder, made pellets (1mm thick & 7mm dia.), and preserved in vacuum desiccators to protect further contamination. Each of the pellets is irradiated for the detection of elements contained. The emitted x-ray energies from each of the elements are detected by [Si(Li)] detector and converted them into voltage pulses. These voltage pulses are processed through spectroscopy amplifier & MCA and then fitted to the analyzing software to display the counts, energy spectrums & their net peak area, errors etc. on monitor. The detected energy spectrums are analyzed by commercial software GUPIX/DAN-32 and the concentration of each of the detected elements are saved as data-base files. Detected elements and their concentrations of one of a chewing sticks are shown in the following table.

Table: The elements and their concentration of Px128.chn

Element	S	Cl	K	Ca	Ti	Mn	Fe	Ni	Cu	Zn	Br	Rb	Sr
Concentration (ppm)	614.961	2358.810	5508.985	5903.369	95.022	808.112	497.972	27.811	28.548	128.206	52.883	325.731	87.016

1.3 Assessment of Elemental Concentration in Lychee Fruit using PIXE Technique and GUPIX/DAN-32 Software

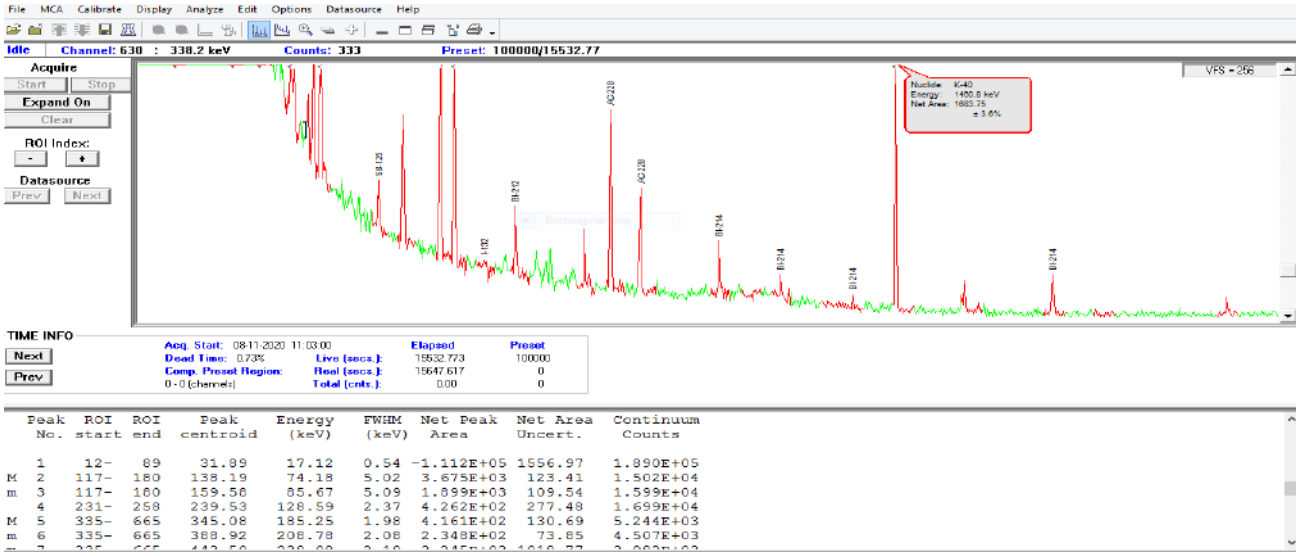
Joynal Abedin, M. M. Rahman, Lokman Hossain

Detection of elements contained in lychee fruits collected from local markets and analysis their concentration Different types of lychee fruits are collected from different markets as samples, dried fully, grounded as fine powder, made pellets (1mm thick & 7mm dia.), and preserved in vacuum desiccators to protect further contamination. Each of the pellets is irradiated for the detection of elements contained. The emitted x-ray energies from each of the elements are detected by [Si(Li)] detector and converted them into voltage pulses. These voltage pulses are processed through spectroscopy amplifier & MCA and then fitted to the analyzing software to display the counts, energy spectrums & their net peak area, errors etc. on monitor. The detected energy spectrums are analyzed by commercial software GUPIX/DAN-32 and the concentration of each of the detected elements are saved as data-base files. Analyzed results of one of the lychee fruits are shown in µg/gm; P(0), S(112.8), Ar(2453.1), K(9514.4), Ca(63601), Sc(30025), Mn(3484.5), Fe(59297.7), Cu(4831), Zn(43526), Br(2799.8), Sr(9168.5), Nb(467.3), Ag(0)

1.4 Detection of Radiological Substances in Soil of Cox's-Bazar Area and Health Risks Assessment

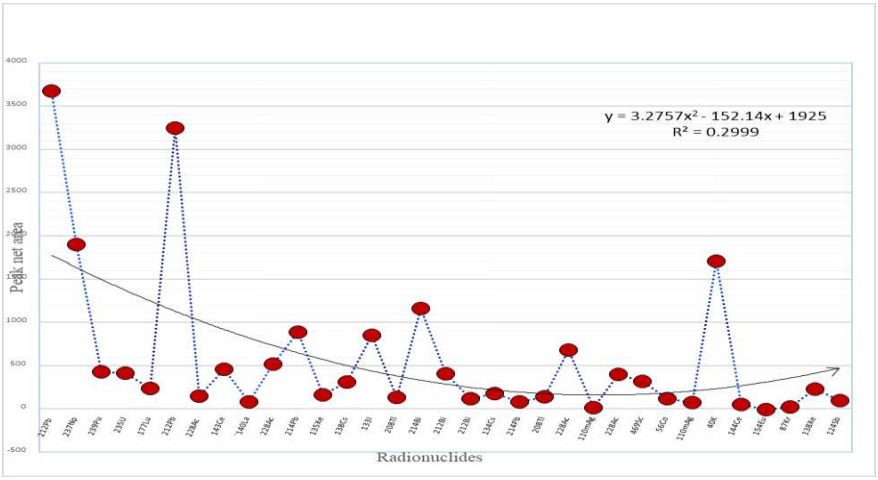
Joynal Abedin, M. M. Rahman, Lokman Hossain, Arafat*

The main objective of the study is to detect radiological substances accumulated in soil and analyze their activity concentration for the assessment of pollution level & health risks. A number of soil samples are collected from different locations and depths of Cox's Bazar sea beach area. The weight of samples is 1000gm each, processed and taken under experiments to detect the radiological substances. Each of the samples kept under experiment about 15647 seconds. The emitted gamma photons are detected by the HPGe detector. The gamma energies are converted into voltage pulses & processed by the data acquisition setup. The controlling software 'Genie-2000' is applied for data acquisition and analysis. The analyzed gamma energy spectrum, net peak area comparison of detected radionuclides of one of the samples are projected below;



Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	12-	89	31.89	17.12	0.54	-1.112E+05	1556.97	1.890E+05
M 2	117-	180	138.19	74.18	5.02	3.675E+03	123.41	1.502E+04
m 3	117-	180	159.58	85.67	5.09	1.899E+03	109.54	1.599E+04
4	231-	258	239.53	128.59	2.37	4.262E+02	277.48	1.699E+04
M 5	335-	665	345.08	185.25	1.98	4.161E+02	130.69	5.244E+03
m 6	335-	665	388.92	208.78	2.08	2.348E+02	73.85	4.507E+03

Analyzed data spectrums of one of the soil samples, Cox's Bazar



Projection of detected radionuclides & comparison their net peak area

1.5 Elemental Analysis of Vegetables 'Lau-shak' Collected from Local using PIXE Technique and GUPIX/DAN-32 Software

Joynal Abedin, M. M. Rahman, Lokman Hossain,

Detection of elements contained in vegetables 'Lau-shak' collected from local markets and analysis their concentration Different types of 'Lau-shak' are collected from different markets as samples, dried fully, grounded as fine powder, made pellets (1mm thick & 7mm dia.), and preserved in vacuum desiccators to protect further contamination. Each of the pellets is irradiated for the detection of elements contained. The emitted characteristic x-ray energies from each of the elements are detected by [Si(Li)] detector and converted them into voltage pulses. These voltage pulses are processed through spectroscopy amplifier & MCA and then fitted to the analyzing software to display the counts, energy spectrums & their net peak area, errors etc. on monitor. The detected energy spectrums are analyzed by commercial software GUPIX/DAN-32 and the concentration of each of the detected elements are saved as data-base files. Analyzed elements & their concentrations (ppm)of one of the 'Lau-shak' are; Mg(65.1), Al(179.8), Si(83.9), Cl(263.9), K(18422.5), Ca(117309.9), Sc(42396.4), Ti(32400.7), V(6405.4), Cr(713.8), Mn(102903.9), Fe(127004.1), Co(9953.3), Cu(1807.4), Zn(8925.9), As(3264.2), Br(10247.1), Kr(5517.7), Rb(9810.6), Sr(17986.4), Zr(4810.4), Nb(143.6), Rh(60), Pd(2269.3), and Ag(9211.1).

1.6 Radiological Assessment of Soil Collected from Coal Mine Area of Dinajpur, Bangladesh

Joynal Abedin, M. M. Rahman, Lokman Hossain, M. Safiul Islam*

The main objective of this study is to detect the radionuclides, their activity concentration in soil Coal Mine area, Dinajpur, and health risks assessment due to toxicity. More than 22 soil samples are collected from different location & depth of the surrounding area of 'Coal Mine, Dinajpur'. The weight of soil samples is 1000gm each and preserved them in separate vacuum desiccator to avoid further contamination. Each of the samples are taken under gamma experiment in lead shielded chamber for the detection of emitted gamma energy lines from each of the radiological substances present in the sample. The detected gamma photons are converted into voltage pulses and processed through the spectroscopy amplifier and MCA circuitries, then displayed on the monitor as spectrums. These spectrum data files are analyzed by Gennie-2000 commercial software for the assessment of activity concentration. The net peak area comparison of detected radionuclides of one of the soil sample is projected below;

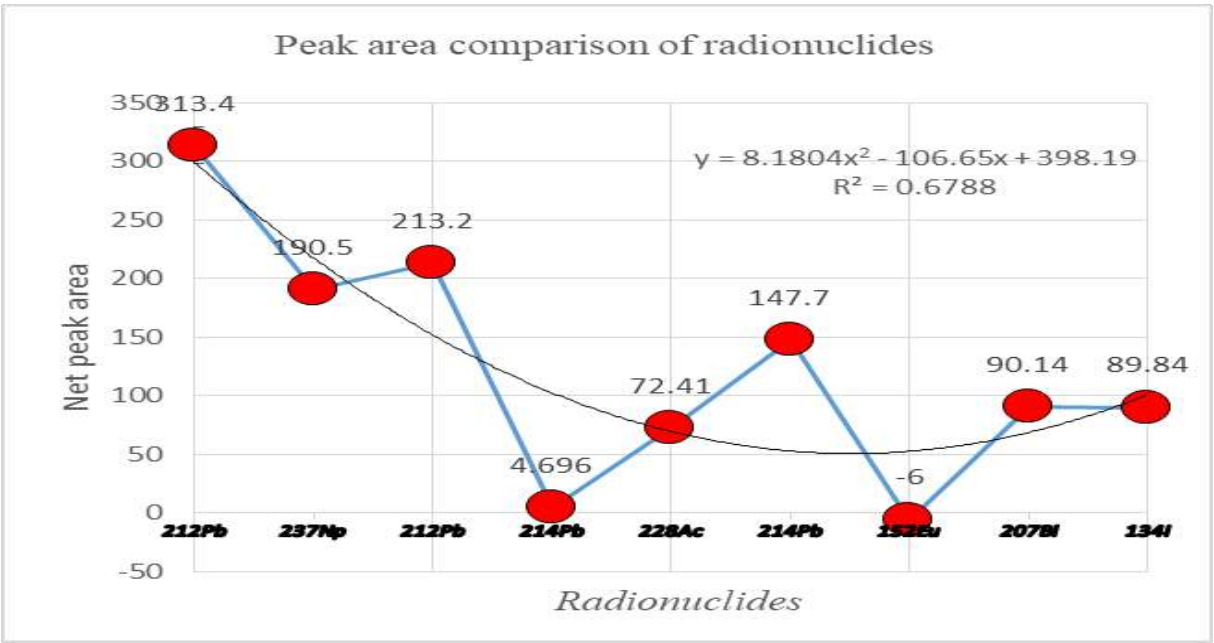


Fig.: Comparison among the detected radionuclides of a soil sample (CMAS013), Dinajpur

Plasma Physics Division, AECD

Objective

The plasma physics division is the newest division of the Atomic Energy Center, Dhaka (AECD) which is started to work in January 2016 to promote fundamental, advanced and applied research works in the related areas of plasma physics. The major objective of the division is to build capacity in the related areas of plasma science and plasma based technology development. The major areas of research and development are as follows: Theoretical, computational and experimental studies on the Space plasma, Astrophysical plasma, Industrial plasma, and Fusion plasma, Quark-gluon plasma, etc.

ATOMIC ENERGY RESEARCH ESTABLISHMENT (AERE), SAVAR

CENTRE FOR RESEARCH REACTOR (CRR), AERE

Objective

Center for Research Reactor (CRR) has been operating and supervising the Bangladesh's only nuclear research reactor named "BAEC TRIGA Research Reactor (BTRR)". It is a light water cooled, graphite reflected reactor, designed for steady state and square wave operation up to a power level of 3 MW (thermal)

and for pulsing operation with a maximum pulse power of 852 MW. The reactor has been designed and constructed by the General Atomics of USA and is renowned for its inherent safety features, including a prompt negative temperature coefficient of reactivity, which allows it to self-regulate and safely accommodate rapid power changes. The reactor achieved its first criticality on 14 September 1986. With the aim of socio-economic development of the country, this reactor facility is being used in various fields of research and utilization such as Neutron Activation Analysis (NAA), Neutron Radiography (NR), Neutron Scattering (NS), experimental reactor safety research, isotope production and human resource development through education & training programme for nuclear research and power program of the country.

1. R&D Work(s)

During the reporting period, the reactor was operated at different power levels depending on the requirements for reactor physics experiments conducted by CRR personnel and to provide neutron beam for various reactor users. The total operating hour was about 132.58hrs. and total burn up of the reactor fuel was about 53MWh. A total number of 797 samples were irradiated through 40 irradiation requests (IRs). Nuclear safety is the most important issues in the nuclear installations. The important reactor safety parameter such as burn up estimation, control rod worth, core excess reactivity, shutdown margin, loss of reactivity with power increases, reactivity coefficients, thermal hydraulic analysis and thermal power calibration of the reactor were measured during the reporting period by scientist/engineer of CRR. Study on these safety parameters of the nuclear reactor is very important for reactor safety and efficient operation.

Different groups of the Institute of Nuclear Science and Technology (INST) used the neutron beam of the reactor to carry out various Research and Development (R&D) activities. Neutron Activation Analysis technique is used to determine the trace elements present in soil, foodstuff, and vegetable samples. The Neutron Radiography group used the NR technique to detect voids, cracks, internal continuity in materials and determine water absorption behavior of jute plastic composites and various types of building materials e.g. bricks, tiles, etc. The scattering group used High Performance Powder Diffraction technique to characterize materials crystallographically and magnetically. The micro-structural information is obtainable by neuron scattering method which is very essential for determining its technological applications. This technique is unique for understanding the magnetic behavior in magnetic materials. Ceramic, steel, electric and electronic industries can be benefited from this facility to improve their products and fabrication process.

Reactor is operated for training, research, practical experiments related to safety, industrial attachment program for students from different universities as well as for trainee from BAEC training institute. During the reporting period, 03 (Three) students from Department of Nuclear Engineering, University of Dhaka, 23 (Twenty-three) students from Department of Nuclear Science and Engineering, MIST, Dhaka have completed their industrial attachment training at CRR.19 (Nineteen) students from Department of Nuclear Engineering, University of Dhaka have completed their practical class and examination at CRR.

2. Manpower Development (Training /Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Emergency Response Plan and Practical Demonstration on Emergency Evacuation	03 July, 2024	CRR	16
2.	Emergency Response Plan and Practical Demonstration on Emergency Fire Response	03 July, 2024	CRR	16
3.	Diagnosis of some alarm issues of the I&C system of BTRR	21 August, 2024	CRR	14

Sl. no.	Title of the program	Date	Place	Number of participants
4.	Emergency Response Plan and Practical Demonstration on Emergency Evacuation	23 September, 2024	CRR	10
5.	Emergency Response Plan and Practical Demonstration on Emergency Fire Response	23 September, 2024	CRR	09
6.	Emergency Response Plan and Practical Demonstration on Emergency Evacuation	17 October, 2024	CRR	13
7.	Emergency Response Plan and Practical Demonstration on Emergency Fire Response	17 October, 2024	CRR	11
8.	Reactor Performance Test (RPT) of digital I&C system and auxiliary systems	17 November, 2024	CRR	10
9.	Nuclear material accounting and control (NMAC) system for nuclear security	25 November, 2024	CRR	10
10.	Emergency Response Plan and Practical Demonstration on Emergency Fire Response	22 December, 2024	CRR	10
11.	Emergency Response Plan and Practical Demonstration on Emergency Evacuation	22 December, 2024	CRR	10
12.	Safety Analysis Report (SAR) of BTRR	27 January, 2025	CRR	09
13.	Inherent Safety Features of BTRR	25 February, 2025	CRR	12
14.	Emergency Response Plan and Practical Demonstration on Emergency Evacuation	19 March, 2025	CRR	11
15.	Emergency Response Plan and Practical Demonstration on Emergency Fire Response	19 March, 2025	CRR	11
16.	Research Progress on Emergency Response and Radiological Response Zone of BAEC TRIGA Research Reactor (BTRR)	29 April, 2025	CRR	13
17.	Feedback on technical meeting and knowledge sharing on incident reporting system for Research Reactors	02 June, 2025	CRR	14
18.	Upgradation of Physical Protection System at Nuclear Facility	02 June, 2025	CRR	12

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Nusrat Jahan	National Status of Nuclear Knowledge Management and Human Recourse Development of BAEC TRIGA Research Reactor (BTRR)	International Conference on Nuclear Knowledge Management and Human Resources Development: Challenges and Opportunities	International Atomic Energy Agency (IAEA)	01-05 July, 2024	Vienna, Austria

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Md. Abdul Malek Soner	Decommissioning Plan and Waste Management Technologies of the BAEC TRIGA Research Reactor	Technical Meeting on Processing Technologies for Irradiated Graphite Waste	IAEA	5–9 August 2024	Vienna, Austria
Dr. Md. Abdul Malek Soner	Enhancing Operational Safety and Utilization of the BAEC TRIGA Research Reactor	Technical Meeting on Safety and Operational Considerations in the Use of Advanced Technologies at Research Reactors	IAEA	30 September - 4 October 2024	Vienna, Austria
Dr. Nusrat Jahan	Operational Experiences and Ageing Management of BAEC TRIGA Research Reactor	International Conference on Research Reactors: Achievements, Experience and the Way to a Sustainable Future	IAEA	11-15 November, 2024	Vienna, Austria
Md. Moazzem Hossain	Utilization and Applications of the 3MW TRIGA Mark-II Research Reactor of Bangladesh	International Conference on Research Reactors: Achievements, Experience and the Way to a Sustainable Future	IAEA	11-15 November, 2024	Vienna, Austria
Dr. Md. Abdul Malek Soner	Operating Experience and Incident Reporting System of the BAEC TRIGA Research Reactor	Technical Meeting for the National Coordinators of the Incident Reporting System for Research Reactors	IAEA	12-16 May 2025	Vienna, Austria

4. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Stakeholder Meeting with scientists from RNPD of INST	09December, 2024	CRR	10
2.	Stakeholder Meeting with scientists from RNPD and NRCD of INST	24 February, 2025	CRR	15

5. Project Work (ADP/FNCA/RCA/TC/CRP/RCA/S&T etc.)

5.1 ADP Project

Balancing, Modernization, Refurbishment and Extension (BMRE) of Safety Systems of the 3 MW TRIGA Mark-II Research Reactor Facility at AERE, Savar, Dhaka. The main objective of the project isto extend the life of BTRR by 15 to 20 years. Under this project several systems of the BTRR are being modernized and refurbished. The most significant upgradation and modernization actions have done under this project are: installation of new digital I&C system, refurbishment of the primary and secondary cooling system and

ventilation system, upgradation of radiation monitoring and protection system, modernization of fire detection, suppression and alarm system, installation of new plate-type heat exchanger etc.

6. Repair &Maintenance, Renovation Works, etc.

Some of the non-routine maintenance works performed during the reporting period is listed below in chronological order:

July-24	• Maintenance of Emergency Core Cooling System (ECCS). • Maintenance of stack monitor and continuous air monitoring system. • A dedicated cable has been installed, linking the fire pump room to the 10hp pump room. This connection ensures a robust and continuous power supply for the 10hp pump, vital for its operational reliability. • A new 10HP motor has been successfully installed at the 10HP pump room. The installation included mounting, electrical wiring, and alignment with the existing pump. Post-installation checks confirmed proper operation, ensuring reliable performance for the pump system. • Primary Pump maintenance: Spacer and lube oil have been changed.
August-24	• Routine maintenance of Area Radiation Monitoring (ARM) system. • Calibration of TPC. • A window-type air conditioner has been successfully replaced in the tools room, located beside the control room. This replacement ensures a comfortable working environment and proper climate control for equipment storage in this critical area. • Faulty magnetic contactors have been removed and replaced with new ones. These new contactors are now securely connected to the Emergency Core Cooling System (ECCS) battery, ensuring reliable power supply and enhanced operational safety for critical systems. • Maintenance and Functional check of the Air-tight Door Control System, Central Air Conditioning System, Air Compressor and DM Plant.
September-24	• Routine maintenance of Reactor I&C system. • Maintenance of Auxiliary Relay Box. • The Argon Vent Fan system in the ventilation room has undergone significant modifications to enhance its performance and safety. The modifications ensure optimal air circulation, preventing the accumulation of inert gases and maintaining a safe atmospheric environment. • Maintenance and Functional check of the Online Purification System and Emergency Core Cooling System (ECCS) of BTRR. • Quarterly Surveillance program of Mechanical System was performed.

October-24	• Calibration of I&C sensors. • Rearrangement of CCTV UPS system adjacent to the control room. • The air drier system within the ventilation room has undergone recent modifications. This work focused on improving the efficiency and effectiveness of moisture removal from the air, which is crucial for maintaining optimal environmental conditions and protecting sensitive equipment. • The Emergency Purging fan motor in the ventilation room at CRR has been successfully repaired. This vital maintenance ensures the fan's readiness for critical smoke extraction in emergencies, maintaining air quality and safety within the facility's ventilation system. • Repair and maintenance of service water system of the Reactor Facility.
November-24	• Commissioning of new I&C system. • Maintenance of hand and foot radiation monitor. • A comprehensive solar line connection system has been successfully established throughout the new building, extending across its various floors. This installation integrates solar power into the building's electrical infrastructure, providing a sustainable and supplementary energy source. • A new 15HP motor has been successfully installed next to the fire pump room, dedicated to the water reservoir system. This installation enhances the pumping capacity for the reservoir, ensuring adequate water supply for fire suppression and other critical needs at the facility. • Quality Inspection work of the Spare Parts, Measuring Equipment and Tools of BTRR.
December-24	• Operation and maintenance of I&C system. • Batteries for both the 650KVA and 20KVA Diesel Generators have been replaced. This critical maintenance ensures reliable starting and operation of both generator units, enhancing power backup capabilities at the facility. • Annual maintenance and surveillance activities of Mechanical System were performed.
January-25	• Maintenance of CRDM. • Repair and maintenance of Cooling System Variable Frequency Drive (VFD). • Operation and maintenance of digital console. • The electrical supply for the online purification pump has been upgraded from 110V to 220V. A new connection was established from the SAND DB board in the heat exchanger room to accommodate the change. This provides a more efficient and stable power source for the pump, ensuring optimal performance of the purification system.
	• A 1hp online purification pump has been replaced with a new unit. The old pump was malfunctioning, leading to inefficient water purification. The new pump ensures proper flow and filtration for optimal system performance. • New electrical cabling has been installed for the SAND system, running from the Heat Exchanger room. This change provides a reliable and updated power connection, ensuring the system operates efficiently and safely.

February-25	• Maintenance and adjustment of CRDM limit switches. • Maintenance of hand and foot radiation monitor. • Maintenance of cooling system Auxiliary Relay Box. • Twelve (12 Nos) industrial exhaust fans have been installed across various plant areas, including the 11kv Sub-station, Heat Exchanger room, and Water Treatment facilities. This upgrade significantly improves ventilation, ensuring a safer and more comfortable working environment by removing heat and moisture. • Routine checks are being consistently performed on the 650KVA, 250KVA, and 20KVA Diesel Generators at CRR. These inspections are vital for ensuring the reliability and readiness of the generators for any power disruption. • A damaged 400A MCCB (Molded Case Circuit Breaker) on the ground floor of the new CRR building has been replaced with a new unit. The old breaker was faulty, compromising electrical safety. This replacement restores proper circuit protection, ensuring the building's main electrical system operates safely and reliably.
March-25	• Troubleshooting of CRDM power system. • Routine maintenance of Stack Monitor. • Rearrangement of conductivity sensor in online purification system. • A new toilet blower has been successfully activated on the reactor building rooftop. This system is essential for proper ventilation, ensuring a constant flow of air to remove odors and maintain a hygienic and safe environment within the facility's restroom areas. • A new solar line has been installed at the lift control box in the lift controlling room. This new connection ensures a stable and dedicated power supply for the lift machine, improving its reliability and overall safety of the system's operation. • To ensure optimal performance and safety, the substation, Main Distribution Board (MDB), and Distribution Board (DB) are thoroughly cleaned every three months. This routine maintenance is critical for preventing dust accumulation, which can lead to overheating, short circuits, and reduced efficiency.
April-25	• Routine maintenance of Reactor I&C system. • Routine maintenance of CAM. • Quarterly maintenance of reactor I&C system. • The UPS battery for the Central Alarm System (CAS) room at CRR has been replaced. This ensures continuous power supply to the critical alarm system, guaranteeing its uninterrupted operation during power outages and enhancing overall security. • 2hp Field pump have been installed outside the reactor building for water drainage. This setup is crucial for managing and removing accumulated water, preventing flooding, and maintaining a safe and dry environment around the facility.

May-25	• Testing of Self Power Neutron Detector (SPND). • Troubleshooting of cooling system VFD (remote operation). • Health checkup of console backup power system. • The solar power line from the new building and the UPS line in the reactor building have been successfully merged. The solar line cable was rerouted from the new building to the reactor building. This integration provides a unified and resilient power source for various security systems, enhancing overall system reliability and operational efficiency. • New electrical connections have been installed for the CRR latter display. This upgrade ensures the display receives a stable and reliable power supply, improving its functionality and visibility for important communications and information. • Three (03 Nos) smart monitors have been installed in various locations throughout the new building. These monitors provide dynamic displays for announcements, information, and presentations, enhancing communication and efficiency for both occupants and visitors.
June-25	• Troubleshooting of ARM system. • Installation of carrier of Self Power Neutron Detector (SPND). • Maintenance of CRDM level switches. • The 250kVA and 20kVA diesel generators at CRR have been integrated. Now, when the 250kVA unit is operating, the 20kVA generator is automatically bypassed or shut down. This configuration optimizes fuel efficiency and reduces wear on the smaller generator by ensuring it only runs when the larger unit is unavailable or specific low-load demands are required. • A common power supply has been connected to the magnetic glass door on the ground floor of the new building. This setup provides a reliable power source for the door's locking mechanism, ensuring secure access while also enabling a "fail-safe" feature that unlocks the door during a power failure for emergency egress.

INSTITUTE OF NUCLEAR SCIENCE AND TECHNOLOGY (INST), AERE

Radioisotope Production Division, INST

Objectives

The Radioisotope Production Division (RIPD) of the Bangladesh Atomic Energy Commission (BAEC) is dedicated to achieving self-sufficiency in the production of radioisotopes and radiopharmaceuticals for medical applications. Among its key products are Sodium Pertechnetate ($Na^{99m}TcO_4$) for intravenous use and Sodium Iodide-131 ($Na^{131}I$) solution for oral administration—both of which are essential for diagnostic and therapeutic procedures in nuclear medicine. These radiopharmaceuticals are now being widely used in nuclear medicine centers across Bangladesh, including in both public and private healthcare institutions.

A major milestone for RIPD has been the successful local production of the $^{99}Mo/^{99m}Tc$ generator. This achievement has eliminated the country's dependency on imports, ensuring a consistent and reliable supply of critical radioisotopes for medical use.

To further support radiopharmaceutical development, RIPD has established an ISO-certified clean room facility. This state-of-the-art facility is equipped for the production of ^{99m}Tc cold kits such as MDP, DTPA, and DMSA, which are vital for various diagnostic imaging procedures. Additionally, RIPD is actively pursuing the necessary drug licenses and regulatory certifications required for the commercial distribution of these products.

Through these strategic initiatives, RIPD is playing a pivotal role in advancing nuclear medicine and strengthening the healthcare infrastructure of Bangladesh.

1. R&D Works

1.1 Sterility Testing and Contamination Analysis of the 99mTc Eluates from RIPDTEC Mo-99/Tc-99m Chromatographic Column Generator

Syedzadi Mahbuba Monzur Mouna, Md. Tauhidul Islam Tanim, Md. Mustafizur Rahman,Mohammed Anwar Hossain, Momtaz Fatima Waheed, 1Rabeya Akhter, Fatema TujJahura, Md. Sultanur Reza, Ruhul Amin

Metastable Technetium-99 is a widely used radioisotope in nuclear medicine that is administered to patients intravenously for imaging, functional studies of cells, and diagnosis of tumor cells of different body organs. Tc-99m is instantly available from the Mo-99/Tc-99m generator, accounts for more than 80% of all nuclear medicine procedures used for imaging, and is in growing demand worldwide every year. Hence, bulk manufacturing of this generator is carried out under strict aseptic conditions to ensure the sterility of Tc-99m. However, at the production stages of Tc-99m, there is still the possibility of getting contaminated with microbes and their endotoxin, which has a pyrogenic effect. The objective of this study is to assess and analyze the microbial and endotoxin contamination of the 3634 Tc-99m eluate samples collected from RIPDTEC

Mo-99/Tc-99m chromatographic column generators. In the case of sterility testing, only 2 samples out of 3634 (0.05% of the total samples) exhibited bacterial growth after 14-day incubation in the media used to detect aerobic bacteria. In contrast, no fungal and anaerobic bacterial growth was observed during the 14-day incubation. In this study, 9 samples out of 3634 (0.25% of the total samples) showed gel clot formation in Tachypleus Amebocytes Lysate (TAL) kits used to detect endotoxin, which indicated the presence of endotoxin in those samples, and the amount was found 0.25-0.50 EU/ml. However, abnormal temperature rise was not observed in the case of any mice injected with eluate samples.

1.2 Comprehensive and Quality Analysis of Freeze-Dried Methylene Diphosphonate Labelled with Technetium-99m: An Extensive Comparison of Biodistribution Study with Commercial Standards

Kifyat Tasnim, Rabeya Akhter, Mustafizur Rahman, Anwar Hossain, Momtaz F. Waheed, Fatema TujJahura, Sultanur Reza, Debasish Chowdhury, Ruhul Amin, Tariqul Islam, Azizul Haque, and Jashim Uddin

Technetium-99m (99mTc) is an important radionuclide used for the prognosis of bone scintigraphy labeled with a suitable kit. The present investigations focus on the aseptic preparation and application of the methylene diphosphoni acid (MDP) kit on bio-organ after labeling with 99mTc collected from a 99Mo/99mTc generator. Before going to the bio-application of the labeled kit, radiochemical purity was determined by paper chromatography using the high-purity germanium (HPGe) detector, and the radiochemical purity of 99mTc-MDP was found to be 99%. Furthermore, negative results were found for pyrogen and bacterial endotoxin tests; fungal growth was also absent. Radiation dose uptake in different organs of Wistar rats was measured by a dose calibrator, and observed results indicate the highest accumulation of 99mTc-MDP in the skull and skeletal part. This study also performed a comparative study model between laboratory and commercially prepared Monrol MDP kits. This study was performed as a bio-application of laboratory-prepared 99mTc-MDPprior to commercial production of cold kits at the radioisotope production division of the Bangladesh Atomic Energy Commission (BAEC). Overall, the observations from this study are within the accepted range and provide prospects for commercial production of the kits for human administration.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of program	Date	place	Number of participants
1.	Technical visit to the Russian Federation for demonstrating facilities related to the high-power multipurpose research reactor (HPMRR)	15-20 July 2024	Moscow	02
2.	Instructor Training Course (ITC) on Reactor Engineering	4 September-10 October, 2024	Tokai, Japan	01

2.2 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of program	Date	place	Number of participants
1.	Conducted full theoretical and practical courses of MD Residency (Nuclear Medicine) course of BSMMU	July 2024 – June 2025	INST, AERE	05
2.	Conducted two two-week training programs for the students of the Department of Nuclear Engineering, Dhaka University.	09-20 February 2025	RIPD, INST	03

3. Organize Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of Participants
1.	Stakeholder meeting (4 INMAS and 1 private Hospital)	18 March 2025	INST, AERE, Savar, Dhaka	05

4. Project Work (ADP/FNCA/RCA/Tc/CRP/S&T)

4.1 IAEA TC Project BGD/6/022

"Producing Therapeutic Radiopharmaceuticals". To produce and supply Therapeutic Radiopharmaceutical (^{177}Lu) to meet these isotopes' local demand is under implementation. Three scientific visits and one fellowship training have been completed.

4.2 IAEA Coordinated Research Project F22077

"Development of new generation of Tc-99m kits"

Under this Collaboration Research Project (CRP), our primary objective is to synthesize the Tc-99m PSMA inhibitor kit and thoroughly evaluate its effectiveness and specificity for imaging prostate cancer.

5. Service Rendered

Sl. no.	Number/quantity of sample/patients/service	Revenue income
1.	121.923 Ci of I-131 Oral Solution	4,40,04,933/-
2.	^{99}Mo/^{99m}Tc Generator of Different Activities	20,31,76,550/-

Nuclear and Radiation Chemistry Division, INST

Objective

The objective of Nuclear and Radiation Chemistry Division (NRCD) is modification of materials to use in the fields of health, agriculture, water treatment and biodegradable packaging material by the application of nuclear technique especially gamma ray. Moreover, this division involved to measure the water quality of research reactor, provides analytical services to different institute of BAEC/other organizations of Bangladesh and study on environmental pollution of different matrix.

1. R&D Work(s)

1.1 Gamma-ray Induced, Superabsorbent and Reusable Polyethylene Oxide/Starch/4-Styrenesulfonic Acid Sodium Salt Hydrogel for the Removal of Cationic Dyes and Chromium (III) Ion

S.M.M. Hasnine, T. Ahmed, S. Sultana, J. Alam, M. Rahman, F. Akter, S. Rahman

Superabsorbent hydrogels were developed by γ-ray crosslinking of polyethylene oxide, starch, and 4-styrene sulfonic acid sodium salt. Their swelling, porosity, and crosslinking behavior were tuned by radiation dose

and composition. The hydrogels showed pH- and ion-sensitive swelling and effectively removed cationic dyes—Basic Fuchsine, Methylene Blue, and Crystal Violet—with maximum capacities of 625, 569, and 498 mg/g. Adsorption was spontaneous, film-diffusion-controlled, and reusable over four cycles with 77–82% efficiency. Cr^{3+} adsorption reached 61%, following Freundlich isotherm and pseudo-second order kinetics. Characterization confirmed successful gelation, improved porosity, and enhanced thermal stability due to SSA incorporation.

1.2 An Approach to Evaluate Antimicrobial, Cytotoxic, Anti-arthritic and Thrombolytic Property of Different Parts of Plant Orchid *Rhynchostylis retusa*

S.M.M.Hasnine, T. Ahmed, S. Sultana, J. Alam, M. Rahman, F. Akter, S. Rahman

Traditional medicine has employed plants to treat conditions including arthritis, thrombosis, cancer, infections, and wounds. The antibacterial, cytotoxic, thrombolytic, and anti-arthritic qualities of ethanolic extracts from various Rhynchostylis retusa (RR) components were assessed in this investigation. Ciprofloxacin was used as a standard in antimicrobial testing against 14 bacteria, which revealed that RR/Root extract was more active than RR/Stem while RR/Leaf had no action at all. Based on LC50 values, cytotoxicity studies showed that RR/Leaf has the most promise. RR/Leaf had the highest thrombolytic activity in contrast to streptokinase. In anti-arthritic studies, RR/Stem extract shown to be the most effective when compared to diclofenac sodium. These results demonstrate the RR extracts' medicinal potential for a range of uses.

1.3 Eco-Friendly Lignin/ N, N-Dimethyl Acrylamide Hydrogel with Carrageenan and Polyvinyl Pyrrolidone for Amphoteric Adsorption of Methylene Blue and Congo Red: Optimization, Characterization, and Adsorption

S.M.M.Hasnine, T. Ahmed, S. Sultana, J. Alam, M. Rahman, F. Akter, S. Rahman

Gamma radiation was used to synthesize lignin-DMA-based hydrogels for adsorbing cationic methylene blue (405 mg/g) and anionic Congo red (417 mg/g). Carrageenan and PVP improved amphoteric behavior and CR uptake. Structural and functional analyses confirmed sulfate-mediated amide activation and π-π interactions. Adsorption followed pseudo-first-order kinetics and the Freundlich isotherm, with both dyes adsorbed spontaneously and endothermically. MB showed faster uptake, while CR had increasing efficiency over time. The hydrogels were effective in batch/column setups and enhanced Zea mays growth without phytotoxicity, supporting their environmental safety.

1.4 Evaluation of In Vitro Antimicrobial, Cytotoxic, Thrombolytic, and Antiarthritic Property of Different Parts of Bari Orchid

S.M.M.Hasnine, T. Ahmed, S. Sultana, J. Alam, M. Rahman, F. Akter, S. Rahman

This study evaluated the antibacterial, cytotoxic, anti-arthritic, and thrombolytic activities of ethanolic and aqueous extracts from different parts of the Bari orchid 1, discovered by BARI, Bangladesh. Fourteen microbes were tested, with several extracts showing comparable or superior effects to ciprofloxacin. Brine shrimp assays revealed strong cytotoxicity (low LC_{50}) relative to vincristine sulfate. Anti-arthritic effects at four concentrations were comparable to diclofenac sodium, while thrombolytic activity at two doses and incubation periods showed results like streptokinase. Some extracts demonstrated dose-dependent efficacy, supporting their potential in traditional and therapeutic applications.

1.5 An Approach to Evaluate In Vitro Antimicrobial, Cytotoxicity, Thrombolytic and Antiarthritic Activity of Different Parts of *Aerides odorata*

S.M.M.Hasnine, T. Ahmed, S. Sultana, J. Alam, M. Rahman, F. Akter, S. Rahman

This study investigated the in vitro antibacterial, cytotoxic, anti-arthritic, and thrombolytic activities of ethanol extracts from different parts of *Aerides odorata* (AO). Among 14 tested bacteria, only the AO/Leaf extract showed antimicrobial activity, comparable to ciprofloxacin. AO/Root extract exhibited the highest cytotoxicity (lowest LC_{50}) and strongest thrombolytic activity, surpassing AO/Leaf and AO/Stem. In contrast, AO/Stem extract demonstrated superior anti-arthritic activity compared to the other parts when tested against Diclofenac sodium. These findings highlight the part-specific therapeutic potential of AO.

1.6 Preparation and Characterization of Quantum Beam Induced Banana Peel Extracts and N, N-dimethyl acrylamide (DMA) Hydrogels for the Decontamination of Amphoteric Dyes from Aqueous Medium and Textile Effluents

S.M.M.Hasnine, T. Ahmed, S. Sultana, J. Alam, M. Rahman, F. Akter, S. Rahman

This work utilized gamma radiation to produce hydrogels based on banana peel extract (both hot and cold)-N, N-dimethyl acrylamide (DMA) to adsorb cationic methylene blue (MB) and anionic Congo red (CR) dyes from aqueous solutions and textile effluents. Cold extraction-derived hydrogels had removal efficiencies of 17.69% for MB and 39.85% for CR. Optimization of the composition of DMA and banana peel extract is underway based on the following factors: gel fraction, swelling degree, moisture content, amphoteric dye, and textile effluent adsorption capability.

1.7 Diallyl Dimethyl Ammonium Chloride (DADMAC) and Acrylic Acid (AAc) Embedded Nonwoven Irradiated Polyethylene Fabric as Efficient Adsorbent to Separate U(VI) from Aqueous Solution

N. Rahman, S. Shahnaz, M. N. Sardar, A. R. Miah, M. H. Kabir

Selective isolation of uranium (VI) from wastewater is now a subject of concern due to its damag ing effect on living beings. In this study, the pre-irradiation technique was used to prepare grafted polymeric adsorbent by diallyl dimethyl ammonium chloride (DADMAC) and acrylic acid (AAc) onto nonwoven polyethylene fabric (PE) and the grafted adsorbent was applied for uranium (VI) adsorption from aqueous solution by batch method. After irradiation of the non-woven poly ethylene fabrics with 50 kGy radiation dose, the grafting reaction was carried out at 80 ºC with a monomer solution consisting of 20 g DADMAC and 20 g AAc to 110 mL deionized water. The prepared adsorbent was characterized by Fourier Transform Infrared (FTIR), Scanning Electron Microscopy (SEM), and Thermo-gravimetric Analysis (TGA). After treatment with NaOH solution, the adsorption study was analyzed by pH, initial metal ion concentrations, contact time, and temperature on the adsorption of U(VI). The highest graft yield was achieved at 598%. The maximum adsorption capacity achieved at 160 mg/g was found by treating with 0.1M NaOH for 4 minutes with an initial concentration of 1000 ppm, pH 3.3, and a contact time of 48 hours at room temperature (25 °C). Kinetic adsorption data fitted better with the pseudo-second-order equation and a good correlation of experimental data with the Langmuir isotherm model suggested mono layer adsorption. Langmuir equation showed that the maximum adsorption capacity for U(VI) was 333.333 mg/g. The study depicted good results on the desorption and reuse of the adsorbent.

1.8 Adsorption of Cu (II) Ions from Aquatic Environment using Pre Irradiated Ethylene Tetrafluoroethylene Film

N. Rahman, S. Shahnaz, M. N. Sardar, A. R. Miah, M. H. Kabir

Although copper (Cu) is a very beneficial metal, having too much of it in the body can cause lung issues, severe anemia, nausea, and vomiting. In order to extract Cu (II) ions from aqueous solution, an adsorbent was constructed in this study employing pre-irradiation grafted Ethylene tetrafluoroethylene (ETFE) film. The grafting method was used to binary monomers of sodium styrene sulfonate (SSS) and acrylic acid (AA), where NaCl served as an additive. The grafted polymer was also subjected to studies of tensile strength, water uptake, surface area extension, Scanning Electron Microscopy (SEM), and Fourier Transform Infrared spectroscopy (FTIR). The adsorption of Cu (II) was investigated with respect to pH, starting metal ion concentrations, contact time, monomer concentrations, and temperature. With 50 kGy of radiation dose, 4% NaCl, and 30% of monomer solution (SSS:AA = 1:2) in water generated the highest graft yield of 470%. The maximum adsorption capacity (412 mg g−1) was discovered with an initial concentration of 2500 mg L−1, a pH of 4.86, and a contact time of 24 h at room temperature (25 °C). A monolayer adsorption was recommended by the good linking between experimental data and the Langmuir Isotherm Model. The kinetic adsorption data closely fitted with the pseudo-second-order reaction. Due to its increased adsorption capacity and reusability, the synthesized new grafted polymer can be considered an efficient adsorbent for Cu (II) removal from wastewater.

1.9 Isotopic and Chemical Assessment of Environmental Samples in Nuclear Power Plant Area, Bangladesh.

M. F. Alam, M. A. Rahman, M. T. Miah, M. A. Islam, S. Sultana

The study area was situated on the vicinity of the RNPP, in the district of Pabna and Kustia, and the site coordinates are located between the northern longitudes of 24.024306 and 24.102518, and between the eastern longitudes of 88.963637 and 89.108499. A total of 20 samples (10 soil, S1-S10 and 10 water samples, W1-W10) were collected, maintaining a distance of about 1km from each other. The soil and water samples were collected at a depth of 5 cm, and 80-120 feet respectively concerning the surface.

The physico-chemical properties (pH, electrical conductivity, total dissolved solid, total hardness, total alkalinity, and silica), major cations (Mg and Ca), anions (Cl^-, SO_4^{2-}, NO_3^-, PO_4^{3-}), concentration of trace metals (Cu, Zn, Fe, Mn, Pb, and Cd), activity of radionuclide ^{226}Ra, ^{232}Th, ^{40}K, and ^{137}Cs have been measured in the water samples. This result revealed that the physico-chemical properties (except silica) were within the safety level set by WHO (2011), DoE (1997) and BIS (2012). The average concentration of the studied metals was lower than the recommended level with the exception of Mg, Pb, Cd, and Mn concentration. The presence of high Mg might be due to the inclusion of sea water into the ground water. The high concentration of other metals can be from the nature such as manganese oxide dissolution, carbonates, and silicates or the anthropogenic origin such as industrial discharge, landfill leaching, etc. (Kohl and Medlar, 2006).

This study also revealed that Mg, Fe and Pb were the dominant metals in the study area. The Water Quality Index (WQI) was used to determine the water quality; the sample W-1 had the lowest WQI value of 92.96, while sample W-5 had the 456.20. According to WQI, the calculated findings show that only 10% of the water samples were good (WQI<100), while 90% were unfit for human consumption (WQI>100). Heavy metal pollution index, HPI is also indicates that the water is contaminated or polluted with heavy metals (HPI>100). The activity of radionuclide ^{226}Ra (<0.18 Bq/L), ^{232}Th (<0.22 Bq/L), ^{40}K (0.27 Bq/L), and ^{137}Cs were found below the detection level. The soil pH and electrical conductivity fall within acceptable limits. The estimated activity concentrations for the soil samples lie in the range of 31.84±1.62 to 37.53±2.17 Bq/kg for ^{226}Ra, 40.74±2.39 to 52.13±3.15 Bq/kg for ^{232}Th, 472.06±28.46 to 685.23±44.13 Bq/kg for ^{40}K, and 1.15±0.42 to 1.25±0.30 Bq/kg for ^{137}Cs. For all the soil samples, the activity shows an overall order of ^{137}Cs< ^{226}Ra<^{232}Th<^{40}K. All these values show significantly higher than the world average values (4, 35, 30, and 400 Bq/kg). The activity concentration of ^{232}Th was pointed out to be higher than the ^{226}Ra in almost all the soil and sediment samples. This is because the radium is more susceptible to solubility.

1.10 Fabricating Nitrile and Sulfonate Functionalized Nonwoven Polyethylene (PE) Adsorbent by using Radiation-induced Grafting for Efficient Capture of Cr (VI) and Co (II)

M. F. Alam, N. Rahman, S. Akter, Z. Fardous, N. Sardar, M. T. Miah, M. A. Islam, S. Sultana

Environmental pollution resulting from heavy metal effluents is a significant concern, and it becomes necessary to treat these effluents before they are released into the ecosystem. In this study, the adsorption of Cr (VI) and Co (II) ions from aqueous solution were analyzed in the grafted films, after Acrylonitrile (AN) and Sodium Styrene Sulfonate (SSS) co-monomers were grafted onto non-woven Polyethylene (PE) using the radiation-induced (γ-ray) grafting method with a 50 kGy radiation dose at 80 o C. FTIR, SEM, TGA, and DMA were used to characterize the adsorbent. The adsorption capacity has been investigated under various conditions, including contact time, pH, solution concentration, and temperature. The maximum adsorption capacity of the adsorbent was obtained at a contact time of 24 hours, an initial metal ion concentration of 600 ppm, pH 1.43, and temperature of 60 ºC for Cr (VI), and a contact time of 6 hours, an initial metal ion concentration of 400 ppm, pH 8.05 and temperature of 70 ºC for Co (II) during the dynamic adsorption phenomena. To fully comprehend the adsorption isotherm processes, the system was fitted to the Langmuir and the Freundlich isotherm models. The findings demonstrated how well the Langmuir isotherm model fit the data, with the highest adsorption capacity of 138.95 mg/g for Cr (VI) and 97.86 mg/g for Co (II). According to kinetic observations, the pseudo-second-order model was found to be consistent with the batch experimental results. The values of ΔH^o, ΔS^o, and ΔG^o in the thermodynamic study suggest that the removal process was endothermic, spontaneous, and favorable, as demonstrated in the thermodynamic observation. Furthermore, investigating the desorption of metal ions and the reuse of the adsorbent suggests that the adsorbent is an efficient and novel alternative material for removing Cr (VI) and Co (II) ions from aqueous media.

1.11 Comparison of Water qUality Parameter in Different Types of Water Collected from Vicinity of Jahangirnagar University

M. F. Alam, M. Angel, J. Ferdousi, P. R. Sarkar, M. F. Begum, M. T. Miah, M. A. Islam, S. Sultana

Different types of water (drinking water, ground water, surface water, and river water) were collected from the Jahangirnagar University area. pH of drinking water was found below standard limit; the others were within the safety standard. Groundwater had higher EC value than the standard limit whereas the other samples had EC at or closer to the standard value. Total hardness, and total alkalinity levels were safe in drinking, surface and river water, but exceeded in groundwater. NO_3^- levels were within standard limits for drinking, surface, and groundwater, except in river water, where they exceeded due to agricultural runoff, raising eutrophication concerns. SO_4^{2-} levels were safe in all but surface water, likely impacted by industrial and agricultural activities. PO_4^{3-} was within limits in drinking water but exceeded in surface and river water, posing a risk of harmful algal blooms. Chloride was absent in all samples, except for a trace in groundwater (1.78 ppm), well below the safe limit. Ca^{2+} levels were safe in drinking, surface, and river water, but exceeded in groundwater (151 ppm), requiring tube well monitoring. Mg^{2+} levels were safe in drinking and surface water, except for VC Pond, while groundwater exceeded and river water fell below the recommended levels.

2. Conference/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Nazia Rahman	Third International Conference on Applications of Radiation Science and Technology (ICARST-2025)	IAEA	07-11 April 2025	Vienna, Austria
Dr. Nazia Rahman	Regional Workshop on the Feasibility Validation of Business Model to Implement Radiation Technology for the Recycling of Polymer Waste	IAEA	28 April -2 May 2025	Bangkok, Thailand
Dr. Salma Sultana	Meeting on Advancing the Global Monitoring of Marine Plastic Pollution under the IAEA NUTEC Plastics Initiative	IAEA	8-12 July, 2024	Vienna, Austria
Md. Nabul Sardar	Regional Training Course on Technical and Economic Feasibility Studies for Radiation-Assisted Recycling of Polymer Waste	IAEA	9th – 13th December 2024	Melaka, Malaysia
Tanvir Ahmed	Regional Training Course on Technical and Economic Feasibility Studies for Radiation-Assisted Recycling of Polymer Waste	IAEA	9th – 13th December 2024	Melaka, Malaysia
Md. Nabul Sardar	Regional Coordination Meeting, on Reutilizing and Recycling Polymeric Waste through Radiation Modification for the Production of Industrial Goods - Phase II	IAEA	17 to 21 February 2025	Jakarta, Indonesia
Md. Nabul Sardar	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February, 2025	University of Rajshahi
Dr. Md. Ferdous Alam	Reutilizing and recycling Polymeric Waste through Radiation Modification for the Production of Industrial Goods-Phase II	IAEA	17-21 February, 2025	Jakarta, Indonesia
Dr. Md. Ferdous Alam	Regional Workshop on Radiation Technology for the Recycling of Polymer Waste	IAEA	April 28–02 May, 2025	Bangkok, Thailand
Dr. Md. Ferdous Alam	National Conference on Physics-2025	BPS	06-07 February, 2025	Rajshahi University, Rajshahi

3. Others

- Lecture delivered on "Nuclear and Radiation Chemistry Division, INST: Activities, Achievements, and Obstacles" at INST seminar room, AERE, June 02, 2025 by Dr. Md. Ferdous Alam.
- Participation as an External Member (Dr. Md. Ferdous Alam) to moderate the question for M. Engg. in Textile Engineering (1st semester, 2023-24), Mawlana Bhasani Science and Technology University, Tangail on January 2025.

Health Physics and Radioactive Waste Management Unit, INST

Objective

Since its inception, the Health Physics and Radioactive Waste Management Unit (HPRWMU) has played a vital role in protecting human health and the environment from the harmful effects of ionizing radiation associated with radiation sources and radioactive waste through radioactivity monitoring, radiation protection and control and radioactive waste management. This unit is conducting its R&D and regular activities in the following areas:

- Radiation Protection (RP): Providing routine and emergency radiation protection services in all radioactive source using establishments and radiation generating/producing facilities/equipment in the country.
- Environmental Radiation Monitoring (ERM): Environmental radiation/radioactivity monitoring/ assessment in different environmental matrix (Soil, Sediment, Sand, Water, Milk, Food stuffs, Vegetation, building material, Air etc.) throughout the country aiming at the assessment and control of radiation exposure to occupational workers and the general public. This work is important to define the appropriate safety limits and code of practices.
- Radioactive Waste (RW) Management: Working on safe management of RW and radiation source (RS) including their ultimate disposal. Collection, segregation, transportation, processing, conditioning and interim storage services of solid and liquid radioactive wastes and disused sealed radioactive source (DSRS) are provided to all radioactive source-using establishments (e.g., health sectors, industrial sectors, research, agriculture etc.) in the country. A central radioactive waste processing and storage facility (CRWPSF) has been established in 2005 to process and safe storage of radioactive waste on interim–basis until final disposal.
- Dosimetry and calibration: Performing calibration and standardization of radiation measuring/monitoring equipment. Performing external and internal radiation dosimetry including Quality Assurance (QA). A Secondary Standard Dosimetry Laboratory (SSDL) has been established in 1988 as a part of IAEA/WHO SSDL network to ensure that the calibration conforms to internationally accepted standards.

HPRWMU is equipped with the necessary equipment and trained personnel to do the above jobs.

1. R & D Work(s)

1.1 Radiological Assessment of NORM/TENORM Resulting from Fertilizer Production Processing.

K. Asaduzzaman, M. Ahmed, M. H. Rahman

Some non-nuclear industries, like fertilizer production use raw materials containing significant levels of natural radionuclide. Processing these can raise radiation levels for workers nearby residents, and the environment—often above normal background levels. These low but steady exposures are now getting more attention. Fertilizers and their waste often contain naturally occurring radioactive materials (NORMs), which can increase due to industrial processes—then called TENORMs. A joint venture fertilizer factory in Chittagong, Bangladesh produces granular urea and ammonia for agriculture. It covers 100 acres and houses most of its staff on-site. Radiation exposure to workers, the environment, and the public from the plant was assessed by measuring NORM/TENORM levels in soil, wastewater, sludge, and fertilizer samples around the factory. Ra-226 and Th-232 were detected in all soil samples, with concentrations ranging from 4.68 ± 1.31 to 35.53 ± 3.40 $Bqkg^{-1}$ and 10.58 ± 1.05 to 110.36 ± 8.53 $Bqkg^{-1}$, respectively. K-40 was present in nearly all soil samples—except three with concentrations ranging from 166.55 ± 13.27 to 502.66 ± 50.69 $Bqkg^{-1}$. However, none of the wastewater samples contained gamma-emitting K-40 above the MDA (15.92 Bq). Ra-

226 was detected in one wastewater sample at 11.99 ± 2.76 Bql^{-1}, while Th-232 was detected in five samples, ranging from 4.46 ± 1.04 to 12.95 ± 3.26 Bql^{-1}. The activity levels of sludge sample were 12.38 ± 3.88, 21.31 ± 1.87 and 149.88 ± 11.83 $Bqkg^{-1}$ for Ra-226 and Th-232 and K-40, respectively. The urea sample contained Ra-226 and Th-232 with activity concentrations of 23.86 ± 2.67 and 16.38 ± 2.02 $Bqkg^{-1}$, respectively. All soil samples, except Soil-06 and Soil-21, coincide with the country average values of Ra-226, Th-232, and K-40, which are 34, 41, and 350 $Bqkg^{-1}$, respectively, as reported in the UNSCEAR 2000 report.

1.2 Determination and Characterization of NORM/TENORM Radionuclides in Ship Dismantling Areas.

K. Asaduzzaman, M. Ahmed, M. H. Rahman

Coastal regions of Bangladesh is a major hub for ship-breaking activities, receiving decommissioned commercial vessels such as cargo carriers, mineral exploration ships, oil and chemical tankers, ferries, and passenger liners. The dismantling process often faces risks due to the presence of radioactive materials reported elsewhere. Unintended radioactive contamination can present serious health hazards to ship dismantling workers and end-users of recycled materials, while also posing long-term risks to the surrounding environment through persistent radiological pollution. This study aims to determine and characterize the presence and concentrations of NORM/TENORM radionuclides, such as Ra-226, Th-232, and K-40, in selected ship dismantling areas to address this issue. Gamma spectrometric analysis was employed to assess the specific activity of radionuclides in environmental samples including soil, sand, sludge, liquid, debris and scrap. The results showed that Ra-226 ranged from 5.20± 1.26 to 57.52±Bq/kg, Th-232 from 6.15 ± 1.49 to 79.92± 5.83 Bq/kg, and K-40 from 111.37± 8.36 to 402.01 ± 32.12 Bq/kg. The findings indicate varying levels of radioactivity, with some samples exceeding the recommended limits, thereby highlighting the necessity for routine monitoring, radiation protection measures, and regulatory oversight in ship recycling facilities. This study provides valuable baseline data for radiological risk assessment and contributes to the formulation of safety guidelines for the ship breaking industry.

1.3 Conceptual Framework for Near-Surface Disposal Facility Siting of Low and Intermediate-Level Waste (LILW) in Bangladesh

Md. Ashikur Rahman, Md. Abu Haydar

The Conceptual Framework for Near-Surface Disposal Facility Siting of Low and Intermediate-Level Waste (LILW) in Bangladesh is a critical initiative aimed at addressing the challenges of radioactive waste management in the context of rapid urbanization and industrialization. The framework aims to establish sustainable strategies for the safe siting and operation of near-surface disposal facilities, integrating environmental safety, stakeholder engagement, and infrastructure development. It aligns with broader public health and environmental protection goals by advocating for improved solid waste management services, including the construction of necessary infrastructure for waste collection, processing, and disposal. Enhanced monitoring and adherence to environmental and social impact assessment protocols are crucial in mitigating potential risks such as air and water contamination during facility operations. Challenges persist, particularly regarding equitable stakeholder participation and the quality of data necessary forin formed decision-making in site selection processes. The framework emphasizes the importance of engaging various stakeholders to ensure transparency and inclusivity in waste management strategies. The urgency of this endeavor is underscored by the pressing need for comprehensive regulatory frameworks to effectively manage municipal and low-level radioactive wastes, safeguarding human health and the environment in Bangladesh.

1.4 Assessment of X-ray Narrow Beam Spectrum by HVL Method using ISO Standard Aluminiumand Copper Filters.

K. M. M. Morshed, H. M. Jamil, M. Ahmed, M. Shamsuzzaman

This study focused on the X-ray beam quality assessment for GE ISOVOLT Titan E tube 320 kV X-ray system of secondary standard dosimetry laboratory (SSDL). The aim of this research is to define the energies of narrow beams of X-ray system in reference to ISO 4037 and IAEA SRS-16 guidelines. In this study, effective energies of the narrow spectrum series of X-rays, namely, N-60, N-80, N-100, N-120, N-200, N-250, N-300 were evaluated by Half Value Layer (HVL) method. This research work was performed by applying spherical ion chamber (1000cc), electrometer, ISO standard Aluminum-Copper filters of various thickness applicable for tube voltage 60-300 kV. The determined energies for narrow spectrum series (e.g., N-

60, N-80, N-100, N-120, N-150, N-200, N-250, N-300) were found to be 45.53 keV, 64.84 keV, 81.25keV, 100.84 keV, 121.03 keV, 171.37 keV and 211.3 keV, respectively. In all cases, energy deviation from ISO reference values were found to be relatively small, such as, 4% ,0.5%, 2.4%, 0.84%, 2.56%, 3.86%, 2% and 1.8%, respectively. The Homogeneity coefficients were determined, and lie between 0.854 to 0.99, which found in good agreement with ISO reference values that lies between 0.91 to 0.99. The Beam Quality Index is also evaluated which lies between 0.768 to 0.856. The determined energies and several parameters which were determined under this study would be useful tools for characterizing radiation protection dosimeters, survey meters by using the GE ISOVOLT Titan E tube 320 kV X-ray system.

1.5 Percentage Depth Dose Assessment by Monte Carlo N-Particle Simulation and Experimental Techniques for Photon beams of Medical Linear Accelerator

K. M. M. Morshed, B. N. Sattar, H. M. Jamil, M. Shamsuzzaman

This study evaluates the radiotherapy photon beam by analyzing percentage depth dose (PDD) of medical linear accelerators (LINACs) using Ion chamber, optically stimulated luminescence (OSL) dosimeters and Monte Carlo N-Particle (MCNP5) simulations. It focuses on enhancing dosimetric precision and accurate dose delivery to tumors while minimizing exposure to healthy tissues as well as improving radiotherapy quality assurance. LINAC is a key instrument to generate photon and electron beams for radiotherapy, which requires beam quality assessment. In this context, PDD measurements were conducted experimentally for photon beams. To verify experimental PDDs, Monte Carlo simulations were performed using MCNP5 integrated with VisEd to model the beam and voxel-based geometry with a view to generate simulated PDDs. The experimental PDD measurements were conducted with water phantom using CC13#??? chamber as well as OSL for LINAC exposure of 6 MV and 15 MV. In PDD measurements by OSL, radiotherapy boluses were used instead of water phantom for experimental simplicity with 6 MV and 15 MV LINAC exposures. In the present study, PDD measurement with radiotherapy boluses and phantoms ensured precise dose estimation exhibiting reasonable agreement with simulated results. PDD values for 6 MV and 15 MV photon beams were measured with clinical standard field size 10 × 10 cm² using chamber, OSL and MCNP5 which showed peak doses at maximum depths (d_{max}) of 1.5 cm and 3.0 cm, respectively. Chamber readings and MCNP simulated PDD values closely agreed with the BJR-25 supplement values for both energies with ±0.5% uncertainty. On the other hand, OSL dosimeters showed some deviations of up to ±4% compared to BJR-25 values, which falls within the acceptable uncertainty of ±5% in radiotherapy level dose assessment. The deviation in OSL PDDs may arise due to slight displacement of OSL chips and tiny air gaps in between each boluses. Nevertheless, PDD values of OSL measurement exhibited the trend of experimental and simulated PDD results. Hence, OSL PDDs precision could be enhanced by optimizing bolus design and setting accuracy to attain further precision for patient treatment.

1.6 Assessment of Calibration for Performance Evaluation of Radiation Detectors used for Radiation Protection at Various Radiological Facilities

K. M. Mahbub Morshed, M. Shamsuzzaman, M. M. H. Bhuiyan

Characterization of radiation monitoring detectors is essential to ensure that the radiation monitoring devices or detectors are working properly, and hence will be suitable for its intended monitoring purpose. In this perspective, some detectors responses were characterized in reference to ISO 4037-1:1996 and IAEA SRS-16 standards. This study signifies the necessity of calibration of detectors, and also establishes the reliability of the calibration process performed at the Secondary Standard Dosimetry Laboratory (SSDL) facility. Presently, the dependence of detectors response with position, angle, and energy was studied through this research work. To conduct this study, the dosimetry of ^{137}Cs, ^{60}Co sources from gamma calibrator (G 10) had been performed with standard equipment and procedure recommended by IAEA SRS-16 in terms of ambient dose equivalent H*(10). With both sources, the measured doses at source to detector distance (SSD) from 100 to 450 cm were verified for three Geiger Muller Survey meters, which showed satisfactory response behavior, and their calibration factors were found to be close to standard value. Similarly, dosimetry of ^{137}Cs, ^{60}Co sources were performed by using Optically Stimulated Luminescence (OSL) dosimeters to verify dose estimation performance in comparison to standard instrument. Then, detectors calibration factors were determined based on OSL doses, and found reasonable agreement. In angular response assessment, it was observed that dosimeters performance was most reliable in 90° direction at 100 cm SSD.

1.7 Comparative Study on Calibration Coefficients of Various Ionization Chambers in Terms of Absorb to Water and Air Kerma

K.M.M. Morshed, B.N. Sattar, M. Shamsuzzaman, M.M.H.Bhuiyan

IAEA Technical Report Series TRS398 is an international code of practice for dosirrretry based on standards of absorbed dose to warer introduced in December 2000 replacing the previous air-kerma based protocol TRS277. In this study we selected five type ionization chambers (Model- NE2571, NE2581, A19, FC65G and TN30013) used as standard at Secondary Standard Dosimetry Laboratory of Bangladesh for Therapy level calibration. We evaluated the TRS277 and TRS398 for the same ionization chambers. In TRS398 Temperature-pressure Correction factor (k_{TP}), Polarity Correction factor (k_{pol}) and Recombination Correction Factor (k_s) are considered in determination of $N_{D,W}$factor where only Temperature-Pressure Correction factor (k_{TP}) was applied in TRS277 air-kerma based N_k factor determination. Moreover, to check the response of ionization chambers with different volume we use two small volume (0.125cc) chambers (Model: CC13&TN31010). In this comparative study TRS398 was found more accurate of absorbed dose to water-based calibration over air-kerma based calibration protocol (TRS277). The average deviation of absorbed dose measurement between TRS277 and TRS398 was found in between 0.06 - 1.1% which shows an excellent agreement with other measurements in the literature. In case of inter chamber comparison the maximum deviation among values of absorbed dose to water for five farmer chambers were 0.01-0.4% for $D_w(Z_{ref})$ which indicates a good sign of accuracy in the measurements. This study will help to understand the absolute dosimetry at different radiotherapy centers and selection of consistent protocol for quality control of radiotherapy machine.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Technical Meeting on ‘’Conceptual Site Models in the Management of Radioactivity Contaminated Land.’’	19-23, August, 2024	Virtual	01
2.	FNCA 2024 Workshop on Radiation Safety and Radioactive Waste Management Project (RSRWM)	October 22-24, 2024	Virtual	01
3.	QGIS Level 1: Fundamental of QGIS for Smart GIS Work	01-17 September 2024	Dhaka, Bangladesh	01
4.	QGIS Level 2: Advanced GIS Work	27 September to 12 October 2024	Dhaka, Bangladesh	01
5.	Webinar on “Neutron spectrometry in radiation protection.”	08 October 2024	Zoom meetings, Organized by: CCRI, BIPM.	02
6.	AITC on Nuclear /Radiological Emergency preparedness	27 Nov-6 Dec 2024	NuHRDC, JAEA, Japan	01
7.	Seminar on “Uncertainty reporting of the measured and evaluated data: a case study of ^{84m}Rb decay data.”	02 December 2024	Conference room, INST, AERE.	06
8.	Workshop on the Implementation of the International Radiation Monitoring Information System (IRMIS)	02-06 December, 2024	Vienna, Austria	01
9.	Webinar on “Nuclear data evaluation for radionuclide metrology.”	05 December 2024	Zoom meetings, Organized by: CCRI, BIPM.	02
10.	Workshop on the Development or Updating of the National Policy and Strategy for the Management of Radioactive Waste and Disused Sealed Radioactive Sources	20 to 24 January 2025	Vienna, Austria	01

Sl. no.	Title of the program	Date	Place	Number of participants
11.	Technical Meeting of the ‘’Underground Research Facilities Network for Geological Disposal on Member State Updates and Global Progress in Developing Geological Disposal Solutions (EVT2404409).’’	18-20 February 2025	Online	01
12.	Technical Meeting on Global Status of Decommissioning - Second Phase (EVT2404266)	10 - 14 March 2025	Online, IAEA, Vienna, Austria	01
13.	Interregional Basic Training Course on the Development of Safety Assessment/Safety Case and Security Plan for the Storage of Sealed and Disused Sealed Radioactive Sources (TNINT9187- 2401039).	24 - 28 March 2025	Ljubljana, Slovenia	01
14.	Training ‘’Foundation Course on NDT.’’	13-30 April, 2025	NDT Division, AEC, Dhaka.	01
15.	Technical Meeting on ‘’Disused Sealed Radioactive Sources Disposal Options in Near Surface Facilities (EVT2404770).’’	14-17 April 2025	Vienna, Austria	01
16.	Workshop on ‘’Environmental Radiation for Operation of an NPP and on Environmental Dose Assessment System’’	27-30 April 2025	TI, RNPP	02
17.	Seminar on, “Neutron Radiography, a NDT Tool: Under development in Bangladesh.”	29 April 2025	Conference room, INST, AERE.	06
18.	Interregional Advanced Training Course on the Development of Safety Assessment/Safety Case and Security Plan for the Storage of Sealed and Disused Sealed Radioactive Sources (TN-INT9187- 2406528).	12 - 16 May 2025	Ljubljana, Slovenia,	01
19.	Seminar on “Nuctear Diplomacy: A perspective of IAEA support to facilitate member sties' competently and compliance with international legal instruments.”	18 May 2025	Conference room, INST, AERE.	07
20.	Seminar on, “Nuclear and radiation chemistry, INST: Activities, Achievements and Obstacles.’’	02 June 2025	Conference room, INST, AERE.	06
21.	Technical Meeting on ‘’High Level Waste Package Design and Emplacement Schemes (EVT2404419).’’	10-13 June 2025	Bure, France	01

3. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of the oral/ poster presentation	Title of the event	Organizer	Date	Place
Mahiuddin Ahmed	Poster presentation on ‘’Shielding Assessment of the Cyclotron Facility using Monte Carlo Simulation’’.	INST Seminar	INST, AERE	03 July 2024	Conference room, INST, AERE.
Dr. Khandoker Asaduzzaman	Environmental Radiation and Radioactivity in radiation related facilities	FNCA 2024 Workshop on Radiation Safety and Radioactive Waste Management Project (RSRWM).	JAPAN and Indonesia	22 October 2024	Online

Name of the participant	Title of the oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr. Khandoker Asaduzzaman	Country presentation on environmental radiation monitoring system	Workshop on the Implementation of the International Radiation Monitoring Information System (IRMIS) 2 - 6 December 2024	IAEA	2 - 6 December 2024	Vienna, Austria
Dr.Md.Mosharraf Hossain Bhuiyan		Training Workshop on the Development of Severe Accident Management Guidelines Using the IAEA Severe Accident Management Guideline Development Toolkit	IAEA	02-06 December 2024	Vienna, Austria
		Second Training Workshop on Methods for Radiological and Environmental Impact Assessment (MEREIA), 07-11 April 2025 (EVT2404526) Virtual	IAEA	07 - 11 April 2025	Online
Dr. Khandoker Asaduzzaman	Radioactive Waste Management	Nuclear and Radiological Emergency Preparedness	INST, AERE	26-05-2025	INST Seminar room

4. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	SSDL, HPRWMU Stakeholders Meeting	18 march 2025	Online Zoom Platform	30

5. Collaboration Work/MoU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house Project/ Universities, etc)

- FNCA project on Radiation Safety and Radioactive Waste Management.
- Establishing and Enhancing National Infrastructure for the Management of Disused Sealed Radioactive Sources, Radioactive Wastes and Naturally Occurring Radioactive Material (RAS9097).

6. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Revenue income
1.	Radiation Survey	104	96,000/-
2.	Calibration and Standardization	306	23,06,500/-
3.	Radioactive source/waste interim storage	09	8,07,600/-
4.	Environmental sample analysis	196	-

13. Others

(i) Performed comprehensive environmental sampling at 20 strategic locations along the Padma River (upstream and downstream of the Rooppur Nuclear Power Plant - RNPP) during a 10-day monitoring campaign.

(ii) Am-241 smoke detectors stored in the CWPSF interim facility are being dismantled to extract the Am-241 sources, which are then securely placed in prescribed canisters. During this reporting period, 90 smoke detectors have been conditioned/processed.

(iii) Performed radiation survey and environmental sample collection of some pre-defined locations of Rajbari and Chuadanga districts as a part of "background radiation monitoring around 100km Radial areas of RNPP".

Reactor Physics and Engineering Division, INST

Objective

The program of the division is to conduct R&D activities using modern methods for the computational analysis of nuclear reactors, with particular emphasis on reactor physics, design and safety. Here, we procure and implement computer codes related to reactor engineering and nuclear data processing with international collaboration. The ultimate objective of the division is to support the development of infrastructure for nuclear power program to meet the ever increasing demand of electricity.

1. R & D Work(s)

1.1 Analysis of the TRIGA MARK-II Benchmark IEU-COMP-THERM-003 with Monte Carlo Code OpenMC

Saad Islam, Mohammad Abdul Motalab.

Ensuring the reliable use of particle transport computer codes necessitates verification against benchmark experiments. This study aims to verify the Monte Carlo code OpenMC using the criticality benchmark model IEUCOMP- THERM-003 from the International Criticality Safety Benchmark Evaluation Project (ICSBEP) Handbook. The analysis focuses on the TRIGA Mark II reactor cores 132 and 133, employing nuclear cross-section libraries ENDF/B-VIII.0, ENDF/B-VII.1, ENDF/B-VII.0, and ENDF/BVI. 2. Results show that OpenMC provides K_{eff} values in close agreement with benchmark values, demonstrating its robustness in neutronic simulations. Comparison with MVP code results obtained previously, particularly with JENDL-3.3, shows similar accuracy.

1.2 Thermal Hydraulics Safety Analysis at Steady State Operation of Burnup Core of TRIGA Mark II Research Reactor Utilizing PARET/ANL and COOLOD-N2.

Md Altaf Hossen

Steady-state thermal hydraulics analysis of 700 MWD burn core of the TRIGA Mark II research reactor has been studied with the computational codes PARET/ANL and COOLOD-N2. This study aims to validate the PARET/ANL code through the execution of steady-state thermal-hydraulics calculations at full power to guarantee that all safety parameters maintain margins well below the safety limits. Fuel centerline temperature, Fuel surface temperature, Fuel clad temperature, DNB heat flux, and DNB ratio of the hottest rod, Enthalpy and Coolant temperature have been calculated. Results from both codes are in good agreement with each other which are far below the safety limit of SAR. Hence PARET/ANL is capable in conducting TRIGA mark II research reactor. Therefore, thermal hydraulics packages and correlations used in this simulation can be utilized for the thermal hydraulics safety analysis of modified TRIGA Mark II cores.

1.3 BTRR Model Development and Verification for MONTE Carlo Simulation.

Saad Islam, Mohammad Abdul Motalab

The Bangladesh Atomic Energy Commission's TRIGA Mark II research reactor (BTRR), located near Dhaka, has been operational since September 1986, primarily for training, education, radioisotope production, and research. Currently, the Reactor Physics and Engineering Division is enhancing its analysis methods by employing modern tools like high-fidelity Monte Carlo analysis and introducing advanced codes and cross-section libraries. This study details the new reactor model implemented by means of the OpenMC code using the nuclear cross-section data libraries based on the ENDF/B-VIII.0 and ENDF/B-VII.1, focusing on calculating critical reactor parameters such as core excess reactivity, shutdown margin, control rod worth, power peaking factors, etc. The accuracy of the model verified by comparisons with previous calculations and experimental data showed good agreement.

1.4 Criticality and Sensitivity Analysis of VVER-1000 Mock-up with SCALE and MCNP5 Code using ENDF/B-VII.1 Nuclear Data Library.

Mohammad Omar Faruk, Mohammad Abdul Motalab, Mohammad Sayem Mahmood, Gil Soo Lee

Accurate analysis of reactor criticality is essential for reactor design and safety assessments. This paper conducts a criticality study of a VVER-1000 mock-up benchmark experiment, which was performed at the LR-0 research reactor operated by the Research Center Rez in the Czech Republic. Benchmark calculations are performed

using two Monte Carlo codes – SCALE (KENO-VI) and MCNP5 – utilizing the ENDF/B-VII.1 continuous-energy nuclear data library for criticality calculations. The mock-up was examined under six different critical configurations by varying coolant levels and boric acid concentrations. This paper provides a comparative analysis of the results from SCALE (KENO-VI) and MCNP5 to assess the suitability of SCALE (KENO-VI) as a verification tool in the regulatory process, with MCNP5 as the reference code. Additionally, the research work also investigates the sensitivity of various reactor system parameters' uncertainty, highlighting their significant impact on criticality result, which could potentially lead to overly conservative safety margin. The study focuses uncertainty on five key technological parameters: fuel assembly pitch, fuel cladding thickness, fuel density, fuel enrichment and boric acid concentration. A comprehensive analysis of these uncertainties, along with an assessment of their sensitivity to the criticality results, is provided in this study.

4. Manpower Development (Training /Fellowship/Workshop/ Meeting)

4.1 Attend in training/fellowship/workshop/meeting

Sl. no.	Title of the Program	Date	Place	Number of participants
1.	International Conference on Research Reactors: Achievements and the Way to a Sustainable Future	11-15, November, 2024	Vienna, Austria	1

6. Oral poster presentation in seminar/symposium/conference (national and international)

Name of the Participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Mohammad Abdul Motalab	Neutronics And Thermal-Hydraulics Coupling for Small Research Reactor Core Simulation: Methodological Development and Validation	International Conference on Research Reactors: Achievements and the Way to a Sustainable Future	IAEA	11-15, November, 2024	Vienna, Austria

7. Project work/MoU (ADP/FNCA/FTC/IAEA/RCA/TC/CRP)

IAEA- CRP Project: Development of Neutronic and Thermal-Hydraulic Coupled Calculational Methodologies for Research Reactor, including Analysis and Treatment of Uncertainties, (F12028)

8. Others

i. Two students from the Nuclear Engineering Department of the University of Dhaka received training in Reactor Core Analysis from the Division as part of their Industrial Training, February 9-19, 2025.

ii. Mohammad Omar Faruk, a scientist from the division, participated in a meeting at the BAEC Head Office regarding the Power Purchase Agreement (PPA) for the electricity of the Rooppur Nuclear Power Plant, May 6-8, 2025.

Iii. Dr. Badrun Nahar Hamid, the head of the division, introduced the research work of the INST through a PowerPoint presentation in front of the visiting 3rd year students of MIST on 27th May, 2025, as a part of their Industrial Training.

Tandem Accelerator Facilities Division, INST

Objective

The 3 MV Tandem Accelerator, inaugurated at the Atomic Energy Research Establishment (AERE), Savar, under the Bangladesh Atomic Energy Commission, represents a milestone in the country's advancement of nuclear research. The primary objective of this division is to ensure continuous operation of the complex accelerator through regular repair and maintenance, and to provide ion beam for fundamental research purposes.

Additional objectives include

- Training manpower in advanced nuclear technology.
- Providing analytical services for qualitative and quantitative elemental analysis of various matrices.
- Investigating nuclear reactions via ion beam irradiation.
- Facilitating research in nuclear physics, material science, and environmental science, etc. for the students from various universities in the country and researchers of other organizations.
- Exploring new social applications such as seed mutation, cancer therapy, etc.

1. R&D Work(s)

1.2 Activation Cross-sections of $^{54}Fe(p,\gamma)^{55}Co$ and $^{54}Fe(p,\alpha)^{51}Mn$ Reactions up to 15 MeV

M. S. Uddin, M. M. Hasan and M. A. Shariff

The cross section of proton-induced reactions in light and medium mass isotopes near the reaction threshold is of considerable significance in the production of medical radionuclides using solution targets and in astrophysics research. This work presented the detail and critical measurements of cross sections of $^{54}Fe(p,\gamma)^{55}Co$ and $^{54}Fe(p,\alpha)^{51}Mn$ reactions using the activation technique within the proton energy range of 1.3 to 15.0 MeV employing a low-energy tandem accelerator and a small cyclotron.

Theoretical calculation, performed using the TALYS code, successfully reproduced the experimental data after optimizing input parameters and by combining compound and direct processes. The model calculations using global parameters (given in TENDL-2015 and TENDL-2023) were only partially successful in reproducing the experimental data. This study identified the (p,α) reaction as the dominant process, while the (p,γ) reaction appeared weakest, possibly due to a higher probability of particle emission compared to γ-ray emission. These findings may provide some useful information related to nuclear astrophysics and reaction modeling. Moreover, the results demonstrate that the $^{54}Fe(p,\alpha)^{51}Mn$ reaction could serve as an effective alternative to the $^{50}Cr(d,n)^{51}Mn$ process for ^{51}Mn production for PET investigation. This approach offers key advantages, including the use of a small medical cyclotron and the ability to obtain high-purity ^{51}Mn, making it a practical choice for future applications.

1.3 Activation Cross-section of Proton-induced Nuclear Reactions on Titanium

M.S. Uddin, M. M. Hasan and M. A. Shariff

Medium-energy proton-induced nuclear reactions on titanium are of considerable significance in nuclear research: both fundamental investigations and application-oriented studies. Titanium is an important element in nuclear technology and is a target material in accelerator production of the medical radioisotopes, ^{44}Sc, ^{47}Sc, etc. Originally, the pair $^{44g}Sc/^{47}Sc$ was developed for theranostic applications: the radionuclide ^{44g}Sc is an interesting positron emitter and it is the diagnostic partner, whereas ^{47}Sc emits a β^- particle and it is the therapeutic partner. Excitation functions of the $^{nat}Ti(p,x)^{43,44m,44g,46,47,48}Sc$ and $^{nat}Ti(p,x)^{48}V$ reactions were measured using stacked target activation from reaction thresholds up to 44.28MeV. A wide energy range was achieved by irradiating several stacks with proton beams of energies 16.7MeV, 27MeV, and 44.5MeV. Cross-section data were obtained from15 to 25MeV at the Lawrence Berkeley National Laboratory (LBNL) and from14 to 44.28MeV and 8–17MeV at the Forschungszentrum Jülich (FZJ). Irradiation in different places has helped in reducing uncertainties, particularly for the lower energy of stack measurements. Our data demonstrate excellent agreement in overlapping energy regions, further validating the quality of our findings.

Typically, results derived from the use of a global set of parameters, as outlined in the TENDL file, are inadequate for accurately predicting experimental outcomes however, a better match between the experimental data and the model calculations using the TALYS code was achieved by carefully selecting specific input parameters. These new measurements provide valuable contributions not only for resolving existing data inconsistencies, especially in the threshold region of the reactions leading to the formation of the medically important radionuclides ^{44g}Sc and ^{47}Sc, but also offer insights into reaction mechanisms.

2. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of the presentation	Title of the event	Organizer	Date	Place
Md. Mehedi Hasan	Repair and Calibration of Radio Frequency Driver Unit Used in 3 MV Tandem Accelerator of BAEC	International Conference on Electronics and Informatics-2024. Theme: Electronics and ICT for Future Bangladesh.	Bangladesh Electronics and Informatics Society.	28-29 December, 2024	Atomic Energy Centre, Dhaka, Bangladesh.

3. Collaboration work/MOU(ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house project, Universities, etc.)

3.1 Title: International research collaboration between Germany, USA and Bangladesh

Period: From 01-02-2019 to date.

A strong research collaboration has been established with various international institutions, especially with Forschungszentrum Jülich (FZJ), Germany, Lawrence Berkeley National Laboratory, USA, etc. Some experimental and theoretical works have been carried out to develop novel radionuclides for medical diagnosis and treatment under a collaborative research between Germany, USA, and Bangladesh. Dr. Shuza Uddin of Tandem Accelerator Facilities Division has joined the collaboration under the financial support of *Alexander von Humboldt Foundation, Germany*, and *Lawrence Berkeley National Laboratory, USA.*This cooperative effort may be considered as successful, from the viewpoint of both scientific development and transfer of knowledge.

3.2 Title: Continuous Air Monitoring Station (CAMS)

Period: From 29-11-2018 to date.

A MoU was signed on 29 November 2018 between Bangladesh Atomic Energy Commission (BAEC) and Department of Environment (DoE) for establishment of Continuous Air Monitoring Station (CAMS) at the roof of TAFD, INST, AERE.

The station has been successfully installed and still operational and gathering valuable air quality data for scientific research. BAEC is providing necessary support and one of TAFD scientist is attached with the said research work.

3.3 IAEA-TC PROJECT TITLE: Strengthening Capacity in the Maintenance and Utilization of the Tandem Accelerator Facility

Code: BGD 0010

Period: From 01-01-2018 to date.

The project has been initiated to improve the knowledge in the field of accelerator technology at the institute/facility and to improve the Quality of life in the country.

With the expected Outputs/Outcomes:

a. Skilled manpower in the utilization of accelerator based nuclear analytical techniques and innovative research in bio-environmental sciences
b. Safe and reliable operation and maintenance of the Tandem accelerator system
c. New crop varieties to be developed

Unfortunately, out of fourteen scientific visits and fellowships, only seven are managed to be completed due to COVID situation. So it was one of the reasons for not fulfilling the project outputs.

Still, knowledge and experience gained by the fellowship, scientific visit and expert mission under the project is a valuable achievement. Some important nuclear equipment procured through the project, which are otherwise difficult to obtain. More equipment are still in the process to arrive, thus the project is not closed yet.

4. Repair & Maintenance, Renovation Works

4.1. Operation, Troubleshooting, Repair and Maintenance of 3 MV Tandem Accelerator Facilities

During the reporting period, the 3MV Tandem Accelerator facilities underwent regular operations, comprehensive troubleshooting, and a series of repair and maintenance tasks to ensure stable performance and continued service in experimental research. Major activities are summarized below:

Daily operation primarily involved the continuous running of the vacuum system. The outgassing procedure of the 358 ion source was carried out as a prerequisite for its main operation. Beam current was successfully obtained at the accelerator Faraday cup using the 358 source. To increase beam current, the lithium charge exchange canal was dislodged from the MPI (Multi-Purpose Injector) section.

Repairs included restoration of the syltherm cooling system of the source by replacing the fan box. An issue with the MPI water flow sensor system was resolved by checking and reconnecting the wiring. Faulty bypass roughing pipelines of the 358 and 860 ion sources were replaced to achieve improved high vacuum in the MPI section.

The new control room UPS parameters were verified using an oscilloscope and multimeter. A malfunction in the 15_3kVA water-cooled UPS was traced to damaged batteries, which were replaced to restore functionality. The industrial computer's burnt power supply unit was also replaced. A short circuit in the input line of the control room cabinet caused failure of the new UPS, which was subsequently diagnosed, and all units were checked.

Further electronic repairs included:

- Replacement of damaged wires and a burnt varistor in the telemeter box.
- Replacement of varistors and fuses in two faulty telemeter CAN fiber units.
- Adapter replacement in a 5-port switch.

A critical regulation error in the 358 source power supply unit was traced to damage on the X7 control slot—burnt capacitors (C19, C20) and diodes (D1, D2), which were replaced. Magnet program, monitor, and LV1 358 regulation errors were resolved accordingly. Water cooling system issues were addressed by replacing attachments on the water circulation motor.

Minor repairs were also conducted:

- Optical fiber cable jackets were patched using insulation tape.
- The CANNODE 3 missing signal issue was corrected.
- The MPI turbo pump, with broken blades, was temporarily repaired using vacuum oil and reinstalled at the IBA1 position. However, it failed after a few hours. Two new turbo pumps were procured and tested; one was installed successfully at the IBA1 location.
- Two newly acquired air cooling units were tested.

In instrumentation and diagnostics:

- A fault in the SW magnet water sensor was resolved by adjusting the F2 potentiometer.
- A burnt tantalum capacitor in the RF driver unit (caused during the terminal voltage rise to ~2100 kV) was replaced.
- The magnetic float attachment was replaced to resolve a driver cooling sensor issue.
- Terminal voltage conditioning was performed.
- SF_6 gas was transferred from gas cylinders to DILO storage, and additional SF_3 was injected into the accelerator tank to boost internal pressure, followed by system-wide gas circulation.
- Repair and maintenance of the Central Air Cooler System.

Experimental chamber and detector-related tasks included:

- Installation and testing of a new lithium-drifted silicon (Si(Li)) PIXE detector.
- Functionality checks of the PIXE and fixed RBS data acquisition systems.
- Replacement of the stepper motor belt used for vertical movement of the sample holder.

- Installation of an automatic liquid nitrogen discharge system on the LN_3 container.
- PIXE calibration using thin standard targets is ongoing.

An issue as all systems shut down during beam entry into the chamber was resolved by thoroughly cleaning oily residues inside the chamber. Full-scale accelerator operation was successfully conducted with beam irradiation at 4.22MeV for nuclear reaction cross-section studies using various stacked samples.

Isotope Hydrology Division, INST

Objective

- Isotope hydrology technique involves the use of stable and radioactive isotopes to understand the movement, origin, age, and interactions of water within the hydrological cycle. This technique has broad applications in **water resources exploration and management.**
- Assessment of aquifer systems in major city areas of Bangladesh using isotope techniques.
- Climate change studies through rainfall isotope monitoring in eight districts of Bangladesh.
- Isotope techniques used for the exploration and mapping of salinity-free aquifers in southwestern coastal regions of Bangladesh.
- Tracing the pollutants origin, movement and water quality using isotope techniques.
- Artificial groundwater recharge evaluation in Barind region using isotope techniques.
- Use of fallout radionuclides (FRN) techniques to assess soil erosion in the hilly regions of Bangladesh for proper agricultural land management.
- Application of Cosmic Ray Neutron Sensor (CRNS) technique for efficient use of water for irrigation water management.

1. R&D Work(s)

1.1 Improving Water Resources Management Practices by Enhancing the Regional Collaboration in Environmental Isotope Analysis and Applications

Ratan Kumar Majumder, Md. Moniruzzaman, Md. Masud Karim, Md. Abdul Quaiyum Bhuiyan and Md Fahad Hossain

This is an IAEA Technical Cooperation Project (RAS7040) for Asia and Pacific region participating 20 countries. The prime objectives of the project are to (i) identify the origin and age of saline water in the south-western coastal region aquifers of Bangladesh using isotope techniques, (ii) mapping the regional geographic distribution of salinity-prone coastal aquifers for the future sustainable groundwater resources management and (iii) to inform the focal Government Organizations for sustainable management and proper use of salinity-free water for future generations. Under this project 15 shallow and 18 deep groundwater samples were collected from Khulna district during June 2025.The Electrical Conductance (EC) values for collected shallow groundwater samples ranged from 971-5385 µS/cm with an average value of 2788µS/cm. The deep groundwater average EC value was 1539 µS/cm ranging from 376-4697µS/cm. The observed EC values are relatively high in the southern part of Khulna district and it gradually decreases towards north.Both hydrochemical and isotopic analyses of collected groundwater samples are in progress in the laboratory.

1.2 Evaluating the Efficacy of Artificial Recharge to Groundwater in Water Scarce Regions using Isotope Techniques

Md. Moniruzzaman, Ratan Kumar Majumder, Md. Masud Karim, Md. Abdul Quaiyum Bhuiyan and Md Fahad Hossain

The RCA project aims to enhance awareness regarding isotope techniques for assessing interventions designed to augment groundwater recharge through artificial measures, with expected outcomes facilitating the effective adoption of nuclear-derived technologies to improve recharge while strengthening capacities for sustainable water resource management, particularly in water-scarce regions. In Bangladesh, numerous Managed Aquifer Recharge (MAR) systems have been implemented in northern and southern regions under government and non-governmental initiatives, where isotope techniques serve as a crucial tool for evaluating mixing between injected and native groundwater and assessing long-term sustainability. Under this framework, the Isotope Hydrology Division designed a sampling strategy targeting MAR-injected water,

conventional domestic tube-wells (non-MAR), and MAR-installed tube-wells, collecting 38 samples from Rajshahi, Chapai Nawabganj, and Naogaon districts for stable isotope and chemical analysis. Electrical conductivity (EC) measurements revealed ranges (averages) of 150–825 µS/cm (526 µS/cm) for injected water, 193–838 µS/cm (492 µS/cm) for domestic tube-wells, and 232–614 µS/cm (428 µS/cm) for MAR tube-wells. Temperature variations were 28.9–35.7 °C (avg. 32.3 °C) in injected water, 27.8–33.7 °C (avg. 29.7 °C) in domestic tube-wells, and 27.8–33.7 °C (avg. 29.0 °C) in MAR systems, while pH values averaged 6.9 (5.14–7.5), 6.7 (6.03–7.3), and 6.6 (6.19–7.2) for the respective water sources. Isotopic and chemical analyses of the samples are currently underway in the laboratory.

1.3 Convective Rain Events in the Surma-Kushiyara River Catchment of Bangladesh and Tracing Their Impact on the Catchment with Isotopes

Ratan Kumar Majumder, Md. Moniruzzaman, Md. Abdul Quaiyum Bhuiyan, Md. Masud Karim and Md Fahad Hossain

This IAEA Coordinated Research Project (CRP) aims to understand the impact of convective rain events (pre-monsoon rain) on the hydrological systems in the Surma-Kushiyara river catchment of Sylhet district which is crucial for the agricultural development in the study area. In this project Erali Beel of Golapgonj Upazilla, Sylhet district has been chosen as the study area. A rainfall collector was installed close the Erali Beel to collect daily rainfall samples and simultaneously, a hand tube-well (12.8 m depth) located close to the rainfall collector was selected to collect groundwater samples. In this study a total of 56 daily rainfall samples and 35 groundwater samples were collected during the year 2024 to understand the influence of convective rainfall events on groundwater recharge in the study area. The $\delta^{18}O$ compositions of pre-monsoon and monsoon rainfalls in the study area range from 0.55 to -5.20‰ (average -1.75‰) and -2.29 to -5.97‰ (average -4.68‰), respectively. The $\delta^{18}O$ compositions of pre-monsoon and monsoon groundwater samples range from -3.79 to -9.48‰ (average -4.65‰) and -4.67 to -11.37‰ (average -5.50‰), respectively. In δ–plot, most of the observed groundwater samples are plotted more or less along and/or slightly below the LMWL (Local Meteoric Water Line), which provides compelling evidence that all groundwater are derived from rainfalls with a minor localized evaporation effect for the groundwater. The pre-monsoon convective rainfalls $\delta^{18}O$ values are heavier than that of monsoon rainfall as well as of the groundwater samples. It is obvious that the pre-monsoon rainfalls do not get enough time to feed the underlying groundwater aquifers and thus rapidly run out of the study area.

1.4 Fresh Groundwater Aquifer Identification in Khulna District using Isotope Hydrology Techniques

Ratan Kumar Majumder, Md. Moniruzzaman, Md. Masud Karim, Md. Abdul Quaiyum Bhuiyan and Md Fahad Hossain

In Bangladesh, salinity is a major problem in the coastal Khulna district lying in the South-Western zone of Bangladesh. Khulna district consists of 9 Upazilas e.g. Batiaghata, Dacope, Dighalia, Dumuria, Koyra, Paikgachha, Phultala, Rupsa and Terokhada. Among them, Batiaghata, Dacope and Koyra Upazila are the most saline prone areas in Khulna District. Prime objective of the project is to use isotope hydrology technique to highlight whether the salinization has taken place during modern time due to rise of sea, low surface water flow, anthropogenic sources or the saline water has entrapped within the aquifers during it deposition time. Under this project, a reconnaissance survey was carried out in Khulna district area during 17-21 June 2025. Traverse and random sampling methods were used for groundwater sampling. A total of 35 shallow (<80m) and 41 deep (>80m) tube-well water were collected during the reconnaissance program. The shallow and deeptube-well groundwater showed electric conductance (EC) ranging from 629 - 12240 µS/cm (average 3425 µS/cm) and 310-5106 µS/cm (average 1387 µS/cm) respectively. In spatial distribution, both the surveyed shallow and deep tube-well groundwater showed low EC values in the northern site of Khulna district mainly inKhulna Metropolitan City area, Dumuria, Phultala, Rupsa and Terokhada Upazilla areas.But with some exceptions both shallow and deep tube-well water EC values gradually increase towards south along the coastal belt mainly in Batiaghata, Dacope, Dighalia and Paikgachha Upazilla areas. The shallow tube-well groundwater average temperature was 27.9 °C ranging from 26.5 -30.0 °C, while the deep tube-well groundwater temperature varied from 26.9 -30.9 °C with an average value of 28.4 °C. Shallow tube-well groundwater pH values ranged from 6.89 – 9.22 with an average value of 7.66. However, deep tube-wellwater average pH value was alkaline (8.07) ranging from 7.14 -9.30.

1.5 IAEA Global Network of Isotopes in Precipitations Program

Ratan Kumar Majumder, Md. Masud Karim, Md. Moniruzzaman, Md. Abdul Quaiyum Bhuiyan and Md Fahad Hossain

The Global Network of Isotopes in Precipitation (GNIP) provides long-term isotope data essential for understanding hydrological processes and climate variability. By analyzing δ^{18} O and δ^{2}H in rainfall, GNIP supports studies on precipitation sources, groundwater recharge, and atmospheric moisture transport. In Bangladesh, the Isotope Hydrology Division has contributed to GNIP by collecting 71 cumulative monthly precipitation samples for stable isotope analysis from eight locations (Savar-10, Dinajpur-9, Sylhet-10, Barisal-9, Satkhira-7, Chuadanga-7, Bandarban-9, Cox's Bazar-10). Additionally, 15 monthly samples (Savar-8, Sylhet-7) were collected for Tritium (^{3}H) analysis. All samples were submitted to the IAEA's Isotope Hydrology Section in Vienna for inclusion in the global WISER database. These efforts enhance climate model calibration, support sustainable water management, and strengthen global collaboration. GNIP remains a vital tool for tracking hydrological changes amid a changing climate.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Regional Training Course of Groundwater Flow Modelling (TN-RAS7040-2400791)	15-19 July 2024	Kualalampur, Malaysia	01
2.	Training Course on Water Isotope Analysis by Laser Spectroscopy (EVT2303868)	August 28-September 01, 2023	Jakarta, Indonesia	01
3.	Training Course on Data Quality Assurance in Stable Isotope Laboratories (EVT2404004)	18-22 November 2024	Vienna, Austria	01
4.	Second Research Coordination Meeting on Understanding the Importance of Convective Rain Events and Tracing Their Impact on the Catchment with Isotopes (IAEA CRP 26598)	04 to 07 November 2024	Vienna, Austria	01
5.	Regional Training Course on Sampling Protocols QA/QC Programme for Isotope and Chemistry Analysis of Water Samples (RAS7040 - EVT2407001)	26 - 30 May 2025	Quezon City, Philippine	02
6.	Regional Training Course on Measurement of Stable Isotopes and Radioisotopes in Water, Bangkok, Thailand(TN-RAS7043-EVT2500720)	16 - 20 June 2025	Bangkok, Thailand	02

3. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	National Consultation Workshop on International Atomic Energy Agency (IAEA) Water Availability Enhancement (IWAVE)	02-03 February, 2025	BAEC Head Quarters	70

5. Oral/Poster presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Ratan Kumar Majumder and Dr. Md Moniruzzaman	Use of Isotope Hydrology in Groundwater Source Identification, Aquifer Mapping, and Sustainable Water Resources Management in Bangladesh	4th Learning Session on the Application of Isotope Hydrology in the Groundwater source identification, Aquifer Mapping, and Sustainable water resources Management in Bangladesh	WARPO	30 June 2025	WARPO Bhaban, Dhaka
Dr. Ratan Kumar Majumder	Convective Rain Events in the Surma-Kushiyara River Catchment of Bangladesh Tracing their Impact with Isotopes	IAEA-CRP F31007 Second Research Coordination Meeting on Understanding the Importance of Convective Rain Events and Tracing Their Impact on the Catchment with Isotopes	IAEA	04-07 November 2024	Vienna, Austria
Dr. Ratan Kumar Majumder and Dr. Md Moniruzzaman	IAEA's Assistance on Isotope Hydrology and Works to be Done	IAEA IWAVE	MoST	14 January 2025	Bangladesh Secretariat, MoST
Dr. Ratan Kumar Majumder	Isotope Hydrological Investigations in Bangladesh	National Consultation Workshop on International Atomic Energy Agency Water Availability Enhancement (IWAVE)	BAEC	02 February 2025	BAEC Head Quarters
Dr. Ratan Kumar Majumder and Dr. Md Moniruzzaman	Isotope Technology for Research on Exploration of Salinity-free Groundwater Aquifers in Khulna District	Project Concept Paper Presentation	MoST	28 April, 2025	Bangladesh Secretariat, MoST
Dr. Ratan Kumar Majumder and Md. Fahad Hossain	Improving Water Resources Management Practices by Enhancing the Regional Collaboration in Environmental Isotope Analysis and Applications (RCA) RAS7040	Regional Training Course on Sampling Protocals and QA/QC Programme for Isotope and Chemistry Analysis for Water Samples (RAS7040 - EVT2407001)	Philippine Nuclear Research Institute (PNRI)	26-30 May 2025	Manila, Philippines
Md. Masud Karim and Md Fahad Hossain	Environmental Isotope Analysis and Hydrochemical Studies of Groundwater Aquifer in Southwestern Part of Bangladesh: Implications for Improving Water Resources Management Practices	Regional Training Course on Measurement of Stable Isotopes and Radioisotopes in Water, Bangkok, Thailand (TN-RAS7043-EVT2500720)	Office of Atoms for Peace (OAP)	16 - 20 June 2025	Bangkok, Thailand

6. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	IAEA Isotope Hydrology	27 January 2025	BAEC Head Quarters	12

7. Repair &Maintenance, Renovation works, etc.

Title: Installation of a Portable HPGe Detector

A Portable Electrical Cooling Canberra HPGe Detector received from IAEA TC Project BGD5033 was installed in the laboratory by the Canberra expert in June 2025. This instrument will be used for soil erosion study.

Reactor and Neutron Physics Division, INST

Objective

Reactor and Neutron Physics Division (RNPD) is entrusted with the responsibility of utilization of the research reactor in the country for research and applications in nuclear techniques. RNPD has three major facilities namely, (i) Neutron Scattering, (ii) Neutron Activation Analysis and (iii) Neutron Radiography. All these facilities utilize neutrons generated in the TRIGA Mark II Research Reactor for specific research and discharging services in the nuclear techniques. These research groups mainly focus on characterization of essential materials, analysis of toxic and heavy elements in different sample matrices and studies of structural and building materials for defects and flaws.

1. R&D Work(s)

1.1 Neutron Activation Analysis

1.1.1 Elemental Contamination Assessments in Sediments of the Meghna River by Neutron Activation Analysis

M. A. Islam, K. Naher, R. Khan, U. Tamim, I. Khalil, M. S. Islam, Aman Ullah, Md. Shahab Uddin

This study evaluates elemental contamination in surface sediments of the Meghna River using the Research Reactor-based Instrumental Neutron Activation Analysis method. A total of 30 surface sediment samples were collected from different locations of the Meghna river. Concentrations of twenty-five elements were determined including seven major elements (Al, Ca, K, Fe, Na, Ti, Zn), ten trace elements (As, Co, Cr, Cs, Hf, Mn, Sb, Th, U, V), and eight rare earth elements (Ce, Dy, Eu, La, Lu, Sc, Sm, Yb). In this study, the quality of the analyses was evaluated by analyzing certified reference materials IAEA-SL-1 (lake sediment), IAEA-Soil-7, and NIST-1633b. The results were compared with the average of Upper Continental Crust (UCC) and Average Shale Value (ASV) as background values, revealing that eight elements (Ce, Cs, Dy, Eu, Hf, Sm, Th, Yb) exceeded both background values, while five elements (La, Lu, Ti, U, Zn) exceeded UCC but remained below ASV. Pollution indices, including the Enrichment Factor and Geo-accumulation Index, indicated minor enrichment for eight elements (Ce, Dy, Eu, Hf, La, Sm, Th, Yb) and moderate contamination for four elements (Ce, Hf, Th, Yb). The pollution load index calculation confirmed moderate metal pollution in twenty samples. The correlation analysis of the elemental concentrations was performed to find the origin and transport behavior of these elements in the river sediments. These findings highlight the varying degrees of elemental contamination in the Meghna River sediments, providing crucial insights into environmental pollution and its potential impacts. The results of this study will be used to set a proper management strategy to reduce future metal contamination of this river.

1.1.2 Natural Radioactivity and Concomitant Radiological Risks in Sediments of the Padma River Near Rooppur Nuclear Power Plant of Bangladesh: Pre-operational Status

M. A. Islam, K. Naher, R. Khan, U. Tamim, I. Khalil, M. S. Islam, Aman Ullah, Md. Shahab Uddin

In this study, natural radioactivity levels in sediments of the Padma River and concomitant radiological risks were assessed. Sediment samples were collected from the Padma River near the under-construction Rooppur Nuclear Power Plant (RNPP) of Bangladesh and analyzed for ^{226}Ra, ^{232}Th, and ^{40}K radioactivity levels using a gamma-ray spectrometry system. The activity concentrations (Bq kg^{-1}) of ^{226}Ra, ^{232}Th, and ^{40}K in sediments of

the Padma River varied from 45.6 ± 6.7 to 119 ±11 with average 73.2±17.4; 49.8 ± 6.9 to 137 ± 11 with average 86.6±20.3, and 540 ± 23 to 1032 ± 32 with average 782±146, respectively. This study indicates that activity concentrations of these radionuclides in the Padma River sediments are relatively higher than the world average values. Among the seven radiological hazard indices determined, four of them: radium equivalent activity, annual effective dose rate, and external and internal hazard indices are within their international guideline values. However, values of absorbed dose rate, gamma representative level index, and excess lifetime cancer risk are considerably higher at all sampling points, suggesting radiological risks for the river environment. The statistical analyses revealed a strong correlation between ^{238}U and ^{232}Th radionuclides. The spatial distribution of activity concentrations and radiological hazard indices for the studied area will serve as a documented radiological reference for the Padma River near RNPP. This study recommends routine monitoring of the radionuclides in the surrounding regions of RNPP to assess any post-operational environmental impact due to radionuclide contamination.

1.1.3 Exploring the Alteration of Environmental Radioactivity in Terms of Compositional Elements of Heavy Minerals in an Anthropogenically Affected Urban River: Radiological and Ecological Risks Assessment

R. Khan, K. Naher, M. A. Islam, U. Tamim, I. Khalil, M. S. Islam, Aman Ullah, Md. Shahab Uddin

This study explored the alteration of naturally occurring radioactive materials (NORMs: ^{226}Ra($\approx^{238}$U), ^{232}Th, ^{40}K) in an anthropogenically disrupted urban river-basin (Turag, Bangladesh) in terms of constitutional substances (Sc, Ti, V, Fe, La, Ce, Sm, Eu, Tb, Dy, Ho, Yb, Lu, Hf, Ta, W, Th, U) of heavy-minerals. Average activity concentrations of ^{226}Ra($\approx^{238}$U), ^{232}Th, and ^{40}K were 41.5±12.9, 72.1±27.1, and 639±100 Bqkg^{-1}, respectively which were relatively higher compared to crustal origin. ∑REEs, Ta, W, Th, and U were ~2 times higher compared to crustal values with Ce and Eu-anomalies. APCS-MLR and PMF receptor models were used to determine the various anthropogenic and/or geogenic sources of NORMs and elements. Layer-wise variations of NORMs and elements were observed to trace the response of sedimentary processes towards the incoming pollution load. Presence of REEs indicates moderate degree of ecological risk to aquatic biota. However, carcinogenic risk (3.84×10^{-4} Sv^{-1}) were significantly higher than threshold limit.

1.1.4 Source Specific Sedimentary Response Towards the Differential Anthropogenic Impacts in Terms of Potentially Toxic Elements in an Urban River

R. Khan, K. Naher, M. A. Islam, U. Tamim, I. Khalil, M. S. Islam, Aman Ullah, Md. Shahab Uddin

To investigate the interplay between varying anthropogenic activities and sediment dynamics in an urban river (Turag, Bangladesh), this study involved 37-sediment samples from 11 different sections of the river. Neutron activation analysis and atomic absorption spectrometry were utilized to quantify the concentrations of 14 metal(oid)s (Al, Ti, Co, Fe, As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn). This study revealed significant toxic metal trends, with Principal coordinate analysis explaining 62.91% of the variance from upstream to downstream. The largest RSDs for Zn(287%), Mn(120%), and Cd(323%) implies an irregular regional distribution throughout the river. The UNMIX-model and PMF-model were utilized to identify potential sources of metal(oid)s in sediments. ~63.65–66.7% of metal(oid)s in sediments originated from anthropogenic sources, while remaining attributed to natural sources in both models. Strikingly, all measured metal(oid)s' concentrations surpassed the threshold effect level, with Zn and Ni exceeding probable effect levels when compared to SQGs.

1.1.5 Sources and Distribution of Potentially Toxic Elements in Urban Road Dust: A Comparative Insights and Risk Assessment of Two Polluted Cities

R. Khan, K. Naher, M. A. Islam, U. Tamim, I. Khalil, M. S. Islam, Aman Ullah, Md. Shahab Uddin

This study provides a comprehensive comparative analysis of seven potentially toxic elements (PTEs) from thirty samples using instrumental neutron activation analysis on the roadside dust samples collected from a south-western city (Khulna) and a highly urban megacity (Dhaka), Bangladesh. The mean concentrations (μg.g^{-1}) of Cr, Mn, Fe, Co, Zn, As, and Sb in the analyzed dust samples were 68±33.2, 386±136, 25648±534, 7±2, 98±63, 3±1, and 1±1, respectively in Khulna city and 67±7, 547±110, 25150±1723, 8.0±0.7, 125±17, 4.0±0.6, and 1.0±0.3, respectively, in Dhaka city, showing uneven distribution in both cities. PMF modelling and multivariate statistical approaches demonstrated that 65.68% anthropogenic and 34.32% geogenic sources for Khulna city, whereas 64.93% mixed (anthropogenic and geogenic) and 35.07% anthropogenic sources

were the main contributors of measured elements in Dhaka city. In both cities, anthropogenic contributions were primarily linked to traffic emissions and industrial activity. Various geo-environmental indicators, including element-specific (I_{geo}, EF, CF), site-specific (Cd, mC_d, PLI, NIPI), and ecological indices (Er^i, RI), were used to assess the contamination characteristics of PTEs and contamination levels in both cities were in the following decreasing order: Sb>Zn>Cr>Fe>As>Mn>Co, whereas individual ecological risks were in the following decreasing order: Sb(34.28) >As(6.28) >Co(1.98) >Cr(1.47) >Zn(1.46) >Mn(0.50) in Khulna, and Sb(18.64) >As(7.56) >Co(2.43) >Zn(1.86) >Cr(1.45) >Mn(0.71) in Dhaka. The study site demonstrated lower potential ecological risks, even though non-carcinogenic and carcinogenic risks from various exposure pathways appeared minimal. Notably, children in both urban cities exhibited heightened vulnerability compared to adults.

1.1.6 Comparison of Environmental Radioactivities in Road-dusts Between a City and a Megacity: Geo-environmental Evaluation, Health Risks and Potential Remediation

R. Khan, K. Naher, M. A. Islam, U. Tamim, I. Khalil, M. S. Islam, Aman Ullah, Md. Shahab Uddin

This pioneering study represents a comprehensive comparative analysis of naturally occurring radioactive materials (NORMs: ^{226}Ra ($\approx^{238}$U), ^{232}Th, ^{40}K) on the roadside dust samples collected from a coastal city (Khulna) and a highly urban megacity (Dhaka), Bangladesh. The corresponding radioactivity was calculated based on Instrumental Neutron Activation Analysis (INAA) of elemental abundances (U, Th, and K). $Average_{n=30}$ radioactivity levels of ^{226}Ra ($\approx^{238}$U), ^{232}Th, and ^{40}K in the road-dust of Khulna city were 46.82 ± 24, 74.79 ± 25, and 541.14 ± 160.8, whereas, in Dhaka city, they were 84.4 ± 13, 126 ± 11, and 549 ± 48 ($Bq.kg^{-1}$), respectively. Khulna city had 1.3, 2.5, and 1.4 times greater ^{226}Ra ($\approx^{238}$U), ^{232}Th, and ^{40}K radioactivity than the global average values, respectively. For Dhaka city, the following values were 2.42, 4.2, and 1.4 times elevated. The levels of radioactivity in Dhaka city are significantly higher than those in Khulna city; however, both cities have exceeded the world average values. The mechanisms for the enrichment and dispersion of NORMs from their fundamental source (surface soil) were studied considering the waterlogging, relative solubility-controlled leaching and translocation, climate conditions, and aerodynamic fractionations (dry and wet air deposition). The computation of standard radiological indices indicates risks to human health. Again, respiratory harm can be inflicted by α-particles originating from the radioactive decay products of ^{232}Th and ^{238}U. In addition to public awareness, policymakers should priorities limiting the evolution of dust particles to mitigate the associated health risks.

1.2 Neutron Radiography

1.2.1 Development of Inspection of Thermal Neutron Shielding Material to be used in the Collimator for TBP at BTRR

Sudipta Saha and S. Islam

Bangladesh atomic energy commission is operating the maiden research reactor (BAEC TRIGA Research Reactor, BTRR) for research and development. Neutron radiography (NR) facility has been operated at the tangential beam port (TBP) to utilize the maximum thermal neutron content of the available beam. The collimator is a critical component of the system, defining the beam geometry and directing it toward the sample and detector to complete the imaging process. To meet the requirements of digital neutron imaging, the collimator needed a redesign to improve the L/D ratio. Additionally, prolonged operation had caused rusting in the metal parts, necessitating replacement. Since the beam port exhibited very high thermal neutron flux, it was essential to control the flux according to the desired L/D ratio. To achieve this, shielding materials were studied using different combinations of high-density polyethylene (HDPE), paraffin wax, boric acid powder, and boron carbide powder. Furthermore, borated polyethylene was synthesized by mixing ethylene glycol with 0.25 wt.% boric acid powder during heating, followed by blending with a melted mixture of paraffin wax and HDPE. The samples were divided into small blocks, dried, and machined for further analysis. Fourier-transform infrared (FT-IR) spectroscopy and thermal neutron radiographic testing were conducted to verify newly formed chemical bonds and thermal neutron attenuation capabilities. Based on these results, different sections of the collimator were planned to be filled with varying material combinations, as thermal neutron and gamma-ray intensities vary across the TBP. It was crucially important to ensure minimal gamma-ray presence at the facility to maintaining maximum safety for radiation workers and sensitive electronics.

1.3 Neutron Scattering

1.3.1 Influence of Cr Substitution on Magnetic, and Spectroscopic Properties of Mg-Ni-La Nano Ferrites

M. S. Islam, M. S. Aktar, S. Hossain, J. Maudood, A. Hye and F. Ahmed

Chromium-dope magnesium-nickel-lanthanum nano ferrites $Mg_{0.5}Ni_{0.5}La_{0.05}Cr_xFe_{1.95-x}O_4$ with composition x = 0, 0.05, 0.1, and 0.15 have been synthesized by sol-gel auto-combustion method and all samples were annealed at 600°C for 8 hours. The magnetic, and spectroscopic properties of the products were characterized by Vibrating Sample Magnetometry (VSM), and Fourier Transform Infrared Spectroscopy (FTIR). The substitution of chromium in Mg-Ni-La spinel ferrites results in a decrease in the saturation magnetization from 23.219emu/gr to 18.723emu/gr. The FTIR spectra confirm the presence of a single-phase cubic spinel structure for all synthesized samples. FTIR reveals two significant absorption peaks which appear between 530–550 cm^{-1} and 360–380 cm^{-1}. So the substitution of chromium in $Mg_{0.5}Ni_{0.5}La_{0.05}Cr_xFe_{1.95-x}O_4$ nano ferrites enhances the magnetic and spectroscopic of the nano ferrites.

2. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Mohammad Amirul Islam	National Conference on Physics-2025	Bangladesh Physical Society	6-7 February 2025	Rajshahi University

3. Collaboration work/MoU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/in-house project/ Universities, etc.):

RNPD has collaboration with

- Sunway University, Malaysia
- Indian Institute of Technology, Kharagpur, India
- Prince of Songkla University, Thailand
- Suez Canal University, Egypt
- University of Brunei Darussalam, Brunei Darussalam
- University of St. Andrews, UK
- Kyungpook National University, South Korea
- Nakhon Pathom Rajabhat University, Thailand
- University of Dhaka, Bangladesh
- Military Institute of Science and Technology, Bangladesh
- Atomic Energy Centre, Dhaka (AECD)
- NAA group of RNPD actively participate in “Research Reactor Utilization/NAA” FNCA Project

INSTITUTE OF ELECTRONICS (IE), AERE

General Electronics Division, IE

Objective

This division deals with the design, development, and fabrication of electronic and nuclear instruments which are mainly used for testing and measuring purposes. Several Nuclear Instruments have been designed in the General Electronics Division. These are Portable Radiation Dose Rate Meter (MDGE), Hand and Foot Radiation Monitor (HFRM), and Scintillation Survey Meter (SSM). These Instruments have been supplied to different Institutes and Industries across the country.

1. R&D Work(s)

1.1 Microcontroller based Portable Radiation Dose Rate Meter (DRMIE)

Microcontroller-based Radiation Dose Rate Meter (DRMIE) has been designed and developed with LCD display and working satisfactorily. One of the new designed DRMIEis working satisfactorily at Abul Khair steel Melting Ltd. The improvement work of this meter is going on.

1.2 Design and Development of a Microcontroller-Based Area Radiation Monitoring System (ARM)

Area Radiation Monitors are used in nuclear installations to ensure the radiation safety of the personnel. Design and Development of microcontroller-based digital ARM has been completed in cooperation with the Nuclear Electronics Division. After fabrication one ARM has been supplied to BINA, Mymensingh and GSD, IFRB, AERE. A new design has been developed and it's Working Satisfactorily.

1.3 Machine Learning and Deep Learning in Antimicrobial and Antibiotic Resistance Prediction

This work highlights the growing role of artificial intelligence (AI), especially machine learning (ML) and deep learning (DL), in predicting antimicrobial resistance (AMR) and antibiotic resistance (AR). These methods utilize large-scale genomic, proteomic, and clinical data to improve prediction accuracy and reduce development time and cost. The review covers key ML/DL techniques—including supervised learning, ensemble models, and neural networks—while addressing challenges like data preprocessing, feature selection, interpretability, data scarcity, biases, and lack of standardized metrics. It also discusses future directions, such as multi-omics integration and federated learning, underscoring the need for interdisciplinary collaboration to develop reliable and scalable AMR prediction systems.

1.4 A Review of Machine Learning and Deep Learning Algorithms for Parkinson's Disease Detection using Handwriting and Voice Datasets

This study explores the development and implementation of rip current detection technologies and their critical role in enhancing beach safety. Rip currents are a leading cause of drowning incidents in coastal regions, necessitating accurate and timely detection systems. The research analyzes various detection approaches, including remote sensing, video surveillance with machine learning algorithms, in-situ sensor networks, and UAV-based monitoring. Emphasis is placed on the effectiveness, real-time capabilities, and integration of these technologies into coastal warning systems. The study further evaluates their impact on reducing fatalities, informing lifeguard operations, and improving public awareness. Findings highlight the importance of technological innovation in mitigating rip current hazards and promoting safer recreational coastal environments.

1.5 Ocean Thermal Energy Conversion (OTEC) Systems for Sustainable Development and Climate Change Mitigation of Bangladesh

This research investigates the potential of Ocean Thermal Energy Conversion (OTEC) systems as a sustainable energy solution for Bangladesh, a country highly vulnerable to climate change and energy insecurity. By harnessing the temperature differential between deep cold and surface warm ocean waters, OTEC offers a continuous, renewable source of electricity, particularly suited for the coastal and island regions of the country. The study evaluates the techno-economic feasibility, geographic suitability within the Bay of Bengal, and potential environmental impacts of large-scale OTEC deployment. It also explores integration with desalination and hydrogen production to enhance utility and scalability. The findings contribute to strategic energy planning, supporting national efforts toward achieving Sustainable Development Goal 7 (SDG-7) and long-term climate resilience.

2. Repair and Maintenance Work

The following instruments were repaired by this time:

Sl. no.	Name of equipment		Beneficiary	Quantity	Income of IE
1.	Repair of Portable Dose Rate Meter	LUDLUM-3000	INMAS, Dinajpur	01	33875/-
2.	Radiation Survey Meter, Radiation Alert Ranger	Serial-309297	INMAS, Chattogram	01	5000/-
3.	Hand Foot & Cloth Contamination Monitor	MHFCIE-11 Serial-071601	HPRWMU, INST, AERE	01	-

Sl. no.	Name of equipment		Beneficiary	Quantity	Income of IE
4.	Portable Dose Rate Meter	LUDLUM-3000/3014	INMAS, Kushtia	01	33875/-
5.	Portable Dose Rate Meter	Radiation Alert Digilert -200 Serial-61316	LGED, Agargaon Sher-e-banglanagar, Dhaka	01	33875/-

3. Lecture Delivered

Sl. no.	Title of program	Date	Place	Number of participants
1.	Industrial Attachment Training Program for the students of different Polytechnic Institute of Bangladesh.	01 July, 2024 to 25 September, 2024	Institute of Electronics	30
2.	Industrial Attachment Training Program for the students of Nuclear Engineering Department of Dhaka University.	09-20 February 2025	Institute of Electronics	02

4. Project Work (ADP/FNCA/RCA/TC/CRP/S&T etc):

Project Type: R&D

R&D- 2430308

Title of the Project: "Supportive Healthcare System: Machine Learning And IoMT-Enabled Digital Development For Multimodal ADL (Activities of Daily Living) Data Analytics".

Principal Investigator: Md. Ziaul Hasan Majumder, SO, GED

Project Tenure: June 2024 to July 2025.

5. Other Activities

5.1 Production Works

The following Instruments were produced by this time:

Portable Dose Rate Meter, Model: DRMIE-11, Serial No: 012401, User: Institute of Electronics, AERE, Savar, Dhaka

5.2 Electronics Calibration of Instruments

The following instrument was Electronics Calibrated by this time

Sl. no.	Name of equipment	Model and serial no.	Beneficiary	Quantity
1.	Portable Dose Rate Meter	Radiation Alert Digilert -200 Serial-61316	LGED, Agargaon Sher-e-banglanagar, Dhaka	01

5.3 Circuit Board Test

The following circuit board has been tested by this time :

Sl. no.	Name of equipment	Beneficiary	Date of receive	Quantity	Action taken	Delivery date
1.	AC Change Over System	RICD, IE		01	Circuit test done for 6 hours	
2.	AC Change Over System	RICD, IE	27.01.25	01	Circuit test done for 6 hours	04.02.25

3.	AC Change Over System	RICD, IE	03.02.25	01	Circuit test done for 6 hours	07.02.25
4.	AC Change Over System	RICD, IE	26.02.25	01	Circuit test done for 6 hours	03.03.25

5.4. Box Design

Box Design of Designed instruments has been done by this time are following:

Sl. no.	Name of equipment	Beneficiary	Quantity	Action taken
1.	Sensor light System Box	NED, IE	01	Sensor light Box has been designed
2.	Mini UPS Box	GED, IE	01	Box design is going on
3.	Portable Dose Rate Meter Box Design	GED, IE	01	Box design is going on

Nuclear Electronics Division, IE

Objectives

This division deals with the design, development and fabrication of electronic and nuclear instruments which are mainly used for test and measuring purposes. A number of Nuclear Instruments have been designed in the Nuclear Electronics Division. These Instruments have been supplied to different Institutes and Industries of the country. This Division is engaged with the R&D works on different projects in order to meet the demands of different facilities of BAEC. This division also involve to make better environment for academic programs.

1. R & D work(s)

1.1 Design, Development and Fabrication of the Area Radiation Monitor (ARM):

Area Radiation Monitors are used in nuclear installations to ensure radiation safety of the personnel. Design and Development of microcontroller based digital ARM has been completed in cooperation with General Electronics Division. Development work for inclusion of more channels is going on.

1.2 Design, Development of a Gamma Source control Console (GSC)

Gamma Source control Console (GSC) is a customized controller for 90kCi Co-60 Gamma irradiator for its research and industrial application. The failure of BRIT supplied control console it stopped Research and industrial application related to the Irradiator. An emergency system has been setup to continue the Research and industrial application. A step has been taken to develop a control console that will control and displays Irradiation time of the Co-60 source along with Compressor ON time. Development work is going on.

1.3 Design and Development of Ultrasonic Humidity Controller

It is a customized instrument for Insect Biotechnology Division of IFRB which is control the humidity of laboratory. Ultrasonic Humidity Controller has been designed and supplied to IBD, IFRB. The development work of Humidity Controller is going on.

1.4 Design and Development of Microcontroller-based Switchover Relay

Changeover relay system is an important part of sophisticated system where a system should run only a few hours and switching to another system which serves the same purpose is very crucial. In many industries, Laboratories certain environment like temperature, humidity is desired and to attain such environment cooler or heater or humidifier is required but such system should not run for a long time as it adversely affects its longevity. Scientist and Engineers of this division has completed the design of microcontroller-based changeover system which will automatically switches to another system after a predefined time.

1.5 Design and Development of High Voltage Power Supply System for Radiation Detection and Monitoring System

High voltage power supply (HVPS) is an elementary part in radiation detection and monitoring system and its importance has increased after entering into the era of Nuclear Power. A HVPS has been designed to power up NaI based scintillation detector and the system can be used to drive GM tube or Si based radiation detector after little adjustment that gives it scalability in the field of radiation detection.

1.6 Design and Development of an IoT-based Smart System to Monitor, Control and Record of Laboratory Environment

This work represents a microcontroller-based automated system employed to monitor and control the laboratory environment from the cloud. A standard LDR (Light Dependent Resistor) based light sensor was developed and a DHT (Digital Humidity and Temperature) sensor was used to acquire surrounding humidity, temperature and light intensity data. Those data were displayed on a Liquid Crystal Display (LCD) and can be accessed from the cloud

1.7 Design and Development of a PIC based Digital Dosimeter

Gamma events and dose rate calculation are very crucial in our everyday life to secure us from radiation and radioactive elements. In this design, a digital dosimeter is developed for assessing dose rate, which is highly cost-effective. To detect the gamma events a highly sensitive Geiger Muller (GM Tube) is used which is activated by a high voltage source. The measured dose rate is displayed on a liquid crystal display (LCD) and warned through a buzzer attached to the system. The system is calibrated at SSDL in BAEC and confirmed to give a standard deviation of 0.27, a calibration factor of 1.01 for a 2 mCi source at a one-meter distance. Currently the system is being modified to make it more user friendly.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of program	Date	Place	Number of participants
1.	International Network on Innovation to Support Operating Nuclear Power Plants Workshop on Robotic and Drone Applications at Operating Nuclear Power Plants	10-12 June 2025	Leibstadt, Switzerland	01

2.2 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of program	Date	Place	Number of participants
1.	Industrial Attachment Training Program for the students of different Polytechnic Institute of Bangladesh.	01 July, 2024 to 25 September, 2024	Institute of Electronics	30
2.	Industrial Attachment Training Program for the students of Nuclear Engineering Department of Dhaka University.	09-20 February 2025	Institute of Electronics	02

3. Service Rendered

Printing 3D Model		
Sl. no.	Number/quantity of sample/patient/services	Revenue income
1.	Prototype of two (2) LN2 Dispensing system of converter pipe (dimension 1.3 mm dia., 76mm height cylindrical type with hole and 1.9mm dia.,1.5mm height hexagonal type with hole) by using 3-D Printer and delivered to SSDL, HPREMU, AERE, Savar, Dhaka on 16/07/2024.	--
PCB fabrication using Protomat S64:		
1.	Six (06) Portable Dose Rate Meter with power supply (150 X 90 mm) fabricated and delivered to GED,IE,AERE, Savar, Dhaka during this period.	--
2.	Six (06) AC Change over system (110 X 70 mm) fabricated and delivered to RICD, IE, AERE, Savar, Dhaka during this period.	--
Nitrogen Gas Cylinder supply		
1.	4 umber of Nitrogen Gas Cylinder supplied to VDRAD, IFRB, AERE.	--

4. Repair and Maintenance Work

Repair of One Ultrasonic Humidity Controller, Model No. UHCIE-II, Serial No.061701, of IBD, IFRB, AERE, Savar, Dhaka Dated: 11/03/2025.

Repair and Maintenance Division, IE

Objective

The division has been providing services through repair, maintenance and installation of scientific, nuclear, non-nuclear and medical instruments of different institutions of Bangladesh Atomic Energy Commission (BAEC) and outside of this organization. In addition, with design, development, fabrication and refurbishment activities, experts of this division are also taking part in the new instrument installation in BAEC.

1. Activities

1.1 Repair & Maintenance, Renovation Works, etc.

Sl. no.	Name & description of the instruments	Intender
1.	Digital Electronics Balance, Model: GR-120, Serial No: 14221115, Country of Origin: Japan, Approximate Price of the Instrument: 1,20,000/- (One Lac Twenty Thousand Taka Only)	NRCD, INST
2.	Canon Laser Printer, Model: LPB6030, Serial No: NNCA184494, Manufacturer: Canon. Tokyo, Japan, Country of Origin: Vietnam, Approximate Price of the Instrument: 15,000/- (Fifteen Thousand Taka Only)	Administration , INST.
3.	HP Laser Printer, Model: Laser Jet ProM102a, Serial No: VMC4L33667, Manufacturer: HP Shanghai, China, Country of Origin: Vietnam, Approximate Price of the Instrument: 15,000/- (Fifteen Thousand Taka Only)	SIU, AERE
4.	Canon Laser Printer, Model: Image Class MF3010, Serial No: JWQ86353, Manufacturer: 30-2, Shimomaruka, Tokyo, Japan, Country of Origin: Korea, Approximate Price of the Instrument: 30,000/- (Thirty Thousand Taka Only)	IHD, INST
5.	Canon Laser Printer, Model: Image Class LPB6030, Serial No: NBHA 150171, Manufacturer: 30-2, Shimomaruka, Tokyo, Japan, Country of Origin: Vietnam, Approximate Price of the Instrument: 20,000/- (Twenty Thousand Taka Only)	IHD, INST.
6.	HP Laser Printer, Model: HP Laser Jet Pro M15a, Serial No VNC3X02298, Manufacturer: HP Inc, Shanghai, China, Country of Origin: Vietnam, Approximate Price of the Instrument: 15,000/- (Fifteen Thousand Taka Only)	MED, CEF.

Sl. no.	Name & description of the instruments	Intender
7.	Samsung Laser Printer: Serial No: Z5R6BAGC200084Z, Model: ML3310 ND, Manufacturer: Samsung, Country of Origin: China, Approximate Price of the Instrument: 30,000/- (Thirty Thousand Taka Only)	SF&RD, IE, AERE
8.	Canon Laser Printer, Model: Canon LPB 6030, Serial No: NJXA279319, Manufacturer: Canon30-2, Shimomaruka, Tokyo, Japan, Country of Origin: Vietnam, Approximate Price of the Instrument: 20,000/- (Twenty thousand Taka Only)	CAD, AERE
9.	Power Amplifier, Model: NANTA3000A, Serial No: 807550, Manufacturer: Karak Electronic Co. Ltd, Country of Origin: Korea, Approximate Price of the Instrument: 85,000/- (Eighty-Five Thousand Taka Only)	Administration , INST.
10.	HP Laser Printer, Model No: HP Laser Jet Pro102a, Serial No: VNC4L36898, Manufacturer: HP, Boeblinger, Germany, Country of Origin: Vietnam, Approximate Price of the Instrument: 18,000/- (Eighteen Thousand Taka Only)	Administration , CAD.
11.	Computer Monitor: Serial No: CN-QGC2RW-BOZ-LLM-692E-A08, Model No: D1981HO, Manufacturer: Dell, Country of Origin: China, Approximate Price of the Instrument: 15,000/- (Fifteen Thousand Taka Only)	CED, CEF, AERE.

2. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participants	Title of the event	Organizer	Date	Place
Subrata Saha	27th International Conference on Computer and Information Technology (ICCIT 2024)	IEEE Bangladesh Section	20-22 December 2024	Cox's Bazar, Bangladesh
Subrata Saha	International Conference on Power, Electrical, Electronics and Industrial Applications (PEEIACON 2024),	IEEE Bangladesh Section	12-13 Sep. 2024	RUET, Rajshahi, Bangladesh

Robotics Instrumentation and Control Division, IE

Objective

This division is involved for designing and developing various types of control systems that facilitate the customized use of scientific instruments in BAEC laboratories and other organizations. Besides, this division helped to design, simulate, prototyping, interfacing, and real-time control of robotic systems applicable to various laboratories and nuclear installations. Moreover, research using meta-materials, optical materials, and energy materials and devices is also currently performed in this division.

1. R&D Work(s)

1.1 Exploring the Optoelectronic and Photovoltaic Characteristics of Lead-Free Cs_2TiBr_6 Double Perovskite Solar Cells: A DFT and SCAPS-1D Investigations

M.K. Hossain, S. Islam, M.N. Sakib, M.S. Uddin, G.F.I. Toki, M.H.K. Rubel, J. Nasrin, S.H. Shahatha, M.R. Mohammad, A.A. Alothman, C.J. Raorane, R. Haldhar and H. Bencherif.

In recent times, the remarkable advancements achieved in the field of perovskite solar cells (PSCs) have sparked significant research efforts aimed at enhancing their overall performance because of their exceptional optoelectronic properties. Due to the toxicity of lead (Pb), the emergence of Ti-based (Cs_2TiBr_6) double-halide PSCs is regarded as a good alternative to Pb-based PSCs. Here, density functional theory (DFT) calculations are performed to examine the prospect of Cs_2TiBr_6 perovskite as a layer of absorber for photovoltaic cells (SCs). These computations looked at the material's structural, optical, and electrical characteristics. The density of states (DOS) results demonstrate strong conductivity, principally provided by the 4p states of Br, whilst Ti-3d and Cs-5p orbital electrons offer insignificant contributions. The electronic

band structure discloses a direct band gap of 1.534 eV. The covalent connections that exist between Ti and Br atoms and the robust electronic charge density around the Ti atom both demonstrate a significant buildup of electronic charge along the 100 planes. The dielectric function and the coefficient of absorption have significance irrespective of lower energies because it is extremely valuable for solar energy applications. The UV absorption peaks of Cs_2TiBr_6 have a maximum of ≈15.51 eV and are magnified with photon energy up to 2.46 eV, indicating that it may have potential for solar applications. This work also investigated a good combination of the hole transport layer (HTL) and electron transport layer (ETL) with the Cs_2TiBr_6 absorber layer. AZnO, Nb_2O_5, LBSO, and Zn_2SnO_4 are executed as the ETLs, and MoO_3, $CuAlO_2$, MEH-PPV, ZnTe, CNTS, GaAs, MoS_2, PTAA, Cu_2Te, Zn_3P_2 are considered as the HTLs to identify the best HTL/Cs_2TiBr_6/ETL combinations using the SCAPS-1D numerical simulation. Among all configurations, ITO/LBSO/Cs_2TiBr_6/CNTS/Au is examined as the best-optimized structure of Ti-based PSC, with J_{SC} of 26.63 mA cm^{-2}, a V_{OC} of 1.123 V, *FF* of 82.94%, and a power conversion efficiency of 24.82%. To validate the findings, PV parameters like the effect of generation rate, recombination rate, J−V, and Q-E characteristics are evaluated. The effect of series and shunt resistance and structure working temperature are explored to observe the effect of these on PSC devices. The accomplished outcomes suggest that Cs_2TiBr_6 can be viewed as an optimistic material for PSCs for its higher stability and environment-friendly characteristics.

1.2 Gamma-Irradiation-Induced Modifications in the Structural and Optical Properties of Makroblend-UT3907 Films

S.J. Alsufyani, T.S. Soliman, M.K. Hossain, M.F. Zaki and T.I. Al-Naggar

The current study aims to obtain information about how gamma-ray exposure affects Makroblend-UT3907 film properties. Makroblend-UT3907 film irradiated with a Co-60 source with doses of 0, 60, 90, 180, and 300 kGy. Gamma-ray exposure alters the structure of the polymer film; this is investigated using X-ray diffraction, Fourier transform infrared, and Raman spectroscopies. The absorbance spectra of the irradiated samples showed a shift toward the high wavelength values in the absorption edge when compared to the unirradiated sample. This indicates a decrease in the energy gap and also enhances the optical parameters and refractive index of the irradiated samples. The direct and indirect band gaps of the unirradiated film are about 3.53 eV and 3.23 eV, which decreases to 3.45 eV and 3.12 eV after being exposed to 300 kGy, respectively. The band-tail width of the new states created by irradiation is increased from 0.14 eV to about 0.20 eV at 300 kGy. Refractive index and optical basicity increased from 2.3353 to 2.3582 and 1.373 to 1.377, respectively, following exposure to 300 kGy. The metallization criterion and electronegativity dropped from 0.420 to 0.415 and 0.949 to 0.927, respectively, indicating significant alterations in optical properties suitable for specialized applications. These results emphasize the possibility of irradiation films for using in potential optical applications, such as integrated optoelectronic applications in fields like optical waveguide production and antireflection coating. The photoluminescence (PL) studies show the hypochromic effect of the PL intensity alters the absorption spectra of the irradiated polymers and their molecules. The results obtained confirmed the possibility of gamma irradiation's impact on modifying the Makroblend-UT3907 film for enhanced performance in radiation-intense environments such as space exploration and medical imaging industries, showcasing the study's contribution to the advancement of materials science in high-stakes industrial applications.

1.3 Envisaging the Energy and Quantum Capacitance in Modified Silicene: A DFT Studies

Y.S. Itas, M.M. Nono, M.K. Hossain, I.F. Alshdoukhi, A.M. Alsuhaibani, M.S. Refat, A. El-Rayyes, M.R. Alrahili, S.H. Shahatha, M.R. Mohammad and R. Haldhar

The present work investigated the quantum capacitance in modified silicene with monovacant as well as divacant defects using density functional theory approach. Similarly non-toxic transition metals (Co, Cu, Ni and Zn) embedded monovalent silicene (MVS) was explored in a quest of high quantum capacitance. Results revealed achievable under coordinated functionalization due to significant binding at the surface of Si. A more stable configuration of silicene was obtained when four B atoms were used on divalent silicene (DVS) which lead to binding energy value of −1.98 eV. Additionally, all the TM- embedded silicene demonstrated metallic properties which closed the band gap of MVS from 0.6 eV to 0 eV. Substituting with B atoms to the MVS transformed MVS to N-type semiconductor resulting in a band gap of 0.38 eV. Significant increase in quantum capacitance (C_Q) values was observed following modifying the MVS with 3B atoms which resulted in C_Q value of 557 μF/cm^2. With respect to the Co, Cu, Ni and Zn embedded systems, high values of 117.3,

133, 134 and 192 μF/cm^2 were obtained, which prompted them to serve as better cathode for asymmetric super capacitors. This research recommends the use of non-toxic transition metals embedded super capacitors to reduce ionizing radiations threats to global community.

1.4 Enhancing Electromagnetic Interference Mitigation: A Comprehensive Study on the Synthesis and Shielding Capabilities of Polypyrrole/Cobalt Ferrite Nanocomposites

M.A. Darwish, M.M. Salem, A. V Trukhanov, W. Abd-Elaziem, A. Hamada, D. Zhou, A.S. Abd El-Hameed, M.K. Hossain and E.H. El-Ghazzawy

In a society increasingly infiltrated by digital and networking technologies, designing electromagnetic interference (EMI) shielding materials is critical for safeguarding sensitive electronic equipment and ensuring the smooth functioning of essential communication networks. This study focuses on the optimization of the properties of cobalt ferrite ($CoFe_2O_4$)/polypyrrole (PPy) nanocomposites made by in-situ polymerization used for electromagnetic (EM) shielding based on their magnetic and dielectric losses. X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), transmission electron microscopy (TEM), vibrating sample magnetometer (VSM), and vector network analyzer (VNA) were employed to study the materials' physical and chemical characteristics. The findings demonstrate that the magnetic and electric properties of the materials composed of $CoFe_2O_4$ and PPy are substantially altered by the integration of $CoFe_2O_4$ and PPy. Adding PPy to $CoFe_2O_4$ reduces the real and imaginary parts of magnetic permeability, and the conductivity, dielectric constant, and dielectric loss are increased. These effects are advantageous for EM shielding applications. The high electromagnetic shielding performance mainly results from the enhanced interfacial polarization induced by interface region among $CoFe_2O_4$ and PPy molecules. The influence of the PPy matrix in altering the dielectric and magnetic loss factors ($tan\delta_E$ and $tan\delta_M$) of the embedded ferrite particles is pronounced. Although $CoFe_2O_4$ shows excellent attenuation characteristics, it cannot optimally match impedance with free space, particularly at higher frequencies. In addition, material thickness and shielding efficiency adjust the reflection loss (*RL*) performance. The prepared composites can attenuate more than 95 % of the incident electromagnetic waves. This study emphasizes the benefits of employing composite materials in EMI shielding designs and the combined advantages of conductive and magnetic materials.

1.5 Advancements in Hazardous Gases Detection: Using Dual Structures of Photonic Crystal Fiber-Based Sensor

P. Pandey, S. Yadav, A.C. Mishra, D.K. Dwivedi, P. Lohia, R.K. Yadav, U. Kulshrestha, V. Kumar, P. Paramasivam, R. Bousbih and M.K. Hossain

This paper presents a comparative analysis of two distinct nonlinear elliptical hollow-core photonic crystal fiber (PCF) based sensors designed for the detection of three gaseous analytes, namely CCl_4 (n = 1.461), $SnCl_4$ (n = 1.5086) and $C_{10}H_{16}$ (n = 1.472). A comprehensive examination is conducted across a wide wavelength range (1.2 μm–2.6 μm). In order to enhance both the fabrication tolerance and sensing performance of the proposed sensors, investigations have been conducted on the diameter of circular and elliptical-shaped air holes, as well as the dimensions of struts and the core size. Silica works as background material for both the sensors. The sensing parameters including relative sensitivity, effective area, birefringence, and dispersion, have been obtained for two different sensors proposed for evaluation. The numerical investigation employs the finite element method based on Comsol Multiphysics. When comparing both sensors, sensor design-2 stands out with an impressive nonlinear coefficient value of 15.470 $W^{-1}Km^{-1}$, a higher relative sensitivity of 98.386 %, enhanced effective area of 1.134×10^{-11} m^2, comparable effective refractive index of 1.496 and significant birefringence -4.701×10^{-5}, along with low confinement loss for $SnCl_4$ followed by CCl_4 and $C_{10}H_{16}$ at 1.2 μm operating wavelength, owing to its higher refractive index compared to sensor design-1 for same sensing analyte. The designed model holds potential applications in sensing, bio-sensing research, and related fields.

2. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income
1.	Production of an "AC Change Over Switch" device for IFRB was completed on 31/03/2024 and delivered on 16/04/2024.	1	

3. Repair & Maintenance, Renovation works etc.

Repair an AC change-over system, An AC change-over system (Model Number: ACC SO2, Serial Number: 102102) of SSDL of INST was damaged and sent to RICD of IE on 29/7/2024. The full board and connectors of the device were changed and delivered on 10/9/2024.

Very large Scale Integration (VLSI) Technology Division, IE

Objective

This annual report aims to provide a comprehensive overview of the activities, achievements, and developments carried out by the VLSI Division of the Institute of Electronics at the Bangladesh Atomic Energy Commission during the fiscal year 2024–2025. It seeks to highlight the institute's contributions to research, development, and innovation in electronics and nuclear instrumentation, document progress on ongoing projects, and outline strategic initiatives for future growth. The report also promotes transparency, accountability, and clear communication with stakeholders, policymakers, and the broader scientific community.

1. R&D Work(s)

1.1 Study the Effect of Gamma Radiation on Mg-doped ZnO thin Films

Md. Nasrul Hoque Mia, AbdulAl Mortuza, Dr. Md. Firoz Pervez

Magnesium-doped zinc oxide (Mg:ZnO) is emerging as a promising radiation-hard material for next-generation high-energy physics detectors and spaceborne electronics. By doping Mg with ZnO , the bandgap can be engineered beyond 3.4 eV, suppressing radiation-induced carrier traps and improving device stability under extreme gamma and proton fluxes. In this project, we focus on the controlled growth of single-crystal Mg:ZnO thin films over a range of Mg concentrations (0–20 at%) and on multiple technologically relevant substrates. We employed spin coting sol-gel methods and improving the film crystallinity, surface morphology, and dopant incorporation. Deposition parameters—substrate temperature, oxygen partial pressure, and post-annealing profiles—are systematically varied to minimize MgO secondary-phase formation while achieving uniform Mg distribution. Film thicknesses are held at 100–300 nm to balance defect healing and strain management.

Early trials have demonstrated reproducible Mg incorporation up to 15 at% without secondary-phase precipitation. Subsequent irradiation studies and in-depth defect analysis will define the optimal doping window for maximum radiation resilience, guiding the design of robust ZnO-based devices for operation in the harshest environments. This work is currently in progress. Once high-quality single-crystal Mg:ZnO films are obtained, we will expose them to graded doses of Co-60 gamma radiation (10–100 kGy) in an inert environment

1.2 Study the Influence of Gamma Radiation on MoO3 thin Films

Abdul Al Mortuza, Dr. Md. Firoz Pervez, Md. Nasrul Haque Mia

Optoelectronic and photonic devices often face performance challenges in harsh environments, such as those encountered in space missions or nuclear radiation zones. Exposure to high-energy radiation can significantly impact the physical properties of these devices. Therefore, investigating the effects of gamma (γ) radiation on semiconductor thin films relevant to such applications is crucial for maintaining optimal device performance.

In this effort, we are synthesizing high-quality h-MoO_3 thin films on glass substrates via doctor-blade and spin coting sol-gel methods. The high-energy γ-radiation doses (50 kGy, 150 kGy, and 250 kGy) influence the characteristics of hexagonal molybdenum trioxide (h-MoO_3) thin films. Results revealed improved crystallinity in the irradiated films, likely due to a reduction in structural defects and lattice disorder. Remarkably, the hexagonal phase of the unirradiated (pristine) films remained unchanged even after exposure to high radiation doses. Field Emission Scanning Electron Microscopy (FESEM) showed that the surface morphology of the films experienced no noticeable alterations after irradiation. A slight decrease in the optical band gap from 2.92 eV to 2.84 eV with increasing γ-radiation exposure. Overall, gamma irradiation enhanced the crystalline quality and slightly narrowed the optical band gap, without altering the original hexagonal phase of the nanocrystalline h-MoO_3 thin films.

1.3 Studying the Effect of High Magnetic Field on BiFeO3 Single Crystal thin Films

Dr. Md. Firoz Pervez, Abdul-Al Mortuza, Md. Nasrul Hoque Mia

Multifunctional $BiFeO_3$ (BFO) thin films harness the material's intrinsic spin cycloid—a long-wavelength antiferromagnetic modulation (~62 nm period)—to unlock novel spintronic, quantum-electronic, and photovoltaic functionalities. By leveraging the Dzyaloshinskii–Moriya interaction that stabilizes the cycloid, these films can generate and manipulate spin currents without external magnetic fields, support coherent magnon modes for quantum logic, and exhibit enhanced bulk photovoltaic effects through spin-polarized carrier separation.

We deposit epitaxial 100–200 nm-thick BFO films heterostructures on (001) $SrTiO_3$, MgO, and Si substrates via spin-coating sol-gel method. Thin film characteristics for different Key parameters for deposition methods including substrate temperature (25–200 °C), oxygen partial pressure (50–150 mTorr), and post-annealing (600 °C, 1 hr O_2), are being systematically observed.

Solar Cell Fabrication and Research Division, IE

Objective

The main objectives of these divisions are:

- To develop a good research team to conduct research in the field of renewable energy.
- To adopt the solar cell fabrication technology.
- To train and develop skilled manpower in the field of renewable energy.
- To fabricate high efficiency single crystalline silicon solar cell.
- To provide environment for conduction research in the field of solar cell fabrication technology.
- To test solar cell that are imported, as a standard testing laboratory for solar cell and solar panel.
- To provide research facilities to the university's student on renewable energy.
- To initiate research collaboration with home and foreign universities.
- To help the government to achieve the millennium Development goal in the field of renewable energy

Activities

Solar Cell Fabrication and Research Division, IE, AERE, BAEC, two different forms of solar cell-based experiments are offered to upper Bachelor of Science students: hands-on experimental work in the silicon solar cell fabrication and demonstration shows where the students watch experiments conducted by the scientist. Our research focuses primarily on student feedback about their immediate research towards these two projects. Data collection is undertaken using questionnaire research based on the intrinsic motivation inventory. This is subsequently supplemented with a qualitative study examining the influence of students' experimental work in the interactive laboratory on their understanding of selected research concepts. Not to mention a few more things: an attempt is made to make the famous University students of the country interested in research by showing the laboratory work, which plays a significant role in increasing the scope of their knowledge.

1. R&D Works

1.2 Performance Analysis of Locally Available Solar Panels for the Proper Utilization of Solar Energy in Bangladesh

M.A. R. Akand, M. K. Basher, S. M. A. A. Zumahi, M, S. Alam and M. A. S. Haque

Bangladesh has the capacity to generate 26,024 megawatts (MW) of electricity, with solar power contributing only 4.61% despite the country's significant potential for solar energy generation. Local environmental factors such as temperature, humidity, dust accumulation, and air mass can significantly affect the performance of solar panels. Therefore, field evaluations are essential to understanding the actual performance of solar panels under real-world conditions. This study assessed the electrical performance of five 20 W monocrystalline silicon photovoltaic panels (100 W total) at the Institute of Electronics, Atomic Energy Research Establishment, Savar, Dhaka. Key parameters including current and voltage at maximum power, short-circuit

current, open-circuit voltage, maximum power output, module efficiency, and fill factor were thoroughly analyzed. The I-V and P-V curve analysis revealed substantial variations in maximum output current (ranging from 66.5% to 89.8% of Standard Test Conditions [STC]) and voltage (ranging from 64.1% to 83.2% of STC). The fill factor, which reflects cell quality, varied from 0.18 to 0.51, compared to manufacturer expectations of 0.22 to 0.75. Additionally, field conversion efficiencies (10.21% to 16.71%) were lower than the manufacturer's calculated efficiencies (14.98% to 22.68%). These These findings highlight the critical role of field evaluations in accurately predicting solar panel performance under specific environmental conditions. By understanding the actual efficiency under real-world conditions, Bangladesh can optimize its solar energy development strategies and project design to maximize electricity generation from this clean and abundant resource.

1.3 Micropattern-based Black-and-white Photovoltaic Modules for Net-zero Energy Buildings: Aesthetic Advancements in BIPVs

M. K. Basher, S. M. A. A. Zumahi and M. A. R. Akand

Building-integrated photovoltaics, or BIPVs, are becoming more and more popular as a sustainable energy option as a result of the construction industry's substantial contribution to climate change and world energy consumption. Since conventional BIPVs' aesthetic and efficiency limitations prevent their wider acceptance on a bigger scale, this work is crucial to addressing such issues. Architects and developers find existing BIPV solutions less appealing due to their restricted color selections, which are mostly black or blue. Some producers and researchers, however, compromised the photoconversion efficiency (PCE) in order to introduce aesthetically pleasing PV modules. In this project, micropattern-based black-and-white photovoltaic (MBWPV) modules with extremely high PCE and aesthetic adaptability will be designed and developed. Custom micropatterns were designed with python programming and the GNU image manipulation program (GIMP), and they were then printed onto PV modules using a UV flat bar printer. The designed visually appealing PV modules met commercial thin-film PV performance standards with a PCE of 12.88%, or 88.83% of the reference module. The results of this study show that BIPVs can be both aesthetically pleasing and energy-efficient, opening the door for their incorporation into net-zero energy buildings and supporting more general environmental sustainability objectives.

1.4 Strain-Tuned Structural, Optoelectronic, and Dielectric Properties of Cubic $MAPbI_3$ Perovskite Driven by Spin-Orbit Coupling: A First-Principles Study

S. M. A. A. Zumahi, M. K. Basher and M. A. R. Akand

Hybrid organic–inorganic perovskites, particularly methylammonium lead iodide ($MAPbI_3$), have emerged as leading candidates for next-generation optoelectronic devices. In this study, we systematically investigate the effects of mechanical strain on the structural, electronic, and dielectric properties of cubic $MAPbI_3$ using first-principles density functional theory (DFT), incorporating the essential role of spin-orbit coupling (SOC). The application of biaxial strain, ranging from compressive to tensile, significantly alters the crystal symmetry, lattice parameters, and bond angles, which in turn modulate the band structureand dielectric response. Our results reveal that SOC profoundly reduces the bandgap and modifies the energy dispersion near the band edges, which is crucial for understanding charge carrier dynamics. Under moderate strain, the bandgap exhibits non-linear behavior, allowing tunability of optical absorption in the visible range—highly desirable for photovoltaic applications. Moreover, the dielectric constant is enhanced under tensile strain, indicating improved screening effects and potential benefits in charge transport and stability. Phonon dispersion confirms the dynamic stability of strained configurations within a tolerable range. These findings offer critical insights into strain engineering strategies for optimizing the performance of perovskite-based optoelectronic and energy-harvesting devices. The comprehensive interplay between strain, SOC, and material properties establishes a theoretical foundation for future experimental and device-level exploration.

1.5 Strain-Incorporated Structural, Electronic, and Dielectric Properties of Cubic $FAPbCl_3$ Perovskites with Spin-Orbit Coupling: A First-Principles Investigation

S. M. A. A. Zumahi, M. K. Basher and M. A. R. Akand

Formamidinium lead chloride ($FAPbCl_3$) perovskites have gained increasing attention for their thermal stability and potential in optoelectronic applications. In this study, we employ first-principles density functional theory (DFT) to explore how mechanical strain and spin-orbit coupling (SOC) influence the

structural, electronic, and dielectric properties of cubic $FAPbCl_3$. The incorporation of biaxial strain, ranging from compressive to tensile limits, allows precise tuning of lattice parameters and bond geometries, thereby affecting the crystal field and electronic interactions within the material. Our calculations demonstrate that the inclusion of SOC significantly modifies the electronic band structure by reducing the bandgap and altering the dispersion of conduction and valence bands. Strain further modulates the bandgap nonlinearly, offering an effective method to engineer optical absorption properties for device applications. The dielectric response, especially the static dielectric constant, shows noticeable enhancement under tensile strain, suggesting improved polarization behavior and potential benefits in charge separation and transport. Additionally, phonon dispersion analysis confirms the dynamic stability of the strained cubic phase within a feasible strain range. These findings underscore the combined effect of strain and SOC in tailoring the fundamental properties of $FAPbCl_3$, thereby paving the way for strain-engineered design of efficient, lead-halide perovskite-based optoelectronic and energy conversion devices.

1.6 Fabrication and Characterization of Irradiated Titanium Dioxide Buffer Layer-Based Artificial and Natural Dye-Sensitized Solar Cells

S. M. A. A. Zumahi, M. A. R. Akand, M. K. Basher, M, S. Alam and M. A. S. Haque

This study presents the fabrication and detailed characterization of dye-sensitized solar cells (DSSCs) employing a gamma-irradiated titanium dioxide (TiO_2) buffer layer, sensitized with both artificial and natural dyes. The TiO_2 layer, a critical component for electron transport and dye anchoring, was exposed to varying doses of gamma irradiation to modify its surface morphology, crystallinity, and electronic properties. The goal was to enhance dye loading, electron mobility, and overall device efficiency. Natural dyes extracted from locally available plant sources were compared with standard artificial dyes to evaluate sustainability and performance trade-offs. Structural, optical, and morphological analyses of the irradiated TiO_2 films were carried out using XRD, UV-Vis spectroscopy, FTIR, fluorescence, and SEM. The photovoltaic performance of the assembled DSSCs was assessed using current-voltage (J–V) characteristics under standard AM 1.5 solar illumination. Results demonstrate that moderate levels of irradiation improved TiO_2 crystallinity and dye absorption, leading to enhanced photocurrent and power conversion efficiency. Natural dyes, although less efficient than synthetic ones, exhibited promising photo-response and environmental advantages. The study highlights the synergistic role of buffer layer irradiation and dye selection in optimizing DSSC performance. This approach provides a viable pathway toward cost-effective, eco-friendly, and efficient solar energy conversion technologies, with potential for further development through nanostructuring and surface engineering.

1.7 Comprehensive Study on the Artificial Intelligence and Its Applications

M. N. Islam, M. S. Alam and M. A. S. Haque

A comprehensive Study on the Artificial Intelligence and Its Applications has been presented in this research. Artificial intelligence (AI) refers to science-generating devices with functions like reasoning, thinking, learning, and planning. AI is a rapidly growing, promising area of research that is reaching its prime. AI has affected our lives and is increasingly penetrating the human perception and lifestyle of our modern world and future. As a branch of computer science, artificial intelligence (AI) attempts to understand the essence of intelligence and produce new kinds of intelligent machines that can respond in a similar way to human intelligence. Therefore, the broad fields of AI are machine and deep learning, data science, reinforcement learning, data mining, knowledge discovery, knowledge reasoning, speech recognition, natural language processing, language recognition, image recognition, computer vision, planning, robotics, gaming, and so on. A robot with AI provides new opportunities for industries to produce work safer, save valuable time and increase productivity. Economic impact assessment and awareness of the social, legal, and ethical problems of robotics and AI are essential to optimize the advantages of these innovations while minimizing adverse effects. The AI applications in automotive, healthcare, finance, robotics, industry, military, autonomous systems, cyber security, communications, transport, jobs in logistics, retail, agri-food, construction and science, etc. Ethical problems surrounding data privacy, algorithmic bias and the potential for job displacement raise concerns about the societal impact of AI. The privacy concerns, regulatory frameworks and ethical guidelines to protect individuals' rights and mitigate potential harms. Algorithmic bias, stemming from biased training data or flawed algorithms can spread unfairness and discrimination, worsening social inequalities.

2. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. M. A. R. Akand	Efficiency Evaluation of Solar Photovoltaic Module Under Local Environmental Condition in Bangladesh	International Conference on Electronics and Informatics -2024	Bangladesh Electronics and Informatics Society	28-29 December, 2024	AEC, Dhaka
Engr. Md. Nazrul Islam	As a participant	The ACSE Survey on Publication Pressure & Research Integrity.	The Asian Council of Science Editors (ACSE)	13 March 2025.	Online platform

3. Project Work (ADP/FNCA/RCA/TC/CRP/S&T etc)

Project Type: SNT

Project ID: SRG - 242256

Project Name: Performance evaluation of available solar panels under the varying weather conditions of Bangladesh for proper utilization of solar energy.

Principal Investigator: Dr. Md. Abdur Rafiq Akand, PSO, SFRD

Associate Investigator: Abdul Al Mortuza, SSO, VLSI

Project Tenure: June 2024 to July 2025.

Production Division, IE

Objective

The Production Division is mainly engaged with fabrication, assembling and repair of the electronic instruments in order to meet the requirement of different institutes of BAEC and other organizations of the country.

1. R & D Work

The following electronic instrument have been produced:

Production of Drop-Out-Relay: Quantity - 04

Specifications: Upper cut-off voltage: 260V, Lower cut-off voltage: 180V, Time delay: 3 min (Adjustable), Input voltage: 220VAC, 50Hz, Output (safe range): 200-250V, Weight: 1.8 Kg.

2. Organize Training/Fellowship/Workshop/Meeting

Sl. No.	Title of the program	Date	Place	Number of participants
01.	Industrial Attachment Training Program -2024	01-07-2024 to 25-09-2024	IE,AERE	30

3. Repair & Maintenance, Renovation works etc.:

Title: Repair of Drop-out Relay : Quantity – 02

Description: Some components were damaged. Replace the components and other necessary servicing was done.

INSTITUTE OF COMPUTER SCIENCE (ICS)

The Institute of Computer Science (ICS) was established in December 1981 at the Atomic Energy Research Institute, Savar. The main objective of the institute is to provide research, development, training and consultancy. The country's first computer IBM-1620 was installed in the computer department of Atomic

Energy Center in Dhaka in 1964. This IBM computer is well known for providing training and data processing services to scientists and researchers of BAEC and other institutes. Later in 1983 another mainframe computer IBM-4341 was installed at the Institute of Computer Science. It was used for training, data processing and research by various government agencies and scientists for another decade.

Due to the promotion and spread of information technology in the last decade, information technology has touched all fields including science. As a result, information technology has achieved a radical change in Bangladesh besides contributing to the socio-economic development of the country. In line with this, ICS is providing science-based research and services by coordinating nuclear science and technology and ICT for the peaceful use of nuclear energy.

IBM-1620

IBM-4341

The Institute of Computer Science provides research, development, training, consultancy and various services through three divisions:

1. Nuclear Cyber Security Division (NCSD)
2. Computer Systems and Networking Division (CSND)
3. Software Engineering Division (SED)

Nuclear Cyber Security Division (NCSD)

Objective

The Nuclear Cyber Security Division (NCSD) is dedicated to advancing both basic and applied research in the domains of nuclear cyber security, computer networks, and information security, as well as cyber-physical infrastructures integrated with emerging Fourth Industrial Revolution technologies. Beyond research, NCSD plays a pivotal role in capacity building by offering specialized training programs on security issues, fostering cyber security awareness, and promoting the use of information and communication technology (ICT) for human resource development at the Bangladesh Atomic Energy Commission (BAEC).NCSD's scholarly contributions include the publication of numerous articles in peer-reviewed journals and conference proceedings, along with active participation in both national and international seminars and workshops. The division also serves as a key ICT service provider for BAEC, delivering domain-based official email services, Management Information Systems, D-Nothi services, and a wide range of software and web application solutions. It oversees the maintenance and upgrading of BAEC's inter-network infrastructure, ensuring core-level network security while fostering manpower development. In recent years, NCSD has enhanced the information and cyber security framework of the Atomic Energy Research Establishment through the successful deployment of advanced firewall services. It is currently spearheading the establishment of a state-of-the-art data center aimed at securing data and digitalizing diverse Commission activities. As part of its human resource development and public awareness mission, NCSD has also developed a Moodle-based e-learning management system focused on nuclear cyber security. Furthermore, the division administers and ensures the secure implementation of the D-Nothi system within BAEC.

1. R&D Works

1.1 Research on BAEC Based Nuclear Cyber Security and Network Security.

M. S. Islam, Md. Mahbub Alam, M.A.Uddin, Md Helal Uddin, M. D. Hossain

ICS presents the Network Systems such as LAN and Wi-Fi at BAEC HQ, AERE, and AECD through efficient design, development, and implementation. A large number of computers and digital control systems are connected with these networks publicly or privately. Both nuclear cyber security and network security are dynamic fields with new threats and technologies constantly emerging. So, it's a challenging issue to ensure network security for these networks and nuclear cyber security which is concerned with the nuclear-related digital control system. Researchers in Nuclear Cyber Security lab focus on staying ahead of cyber adversaries and continuously enhancing security measures to protect critical infrastructure and sensitive data.

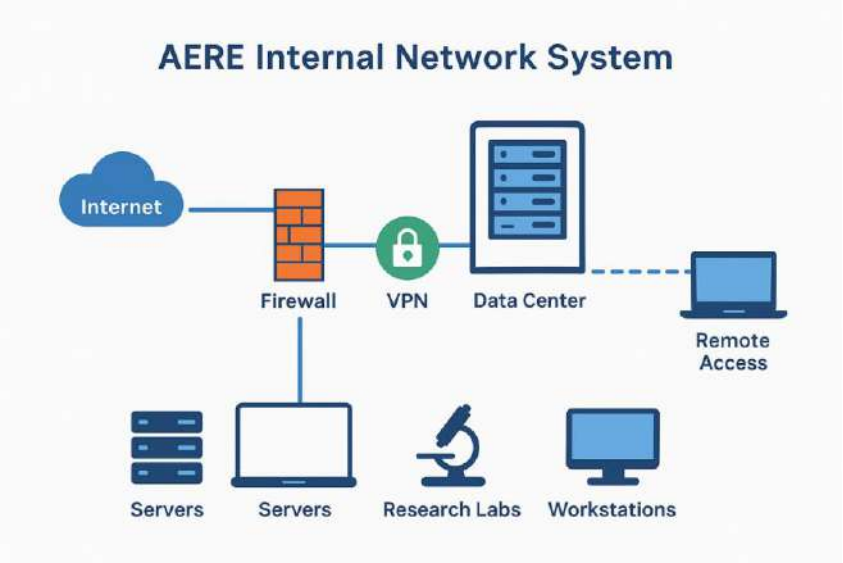


Fig 1. AERE Internal network System.

At present, CISCO next-generation hardware firewall has been implemented at ICS network server room, AERE as part of ensuring the core network security. This firewall is running under the supervision of NCSD division.

Fig 2. AERE Active Network Monitoring System.

1.2 Expansion of Moodle Based E-learning Management System at BAEC

M. S. Islam, Md. Mahbub Alam, M.A. Uddin, Md Helal Uddin, M. D. Hossain

Bangladesh Atomic Energy commission (BAEC) offers various training and short courses to the employees and students. It includes specialized training courses, Industrial attachment training, different nuclear activity

short term or long term courses etc. So in order to make it easier, Moodle based E-learning Management System has been developed at NCSD division of ICS Network Local server. Expanding a Moodle-based e-learning management system (LMS) at the Bangladesh Atomic Energy Commission (BAEC) involves enhancing its features, functionalities, and content to improve the overall learning experience for students and instructors.

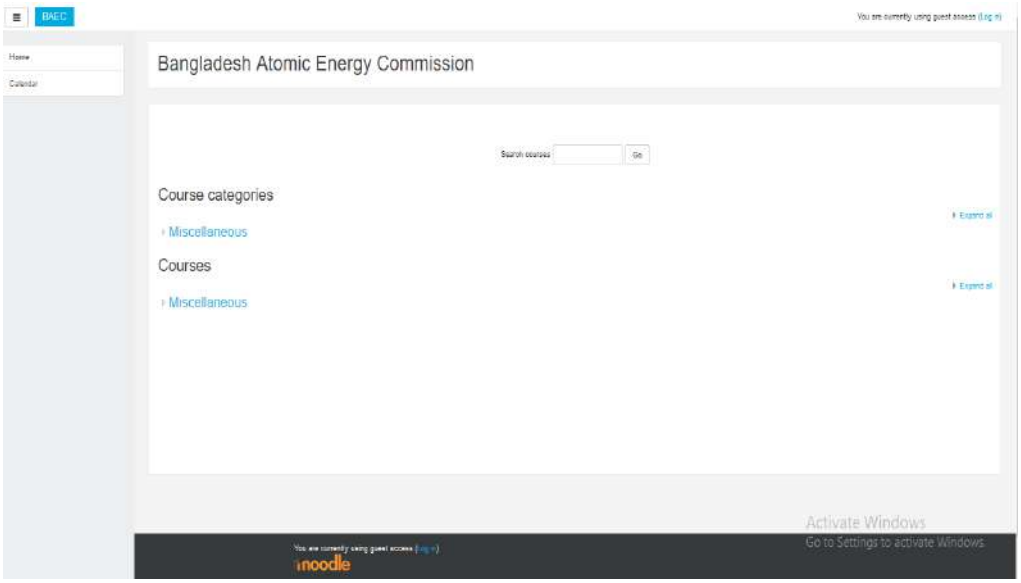


Fig 3. Moodle Based E-Learning Management System at BAEC

1.3 Research on Nuclear Knowledge Management System

M. S. Islam, Md. Mahbub Alam, M.A. Uddin, Md Helal Uddin, M. D. Hossain

Bangladesh Atomic Energy commission (BAEC) is a multidisciplinary research organization. Nuclear Knowledge Management (KNM) is one of the paramount research areas of NCSD lab according to the BAEC current demand. A Nuclear Knowledge Management System is a comprehensive approach to capturing, organizing, preserving, and disseminating knowledge within the nuclear industry. It involves the systematic management of knowledge related to nuclear technology, safety, research, operations, and best practices to support decision-making and enhance overall performance.

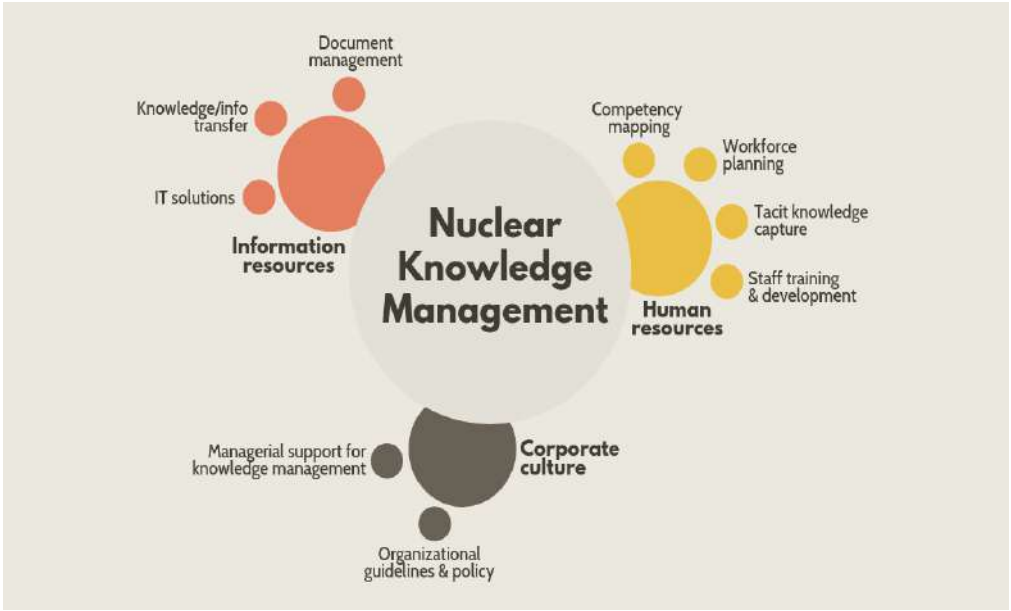


Fig 4. Nuclear Knowledge management System section

1.4 A Private Cloud Configuration to Meet-up the 'Big Data' Challenges of BAEC and its Establishments

M. S. Islam, Md. Mahbub Alam, M.A. Uddin, Md Helal Uddin, M. D. Hossain

The Bangladesh Atomic Energy Commission (BAEC) and its associated establishments generate, store, and process vast volumes of data from research, experiments, simulations, operational records, and administrative activities. This includes structured, semi-structured, and unstructured data from nuclear science research, environmental monitoring, medical isotope production, energy simulations, and institutional databases. The challenges posed by this "big data" scenario—such as data silos, security concerns, processing delays, and high storage requirements—necessitate an efficient, secure, and scalable infrastructure.

Current and upcoming era is the era of Big Data, where it comes along with challenges between Big Data storage, processing and security that raises problems. On one side, the large amount of trust related data must be highly available, flexible, and fast processing and on the other side, the trust and security of Big Data are the challenges.

No doubt, various types of BAEC data such Biological Data, Medical Record Data, Physical Data, etc. can strengthen the 'Big Data' concept in the context of data collection point of view. According to the present-day information security crisis there is an extreme need for the storage and management of the trust-worthy data through the private cloud adoption.

This proposal highlights the challenges of Big Data management in the context of BAEC establishment and present a private cloud storage solution to meet up these challenges for the BAEC and its establishments through the efficient design, development, and implementation. This study also discusses the capabilities of the private cloud storage as it is more superior to public cloud for Big Data storage and for the Information Security.

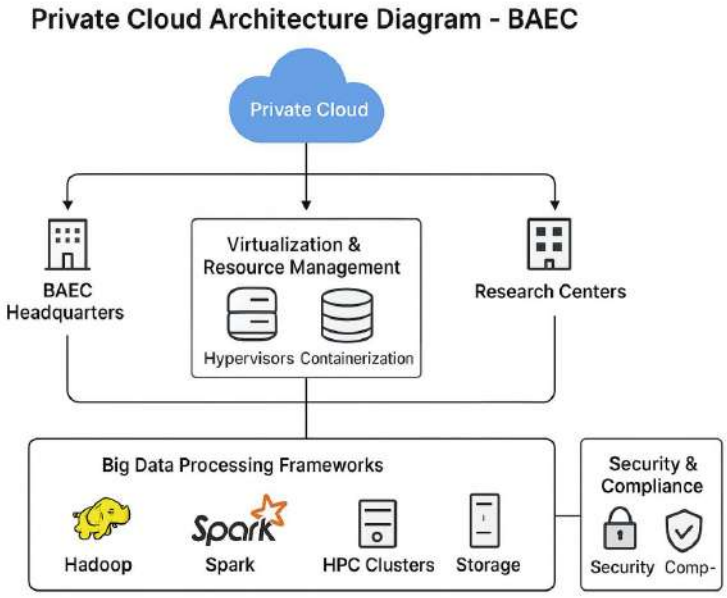


Fig 5. System Architecture: Private Cloud Storage for BAEC Establishments to meet up the Big Data Challenges

This is an ongoing research activity of Nuclear Cyber Security Division (NCSD).There are many ongoing future research are in place to do discuss more on the security of cloud in a virtualized environment and how to handle more in coming data into cloud regardless of private or public cloud. The authors of this work are also concerned to put effort in this issue as their future work.

1.5 Implementation D-Nothi System at BAEC and its Regional Offices

M. S. Islam, Md. Mahbub Alam, M.A. Uddin, Md Helal Uddin, M. D. Hossain

Currently, BAEC and its regional offices have transitioned from the e-Nothi System to the D-Nothi System. The D-Nothi platform has brought a wealth of changes, introducing a fully module-based structure designed

for greater efficiency and flexibility. headings edit, any mistaken correction, training to employeesetc related activities. This new system has been implemented across BAEC and its regional offices under the guidance and technical supervision of the **Institute of Computer Science (ICS)**. Within ICS, the **NCSD division**

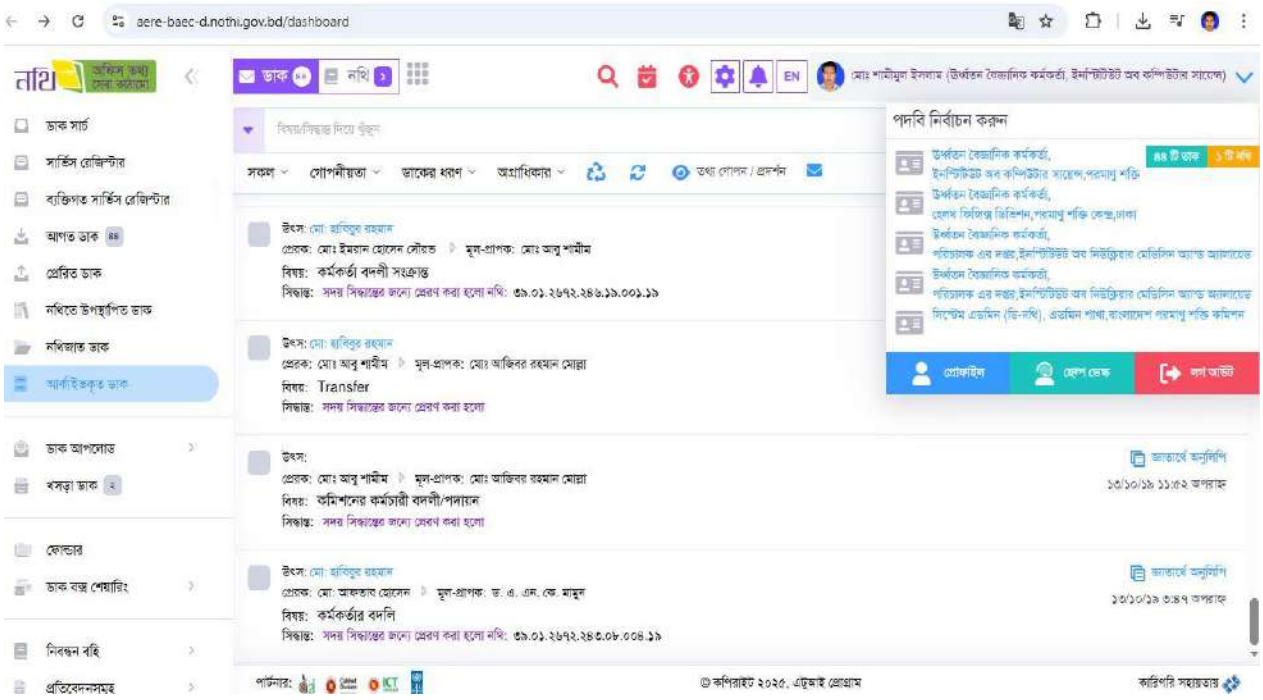


Fig. 6- Overview of D-Nothi System.

provides a dedicated system administrator who plays a pivotal role in both deploying and managing D-Nothi. The D-Nothi administrator carries a range of important responsibilities, including:

1. Adding employees to the system and processing their resignation upon orders from higher authority.
2. Editing D-Nothi headings and making corrections when mistakes occur.
3. Providing training sessions to help employees adapt to the new system.
4. Performing various administrative activities to ensure smooth operation and user support.

With these coordinated efforts, the D-Nothi System is now serving as a modern, organized, and efficient backbone for BAEC's official workflow.

2. Manpower Development

2.1 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	D-Nothi Office Management Training-2025	18-20 February, 2025	AECD, Dhaka	25
2.	D-Nothi Office Management Training-2025	19-21 January. 2025	BAEC HQ	25

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of the oral/poster presentation	Title of the event	Organizer	Date	Place
Md. Shamimul Islam	D-Nothi Management for all BAEC Employees	Seminar on D-Nothi Management for all BAEC Employees	SID, BAEC	03-09-2024	BAEC HQ

3. Service Rendered

Sl. no.	Name of service provided	Number/quantity of service provided	Income
1.	BAEC Domain based Official Email Services	120	
2.	Management Information System Administration Services	489	
3.	E-Nothi Administration Services	510	
4.	Consultation to the Scientists on the Computer and ICT	590	
5.	Wi-Fi Internet Security Services	611	

Software Engineering Division (SED)

Objective

The Software Engineering Division (SED) is mainly responsible for all aspects of nuclear software system from the early stages of system specification through to analysis, design, development and maintaining the system after it has gone into use. In addition, this division is continuing research and development in the field of building knowledge-based expert system to full-fill the goal of Digital Bangladesh, nuclear knowledge management system, e-learning, computer security, mining nuclear knowledge, software development meeting scientific and computation need, data acquisition and analysis, computer simulation and modeling, artificial intelligence and internet of things (IOT), developing database system for storing and processing nuclear data, facilitating paperless administrative work in BAEC, developing ICT based applications/tools to provide hassle-free scientific and other services to the mass people and doing research work in the upcoming technologies.

1. R&D Work

1.1 Development of BAEC Scientists' Profile Management System

Nayan K. Datta, Md Mahbub Alam

The Scientist Profile Management System (SPMS) is a web-based or enterprise application designed to manage, organize, and maintain comprehensive profiles of scientists within a research organization, academic institution, or government agency. This system acts as a centralized platform where all relevant professional information, contributions, and achievements of scientists can be stored, updated, and accessed efficiently.

Objectives:

- To centralize and streamline the storage of scientist-related data.
- To facilitate easy access and retrieval of research profiles, publications, awards, and project involvements.
- To support performance evaluation, grant applications, and collaborations.
- To ensure data consistency, integrity, and security across the institution.

Key Features:

1. **Scientist Registration and Profile Creation**
   - Personal and professional details (name, designation, department, contact).
   - Academic background and qualifications.
2. **Research and Publication Management**
   - Upload and categorize research papers, journal articles, patents, and conference proceedings.
   - Integration with indexing databases (e.g., Scopus, Google Scholar).
3. **Project and Grant Tracking**
   - Details of current and past research projects.
   - Funding information and project collaborators.

4. **Awards and Achievements**
    - Honors, recognitions, and distinctions received by scientists.
5. **Administrative Dashboard**
    - Role-based access for scientists, administrators, and reviewers.
    - Tools for approving, updating, or archiving profiles.
6. **Search and Reporting**
    - Advanced search filters to find scientists based on research area, keywords, or achievements.
    - Exportable reports for audits, assessments, or annual reports.
7. **Security and Data Privacy**
    - Access control and encryption to protect sensitive information.
    - Regular backups and audit logs.

Technologies Used

- Frontend: HTML5, CSS3, JavaScript,
- Backend: ASP.NET Core / Node.js
- Database: Microsoft SQL Server / MySQL
- Authentication: OAuth2 / JWT for secure login
- Hosting: Cloud-based (Azure/AWS) or on-premises server deployment

Benefits

- Saves time and reduces redundancy in managing scientist data.
- Improves transparency and accessibility of research contributions.
- Helps in building a credible institutional research repository.
- Facilitates collaboration and interdisciplinary research through better visibility of expertise.

1.2 Enhance the Quality, Relevance, and in Formativeness of the Divisional and Institutional Information.

This includes incorporating detailed descriptions of the goals, objectives, ongoing research and development activities, service delivery processes, stakeholder information, key achievements, and national and international contributions of all institutions, centers, institutes, units, and divisions under the Commission. Additionally, the inclusion of relevant images, flowcharts, diagrams, and graphs has been advised to improve visual engagement and clarity for users.

To modernize and enrich the official website of the Commission, the SED, ICS aimed at improving both the content and structure of the site. The goal is to transform the website into a more dynamic, informative, and user-friendly platform that accurately reflects the activities and impact of the Commission.

It emphasized the need to include comprehensive and updated information about every institution, center, institute, unit, and division operating under the Commission. This includes clear documentation of:

Goals and Objectives: Clearly defined missions and long-term visions of each entity.

Ongoing Research and Development (R&D): Current scientific, technical, and innovative projects being pursued.

Service Delivery Mechanisms: Description of services offered to the public, industries, or other stakeholders.

Stakeholders: Identification of individuals, organizations, or sectors benefiting from or collaborating with each entity.

Achievements: Notable milestones, successful projects, innovations, and recognitions.

Contributions at National and International Levels: Participation in global collaborations, publications, conferences, or contributions to national development.

To enhance the clarity and visual appeal of the website, it has also been recommended to integrate supporting visuals such as photographs, flowcharts**,** diagrams**,** and graphs. These visual elements will help users understand complex information more easily and will present the Commission's work in a more engaging and professional manner.

This initiative is aimed at increasing transparency, fostering public awareness, and promoting the Commission's scientific and institutional contributions to both national and global audiences.

1.3 Contents Management, Up-gradation and Uploading of the Official Web Portal of BAEC

Nayan K. Datta, Md Mahbub Alam

A content management system (CMS) is a software application or set of related programs that are used to create and manage digital content.

The website of BAEC is to reflect the activities of different institutes in Bangla as well as in English. All types of up-gradation like notice board, NOC, All types of notices of BAEC on the notice board are updated on the web portal. As a result, everybody can know about notices very easily and able to simplifies official activities and accelerates the activities stated in the notice. These service providing activities are routine work as well as continuous activities of this division. NOC of Officers and staffs for passport that is approved by the BAEC are updated in the web portal. As a result, getting and processing passport from passport office have become easier and faster. Besides those, Recruitment Result, Ex Bangladesh earn leave, different "Service box" are updated on the due time. Transfer order, Tender, Annual Performance Agreement (APA), National Integrity Strategy Action Plan etc. are done according to the request of the higher authority. Several requests notes have been sent to SID, HQ to get updated information/photo of different institutes/divisions of BAEC.

1.4 Management and Maintenance "Directory of Personnel" of BAEC

N. K. Datta, M. M. Alam

BAEC maintain an employee database where all scientists, Engineers, Doctors and Geologists are on recorded according to institute. Newly appointed employees are added on the database and any up-gradation process is done in the nick of time. To track the employee faster, add new employees in simple steps, Update or Modify details easily, filter and track the employee faster. According to official order of BAEC any posting/newly recruitment/deletion of scientist are done at the due time on the "Directory of Personnel" of BAEC.

1.5 Management and Maintenance of Foreign Visit Records Web-based Software of BAEC

N. K. Datta, M. M. Alam

Scientists of BAEC travel to abroad to attend in seminars, symposium and training for different official purposes. Foreign visit database aims to store overall information of each and every visit of the scientists. BAEC maintain a Foreign Visit database where all international Seminar/ Symposium/ Conference/ Workshop/ Meeting attended by the employee of BAEC are recorded. We provide technical support on any problem to enhance this activity.

There are features available to search list of event participation of any specific scientist or all the participants of any specific event. It is also possible to search participants or events of any specific month of any year. In any specific visiting history, it shows the name of the event, duration, participant's details including designation and institute. If any problem occurred during maintain the normal activities of this software we provide technical support.

2. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income
1.	Management and Maintenance Official Web-portal of BAEC	As per required	-
2.	Contents Uploading at the Official Web-portal.	About 355	-
3.	Management and Maintenance Directory of Personnel of BAEC.	About 205	-
4.	Management and Maintenance Foreign Visit Records Web-based software of BAEC.	About 5	-

3. Software Development

1. Design and Upload the Contents of the Webpages of the Official Website of Bangladesh Atomic Energy Commission
2. Design and Development of Scientists' Profile Management System.

Computer System and Network Division (CSND)

Objective

The Computer System and Network Division (CSND) is primarily responsible for the design and implementation of computer networks, as well as the use of software for effective network management. CSND provides services such as computer hardware and software installation, maintenance, troubleshooting, and the development or upgrading of BAEC network infrastructure. It also manages broadband and Wi-Fi internet services, prepares ID cards for BAEC employees, students, and visitors, and offers manpower development, IT training, and consulting services. In addition, the division engages in policy-related and IT-focused national and international collaborations with the Ministry of Science and Technology.

1. R&D Works

1.1 Research on BAEC Predicting the Prodrome Phase of Migraine using Machine Learning Analysis of Trigger Incidents

Md. Haidar Ali, Osman Goni, Abu Shameem.

ICS presents the Network Systems such as LAN and Wi-Fi at BAEC HQ and AERE through efficient design, development, and implementation. A large number of computers and digital control systems are connected with these networks publicly or privately. Both nuclear Cyber security and network security are dynamic fields with new threats and technologies constantly emerging. So, it's a challenging issue to ensure network security for these networks and nuclear Cyber security which is concerned with the nuclear-related digital control system. Researchers in Nuclear Cyber Security lab focus on staying ahead of Cyber adversaries and continuously enhancing security measures to protect critical infrastructure and sensitive data.

1.2 Optical Fiber Network Route Planning, Design and Deployment for Atomic Energy Research Establishment

Md. Haidar Ali, Osman Goni and Abu Shameem.

Robust network infrastructure, sized and specified correctly, is crucial for dependable IT systems. For the Atomic Energy Research Establishment (AERE), an optical fiber backbone provides the capacity, low latency, and signal quality needed to support high-speed internet and mission-critical applications. Designing a fiber-optic network involves: selecting the types of communication services and protocols the network will carry; planning the geographic routes and civil works; specifying transmission equipment, transceivers, and optical transport systems; and defining the fiber plant topology, fiber types, splicing and termination standards, and operational/test procedures required for reliable installation and maintainable operation..

1.2 Implementation of Local Area Network (LAN) & Build a Secure LAN System BAEC Head Quarter

Md. Haidar Ali, Osman Goni and Abu Shameem.

Network security involves implementing physical and software-based preventive measures to protect the underlying networking infrastructure from unauthorized access, misuse, malfunction, modification, destruction, or improper disclosure. The goal is to create a secure platform that enables computers, users, and programs to carry out their authorized, critical functions within a protected environment. A Local Area Network (LAN) is a computer network that spans a limited geographical area, such as a home, school, computer laboratory, office building, or campus. It consists of interconnected workstations and personal computers, each capable of accessing and sharing resources such as data, printers, scanners, and storage devices across the network. LANs are typically characterized by high communication speeds and data transfer rates compared to wide area networks (WANs).

Fiber-optic communication can transmit voice, video, and telemetry either within local area networks or across long distances. Optical fiber is widely used by telecommunications providers to deliver telephone services, Internet connectivity, and cable television signals. Notably, researchers at Bell Labs have achieved a

record bandwidth–distance product of over 100 petabit·kilometers per second using fiber-optic technology. Communication between remote parties is enabled through networking, which involves the interconnection of computers, transmission media, and networking devices. In discussing networks, three key concepts must be considered distributed processing, network criteria, and network structure. The objective of this design and implement a secure Local Area Network (LAN) for the Bangladesh Atomic Energy Commission (BAEC) Headquarters. The design will address both the physical and logical aspects of the LAN, with the aim of ensuring robust performance, scalability, and strong security measures to protect network resources and system services. The study will also include an examination of the existing LAN setup at BAEC HQ to identify improvement areas and implement a secure, high-performance LAN solution.

2. Seminar/Symposium/Conference (National and International)

Name of the participant	Title of the event	Organizer	Date	Place
Md. Haidar Ali	Usage of E-Participation tools on National Web Portal	a2i	24 March 2024	BCC

3. Service Rendered

Sl. no.	Name of service provided	Number/quantity of service provided	Income
1.	BAEC HQ Network Service Provided	140	-
2.	BAEC AERE Broadband Network Service Provided	450	-
3.	Official ID Card Provided	355	-
4.	Repair & Maintenance Assemble, Troubleshooting, Repair and Maintenance of PC	55	-

INSTITUTE OF ENERGY SCIENCE (IES), AERE

Objective

Bangladesh Atomic Energy Commission is struggling on reinforcing its culture of innovation with un-relented commitment to face the energy challenges of Bangladesh in the new millennium. Energy is the strategic input for sustainable development, and the issue of energy security is considered like the individual, social, and territorial security. Institute of Energy Science started functioning on April 2008 at the Atomic Energy Research Establishment campus to build a favorable infrastructure for sustainable energy research and to promote the technological know-how in both renewable and non-renewable energy fields. The planned research and development activities are diverse and broad and the main objectives are to

- build trained and skilled manpower in different areas related to energy production
- undertake and promote R&D activities in the respective fields
- develop new technology for efficient and cost-effective energy production
- perform R&D in renewable sources, including hydrogen energy
- support academic activities, such as M.Sc., M.Phil., Ph.D. studies, and carry out collaborative research programs

1. R&D Work(s)

1.1 Customization of Source Term into JRODOS Compatible XML File Format using Visual Basic for Nuclear Accident Analysis

S.M.T. Hassan, M.A. Khaer, M.T. Chowdhury, M.M. Rahman

A Visual Basic code was developed to generate an XML file in the RODOS format from the provided source term data in Microsoft Excel Spreadsheet. This XML file can be directly used in JRODOS (Java-based Real-

time On-line Decision Support) platform. A simple source term model was used to check the applicability of the code. Finally, the code was successfully implemented to reproduce the JRODOS-formatted XML file for a detailed Fukushima Dai-ichi nuclear power plant accidental scenario. This code simplifies a vital analysis step, which would otherwise be very cumbersome, especially for a complex source term scenario involving many radionuclides, release intervals, and release heights of a nuclear accident.

1.2 Study of Radiological Impact Due to Accidental Release of Significant Radionuclides Considering Various Weather Conditions from The TRIGA Mark-II Research Reactor of Bangladesh

M.A. Khaer, S.M.T. Hassan, M.T. Chowdhury, M.M. Rahman

From its commissioning, it was required to ensure the nuclear or radiological safety of the BAEC TRIGA Mark-II Research Reactor according to the country-specific regulatory guidance (BAERA Guidance) or followed by any international guidance (US NRC or IAEA Guidance). It is always important to take protective actions not to commit enough radiological doses. Therefore, the present work focused on the core inventory and radiological dose assessment due to a hypothesized research reactor accident of TRIGA Mark-II at Savar, Dhaka, Bangladesh. The core inventory and source term of five radionuclides (^{137}Cs, ^{131}I, ^{133}Xe, ^{85m}Kr, and ^{90}Sr) were studied using the ORIGEN 2.1 code until December 2021. These radionuclides were chosen due to their high emission characteristics from a nuclear accident. The dose values of TED, ground deposition, and organs were calculated for an 80 km radius from the reactor site using the HotSpot 3.1.2 code and meteorological data of six seasons of Bangladesh. The assessed dose values are compared and it is shown that dose values in the rainy season are highest due to the rainout coefficient. The other five seasonal TEDE data show similar dose patterns and are also high enough to the permissible limit of dose values. So, regardless of the time of year, if an accident occurs, it is necessary to immediately take preventive radiological measures based on the local authority emergency response plan.

1.3 Assessment of Radionuclide-Specific Contributions to Exposure Pathways Following a Hypothetical Accident at the TRIGA Research Reactor in Bangladesh

M.A. Khaer, S.M.T. Hassan, M.T. Chowdhury, M.M. Rahman

This study investigates the individual radiological contributions of 13 selected radionuclides to various exposure pathways under hypothetical severe accident scenarios at the TRIGA Mark-II research reactor in Bangladesh. Two core damage conditions—50% and 100% core meltdown—were considered to evaluate the potential environmental and health impacts resulting from the atmospheric release of radionuclides. The analysis was conducted using the HotSpot 3.1.2 code, which incorporates the Gaussian Plume model for atmospheric dispersion and dose estimation. Four major exposure pathways were assessed: inhalation, cloud submersion, ground shine, and resuspension. Meteorological conditions were represented using 30 years of historical data for both dry and rainy seasons, capturing seasonal variability in dispersion behavior. The study focused on the pathway-specific dose contributions of key radionuclides, ^{137}Cs, ^{134}Cs, ^{131m}Xe, ^{133}Xe, ^{133m}Xe, ^{131}I, ^{133}I, ^{85}Kr, ^{90}Sr, ^{140}Ba, ^{99m}Tc, ^{127}Te, and ^{127}Sb.The results revealed that ^{131}I was the dominant contributor to the inhalation dose, particularly affecting the thyroid, while ^{137}Cs played a significant role in ground shine and submersion pathways, with major implications for whole-body and bone marrow doses. Noble gases like ^{133}Xe primarily influenced cloud submersion but had limited impact on committed organ doses. ^{90}Sr showed notable contributions to inhalation and bone dose, especially under dry conditions.

The study demonstrates that the dose impact varies significantly by radionuclide, pathway, and season, underscoring the importance of nuclide-specific risk assessment in radiological emergency planning. These findings provide valuable insights for refining protective measures, enhancing reactor safety analysis, and supporting regulatory preparedness strategies in research reactor environments.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Improvement of Radiation Transmission Imaging	September 24, 2024 – December 06, 2024	Institute for Integrated Radiation and Nuclear Science, Kyoto University, Japan	01
2.	1st RCM of CRP on Simulation of Transient Tests at S-Allegro Helium Facility	March 03-06, 2025	Virtual Platform	02
3.	1st RCM of CRP on Fuel Modelling Exercises for Coated Particle Fuel for Advanced Reactors Including Small Modular Reactors	May 06-09, 2025	Virtual Platform	02
4.	Kick-off Virtual Meeting on WP1, WP5 of Benchmark Analysis of Transient Experiments Performed at Gas Cooled Test Facility S-Allegro	June 17, 2025	Virtual Platform	02

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Md. Abu Khaer	Assessment of Radionuclide-Specific Contributions to Exposure Pathways Following a Hypothetical Accident at the TRIGA Research Reactor in Bangladesh	Seminar	Institute of Energy Science	May 20, 2025	IES, AERE, Savar, Dhaka
Md. Abu Khaer	A Hypothetical Multi-Core Accident Analysis of Rooppur Nuclear Power Plant of Bangladesh	Seminar	Institute of Energy Science	June 23, 2025	IES, AERE, Savar, Dhaka

4. Project Work (ADP/FNCA/RCA/TC/CRP/S&T etc.)

4.1 S&T Project (Special Allocation):

(i) Study of Individual Radionuclide Impact on the Radiological Dose Distribution of TRIGA Research Reactor in Bangladesh after a Hypothetical Accident, Principal Investigator: Dr. Mohammed Tareque Chowdhury, Associate Investigator: Md. Abu Khaer, (Project ID: SRG-246447)

Period: July, 2024 - June, 2025

(ii) Detail and Realistic Modeling of Nuclear Accidents and Its Consequences, Fundamental Heat Transfer in Nuclear Reactors, Materials Damage in Nuclear and Non-Nuclear Applications, and Renewable Energy Research, Principal Investigator: Dr. Mohammad Mizanur Rahman, Associate Investigator: Dr. Mohammed Tareque Chowdhury

Period: July, 2024 - June, 2025

4.2 Coordinated Research Project (CRP):

(i) Implementing OpenFOAM to benchmark on thermal hydraulics of transient tests at S-Allegro Helium Facility. Chief Scientific Investigator: Dr. Mohammad Mizanur Rahman, Associate Investigator: Dr. Mohammed Tareque Chowdhury, (IAEA Research Contract No: 28719)

Period: January 10, 2025 – January 31, 2029

(ii) Implementation of fuel performance modeling code OFFBEAT for advanced reactors including SMRs to study the coated particle fuel. Chief Scientific Investigator: Dr. Mohammed Tareque Chowdhury, Associate Investigator: Dr. Mohammad Mizanur Rahman, (IAEA Research Contract No: 28911)

Period: May 31, 2024 – May 31, 2029

5. Memorandum of Understanding (MOU)

A MOU (Memorandum of Understanding) between the Institute of Energy Science, Bangladesh Atomic Energy Commission, Bangladesh and the Institute for Integrated Radiation and Nuclear Science, Kyoto University, Japan has been signed by the BAEC and the Kyoto University.

The two parties agree to promote academic and research exchange between them in the field of nuclear engineering, particularly in the areas of thermal hydraulics and safety.

Period: December 20, 2024- December 19, 2029

INSTITUTE OF RADIATION AND POLYMER TECHNOLOGY (IRPT), AERE

Objective

The main objectives of the institute are

- Application of radiation processing technologies for the socio-economic development of the country.
- Providing commercial gamma irradiation services for quality improvement of food items and sterilization of medical products, pharmaceutical raw and packaging materials etc.
- To provide irradiation service to research organizations for R & D purpose.
- To expand cooperation with other scientific organizations, universities, private and public sectors through mutual exchange of educational programs, training, technical cooperation and expert services.
- To develop human resources in the field of nuclear science and technology.
- Transferring the technology to the entrepreneurs for industrial applications.

1. R&D Work(s)

- Radiolysis synthesis of nano materials was done and the photocatalytic application was examined**.**
- Different types of hydrogels were prepared for biomedical application and heavy metal removal.
- Phytochemical synthesis of nano materials was done and the photocatalytic application was examined.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Training on “Digital attendant system”	12, September, 2024	Institute of Electronics, AERE, Savar, Dhaka	02

3. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Dosimetry for gamma irradiator	18, June. 2025	Seminar Room, IRPT, AERE, Savar, Dhaka.	12

Sl. no.	Title of the program	Date	Place	Number of participants
2.	Application of gamma radiation	16, April, 2025	Seminar Room, IRPT, AERE, Savar, Dhaka.	11
3.	Safety and security of gamma radiation	08, January, 2025	Seminar Room, IRPT, AERE, Savar, Dhaka.	14
4.	Development of biopolymer films using alginate	21, October, 2024	Seminar Room, IRPT, AERE, Savar, Dhaka.	11
5.	Fabrication and Characterization of glass fiber reinforced composites for electrical applications	19, August, 2024	Seminar Room, IRPT, AERE, Savar, Dhaka.	14

4. Stakeholder Meeting

Several stakeholder meetings were held with different companies e.g. Pran Agro Ltd., Square Food and Beverage Ltd. Etc. for promoting irradiation services to these stakeholders from July 2024 to June 2025 at IRPT.

Title	Place	Date
Experience Sharing Meeting with Stakeholders	Seminar Room, IRPT, AERE, .Savar, Dhaka.	29june, 2025
Experience Sharing Meeting with Stakeholders	Seminar Room, IRPT, AERE, Savar, Dhaka.	23 February, 2025

5. Project work (ADP / FNCA / RCA / TC / S&T / CRP)

One ADP Project entitled "Strengthening of the Existing Gamma Source of Bangladesh Atomic Energy Commission" is running at the Institute.

6. Service Rendered

SI. no.	Number of services given organization	Income
1.	01 company (12 consignment)	322,796

INSTITUTE OF NUCLEAR GEOLOGICAL SCIENCE (INGS), AERE

Objective

Institute of Nuclear Geological Sciences is mainly engaged in nuclear mineral exploration program in the potential area of Bangladesh. INGS is responsible to explore atomic minerals containing uranium, thorium and other associated valuable metals in different prospective zones of Bangladesh together with nuclear technology transfer to different national, international mining companies, Government organizations for mineral resource exploration and development. Besides INGS is now working on geochemical and mineralogical characterization of radioactive rock and sediment, radon survey in potential radioactive anomalous zone of Bangladesh and on geotechnical and geo-environmental studies. In addition, this institute provided geophysical borehole logging services as per demands of different organizations/companies.

1. R&D Works

1.1 Borehole Geophysical Logging for the Delineation of Lithological Boundaries at Hatirjhil and Dhanmondi Lake Area, Dhaka City for Groundwater Monitoring

M.Z. Kabir, M.S. Islam, M.M Zaman, M.G Rasul, F. Deeba, M. Rajib, N.T. Dina, S.C Das, T. Shaha and J. Uddin

Borehole geophysical logging was conducted at Hatirjhil Lake ($90^0$41′8.5″E and $23^0$77′2.1″N) and Dhanmondi Lake ($90^0$25′4.4″E and $23^0$46′13.7″N) area for identifying lithologic boundary for groundwater monitoring. Two boreholes at each site were logged by conventional logging techniques for natural gamma,

self-potential and resistivity. Geophysical logs reveal four different lithological boundaries: clay, silty clay, fine to very fine sand and medium to fine sand. One shallow aquifer with 40-50 feet thick was delineated at each drill hole. Combined logs attribute that the shallow aquifer containing water is fresh.

Subsurface lithology at Hatirjhil Lake

Having some oxidized clay and sand part within the casing area, medium to very fine sand layer characterizes upto100 m (328 feet) with a small patch of silty clay and clay layer at 5-22 m (16-72 feet) and 60-80m (197-262 feet). Between these two layers, a depth from 22-60m (72-197 feet) is identified as fine to very fine sand. At the lower part of the drill hole 85-100m (279-328 feet), medium to fine sand layer is found. This sand layer shows moderate gamma counts of upto120 counts per second (cps). The gamma counts with corresponding SP and SPR values at the depth of 85-100m indicate a permeable water bearing layer that could be attributed as the upper aquifer. The SP and SPR value were changed sharply at the bottom of the drill hole. This may be due to the interference of drilling fluid that has invaded to the formation. Between 20-22 m (65-72 feet) and 65-85m (213-279 feet), sediments are characterized by moderate to high gamma counts (120 cps and above) and corresponding SP and SPR values that indicates very fine sand with the possibility of presence of clay minerals like muscovite and biotite.

Subsurface lithology at Dhanmondi Lake

At the upper part of the borehole, approximately 7 m (23 feet) clay to silty clay layer is observed. This clay layer has been identified showing moderate to high gamma counts of upto 150 counts per second (cps). After that, a dominant fine to very fine sand layer exists at the depth of 7- 80 m (23-262 feet). This fine to very fine sand layer between 7- 80 m shows moderate gamma counts of up to 110 counts per second (cps). Below this layer, the gamma values (40-90 cps) with corresponding SP and SPR log indicate almost homogeneous medium to fine sand layer from the depth of 80-105m (262- 344 feet). These values represents that this layer could be attributed as the upper aquifer. SP log sharply reflecting to the negative side at a depth of 80-110m (262-361 feet) and corresponding SPR log indicate permeable water bearing formation. The SP and SPR log suggest that the formation water is fresh. From the gamma log, different lithological boundaries like clay, fine to very fine sand and medium to fine sand were determined where water containing sandy layer (upper aquifer) can be distinguished.

1.2 Measurement of Radon Concentrations in the Transboundary Chela River of Sunamganj District and Bholaganj Sadapathar of Sylhet District for Radioactive Mineral Exploration

F. Deeba, N.T. Dina, M.Z. Kabir, S.C. Das and T. Saha

Geological exploration activities were carried out in the recent fluvial depositions of Chela river at Chatak upazilla of Sunamganj district and at Bholaganj Sadapathar, which is renowned for its unique white stones scattered along the bank of the Dhalai River of Sylhet. The study measure the radon concentration as a natural tracer for exploring uranium mineralization zone. Radon (^{222}Rn) occurs in nature as chemically inert gas resulting from the radioactive decay of ^{226}Ra in ^{238}U series found in most of the soils. The professional radon monitor Alpha GUARD PQ2000 PRO (Bertin Technologies) was used to measure radon concentration in soil gas. The measured radon concentration for Chela river and Bholaganj ranges from 500 to 55,740 ± 3.37 Bqm^{-3} and 200 to 21.92± 1.47 respectively at 20 cm depth, with average value of 25539.1 Bqm^{-3} and 13088.89 Bqm^{-3}. The high value of soil gas radon may be as a result of the loose soil matrix, the occurrence of heavy radioactive mineral sand, radium distribution, the underlying bedrocks, probable subsurface fault, and flooding by water streamed through adjacent uranium-rich Ore. In the Chela river section, the annual effective dose ranges from 0.004752 to 0.52975 mSv/y with average value of 0.24272 mSv/y. Moreover, the annual effective dose varies from 0.12439 to 0.20837 mSv/y with mean value of 0.00190 mSv/y for Bholaganj area, calculated from the radon values. The soil gas radon in the recent transported sand of the studied rivers stretches out in the medium radon zone (10–100 KBqm^{-3}) suggestive to extensive exploration activities to confirm uranium mineralization in the area.

1.3 Natural Radionuclide and Radon Concentration at Charfesson and Char Kukri Mukri of Bhola District, Southern Island of Bangladesh

F. Deeba, M.Z. Kabir, N.T. Dina, and M.G. Rasul

On-site ^{222}Rn concentration was measured to evaluate the annual effective dose received by the inhabitants of the study area using Alpha Guard PQ2000 PRO (Bertin, Germany) radon monitor at Charfesson and Char

Kukri Mukri of Bhola District, Bangladesh, under the special allocation fund of Ministry of Science and Technology (MoST) for the FY 2024-25. The concentration of natural radionuclides ^{40}K, ^{238}U and ^{232} Th as well as natural gamma dose rates were also evaluated using Portable Gamma-ray Spectrometer (Gamma Surveyor-II). The range of radon concentration varies from 30- 6920 Bqm^{-3} with an average value of 4099.75 Bqm^{-3}. The annual effective dose due to soil gas radon varies from 0.0002 mSv/y to 0.0657 mSv/y with an average value of 0.0389 mSv/y at the Ch arfesson area. Whereas the range of radon concentration varies from 990- 4180 Bqm^{-3}, with an average value of 2031 Bqm^{-3}. The annual effective dose due to soil gas radon varies from 0.0094 mSv/y to 0.0397 mSv/y with an average value of 0.0193 mSv/y at the Char Kukri Mukri area. The average activity concentrations of ^{40}K, ^{238}U and ^{232} Th and Dose Rate were 311.82, 63.26, 41.24 Bq/kg and 47.235 nSv/h respectively at Charfesson area. The average activity concentrations of ^{40}K, ^{238}U and ^{232} Th and Dose Rate were 234.43, 73.43, 73.43 Bq/kg and 54.727nSv/h respectively at Char Kukri Mukri area. The average ^{238}U and ^{232}Th are above the world average value (^{238}U=35 Bq/kg, ^{232} Th = 30 Bq/kg) by UNSCEAR 2000.

Therefore, exploration for radioactive materials and REEs in the geological environment of Bangladesh would be a massive development in natural resource research. This would facilitate the potential economic utilization of mineral resource for the sustainable development of Bangladesh.

1.4 Granulometric Characterization of the Coastal Island Sediment from Char Fassion of Bhola District

F. Deeba, N.T. Dina, M.Z. Kabir and M.G. Rasul

The islands/chars of the southern coastal belt of Bangladesh are found to be prospective mineralization zones, considering the heavy mineral concentration. The studied Char Fassion of Bhola district is the largest island in the southern coastal part of Bangladesh, and it is crucial to carry out detailed study in the islands/chars of this coastal belt. In this study, 18 samples were collected of which 08 from Char Fasion and 10 from Char Kukri Mukri of the southern island of Bangladesh, under the special allocation fund of Ministry of Science and Technology (MoST) for the FY 2024-25. Grain size analysis was done to describe the grain size distribution of clastic sediments. About 500 grams samples were taken and sieved by Restch ASTM type Sieving machine for 30 minutes using 1mm, 0.5 mm, 0.25 mm, 0.125 mm, 0.063 mm and a pan. Finally, the fractionated part was weighed using analytical balance and the weight percentages of individual sieve fraction were calculated. Grain size distributions were processed according to Folk and Ward grain size statistics (e.g., mean, skewness, sorting, and kurtosis) through GRADISTAT software. The majority of the samples are confined toward the sand corner of the Sand Gravel-Mud ternary plot, and belong to sand, or muddy sand group. The average sand and mud concentration is about 89% and 11% respectively to the total composition of sediments. Graphic Mean, Standard deviation, Skewness and kurtosis values ranges from 1.05Φ to 2.76Φ, 0.54Φ to 2.02Φ, 0.10Φ and 0.87Φ and 1.006Φ to 6.555Φ respectively. The studied sand samples were dominantly fine grained, moderately sorted, very positively skewed and leptokurtic in nature, which were deposited under moderate to low energy conditions with dominant rolling and suspension processes.

1.5 Occurrence and Distribution of Economic Heavy Mineral Sands from Urir Char, North-east Island of Bay of Bengal, Bangladesh

N.T. Dina, F. Deeba, M.G. Rasul and S.C. Das

This geological field survey was carried out in the Urir Char sediments of northeastern Bangladesh under the Research and Development (R &D) fund of Ministry of Science and Technology (MoST) for the FY 2024-25. Textural and mineralogical properties of the Urir Char sediments were characterized to infer their depositional environment, distribution and mineralogical composition of heavy mineral. About 200 g of samples were sieved for 20 min on a sieving machine (BIOBASE, BK-TS200 Model) utilizing 1, 0.5, 0.25, 0.125, 0.063, 0.045 mm meshes and a pan. The results were analyzed for Folk and Ward (1957) grain size statistics (such as mean, median, sorting, skewness, and kurtosis) with GRADISTAT software. Heavy mineral (2.9 g/cm^3) separation was done to know the percentage of heavy fraction in the raw sand. For the study, Bromoform ($CHBr_3$) was used as a density separator to separate the heavy from the light minerals. The studied samples were fine to very fine-grained sand and moderately sorted to moderately well sorted, deposited in riverine environments. Average heavy mineral concentration was 3.28%.

1.6 Radioactive and Rare-Earth Element (REEs) Exploration at Bholaganj Quarry Area and Transported River Sediments in Sylhet and Sunamganj District, Bangladesh

T. Saha, M.Z. Kabir, F. Deeba, N.T. Dina, S.C. Das, and M. J. Uddin

A radiometric exploration of the season 2024-25 was conducted in February 2025 at Bholaganj—the country's largest stone quarry which is situated along the Dhalai River at Chhatak and the transboundary Chela River in Sunamganj District, northeastern Bangladesh. The primary objective of the survey was to investigate the presence of radioactive minerals and rare earth element (REE)-bearing sediments transported through these river systems. The survey employed a suite of field instruments including a portable gamma-ray spectrometer (Gamma Surveyor II), a Geiger counter (BR-9C series radiation detector), and an individual dose rate meter (FS2011) to assess in-situ radioactivity. A total of 19 sampling points were selected across the study area, located between latitudes 25.04683°N to 25.17241°N and longitudes 91.67277°E to 91.75397°E, as recorded by a Garmin ETREX 22X GPS device. The in-situ measurements quantified concentrations of uranium (U-238), thorium (Th-232), and potassium (K-40). In the Bholaganj quarry area, ^{238}U concentrations ranged from 2.98 to 7.06 ppm (average 4.57 ppm), ^{232}Th ranged from 5.60 to 11.95 ppm (average 8.63 ppm), and ^{40}K ranged from 0.69% to 1.35% (average 0.91%). These levels corresponded to gamma dose rates ranging from 30.48 to 61.31 nSv/h, with an average of 41.57 nSv/h. In contrast, the Chela River sediments showed higher radioactivity where U ranged from 4.29 to 13.38 ppm (average 10.26 ppm), Th from 7.42 to 24.64 ppm (average 18.75 ppm), and K from 0.87% to 2.18% (average 1.72%). Corresponding dose rates measured by the Gamma Surveyor ranged from 38.00 to 113.15 nSv/h, with an average of 89.21 nSv/h. Radon concentration data were also collected to evaluate potential health risks associated with environmental radiation exposure. Additionally, sediment samples were collected from all sites for laboratory analysis to determine grain size distribution, mineralogical composition, and elemental concentrations using various analytical techniques.

1.7 Application of Spectral Signature using Satellite Imagery in Heavy Mineral Prospects of the Southeast Coastal Zone of Bangladesh

T. Saha, M. Rajib and M. G. Rasul

Band ratioing and decorrelation stretch (DS) techniques applied to satellite imagery, particularly Landsat data, have proven effective in distinguishing lithological units and surface structural features in the southeast coastal region of Bangladesh. This area, especially the Cox's Bazar coast, is well-known for its abundant heavy mineral deposits where 15 of the 17 known deposits is located along this stretch—due to the continuous deposition and reworking of sediment that facilitates the concentration of heavy minerals. The present study utilized multi-temporal Landsat-9 OLI (Operational Land Imager) imagery, specifically chosen to be cloud- free during the winter season for optimal analysis. Imagery was downloaded from the USGS Global Visualization Viewer (GloVis, 2024), clipped to the area of interest, and projected using the Universal Transverse Mercator (UTM) coordinate system, Zone 46, with the WGS 84 datum. Image processing was performed using Erdas Imagine 11, while digitization and statistical analyses were conducted using ArcGIS 10 and DSAS 4.2 (Digital Shoreline Analysis System, an ArcGIS extension), respectively. For each image used, the maximum temperature of the acquisition day was considered to aid in interpreting thermal anomalies linked to mineralized zones. To ground-truth the remote sensing findings, a field survey was carried out during which 17 samples were collected from key locations. Portable gamma-ray spectrometry was used to detect naturally occurring radioactive anomalies, including concentrations of potassium (K), equivalent uranium (eU), and equivalent thorium (eTh), as well as their associated dose rates. The results showed that ^{238}U concentrations ranged from 7.84 to 370.17 ppm (average: 58.51 ppm), ^{232}Th from 11.49 to 460.21 ppm (average: 80.71 ppm), and ^{40}K from 0.49% to 7.32% (average: 1.25%). Corresponding dose rates ranged from 53.30 to 2340.92 nSv/h, with an average dose rate of 438.98 nSv/h. This integrative approach combining satellite remote sensing, thermal analysis, and in-situ radiometric measurements effectively delineates zones with elevated radioactivity in the coastal sedimentary environment of southeastern Bangladesh.

1.8 Experimental Study on the Development of Model Constructed Wetland

M. Rajib, T. Saha and M. G. Rasul

Constructed Wetlands (CWs) are artificial basins used to treat wastewater by imitating processes encountered in natural wetlands. CWs are also used as post-treatment facilities to improve the quality of treated water.

They can be designated as nature-based solutions (NbS) for the treating wastewater especially suitable for small communities and rural populations. Also, CWs can also be utilized in treatment of rainwater harvested from buildings which can be recharged into aquifers. Unfortunately, the idea of artificial or constructed wetland is still not popular in Bangladesh. The main components of constructed wetlands are wastewater, porous media, vegetation, and micro-organisms. The hydrodynamics of CWs for conventional wastewater treatment depend on two types of materials- the natural sediments of the area and the physical structure constructed surrounding it. Several experimental studies are being going on for the development of the model CWs at laboratory scale. Selection of substrate with various geomaterials, plant, contaminant, dimensions of the model, suitable tracers, etc. are considered for during the experiment. Besides, the geochemical behaviors of the contaminant through the geomaterials are also important to observe. For these purposes, two model wetlands were prepared at a scale of 18x12x15 inch for horizontal and vertical flow study where different geological materials will be utilized as substrate layers and submerged macrophytes as absorber plant. Sorption of some nuclides on various types of geomaterials is being tested. The results of using all these parameters will be compared to conclude on the ideal design of a constructed wetland that can be applicable in managing wastewater.

1.9 Porosity and Pore Size Distribution Study of VARIOUS Kinds of Hard Rocks of GDH-54, Bangladesh

M. Rajib and S.C. Das

As a part of geomaterial characterization for sorption study, different types of hard rocks were undergone Mercury Intrusion Porosimetry (MIP) study to determine the bulk density, porosity and pore size distribution (PSD). Several hard rock samples were collected from GDH-54, the geological drill hole by Geological Survey of Bangladesh at the northern part of Bangladesh. Six (6) samples of granite, granodiorite-gneiss, diorite, horlnblendites from different depth (ranging from 370-580 meters) were analyzed using MIP techniques. Bulk densities were found to be 2.71-2.92 g/ml, whereas porosity was determined as 0.78-4.63% in those hard rock samples. These parameters are significantly dependent on mineralogical composition and depth, however, no specific trends were observed from these small numbers of samples. Such small amounts of porosity in the hard rock samples make these geomaterials suitable for subsurface construction for any geological disposal facility. The distribution of various sizes of pores is another factor to consider while using these materials. Such PSD is responsible for adsorption of various contaminants at the disposal facility.

1.10 Earthquake Occurrence in and Around Bangladesh During last Two Decades

M. Rajib, M. Parveen*, P. Majumder* and M. G. Rasul

The Auxiliary Seismic Station (AS007) at Bariadhala (BRDH), Chattogram under the Comprehensive Test-Ban Treaty Organization (CTBTO) is operated to observe artificial earthquakes generating from nuclear tests in nearby regions. The seismometer data from IDC through V-sat communication can be utilized for natural earthquake monitoring as well as subsurface geological information. In Bangladesh, earthquake is considered as hidden disaster as the country is tectonically located at the junction of three tectonic plates (Eurasian, Burma and Indian plate). To understand the potential risks of the deadly catastrophe in Bangladesh, an earthquake distribution map was prepared using earthquake occurrence data of the last two decades. Earthquake data from January, 2001 to December 2024 were used from the United States Geological Survey (USGS) Earthquake Catalogue. In the present study, earthquakes of 3.5 or above magnitude were considered, which caused significant seismic activity in and around Bangladesh. During the above-mentioned period, more than 600 earthquakes were recorded, among them around 450 earthquakes are 3.5 to 4.4 magnitude, 170 are 4.5 to 5.4 magnitude, 13 are 5.5 to 6.4 magnitude and 1 more than 6.5 magnitude. The Eastern part of Bangladesh is identified as the earthquake prone area where higher magnitude earthquake frequency also increased in recent time.

*Department of Environmental Science and Disaster Management, Daffodil International University, Savar, Dhaka

1.11 Monitoring of the Earthquake Signals, Maintenance and Calibration of Auxiliary Seismic Station of CTBTO (AS-007, BRDH) and NDC

M. Rajib and M. G. Rasul

As designated National Data Center (NDC), Bangladesh Atomic Energy Commission carry out the operation, maintenance and calibration of the seismometer at AS007 with the continuous support from International

Data Centre (IDC) at CTBTO head office at Vienna. The seismometer data from IDC through V-sat communication are utilized for regional earthquake monitoring. The NDC staffs are responsible for analyzing the seismic signals by the NDX-in-a-Box software. For successful operation of the station and the NDC, regular maintenance of of all the components is conducted with the remote assistance from CTBTO. Specifically, the scheduled calibration of the seismometer was conducted during alternate window of October 2024. The results of BHZ, BHE and BHN channels were obtained within the 5% of accepted deviation. Later, the repair activities of the station building were carried out for subsidence and erosion prevention which halted the data receive and transmission for several months. After the renovation, all the components were brought into operation successfully.

1.12 Installation and Validation of the Capacity Building System at the National Data Center of CTBTO

M. Rajib, M. H. Rahman, M. G. Rasul, F. Islam, F. Deeba, M. F. Hossain and S.C. Das

An NDC Capacity Building System (CBS) equipment was donated to the Government of the People's Republic of Bangladesh, through NDC at BAEC by the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization. The donation (equipment and installed software) is a part of the Commission's ongoing technical assistance to Signatory States of the Comprehensive Nuclear-Test-Ban Treaty, with the financial assistance from the European Union (EU), thanks to the NDCs-4-All initiative of the Honorable Executive Secretary. It is intended to increase the capacity of the NDC to receive and process International Monitoring System (IMS) data and to ensure the ability to reproduce products of the International Data Centre (IDC), as well as to produce its own products which shall serve to further establish the active involvement of the People's Republic of Bangladesh in the Commission's verification regime. The CBS was successfully completed following hardware installation; configuration of the CBS server to receive data from many stations, including four IMS stations: BRDH,CMAR, LZDM and WRA; arranging two working places for NDC analysts; presentation of the installed CBS to NDC technical staff; demonstration on the use of NDC-in-a-Box components for NDC staff; installation of both SHI and RN NDC-in-a-Box Virtual Machine component on the workstations and hands-on training on using NDC-in-a-Box components. The data is being delivered to the CBS server in real-time mode from the IDC and from various SEEDlink servers available in the Internet.

1.13 Assessment of Rare Earth Elements, Th and U in Coal Fly Ash and Coal Seams of Bangladesh: An Integrated Radiometric and Geochemical Approach

S.C. Das and M. G. Rasul

This study includes the first combined geochemical and radiometric analysis of coal and coal fly ash from the Barapukuria coal basin in northwest Bangladesh. Finding the potential zone for U, Th, and geochemical analysis for REE prospecting involved a thorough core logging and radiometric survey (gamma spectrometry and radon survey). According to the radiometric study, the concentrations of Th and U are between 5.38 and 21.70 ppm, with an average of 10.96 ppm and 3.11 and 9.30 ppm, with an average of 6.9 ppm, respectively. These values are regarded as encouraging for these elements. The dose rate, U, Th, and K vertical distributions show a fluctuating pattern, with a rising tendency for U and Th with depth. Additionally, the average radon concentration (573.9 Bq/m3) ranges from 8 to 2181 Bq/m3. When the radiometric data from this study is compared to the geological databases of U and Th concentrations, it shows promising for both elements; nevertheless, more detailed investigation is needed to limit the possibility. Finaly, this study will support appropriate radiological hazard management in the Barapukuria coal mine region and provide a baseline record for Bangladesh's coal and coal fly ash prospects for REEs, Th and U.

1.14 Assessment of Carbon Emission from Terrestrial Forest Soil of Bangladesh: Implication for Climate Change

M. G. Rasul, S. C. Das, T. Saha and M. Moniruzzaman

This study involves research collaboration with Forum for Nuclear Cooperation in Asia (FNCA) to fulfil the objectives of the FNCA project. Climate change is coming faster than we thought and is one of the greatest threats we face today. Recent rapid rise in temperature is considered the main driver of climate change and the global warming is mainly caused by increasing carbon dioxide (CO_2) concentration in the atmosphere. Soil is the largest reservoir of carbon in terrestrial ecosystems, emitting CO_2 by microbial decomposition of soil organic carbon (SOC). This CO_2 flux is estimated to be about six times that of CO_2 flux due to the use of

fossil fuels. Therefore, even a small change in the CO_2 emission from soils due to global warming could have a significant impact on the atmospheric CO_2 concentration and the global carbon cycling, and thus the Earth's climate. A total of sixteen samples were collected from eight pre-selected terrestrial forest areas (Sakhipur, Tangail, Amtoli, Mymensingh, Gazipur Sadar, Gazipur, Lawachara and Madhabkunda, Moulavibazar, Hathazari and Satkanai, Chittagong) of Bangladesh for SOC analysis. A special sample technique contains twenty steps designated by FNCA, was used to collect the soil samples from surface to 20 cm depth with a 5 cm interval to make two composite samples from each location. From the collected samples, a total of eight samples, one sample from each location, were oven dried for one week at a constant temperature of 50°C for determination of soil properties. The rest of the samples were undergone incubation experiment where one batch kept in incubator at mean annual temperature (MAT) of each location and another batch at 10°C higher than the MAT for 24 hours. A total of ninety-six gas samples were collected in gas vial for SOC analysis. The samples were sent to Japan for SOC analysis using accelerated mass spectrometer. The mean annual temperature varies from 20.66°C to 32.69°C and mean annual pressure fluctuates from 2073.20 mm to 4533.72 mm. The climatic zone falls in tropical savanna to tropical monsoon and forest types are of sal and hill forest. The soil type includes nitrosols, cambisols and gleysols.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participant
1.	Third International Conference on Applications of Radiation Science and Technology (ICARST-2025), IAEA-CN-332; EVT2306594	7–11 April 2025	Vienna International Centre, Vienna,	01
2.	Second Research Coordination Meeting (RCM) on Development of radiometric methods to measure and study hydrodynamics of constructed wetlands (F22076)	1-4 April, 2025	Vienna, Austria	01
3.	3rd National Seminar on Geology for the Sustainable Development of Bangladesh, organized by, Dhaka,	9-10 May, 2024	CIRDAP and GSB, Dhaka, Bangladesh	01
4.	2nd research coordination meeting on the IAEA climate project for the safety of nuclear installations, Climate Change IAEA CRP, J72007	23-27 June, 2025	Vienna, Austria	01
5.	3rd National Seminar on Geology for the Sustainable Development of Bangladesh, organized by, Dhaka,	9-10 May, 2024	CIRDAP and GSB, Dhaka, Bangladesh	01
6.	3rd National Seminar on Geology for the Sustainable Development of Bangladesh, organized by, Dhaka,	9-10 May, 2024	CIRDAP and GSB, Dhaka, Bangladesh	01

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Mohammad Rajib	Development of Horizontal Flow Constructed Wetlands for Radiotracer Application	Third International Conference on Applications of Radiation Science and Technology (ICARST-2025), IAEA-CN-332; EVT2306594	IAEA	7–11 April 2025	Vienna International Centre, Vienna, Austria
	Nuclear Geoscience for Sustainable Development of Bangladesh	3rd National Seminar on Geology for the Sustainable Development of Bangladesh, organized by, Dhaka,	Geological Survey of Bangladesh	9-10 May, 2024	CIRDAP and GSB, Dhaka, Bangladesh
Dr. Md Moniruzzaman	The significance of considering hydro-meteorological risks for safe nuclear power planning	3rd National Seminar on Geology for the Sustainable Development of Bangladesh, organized by, Dhaka,	Geological Survey of Bangladesh	9-10 May, 2024	CIRDAP and GSB, Dhaka, Bangladesh

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Sudeb Chandra Das	Primordial Radionuclides in the Trans-boundary River Sediments across the Dauki Fault Belt at the North-east Bangladesh: Implication on U-Th Mineralization and Radiological Consequences	3rd National Seminar on Geology for the Sustainable Development of Bangladesh, organized by, Dhaka,	Geological Survey of Bangladesh	9-10 May, 2024	CIRDAP and GSB, Dhaka, Bangladesh

4. Project work: (ADP/FNCA/RCA/TC/ CRP/ S&T etc)

4.1 Forum for Nuclear Cooperation in Asia (FNCA)

Title: Climate Change (Evaluating the Carbon Emission from Forest Soils)

Lead Project Personnel: Dr. Md. Golam Rasul, Chief Geologist & Director as Project Leader

Funding Source: BAEC & Japan

Duration: 5 (Five) years.

Objective: To understand processes driving carbon cycling in terrestrial ecosystems (soils, in particular) and their sensitivity to rise in temperature, and to predict carbon cycle feedback to global warming.

4.2 Coordinated Research Proposal (CRP)

4.2.1 Title: Determination of radionuclide sorption capacity of constructed wetland materials for hydrodynamics study (CRP#26702)" under CRP Code F22076: Development of Radiometric Methods to measure and study hydrodynamics of constructed wetlands.

Lead Project Personnel: Dr. Mohammad Rajib, Principal Geologist as Chief Scientific Investigator (CSI)

Funding Source: International Atomic Energy Agency (IAEA)

Duration: 4 (four) years.

Objective: To investigate the adsorption properties of both geological and construction materials to assess the migration of contaminant using constructed wetlands (CWs).

4.2.2 Title: Implementation of geospatial techniques for flood and drought monitoring for the safety of nuclear installations

Lead Project Personnel: Dr. Md. Moniruzzaman, Principal Geologist as Chief Scientific Investigator (CSI)

Funding Source: International Atomic Energy Agency (IAEA)

Duration: 4 (four) years.

Objective: To quantify the probability of climate hazards particularly river flood against the safety of nuclear installations, achieving high level recommendations and train the junior scientists in the relevant field.

4.3 Special Research Grant (S&T)

4.3.1 Title: Determination and Distribution of Naturally Occurring Radioactive Materials (NORMs) and Rare Earth Elements (REEs) in the Coastal Environment of Bangladesh

Responsibility: Dr. Farah Deeba, Principal Geologist as Principal Investigator (PI)

Duration: 1 (one) year.

Funding Source: Research Contract Proposal on Capacity Utilization Program under Special Allocation for Science and Technology for the Financial Year, 2024-25 financed by Ministry of Science and Technology (MoST), Bangladesh.

Objective The main objectives of the proposed research are-

- To study the concentration of the natural radioactivity concentration and distribution of primordial radionuclides (^{226}Ra, ^{232}Th and ^{40}K) in the coastal sediment.

- Geochemical characterization and distribution of Rare Earth Elements (REEs).
- To evaluate the environmental radiological assessment due to Naturally Occurring Radioactive Materials (NORMs).

4.4 Research Grant (R&D)

4.4.1 Title: Occurrence and Distribution of Economic Heavy Mineral Sands from Urir Char, North-east Island of Bay of Bengal, Bangladesh

Lead Project Personnel: Nafisa Tamannaya Dina, Senior Geologist as Project Director (PD)

Duration: 1 (one) year.

Funding Source: Research and Development fund for the Financial Year, 2024-25 financed by Ministry of Science and Technology (MoST), Bangladesh.

Objective: Textural and mineralogical analysis of the studied sediments to infer their depositional environment, distribution and mineralogical composition of heavy mineral to find out the potentiality of new economic heavy mineralization zone.

4.4.2 Title: Assessment of Rare Earth Elements, Th and U in coal fly ash and coal seams of Bangladesh: An Integrated Radiometric and Geochemical Approach

Lead Project Personnel: Sudeb Chandra Das, Scientific Officer as Project Director (PD).

Duration: 1 (one) year.

Funding Source: Research and Development fund for the Financial Year, 2024-25 financed by Ministry of Science and Technology (MoST), Bangladesh.

Objective: To appraise the occurrence of Rare Earth Elements, Th and U in Coal Fly Ash and Coal Seams of Bangladesh and assess their economic potential.

4.4.3 Title: Application of Spectral Signature using Satellite Imagery in Heavy Mineral Prospects of the Southeast Coastal Zone of Bangladesh.

Lead Project Personnel: Tumpa Saha, Scientific Officer as Project Director (PD).

Duration: 1 (one) year.

Funding Source: Research and Development fund for the Financial Year, 2024-25 financed by Ministry of Science and Technology (MoST), Bangladesh.

Objective: To study of spectral signatures from multispectral satellite imagery and determine the presence of heavy mineral as well as their potential areas in the southeast coastal area of Bangladesh.

5. Memorandum of Understanding (MoU)

Research collaboration with the Institute of Water and Flood Management (IWFM), Bangladesh University of Engineering and Technology (BUET). For flood frequency analysis in river site of RNPP or other sites, we made a research collaboration agreement with IWFM, BUET for 04 year. September 2024. Follow up meeting was held in BUET on 16 October, 2024 where we visited IWFM lab and other research facilities. BAEC Team and BUET team attended online meeting attended for Coastal data familiarization and analysis, October 30, 2024.

A total of 08 research meetings with BUET team and 04 Visits (02 at BAEC, 02 at BUET) were performed with aim to share the project progress.

6. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Revenue income
1.	Geophysical Logging Service	11	345000/-
Total			345000/-

7. Repair & Maintenance, Renovation Works etc

7.1 Title: Repair work of the CTBTO station building for the prevention of erosion and subsidence

Description: The CTBTO-IMS auxiliary seismic station, AS007 (BRDH) is located atop a hill in Bariadhala, Sitakund, Chattogram. Erosion of the sediments and subsidence occurred on the flanks of the hills around the seismic vault and the building. As a consequence, the floor of the building began to subside, fractures and cracks opened at the bottom of the walls and in the external pavement in various places, creating a potential risk for the safety of the station. To resolve the problem, Bangladesh Atomic Energy Commission and the Provisional Technical Secretariat have agreed to reinforce the station infrastructure and its surroundings. Appropriate soil stabilization techniques were conducted to protect against hill erosion and subsidence, with funding jointly provided by the European Union (EU) and Bangladesh. After critical analysis of the subsidence rate, cracks and fractures formed, building condition, surrounding environment, soil formation, drainage system, and other factors in and around the station, partial dismantling of the existing structure and subsequent renovations were carried out. In addition, the plantation of suitable trees was carried out around the station building for soil erosion resistance. Renovation work enables the station to be operated and sustained over a long period of time.

7.2 Title: Installation and maintenance of laboratory equipment at GECCD laboratory

Description: In the GECCD laboratory, two incubator, one **laboratory** oven, one muffle furnace, one sieve shaker, one weight machine and a new desktop computer has been newly installed. New electric connection lines have been setup for the above instruments.

INSTITUTE OF NUCLEAR MEDICAL PHYSICS INSTITUTE (INMP), AERE

Globally, the number of cancer patients is rising at an alarming rate, and Bangladesh is not an exception. In reference to this context, the endeavor to create a specialized institute for cancer research was initiated in 2013 and reached its final form in 2018. Since then, the Institute of Nuclear Medical Physics has dedicated itself to offering both affordable conventional treatment options and state-of-the-art research on this sneaky illness. In addition, it is producing skilled nuclear medical physicists and technologists by providing appropriate academic and hands-on training.

At INMP, we currently offer radiation therapy for cancer using a top-notch LINAC equipment, as well as PET-CT and ultrasound technology for diagnosis. The united efforts of a scientist, engineer, and doctor at INMP have created a multidisciplinary research environment on several branches of a cancer treatment facility. Numerous research articles are published worldwide in journals with high impact factors each year. All year long, a number of research groups from several Bangladeshi universities collaborate on projects related to our service and research.

The prime objectives of this institute are

- To provide patient's services for cancer detection and radiotherapy through medical physics techniques.
- To build up skilled radiation oncologists, medical physicists and technologists through academic and specialized training.
- To establish a Cyclotron facility for the production of isotopes, MRI and Brachytherapy facility in order to clinical use and multidisciplinary research.

1. R&D Work(s)

Scientific Routine Activities : Quality Control (QC)

	QC	Times	By using
LINAC	Absolute Dosimetry	12	Water phantom
	Relative Dosimetry	04	3D water phantom
PET CT	Air Calibration of CT	56	-
	Short Tube	240	
	Image Quality of CT	56	CAT phantom
	PET QC	176	^{22}Na source

2 Repair & Maintenance , Renovation works etc.

INMP building is repairing under the "Establishment of Cyclotron and PET/CT at INMP, Savar project." The Clinac-iX LINAC machine is upgraded to Volumetric Arc Therapy (VMAT) under the same project.

3. Manpower Development

(Arranged Training program /Arranged Workshop /Arranged Seminar /Arranged Symposium /Arranged Conference)

Sl. no.	Title	Date	Place	No. of participant
1.	Scientific Seminar on "PET-CT & Cyclotron Facilities and Advanced Medical Physics Techniques"	03/02/2024	INMP, AERE	40
2.	Seminar on "Modern Cancer Treatment Methods, Prevention and Japan's Experience"	11/02/2025	INMP, AERE	50
3.	Seminar on "Development of an Integrated Dosimetric System for Quality Improvement of Cancer Treatment"	19/02/2025	INMP, AERE	40
4.	Seminar on "Integrated Dosimetry System Development: Enhancing Radiation therapy through IAEA Project INT-6066"	15/05/2025	Chattogram Maa-O-Shishu Hospital	40

4. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Md. Abul Hasnat	Preshipment Inspection of Cyclotron in USA	Siemens	5-10 July 2024	San Frabsisco
Rayhan Alam & Juwel Hosen	Preshipment Inspection of Cyclotron in Sw+eden	GE Healthcare	23-29 July 2024	Uppasala, Sweden
Priyanka Poddar	Regional Training Course II on Radiotherapy Patient Safety and QUATRO Audit Methodologies (TN-RA56107-2402779).	IAEA	26 - 30 May 2025	Bangkok, Thailand
Dr. M Rafiqul Islam	Regional Training Course on Comprehensive Audits in Radiotherapy Using IAEA QUATRO Methodology. (TN-RAS6107-2402447)	IAEA	29 Sep 2024 to 5 Oct 2024	Denpasar, Indonesia
Dr. M Rafiqul Islam	Follow-up Research Under JASSO Fellowship	Japan	14 Otc 2024 to 11 Jan 2025	Sendai, Japan

5. Collaboration Work/MoU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house Project/ Universities, etc.)

Dr. Rafiqul Islam is the counterpart of the following IAEA INT project-

IAEA interregional project INT 6066, titled "Supporting Countries to Increase Access to Affordable, Equitable, Effective and Sustainable Radiation Medicine Services within a Comprehensive Cancer Control System"

6. Service Rendered

Sl. No.	Name of service provided	Number/quantity of sample/patient/service	Revenue income
1.	PET Scan	445	10765000/-
2.	Radiotherapy	287	4427320/-
3.	USG	44	11950/-
		Total =	1,52,04,270/-

BEACH SAND MINERALS EXPLOITATION CENTRE (BSMEC), COX'S BAZAR

Objectives

- Geological exploration for economic placer minerals in the coastal and fluvial depositional environment of Bangladesh.
- Routine laboratory and plant processing of placer sands; processing of separation of economic minerals like Magnetite, ilmenite, zircon, garnet, rutile, silica from bulk sand.
- Comparative study on the occurrence, distribution, mineral composition, and characteristics of heavy and radioactive minerals from the coastal and fluvial environment of Bangladesh.
- Determining radionuclides and trace elements in the sediments and seawater of the southeast coast.
- Study on marine and coastal environmental radioactivity.
- Laboratory enrichment of radioactive mineral (i.e., Monazite) and quantification of radioactivity.
- Providing research support and industrial training to academic and professional organizations.
- To understand the fundamental principles and laws that govern the universe, to unify existing theories into a coherent framework, and to explore the underlying nature of space, time, matter, and energy.

1. Research & Development Work(s)

1.1. Possible Shortcomings of the Foundation of General Relativity and the Possibility of a Theory of Gravity Without Spacetime as the Dynamical Variable of Gravity

S. J. Hassan

The objective of this study is to investigate possible shortcomings of general relativity and to understand whether a theory of gravity can be formulated conceptually different from general relativity. It has been found that there are convincing arguments to consider that general relativity is foundationally flawed. General relativity explains gravity in terms of the curvature of a four-dimensional spacetime, as introduced in special relativity, due to the presence of energy-momentum, the foundation of this theory. However, it cannot explain why spacetime, arguably not a physical or material item but rather much like a mathematical construct used to represent an inertial frame-independent energy-momentum relationship, should become curved due to the presence of energy-momentum. However, because gravity is not a force in this theory, it arguably cannot properly explain the pull of gravity. Additionally, general relativity is not a quantum mechanical theory, and there is no known realistic quantum theory of gravity yet. There are foundational difficulties with general relativity while quantizing it. It predicts various singularities and even violates the energy and information conservation laws below the event horizon of black holes, along with some other conceptual fuzzinesses. Most of these problems arguably emerge from the foundation of general relativity. The possibility of an alternative way to formulate a theory of gravity in terms of statements about energy, rather than the curvature of spacetime, has also been studied qualitatively, where spacetime does not exist as a dynamical variable altogether, which may eventually lead to a quantum theory of gravity.

1.2. Probing into the Nature of Spacetime at the Possible Deepest Level with our Current Understanding of the Universe

S. J. Hassan

The objective of this study is to investigate the nature of spacetime at the possible deepest level according to our current understanding of the universe. It has been found that time dilation is a statement about the increased velocity of a system relative to an observer, which is related to the increase in the system's momentum. The increase in momentum is associated with the rise in the system's total energy, which is the origin of the unification of space and time into spacetime. From this argument, it should be obvious that we represent the energy-momentum relationship in terms of spacetime for an inertial observer, with nothing to do with higher dimensions. By incorporating the postulates of special relativity, an energy-momentum relationship that is independent of the inertial observers can be derived. So, spacetime is, in effect, rather much like an abstract mathematical construct, which only captures the experimental fact that the speed of light in the vacuum is inertial frame independent.

According to special relativity, massless particles do not sense time at all. We know that massive particles can become massless particles and vice versa under suitable conditions. Special relativity and quantum field theory do not provide insight into the origin of these transitions. So, it is not surprising that there may be something missing in the spacetime concept in special relativity as well. Time may not be an intrinsic part of the physical world. A better understanding of the Higgs mechanism should provide better insight into these transitions.

2. Repair, Maintenance, and Renovation Work(s)

Maintenance works on the pilot plant, quality control lab, and other labs at this center are carried out regularly.

3. Others

3.1 Radiation Monitoring

Raw and processed sands are stored in various locations in the center, many of which contain radioactive materials. The radiation levels of all these sands are monitored regularly.

ATOMIC ENERGY CENTRE (AEC), CHATTOGRAM

Objectives

- Ensure safety of food and environment from radioactive contamination;
- Monitoring and assessing of pollution level in marine and coastal environment due to nuclear activitie or radioactive waste disposal;
- Promote research and development activities on environmental issues;
- Expand cooperation with other scientific organizations, universities, private and public sectors through mutual exchange of educational programs, training, technical cooperation and expert services;
- Develop human resources in the field of nuclear science and technology.

1. R & D Work(s)

1.1 Assessment of Natural Radioactivity Concentrationand Concomitant Health Hazard to the Inhabitants of Sylhet Division

AKM S. I. Bhuian, M. Debnath, S. R. Talukdar and S. Hossain

Bangladesh Atomic Energy Commission assigned the task of collecting surface soil samples from across the Sylhet Division prior to the commissioning of the Rooppur Nuclear Power Plant (RNPP). A total of 60 samples, taken from a depth of 0–5 cm, were collected from urban, rural, and forested areas of Habiganj, Moulvibazar, and Sylhet districts. The samples were air-dried, homogenized, and sieved before being analyzed using gamma spectrometry with High-Purity Germanium (HPGe) detectors to determine the activity concentrations of naturally occurring radionuclides. The resulting data will offer a comprehensive assessment of natural radioactivity levels in the region's soils, evaluate potential radiation exposure risks, and support the development of evidence-based public health and environmental protection policies. Ultimately, the study

will provide essential baseline information for long-term environmental monitoring and radiological risk management in the Sylhet Division.

1.2 Assessment of Natural Radioactivity and Heavy Metal Concentrations with Health Hazard on Inhabitants of Chattogram Division

AKM S. I. Bhuian, M. Debnath, S. R. Talukdar and S. Hossain

Under the 'Development of Countrywide background gamma radiation mapping baseline database' initiative of Bangladesh Atomic Energy Commission - 90 surface soil samples (a depth of 0–5 cm) were collected from different locations of Chattogram, Cox's Bazar, Rangamati and Bandarban districts, which represent urban, rural, and hilly areas. Surface water samples were also collected from each of the locations. The soil samples were air-dried, homogenized, sieved, and analyzed using High-Purity Germanium (HPGe) detectors. Radiological hazard parameters—including absorbed dose rate, annual effective dose, radium equivalent activity, and external hazard index—were calculated and compared to international safety standards. Geographic Information System (GIS) mapping and statistical modelling were performed to visualize spatial distribution patterns. Additionally, selected soil and water samples were chemically treated and analyzed for heavy metal concentrations using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). This study will provide essential baseline data on natural radioactivity and heavy metal pollution, contributing to environmental monitoring, public health protection, and regional policy development.

1.3 RFID-Based Identification and Tracking System for Safeguarding Radioactive Sources at RTML Laboratory of AECC

M. Debnath and R. Roy

The proposed project aims to enhance the safety and accountability of radioactive source management through real-time, automated tracking. Following the completion of a literature review and the development of circuit schematics using Proteus software, preparations have been made to establish an electronic laboratory for system prototyping. A digital oscilloscope has been borrowed for preliminary testing, and a purchase order has been placed for a signal generator to facilitate circuit testing and calibration. Additional studies have been conducted, and the procurement of remaining materials is underway. With the laboratory setup nearing completion, the project is set to transition into the prototyping and testing phase, marking a significant step toward implementing a secure and efficient RFID-based tracking system at RTML.

1.4 Accreditation of RTML for Detection and Quantification of Cs-137 in Milk Powder by Direct Gamma Counting Method

M. Debnath, N. S. Resma, S. R. Talukdar, AKM S. I. Bhuian, and S. Hossain

The project for ISO/IEC 17025 accreditation of the Radioactivity Testing and Monitoring Laboratory (RTML) at the Atomic Energy Centre, Chattogram (AECC), was launched to enable the detection and quantification of Cs-137 in milk powder using the direct gamma counting method. Initial progress included the completion of all necessary documentation, staff training, and the procurement of Certified Reference Materials (CRM). A pre-assessment by the Bangladesh Accreditation Board (BAB) confirmed the facility's satisfactory level of preparation.

In the middle of journey, the accreditation process was interrupted due to the malfunction of two High-Purity Germanium (HPGe) detectors, which are critical for accurate gamma spectrometric analysis. However AECC in formed the situation to the BAEC. In response, recently a new HPGe detector system has been provided from the BAEC. Installation of the new system is currently underway. Once installation is complete, method validation will follow. AECC will then request BAB to conduct the final audit, paving the way for completion of the accreditation process.

1.5 Monitoring of the Marine Environment for Enhanced Understanding of the Abundance and Impact of Marine Plastic Pollution in Bay of Bengal under IAEA/nonRCA- RAS7038 project

S. Hossain,N. S. Resma, M. Debnath,N. Khatun,R. Roy and ARM Tareq

The International Atomic Energy Agency (IAEA) has initiated the NUTEC Plastics program to support Member States in harnessing nuclear and isotopic techniques to combat plastic pollution. Within this initiative, Technical Cooperation Project RAS7038 advances a downstream strategy to assess marine micro-

plastic contamination across Asia and the Pacific. Its objectives include establishing baseline surveys, characterizing spatial and temporal pollution trends, and employing reliable, cost effective analytical methods to trace the origin, transport, fate, and ecological impact of marine plastics. Under this project, Micro-plastic analysis laboratory of AECC has completed two phases of systematic sampling to assess the temporal and seasonal variation across the study area in Cox's Bazar Sea Beach and Sonadia Island, Cox's Bazar. Total 24 beach sand samples (with 5 replicas) from Cox's Bazar and 12 sea water samples (with 2 replicas) from Bay of Bengal have been collected and processed in strict accordance with the IAEA micro-plastic analysis protocol. So far, Physical identification of the possible micro-plastic (PMP) of the samples of first phase samples (12 beach sand and 6 sea water) which were collected during March, 2024 have been done using Stereo microscope (Zeiss Stemi 305). Initial physical identification revealed that, among the identified PMP, fibers are the dominant type of micro-plastic which comprised approximately 95 % in all the sand and sea water samples with the abundance ranking: fiber>fragment>film>bead. The processing of the samples of second phase which were collected during February, 2025 is going on following the same protocol. Subsequent polymer characterization by Fourier Transform Infrared Spectroscopy (FTIR) is planned to elucidate polymer type and source for further analysis of the transport pathways and environmental persistence.

1.6 Occurrence and Distribution of Micro-plastic in the Northern Bay of Bengal: A Case Study on the Coast of Sonadia Island

S. Hossain,N. S. ResmaR. Royand ARM Tareq

Micro-plastic (MP) pollution has emerged as a critical global environmental concern due to its persistence and potential ecological risks in both terrestrial and marine ecosystems. Although MPs have been widely documented in beaches, rivers, and deep-sea sediments, island ecosystems—particularly in the Northern Bay of Bengal—remain understudied. This study investigates the occurrence, distribution, and ecological risk of MPs in Sonadia Island's beach sand, addressing a key research gap and providing essential data to support conservation efforts in vulnerable coastal habitats. Beach sand samples were collected from five high-tideline stations on Sonadia Island, with MPs isolated via density separation, filtration, and stereomicroscopic analysis. The mean concentration of possible microplastics (PMPs) was 17.68 ± 7.88 particles/kg, lower than many global sandy beaches but indicative of notable contamination. Fibers dominated (74%), followed by fragments (18%), films (7%), and foams (1%), with 52% of MPs sized 0.3–1 mm. Transparent particles were most abundant (72%), though colored MPs (red, blue, green, black, white) were also present. Elevated fiber proportions suggest origins from fishing gear and industrial discharge. Contamination Factor (CF) and Pollution Load Index (PLI) values >1 confirmed moderate to considerable pollution levels across sampling sites.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participants
1.	International Conference on Enhancing Nuclear Safety and Security Through Technical and Scientific Support Organizations (TSOs): Challenges and Opportunities in a Rapidly Changing World	2-6 December, 2024	Vienna, Austria	01
2.	Training Course on Advanced Gamma Ray Spectrometry	17-21 March 2025	Fukushima, Japan	02
3.	Research Coordination Meeting on Coordinated Research Project (IAEA Research Contract No: 26540)	14-18 April 2025	Hanoi, Vietnam	01

3. Organize Training/Fellowship/Workshop/Meeting/Seminar

Sl. no.	Title of the program	Date	Place	No. of participants
1.	অগ্নি দুর্ঘটনা মোকাবিলা বিষয়ক প্রশিক্ষণ	30/10/24	AECC	40
2.	জাতীয় শুদ্ধাচার কৌশল কর্মপরিকল্পনা বাস্তবায়ন সম্পর্কিত প্রশিক্ষণ	30/09/24	AECC	20
3.	Department of Physics, University of Chittagong-এর শিক্ষার্থীদের অংশগ্রহণে বিজ্ঞান বিষয়ক সেমিনার	05/05/25	AECC	98
4.	Cider International School, Chattogram-এর শিক্ষার্থীদের অংশগ্রহণে বিজ্ঞান বিষয়ক সেমিনার	30/04/25	AECC	55
5.	Department of Physics, Rangamati Govt. College, Rangamati-এর শিক্ষার্থীদের অংশগ্রহণে বিজ্ঞান বিষয়ক সেমিনার	19/02/25	AECC	45

4. Oral/Poster Presentation in Seminar/Symposium/Conference/Workshop (National/International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Shahadat Hossain	Facilitation of Safe And Secure Trade Using Trace Alarm Assessment Tool In Chattogram Sea Port: A Case Study Of Bangladesh	International Conference on Enhancing Nuclear Safety and Security Through Technical and Scientific Support Organizations (TSOs): Challenges and Opportunities in a Rapidly Changing World	IAEA	2-6 December, 2024	Vienna, Austria
Dr. AKM Saiful Islam Bhuian	Evaluation and Improvement of Efficiency of the RPMs Alarm Assessment Process to Ensure Safe and Secure Trade through Chittagong Sea Port, Bangladesh	Research Coordination Meeting on Coordinated Research Project	IAEA	14/08/25 - 18/08/25	Vietnam
Chowdhury Kaiser Mahmud	Atomic Absorption Spectrometry: An overview	Department of Physics, University of Chittagong-এর শিক্ষার্থীদের অংশগ্রহণে বিজ্ঞান বিষয়ক সেমিনার	AECC	19/02/25	AECC
Manish Debnath	RTML: An overview	Department of Physics, University of Chittagong-এর শিক্ষার্থীদের অংশগ্রহণে বিজ্ঞান বিষয়ক সেমিনার	AECC	19/02/25	AECC
Nighat Sultana Resma	An introduction of micro-plastic analysis Lab	Department of Physics, University of Chittagong-এর শিক্ষার্থীদের অংশগ্রহণে বিজ্ঞান বিষয়ক সেমিনার	AECC	19/02/25	AECC

5. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	No. of participants
1.	Stakeholder meeting with Bangladesh Trade Facilitation (BTF)	18/12/24	AECC	15
2.	কর্মপরিকল্পনা২০২৪-২০২৫ বাস্তবায়নের লক্ষ্যে সেবাপ্রদান প্রতিশ্রুতি বিষয়ক স্টেকহোল্ডারদের সভা	25/09/24	AECC	20

6. Project Work (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house Project/Universities, etc.)

6.1 Program Title: Evaluation and Improvement of Efficiency of the RPMs Alarm Assessment Process to Ensure Safe and Secure Trade through Chittagong Sea Port, Bangladesh

Program Type:IAEA –CRPJO2015(Contract No 26540)

6.2 Program Title: Monitoring of the Marine Environment for enhanced understanding of the abundance and impact of Marine Micro-Plastic Pollution in the Bay of Bengal.

Program Type: IAEA-Non RCA (RAS7038)

6.3 Program Title: Strengthening Ocean Health for Sustainable Development: A Global Approach Using Nuclear and Isotopic Techniques

Program Type: IAEA-Inter Regional Project (INT7022)

7. Service Rendered

Sl no.	Name of the service provided		Number/quantity of sample/ patient/service	Revenue income
1	Radioactivity testing of imported foods, allied materials & survey of miscellaneous materials	July	1199	2,45,97,211.00
		August	1026	2,30,90,375.00
		September	1875	2,90,36,529.00
		October	2091	3,07,38,712.00
		November	1678	2,49,33,364.00
		December	1272	4,11,59,718.00
		January	1851	3,88,17,516.00
		February	2091	4,51,70,899.00
		March	2514	4,42,05,739.00
		April	1885	3,43,52,971.00
		May	1807	3,23,35,050.00
		June	1311	2,80,64,338.00
		Total	20600	28,40,35,409.00

RADIOACTIVITY TESTING AND MONITORING LABORATORY (RTML), MONGLA

Objective

Radioactivity testing of foods and other allied materials imported & exported through Mongla sea-port at Mongla, Bagerhat, Bhomra land-port in Satkhira, Benapole land-port and Jashore airport. Radioactive materials safety service to the port authority and customs department while inspection of special consignments that contain suspected radioactive materials in it. Activities like nuclear security, safeguard and controlling illegal traffic of radioactive materials in the region. Radioactivity analysis of environmental samples, harmful contaminated objects, radioactive material or any other sample requested for nuclear forensic investigation. Radiation protection and safety service during transport of radioactive materials imported or exported through Mongla port to assure safe handling of radioactive materials to and from the region. Radiation protection and safety service to the public, hospitals, local industries, universities or research institutes and exploration companies etc.

1. R&D Work(s)

1.1 Assessment of Radiation dose and Heavy Metal Concentration in the Soil of Sundarbans Eco Tourism Center, Bangladesh and its Health Effects on Human

Mst. Shafaly Khatun, Mithun Chandra Bhakto, Sadia Afrin Swarna, Goshtha Gopal Biswas.

The radiation doses and heavy metal concentrations of ten soil samples from different locations in Sundarbans were investigated to evaluate the environmental radioactivity of heavy metal toxicity and the health hazards

associated with it. A High Purity Germanium (HPGe) detector and an atomic Aborption Spectrometry (AAS) were used for this purpose. The activity concentration of 40K of the samples varied from 710 to 820 with an average value of 766 Bq/Kg. the activity concentration of 232Th of the samples varied from 55 Bq/Kg to 63 Bq/Kg with an average value of 59 Bq/Kg. The activity concentration of 226Ra of the samples varied from 38 to 48 Bq/Kg with an average value of 43.5 Bq/Kg. So, the activity concentration of all the radionuclides was found higher than the global average value. the mean radium equivalent(Raeq) and outdoor radiation hazard index (Hex) for the area under study were determined as 186.75 Bq/Kg and 0.51 respectively which are lower than the recommended value by UNSCEAR, 1993 and 2000. The total absorbed dose rate due to three primordial radionuclides lies in the range from 82.51 to 93.53 nGy/h with a mean of 88.63 nGy/h which yields the mean annual effective dose of 108.70 μSv/y which is within the permissible value. The mean concentration of lead (Pb) was found in the traced amount (0.00099mg/kg), and cadmium (Cd) is absent here. So, all of these investigated parameters of data indicate that there is no radiological and heavy metal toxicity risk from the soil of Sundarbans Eco Tourism Centre

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participation
1.	Interregional Training Course on External Support and Technical Support Organizations (TSOs) for a New Nuclear Power Program	04-08, November, 2024	Moscow, Russian Federation	01

3. Service Rendered

Sl. no.	Number/quantity of sample/patient/service	Revenue income (if any)
1.	180	35,51,757.69/-
	Total	35,51,757.69/-

II. BIO-SCIENCES

INSTITUTE OF FOOD AND RADIATION BIOLOGY (IFRB), AERE, SAVAR

Agrochemical and Environmental Research Unit, IFRB

Objective

Agrochemical and Environmental Research Division (AERD) is involved in research relating to analysis of elemental and pesticide residues and their impact on the environment and human health. The laboratory provides facilities to different Universities, Government and Non-government organizations for a long time by analyzing the presence of heavy metals, trace elements and pesticides residues in food and environmental samples.

The objectives are:

- To know the present status of residues of pesticides, heavy metals and trace elements in food and environment.
- To generate and provide pesticide residue data for fixing National Acceptable Daily Intake (ADI) and Maximum Residue Limit (MRL) of Bangladesh.
- To promote safe and effective use of pesticides for safe guarding human health and environment.

1. R&D Work(s)

1.1 Heavy Metal Contents of Suckermouth Catfish *(Hypostomus plecostomus)* from Five Different Rivers in Bangladesh

M.Nesha, Z.Fardous, M.A.Rahman and M.A.Z.Chowdhury

The sucker mouth catfish *(Hypostomus plecostomus),* an invasive species in Bangladesh originally introduced as an aquarium fish, has now spread across most of the country, posing ecological threats while also offering

potential economic and nutritional benefits. This study evaluates its heavy metal contamination from five major rivers in Bangladesh: Meghna, Buriganga, Dhaleswari, Shitalakshya, and Turag. Heavy metal analysis detected elevated cadmium (0.0521 ± 0.003 kg/mg) and lead (0.1125 ± 0.056 kg/mg) levels in Turag river fish, exceeding WHO/FAO safety limits. A strong correlation between Cd and Pb (0.969) suggested common pollution sources. Risk assessments, including estimated daily intake (EDI), target hazard quotient (THQ), and hazard index (HI), indicated no immediate noncarcinogenic risks (HI < 1). However, long-term exposure to Pb and Cd in Turag and Dhaleswari fish posed potential health concerns. Carcinogenic risk (incremental lifetime cancer risk, ILCR) remained within acceptable limits, though the Turag river samples showed the highest risk (0.000795). Significant heavy metal contamination in samples from Turag and Dhaleswari rivers suggests they are unsuitable for human consumption while Shitalakshya and Meghna rivers appear safe for human consumption.

1.2 Analysis the Pearson Correlation for Heavy Metals Between Soil and Tobacco Plant Parts from Baraigram, Natore in Bangladesh

M.A. Rahman , M. Nesha, Z. Fardous, and M.A.Z. Chowdhury

Heavy metal uptake and distribution within plants depend on several factors, including soil availability, plant physiology, and metal mobility. To further understand the relationships between different heavy metals, a correlation analysis was conducted between heavy metal concentrations in plant tissues (roots, shoots, and leaves) and their respective concentrations in soil samples from Tobacco. The Pearson correlation analysis reveals that Manganese (Mn) exhibits the strongest correlation between shoots and leaves (0.85), indicating a highly synchronised accumulation pattern between these plant parts. Similarly, Chromium (Cr) and Iron (Fe) also show strong correlations, particularly between shoots and leaves (0.82 and 0.81, respectively), suggesting efficient translocation and similar distribution trends within the aerial parts of the tobacco plant. The Pearson correlation matrix in the relationship between heavy metal concentrations in soil and different parts of the tobacco plant (roots, shoots, and leaves). Iron (Fe) has the highest soil-root correlation (0.83), followed by Chromium (Cr) and Manganese (Mn) (0.81 and 0.79, respectively), indicating strong metal uptake in roots. In contrast, Copper (Cu) and Cadmium (Cd) show the weakest soil-leaf correlations (0.55 and 0.58), suggesting limited translocation to the upper plant parts. Overall, soil-root correlations are the highest, while correlations decrease progressively from roots to shoots and further to leaves, highlighting restricted metal movement within the plant.

Food Safety and Quality Analysis Division, IFRB

Objective

Food Safety and Quality Analysis Division (FSQAD) is involved in carrying out research on food quality and safety, hazard identification, risk assessment, food processing, preservation and development of convenience food. The division also emphasizes on food authentication through molecular and other analytical techniques. The main objectives of FSQAD are focused on food irradiation processing, reducing post-harvest losses, combating food fraud, detection of hazardous factors (adulterants and contaminants), and exploring nutritional and functional quality through nuclear and complementary techniques to enhance food safety and security for consumers improving public health.

1. R&D Work(s)

1.1 Ginger (*Zingiber officinale*), Turmeric (*Curcuma longa*) and Red Silk Cotton (*Bombax ceiba*) Flowers: Exploring Their Phyto-Physicochemical and Nutritional Potential

M. Shahjalal, M. A. Rahman, A. Hossain, M. Islam, M. A. Khatun, M. K. Munshi, R. Huque and M. S. Hussain

Edible flowers are gaining global popularity owing to their nutritional, aesthetic, and potential therapeutic benefits. The present study focused on the nutritional quality and phyto-physicochemical potential of flowers from three plant varieties: ginger, turmeric, and red silk cotton. The nutritional quality and physicochemical properties were measured according to the standard AOAC method. Total phenolic compounds (TPC), β-carotene, and ascorbic acid content were estimated by colorimetric assay. The obtained results indicate that red silk cotton flowers have the highest protein content (3.09%), crude fiber (1.76%), total carbohydrates

(6.17%), energy content (50.89 kcal/100g), Ca (139.06 mg/100g), P (85.52 mg/100g), and Fe (17.83 mg/100g) content compared to ginger and turmeric flowers on a fresh basis. The highest TPC (367.28 mg/100 g) of red silk cotton flower represents a greater antioxidant potential, offering therapeutic benefits. Among the three flower types, ginger flowers had the highest β-carotene content (45.67 mg/100g), and turmeric flowers had the highest vitamin C content (116.86 mg/100g), which may influence consumers' dietary choices. The red silk cotton flowers have an advantageous nutritional and phyto-physicochemical profile among the three studied flowers that can create exciting possibilities for therapeutic and culinary applications.

1.2 Detection of Antibiotic Resistance Gene in *Salmonella* spp. Isolated from Tilapia Fish (*Oreochromis niloticus*)

A. Hossain, M. Islam, M. A. Rahman, M. Shahjalal, M. K. Munshi and M. S. Hussain

This study aims to detect antibiotic resistance genes in *Salmonella* strains isolated from tilapia fish (*Oreochromis niloticus*), a widely consumed fish species. Tilapia fish samples were collected from local markets and processed to isolate *Salmonella* spp. using selective enrichment media with spread plate technique. The bacterial isolates were identified by various biochemical tests and confirmed by PCR technique. DNA was extracted from confirmed *Salmonella* strains, and PCR was conducted to identify the presence of specific antibiotic-resistance genes. The PCR products were analyzed using gel electrophoresis, and the presence of resistance genes was confirmed by comparison to known antibiotics markers. The study revealed that a significant proportion of *Salmonella* spp. isolates from tilapia fish exhibited resistance to two selected antibiotics, as tetracycline and sulfonamides, with several isolates other harboring resistance genes. This indicates the potential risk of antibiotic-resistant *Salmonella* strain in tilapia fish, which could pose a public health threat, especially if transmission occurs through contaminated fish products. The findings highlight the importance of monitoring antibiotic resistance in foodborne pathogens and emphasize the need for improved antimicrobial stewardship in aquaculture practices to reduce the spread of resistant strains.

1.3 Effects of Different Poultry Feeds on Meat Quality of Boiler Chicken

M. Islam, M. A. Khatun, M. A. Rahman, M. Shahjalal, A. Hossain, M. S. Hussain and M. K. Munshi

The body composition of broiler chickens is largely influenced by the quality of their diet. In addition to conventional poultry feed (PF), the larvae of the black soldier fly (BSF) have emerged as a promising alternative due to their high content of protein, fat, vitamins, and minerals. This study aimed to evaluate the effects of PF and BSF-based diets on the nutritional quality of broiler chicken meat, focusing on key parameters such as moisture, protein, fat, and ash content. The results indicated that chickens fed a BSF-based diet produced meat with significantly ($P < 0.05$)higher protein content (29.14 ± 0.30%) compared to those fed a conventional PF diet (16.92 ± 1.20%). Additionally, the BSF-fed chicken meat showed lower moisture (71.41 ± 0.16%) and fat (2.82 ± 0.60%) content than that of the PF group, with these differences also being statistically significant ($P < 0.05$). Energy levels were found to be higher in the BSF group, and mineral analysis revealed significantly elevated levels of calcium (Ca), phosphorus (P), and iron (Fe) in the meat from BSF-fed chickens. Overall, the findings suggest that incorporating BSF larvae into poultry diets can enhance the nutritional profile of broiler chicken meat, making it a viable and beneficial alternative to conventional feed.

1.4 Study on Phytochemical Properties in Seaweeds Available in the Bay of Bengal

M. A. Khatun, M. Islam, M. A. Rahman, M. Shahjalal, A. Hossain, M. K. Munshi and M. S. Hussain

The seaweed samples used were of two genera: *Gracilaria sp.* (red algae) and *Ulva sp.* (green algae). Bioactive properties, including phenolic and flavonoid contents, antioxidant activities and beta carotene, were assessed using standard methods. The phenolic content of the samples ranged from 5.02mg GAE/g to 144.78mg GAE/g, with significant variation observed between the red algae (*Gracilaria sp.*) and green algae (*Ulva sp.*). The antioxidant potential was evaluated through DPPH radical scavenging assays, which revealed significant activity, particularly in *Ulva sp.* due to having the higher flavonoid content. This strong antioxidant activity showed a strong correlation with total phenolic and flavonoid contents. The beta carotene content was also found as higher in red algae compared to the green type.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participants
1.	FNCA project: Combating Food Fraud using Nuclear Technology (CFF)	14 - 16 October, 2024	Sydney, Australia	02
2.	IAEA RAS 6103: Application of the Indicator Amino Acid Oxidation (IAAO) Method to assess Essential Amino Acid Metabolic Availability from Foods	16 - 20 June, 2025	Toronto, Canada	01

2.2 Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participants
1.	Organizational Attachment Training for the Diploma in Engineering (Food Technology)	30-06-2024 to 30-09-2024	FSQAD, IFRB	05

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral / poster presentation	Title of the event	Organizer	Date	Place
M. Shahjalal	Ginger (*Zingiber officinale*), Turmeric (*Curcuma longa*) and Red Silk Cotton (*Bombax ceiba*) Flowers: Exploring Their Phyto-physicochemical and Nutritional Potential	Annual Plant Tissue Culture & Biotechnology Conference 2024	Bangladesh Association for Plant Tissue Culture & Biotechnology	1st Februay 2025	Sher-e-Bangla Agricultural University, Dhaka

4. Project Work (ADP/ FNCA/ RCA/ TC/ CRP/ S&T etc)

4.1 Forum for Nuclear Cooperation in Asia (FNCA)

Title: Combating Food Fraud using Nuclear Technology

Period: 2023-2025

This project seeks to create an affordable food provenance technology platform using nuclear technology for FNCA member countries, with the goal of reducing fraud in the supply chain. Additionally, it aims to develop a regional fingerprint database to combat fraudulent activities and support business and trade among FNCA member nations. The food commodities of interest are seafood (specifically black tiger prawns) and agricultural products (spices). The analysis focuses on trace elemental analysis, stable isotope analysis, and detecting adulteration. Samples of black tiger prawns have been collected from both wild and farmed sources. Further research is ongoing

4.2 IAEA RCA Project (RAS 6103)

Title: Applying Stable Isotope Techniques to Assess Protein Quality of Sustainable Food Sources for the Improvement of Maternal and Child Nutrition

Period: 2022-2025

In the Asia-Pacific region, plant proteins are the primary protein source, with cereals like wheat, rice, and maize being predominant. Plant proteins are often perceived as deficient in essential amino acids, particularly lysine and tryptophan. However, this may be less significant when consuming a variety of plant-based proteins. New analytical methods are needed to evaluate dietary amino acid and protein quality to update

dietary protein requirements for infants, children, and women of reproductive age. In Bangladesh, lentils have been selected for study, focusing on the amino acid methionine using the IAAO method, with further research ongoing.

4.3 IAEA RCA Project (RAS 1028)

Title: Improving the Quality Management Practices in Radiation Processing Facilities for Better Performance and Applications

Period: 2022-2025

Radiation processing technologies play an important role in material processing as well as the sterilization and decontamination of various products. This regional project has been thoughtfully designed to support the enhancement and establishment of radiation processing technologies within industrial gamma and electron beam facilities. It primarily focuses on ensuring the safe and efficient operation of radiation processing in industry, agriculture, and environmental contexts. Notably, the reliability and accuracy of the dosimetry systems within radiation infrastructures are significant considerations. Critical areas requiring attention include Quality Assurance/Quality Control (QA/QC), intercomparison dosimetry, and quality management systems.

5. Service Rendered: Food, feed and herbal supplement samples

Sl. no.	Number of service	Revenue income
1.	18	18,500/-
2.	03	BAEC internal service

Gamma Source Division, IFRB

Objective

Gamma Source Division (GSD) is the pioneer irradiation service provider in Bangladesh. The main objectives of this division are to provide irradiation services to research and commercial sectors for the purpose of developing and utilizing gamma irradiation technology to improve the quality of products. GSD of the Institute of Food and Radiation Biology (IFRB) has been rendering irradiation services since 1979 to different institutes/organizations and private companies using Co^{60} panoramic gamma irradiator. GSD has provided irradiation services for research purposes to 06 different government (including institutes of BAEC) and private organizations at free of cost during July, 2024 to June, 2025. Moreover, GSD has rendered commercial irradiation services to 12 food industries and 38 medical and pharmaceutical companies of Bangladesh during this period. The radioactivity of the source was 915.75 TBq (24.75 kCi) on 1st July, 2024 and 802.90 TBq (21.70 kCi) on 30th June, 2025.

1. R&D Work(s)

1.1 Utilization of Co-60 Gamma Irradiator of GSD in Research and Development (R&D) Purposes

Arifatun Nahar, Md. Tauhidul Islam Tanim, Md. Ariful Hoque, Md. Khalid Hossain, Md. Nasim Sheikh and Md. Firoz Mortuza

During this period, GSD provided irradiation services for R&D purposes to 11 (Eleven) government (including institutes of BAEC) and private organizations at free of cost. GSD has provided irradiation services for research purposes to various divisions/institutes of Bangladesh Atomic Energy Commission (BAEC), Bangladesh Forest Research Institute (BFRI), Bangladesh Jute Research Institute (BJRI), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Al-Madina Pharma Ltd., Emami Bangladesh Limited, Polytech International, UniMed UniHealth Pharmaceutical Ltd, Square Pharma Ltd.etc at free of cost during this time period. GSD provided irradiation service for research purpose to 654 food samples (rice seed, potato, rubber seed, bean seed, jute seed, rice callus, dry fish, spirulina etc.) and 3,848 medical and pharmaceutical samples (Bone graft, bone chips, amnion graft, skull bone, scaffold, amniotic membrane, ETFE film, DNA sample, bacterial solution, hydrogel, Xylogel 2% Jelly, eye drops, spirulina powder, chitosan, gelatin film etc.).

1.2 Area Radiation Monitoring of Gamma Source Division (GSD)

Md. Tauhidul Islam Tanim, Md. Ariful Hoque, Md. Khalid Hossain, Arifatun Nahar, and Md. Firoz Mortuza

Radiation monitoring is an essential component of any radiation safety program in a nuclear or radiological facility. Radiation monitoring involves the measurement of radiation dose or radionuclide contamination for reasons related to the assessment or control of exposure to radiation or radioactive substances, and the interpretation of the results. Gamma Source Division of IFRB possesses a Cobalt-60 gamma irradiator. In GSD, area radiation monitoring is performed regularly by responsible personnel or Radiation Control Officers (RCOs). Radiation monitoring is performed with Geiger-Muller counter at three feet above the ground. Area radiation monitoring was performed with Geiger-Muller counter (Model- DRGE-11 Serial No. 020302) at three feet above the ground at different strategic positions in two different situations: a) source in shield condition and b) source in exposed condition. Radiation monitoring was performed on 04th July, 2024. At that time, the activity of the source was 915.75 TBq (24.75 kCi). During this area radiation monitoring, radiation dose rates at some positions near Co-60 gamma source were found higher than the other positions. Radiation workers and source operators stay very short period of time at these positions during manual sample handling and source operation. It's worth mentioning that the counts of TLD used by radiation workers were always found within acceptable limit.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participants
1.	TC Training EVT2404813: Regional Training Course on Collection of entomological baseline data, and data management tools to support SIT projects for mosquito control	14-18 October, 2024	Quezon City, Philippines	01
2.	Third Research Coordination Meeting on Novel Irradiation Technology for Phytosanitary Treatment of Food Commodities and Promotion of Trade	9-13 December, 2024	Vienna, Austria	01
3.	Third International Conference on Applications of Radiation Science and Technology	7 – 11 April, 2025	Vienna, Austria	01

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral / poster presentation	Title of the event	Organizer	Date	Place
Dr. Md. Firoz Mortuza	Poster presentation on "Quality Management in Dosimetry and Radiation Processing for Low and High Dose Irradiation"	Third International Conference on Applications of Radiation Science and Technology	IAEA	07-11 April, 2025	Vienna, Austria

4. Collaboration Work/ MOU (ADP/ FNCA/ MEXT/ FTC/ IAEA/ RCA/ TC/ S&T/ CRP/ In-house Project, Universities, etc)

4.1 Project Title: Improving the Quality Management Practices in Radiation Processing Facilities for Better Performance and Applications (RCA); **Project Code**- IAEA Regional TC:RAS/1028. Dr. Firoz Mortuza is working as Additional National Counter (ANPC) part of this project. Other divisional members are the national team members of this project. **Period:** 2022-2025

4.2 **Project Title:** Determination and validation of generic phytosanitary irradiation dose of insects pests (Order: Lepidoptera) of food commodities highlighting on the effects of irradiation dose-rates (Research Contract no. 25011 under CRP-D61026). Dr. Firoz Mortuza is the Chief Scientific investigator (CSI) and Arifatun Nahar is Additional Chief Scientific Investigator of this project. Other divisional members are working as scientific workers in the project. **Period**: 2022-2026

4.3 **Project Title:** 'Enhancing the Capacity and the Utilization of the Sterile Insect Technique for Aedes Mosquito Control' IAEA-RAS/5/095 (2022-2025). Dr. Mahfuza Khan is working as National Counter Part (NCP) and Scientific Officers of Insect Biotechnology Division and Gamma Source Division are Team members of this non-RCA project.

4.4 **Project Title:** 'Validating the Sterile Insect Technique (SIT) as a Key Component of an Area-Wide Integrated Pest Management (AW-IPM) Programme against *Aedes aegypti* in Dhaka' IAEA Technical Cooperation Project BGD 5035 (2022-2025). Dr. Mahfuza Khan worked as National Counter Part (NCP) of the project.

5. Service Rendered

Sl. no.	Name of service provided	Number/ quantity of sample/patient/service	Revenue income
For Research & Development (R&D) Purpose			
1.	Food sample irradiation	654 pcs	Free of cost
2.	Medical and pharmaceutical sample irradiation	3848 pcs	
For Commercial Purpose			
1.	Food product irradiation	45144 kg	20,31,480/-
2.	Medical and Pharmaceutical products irradiation	2253 cft	14,90,250/-
Total = (Thirty-five lac twenty thousand seven hundred thirty taka only)			35,20,730/-

Insect Biotechnology Division, IFRB

Objective

This division is accommodating the nuclear and advanced biotechnological tools in research related to insect science by addressing SDG2 and SDG3. The use of chemical pesticide has been the major means of insect control, but it has some serious toxic effects to human health and environment. These facts have stimulated interest in the search for alternative methods of pest management. Research programmes of this division are designed to develop protocols to be transferred to the stakeholders in the field of food irradiation, mosquito management, area-wide fruit fly suppression/control etc. R & D activities conducted for the reporting period are given below:

1. R&D Work(s)

1.1 Survey and Monitoring of Tephtritid Fruit Flies (Diptera: Tephritidae) in Bangladesh

M. Aftab Hossain and Kajla Seheli

Multilure survey traps baited with Biolures (Yeast hydrolysate and 2 component) were maintained at fifteen sites of Harirampur upazila of Manikgonj district (June-August) and Sherpur sadar upazila of Sherpur district (August-October) in 2024. A total 18 species of both dacini and non dacini fruit flies were collected. Among the dacini fruit flies, the polyphagous fruit pest *Bactrocera dorsalis*, cucurbit pests *Zeugodacus cucurbitae* and *Z. tau* are dominating species. Among the non dacini fruit flies, the bamboo shoot infesting flies, *viz., Acroceratitis ceratitina, A. bimacula, A. parastriata, Gastrozona soror* are dominating species in both Manikgonj and Sherpur districts. Fruit fly monitoring Hawaii traps baited with cuelure and methyl eugenol were maintained at five sites of AERE campus from July 2024 to June 2025 for studying the seasonal population fluctuations of dacinae. The highest population of *B. dorsalis* was recorded in the month of July 2024 and the lowest was in January 2025. For *Z. cucurbitae*, the peak population was observed in the month of March 2025 and the lowest was in

November 2024. A total 16 species of dacini fruit flies were recorded from AERE campus. The survey and monitoring data of tephtritid fruit flies in Bangladesh will greatly help entomologist and crop protectionist to prepare a pest risk analysis document and to develop pest control strategies.

1.2 Comparative Study Between Semi-field and Laboratory Reared *Aedes aegypti* Mosquitoes as a Prerequisite for Sterile Insect Technique (SIT) Implementation in Bangladesh

Nahida Sultana, Ananna Ghosh and Kajla Seheli

A comparative study was conducted to evaluate the development of *Aedes aegypti* mosquitoes under semi-field and laboratory conditions as a prerequisite for the SIT program. The main objectives were to assess mosquito rearing parameters, determine the impact of radiation on sterile males, and ensure the quality of mosquitoes for successful field release. Key findings revealed that pupation patterns and sex ratios varied between the two conditions. In the semi-field environment, peak pupation occurred on days 3–4, with female pupae being more prevalent. In contrast, laboratory-reared mosquitoes showed peak pupation on days 2–3, with a higher proportion of male pupae. No significant differences were observed in larval size across instars between the two conditions. However, pupae reared in semi-field cages were generally larger, although the size difference was not statistically significant. These results suggest that semi-field conditions may better mimic natural environments and produce more robust sterile males for field release. The study emphasizes the importance of optimizing semi-field rearing systems to improve mosquito quality for SIT programs. Future research will focus on enhancing rearing conditions, evaluating sterile male mating success, survival, and dispersal capacity, and conducting pilot field trials to assess the effectiveness of semi-field-reared sterile males in suppressing wild *Aedes aegypti* populations.

1.3 Study the Impact of Gamma Irradiation Induced Mutation in the Male Specific M Locus of Chromosome I (*Nix* gene) Carrying *Aedes aegypti,* Main Dengue Vector in Bangladesh

Ananna Ghosh and Kajla Seheli

Aedes aegypti, a major vector of arboviruses, possesses a genome size of 1,376 Mbp organized into three chromosomes. The *Nix* gene, located on the M locus of chromosome I, plays a crucial role in male sex determination. Mutation in this gene can disrupt the structure and function of the Nix protein. This study aimed to investigate the mutational effects of gamma irradiation on the *Nix* gene sequence to determine sterility dose in *A. aegypti* as part of a Sterile Insect Technique (SIT) strategy. Male pupae aged 26–30 hours were irradiated with gamma doses of 40, 50, 60, 70, and 80 Gy using a dry storage irradiator (90 kCi Cobalt-60 source) at the Institute of Food and Radiation Biology (IFRB), Bangladesh. Dosimetry was conducted using the Fricke system. After adult emergence, genomic DNA was extracted from adult mosquitoes using the Wizard® DNA purification kit. PCR amplification of the *Nix* gene (280-320bp) was performed using specific primers (forward: 5'-GATTTTTGTTTTTGTCGTGCAA-3'reverse: 5'-AATGCAAGTATCATAGG TCAGCA-3'). Successful amplification was confirmed by using 1% agarose gel electrophoresis. The PCR products were purified and sequenced using the Sanger sequencing method. Chromatogram quality was examined using Chromas, BioEdit, and FinchTV, and obtained sequences were aligned using ClustalW. *Nix* sequence (control non-irradiated) submitted to NCBI GenBank with accession no. OR451210. Further bioinformatics analysis will be performed with the irradiated and control (non-irradiated) samples in order to identify point mutations induced on by gamma irradiation.

2. Manpower Development

2.1 Attend Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No of participant
1.	Mahfuza Momen attended "Regional Training Course on Collection of entomological baseline data, and data management tools to support SIT projects for mosquito control" (RAS5095)	14-18 October, 2024	Quezon City, Philippines	24
2.	Ananna Ghosh attended "Regional Training Course on Geographical Information System (GIS) for Fruit Fly Surveillance and Data Management" (RAS 5097)	3-7 March, 2025	Hanoi, Vietnam	23

Sl. no.	Title of the program	Date	Place	No of participant
3.	Dr. Kajla Seheli attended Fourth FAO/IAEA Research Co-ordination Meeting on "Mosquito Irradiation, Sterilization and Quality Control" (CRP D44004)	5-9 May, 2025	Athens, Greece	21

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of the oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Kajla Seheli	"Sterility dose optimization and Impact of exogenous factors on laboratory reared *A. aegypti* male quality in Bangladesh" Form of presentation: Oral	Fourth FAO/IAEA Research Co-ordination Meeting on "Mosquito Irradiation, Sterilization and Quality Control" (CRP D44004)	IAEA	5th May, 2025	Athens, Greece

4. Project work (ADP/FNCA/RCA/TC/CRP/ S&T etc.)

4.1 FAO/IAEA Coordinated Research Programme CRP No. 23909/R0 (2020-2025) titled 'Optimization of ɣ -Irradiation Process for Mass Sterilization and the Quality Assurance of Sterile *Aedes aegypti* for Field Release Programme'.

4.2 FAO/IAEA Coordinated Research Programme RAS 5097 (2022-2025) titled 'Strengthening and Harmonizing Surveillance and Suppression of Fruit flies'

4.3 R&D-2420191 (2024-2025) Study the impact of gamma irradiation induced mutation in the male specific M locus of chromosome I (Nix gene) carrying Aedes aegypti, main dengue vector in Bangladesh

4.4 FAO/IAEA Technical Cooperation Project IAEA TC BGD 5035 (2022-2025) titled 'Validating the Sterile Insect Technique (SIT) as a Key Component of an Area-Wide Integrated Pest Management (AW-IPM) Programme against Aedes aegypti in Dhaka'.

Microbiology and Industrial Irradiation Division, IFRB

Objective

MIID is one of the pioneer divisions of IFRB. The division deals with microorganisms closely associated with the health and welfare of human being. MIID is basically involved in doing research and development work on different aspects of radiation microbiology. The R&D activities conducted for the reporting period are given below.

1. R&D Works

1.1 Simultaneous Detection of Different Types of Foodborne Pathogens Using Molecular Techniques

Abdullah-Al-Mahin, Md. Shakhawat Hossain, Md. Azadul Kabir Sarker and Md. Kamruzzaman Pramanik

Foodborne outbreaks are a significant threat to global public health, and the situation is particularly alarming in Bangladesh due to its hot, humid climate and dense population. Food and drinking water can be easily contaminated by various pathogenic microorganisms. Different pathogenic bacteria, such as *E. coli*, *Salmonella* spp., and *Listeria* spp., are the primary causes of these outbreaks. Traditional culture-based techniques for detecting bacterial pathogens are time-consuming and labour-intensive. Therefore, an alternative, rapid, and cost-effective method for screening and identification of these pathogens is required. Multiplex PCR (polymerase chain reaction) is a molecular technique that can be used to identify pathogenic microorganisms from various sources. In the present study, we developed a simple multiplex PCR technique to simultaneously identify three key foodborne pathogens: *E. coli*, *Salmonella enteritidis*, and *Listeria monocytogenes*, focusing on the malB, invA, and hylA genes, respectively, specific to each pathogen. The primers were selected from various scientific sources and assessed using BLAST to ensure they did not

interact or cross-react with each other. The assay's specificity and detection limits were evaluated using known selective bacterial cultures of these pathogens. The multiplex PCR could detect 10^3 CFU/mL of the pathogens in lettuce. The developed assay can be used easily and conveniently for food safety assessments.

1.2 Study of Bioplastic (PHAs) Producing Bacteria Isolated from Amin Bazar Landfill Area, Bangladesh

Tabassum Mumtaz, Khadeja Akter Riya and Jayanta Kumar Basak

Petrochemical plastics, although widely used due to their low cost and accessibility, have caused significant environmental pollution due to their non-biodegradable nature and poor waste management. Despite growing concerns, an effective and sustainable solution remains elusive. Bacterial bioplastics, particularly polyhydroxyalkanoates (PHAs), offer a promising alternative due to their biodegradability, biocompatibility, and versatility. This study aimed to isolate PHA-producing bacteria from soil samples collected in and around the Amin Bazar landfill in Savar, Dhaka. Five slightly alkaline soil samples (pH 7.5–7.85) were analyzed using the serial dilution plate method. The highest microbial count was found to be 1.3×10^4 cfu/mL from Sample 2, collected from within the landfill. Out of 27 morphologically distinct colonies, 13 isolates demonstrated potential for PHA production, confirmed via Nile red fluorescence under UV light at 360 nm. Eight of these isolates, showed strong fluorescence, with isolate S3/8 being the most promising. The PHA production efficiency was compared using glucose, sucrose as a synthetic and sugarcane juice as a natural source of carbon. Batch fermentation experiments using 0.5% glucose and sugarcane juice as carbon sources demonstrated that isolate S3/8 achieved the highest DCW: 1.9 g/L at 115 hr in glucose and 2.2 g/L in sugarcane juice. Although sugarcane juice supported more biomass production, it was not as efficient as expected for PHB synthesis. The study's findings emphasize the landfill as a potential source of PHA-producing microbes. Future research aims to optimize substrates and culture conditions to increase yield and determine the commercial feasibility of biopolymer production.

1.3 Identification and Determination of the Bioactive Properties of Marine Algae Extracts and their Associated Microorganisms

Fahim Faysal, Md Kamruzzaman Pramanik

Marine algae have gained significant attention due to their diverse bioactive compounds with potential applications in biotechnology, medicine, and pharmaceuticals. This study focuses on identifying and evaluating the bioactive properties of marine algae extracts and their associated microorganisms. The samples were categorized into two genera: Gracilaria sp. (red algae) and Ulva sp. (green algae). Bioactive properties, including antioxidant and antibacterial activities, were assessed using standard methods. The antioxidant potential was evaluated through DPPH radical scavenging assays, which revealed significant activity, particularly in Ulva sp. This strong antioxidant activity showed a strong correlation with total phenolic and flavonoid contents. The higher antioxidant capacity of Ulva sp. extracts may be attributed to their prolonged exposure to solar UV radiation, which likely stimulates the production of bioactive compounds. Antibacterial activity was determined using the agar well diffusion method against four bacterial strains: Staphylococcus aureus, Escherichia colt, Listeria monocytogenes, and Salmonella spp. The Gracilaria sp. extracts exhibited moderate antibacterial effects, while Ulva sp. extracts showed enhanced activity, particularly against Staphylococcus aureus. Furthermore, microorganisms associated with the algae were isolated and characterized for their antioxidant and antibacterial properties. Notable activity was observed in specific microbial strains, underscoring their potential as sources of bioactive compounds. This study highlights the potential of marine algae and their associated microorganisms as sources of bioactive compounds with antioxidant and antimicrobial properties. These findings contribute to the growing understanding of marine algae's applications in developing natural therapeutic agents and addressing challenges such as antibiotic resistance.

1.4 The production of Single Cell Protein Generated Through Multi Food Waste Substrate Fermentation Intended to be used as the Nutritional Source for Human and Animal

Zinat Mahal, Tabassum Mumtaz

Production of single cell proteins (SCP) utilizing food wastes is an alternative solution to meet the global protein shortage and minimize problems associated with environmental pollution. This study aimed at utilization of fruit wastes and leftover rice to produce SCP via fermentation using special yeast for potential

human food and animal feed. The waste materials like jackfruit rags, watermelon rinds, and leftover rice were used as substrate for SCP production. During the fermentation process the highest yeast cell growth as well as protein production was found on the fourth day of fermentation in jackfruit rags and watermelon rinds whereas in leftover rice the highest cell growth and protein production was found on the second day of fermentation. Reducing sugar content was higher in leftover rice on the second day of fermentation comparing to jackfruit rags and watermelon rinds. Nutritional analysis of produced SCP is currently ongoing. This study demonstrated an effective approach to use different food waste as substrate to set up a lab scale fermentation process allowing the performance of biovalorization of different food waste for getting an added value product used as human food or as animal feed.

1.5 Analysis of Cellulase Prducing Microorganisms in Paper Based Cultural Heritage Objects along with the Effect of Gamma Radiation

Md Zahid Hasan, Tabassum Mumtaz, Md Kamruzzaman Pramanik

Newspapers are witness of culture and historical milestones and these or similar items are made of cellulose based paper and can be deteriorated by cullutytic molds and bacteria if not preserved properly. To determine the applicability of ionizing radiation for conservation of these materials, archived newspaper samples were collected and subjected to different doses of radiation (2.0, 4.0, 6.0, 8.0, 10.0 and 15.0 kGy) by cobalt-60 gamma source to disinfest and disinfect selected newspaper samples. Number of total bacteria and fungi present in the sample were 1.2×10^5 cfu/g and 1.9×10^4 cfu/g respectively which became below detection limit after irradiation with 8 kGy. 8 of the fungal and 7 of the bacterial isolates exhibited cellulase producing potential. Considering mechanical properties, tensile strength increased non-significantly at the highest irradiation dose (15 kGy). DSC and TGA indicated thermal stability of main components of paper was not changed at the highest irradiation dose applied. FTIR could not detect the presence of C=O radical. SEM could not detect any significant change in the cellulose structure. Molecular identification of the cellulase producing bacteria and fungi along with analyzing effect of irradiation on samples from diverse sources to depict the irradiation effect more clearly.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Third Research Coordination Meeting on Nuclear Techniques to Support Risk Assessment of Biotoxins and Pathogen Detection in Food and Related Matrices	23-27 June, 2025	Accra, Ghana	1 (Dr. Abdullah- Al- Mahin)
2.	2nd Research Coordination Meeting on IAEA CRP 'Development and Implementation of Cultural Heritage Preservation using Ionizing Radiation Technology'	14 Oct- 18 Oct 2025	Rome, Italy	01 (Dr. Md Zahid Hasan)

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr Md Zahid Hasan	Poster presentation on 'Disinfection and Preservation of Archived Newspapers by Radiation Processing Technologies'	Third International Conference on Applications of Radiation Science and Technology (ICARST-2025)	IAEA	7-11 April, 2025	Vienna, Austria

4. Collaboration Work/ MOU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house Project, Universities, etc.)

4.1 CRP project of IAEA Research Contract No. 25070 entitled "Detection of Pathogens and Associated Toxins in Food and Water using Nuclear and Related Techniques (2022-2026). Chief Investigator: Dr. Abdullah-Al-Mahin

4.2 Special Allocation of Science and Technology Ministry of Government of Bangladesh (Financial year 2023-24) entitled "Simultaneous Detection of Different Closely Related Foodborne Pathogens using Multiplex PCR (Project ID# SRG-231172). Principal Investigator: Dr. Abdullah-Al-Mahin.

4.3 CRP project of IAEA Research Contract No. 22082 entitled "Development and Implementation of Cultural Heritage Preservation using Ionizing Radiation Technology" (2023-2027). Chief Scientific Investigator: Dr. Md Zahid Hasan.

4.4 Special Allocation of Science and Technology Ministry of Government of Bangladesh FY 2024-2025 entitled "The production of Single Cell Protein generated through multi food waste substrate fermentation intended to be used as the nutritional source for human and animal" (Project ID# SRG-243316; Group: ES). Principal Investigator: Dr Zinat Mahal

5. Service Rendered

Sl. no.	Name of service provided	Number/ quantity of sample/ patient service	Revenue income
1.	Microbiological analysis	54	199,200.00

Radiation Entomology and Acarology Division, IFRB

Objective

The R&D activities of Radiation Entomology and Acarology Division (READ) focus on development of environmentally safe integrated pest management techniques against agricultural and stored products insect/mite pests with possible incorporation nuclear, molecular and nano technology with other conventional techniques. This division aims to ensure multiple beneficial uses of insects such as waste management, production of organic-fertilizers, production of protein rich, affordable, sustainable and valuable poultry and fish feed and foodas well as use of insects in medical fields, especially diabetic/accidental and any other chronic wound care. In this regard, conducting research on cost-effective, sustainable and accessible maggot production and maggot therapy treatment to prevent skin loss, prevent amputation and overuse of antibiotics to healing wounds.

1. R&D Work(s)

1.1 Mating Competitiveness of Sterile Blowfly (*Luciliacuprina*) for Effective Sterile Insect Technique (SIT) and Field Release

To control populations of the blowfly *Luciliacuprina*, which causes significant damage to sun drying marine fish in Bangladesh, the Sterile Insect Technique (SIT) is employed through the release of irradiated sterile flies into the target area. However, the success of an SIT program depends largely on the ability of sterile males to effectively compete with wild males for mating opportunities with wild females. Even irradiation may reduce male sexual activity and competitiveness, depending on the dose applied. Therefore, in addition to assessing sterility at various irradiation doses, it is essential to evaluate the mating competitiveness (C value) of irradiated males. According to Fried's formula, a C value of ≥ 0.5 is considered acceptable for SIT programs, while values ≥ 0.8 are regarded as ideal. In the present study, the observed C values at 35, 40, 45, 50, and 55 Gy were 0.98, 1.11, 1.08, 1.19, and 0.24, respectively. These results indicate that males irradiated at doses between 35–50 Gy exhibited strong mating competitiveness, while 55 Gy led to a substantial reduction in competitiveness. The selection of an optimal sterilizing dose should consider not only mating competitiveness but also additional biological parameters, including male and female sterility, flight ability, and adult longevity.

1.2 Biology and Morphological Description of *Cyclosiapapilionaris* (Drury, 1773) (Lepidoptera: Zygaenidae) Moth: a Serious Pest of Lotkon Fruit (Burmese grape) in Bangladesh

Cyclosiapapilionaris is commonly known as Drury Jewel mothand day-flying species. The larvae of this moth species defoliate the delicate leaves of young trees and nursery plants of Burmese grape (*Baccaurearamiflora*). There is a lack of biological information regarding the management of *Cyclosiapapilionaris*. Currently, developmental stages are not well described and characterised. This study aims to demonstrate the developmental stages with descriptive images. The biology of the *Cyclosia papilionaris* moth was conducted in laboratory conditions on their host plants. The study was carried out at a temperature of 27.61 °C (±3.85) and 69% (±4.58) relative humidity. The female deposited eggs in clusters, and each cluster contains a maximum of 68 eggs and a minimum of 18 eggs (36 eggs on average). The total larval period (1^{st} instar to 4^{th} instar) was 20.09±1.61 days, and the pupal period was 28.09±6.56 days, respectively. The pupal cocoon was constructed using a plastic substrate combined with leaves, thus offering substantial support for the laboratory rearing process. The female moth (17.82±2.48 days) lived longer than the male moth (5.73±0.65 days), respectively. The current biological study of this species could provide valuable support for managing this pest species in an agroecosystem.

1.3 Life History Traits of the Cycad Blue Butterfly, *Chiladespandava* (Horsfield, 1829) (Lepidoptera: Lycaenidae), as well as Natural Enemies Recorded of this Species

Cycas plant are ornamental plant which cultivated in ex-situ and in-situ conditions.*Chiladespandava* commonly known as cycad blue butterfly which is an important harmful pest, and causes substantial damage of Cycas plant home and garden. Regarding the management of the cycad blue butterfly, there is no biological data available in Bangladesh perspective. In this study, we observed the life history traits of *Chiladespandava*under field and laboratory conditions. The study was carried out at a temperature 25.2 °C (±3.85) with an average 65% (±4.58) relative humidity and a light: dark ratio (L:D) of 12:12. We found larval and pupal colour plasticity which plays in their adaptive implication with host plant to protect from predators. The four predatory beneficial insects (salticid spiders, red ants, blister beetles, and unknown beetle species) were identified which may help to control cycad blue butterfly population in naturally. The female deposited eggs in single, and female visited host plant repeatedly for oviposition. The total larval period (fist instar to fourth instar) was 10.99± (0.89) days, and the pupal period was 8.22± (1.30) days, respectively. Pupa was made by using plastic substrate and petridish glassware surface along with leaves. The female and male butterfly lived 10.66± (5.57) days and 10.33± (4.94) days, respectively. The present life cycle observation, nature of damage, and control measure strategy will help to manage this pest species.

1.4 On-farm Trial of Three Generalist Predators Against Macadamia Lace Bug in the Early Flowering Season of Macadamia to Understand their Dynamic Interactions and Comparative Efficacy in Lace Bug Nymph Control

Macadamia lace bugs are a major pest of the early flowering season for macadamia trees, in Australia. The management of macadamia lace bugs primarily depends on broad-spectrum insecticides that increase pesticide resistance problems and pose challenges for pollinating insects. Although predators were recorded for macadamia lace bugs in macadamia orchards in Australia, their dynamic interaction with macadamia lace bug has not yet been investigated. The present aim of this study to understand how different predators interact with each other and with the lace bug nymphs, and how these interactions affect lace bug control. Three generalist predators; comb-footed spiders and brown and green lacewing larvae were used in this experiment. Comb-footed spidersand brown lacewing larvae were collected from the Malua macadamia farm in New South Wales, and green lacewing larvae were supplied by BioResources Pty Ltd, Queensland, Australia. Macadamia lace bug nymphs were collected from Malua macadamia farm. In this study generalist predators were used with macadamia lace bug nymphs individually and in combination. The results revealed that generalistpredator species usually reduced lace bug nymph numbers when tested on their own or in combination. Green lacewing larvae were unparalleled in their ability to reduce the survival of lace bug

nymphs compared with other predators. Green lacewing larvae reduced the lace bug nymph survival significantly. Brown lacewing larvae were not so effective at controlling lace bug nymphs. Spiders were able to control lace bug nymphs, but not as effectively as green lacewing larvae. The combination of brown lacewing larvae with spiders was as effective as single predators in lace bug nymph control but not significantly different from individuals. Intraguild predation between generalist predators was found and was not so detrimental to lace bug nymph control. This study highlighted that the generalist predators within macadamia could have potential for controlling pests, but they may need support from augmentation with exotic predators. This is the first study document on the dynamic interaction of the generalist predators with macadamia lace bug nymphs in outdoor settings.

2. Manpower Development

Sl. no.	Title	Place	No. of participants
1.	In- house training session	REA division	6

3. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participants	Title of the event	Organizer	Date	Place
Dr. ATM Fayezul Islam and Md. Mosharraf Hossain	A training program for dry fish producer and businessman to produce healthy and safety food	Bangladesh Food Safety Authority, Ministry of Food	06-07 July, 2024	Cox's Bazaar

4. Collaboration Work

4.1 Agreement for academic co-operation between Faculty of Science, Yamaguchi University, Japan and Institute of Food and Radiation Biology (IFRB-PCM-READ-5) entitled "Ecological approach to the Lepidopteran insects in relation with environmental adaptation and population management" has been extended for next 5 years (2025-2030).

4.2 A memorandum of understanding (MoU) accomplished between the department of Plant and Animal Production, Vocational School of Technical Sciences (VSTS), Kirşehir, Turkey and the Institute of Food and Radiation Biology (IFRB-PCM-READ-4) entitled "Insect Biodiversity exploration, and multipurpose beneficial use of insects".

4.3 A collaborative work is being established with Applied Biosciences, Macquarie University, Sydney on "feasibility study of maggot (fly larvae) therapy for diabetic and other wound/ulcer treatment"(IFRB-PCM-READ-3).

Cytology and Biocontrol Research (CBR)

Objective

The primary objective of this research wing is to set up "Cytology and Biocontrol Research Division (CBRD)" at IFRB. Then, the final goalis proposed to establish an institution, namely "Institute of Zoology and Medical Entomology (IZME)" at AERE, BAEC with the aim of building Smart Research in Smart Bangladesh. That's why,research based on the BAEC previous perspective plan 1993-2010 (IFRB-PCM-2-REA-4, IFRB-PCM-2-REA-5, IFRB-PCM-5-REA-7, IFRB-PCM-7-REA-9) with special focusing on biology, morphology, taxonomy, cytology, cytogenetics and biocontrol of dipteran insects has been continuing using cobalt^{60}gamma radiation at CBR (founded in 15 Nov 2020), Radiation Entomology and Acarology Division (READ), IFRB.

1. R&D Work(s)

1.1 Effect of Tube Diameter and Tube Colour on Flight Ability of Laboratory-reared Melon Fly, *Zeugodacuscucurbitae* (Diptera: Tephritidae)

Tahera Hossain, Farzana Yesmin and Md. Hasanuzzaman

Tephritid fruit flies are serious agricultural pests Bangladesh causing economic losses. *Zeugodacuscucurbitae* causes damage to crops from primordial stages to harvest stage. Flight ability test is a quality control parameter and serves as a key component in sterile insect technique (SIT). In this experiment, we studied the effect of tube diameter and tube colour on the flight ability of laboratory-reared melon fly adults. The pure line mass rearing of *Z. cucurbitae*is continuously conducted at the Cytology and Biocontrol Research (CBR) fruit fly laboratory parameters for fundamental research. To test the effect of tube diameter on flight ability, we used two tube diameter treatments,4.5 cm diameter and 5.5 cm diameter. Tube height was constant (10 cm). Six tubes were set up for each of the two treatments (with 100 pupae in each tube), resulting in a total of 12 tubes with 1200 pupae in total. There was no significant difference between the two tube diameter treatments in percentage fliers ($p>0.05$, df =1, 10; $F=0.02$). To assess whether tube color has an impact on flight ability, we conducted another experiment. A total of 12 tubes (6 black tubes and 6 white tubes) with 100 pupae in each tube were observed, resulting total 1200 pupae. The tube height was same for all tubes. There was significant difference in percentage fliers (p0.05, df =1, 10; $F=9.49$) between the two tube color treatments. This study will help to standardize flight ability assessment of *Z. cucurbitae* and provides baseline data for future research.

1.2 Telomeres in the Polytene Genome of *Bactrocerazonata* and *Zeugodacus tau* (Diptera: Tephritidae) Detected by the C-banding Technique

Farzana Yesmin, Md Nazim Uddin, David Haymer, Tahera Hossain and Md. Hasanuzzaman

Telomeres are repetitive sequences of non-coding DNA found at the ends of eukaryotic chromosomes. Here, telomere banding patterns were detected in the salivary gland polytene chromosomes of *Bactrocerazonata* and *Zeugodacus tau* by C-banding technique. Both species infest a wide number of fruits and vegetables in tropical, sub-tropical and temperate regions of the world. Studies of polytene genomes of these and other tephritid fruit flies have been of great value in elucidating aspects of chromosome structure, gene activity and serving as tools for identification that can be critical for adoption novel control strategies to control these pests. Polytene genome of these species consists of five (2-6) banded chromosomes with ten polytene arms. Long arms are abbreviated as Left (L) and short arms as Right (R). In *B. zonata*, 2L telomere is slightly swollen with a combination of heterochromatic and euchromatic parts, 2R is totally heterochromatic. 3L tip has dotted heterochromatic cover, while 3R tip is rounded heterochromatic. 4L and 4R telomeres are rectangular with dense heterochromatic accumulation in ending caps. 5L telomere is expanded with dotted heterochromatic, 5R is rounded with heavily heterochromatic cap. 6L telomere is rhomboid and heterochromatic, while 6R is rounded and euchromatic. In *Z. tau*, 2L telomere is convex and euchromatic, 2R is straight and heterochromatic. 3L telomere is densely heterochromatic, 3R is comparatively flattened with dotted heterochromatic material. 4L and 4R tips are straight and highly heterochromatic. 5L and 5R have extensive euchromatic telomeres, but 5L end is heterochromatic, 5R is euchromatic. 6L is expanded and largely heterochromatic, whereas 6R telomere largely euchromatic. In fruit flies, telomeres of polytene chromosomes may serve as a cover for chromosome tips to protect them from nucleolytic degradation, recombination, repair and interchromosomal fusion. Thus, they play a vital role in maintaining chromosomal stability and preserving information in the genome.

1.3 Study on the Polytene Chromosomes of *Chironomus* spp. (Diptera: Chironomidae) in the Wetlands of the Savar region, Dhaka District, Bangladesh

Md. Hasanuzzaman, Md. Jahangir Alam, Md Nazim Uddin, Md. Mansurul Haque and Farzana Yesmin

Chironomid larvae have distinct salivary gland polytene chromosomes with precise banding patterns. Chromosome arms possess two transcriptionally active sites, i.e., Balbiani rings (BRs) and Nucleolar

organizers (NORs). Structural changes in the chironomid chromosomes serve as pollution bioindicators in fresh water ecosystems, which are directly related to the ecology of the aquatic environment. Savar city is centrally located in Bangladesh and about 380,000 people live there, which makes it the second most populous city in the district. Anthropogenic sources, such as untreated industrial effluents, household waste, and run-off from agriculture, are the main reasons for surface and underground water pollution. Therefore, the aim of this study was to observe the polytene chromosome structural patterns of chironomid larvae collected from Savar wetland regions. Salivary gland polytene chromosomes of the 4th instar larvae were examined in order to describe their chromosomal diversity in these habitats. We followed the lactoaceto orcein squash method for polytene chromosome preparation. Two karyotypes (Type 1 from Jahangirnagar Campus under Pseudothummi Cytocomplex and Type 2 from Savar DOHS under Thummi Cytocomplex) have been observed. Pseudothummi Cytocomplex has an AE, CD, BF, and G- chromosome arm combination, whereas Thummi cytocomplex shows an AB, CD, EF, and G- chromosome arm combination. Here, Thummi is considered to be basic, while Pseudothummi is considered to be structurally changed due to environmental factors. Chromosome arms BF and AB are the longest and G is the smallest in the karyotypes. In both types, BRs and NORs were detected in the G arms. Centromeric bands were also detected in each arm and these bands were deeply stained, i.e., were highly heterochromatic in nature. Karyotypic analysis in these two cytocomplexes has indicated the presence of a much larger chironomid fauna in this region, as well as structural changes in their chromosome arm combinations.

1.4 Morphology, Sexual Dimorphism and Developmental Changes of the Larval Salivary Glands in Dengue Vector Mosquitoes *Aedes* spp. (Diptera: Culicidae)

Md. Hasanuzzaman, Asaduzzaman, Labiba Tahsin, Kabirul Bashar, Tahera Hossain and Farzana Yesmin

Dengue is the most widespread mosquito-borne viral disease of humans worldwide. Aedes aegypti is one of the most common and invasive mosquito species worldwide and major vector of dengue, chikugunya, Zika and yellow fever. The present study deals with structural morphology, sexual dimorphism and developmental changes of larval (1st to 4th instar) salivary glands in *Aedes aegypti* and *Aedes albopictus* for the first time in Bangladesh. The larval salivary glands were dissected in Ringer's solution, then fixed in Carney's solution. Images were captured using Zeiss Stemi 305 SZ microscope with Zeiss Axiocam 105 color camera. The gland is comprised of two elongated asymmetrical lobes, located at anterolateral position in larval thorax. The lobes are connected anteriorly into a slender duct known as salivary duct. Development of larval (1st to 4th instar) salivary glands is by cell-growth which are polytene cells containing polytene chromosomes. A remarkable feature is that, salivary glands are also sexually dimorphic in larval stage, i.e. male and female larva can be distinguished by examining their lobes morphology. Salivary glands of the vector mosquitoes are very much important for their roles in blood feeding and pathogen transmission to vertebrate hosts. Developmental changes of salivary glands in 1st to 4th instars clearly express their structural and functional differences that enable females to engage successfully in disease transmission and hematophagy. Further study of polytene chromosomes is in progress to find out chromosomal inversions which are very common in *Aedes* species and are considered as an important factor contributing to speciation.

2. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Farzana Yesmin	Telomeres in the polytene genome of *Bactrocerazonata* and *Zeugodacus tau* (Diptera: Tephritidae) detected by the C-banding technique (Poster)	The 2nd International Electronic Conference on Entomology (IECE 2025) Session: Biochemistry, Biotechnology, Genetics, and Genomics	MDPI and *insects* (an Open Access Journal by MDPI)	19-21 May 2025	Online
Dr. Md. Hasanuzzaman	Study on the polytene chromosomes of *Chironomus* spp. (Diptera: Chironomidae) in the	The 2nd International Electronic Conference on Entomology (IECE 2025) Session: Biodiversity,	MDPI and *insects* (an Open Access	19-21 May 2025	Online

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
	wetlands of the Savar region, Dhaka district, Bangladesh (Poster)	Climate Change, Conservation, Ecology, and Evolution	Journal by MDPI)		
Tahera Hossain	Effects of diet on the fecundity of continuously mated females of the Melon Fruit Fly *Zeugodacuscucurbitae* (Diptera: Tephritidae)(Poster)	The 2nd International Electronic Conference on Entomology (IECE 2025) Session: Pest Management, Pesticide Resistance, and Toxicology	MDPI and *insects* (an Open Access Journal by MDPI)	19-21 May 2025	Online
	Effect of tube diameter and tube colour on flight ability of laboratory-reared Melon fly, *Zeugodacuscucurbitae* (Diptera: Tephritidae)(Poster)	The 2nd International Electronic Conference on Entomology (IECE 2025) Session: Behaviour, Biology, and Physiology	MDPI and *insects* (an Open Access Journal by MDPI)	19-21 May 2025	Online

3. Project Work

UNESCO- TWASResearch Grant Project 2022, Trieste, Italy. Title of the project: Karyology in some Dipteran insects. Principal Investigator (PI): Dr. Farzana Yesmin. Duration: 2023-2025 (2 years)

Veterinary Drug Residue Analysis Division, IFRB

Objective

- To build capacity in analyzing food contaminants, including prohibited substances, in accordance with international standards.
- To generate data on the disposition and residue depletion of veterinary drugs in food-producing animals for risk assessment and establishing maximum residue limits (MRLs).
- To investigate the toxicological effects of food contaminants in in vivo and ex vivo systems.
- To safeguard national public health and enhance the export competitiveness of Bangladeshi food products by providing high-quality testing services.

1. R & D Work(s)

1.1 Development, Adaptation, and Validation of Nuclear and Related Analytical Methods for Detection and Determination of Contaminants in Food, Feed, and Environmental Samples

M. J. Islam, M. N. Islam, M. H. Islam, M. M. Nobi, M. M. B. Prince, D. Chakma, C. K. Shaha, M. A. Mannan and A. S. M. Saifullah

To ensure the safety of food, feed, and environmental samples by developing, adapting, and validating precise, accurate, and reliable nuclear and related analytical methods for the detection and quantification of contaminants.

1.2 Conduct Routine Analysis, Collaborative Research, Inter-laboratory Comparison Testing, and Provide Services Including Training, Testing, and Tutoring

M. J. Islam, M. N. Islam, M. H. Islam, M. M. Nobi, M. M. B. Prince, D. Chakma, C. K. Shaha, M. A. Mannan and A. S. M. Saifullah

To enhance analytical capabilities, foster collaboration, ensure consistency in testing, and provide comprehensive services to improve the quality and reliability of scientific analyses in food, feed, and environmental sectors.

1.3 Achieve, Maintain, and Expand the Scope of ISO 17025 Accreditation

M. J. Islam, M. N. Islam, M. H. Islam, M. M. Nobi, M. M. B. Prince, D. Chakma, C. K. Shaha, M. A. Mannan and A. S. M. Saifullah

To ensure the highest standards of quality, reliability, and competence in laboratory testing and calibration services by achieving, maintaining, and expanding the scope of ISO 17025 accreditation.

1.4 Depletion Study and Withdrawal Period Calculation of Veterinary Pharmaceuticals in Food-Producing Animals

M. J. Islam, M. N. Islam, M. H. Islam, M. M. Nobi, M. M. B. Prince, D. Chakma, C. K. Shaha, M. A. Mannan and A. S. M. Saifullah

Description: To ensure the safety of food products derived from animals treated with veterinary pharmaceuticals by accurately determining the depletion rates of these substances and establishing appropriate withdrawal periods.

1.5 Investigation of the Toxicological Effects of Food Contaminants in *in-vivo,* and *ex-vivo* System

M. J. Islam, M. N. Islam, M. H. Islam, M. M. Nobi, M. M. B. Prince, D. Chakma, C. K. Shaha, M. A. Mannan and A. S. M. Saifullah

To assess and understand the toxicological impacts of food contaminants on biological systems by conducting in-vivo and ex-vivo studies, thereby contributing to the safety evaluation and risk assessment of food products.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of Participant
1.	Regional Training Course on "Multiclass Food Hazard Monitoring/Surveillance Programme"	19 to 23 August 2024	Xiamen, China	2
2.	Fellowship Program on "Enhancing Competence in Nuclear and Complementary Capabilities for Testing/Monitoring Veterinary Drug Residues and Other Contaminants in Foods"	18 to 29November 2024	Bangkok, Thailand	2
3.	Advanced Regional Training Course on "Isotopic Confirmatory Techniques for Residues/Contaminants in Food Products"	27 to 31 October 2024	Doha, Qatar	1

3. Collaboration Work/MoU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/In-house Project/ Universities, etc)

3.1 Non RCA Project Code: RAS5096

Title:"Strengthening Multi-Stakeholder Food Safety Monitoring Programmes for Chemical Contaminants and Residues in Plant and Animal Products Using Nuclear/Isotopic Techniques"

Project counterpart: Dr. A S M Saifullah

Duration: 2022 to 2026.

3.2 IAEA Coordinated Research Project: D52043

Title: "Depletion of veterinary Pharmaceuticals and Radiometric Analysis of their Residues in Animal Matrices."

Chief Scientific Investigator (CSI): Dr. A S M Saifullah

Duration: 3 March 2020 to 1 June 2025.

3.3 IAEA TC Project BGD5034

Title: "Enhancing Competence in Nuclear and Complementary Capabilities for Testing/Monitoring Veterinary Drug Residues and Other Contaminants in Food"

Project Counterpart: Dr. A S M Saifullah

Duration: 2022 to 2026.

Plant Biotechnology and Genetic Engineering Division, IFRB

Introduction

Plant Biotechnology and Genetic Engineering Division is a leading research oriented laboratory in the country. It initiated research on plant tissue culture in the early eighties with micropropagation of forest tress. Later on the other crops plants like cereals, fruit, medicinal, ornamental, vegetable, spices etc. have been included in the program. In the mid-nineties research on Agrobacterium-mediated genetic transformation has been initiated with the fiber crop jute and this technique is expanded gradually to other plants of economic importance viz. rice, tomato and Papaya. Now the scientists of this division are doing their research on mutation breeding to improve crop plants besides the previous program.

Objectives

- To develop suitable protocol for disease free and high yielding plantlets production through in vitro culture.
- To establish in vitro protocol for commercial production of forest, fruit, medicinal and ornamental plants.
- To identify the desired tissue culture derived lines from seed, embryo and anther culture through observational traits and primary yield traits.
- To improve crop plants through mutation breeding using carbon Ion beam and gamma irradiation.
- To molecular characterization of mutant lines.
- Green synthesis of nanomaterials and effect study of nanomaterials on plants in vitro and in vivo.

1. R & D Work(s)

1.1 Improvement of Three Indigenous Banana Varieties (*Musa spp*. var. Sagar, Agnishwar and Sabri) Through Gamma Irradiation and *in vitro* Propagation Techniques

M. R. Islam, M. T. Jahan, Pronabananda Das, Md. Monirul Islam, Md. Monirul Islam, M. H. Kabir, M. A. Islamand A.N.K. Mamun

In the present experiment, shoot tip segments obtained from the sword suckers of three banana varieties viz. Sagar, Agnishwar and Sabri were cultured onto MS fortified with different concentrations (0.5 mg/l – 5.0mg/l) of BAP and Kin singly or in combination with NAA (0.1 mg/l – 1.2mg/l). Among the various hormonal supplements, best response towards multiple shoot regeneration was noticed from the shoot tip segment when cultured on MS fortified with 4.0 mg/l BAP + 1.0mg/l NAA. In this combination an average of 12 shoot buds were induced. *In vitro* grown shoot buds were developed in length slightly when they were maintained in the same medium containing same hormonal supplements for three to four weeks. *In vitro* grown multiple shoots were routinely sub-cultured and maintained in the same basal medium containing same hormonal supplements. After three to five sub-cultures, a huge number of multiple shoots were regenerated from the responded shoot segments and they were developed into satisfactory height . Banana plants often possess several types of plant pathogen viz. panama, fusarium wilt, black sigatoka etc which causes different type of diseases as a consequence hampered banana production in the country. So, creation of disease resistant varieties is very important. In the present study Shoot tips were excised from the three banana plant varieties. Later, they were irradiated with five level of dose from 20 to 60 Gy of a cobalt-60 source at a dose rate of 20 Gy/min. LD^{50} were determined for each of the three mentioned banana plant varieties. 40 Gy were effective for Sagar and Sabri, on the other hand 50 Gy were fruitful to Agnishwar. The regenerated shoots did not produce root spontaneously. So for root induction, *In vitro* raised shoots were separated from the clamps of multiple shoot and they were sub-cultured on full strength as well as half strength of MS fortified with different concentrations of IAA and IBA. In this experiment the best root development was observed in the MS medium supplemented with 1.5 mg/l IBA. About 08 days were required for the initiation of roots and

within 15 days sufficient number of healthy roots were developed. The mean number as well as mean length of roots were found to be 8.24 and 9.2cm respectively in this combination. The results showed that, the rooting response in the full strength MS was higher compared to half strength MS and MS0. In the present study, IBA was found to be more effective than IAA used in both full strength MS and half MS. Fully developed mutant plants as well as tissue culture derived plantlets were then transferred to small poly bags containing a mixture of soil, sand and compost in the ratio of 1:1:1 for further development. Well-developed plantlets in the poly bags or plastic cups finally transplanted to natural conditions. Maximum 94% tissue culture derived plants survived under natural environment. A few number of mutant plant also survived in the natural condition and they were maintained separately in the experimental garden.

1.2 *In Vitro* Mass Propagation of Sugarcane Var. 'China' using Leaf Sheath Explants

M.H. Kabir*****, Pronabananda Das, Md. Monirul Islam, Md. Monirul Islam, M.R. Islam, M.T. Jahan,and A.N.K. Mamun

This study used leaf-sheath explants to explain the effects of different concentrations and combinations of plant growth regulators for the in vitro multiplication of the sugarcane variety China. A successful and repeatable procedure was developed. Direct multiple shoot formation from leaf-sheath was observed on MS medium supplemented with 10.0 mg/l NAA, in which 90% explants induced shoots inoculation after 90 days. The average number of shoots formed per explant was 30.0 ± 2.50 and the average shoot length of 7.2 ± 0.50 cm were achieved in this medium inoculation after 90 days. Regenerated shoots rooted well when they were transferred into half strength of MS + 2.50 mg/l NAA, in which 90% shoots rooted within 30 days of inoculation period. The average number of roots produced per shoot was 15.0 ± 1.25 and the average root length of 7.50 ± 2.30 cm was observed in this medium. Ninety percent of the *in vitro* raised plantlets were survived in the open environment.

1.3 Clonal Propagation of Chrysanthemum Morifoliumramat using Various Explants Obtained from Field Grown Plants

M.T. Jahan, M.R. Islam, S.A.M.Shariar Islam, Pronabananda Das, Md.Monirul Islam, Md.Monirul Islam , M.H.Kabir, M. A.Taher and A.N.K.Mamun

A reliable and rapid large scale micropropagation method has been established from the node, shoots tip and leaf explant of Chrysanthemum morifolium growing in field condition. Experiments were conducted to standardize the culture media with plant hormone for multiple shoot proliferation and rooting for obtaining plantlets with uniform characteristics like mother plant in terms of growth and habits. Different concentrations and combinations of auxins (IAA) and cytokinins (BAP, Kin) were used in MS for the above purpose. Maximum shoot regeneration was found in MS treated with 2.0 mg/l BAP both in node and shoot tip explants. In the above combination, nodal explants produced 16 initial shoots. Shoot tip explants produced 12 shoots and leaf segment produced 07 shoots. For in vitro rooting, different concentrations of IBA and NAA were used. Higher rooting percentage was recorded on MS fortified with 1.5 mg/l IBA. The rooted plantlets were hardened and successfully established in the soil. About 90% of the regenerated plantlets survived in the natural environment.

1.4 Indirect Organogenesis in Gladiolus (*Gladiolus grandifolius*) using Corm and Cormel Explant Growing *in vitro*

M.T. Jahan, M.R. Islam, A.N.K. Mamun, P.K. Roy, M.Z. Rahman and M. H. Kabir

A suitable protocol was developed for in vitro propagation of different varieties of Gladiolus spp. with and intervening callus phase by using corm and cormel explant. High frequency of calli was obtained from both of the explants when cultured on MS containing 2.0 mg/l NAA. Calli were then tried for multiple shoot regeneration by culturing on to MS with BAP and 2ip singly or in combination with NAA. Best response towards multiple shoot regeneration was observed from both corm and cormel explants derived calli on MS fortified with 1.0 mg/l BAP. In this combination an average of 16 shoots regenerated from corm segment derived callus. Plantlets produced profuse rooting within 30 to 35 days after transfer to MS supplemented with different concentrations of IBA (0.5-2.5 mg/l). Best root development was obtained in MS containing 1.5 mg/l IBA. Rooted plantlets were transferred to soil for hardening. About 85 to 90% plantlets were successfully established to the field condition.

1.5 Development of Androgenic Plants from Anther Culture of Indica Rice Genotype 'Lombur

Pronabananda Das, M.H. Kabir, Md. Monirul Islam, Md. Monirul Islam, M.R. Islam, M.T. Jahan,and A.N.K. Mamun

Plant breeding uses anther culture to rapidly produce homozygous lines and increase the efficacy of selection. The conventional method of inbred-line formation, which often entails several cycles of inbreeding, can be substituted by the regeneration of haploid plants from cultured rice anthers and subsequent diploidization, producing entirely homozygous genotypes or doubled haploids. In this investigation, after cold-pretreatment spikes of rice (7 days at 4°C), the anthers were cultured on the callus-induction medium MS supplemented with 2mg/l 2,4-D, 0.5mg/l Kn and 50mg/l casein hydrolysate plus 60g/l sucrose. The calli were transferred to MS medium supplemented with 1.5mg/l BAP, 0.5 mg/l Kn and 0.5 mg/l NAA where green spots initiated. Multiplication of shoots was found better on MS medium with 2mg/l BAP and initiation of roots on hormone free MS medium. On average, 27% of the plants obtained were albinos and 59% of the green plants maintained and transplanted in the field to assess the morphological traits. Fourty seven regenerants showed normal morphological appearances with 80-95% grain fertility.

1.6 Study of the Mechanisms of a Receptor for Peptidoglycan in Growth Promotion by *Bacillus pumilus* TUAT1 in *Arabidopsis thaliana*

Md. Monirul Islam*, M.H. Kabir*,Pronabananda Das, Md. Monirul Islam, M.R. Islam, M.T. Jahan,and A.N.K. Mamun

Multiplication of shoots was found better on MS medium with 2mg/l BAP and initiation of roots on hormone free MS medium. On average, 27% of the plants obtained were albinos and 59% of the green plants maintained and transplanted in the field to assess the morphological traits. Fourty seven regenerants showed normal morphological appearances with 80-95% grain fertility.In Arabidopsis, lysin motif proteins, LYM1, LYM3 and CERK1, are required for recognizing bacterial PGNs to mediate immunity. Here, we examined the involvement of PGN receptor proteins in the plant growth promotion (PGP) effects of *B. pumilus* TUAT1 using Arabidopsis mutants defective in PGN receptors. Root growth of wild-type, *cerk1-1, lym1-1* and *lym1-2* mutant plants was significantly increased by TUAT1 inoculation, but this was not the case for *lym3-1* and *lym3-2* mutant plants. RNA-seq analysis revealed that the expression of a number of defense-related genes was upregulated in *lym3* mutants. These results suggested that *B. pumilus* TUAT1 may act to reduce the defense response, which is dependent on a functional LYM3. The expression of the defense-responsive gene, *WRKY29*, was significantly induced by the elicitor flg-22, in both wild-type and *lym3* mutants, while this induction was significantly reduced by treatment with TUAT1 and PGNs in wild-type, but not in *lym3* mutants. These findings suggest that the PGNs of *B. pumilus* TUAT1 may be recognized by the LYM3 receptor protein, suppressing the defense response, which results in plant growth promotion in a trade-off between defense and growth.

2. Manpower Development

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Annual Plant Tissue Culture and Biotechnology conference-2024	February 01, 2025	Sher-e-Bangla Agricultural University	03
2.	International Biotechnology Conference-2025	Jun 20-21, 2025	BRAC University, MerulBadda, Dhaka.	04

3. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Pronabananda Das	Comparative effect study of gamma and ion beam irradiation on local rice genotypes of Bangladesh.	Annual Plant Tissue Culture and Biotechnology conference-2024	Bangladesh Association for Plant Tissue Culture & Biotechnology.	February 01, 2025	Sher-e-Bangla Agricultural University

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Pronabananda Das	Comparative Analysis of Mutagenic Sensitivity and Growth Traits in Tomato	International Biotechnology Conference-2025	BRAC University	Jun 20-21, 2025	BRAC University, MerulBadda, Dhaka
Md. Monirul Islam	Study of the Mechanisms of Involvement of a Receptor for Peptidoglycan in Growth Promotion by *Bacillus pumilus* TUAT1 in *Arabidopsis thaliana*"	Institutional seminar-2025. IFRB, AERE, Savar, Dhaka, Bangladesh.	IFRB, AERE, Savar, Dhaka.	22 January, 2025,	IFRB, AERE, Savar, Dhaka.

4. Collaboration Work (ADP/FNCA/MEXT/IAEA/RCA/FTC/S&T/CRP/In house Project

Plant Biotechnology and Genetic Engineering Division (PBGED) has collaboration with International Atomic Energy Agency (IAEA), Regional Cooperative Agreement (RCA) Austria, Forum for Nuclear Cooperation (FNCA), Japan and LalTeer Seed Limited, Gazipur, Bangladesh. At present scientists of this division engaged in several projects, these are as follows:

- IAEA/ RCA project entitled, "Enhancing crop productivity and quality through mutation by speed breeding". RAS5088.
- Forum for Nuclear Cooperation in Asia (FNCA) project entitled, "Mutation Breeding Project".

5. Memorandum of Understanding (MOU)

Plant Biotechnology and Genetic Engineering Division (PBGED) has MOU with LalTeer Seed Limited, Gazipur, Bangladesh for the Mutation Breeding project of Rice.

Molecular Radiobiology and Biodosimetry Division, IFRB

Objectives

The Molecular Radiobiology and Biodosimetry Division (MRBD) plays a crucial role in both radiation emergency preparedness and advanced research in molecular radiation biology, with the overarching aim of contributing to human health and safety. The major objectives of the division are:

- To assess radiation exposure in accidentally exposed individuals by evaluating absorbed dose through chromosomal DNA damage analysis.
- To investigate DNA damage repair mechanisms in extremely radiation-resistant bacteria, generating knowledge with potential applications in biomedical research.
- To monitor chromosomal status and ensure the genomic safety of patients undergoing radiotherapy or radionuclide treatments.
- To identify, develop, and characterize microbial strains, including mutant varieties, through advanced molecular and microbial research such as metagenomics, epigenetics, gene expression profiling, microbial typing, and protein purification, for economic, health, and environmental benefits.

1. R & D Works

1.1 Draft Genome of the Probiotic *Weissellaconfusa* mrbd Isolated from Fermented Rice (PantaBhat)

A.Y.K. Md. Masud Rana, Safaiatul Islam, Abu Hena Mostofa Kamal, Md. Ziaur Rahman and Protul Kumar Roy

The draft genome of *Weissellaconfusa* strain mrbd, a potential probiotic isolated from the traditional fermented rice dish "Pantabhat," was sequenced and characterized. Genomic DNA was extracted using the Wizard Genomic DNA Purification Kit (Promega, USA), and a paired-end (2×76 bp) library was prepared with the IlluminaNextera XT kit. Raw reads were quality-checked with FastQC, trimmed using Trimmomatic, and assembled with SPAdes v3.15.5 in error correction mode. The assembly was validated using QUAST and

annotated with the NCBI Prokaryotic Genome Annotation Pipeline (PGAP). Species identification was confirmed using K-merFinder and whole-genome phylogeny inferred by GBDP analysis. The sequencing generated 2,283,780 reads, yielding a 2.3 Mb draft genome across 32 contigs (N50: 216.4 kb; L50: 4) with 45% GC content and 59× coverage, including a single plasmid of ~24 kb. The genome harbors 2,146 genes, comprising 2,067 coding sequences and 58 RNA genes (5S, 16S, and 23S rRNAs; 51 tRNAs; 3 ncRNAs), supporting robust transcriptional and translational potential. This well-annotated draft genome of *W. confusa*mrbd enriches genomic resources for lactic acid bacteria and provides a basis for exploring its probiotic attributes. The genome has been deposited in the NCBI GenBank under the strain designation mrbd.

1.2 Heavy Metal (Cobalt) Tolerance of *B. Cereus* mrbd from Gamma Source Pool Water

Safaiatul Islam, Abu Hena Mostofa Kamal, Md. Ziaur Rahman, Protul Kumar Roy and A.Y.K. Md. Masud Rana

Bacillus cereus strain mrbd, isolated from the pool water of a ^60Co gamma irradiator, was evaluated for its cobalt tolerance with the aim of assessing its potential for heavy metal bioremediation. Cobalt resistance was tested on Mueller–Hinton agar plates supplemented with increasing concentrations of cobalt chloride (0–300µg/mL). Bacterial cultures, standardized to an optical density of 0.5 at 620nm in Tryptone Glucose Yeast extract (TGY) medium, were inoculated (50µL) onto the plates and incubated at 37°C for 24h. Visible growth was observed at cobalt concentrations of 25–75µg/mL, whereas complete growth inhibition occurred at 100µg/mL, defining the upper tolerance limit of the strain. These results indicate that *B. cereus*mrbd exhibits moderate cobalt resistance and represents a potential candidate for the bioremediation of cobalt-contaminated environments. Further study is needed.

2. Manpower Development

2.1 Attended in Training/Fellowship/Workshop/Meeting

SI. no.	Title of the program	Date	Place	No. of participants
1.	Training on "Applications of Epigenetic Aging Clocks and Methylation Risk Scores using Whole Genome Methylation Profiling"	24 July, 2024	Illumina Inc. (Webinar)	1
2.	Workshop on "Molecular Diagnosis and precision Medicine"	03 May, 2025	Stamford University, Dhaka	2

3. Oral/Poster Presentation Seminar/Symposium/Conferences (National/International)

Name of participants	Title of the oral/poster presentation	Title of the event	Organizer	Date	Place
Safaiatul Islam	Analysis of Radiation Induced Chromosomal Aberrations in Irradiated peripheral Blood Sample from Healthy Individuals	Seminar on "Dissertation of research activities in R & D"	Ministry of Science and Technology, Bangladesh	29 May, 2025	National Museum of Science and Technology, Dhaka

4. Project Work

S & T Project, entitled "Analysis of Bacterial Diversity and Probiotic Content in Watered Rice (Panta bhat)"", Principal investigator: Dr. A. Y. K. Md. Masud Rana, Associate investigator: Safaiatul Islam (Project ID: SRG -241091)

INSTITUTE OF TISSUE BANKING AND BIOMATERIAL RESEARCH (ITBBR), AERE

Objective

The Institute of Tissue Banking and Biomaterial Research (ITBBR)plays a critical role by producing clinically safe and cost-effective tissue grafts in the treatment of patients with burn injuries and bone defects

by collecting, processing, preserving, and distributing human tissues for clinical use. ITBBR also processes and preserves cranial bone autografts for patients with trauma, surgery (e.g., tumour removal), decompressive craniectomy, or congenital anomalies. Moreover, ITBBR is doing research work ondecellularized human amniotic membrane for burn wound healing, nanomaterials-based scaffolds for bone tissue engineering, and multidrug-resistant bacteria.

1. Research and Development (R&D) Work

1.1 Collection, Processing, and Sterilization of Human Amniotic Membrane for the Treatment and Regeneration of Damaged Skin and Soft Tissues

P. C. Karmakar, F. Diba, T. A. Arafat, M. S. Rahman, N. Akhtar, S. M. Asaduzzaman

The human amniotic membrane (HAM) is a well-established biological dressing commonly used in ophthalmic procedures, plastic and cosmetic surgeries, abdominal and vaginal reconstructions, and skin repair treatments. Its key benefits include enhancing epithelial cell migration, strengthening basal cell adhesion, and supporting epithelial differentiation. After normal vaginal deliveries, amniotic sacs are collected from healthy, disease-free donors. The amnion is carefully separated from the chorion using sterile instruments, thoroughly rinsed with sterile saline solution six to eight times, and then placed on sterile gauze to dry overnight at 40±1°C. Once dried, the membranes are trimmed into standard dimensions—17×10 cm, 10×10 cm, and 5×5 cm—sealed in polythene pouches, vacuum-packed, and labelled inside a laminar flow cabinet. Final sterilization is performed using gamma irradiation at a dose of 25 kGy. During the reporting period, 1,327 amniotic sacs were processed, yielding 5,010 pieces of HAM allografts, of which 4,735 were distributed for clinical rehabilitation surgeries.

1.2 Preparation and Preservation of Cancellous Bone Chips for Application as Osteoconductive Materials in Bone Defect Repair

F. Diba, T. A. Arafat, P. C. Karmakar, M. S. Rahman, N. Akhtar, S. M. Asaduzzaman

Allogenic cancellous bone chips are widely regarded as an effective graft material for treating complex skeletal conditions, such as spinal disorders, congenital abnormalities, degenerative bone diseases, fractures, non-union injuries, oral and maxillofacial defects, and cysts or cyst-like lesions. These cancellous bones—typically femoral heads and condyles—are obtained from medically approved living donors undergoing surgery and are initially preserved frozen in hospitals. Upon arrival at the tissue bank, the femoral heads are dissected under sterile conditions using a surface-sterilized electric band saw. Radiation is applied to the bone tissues to eliminate potential microbial contamination. Following ITBBR's standard procedures, which conform to IAEA guidelines, the bones are pasteurized, processed, sterilized by radiation, and stored appropriately. From July 2024 to June 2025, ITBBR prepared 12,348 cc of radiation-sterilized bone allografts, of which 11,442 cc were distributed for orthopaedic reconstruction surgeries.

1.3 Radiation-Sterilized Autologous Cranial Bone Grafts for Skull Defect Reconstruction: Procurement, Processing, Storage, and Distribution

T. A. Arafat, P. C. Karmakar, F. Diba, N. Akhtar, S. M. Asaduzzaman

Autologous cranial bone is a preferred graft material for reconstructive surgeries aimed at repairing skull defects resulting from trauma, infections, or neurosurgical interventions. The Institute of Tissue Banking and Biomaterial Research (ITBBR) is the only authorized centre for processing and preserving human cranial bone. Initially, cranial bones are stored at -80°C until they undergo processing. They are thawed to room temperature and handled under sterile conditions when ready. The bones are treated with a povidone-iodine solution, rinsed thoroughly with sterile distilled water, double-packed in polyethene, vacuum-sealed, and wrapped in fabric. Each package is labelled with key information, including the graft ID, gamma irradiation dose and date, storage conditions, and expiration date. For enhanced safety, a third polyethylene layer is added before gamma sterilization. The bones are stored again at -80°C while sterility testing is conducted. Once they pass these tests, the cranial bone autografts are distributed to hospitals and clinics. During the reporting period, 551 grafts were supplied, supporting the treatment of patients with traumatic brain injuries, tumors, and stroke-related complications.

1.4 Collection, Preparation, and Distribution of Radiation-Sterilized Demineralized Bone Granules for use in Oral and Maxillofacial Surgical Treatments

P. C. Karmakar, F. Diba, T. A. Arafat, M. S. Rahman, N. Akhtar, S. M. Asaduzzaman

Demineralized bone matrix (DBM) has proven to be an effective option for surgically treating maxillofacial bone defects. It offers essential growth factors, osteoinductive proteins, and strong mechanical support, all while posing a low risk of disease transmission. The demineralization process enhances its biological activity, making DBM a highly suitable graft material for maxillofacial bone regeneration. At ITBBR, bone granules are demineralized using a 0.6N hydrochloric acid solution. During the reporting period, 86 vials demineralized bone granules were produced for application in oral and maxillofacial bone defect surgeries.

1.5 Microbiological Quality Control of Gamma-Irradiated Tissue Allografts

T. A. Arafat, F. Diba, P. C. Karmakar, N. Akhtar, S. M. Asaduzzaman

The successful transplantation of human tissue allografts significantly enhances patients' quality of life and, in some cases, can be life-saving. However, if allografts are contaminated, they pose a serious risk of infection or even death to recipients. To ensure safety and uphold scientific standards, tissue banks must implement strict technical protocols for collecting, storing, documenting, and distributing grafts.Gamma irradiation is a widely recognized method for the terminal sterilization of tissue allografts, offering precise control and leaving no harmful residues. At ITBBR, a sterilization dose of 25 kGy has beenvalidated as effective based on assessments of initial bioburden and microbial resistance. During the reporting period, microbiological testing was conducted on 288 amniotic membrane samples from 21 batches, 863 bone samples from 32 batches, and 436 cranial bone samples from 27 batches. All tested samples were confirmed to be microbiologically safe for transplantation.

1.6 Molecular Profiling of Antimicrobial Resistance (AMR) Genes in *Pseudomonas* spp. and *Acinetobacter* spp. Isolated from Burn–Wound Patients

F. Diba, T. A. Arafat, P. C. Karmakar, N. Akhtar, S. M. Asaduzzaman

Antibiotic resistance is a worldwide problem that is made worse by Bangladesh's poor healthcare procedures as well as the excessive misuse of antibiotics. In burn patients, many isolates, specifically those from opportunistic bacteria like *Acinetobacter* spp. and *Pseudomonas*spp., show multidrug resistance (MDR). Isolates (previously isolated from burn wound infection) were analyzed for the synthesis of beta-lactamases (ESBL, MBL) and overexpression of the efflux pump, both phenotypically and genotypically. Mobile genetic elements (plasmid, integron) and biofilm-forming capability in these MDR isolates were also evaluated. Isolates exhibited high resistance to the 2nd-3rd generation of cephalosporin and quinolone, moderate resistance to carbapenem and the 4th generation of cephalosporin, and low-level resistance to colistin and macrolide. Among the MDR isolates, 85% produced beta-lactamase, 28% had active efflux pump activity, 42.8% had biofilm-forming capability, and only 28.5% carried a plasmid. The genetic information of MDR *Pseudomonas* spp. And *Acinetobacter* spp. investigated in this study may provide valuable insight into understanding the underlying mechanism of multidrug resistance and finding better treatment options for MDR-associated infection in Bangladesh.

1.7 Efficacy Determination of Activated Platelet-Rich Plasma and Decellularized Human Amniotic Membrane in Rat-Model Burn Wound Treatment

T. A. Arafat,P. C. Karmakar,F. Diba, N. Akhtar, S. M. Asaduzzaman

Burn injuries are severe injuries that result in numerous physical, psychological, and social issues, particularly in areas with minimal access to quality medical care. Human Amniotic Membrane (HAM) and Platelet-Rich Plasma (PRP) are renowned for their robust health effects, such as anti-inflammatory activity, anti-scarring, promotion of blood vessel development, and wound healing. This research aimed to assess the efficacy of gel mixtures containing decellularized HAM and PRP and sodium alginate, glycerin, propylparaben, and triethanolamine in burn wound healing. Three gels were developed: dHAM, PRP, and a mixture of dHAM and PRP.Their physicochemical properties e.g.,pH, homogeneity, and spreadabilitywere assessed. Red blood cell compatibility, Fourier Transform Infrared Spectroscopy (FTIR), and Nuclear Magnetic Resonance (NMR) tests were also performed to ascertain non-toxicity and determine functional groups.The results indicate that the gel of dHAM and PRP would have significant therapeutic promise in enhancing burn wound healing.

5. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Md. Shaifur Rahman	Mesenchymal Stem Cells (MSCs): Application for Long and Cranial Bone Defect Reconstruction	Seminar	Institute of Tissue Banking and Biomaterial Research, AERE, Savar, Dhaka	12th February, 2025	Institute of Tissue Banking and Biomaterial Research, AERE, Savar, Dhaka
Tusher-Al-Arafat	Assessment of Sodium Orthovanadate as a Radioprotective Agent in Mice Exposed to Full-Body Irradiation	Seminar	Institute of Tissue Banking and Biomaterial Research, AERE, Savar, Dhaka	22nd May, 2025	Institute of Tissue Banking and Biomaterial Research, AERE, Savar, Dhaka

6. Project Work (ADP/FNCA/RCA/TC/CRP/S&T, etc.)

6.1 S&T Project

Title: Genomic diversity of MDR *Pseudomonas* spp. and *Acinetobacter* spp. from burn wounds and study of antibacterial activity of HAM-based dressing materials against the bacteria

Period: 2024-25

6.2 ADP Project

Title: Modernization and Strengthening of Services and Research Facilities of the Institute of Tissue Banking and Biomaterial Research

Period: 2021-2025

7. Services Rendered

Sl. no.	Number/quality of sample/patient/service	Revenue income
1.	Supply of bone tissue allografts (bone chips, massive bone allografts, and demineralized bone granules) (cc)	8,17,000.00
2.	Supply of bone autografts (pcs)	
3.	Supply of amniotic membrane allografts (pcs)	103050.00
	Total	9,20,050.00

8. Others

8.1 Public and Professional Awareness Activities

Tissue transplantation is relatively a new concept for most people in our country. ITBBR runs ongoing country wide campaigns to fill this knowledge gap as part of its Public Professional Awareness (PPA) Program. These activitiesaim to educate the people on tissue donation, life-saving advantages, and the science. In addition, ITBBR personnels frequently interacts with medical professionals through meetings to enhance their knowledge and understanding of tissue transplantation processes.

NUCLEAR MEDICINE

NATIONAL INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (NINMAS), SHAHBAG

The National Institute of Nuclear Medicine & Allied Sciences (NINMAS) is the apex Nuclear Medicine facility in Bangladesh and it is located at Bangabandhu Medical University (BSMMU) premise. The Institute provides medical imaging using nuclear techniques and therapeutic treatment services.

Objectives

- To render specialized medical services to the people using nuclear technology.
- To improve and upgrade Nuclear Medicine facilities in Bangladesh.
- To conduct training of physicians, physicists radio pharmacists and technologists in the field of nuclear medicine.
- To conduct academic and research activities.
- To coordinate and standardize the activities of all nuclear medicine establishments of BAEC.

Major activities

The services rendered by the institute are:

- Clinical (both diagnostic and therapeutic)
- Academic and
- Research & Development.

All services are provided under the following divisions:

1) PET-CT Division
2) Scintigraphy Division
3) Nuclear Cardiology Division
4) Nuclear Nephrology Division
5) Research and Development Division
6) Thyroid Division
7) In-vitro Division
8) Ultrasound and Color Doppler Division
9) Medical Physics Division
10) Cyclotron Division

1. Clinical Services

1.1 Diagnostic Activities

1) The Institute is equipped with two (2) PET-CT facilities. PET-CT scan is very useful for early diagnosis and staging of cancer for the people of Bangladesh.
2) The institute is equipped with three SPECT, one SPECT-CT and one planar Gamma camera. The studies include: Bone scan, Renal scan (DTPA, DMSA, MAG3 with split function and GFR measurements), Cardiac scan (Myocardial Perfusion Imaging- MPI), Hepatobiliary-HIDA scan, Lymphoscintigraphy, GIT bleeding, Meckel's scan, Hemangioma scan, Thyroid Scan, Parathyroid scan, Brain scan, Salivary gland scan, Lung Perfusion scan etc. Pediatric Brain Scan also done routinely.
3) Thyroid Imaging and Uptake.
4) BMD (Bone Mineral Densitometry) for early detection of osteoporosis/osteopenia and low bone mass.
5) Conventional and Power & Color Doppler Ultrasound Imaging: At present there are 5 Color Doppler's including one 4D, one 3D and three 2D machines. All sorts of diagnostic USG, including normal B-scan of different organs, HRUS of superficial organs and Color Doppler of the vascular system are routinely performed.
6) Hormone Analysis: By using the RIA and modern CLIA techniques the In-vitro division is estimating all thyroid-related hormones like T3, T4, TSH, FT3, FT4, LH, FSH, pituitary hormones, estrogen,

progesterone, prolactin, testosterone, follicular stimulating and luteinizing hormones, Vitamin D, parathormone, Tumor Marker: Thyroglobulin, Thyroid antibodies etc.

1.2 Therapeutic Activities

1) The therapeutic component of our activity is extensively in the treatment of thyroid cancer and hyperthyroid patients using I-131.
2) Strontium-90 for pterygium, corneal neovascularization and squamous cell carcinoma of the conjunctiva.

2. Academic activities

1) NINMAS is the only institute in the country where postgraduate degrees on Nuclear Medicine MD residency course have been conducted for medical graduates under Bangladesh Medical University (BMU). In the last academic session, seven (7) residents were admitted for MD course of five (5) years duration. In 2024-2025, Sixteen (16) doctors have successfully obtained their post-graduate MD degree.
2) Weekly Journal Club as a continuous education program was conducted on recent Nuclear Medicine & Allied Sciences related works regularly in this institute.
3) Weekly Scientific Seminars also arranged with the participations of Doctors, MD residents, Scientists and relevant technologists as a continuous education program was conducted on recent Nuclear Medicine & Allied Sciences related works regularly in this institute.
4) Thesis protocol also presented by the MD Residents as a part of their Thesis Defense.
5) Scheduled lectures were delivered routine to post-graduate students (MD, MS) of different disciplines of BMU, BIRDEM, NIKDU, NICVD, NSH, NICRH, NICDH and Heart Foundation and students are placed for 15-30 days for practical demonstration.
6) Collaborator of the 'Multi-Disciplinary Team Approach consultation between oncologists, Head neck surgeons, Pathologists and palliative care units along with Nuclear Medicine specialists of NINMAS for clinical management of complicated and academic cases.

3. Production of Radiopharmaceuticals at Cyclotron Facility

Cyclotron Facility at NINMAS, BAEC – IBA Cyclone® 18/9:

The IBA Cyclone® 18/9, a dual-particle medical cyclotron, is installed in the basement of Block-F at the BMU campus and is operated by the National Institute of Nuclear Medicine and Allied Sciences (NINMAS), under the Bangladesh Atomic Energy Commission (BAEC). This cyclotron is capable of accelerating protons to an energy of 18 MeV and deuterons to 9 MeV.

It facilitates the routine production of a range of positron-emitting radionuclides, including Fluorine-18 (^{18}F), Oxygen-15 (^{15}O), Nitrogen-13 (^{13}N), and Carbon-11 (^{11}C), along with other isotopes derived from solid targets, for use in Positron Emission Tomography (PET) imaging.

Currently, the primary use of the cyclotron is the production of Fluorine-18 for the synthesis of ^{18}F-fluorodeoxyglucose (^{18}F-FDG), which is utilized in routine PET-CT imaging. The ^{18}F-FDG produced at the facility is supplied twice weekly to several PET centers across the country, including NINMAS, INMAS Dhaka, Combined Military Hospital (CMH), Evercare Hospital Dhaka (EHD), Medi nova Medical Services Ltd., and the Institute of Nuclear Medical Physics (INMP), Savar.

In addition to ^{18}F-FDG, the cyclotron facility is technically equipped to produce other clinically relevant ^{18}F-labeled radiopharmaceuticals such as ^{18}F-sodium fluoride (^{18}F-NaF), ^{18}F-fluorothymidine (^{18}F-FLT), and ^{18}F-misonidazole (^{18}F-MISO).

As of recent operational developments, the production of ^{18}F is being carried out three times per week, expanding the facility's capacity to meet increasing clinical demand. Moreover, ^{18}F-labeled prostate-specific membrane antigen (^{18}F-PSMA) PET imaging has been introduced for the evaluation and management of prostate cancer. These specialized PET scans are currently performed bi-monthly (every 15 days), on alternating days of the month.

4. Manpower Development

4.1 Training Attended

Sl. no.	Name of the participants	Title of the program	Date	Place	Number of participants
1.	Md. Nahid Hossain	Regional Training Course on Medical Physics Academic Programmers' (TN-RAS 6101 - 2306257)	05-09 August 2024	Beijing, China	
2.	Sanjida Islam	ANENT 10th Webinar on Application of Radiation in Medicine	29 August 2024	Vienna, Austria. **(Virtual)**	
3.	Dr. Tapati Mandal	Regional Training Course on Fundamental Clinical Applications of Hybrid Imaging (PET-CT & SPECT-CT) and CT Role in Hybrid Imaging. TN-RAS6106-2403111	3 to 7 September 2024	Denpasar, Indonesia,	26
4.	Dr. Jasmin Ferdous	International Conference on Hybrid Imaging (IPET 2024) **(Virtual)**	7-11th October, 2024	Vienna, Austria. **(Virtual)**	
5.	Dr. Urnas Islam	International Conference on Hybrid Imaging (IPET 2024) **(Virtual)**	7-11th October, 2024	Vienna, Austria. **(Virtual)**,	
6.	Dr. Mohammad Sajjad-Al-Mishal	International Conference on Hybrid Imaging (IPET 2024) **(Virtual)**	7-11th October, 2024	Vienna, Austria. **(Virtual)**,	
7.	Dr. Mohammad Sajjad-Al-Mishal	Basic Training - From concept to certification by ISUOG **(Virtual)**	20th November, 2024	Webinar Livestream	
8.	Dr. Urnas Islam	Bangladesh International Cancer Congress 2024 Third International	13-14th December, 2024	Dhaka. Vienna, Austria **(Virtual)**	
9.	Md. Nur-E Alam Siddiquee	Regional Workshop on the Role of the Medical Physicist in Quality Management of Diagnostic Radiology Departments	27 to 31 January 2025	Chiang Rai, Thailand	
10.	Dr. Urnas Islam	Conference on Applications of Radiation Science and Technology (ICARST 2025) **(Virtual)**	7-11th April 2025.	Dhaka. Vienna, Austria **(Virtual)**	
11.	Dr. Mohammad Sajjad-Al-Mishal	Third International Conference on Applications of Radiation Science and Technology (ICARST 2025) **(Virtual)**	7-11th April 2025.	Vienna, Austria **(Virtual)**	
12.	Dr. P. Akhter	Regional Training Course on Clinical Applications of Theranostics using Ga-68 Labeled, Lu-177, and Ac-225 Radiotracers	26 to 30 May 2025	Lahore, Pakistan	
13.	Dr. Mohammad Sajjad-Al-Mishal	International Conference on Advances in Radiation Oncology (ICARO-4). **(Virtual)**	2-5th June, 2025	Vienna, Austria **(Virtual)**	
14.	Sanjida Islam	Regional Training Course on the Production and Quality Control of Radiopharmaceuticals (TN-RAS6111-2500805)	16-20 June 2025	National Cancer Institute, Putra Jaya, Malaysia-IAEA	15

4.2 Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Tapati Mandal	Strengthening the application of Hybrid Imaging and Theranostics Techniques for the effective management of patients with communicable & non-communicable disease	INMAS	8th October 2024	Dhaka
Md. Nahid Hossain	Clinical Application of PET-CT	SNMB	29 October 2024	INMAS, Suhrawardy
Dr. Jasmin Ferdous	Bangladesh International Cancer Congress 2024	BICC	13-14th December, 2024.	Dhaka.
Md. Nahid Hossain	Application of Medical Physics in Cancer Management	BMPA	26 December 2024	Atomic Energy Centre, Dhaka

5. Arranged Training Program/Workshop/Seminar/Symposium/Conference

Sl. no.	Title of the event	Date	Place	No. of participants
1.	জাতীয় শুদ্ধাচার কৌশল কর্ম-পরিকল্পনা, ২০২৪-২০২৫ সভাপতিত্বে: অধ্যাপক ফেরদৌসী বেগম, পরিচালক, নিনমাস পরিচালনায়: ডাঃ মোহাম্মদ সাজ্জাদ-আল-মিশাল, চিকিৎসা কর্মকর্তা, নিনমাস	২৮ নভেম্বর, ২০২৪	নিনমাস অডিটরিয়াম	4
2.	36th National Conference of The Bangladesh Society of Ultrasonography	6-7th December, 2024	Dhaka.	
3.	28th National Conference of Society of Nuclear Medicine Bangladesh	7-8th February, 2025	Cox's Bazar, Bangladesh	224
4.	জাতীয় শুদ্ধাচার কৌশল কর্ম-পরিকল্পনা, ২০২৪-২০২৫ সভাপতিত্বে: অধ্যাপক ডাঃ এ.কে.এম ফজলুল বারি, পরিচালক, নিনমাস প্রশিক্ষক : ডাঃ তপতী মন্ডল, এসএমও, নিনমাস	২৭ এপ্রিল, ২০২৫	নিনমাস অডিটোরিয়াম	40
5.	Scientific Program for One-day Lab Visit At NINMAS Department of Medical Biotechnology, BRAC University on "Diagnostic and Therapeutic Application of Nuclear Medicine"	6th May' 2025	NINMAS, Dhaka	58
6.	World Thyroid Day 2025 and Scientific seminar on Different Cases of Thyroid Disorder by Dr. Jasmin Ferdous (PMO)	25th May' 2025	NINMAS	150
7.	16th Thyroid Conference	16th May, 2025	Pan Pacific Sonargaon, Dhaka	151
8.	জাতীয় শুদ্ধাচার কৌশল কর্ম-পরিকল্পনা, ২০২৪-২০২৫ সভাপতিত্বে: অধ্যাপক ডাঃ এ.কে.এম ফজলুল বারি, পরিচালক, নিনমাস প্রশিক্ষক: ডাঃ উরনাছ ইসলাম, এসএমও, নিনমাস	২ জুন, ২০২৫	নিনমাস অডিটোরিয়াম	59

6. Seminar/Journal Club/Symposium/Conference/Workshop/Meeting Arranged

Name of the presenter	Topic	Date	Place	Participant
Md. Hasan Mehdi (SO, NINMAS)	The Teaching of Michael Pollan on Healthy Eating	2nd July, 2024 (Tuesday)	NINMAS, Auditorium	35
Sanchoy Chandra Biswasarma (SO, NINMAS)	The Limitations of 18F-FDG and the Advancements in Alternative 18F-Radiopharmaceuticals	8th July, 2024 (Tuesday)	NINMAS, Auditorium	33
Md. Nur-E-Alam Siddiquee (SO, NINMAS)	Experience of Training course on radiation protection for radiation workers and RCO's of BAEC, medical facilities and industries	16th July, 2024 (Tuesday)	NINMAS, Auditorium	30
Dr. S.M. Arifur Rahman (MO, NINMAS).	Lung Cancer Detected as a Metachronous Second Primary Malignancy in a patient with pharyngeal carcinoma during F18-FDG PET-CT scan- a case report	30th July, 2024	NINMAS, Auditorium	32
Sanjida Islam (SO, NINMAS)	A comparative Insight: Tc-99m PSMA vs PET PSMA Tracers in Prostate Cancer	13th August, 2024 (Tuesday)	NINMAS, Auditorium	34
Prof. Dr. Fatima Begum (Director, NINMAS)	Radioactive Iodine Treatment in Differentiated Carcinoma: Prof. Dr. Kamaluddin Ahmed's Legendary Works and Subsequent Experiences in 43 years at NINMAS	27th August, 2024 (Tuesday)	NINMAS, Auditorium	40
Farzana Rahman Ananna (MO, NINMAS)	Unique scenarios & cases in Scintigraphy & Nuclear Nephrology Department	3rd September, 2024 (Tuesday)	NINMAS, Auditorium	33
Muhtasim Kadir (Engineer, NINMAS)	Theory of CT Scanner	17th September, 2024 (Tuesday)	NINMAS, Auditorium	30
Dr. Afroja Sultana (MO, NINMAS)	Role of Tc99m RBC Scan in Diagnosis of Hemangioma	24th September, 2024 (Tuesday)	NINMAS, Auditorium	32
Dr. Nabeel Fahmi AIi (SMO, NINMAS)	Neck Compartments & Thyroid Gland: A Comprehensive Ultrasound Perspective	8th October, 2024 (Tuesday)	NINMAS, Auditorium	34
Muhtasim Kadir (Engineer, NINMAS)	Electrical Hazard and Prevention (বৈদ্যুতিক ঝুঁকি এবং প্রতিরোধ)	5th November, 2024 (Tuesday)	NINMAS, Auditorium	35
Sanchoy Chandra Biswasarma (SO, NINMAS)	Evaluating the Impact and Cost-Effectiveness of Congenital Hypothyroidism Screening Programme conducted in Bangladesh by Bangladesh Atomic Energy Commission	12th November, 2024 (Tuesday)	NINMAS, Auditorium	25
Mr. Abu Sayed, Department of Biomedical Physics & Technology, University of Dhaka	Lung Cancer Diagnosis from CT images using automated ROI cropping ensemble classification and segmentation architectures	19th November, 2024 (Tuesday)	NINMAS, Auditorium	27
Sanjida Islam (SO, NINMAS)	The Future of Nuclear Medicine, Molecular Imaging and Theranostics	26th November, 2024 (Tuesday)	NINMAS, Auditorium	25
Md. Shohag Mia (SO, NINMAS)	Therapeutic Radionuclides: Past, Present and Future	3rd December 2024 (Tuesday)	NINMAS, Auditorium	23
Md. Nur-E-Alam Siddiquee (SO, NINMAS)	PMI of Medical Cyclotron IBA Cyclone 18/9MeV at NINMAS	18th December 2024 (Tuesday)	NINMAS, Auditorium	26
Prof. Dr. Rubina Begum (CMO, NINMAS)	Management of Hypothyroidism	14th January, 2025 (Tuesday)	NINMAS, Auditorium	24
Dr. Afroja Sultana (MO, NINMAS)	Metastatic Follicular Thyroid Carcinoma, Oncocytic (Hurthle cell) variant: challenges in diagnosis and treatment	15th January, 2025 (Wednesday)	Classroom-1013 NINMAS	15
Dr. Mohammad Sajjad-Al-Mishal (MO, NINMAS)	Role of Vitamin-D & Natural Calcium in Thyroid Carcinoma Patients	5th February 2025 (Wednesday)	Classroom-1013 NINMAS	29

Name of the presenter	Topic	Date	Place	Participant
Dr. Nabeel Fahmi Ali (SMO), Prof. MD. Nahid Hossain (CMO), Dr. Papia Akter (SMO), Prof. Dr. Nasreen Sultana. Prof. Dr. Fatima Begum (PI)/ Dr. Jasmin Ferdous(PMO), Dr. Pupree Mutsuddy (PMO)	Last 5 years (2021-2025) running projects at NINMAS Projects are-	8th April, 2025 (Tuesday)	NINMAS, Auditorium	35
Dr. Pupree Mutsuddy (PMO, NINMAS)	Exploring Funding and Collaboration in National and International Research Projects	17th April, 2025 (Tuesday)	NINMAS, Auditorium	32
Prof. Dr. Nasreen Sultana (CMO, NINMAS)	Journal Club	22nd April, 2025 (Tuesday)	NINMAS, Auditorium	39
Dr. Tapati Mandal (SMO, NINMAS)	PSMA PET/CT Scan in Prostate Cancer: Experience from Regional Training Course (RTC)RAS 6106, Bali, Indonesia	27nd April, 2025 (Sunday)	NINMAS, Auditorium	41
Dr. Papia Akhter (SMO, NINMAS)	Comparative Analysis between F-18 PSMA-1007 and F-18 FDG PET/CT scan in a case of Metastatic Prostate Carcinoma	4th May, 2025 (Sunday)	NINMAS, Auditorium	35
Dr. Nabeel Fahmi Ali (SMO, NINMAS)	Sonographic Evaluation of Thyroid	12th May, 2025 (Monday)	NINMAS, Auditorium	33
Prof. Mohammad Monir Uddin, Dept. of Mathematics and Physics, North South University	Multimodal AI for Automated Medical Image Segmentation and Precision Diagnosis	18th May, 2025 (Sunday)	NINMAS, Auditorium	37
Dr. Jasmin Ferdous	Different Cases of Thyroid Disorder	25th May' 2025 World Thyroid Day	NINMAS, Auditorium	150
Dr. Urnas Islam (SMO, NINMAS), Raisa Nusrat & Md. Rahinur Rahman (BUET, EEE, Final year)	Weekly Scientific Seminar & General Meeting on 2nd June, Monday. 1.Topic: Management of Hyperthyroidism Patient 2.Topic:ThyroFution: AI Based Multimodal Classification of thyroid Nodules 3.General Meeting with Head of the Departments.	2nd June, 2025 (Monday)	NINMAS, Auditorium	53
Dr. Shimul Sarker (MO, NINMAS)	Diagnostic Utility of Thyroid Uptake and Scan in Thyroid Disorder	22nd June, 2025 (Sunday)	NINMAS, Auditorium	32

7. Weekly Journal Club & Scientific Program Presented by Md Residents of Nuclear Medicine

Name of the presenter	Topic	Date	Place	Participant
Presenter Residents: Dr. Afrida Khanom Dr. Mostafa Taufiq Elahi Dr. Forhad-E-Ghani	Bone Scintigraphic Pattern and Correlation with Serum Prostate Specific Antigen Levels in Prostate Cancer Patients at NINMAS	30th April, 2025 (Wednesday)	Classroom-1013 NINMAS	43
Presenter Residents: Dr. Pinky Rani Das, Dr. Nabila Nuzhat & Dr. Khandaker Samia	Persistent low Thyroglobulin Levels with Positive Post therapy Scan in Metastatic Differentiated Thyroid Carcinoma	7th May, 2025 (Wednesday)	Classroom-1013 NINMAS	36
Presenter Residents: Dr. Afroza Sultana, Dr. Kamrun Nahar Kainath, Dr. Eshita Nandy	Correlation of B-mode and Doppler Ultrasound Parameters of Kidney with Serum Creatinine Level in Chronic Kidney Disease Patients	14th May, 2025 (Wednesday)	Classroom-1013 NINMAS	34

Name of the presenter	Topic	Date	Place	Participant
Presenter Residents: Dr. Fatema Farzana, Dr. Fatema Morium	Efficacy of SPECT Myocardial Perfusion Imaging (MPI) in Combination with Coronary Artery Calcium (CAC) Score for the Diagnosis of Coronary Artery Disease (CAD)	20th May, 2025 (Tuesday)	Classroom-1013 NINMAS	25
Presenter Residents: Dr. Mimi Akhter Dr. Afia Mobbashira	Role of 18F- FDG PET-CT and MRI for Predicting Pathological Response to Neoadjuvant Chemotherapy in Breast Cancer Management	27th May, 2025 (Tuesday)	Classroom-1013 NINMAS	33
Presenter Residents: Dr. Farzana Rahman Ananna Dr. Tanusree Bhowmik Dr. Nabila Nuzhat	Homsy's sign in DTPA renogram- Initial Experience at NINMAS	17th June, 2025 (Tuesday)	Classroom-1013 NINMAS	28
Presenter Residents: Dr. Zinnah Sayar Mahnud Dr. Md Ibnul Khan	Effect of Single Dose of Radioiodine Therapy on Volume Reduction of Thyroid Gland in Hyperthyroidism	24th June, 2025 (Tuesday)	Classroom-1013 NINMAS	22

8. Thesis Protocol Presentation by MD Residents of Nuclear Medicine

Name of the presenter	Topic	Date	Place	Participant
Dr. Tanusree Bhowmik (MD Resident, Phase-B, NINMAS)	Diagnostic value of gray scale ultrasound and Doppler for grading of cirrhosis of liver.	31th July, 2024 (Wednesday)	NINMAS, Auditorium	35
Dr. Nabila Nuzhat (MD Resident, Phase-B, NINMAS)	The role of Regional Myocardial Perfusion Imaging in predicting vessel related outcomes of patients with known coronary artery disease	31th July, 2024 (Wednesday)	NINMAS, Auditorium	35
Dr. Afrida Khanam, Resident, MD (Phase-B) Nuclear Medicine, NINMAS	Role of cortical tracer transit time in predicting post-operative renal function improvement obstruction patients with Pelvic-ureteric junction obstruction	18th June, 2025 (Wednesday)	NINMAS, Auditorium	29
Dr. Mostafa Toufiq Elahi, Resident, MD (Phase-B) Nuclear Medicine, NINMAS	Carotid Intima media Thickness as surrogate marker of lower limb arterial lesions with diabetic foot in adult patients	18th June, 2025 (Wednesday)	NINMAS, Auditorium	29
Dr. Forhad-E-Ghani, Resident, MD (Phase-B) Nuclear Medicine, NINMAS	Serum NT-proBNP levels in hibernating and non-viable myocardium: A comparative Study using Cardiac PET imaging	18th June, 2025 (Wednesday)	NINMAS, Auditorium	29

9. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr. Tapati Mandal	PSMA PET-CT scan in prostate cancer: Experience from Regional Training Course (RTC) RAS 6106	Strengthening the application of Hybrid Imaging and Theranostics Techniques for the effective management of patients with communicable & non-communicable disease	INMAS, Dhaka	8th October, 2024	INMAS, Dhaka

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr. Tapati Mandal	Skeletal Muscle Metastases in Renal Cell Carcinoma: The Role of PET-CT scan-A case report	19th SFO & BICC 2024	Oncology club Bangladesh	13-14 December 2024	Radison Blu, Dhaka, Bangladesh
Mohammad Anwar-Ul-Azim, Md. Jashim Uddin, Sanchoy Chandra Biswasarma, Sanjida Islam, Md. Saiful Islam, Hasan Mehdi, Md. Shohag Mia, Nur-E-Alam Siddiqee, Nahid Hossain	Prospectus of Fluorine -18 labeled Radiopharmaceuticals beyond 18F[FDG] in Diagnostic Molecular Imaging.	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Md. Abu Bakker Siddique, Tapati Mandal, Pupree Mutsuddy, Papia Akhter, S M Arifur Rahman, Afrida Khanam, Kabid Hosain, Fatima Begum	Trends of Malignancies Among Geriatric Population: A Year-Long Retrospective Analysis in PET/CT Division of NINMAS	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Pupree Mutsuddy, Tapati Mandal, Papia Akhter, S M Arifur Rahman, Fatema Tuz Zohra, Md. Abu Bakker Siddique, Fatima Begum, Shamim MF Begum	Brief Overview on Addressing Pitfalls In F-18 FDG Imaging: Interpretation Challenges, Confidence Enhancement and Diagnostic Strategies	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Papia Akhter, Pupree Mutsuddy, Tapati Mandal, S. M. Arifur Rahman, Md. Abu Bakker Siddique, Fatima Begum	Comparative Analysis Between F-18 PSMA-1007 And F-18 FDG PET/CT scan in Metastatic Prostate Carcinoma: A Case Report	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Afroja Sultana, Nasreen Sultana, Sharmin Reza, Jesmin Ferdous, Urnas Islam	Role of Tc-99m RBC Scan for Confirmatory Diagnosis of Hepatic Hemangioma- a Case Series	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Md. Nahid Hossain, Md. Mahi Uddin, Md. Shohag Mia, Hasan Mehdi, Nur-E-Alam, Tanvir Ahmed Biman	Investigation of the Radionuclides Induced in the Concrete Materials Exposed to Neutron at F-18 Production in Cyclotron	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Md. Jashim Uddin, Mohammad Anwar-Ul Azim, Sanchoy Chandra Biswasarma, Sanjida Islam, M. Saiful Islam	In-house Development of A Semi-Automated Dispensing System for [18F]FDG at the Cyclotron Facility of National Institute of Nuclear Medicine and Allied Sciences and Optimizing Its Sterile and Aseptic Dispensing Condition	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Md Shohag Mia, Md. Nur-E Alam Siddiquee, Sanjida Islam, Muhtasim Kadir, Hasan Mehdi, Sanchoy Chandra Bishwasarma, Md. Jashim Uddin, Md. Nahid Hossain	Therapeutic Radionuclides for Cancer Treatment: Future Prospects of Ac-225 Alpha Emitter Production with 18/9 MeV Cyclotron at NINMAS	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Hasan Mehdi, ARK Reepon, Md. Shohag Mia, Sanchoy Chandra Biswsarma, Nur-E-Alam Siddiqee, Muhtasim Kadir, Sanjida Islam, Md. Jashim Uddin, Mohammad Anwar-Ul Azim, Nahid Hossain, Ferdoushi Begum	Enhancing Medical Imaging Reporting Through Virtual Reality (VR)	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Sanjida Islam, Mohammad Anwar-Ul Azim, Md. Jashim Uddin, Sanchoy Chandra Biswasarma, Md. Saiful Islam, Md Shohag Mia, Hasan Mehdi, Nur-E-Alam Siddiqee, Muhtasim Kadir, Mustafa Mamun, Nahid Hossain, Ferdoushi Begum	Factors Influencing 18F-FDG Yields at NINMAS: A Comprehensive Analysis of 100 Production Batches	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Sanchoy Chandra Biswasarma, Mohammad Anwar-Ul Azim, Md. Jashim Uddin, Mustafa Mamun, Shakera Khatun, Sanjida Islam, Priyanka Podder, Maleka Pervin, Md. Emdad Hossan, Md. Saiful Islam, 1Hasan Mehdi, Md. Shohag Mia, Nur-E-Alam Siddiqee, Muhtasim Kadir, Nahid Hossain, Ferdoushi Begum	Assessment Of the Impact and Cost-Effectiveness of The Congenital Hypothyroidism Screening Program in Bangladesh by The Bangladesh Atomic Energy Commission	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Sharmin Reza, Rahima Perveen, Urnus Islam, Nasreen Sultana	Dough Nut Sign: An Unusual Scintigraphic Pattern Observed in Bone Scan Findings	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Mohammad Sajjad-Al-Mishal, Jasmin Ferdous, Urnas Islam, Shamsun Nahar Bailey, Shimul Sarkar, Fatima Begum	Unusual Biochemical Challenges in Papillary Thyroid Carcinoma: Elevated Thyroglobulin and TSH Levels: A Case Report	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Md. Nur-E Alam Siddiquee, Md. Shohag Mia, Mohtasim Kadir, Hasan Mehdi, Md. Nahid Hossain, Sanjida Islam, Md. Jashim Uddin, Sanchoy Chandra Biswasarma	Longitudinal Analysis of Energy Resolution Degradation in PET-CT: A Five-Year Quality Assurance Study	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Muhtasim Kadir, Nasreen Sultana, Md. Emdad Hossan, Md. Shohag Mia, Md. Nur-E Alam Siddiquee, Hasan Mehdi, Sanjida Islam, Sanchoy Chandra Biswasarma, Md. Jashim Uddin, Kabid Hasan, Khokon Kumar Nath, Mohammad Anwar-Ul Azim, Md. Nahid Hossain, Ferdoushi Begum	Enhanced Feature Identification in Medical Imaging Using Contrast Enhancement, Edge Detection, and Texture Analysis Techniques	28th National Conference	Society of Nuclear Medicine, Bangladesh	7th February , 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
A.K.M Fazlul Bari, Nasreen Sultana, Sharmin Reza, Rahima Parveen, Shaila Sharmin, Shamsun Nahar, Nabeel Fahmi Ali, Afroza Sultana	Role of Doppler, 3D/4D & Elastosan to diagnose Thyroid Diseases	16th thyroid conference 2025	BITMIR The Thyroid Centre	16th May 2025	Pan Pacific Sonargaon, Dhaka

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
A.K.M Fazlul Bari, Md. Abu Bakkar Siddique, Dr. Rubina Begum, Pupree Mutsuddy, Tapati Mondal, Papia Akhter, Farhana Haque, Jasmin Ferdous, Mohana Hossain, Urnas Islam, Mohammad Sajjad Al Mishal.	"Sclerotherapy & Radio Frequency/Microwave Ablation of Thyroid Nodules."	16th thyroid conference 2025	BITMIR The Thyroid Centre	16th May 2025	Pan Pacific Sonargaon, Dhaka

10. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Scientific Seminar on Research rvorks Sharing with Stakeholders about "Ir-r'rpofiance of Assessing Three Sites BMD lor Better Management of Osteoporosis & hrlerior Thl roiC Afier) flou by Color Doppler Sonography in thyrotoxicosis" Dr. Mita Dutta, Consultant, Dept. of Endocrinology. BSMMU	29 January, 2025 (Wednesday)	NINMAS, Auditorium	50
2.	Scientific Seminar on Research works Sharing with Stakeholders about Future Nuclear Medicine and Imaging by Prof. Dr. A.K.M. Fazlul Bari, Director, NINMAS	29th June, 2025 (Sunday)	NINMAS, Auditorium	59

11. Service Rendered

Number of Patients	70,802
Blood Samples Analysis	32,840
[^{18}F] FDG Production	69.90 Ci
Total Income in BDT	13,04,46,720 (Thirteen Crore Four Lac Forty-six Thousand Seven hundred & Twenty Taka only)

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), DHAKA

Objective

Institute of Nuclear Medicine & Allied Sciences is one of the oldest Nuclear Medicine in this country and it was established in 1961 in the Dhaka Medical College premises. At present this institute included different technologies like PET-CT, SPECT-CT, Dual headed Gamma Camera, BMD, thyroid scanner, 3D & 4D ultrasound and well equipped RIA and CLIA facilities. Significant number of patient's health care services are offered from this institute as regular basis. Our objectives to render specialized medical services by using nuclear technology and also conduct academic & research activities.

1. Manpower Development

Sl. no.	Title of the event	Date	Place	No. of Participant
1.	Monthly Seminar	16-07-2024 06-09-2024 03-12-2024 08-01-2024 11-02-2025 11-03-2025	Auditorium INMAS, Dhaka, Dhaka Medical College Campus, Dhaka-1000, Bangladesh.	65 70 63 55 45 62
2.	Virtuousness	29-09-2024 22-12-2024	Auditorium INMAS, Dhaka, Dhaka Medical College Campus,Dhaka-1000, Bangladesh	64 58

2. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Jasmine Ara Haque Dr. Afroza Akhter	American Society of Nuclear Cardiology Conference (ASNC)	American Society of Nuclear Cardiology	05-07 September 2024	Austin, Texas, USA
Dr. Jasmine Ara Haque Dr. Rawnak Afrin Dr. Mohana Hossain Dr. Afroza Akhter Dr. Shaila Sharmin	ITERNATIONAL CONFERENCE ON HYBRID IMAGING (IPET-2024)	IAEA	07-11 October 2024	Vienna ,Austria
Dr. Shankar Biswas Dr. Rubina Begum Dr. Rawnak Afrin Dr. Afroza Akhter Dr. Shaila Sharmin	19th SFO Bangladesh International Cancer Congress (BICC) 2024	SAARC Federation of Oncologist	13-14 December 2024	Radisson blue water garden Hotel, Dhaka, Bangladesh
Dr. Shankar Biswas Dr. Rubina Begum Dr. Farhana Rahman Dr. Rawnak Afrin Dr. Mohana Hossain Dr. Sadia Hossain Dr. Afroza Akhter Dr. Tania Sultana Dr. Tamina Biswas Dr. Shaila Sharmin Dr. Mahmudur Rahman Majumder Dr. Sabrina Islam	36th National conference of (BSU)	Bangladesh Society of Ultrasonography	06-07 December 2024	Bangabandhu International Conference Center
Dr. Shankar Biswas Dr. Farhana Rahman Dr. Rawnak Afrin Dr. Mohana Hossain Dr. Sadia Hossain Dr. Afroza Akhter Dr. Tania Sultana Dr. Tamina Biswas Dr. Shaila Sharmin Dr. Sumaiya Alam Dr. Tanvieul Hasan Majibur Rahman Bodrul Hasan Mamun Shahida Khatun Md. Abul Hasan Bikash Chanra Biswas Kamal Uddin Habibur Rahman Serker Abul Kalam Azad Abdul Awal Khan	28th National conference of (SNMB)	Society of Nuclear Medicine, Bangladesh (SNMB)	07-08 February 2025	Ocean Paradise, Cox's Bazar, Dhaka, Bangladesh

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Mohana Hossain Dr. Rahima Parvin Dr. Shaila Sharmin	16th Thyroid Conference 2025, ÔÔThyroid- The Mother Gland''	Bangladesh Institute of Thyroid Medicine & Imaging Research (BITMIR),	16 May 2025	Hotel Pan Pacific, Sonargaon Dhaka, Bangladesh.
Dr. Shankar Biswas Dr. Farhana Rahman Dr. Rawnak Afrin Dr. Mohana Hossain Dr. Sadia Hossain Dr. Rahima Parvin Dr. Afroza Akhter Dr. Tania Sultana Dr. Tamina Biswas Dr. Shaila Sharmin Dr. Sumaiya Alam Dr. Tanvirul Hasan	Workshop on Interventional Ultrasonography, Part-1	Bangladesh Society of Ultrasonography	26 July 2025	Auditorium INMAS, Dhaka, Dhaka Medical College Campus,Dhaka-1000, Bangladesh
Dr. Tanima Biswas	Regional Workshop on Streamlined and Emerging theranostic Techniques"(ME-RAS6106-2406933)	IAEA	09-13 June 2025	Thailand, Bangkok
Dr. Shankar Biswas	International Forum on Rays of Event (EVT2502487)	IAEA	30 June 2025 to 02 July 2025	Addis Ababa, Ethiopia
Dr. Mohana Hossain Dr. Rawnak Afrin	International Conference on Hybrid Imaging (IPET-2024) (CN-326/EVT2300043)	IAEA	07-11 October 2024	Vienna, Austria

3. Stakeholder Meeting

Sl. no.	Title of program	Date	Place	Number of participant
1.	Stakeholder Meeting	20-03-2025	Auditorium INMAS, Dhaka, Dhaka Medical College Campus, Dhaka-1000, Bangladesh.	55

4. Collaboration Work/MoU (ADP/FNCA/MEXT/FTC/IAEA/RCA/S&T/CRP/ In–house Project/ Universities, etc.

4.1 IAEA-RCA Project: "Strengthening the Application of Hybrid Imaging and Theranostics Techniques for the Effective Management of Patients with Communicable and Non-Communicable Diseases (2024-2027)" Non RCA RAS 6106.

4.2 S&T Project: Evaluation of therapy response by 18F FDG PET- CT in EGFR wild type and EGFR mutated Lung Adenocarcinoma patients among Bangladeshi Population (SRG-245416)

4.3 IAEA TC PROJECT 2026-2027 cycle (BGD2024001): Advancing Diagnostic and Therapeutic Nuclear Medicine Facilities for Cancer Care in Bangladesh: A Strengthening Project.

5. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Income (if any)
1.	Patient Service	48,528.00	69,741,850.00
		Total=	69,741,850.00

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), MITFORD

Objective

- Application of Nuclear technology in Medical services
- To improve and upgrade nuclear medicine facilities in Bangladesh.
- To conduct academic and research activities.

1. R&D Work(s)

1.1 Menstrual Abnormality Experienced in Well Differentiated Thyroid Carcinoma Female Patients After Single Dose Radioiodine Therapy – Mono Institute Based Experience

Samira Sharmin, Syed Muhammad Baqui Billah, Hosne Ara Rahman, Afroza Naznin, Farida Yasmin, Md Monir Uddin

This study was designed to evaluate the experience of menstrual problem in DTC patients after a single dose of radioiodine therapy. Mean age of the study subject was 30.7± 5.01 years. Out of 79 female patients 12 (15.1 %) reported no problem or any kind of menstrual abnormality. Oligomenorrhoea identified in 12 (15.1 %) , hypomenorrhoea in 13 (16.5%), delayed pregnancy in 1 (1.2 %). Persistent problem with menstruation before and after therapy was reported by 11(13.9 %). Menopause was reported by 12 (15.1 %) during the study period. This result concluded that female patient receiving radioiodine therapy had experienced menstrual abnormalities of varying degree.

1.2 Radioiodine Induced Salivary and Lacrimal Gland Dysfunction in Differentiated Thyroid Carcinoma Patients: An Observational Study

Farida Yasmin, Afroza Naznin, Samira Sharmin, Hosne Ara Rahman

A total 124 patients with DTC were included in this study to assess the radioiodine induced salivary & lacrimal gland damage who were completed a follow- up period of minimum 60 months after radioiodine therapy. A total 46 (37.1 %) patients experienced salivary gland symptoms where xerostomia (34.2%) was the most common. Lacrimal gland symptoms were found in 12 (9.6%) patients, 10 (7.8 %) patients showed features of chronic sialadenitis in ultrasonogram. The result concluded that salivary gland damage is a common manifestation of thyroid cancer patients after radioiodine therapy.

1.3 Metastatic Pattern in Triple Negative versus Triple Positive Invasive Ductal Carcinoma of Breast: Single Center Experience

Afroza Naznin, Farida Yasmin, Samira Sharmin, Hosne Ara Rahman

Breast carcinoma patients presents with various subtypes like estrogen (ER), progesterone (PR) and human epidermal growth factor receptor 2 (HER2) based on expression of hormone receptor. Out of enrolled 30 patients 18 (60 %) were triple negative (TNBC). In TNBC group 68.8 % showed lymph node metastasis, 5% showed lung metastasis . None of the TNBC group showed skeletal metastasis ($P < 0.025$). Out of 12 (40%) triple positive (TPBC) group 31.2 % had lymph node metastasis ,25 % showed skeletal & hepatic metastasis respectively. The results revealed TNBC showed propensity for lymph node metastasis while TPBC tends to metastasize skeletal system.

1.4 Evaluating Fetal Safety by Monitoring TI, MI And Scan Duration During Pregnancy Ultrasound at INMAS, Mitford: Practicing ALARA Principle

Farida Yasmin, Afroza Naznin, Samira Sharmin, Partha Pratim Saha, Hosne Ara Rahman

Ultrasound is a form of energy which has the potential to produce bioeffects in tissue but epidemiological studies have failed to show the harmful effect. Clinical guidelines for US technology have been established

for human safety, which include Thermal index (TI) and Mechanical index (MI).The appropriate TI and MI range for embryonic examination are < 1. A total 600 pregnant women were included in the study over a period of 1 year. Observation over 6 months identified mean values of TI & MI and scan time were within the allowable safety limit.

1.5 Exploring the Potential of Quantitative Shear Wave Elastography in Uterine Myoma and Adenomyosis Evaluation: Initial Experience

Afroza Naznin, Farida Yasmin, Samira Sharmin, Hosne Ara Rahman

Shear wave Elatography (SWE) is an ultrasound technique which is gaining reputation in diagnostic work-up of various organs. A total 30 patient were included in the study having either uterine myoma or adenomyosis. Mean Young Modulus (YM) value in kilopascal (KPa) were documented from anterior, posterior and fundal wall of uterus including the uterine mass if any. Mean elasticity value of myometrium is higher in Adenomyosis (38.10 KPa), but the difference was not statistically significant (p<0.873)This study documented the distinct color patterns in strain elastography, which can aid in distinguishing adenomyosis and uterine myoma.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of event	Date	Place	No of participant
1.	Regional Training Course on Fundamental Clinical Applications of Hybrid Imaging	3-7th September 2024	Denpasar, Indonesia	1
2.	16th Asia Oceania Congress of Nuclear Medicine and Biology & the 10th Congress and 26th Annual Scientific Meeting of the Indonesian Society of Nuclear Medicine	3-7th September 2024	Bali, Indonesis	1
3.	19th SFO Bangladesh International Cancer Congress	13-14th Decembor 2024	Dhaka	3
4.	31st WFUMB Center of Education Workshop “Perinatal Ultrasound: Mother’s Perspective”	14-15th February 2025	Dhaka	1
5.	Master class on Head Neck Imaging organized by Bangladesh Society of Radiology & Imaging	16 April, 2025	Dhaka	1
6.	তথ্য অধিকার, অভিযোগ প্রতিকার ব্যবস্থা ও জিআরএস সফটওয়্যার বিষয়ক প্রশিক্ষণ	30th April 2024	BAEC, Dhaka	1
7.	ডি নথি অফিস ব্যবস্থাপনা প্রশিক্ষন	19-21 january, 2025	BAEC, Dhaka	4
8.	অগ্নি নিরাপত্তা সচেতনার লক্ষ্যে হাতে-কলমে প্রশিক্ষন	4th February 2025	INMAS, Mitford	7

3. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	CME of SSMCH	7th October 2024	SSMCH Surgery Seminar Room	30

4. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Dr. Afroza Naznin	Hybrid Imaging: SPECT-CT	CME	SSMCH	7th October 2024	Dhaka
Dr. Afroza Naznin	Lymphoma & Emerging Theranostics for Breast Cancer: Experience from RTC in Indonesia	CME	INMAS, Dhaka	8th th october2024	Dhaka
Dr. Samira Sharmin	Two Case Reports: Role of Doppler in Correlation with Other Imaging Modalities.	36h National Conference of Bangladesh Society of Ultrasonography	BSU	6-7 Decembor 2024	Dhaka
Dr. Farida Yasmin	Ultrasonography in the Diagnosis of Primary Malignant Bone Tumor	36th National Conference of Bangladesh Society of Ultrasonography	BSU	6-7 Decembor 2024	Dhaka
Dr. Afroza Naznin	Ultrasound Features of Median Nerve in Clinically Suspected Carpal Tunnel Syndrome	36th National Conference of Bangladesh Society of Ultrasonography	BSU	6-7 Decembor 2024	Dhaka
Dr. Samira Sharmin	Menstrual Abnormality Experienced in Well Differentiated Thyroid Carcinoma Female Patients after Radioiodine Therapy –Single Institute based Experience INMAS, Mitford, Dhaka.	19th SFO Bangladesh International Cancer Congress.	BCS	13-14 December 2024	Dhaka
Dr. Samira Sharmin	Thyroid Hormone Abnormalities in Young Women: Links to BMI, Menstrual Issues and Subfertility – An Observation at INMAS, Mitford.	28th National Conference of Society of Nuclear Medicine Bangladesh	SNMB	7-8th February 2025	Cox's Bazar
Dr. Afroza Naznin	Carotid Intima Media Thickness in Radioiodine Treated Thyroid Carcinoma Vs Thyrotoxicosis Patients: Is There Any Increased Risk of Atherosclerosis?	28th National Conference of Society of Nuclear Medicine Bangladesh	SNMB	7-8th February 2025	Cox's Bazar
Dr. Farida Yasmin	KlippleTrenaunay Syndrome: A case report on venous malformation	31st National convention & Scientific Seminar	BSRI	15 February 2025	Dhaka
Dr. Farida Yasmin	Duplex Ultrasound in the Evaluation of Soft tissue Hemangioma: A case Series	31st National convention & Scientific Seminar	BSRI	15 February 2025	Dhaka
Dr. Afroza Naznin	Role of Nuclear Medicine in Thyroid Cancer Management	16th Thyroid Conference 2025	BITMIR	16 May 2025	Dhaka

5. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
	জাতীয় শুদ্ধাচার কোশল কর্ম পরিকল্পনা ২০২২-২৩ এর সূচক মোতাবেক গণশুনানী আয়োজন ও সেবা গ্রহীতাদের অভিযোগ বিষয়ে Stakeholder মত বিনিময় সভা (one meeting in each quarter)	27/08/2024 17/12/2024 19/03/2025 18/06/2025	INMAS, MITFORD	28 27 27 28

6. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income
1.	Scintigraphy service	1,975	
2.	Blood sample analysis	15,123	2,46,91,950
3.	I 131 Therapy	54	
4.	USG and others	18,633	
		Total – 35,785	Total : 2,46,91,950

7. Repair & Maintenance, Renovation Works, etc.

Project "Enhance capacity of Institute of Nuclear Medicine and allied Sciences (INMAS) at Mitford, Cumilla, Faridpur, Barishal and Bogura" is going on.

Description: Renovation/ Modification/ Beautification works of the existing building and reception counter including all necessary civil, sanitary, mechanical and electrical works at INMAS, Mitford.

Installation of modern equipments like PET/ CT, SPECT/CT, Dual head SPECT , CLIA, RIA counter.

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), CHATTOGRAM

Objective

Main objectives of the institute are:

- To perform nuclear medicine diagnostic services
- To provide nuclear medicine therapeutic services
- To accomplish academic and training activities
- To conduct research and development (R&D) works.

Future objectives of the institute are:

- Enhancement of the diagnostic & therapeutic capabilities, comprising expansion of infrastructure, equipment & manpower etc.
- Further expansion of the scopes of academic, research& development activities and development of skilled human resources.

1. R&D Work(s)

1.1 Analysis of Bone Mineral Density (BMD) and Associated Risk Factors: A Single Center Study

MahjabinNobi Khan, Muhammad Farhan Muhtasim, Noor-E-AmrinAlim, Mohammad Sazzad Hossain, Abdullah Al Persi, Md. AjijulHoq, Anjuman Ara Akhter

This retrospective study included a cohort of 628 individuals seeking bone mineral density (BMD)assessments usingDual Energy X-ray Absorptiometry (DEXA or DXA). Correlation amongBMD and five contributing factors (age, gender, origin,parity of the female participants and pre-existing clinical conditions i.e. hypertension, diabetes)were studied.

This study included 84% female and 16% male participants. The mean BMD was found significantly lesser in older participants (aged >50 years) (p=.000** for both sites of lumbar spine (LS) and femoral neck (FN)). It also varied significantly in both skeletal sites, depending on the gender (p=.000** and p=.027** respectively). Rural participants were found with lower BMD than urban one (p=.000** and p=.037** respectively). Interestingly, diabetic participants were found to have higher bone density in this study (p=.002** and p=.000** respectively). BMDs of LS and FN were found to have significant negative correlations with age(-.201** and -.280**) and parity (-.317**and -.236**). A significant decrease in mean BMD was also found in multiparous (parity >2) female compared to normal (parity <2) and nulliparous female (.000** and .048* respectively for LS and FN).This proactive approach to prevent osteoporosis in study population involves a meticulous investigation of its etiological factors and addressing them precedently.

1.2 Role of High-Resolution Ultrasound in Traumatic Eye Injury- Two Case Reports

Mohammad Sazzad Hossain, Noor-e AmrinAlim, Muhammad Farhan Muhtasim, Abdullah Al Persi, MahjabinNobi Khan, Md. AjijulHoq, Anjuman Ara Akhter, Pabitra Kumar Bhattacharjee

Significant intraocular changes can occur following physical assault and blunt trauma. Prompt diagnosis is critical for proper management in such scenario. High resolution ultrasound (HRUS) is a very important modality for enaluation of eye in emergency situations. Two young men with post-traumatic sudden loss of vision were referred to the Institute of Nuclear Medicine & Allied Sciences (INMAS), Chattogram for ultrasound evaluation of the eyes. HRUS of both eyes revealed bilateral retinal detachment in one patient and unilateral posterior segment lens dislocation in another patient. These cases highlight the role of ocular ultrasound to detect post-traumatic morphological or structural changes and thus facilitate proper management.

1.3 Incidental Detection of Thoracic Ectopic Kidney with Bochdalek Hernia-A Case Report

Noor-e AmrinAlim, Muhammad Farhan Muhtasim, Abdullah Al Persi, MahjabinNobi Khan, Mohammad Sazzad Hossain, Anjuman Ara Akhter, Pabitra Kumar Bhattacharjee

Bochdalek hernia is a congenital defect in the diaphragm that allows abdominal organs to move into the chest cavity. It is the most common type of congenital diaphragmatic hernia, occurring in about 1 in 2,200 to 12,500 live births, predominantly affecting the left side of the thorax. This condition usually involves a normal diaphragm and is associated with various other abnormalities. Intra-thoracic kidney, a rare form of renal ectopia, occurs in less than 0.25% of congenital diaphragmatic hernia cases. It is most often found incidentally because it usually presents without symptoms. Herein we report a case of a 25-year-old male who was referred for renal scintigraphy due to an unvisualized left kidney on ultrasound. A DTPA renogram indicated an unusually high position of the left kidney, which was later confirmed as Bochdalek hernia with intra-thoracic kidney through a CT scan.

1.4 Study of Radiological Impact due to Accidental Release of Significant Radionuclides Considering Various Weather Conditions from the TRIGA Mark-II Research Reactor of Bangladesh

Khaer M.A., AjijulHoq M., Hassan S.M.T., Chowdhury M.T., and Rahman M.M.

From its commissioning, it was required to ensure the nuclear or radiological safety of the BAEC TRIGA Mark-II Research Reactor according to the country-specific regulatory guidance (BAERA) or followed by any international guidance (US NRC or IAEA). It is always important to take protective actions not to commit enough radiological doses. Therefore, the present work focused on the core inventory and radiological dose assessment due to a hypothesized research reactor accident of TRIGA Mark-II at Savar, Dhaka, Bangladesh. The core inventory and source term of five radionuclides (137 Cs, 131 I, 133 Xe, 85m Kr, and 90 Sr) were studied using the ORIGEN 2.1 code until December 2021. These radionuclides were chosen due to their high emission characteristics from a nuclear accident. The dose values of TED, ground deposition, and organs were calculated for an 80 km radius from the reactor site using the HotSpot 3.1. 2 code and meteorological data of six seasons of Bangladesh. The assessed dose values are compared and it is shown that dose values in the rainy season are highest due to the rainout coefficient. The other five seasonal TEDE data show similar dose patterns and are also high enough to the permissible limit of dose values. So, regardless of the time of year, if an accident occurs, it is necessary to immediately take preventive radiological measures based on the local authority emergency response plan.

1.5 Customization of Source Term into JRODOS Compatible XML File Format using Visual Basic for Nuclear Accident Analysis

Hassan S.M.T., Khaer M.A., AjijulHoq M., Chowdhury M.T., and Rahman M.M.

A Visual Basic code was developed to generate an XML file in the RODOS format from the provided source term data in Microsoft Excel Spreadsheet. This XML file can be directly used in JRODOS (Java-based Real-time On-line Decision Support) platform. A simple source term model was used to check the applicability of the code. Finally, the code was successfully implemented to reproduce the JRODOS-formatted XML file for a detailed Fukushima Dai-ichi nuclear power plant accidental scenario. This code simplifies a vital analysis step, which would otherwise be very cumbersome, especially for a complex source term scenario involving many radionuclides, release intervals, and release heights of a nuclear accident.

1.6 Fetal Central Nervous System Anomalies: Report on Myelomeningocoele and Obstructive Hydrocephalus

Abdullah Al Persi, Muhammad Farhan Muhtasim, Noor-e AmrinAlim, Mohammad Sazzad Hossain, Anjuman Ara Akhter, MahjabinNobi Khan, MdAjijulHoq, Pabitra Kumar Bhattacharjee

Anomalies of the central nervous system (CNS) are among the more prevalent congenital abnormalities and are usually linked to a high rate of morbidity and mortality. Therefore, the in utero identification of CNS abnormalities is of immense value to the practice of obstetric ultrasound. In this article, we report two such cases diagnosed prenatally through ultrasound: firstly, a case of myelomeningocoele – the most severe type of spina bifida and the other of isolated, obstructive hydrocephalus likely due to foramen of Monro (FOM) occlusion. Ultrasound imaging proved to be quite effective and findings were conclusive to reach the diagnoses. Report of these cases demonstrate the value of prenatal ultrasound in diagnosing major fetal CNS abnormalities, as well as excluding them when normal.

1.7 Prevalence and Seasonal Variations of Vitamin D Deficiency in the Southeastern Region of Bangladesh

MahjabinNobi Khan, Muhammad Farhan Muhtasim, Abdullah Al Persi, Md. AjijulHoq, Noor-E-AmrinAlim, Mohammad Sazzad Hossain, Anjuman Ara Akhter, Pabitra Kumar Bhattacharjee

Vitamin D deficiency due to varying sunlight exposure in adult population is one of the prevalent medical conditions worldwide. Aim of this study was to investigate the prevalence of and the seasonal influence on vitamin D deficiency among the people residing in the Chattogram division of Bangladesh. The serum 25-hydroxy vitamin D (25-OHD) was assessed by the chemiluminescence method. To investigate the seasonal impact three distinct seasons were broadly categorized winter, summer, and rainy seasons. This observational study analyzed serum 25-OHD data from 969 participants, comprising 777 adults (80%) and 192 children (20%). Among the adults, 77% were female and 23% male, while in the child group, 53% were female and 47% male. A significant positive correlation was found between age and serum 25-OHD (p=. 001**). Comparison based on gender, adult males showed relatively higher mean serum 25-OHD levels (18.79±11.02 ng/mL) than females (16.69±10.16 ng/mL). The varying degrees of vitamin D deficiency (mild, moderate, severe) were significantly associated with the gender of the adult participants (X2 (2, N= 712)= 5.994, p= 0.05*) as well. Seasonal comparison in women showed a better status of vitamin D3 (significantly higher, mean difference: 2.16, p= 0.047*) in the rainy season than winter. The highest average serum vitamin D3 levels were observed during the rainy season, while the lowest occurred in winter, with significant seasonal variation in 25-OHD levels found only in females. This suggests that seasons may influence vitamin D deficiency status.

1.8 Analysis of the Impact of Chronic Low-dose Ionizing Radiation (IR) on Thyroid Gland and its Function in Radiation Workers.

Mahjabin Nobi Khan

Ionizing radiation is an occupational risk factor, which is capable of showing deterministic and stochastic effect causing potential damage to the workers' health. The aim of this study is the assessment of morphological and physiological alteration of thyroid glands, which is an important radiosensitive organ.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
01	Training of RIA Counter (Automatic)	18-08-2024 to 26-08-2024	Shinjin Medics Inc Republic of Korea	01
02	The 16 Asia Oceania Congress of Nuclear Medicine and Biology In conjuctionwithThe 10 Congress & 26 Annual Scientific Meeting of Indonesian Society of Nuclear Medicine and Molecular Theranostic and International Symposium on Radiopharmaceutical Therapy 2024.	05-09-2024 to 07-09-2025	Intercontinental, Bali, Indonesia	01
03	Regional Training Course on Clinical Applications of Theranostic using Ga-68 Labeled/Lu-177/Ac-225 Radiotracers (TN-RAS6105-2406312)	26-05-2025 to 30-05-2025	Lahore, Pakistan	01
04	Workshop on Awareness of D-Nathi Features and Enhancement of D-Nathi Activities	28-05-2025	PTI, Chattogram	01

3. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
01	Hepatobiliary Ultrasound (Part-1)	30-07-2024	INMAS, Chattogram	08
02	Management of Patient care and behavioral interventions	20-08-2024	INMAS, Chattogram	20
03	Analysis of the Outcome of R&D-2023-2024 Research Project	27-08-2024	INMAS, Chattogram	13
04	Radiation risk assessment mearsuring dose levels within INMAS, Chattogram.	10-09-2024	INMAS, Chattogram	15
05	NIS (National Integrity Strategy)	17-09-2024	INMAS, Chattogram	19
06	Principles & Operational procedure of Myocardial Perfusion Imaging	24-09-2024	INMAS, Chattogram	18
07	Primer on Radioimmuno Therapy	08-10-2024	INMAS, Chattogram	08
08	Professionalism and radiation safety in nuclear medicine setting	15-10-2024	INMAS, Chattogram	24
09	Hepatobiliary Ultrasound (Part-2)	29-10-2024	INMAS, Chattogram	07
10	Artificial intelligence in medical imaging	12-11-2024	INMAS, Chattogram	23
11	Renal Scintigraphy Speaker	14-01-2025	INMAS, Chattogram	18
12	Renogram (Renal Transplant Scintigraphy)	21-01-2025	INMAS, Chattogram	19
13	Hepatobiliary Ultrasound (Gall Bladder-I)	28-01-2025	INMAS, Chattogram	08
14	Radiological Emergency Response Guidelines by IAEA	17-02-2025	INMAS, Chattogram	35

Sl. no.	Title of the program	Date	Place	Number of participants
15	Case Presentation#1 : DSV PTC, Case Presentation#2 : Mucinous cystic adenocarcinoma	24-02-2025	INMAS, Chattogram	08
16	Hypertension	21-042024	INMAS, Chattogram	22
17	Hepatobiliary Ultrasound (Part-4)	28-04-2025	INMAS, Chattogram	08
18	Radiation Exposure and Cancer Risk	12-05-2025	INMAS, Chattogram	08
19	NIS (National Integrity Strategy)	19-05-2025	INMAS, Chattogram	21
20	Guideline based management for DTC patients	26-05-2025	INMAS, Chattogram	08
21	Clinical application Theranostics using Ga-68, Lu-177 an Ac-225	23-06-2025	INMAS, Chattogram	15

4. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Mahjabin Nobi Khan	Biochemical, Hematological status and Gene expression analysis to observe the Effects of Occupational Exposure to Low Dose Ionizing Radiation.	The 10 Congress & 26 Annual Scientific Meeting of Indonesian Society of Nuclear Medicine and Molecular Theranostic and International Symposium on Radiopharmaceutical Therapy 2024.	The 16 Asia Oceania Congress of Nuclear Medicine and Biology	05th September, 2024 to 07th September, 2024	Intercontinental Bali, Indonesia
Dr. Muhammad Farhan Muhtasim	Mucinous Cystic Neoplasm of Appendix: A Case Report	36th Annual General Meeting	Bangladesh Society of Ultrasonography	6th December, 2024	Bangabandhu International Conference Center (BICC), Sher-e-Bangla Nagar, Dhaka
Dr. Muhammad Farhan Muhtasim	The Eminence of Nuclear Medicine Imaging Over Other Prognostic Markers in the Management of Diffuse Sclerosing Variant Papillary Thyroid Cancer: A Case Report	28th National Conference	Society of Nuclear Medicine, Bangladesh (SNMB)	07th February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar

5. Stakeholder Meeting

Sl. No.	Title of the program	Date	Place	Number of participants
1.	Stakeholder Meeting	03-08-2024	INMAS, Chattogram	23
2.	Stakeholder Meeting	27-10-2024	INMAS, Chattogram	12
3.	Stakeholder Meeting	29-01-2025	INMAS, Chattogram	16

6. Memorandum of Understanding (MoU)

Memorandum of Understanding with the Department of Genetic Engineering & Biotechnology of Chittagong University to establish a framework for cooperation, collaboration, and understanding.

7. Service Rendered

Sl. no.	Number/quantity of sample/patient/service	Revenue income
1.	55,705	4,56,30,210.00

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), MYMENSINGH

Objective

Institute of Nuclear Medicine and Allied Sciences (INMAS), Mymensingh as an organization of Bangladesh Atomic Energy Commission is committed to peaceful use of Atomic Energy in the field of medicine. This Institute offer Nuclear Medicine therapy services in hyperthyroidism and thyroid cancer. A host of senior & junior qualified & skilled Doctors and technologists are working in this Institute. Recently the Institute is going to be equipped with MRI and the prestigious Nuclear Medicine PET-CT facilities which is a very useful nuclear technology for diagnosis and staging of cancer patients. They are all with the purpose to provide specialized medical services to the people using nuclear and high-quality ultrasound technology. To improve and upgrade Nuclear Medicine facilities in the country. To build up skilled nuclear medicine physicians, physicists and technologists through academic & specialized training.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Workshop on Bangladesh Delta Plan	13/02/2025	RAPTC, Dhaka	01

2. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Doppler in Fetal Growth Restriction & Preeclampsia	24 September, 2024	Sodesh Hospital(Pvt), Mymensingh.	102
2.	Grave's Hyperthyroidism: Diagnosis and Treatment	12 November, 2024	INMAS, Mymensingh	18
3.	MUSA & subsequent developments	24 June, 2025	INMAS, Mymensingh	12

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Prof. Dr M. Nasim Khan, Prof. Dr Ratan Kumar Chacraborty, Dr Shakila Zaman Rima, Dr. Rowshan Ara Ruma, Dr. Nazmun Nahar Shapla, Dr. Fahima Akhter Dowel	Retroperitoneal Dermoid cyst in a young girl.	36th National Conference of Bangladesh Society of Ultrasonography	BSU	06.12.2024 to 07.12.2025	BICC, Dhaka

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Prof. Dr Ratan Kumar Chacraborty, Prof. Dr M. Nasim Khan, Dr Shakila Zaman Rima, Dr. Rowshan Ara Ruma,Dr. Nazmun Nahar Shapla, Dr. Fahima Akhter Dowel, Md. Abdul Karim, Md. Mafiz Uddin	"Severe Skeletal manifestations of parathyroid adenoma in a young woman: A rare case of extensive brown tumors and fractures" and "Effective Dose & Predilection sites of Bone Metastasis in Breast & Lung Cancer: A SPECT-CT Study with ^{99m}Tc-MDP.	28th National Conference of Society of Nuclear Medicine, Bangladesh	SNMB	07.02.2025 to 08.02.2025	Ocean Pradise Hotel & cox's Bazar

4. Organize Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Briefing Meeting on Service providing Commitments among the Stakeholders.	09.07.2024	Conference Room, INMAS, Mymensingh	23

5. Project Work (ADP/FNCA//RCA/TC/CRP/S&T, etc)

IAEA RCA Project "Strengthening Hybrid Imaging in Nuclear Medicine in Asia (RAS 6079)"

6. Service rendered

Sl. No.	Number/quantity of sample/patient / service	Revenue income
1.	1,02,717	7,34,69,890/-

7. Repair & Maintenance, Renovation Works, etc.

- Regular Maintenance of 60 KVA UPS in SPECT/CT Room, 3KVA UPS in BMD and Ultrasound Machine rooms.
- Regular Maintenance of 45 KVA Perkins GPR50 Generator System
- Regular Maintenance of Air Condition System (AC)
- Maintenance of Ultrasound Machine, Problem in AccuvixA10 repaired by our institute senior tech replacing the power supply.
- Regular practicing of QC program of Nuclear Medicine Instruments and assisted in repair and maintenance
- Renovation of a dedicated room for breast-feeding mothers in the institute.

8. Others

a. The Institute provides research facility for post graduate students of MD, MS, M Phil & PhD program of different institutes such as MMC.

b. Radioimmunoassay laboratory provide services to different research programs of different discipline of medical sciences.

c. This Institute provides facility to perform research program in association with other institutes such as MMC & BAU, Mymensingh.

d. Series of lectures were arranged on SPECT-CT for doctors, scientist & scientific staff of INMAS, Mymensingh.

e. Series of lectures on radiation control and safety were held on during this period for scientific staffs of INMAS, Mymensingh.

f. Scheduled lectures were delivered routine to Postgraduate students of different disciplines (MD, MS, DEM) of MMCH and students placedFor Practical demonstration.

g. Weekly journal meeting as continuous education program conducted on recent Nuclear Medicine and Allied science related works regularly inthis institute.

h. Participation in weekly clinical meeting and journal club arranged by MMCH& MMC where highlightedNuclear Medicine and AlliedScience related facilities.

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), SYLHET

Objective

Institute of Nuclear Medicine & Allied Sciences, Sylhet is located at the North-East part of the country. It was established in the year of 1980 at Sylhet M.A.G Osmani Medical College campus. The institute provides both diagnostic and therapeutic services by using nuclear technologies & ultrasound system to improve the health care services to the people of greater Sylhet division. The institute also provides academic and research activities to upgrade the knowledge regarding nuclear medicine among the professionals.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

2. Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title (training program/workshop/seminar/ symposium/conference)	Date	Place	Number of participants
1.	Integrity Training	11-02-2025	INMAS, Sylhet	14
2.	Integrity and morality Training	24-10-2025	INMAS, Sylhet	14
3.	Integrity Training	22-05-2025	INMAS, Sylhet	15
4.	Office management, Integrity Training, Scheduled leave rules, Financial management	25-06-2025	INMAS, Sylhet	19

3. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Meeting with participant	18-02-2024	INMAS, Sylhet	20
2.	Meeting with participant	22-02-2025	INMAS, Sylhet	31
3.	Meeting with participant	07-04-2025	INMAS, Sylhet	18

4. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income
1.	Patient Service	34,161	2,35,21,100/-
2.	Sample Analysis (including blood sample)	22,236	

5. Others

Placement of MS/MD students at Inmas,Sylhet for Nuclear Medicine Students.

Sl. no	Title of the program	Date	Place	Number of participants
1.	Residence of MD (Radiology & Imaging) Phase A	17-12-2024 to 31-12-2024	Inmas, Sylhet	6
2.	Residence of MS (Orthopedics surgery)	16-05-2025 to 28-05-2025	Inmas, Sylhet	2
3.	MS, Resident (Otolaryngology)	08-09-2024 to 14-09-2024	Inmas, Sylhet	2
4.	MS, Resident (Otolaryngology)	01-10-2024 to 29-10-2024	Inmas, Sylhet	2

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), RAJSHAHI

Objective

INMAS, Rajshahi is located at North West part of the Bangladesh. This Institute provides services to the people of greater Rajshahi and nearby districts using nuclear technology and Ultrasonography and is making a great impact in this region for betterment of health services.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participants
1.	JSUM Fellowship in Osaka, Japan	27/05/24 to 27/11/24	Osaka, Japan	01
2.	"মৌলিক প্রশিক্ষণ কোর্স"	03/11/24 to 28/11/24	Dhaka	01
3	WFUMB Centre of Education Workshop on "Perinatal Ultrasound: Mother's Perspective"	14/02/25 to 15/02/25	BIAM Auditorium, Dhaka	01
4	"Regional Training Course II on Radiotherapy Patient Safety and QUATRO Audit Meghologies (TN-RAS6107-2402779) at Bangkok, Thailand"	26/05/25 to 30/05/25	Bangkok, Thailand	01
5	"WFUMB Congress-2025 to be arranged by World Fedaration for Ultrasound in Medicine and Biology (WFUMB) at Japan"	29/05/25 to 01/06/25	Kyoto, Japan	01

2. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	No. of participant
1.	MS/MD Residency Training Course	02/11/24 to 14/11/24 01/02/25 to 27/02/25	INMAS, Rajshahi	08
2.	In-Plant Training of 4th year students of Bio-Chemistry and Molecular biology, University of Rajshahi	07/12/24 to 12/12/24	INMAS, Rajshahi	10
3.	Training on Medical Technology (Diploma), IHT, Rajshahi, Joypurhut' Shirajgang	09/09/24 to 15/09/24 24/09/24 to 30/09/24	INMAS, Rajshahi	38

Sl. no.	Title of the program	Date	Place	No. of participant
		10/03/25 to 17/03/25 31/03/25 to 06/04/25 05/05/25 to 10/05/25 02/06/25 to 08/06/25 26/05/25 to 01/06/25		
4.	Training on Medical Technology (B. Sc), Institute of Health Technology Rajshahi .	20/02/25 to 05/03/25 18/06/25 to 01/07/25	INMAS, Rajshahi	25

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Md. Shariful Islam Chowdhury	Leveraging Anterior and Posterior Views for Metastasis Classification Using Attention-Based Deep Learning	28th National conference of Society of Nuclear Medicine, Bangladesh.	Nuclear Medicine Bangladesh	07,08-02-2025	Cox's Bazar
Dr. Shibli Nishad Alam	Bone Mineral Density in Symptomatic Patients Receiving Suppressive Doses of Thyroxine for Differential Thyroid Carcinoma at INMAS, Rajshahi	28th National conference of Society of Nuclear Medicine, Bangladesh.	Nuclear Medicine Bangladesh	07,08-02-2025	Cox's Bazar
Dr. Shibli Nishad Alam	Contrast Enhanced Ultrasound: An Excellent tool in diagnosing hepatic focal lesions.	36th Conference of Bangladesh Society of Ultrasonography	Bangladesh Society of Ultrasonography	06,07-08-2024	BICC, Dhaka

4. Collaboration Work/MOU (ADP/FNCA/MEXT/FTC/IAEA/RCA/TC/S&T/CRP/ In-house project, Universities, etc)

4.1 NPC of IAEA Non RCA Project RAS6107

"Ensuring Radiotherapy Patient Safety in Enabling Improved Health Outcomes through a Collaborative Multilayered Quality Assurance System".

Period: 2024-2027.

4.2 ANPC of IAEA RCA Project RAS6109

"Title: Improving the Quality and Safety of Diagnostic and Interventional Radiology Services to Benefit Health Care by Enhancing the Status, Knowledge and skills of Medical Physicists"

Period: 2024-2027.

5. Service Rendered

Sl. no.	Number/quantity of sample/patient/service	Revenue income
1.	Patient service = 60619	=4,41,01,600/-
2.	Blood Sample analysis = 66784	

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), DINAJPUR

Objective

Institute of Nuclear Medicine and Allied Sciences, Dinajpur was established in the year 1982 at Dinajpur Sadar Hospital campus to serve the endemic goiter zone of greater Dinajpur and Rangpur districts. The main purpose was to serve goiter affected persons both in diagnosis and treatment. In the following decades the Institute served a huge number of patients with different Thyroid Disorders. At the stage of establishment institute was only confined to treat Thyrotoxic patient by ^{131}I but at present we also provide post-operative treatment to Thyroid Cancer patients with ^{131}I ablation. As well as, other nuclear medicine studies e.g. Radioisotope Scan of Thyroid Gland, %RAIU, Dynamic and Static Renal studies, Skeletal Scintigraphy, DEXA Scan for bone mineral densitometry, In-vitro assays of different hormonal status and many others. Its not just the epicenter of Nuclear Medicine in these Dinajpur, Panchagarah & Thakurgaon districts at present but also provides competent different sonological studies and CT scans in the field of Medical Radiology & Imaging.

1. Activities

Both Diagnostic and Therapeutic facilities are available here.

1.1 Diagnostic

Both In-vivo and In-vitro techniques are used in this Institute for diagnosis of diseases.

A. **In-vivo technique**

The following tests are performed here for diagnosis of various diseases.

1) Thyroid Scan: This test is performed with thyroid scanner to determine the function of thyroid gland.
2) Nuclear Imaging: Diseases of bone, brain, liver, kidney, thyroid gland etc. are detected by taking images of the respective organs with Dual Head SPECT.
3) BMD: Bone Mineral Densitometry (BMD) is used to assess bone mineral content of the patient for detection of osteoporosis and osteopenia.
4) Renogram: This test is performed with SPECT machine to determine the functional status of kidneys.
5) SPECT-CT: a) HRCT-Chest, CT-Abdomen with or without contrast, CT-Brain, CT-Orbit, Paranasal sinus, cervival spine, Mastoid bones routinely done. b) Fusion image (SPECT-CT) also performed here.

B. **In-vitro technique**

Thyroid related hormones (T_3, T_4, TSH, FT_3, FT_4, Tg and Antithyroid Antibody, vitamin D3, tumor marker) are being estimated in the lab by Radio Immunoassay (RIA) technique and CLIA method.

C. **Ultrasonogram with Color Doppler**

Ultrasonogram both conventional and Color Doppler ultrasound available here. In addition with routine USG, Foetal anomaly Scan, NT-Scan routinely performed here.

1.2 Therapeutic

Radioactive Iodine (I-131) is used for treatment of thyrotoxicosis and thyroid cancer patient.

2. Repair & Maintenance, Renovation Works, etc

Under the project of "Enhancing Capacity of INMAS at Dhaka, Chittagong, Khulna, Sylhet, Rajshahi, Dinajpur and Rangpur" Renovation works done. Thyroid Uptake System, BMD Machine, Color Doppler Ultrasonography, Dual Head SPECT, Dual Head SPECT-CT Machine installed in the institute by this project.

3. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of oral/poster presentation	Title of the event	Date	Place
Dr. B. K. Bose	Meeting for Implementation of the Tobacco	Civil Surgeon Office, Dinajpur	30 Sep. 2024	Meeting room, DC Office, Dinajpur

Name of the participant	Title of oral/poster presentation	Title of the event	Date	Place
	Control Law			
Dr. B. K. Bose	Meeting for National TB Coltrol Programe	Civil Surgeon Office, Dinajpur	11-12 Nov. 2024	General Hospital Dinajpur
Dr. B. K. Bose	Meeting for Implementation of the Smoking and Tobacco Products Control Act	Civil Surgeon Office, Dinajpur	12 January 2025	Meeting room, DC Office, Dinajpur
Dr. B. K. Bose Dr. Md. Maidul Islam Md. Anamul Haque K M Kamrul Hasan Zakir Hossain	28th National Conference of SNMB-2025	Society of Nuclear Medicine Bangladesh	7-8 Feb. 2025	Ocean Paradise Hotel & Resort, Cox's Bazar
Dr. B. K. Bose	Meeting for Vitamin A Capsul Camping	Civil Surgeon Office, Dinajpur	11 March 2025	General Hospital Dinajpur

4. Stakeholder Meeting

a) Mohammad Mizanur Rahman, Director (Administration), BAEC, Dhaka. 16-11-2024

b) S. M. Nizamul Islam, Head (Finance & Budget), BAEC, Dhaka. 16-11-2024

c) Md. Muzaffar Ali Mia, Accounts Officer, Finance & Budget Division, BAEC, Dhaka. 14-06-2025

4. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient/service	Income
1.	Patient Service	1612	3,69,400/-
2.	Sample Analysis (including blood sample)	10758	79,27,500/-
3.	Thyroid Scan, Ultrasonography and others	5951	77,35,260/-
Total		18321	1,60,32,160/-

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), RANGPUR

Objective

Institute of Nuclear Medicine and Alliad Sciences, Rangpur is located in the northern part of the country in the premises of Rangpur medical College Hospital. The Institute provides diagnostic & therapeutic services to the people of Northern part of Bangladesh covering greater Rangpur, part of greater Bogra & Dinajpur using Nuclear technology & ultrasound system. Since inception in 1989 the Institute made a great impact in this region for the betterment of health services.

Activities

1. R&D Works(s)

1.1 Nuclear Medicine

- Nuclear Imaging: MDP Bone Scan, MIBI Para-Thyroid Scan, DMSA Planar, Spect-CT of Scan Bone, parathyroid gland, neck, submandibullar gland, brain, DTPA Renogram, ect.

- Thyroid Studies : Thyroid Scanning, Thyroid Up-take systems
- In-vitro Assay: RIA Tests: Thyroid hormones T_3, T_4, TSH, FT_3 FT_4, Tg, LH, FSH, Prolactin, Testosterone, Progesterone, ect.
- CLIA Tests: Oncology - CA125, CA19-9, CEA, PSA, ect
- Bone Mettabolism - Vitamin D Total
- Thyroid – Anti -Tg, Anti-TPO, FT_3, FT_4, Total T_3, Total T_4, TSH, ect
- Reproductive Endocrinology- FSH, hCG, LH, Progesterone, Prolactin,Testosterone
- Clinical Bio-Chemistry Tests : S. Creatinine, Glocose, Uric Acid, Amylase, Bilirubin, ALP, ALT, AST, HbA_1C, ect.
- ltrasound Systems: Breast, Testes, Eye, Thyroid, Parotid & Brain, Hbs, Hip joint, Gy & Ob, Scan for anomalies, ect.
- H.R Ultrasound: HRUS of Various organs
- Color Duplex Studies: Color Duplex Studies of Various organs
- 3-D & 4-D Ultrasound: 3-D & 4-D Ultrasound Studies of Various organ
- Iodine-131 Therapy for Thyrotoxicosis & Thyroid Cancer
- Beta Radiation Therapy: Therapy for Pterygium, Vascularised Corneal Ulcer, ect
- BMD: Bone Mineral Densitometer is used to assess bone mineral content of the patients for detecton of Osteoporosis & Osteopenia.

By using invivo & in vitro nuclear techniques & ultrasound various R & D programmes are going in relation to hypothyroidism, thyrotoxicosis thyroid cancers, renal diseases foetal maturity & hepatobiliary diseases scientific discussions on journals collected through Internet are done time to time.

2. Manpower Development

Sl. no.	Title (tarining program/workshop/seminar/ symposium /conference)	Date	Place	No. of participant
1.	Industrial Tarining Programme Diploma-in-Enginering for the Department of Electro-Medical .	12 week 23/06/24 to 23/09/24	I NMAS, Rangpur.	36

3. Stakeholder Meeting

08/06/2024- Establishment of good governance rectification of allegation by the Stakeholder's participation meeting held at the seminar hall of INMAS, Rangpur.

4. Academic Activities

- The Institute is carrying out academic activities in Collaboration with the Department of Physiology, Endocrinology, Gynecology & Oncology Dept. of Rangpur Medical College Hospital.
- Arranged scientific & technical discussions on Nuclear Medicine & Ultrasonography for our newly appointed doctors & scientists.

5. Service Rendered

SI. No.	Number of service provided	Number/quantity of sample/patients /service	Revenue income
1.	Patient Service	15741	1,98,13,100.00
2.	Sample Analysis (including blood sample)	27063	1,26,12,300.00
Total		42804	3,24,25,400.00

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), KHULNA

Objective

- To provide diagnostic and Therapeutic services to the patients using nuclear technology and ultrasound system and to conduct academic and research activities
- To promote better understanding of nuclear medicine services among the medical professional
- To improve and upgrade nuclear medicine facilities concerning local perspectives
- To facilitate research and development works in the relevant fields

1. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	In-house Training Workshop on Office discipline and regulations	24/04/2025	INMAS, Khulna	15
2.	In-house Training Workshop on Basic financial management	27/04/2025	INMAS, Khulna	15

2 Service Rendered

Sl. no.	Number/quantity of sample/patient/service	Revenue income
1.	45,501	Tk. 3,24,35,400.00

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), BARISHAL

Objective

Institute of Nuclear Medicine and Allied Sciences, Barishal has been established in the year of 1989 with the aim of peaceful application of nuclear science for the betterment of the human health at the Campus of Sher-e-Bangla Medical College and Hospital.The Institute delivers its service mostly to the patients attending the Sher-e-Bangla Medical College Hospital and also to the people of the Barishal Division and as well as people of the neighboring districts like Madaripur, Pirojpur, Bagerhat, etc. With the course of time the service and facilities of the Institute are increasing day by day. The number of patients and amount of revenue earning are increasing every year but the institute is providing its services with the same manpower as it was at the time of establishment. It is now a four storied building, the renovation of the building and establishment of the modern equipment was done time to time since its establishment. Recently the renovation/ modification/beautification of the existing building has completed with installation of advanced medical and office equipment, under the ADP project- "Enhance Capacity of The Institute of Nuclear Medicine and Allied Sciences at Mitford, Cumilla, Faridpur, Barishal and Bogura". After the completion of the project work the Institute has got a new look and patients are getting benefits of advanced technologies, easier services and comfortable waiting spaces and the staffs of the institute are experiencing good working environment.

1. R&D Work(s)

1.1 Estimation of Bone Mineral Density of the Normal Healthy Population at Barishal Regionusing DEXA Scan.

Md. Sabbir Hossen. NafisaJahan, FerdousSharmin, Nusrat Jahan,

2. Manpower Development (Training /Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Organizer	Date	Place	Number of participants
1.	28th National Conference of Society of Nuclear Medicine Bangladesh	SNMB	7-8 February, 2025	Ocean Paradise Hotel & Resort, Cox's Bazar	02

3. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Seminar on "Service delivery commitment processes " Organized by: Institute of Nuclear Medicine & Allied Sciences, Barishal	17/09/2024 26/11/2024 18/03/2025 17/06/2025	Auditorium, INMAS, Barishal	26 26 26 26
2.	Arranged In-house Training for Officers& Staffs of INMAS, Barishal for National integrity	05/09/2024 12/11/2024 12/02/2025 06/05/2025	Auditorium INMAS, Barishal	Officers = 09 Staff =18 (per training day)
3.	Arranged In-house Training for Officers& Staffs of INMAS, Barishal for Right of information act	19/09/2024 10/12/2024 25/02/2025 27/05/2025	Auditorium INMAS, Barishal	Officers = 08 Staff =18 (per training day)
4.	Arranged Learning session for capacity buildup under In-house Training for Officers& Staffs of INMAS, Barishal	11/05/2025	Auditorium INMAS, Barishal	Officers = 08 Staff =18

4. Organize Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Establishing dispute prevention & good governance	19/08/24 19/11/24 11/03/25 03/05/25	Auditorium, INMAS, Barishal	40 45 39 41

5. Academic Activities

5.1 Lectures Delivered to FCPS Part-2 Students of SBMC on

Sl. no.	Date	Lecturer
1.	02/2/25 ,4/02/2025	Dr. Md. Sabbir Hossen, MO
2.	08/02/2025 –01/05/2025	Dr Ferdous Sharmin SMO & Dr Nusrat Jahan SMO

6. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income
1.	Clinical Nuclear Medicine Ultrasonography Blood Sample study	Total number of patients 38,110 • USG=13,553 • Blood sample(Radioactive assay)=19,741 • Nuclear Imaging, Tc 99 scan & I-131 scan=1091 • Uptake, Nuclear therapy, I-131 scan therapy=118 • Biochemical Test= 2641 • Others/Follow up patient=966	2,31,66,210/-

7. Repair & Maintenance, Renovation Works, etc

Title: Enhance Capacity of Institute of Nuclear Medicine & Allied Sciences (INMAS) at Mitford, Cumilla, Faridpur, Barishal and Bogura (1st Revision) Bangladesh Atomic Energy Commission

Description: Renovation, modification , beautification of the existing building with horizontal extension, installation of Substation, SPECT CT, Dual head SPECT, thyroid camera, thyroid uptake system, BMD, RIA counter, CLIA, high definition ultrasonography machine etc.has done under the project.

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), FARIDPUR

Objective

Institute of Nuclear Medicine & Allied Science (INMAS), Faridpur was established along with other three institute in Mitford, Commilla and Bogra as a common project. The institute is situated in the premises of Faridpur medical college hospital. The foundation stone was led on 15 September 1995, construction was completed in early 1997 and the institute started running in October 1997. Patients from greater Faridpur district and adjacent areas usually attend the institute to receive nuclear medicine services. The institute has been rendering services through its following scientific divisions.

a) Nuclear scanning/Scintigraphy
b) Thyroid Division
c) In-vitro Nuclear Medicine
d) Therapeutic Nuclear Medicine
e) Ultrasound division
f) SPECT and SPECT CT

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Basic Nuclear Medicine and Administration" for officers and stuff	19-27 June, 2024	INMAS, Faridpur	30

2. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Ganasunani	3rd week per month	INMAS, Faridpur	30

3. Service Rendered

Sl. no.	Name of service provided	number/quantity of sample/patient / service	revenue income
1	Patients Service including Ultrasound Doppler, Scintigraphy, Radioiodine therapy, SPECT and SPECT CT	8126	1,67,69,850
2	Blood sample	18306	**1,67,69,850/-**
		Total - 26432	

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), BOGURA

Objective

The Institute of Nuclear Medicine & Allied Sciences, Bogura is a government institute of specialized and applicable research-oriented health services. The government fund and labors are totally used here for public health service and mankind. The main objective of the Institute is to apply atomic energy in a safe and peaceful way for the well-being of mankind, rather than to use it in destruction. The Institutue is mainly involved with diagnosis and treatment of various human diseases using radiopharmaceuticals. Academic and

research activities are also performed here. Dual Head SPECT Gamma Camera, BMD, Thyroid Uptake System, Gamma Counter, Pterygium Applicator, Ultra sonogram with Color Doppler and other associated ultra-modern equipment's are available in this institutue.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Duel Head SPECT Gamma Camera Operational and Clinical Training	21/06/25-26/06/25	INMAS, Mitford	2

2. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Monthly Meeting	14/07/24	INMAS, Bogura	7
2.	Monthly Meeting	07/08/24	INMAS, Bogura	7
3.	Ethics Committee Meeting	22/08/24	INMAS, Bogura	5
4.	Monthly Meeting	05/09/24	INMAS, Bogura	7
5.	Monthly Meeting	09/10/24	INMAS, Bogura	5
6.	Monthly Meeting	09/11/24	INMAS, Bogura	7
7.	Ethics Committee Meeting	26/11/24	INMAS, Bogura	5
8.	Monthly Meeting	10/12/24	INMAS, Bogura	5
9.	Monthly Meeting	13/01/25	INMAS, Bogura	7
10.	Monthly Meeting	13/02/25	INMAS, Bogura	6
11.	Ethics Committee Meeting	16/03/25	INMAS, Bogura	5
12.	Monthly Meeting	18/05/25	INMAS, Bogura	6
13.	Ethics Committee Meeting	24/06/25	INMAS, Bogura	5

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Md. Abdul Awal	28th National Conference-SNMB	SNMB	07/02/25-08/02/25	Ocean Paradise Hotel & Resort, Cox's Bazar
Dr. Suraiya Sharmin				
Md. Faruk Hossain				
Dr. Nazia Tarannum				
Md. Arman Ali				
Md. Abdus Sobhan Akanda				

4. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Stakeholder Meeting	12/11/2025	INMAS, Bogura	15
2.	Stakeholder Meeting	20/02/2025	INMAS, Bogura	11

5. Service Rendered

Sl. no.	Name of service provided	number/quantity of sample/patient / service	Revenue income (if any)
1.	Patient Service	53963	3,42,06,230.00

INSTITUTE OF NUCLEAR MEDICINE & ALLIED SCIENCES (INMAS), CUMILLA

Objective

One aspect, of the peaceful use of nuclear energy is the medical use of nuclear energy. Nuclear medicine is a specialized procedure that uses radioactive isotopes for diagnosis and treatment. INMAS, Cumilla is one of them. INMAS, Cumilla is established in 1996, located at Cumilla Medical College Campus. This institute, provides diagnostic and the rapeutic treatment service by using nuclear medicine technique, Ultrasound; Color duplex study of the patients of East part of Bangladesh covering Cumilla, Feni, Noakhali, Chandpur, Laxmipur, B.baria etc.)

1. R&D Works

1.1 "Evaluation of Thyroid Function in Patients with Gestational Diabetes Mellitus"

M MArif Hosen, Md. Nazmul Islam, Shartaz Begum, Fahema Farjana Shimu, Shibli Nishad Alam

The most common endocrine disorders during pregnancy are gestational diabetes mellitus (GDM) and thyroid disease. A case control study was conducted to evaluate and compare thyroid function in patients with and without gestational diabetes mellitus at Institute of Nuclear Medicine & allied Sciences (INMAS) Cumilla in collaboration with the department of obstetrics & Gynecology, Cumilla Medical College Hospital. According to inclusion and exclusion criteria, 148 pregnant women were included in the study, 74 patient with GDM (case) AND 74 patient with non-GDM (control). The thyroid function was evaluated by serum TSH and FT4. Data analysis was done by chi-square test (Categorical variables) and unpaired t- test (Continuous variables).

In the study, mean age was relatively higher in GDM patient (28.84$\pm$ 3.64 years) than non-GDM (27.12$\pm$ 3.99 years). Most of the patients 86 (58.1%) were in <30 years age group. Majority was multigravida. TSH value was high in case group (4.68$\pm$ 5.71 mIU/ml) in comparison to control (2.78$\pm$ 3.74mIU/ml) and statistically significant ($p<0.05$). In the study, 16.2% (34 of 148) patients had thyroid disorder. Thyroid disorder was more in GDM (21.6%) versus non-GDM (10.8%) patient. Association of thyroid disorder with GDM patient was higher than non-GDM group, but the result was not statistically significant [OR:2.3 (CI:1 to 5.7); p=0.074]

Thyroid disorder was more in gestational diabetes mellitus patient in comparison to patients without gestational diabetes mellitus.

2. Manpower Development (Training/Felloship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of program	Date	Place	Number of participants
1.	Anyscan's (SPECT) digital Duel-Head Gamma Camera	25 Jun 2025	INMAS, Mitford	02

3. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of program	Date	Place	Number of participants
1.	Monthly coordination meeting	08/07/2024	Inmas, Cumilla	36
2.	Monthly coordination meeting	22/08/2024	Inmas, Cumilla	36
3.	Monthly coordination meeting	07/09/2024	Inmas, Cumilla	37
4.	Monthly coordination meeting	10/10/2024	Inmas, Cumilla	37
5.	Monthly coordination meeting	06/11/2024	Inmas, Cumilla	37
6.	Monthly coordination meeting	29/12/2025	Inmas, Cumilla	37
7.	Monthly coordination meeting	30/01/2025	Inmas, Cumilla	37
8.	Monthly coordination meeting	27/02/2025	Inmas, Cumilla	37
9.	Monthly coordination meeting	13/03/2025	Inmas, Cumilla	37
10.	Monthly coordination meeting	06/04/2025	Inmas, Cumilla	36
11.	Monthly coordination meeting	04/05/2025	Inmas, Cumilla	37
12.	Monthly coordination meeting	04/06/2025	Inmas, Cumilla	38

4. Organize Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Collaboration of stakeholder to strengthening the service of INMAS, Cumilla	17/05/2025	Seminar Hall, INMAS, Cumilla	21

5. Academic Activities

- Honorary trainee on Nuclear Medicine & Ultrasound-02
- Lecture give to trainee doctors of INMAS & 5th Year MBBS study of Cumilla medical College Hospital.

6. Service Rendered

Sl. no.	Number/quantity of sample/patient/service	Revenue Income
1.	36,043 Patients (2024-2025)	2,56,97,750/-

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), COX"S BAZAR

Objective

- Ensuring safe use of Nuclear Medicine in Diagnostic and Therapeutic procedures.
- Ensuring clinical use of radionuclides applied in nuclear medicine.
- Development of skilled human resources in the field of nuclear science and technology.
- Ensuring safety and peaceful use of nuclear energy.
- Expanding the uses of nuclear energy.
- Expanding the uses of nuclear technology in medical service.
- Increase research capacity in science and technology.
- To increase transparency and ensure accountability in official activity.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Training of BMD with accessories in Nimes France	21 July – 29 July 2024	France	01
2.	Training of 4D High Resolution Color Doppler	18 Aug –24 Aug 2024	Japan	01
3.	Training of RIA Counter	19Aug - 25Aug 2024	Korea	01
4.	Training of Duel Head SPECT Gamma Camera at Mediso Medical Imaging Systems	15Sept - 28Sept 2024	Hungary	01

2. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Service Improvement and Awareness program	02Dec 2024	Inmas Cox's Bazar	32
2.	Service Improvement and Awareness program	31May 2025	Inmas Cox's Bazar	20

3. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income
1.	Patient Serviceincluding Ultrasound Doppler, Scintigraphy, Radioiodine therapy, follow-up	4682	55,22,250/-
2.	Sample Analysis	3598	
	Total	8280	55,22,250/-

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), SUHRAWARDY

Objective

Institute of Nuclear Medicine and Allied Sciences (INMAS), Suhrawardy, under BAEC, aims to provide cost-effective, specialized diagnostic and therapeutic services while advancing research in nuclear medicine. The institute addresses cancer, thyroid, and kidney diseases using advanced equipment such as Gamma Camera, PET-CT, Color Doppler Ultrasonography, Bone Mineral Densitometry, Thyroiduptake machine, Automated Immunoassay systems etc. The institute has been providing a range of services from advanced imaging to hormonalanalysis, and RadioactiveIodine therapy. INMAS, Suhrawardy also contributes to national healthcare by training professionals and promoting research to enhance early diagnosis, precision treatment, and patient outcomes in a resource-conscious healthcare environment.

1. R & D Work

1.1 Analysis of the Relationship Between Body Mass Index and Bone Mineral Density

Ilteza Tabassum, Md. Rezwan-Ul-Haque, Zeenat Jabin

To investigate the association between Body Mass Index (BMI) and Bone Mineral Density (BMD), as measured by DEXA scan, within a single institutional cohort, aiming to understand their relationship for bone health assessment.

1.2 Studying the Demographic Characteristics of Differentiated Thyroid Carcinoma Patients Treated with Radioiodine at INMAS, Suhrawardy

Jinia Afrin Khan, Moontaha Binte Rashid, Zeenat Jabin

To evaluate the response of Radioiodine treatment in DTC patients at INMAS, Suhrawardy and analyze the outcome of patients in a single institute.

1.3 Observing the Metastatic Pattern of Breast Carcinoma in PET-CT Imaging at INMAS Suhrawardy

Moontaha Binte Rashid, Mariom Nusrat, Md. Rewan-Ul-Haque, Sudipto Das, Zeenat Jabin

To analyze 18F-FDG PET-CT imaging data from breast carcinoma patients at INMAS Suhrawardy to identify and describe the common and rare patterns of metastasis, ultimately demonstrating the impact of these findings on therapeutic strategies and disease staging.

1.4 Validation of Radioimmunoassay for Quantification of Hormones in Human Serum

Kazi Reazuddin Ahmed, Sudipto Das

To validate a Radioimmunoassay (RIA) for precise and reliable quantification of various hormones in human serum. This ensures the assay's accuracy, sensitivity, and specificity, making it suitable for diagnostic and research applications.

1.5 Evaluation and Response Assessment of Lymphoma in PET-CT

Md. Rewan-Ul-Haque, Mariom Nusrat, Sudipto Das, Zeenat Jabin

To retrospectively analyze 18F-FDG PET-CT findings in Hodgkin's and non-Hodgkin's lymphoma patients at a single institute. We aimed to describe disease characteristics, histological subtypes, and the utility of Deauville scores for assessing disease severity and guiding clinical management.

1.6 Analysis of Patient and Institutional Hurdles in Bangladesh's New Nuclear Medicine Institutes

Sudipto Das

To identify and analyze the key patient experiences and institutional hurdles encountered in accessing and operating PET-CT services within a newly established nuclear medicine institute in Bangladesh. It's a type of observational situational analysis.

2. Manpower Development (Training/Fellowship/Workshop/Meeting)

2.1 Attend in Training/Fellowship/Meeting

Sl. no.	Title of the event	Date	Place	Name of the participants
1.	Training of BMD with accessories in Nimes France	22nd- 28th July, 2024	France	Prof. Dr. Zeenat Jabin
2.	Training of 4D Color Doppler in India	15th-23rd July, 2024	India	Dr. Jinia Afrin Khan, Dr. Moontaha Binte Rashid
3.	Training of 4D High Resolution Color Doppler	18th - 24th August, 2024	Japan	Dr. Md. Rezwan Ul Haque
4.	Regional Workshop on Streamlined and Emerging Theranostic Techniques	09th- 13th June, 2025	Thailand	Mr. Sudipto Das
5.	Operational Training of Dual Head SPECT Gamma Camera at Mediso Medical Imaging Systems Ltd in Hungary	16th – 27th September, 2024	Hungary	Mrs. Razia Nime
6.	Training of RIA Counter (Automatic) at Shinjin Medics Inc	20th- 23rdAugust, 2024	South Korea	Mrs. Rehana Pervin

3. Oral/Poster Presentation in Seminar/Symposium/Conference

3.1 Oral Presentation

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr. Md. Rezwan-Ul-Haque	Ludwig's angina and Acute Neck Abscess: A Case Report	36th National Conference of Bangladesh Society of Ultrasonography	BSU	06th – 07th December, 2024	Bangladesh – China Friendship Conference Centre, Sher-E-Bangla Nagar, Dhaka
Dr. Jinia Afrin Khan	Caesarean Scar Dehiscence: Diagnostic Insights through Ultrasonography				
Dr. Mariom Nusrat	An Unusual Case of Placental Chorioangioma				
Dr. Ilteza Tabassum	Hemi agenesis of Thyroid gland diagnosed in an elderly woman by HRUS				
Dr. Moontaha Binte Rashid	BIRADS 4 Suspicious Mass in a Postmenopausal Woman: Case Report				
Dr. Jerin Sultana	Invasive Mole-a Rare Case Diagnosed by Ultrasonography				
Dr. Md. Rezwan-Ul-Haque	How A Single Lymph Node Raised the Deauville Five-Point Scale from Score 2 to Score 5: Case Report of a Lymphoma Patient	28th National Conference of Society of Nuclear Medicine, Dhaka	SNMB	7th - 8th February, 2025	Ocean Paradise Hotel& Resort, Cox's Bazar

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr. Jinia Afrin Khan	Unusual Suprasternal Swelling of a Neglected Case of Differentiated Thyroid Carcinoma-Not the End of the Story				
Kazi Reazuddin Ahmed	Optimization of Radioimmunoassay Protocol for INMAS, Suhrawardy Using Taguchi Method				

3.2 Poster Presentation

Name of the participant	Title of oral/ poster presentation	Title of the event	Organizer	Date	Place
Dr. Jerin Sultana	Unveiling Localized Ewing Sarcoma: The Role of 99mTc-MDP Bone Scintigraphy in a Pediatric Case	28th National Conference of Society of Nuclear Medicine, Dhaka	SNMB	7th - 8th February, 2025	Ocean Paradise Hotel& Resort, Cox's Bazar
Dr. Moontaha Binte Rashid	Patterns of Metastases of Non–Small Cell Lung Cancer (NSCLC): Single Institute Experience				
Dr. Ilteza Tabassum	Assessment of Sarcopenia and Sarcopenic Obesity by DXA Scan: New Insights				
Sudipto Das	Enhancing PET-CT Image Accuracy: The Role of Pre-Scan Training and Breathing Protocols in Minimizing Respiratory Motion Artifacts				

4. Seminar/Symposium/Conference/Workshop/Meeting

4.1 Attended

Name of the participants	Title of the event	Organizer	Date	Place
Prof. Dr. Zeenat Jabin, Dr. Jinia Afrin Khan, Dr. Jerin Sultana, Dr. Ilteza Tabassum, Dr. Moontaha Binte Rashid, Dr. Md. Rezwan-Ul-Haque,Mr. Sudipto Das, Mr. Kazi Reazuddin Ahmed, Mr. Ayub Ali Badal	28th National Conference of Society of Nuclear Medicine, Dhaka	SNMB	7th - 8th February, 2025	Ocean Paradise Hotel& Resort, Cox's Bazar
Prof. Dr. Zeenat Jabin, Dr. Jinia Afrin Khan, Dr. Jerin Sultana, Dr. Mariom Nusrat Dr. Ilteza Tabassum, Dr. Moontaha Binte Rashid and Dr. Md. Rezwan-Ul-Haque	36th National Conference of Bangladesh Society of Ultrasonography	BSU	06th – 07th December, 2024	Bangladesh – China Friendship Conference Centre, Sher-E-Bangla Nagar, Dhaka

Name of the participants	Title of the event	Organizer	Date	Place
Prof. Dr. Zeenat Jabin, Dr. Jinia Afrin Khan, Dr. Jerin Sultana and Dr. Ilteza Tabassum	19th SFO Bangladesh International Cancer Congress (BICC) Conference	Oncology Club	13th – 14th December, 2024	Radisson Blu Garden Hotel, Dhaka
Mr. Kazi Reazuddin Ahmed	2nd International Conference on Recent Advancement in Chemistry (ICRAC-2024)	Department of Chemistry, Jagannath University	31st January – 01st February, 2025	Jagannath University, Dhaka

4.2 Arranged

Title of the event	Venue	Date	Partner
Clinical Applications of PET-CT	Multipurpose Hall, INMAS, Suhrawardy	29th October, 2024	SNMB
Hypothyroidism: Diagnosis and Treatment Approach	Conference Room, INMAS, Suhrawardy	25th February, 2025	Nuvista Pharma

5. Stakeholders Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Meeting with the participation of stakeholders for establishing good governance to implement the National Integrity Strategy 2024-2025	26th February, 2025	Multipurpose Hall, INMAS, Suhrawardy	22

6. Project Work (ADP/FNCA/RCA/TC/CRP/S&T etc.)

IAEA TC project TC (ME-RAS6lll-2306823) titled:

"Enhancing the Management of Cancer through Capacity Building in Theranostics" Project Counterpart: Professor Dr. Zeenat Jabin Background:

Cancer is a major global cause of death, accounting for one in six deaths. The 'theranostics' approach, combining diagnosis and therapeutics, is emerging as a targeted, safe, and efficient pharmacotherapy. This project aims to enhance cancer management in regional Member States (MSs) through radiopharmaceutical development in theragnostic. The main areas will be the development of molecular carriers for cancer diagnosis and treatment using imaging/therapeutic radionuclides. The nuclear technique used will focus on regional resources for cancer treatment, filling a major gap in clinical applications.

To contribute to the improvement of cancer management facilities by enhancing the development of theragnostic grade radiopharmaceuticals.

Through targeted capacity building in the field of theranostics, this project aims to lay the ground work for improving cancer management. Implementation of the road map for the project will take place between 2024 and 2025.

7. Service Rendered & Revenue Income

Name of service	No. of patient/ sample	Revenue income
Scintigraphy	789	12,45,200/-
Ultrasonography	6,805	34,97,900/-

Name of service	No. of patient/ sample	Revenue income
Thyroid (Consultation + Radio Iodine Therapy)	599	10,69,500/-
PET-CT	356	94,41,000 /-
Blood sample analysis	12,076	1,15,21,150/-
BMD	159	2,90,500/-
Total	20,490	2,70,65,250/-

8. Others

Prof. Dr. Zeenat Jabin is working as editor of two scientific journals

a) Bangladesh Journal of Nuclear Medicine &
b) Bangladesh Journal of Ultrasonography

9. Extracurricular

- Dr. Zeenat Jabin, Dr. Mst. Afifa Khatun, Dr. Jinia Afrin Khan, Dr. Mariom Nusrat and Mr. Sudipto Das are serving as the members of Scientific and Technical Review Committee.
- Mr. Sudipto Das is serving as RCO
- Prof. Dr. Zeenat Jabin, Dr. Jerin Sultana, Dr. Md. Rezwan-Ul-Haque, Mr.Kazi Reazuddin Ahmed and Mr. Md. SiddiqueHossain are serving as the members of the ethics committee.
- Mr. Sudipto Das, Dr. Ilteza Tabassum, Mr. Md. Altaf Hossain,Mrs. Razia Nime are serving as the members of purchasing committee.
- Mr. Kazi Reazuddin Ahmed is serving as seminar convener for weekly scientific seminar

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), MOHAKHALI

Introduction

The Institute of Nuclear Medicine & Allied Sciences, Mohakhali was established along with other seven institutes in Suhrawardy, Gopalganj, Jessore, Pabna, Cox's Bazar, Satkhira and Kushtia as a common project in 2023. The foundation stone was led in 2017, and construction was completed in 2022. It is a government institute that provides relevant, specialized and research-based healthcare services, located on the campus of National Institute of Diseases of the Chest and Hospital (NIDCH), Mohakhali, Dhaka-1212.

Objectives

The institute's main goal is to harness atomic energy for people in a safe and peaceful manner rather than for destructive purposes.

- Develop and implement advanced nuclear medicine technologies and services, including PET-CT, Bone Scans, Renograms, RIA, CLIA, and Thyroid treatments, to enhance diagnostic accuracy and treatment outcomes.
- Foster scientific research in nuclear medicine to innovate new diagnostic and therapeutic approaches for cancer and other diseases.
- Implement digitalization strategies to establish INMAS Mohakhali as a one-stop center for comprehensive nuclear medicine services, ensuring efficient patient management and access to specialized treatments.
- Develop skilled human resources through robust educational programs and training initiatives in collaboration with universities and international partners.

These objectives underscore our commitment to advancing healthcare capabilities, fostering innovation, and building a skilled workforce capable of meeting future healthcare demands in Bangladesh

Activities

The services rendered by the institute are:

- Clinical (both diagnostic and therapeutic)

All services are provided under the following divisions:

a) PET-CT Division
b) Scintigraphy Division
c) Thyroid Division
d) In-vitro Division
e) Ultrasound and Color Doppler Division

Regular Services

1. Clinical Activities

1.1 Diagnostic Activities

a) The Institute is equipped with one (01) PET-CT facility. PET-CT scan is very useful for early diagnosis and staging of cancer for the people of Bangladesh.

b) The institute is equipped with one (01) SPECT-CT, and two (02) SPECT Gamma Cameras. The studies include Bone scan, Renal scan (DTPA, DMSAand GFR measurements), Cardiac scan, Lymphoscintigraphy, Thyroid Scan, Parathyroid scan, etc.

c) Thyroid Imaging and Uptake.

d) BMD (Bone Mineral Densitometry) for early detection of osteoporosis/osteopenia and low bone mass.

e) At present there are four(04) Color Doppler's including two 4D, two3D machines. All sorts of diagnostic USG, including normal B-scan of different organs, HRUS of superficial organs and Color Doppler of the vascular system are routinely performed.

f) Hormone Analysis: By using the RIA and modern CLIA techniques the In-vitro division is estimating all thyroid-related hormones like T3, T4, TSH, FT3, FT4, LH, FSH, pituitary hormones, estrogen, progesterone, prolactin, testosterone, follicular stimulating and luteinizing hormones, Vitamin D, parathormone, Tumor Marker: Thyroglobulin, Thyroid antibodies etc.

1.2 Therapeutic Activities

The therapeutic component of our activity is extensively in the treatment of thyroid cancer and hyperthyroid patients using I-131.

2. Arranged Training Program/Workshop/Seminar/Symposium/Conference

Sl. no.	Title (training program/ workshop/ seminar/ symposium/ conference)	Date	Place	No. of participant
1.	Weekly Seminar	Every Tuesday	INMAS, Mohakhali	12

3. Manpower Development (Training Attended)

Sl. no.	Name of the participant	Title of the event	Organizer	Date	Place
1.	Dr. SharminQuddus CMO & Director	ডিনথি অফিস ব্যবস্থাপনা	ইনস্টিটিউট অব কম্পিউটার সায়েন্স	18-20 February, 2025	Atomic Energy Centre, Dhaka
2.	Dr. SharminQuddus CMO & Director	Training of BMD with accessories		22-28 July, 2024	Nimes,France
3.	Dr. RahimaAkter SMO	Training of 4D High Resolution Color Doppler		19-26 August, 2024	Japan
4.	Dr. Nilufa Yasmeen MO	Training of 4D Color Doppler		15-22 July,2024	India

Sl. no.	Name of the participant	Title of the event	Organizer	Date	Place
5.	Md. AlamgirKabir SEO	Training of RIA Counter (Automatic)		20-26 August, 2024	Republic of Koria
6.	Md. Shahidul Islam Khan TO	Operational Training of Dual Head SPECT Gamma Camera	Mediso Medical Imaging System Ltd.	16-27 September, 2024	Hungary
7.	Pabitra Kumar Kundu AO	ডিনথি অফিস ব্যবস্থাপনা	ইনস্টিটিউট অব কম্পিউটার সায়েন্স	18-20 February, 2025	Atomic Energy Centre, Dhaka

3. Seminar/Symposium/Conference/Workshop/Meeting Attended

Sl. no.	Name of the participant	Title of the event	Organizer	Date	Place
1.	Dr. SharminQuddus Dr. Iqbal Hossain Dr. RahimaAkter Dr. HumayraTasnim Dr. Arshad Hossain Dr. Nilufa Yasmeen	36th National Conference	Bangladesh Society of Ultrasonography (BSU)	06-07 December 2024	Banghabandhu International Conference Centre
2.	Dr. RahimaAkter Dr. HumayraTasnim Dr. Arshad Hossain Md. Jahir Alam Mahbuba Zaman Dr. Nilufa Yasmeen	19th SFO BICC	Oncology Club	13-14 December 2024	Radisson Blu Water garden Hotel, Dhaka
3.	Dr. Iqbal Hossain Dr. RahimaAkter Dr. HumayraTasnim Dr. Arshad Hossain Md. Jahir Alam Mahbuba Zaman Dr. Nilufa Yasmeen Md. AlamgirKabir Md. Shahidul Islam Khan	28th National Conference	Society of Nuclear Medicine of Bangladesh	07-08 February, 2025	Ocean Paradise Hotel & Resort, Coxs Bazar

5. Service Rendered and Revenue Income

Name of service (department wise)	No. of patient/sample	Income
a) BMD (Bone Mineral Density)	43	18,672,010.00
b) CT Scan	02	
c) Gamma Camera	04	
d) In-Vitro Lab	2960	
e) Miscellaneous Services	132	
f) PET-CT	483	
g) Radio-iodine Therapy Unit	4	
h) Scintigraphy	722	
i) Therapy	19	
j) Thyroid	560	
k) Ultrasound	3052	

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), JASHORE

Objective

Institute of Nuclear Medicine and Allied Sciences (INMAS), Jashore was established in 2023 under the "Establishment of 8 INMAS around the country" project with the supervision of BAEC. This institution is now fully operational with nuclear medicine and other facilities like SPECT-CT, BMD, ultrasound, in-vitro laboratory, and others. It offers diagnostics like radionuclide imaging, biomarkers, hormone tests as well as therapies, including treatment for thyroid cancer and follow-up care. INMAS, Jashore is an esteemed institution dedicated to providing services, conducting research, and offering academic programs in nuclear medicine and related sciences for Jashore suburb and southwestern region of the country.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in Training/Workshop

Sl. no.	Name of the training	Date	Place	Number of participants
1.	Taining on 4D color Doppler and ultrasound	19-25 August, 2024	Tokyo, Japan	1
2.	Training of 4D products and application of Color Doppler	15- 23th July, 2024	Noida, India	1
3.	Training of BMD with accessories in Nimes France during	22-28th July, 2024	Nimes, France	2
4.	Ultrasound workshop	22nd December	Online (Multan USG service, Pakistan)	1

2. Oral/Poster Presentation in Seminar/Symposium/Conference (National and International)

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Md Asraful Alam	Graphene based electrochemical Biosensor for the detection of cardiac biomarkers	2nd International Conference on Recent Advances in Chemistry	Department of Chemistry, Jagannath University	31st Jan-01st Feb, 2025	Jagannath University, Dhaka
Md Asraful Alam	Emerging nanomaterials-based drug delivery for cancer theranoistics: Anuclear Medicine perspective	28th National Conference of Society of Nuclear Medicine	Society of Nuclear Medicine, Bangladesh	07-08th February, 2025	Ocean Paradise Hotel and Resort, Coxbazar
Md Shohagh Hossain	Diagnostic Dillemma between early Hashimoto's thyroiditis Vs Graves' disease in 99mTc-pertechnetate scintigraphy: Overcoming the challenge	28th National Conference of Society of Nuclear Medicine	Society of Nuclear Medicine, Bangladesh	07-08th February, 2025	Ocean Paradise Hotel and Resort, Coxbazar
Dr. Dr. Deepa Bairagi	Herlyn-Werner-Wunderlich Syndrome: Case-based diagnostic and functional insights using DTPA renogram	28th National Conference of Society of Nuclear Medicine	Society of Nuclear Medicine, Bangladesh	07-08th February, 2025	Ocean Paradise Hotel and Resort, Coxbazar
Dr. Tuba Ul Jannat Mou	Enhanced detection of skeletal metastases: Tc-99m MDP planar	28th National Conference of Society of	Society of Nuclear Medicine,	07-08th February, 2025	Ocean Paradise Hotel and Resort,

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
	imaging combined with SPECT-CT-single center experience	Nuclear Medicine	Bangladesh		Coxbazar
Dr. Deepa Bairagi	-	International conference on Hybrid Imaging (IPET)	07-11th October, 2024	IAEA	Online (Vienna, Austria)

3. Service Rendered

Sl. no.	Name of service provided	Number/quantity of sample/patient / service	Revenue income (taka)
1.	BMD (Bone Mineral Density)	39	62500
2.	CT Scan	5	8300
3.	Gamma Camera	384	609200
4.	General	1499	765700
5.	In-vitro lab	4056	2921250
6.	Miscellaneous Services	36	29400
7.	Thyroid	863	709700
8.	Ultrasound	1445	665950
Discount			43410
Refund (Due to patient declination)			10600
Total		6009	5717990

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), GOPALGONJ

Objective

- Establish a support system for the major local hospitals by providing adequate information about the services available and by delivering global standard nuclear medicine and allied procedures/services according to their requirement.
- Ensure availability of nuclear medicine and allied procedures/services according to the requirement of major hospitals in neighbouring districts and disseminate adequate information about the procedure/services in order to emerge as a sustainable support to the older and busier INMASes in the southern region during their frequently occurring overflowing of schedules.
- Establishment of শুদ্ধাচারঅনুশীলন that will in turn facilitate best possible ambience in all possible aspects towards the service seeking people throughout their stay within the premises of INMAS Gopalganj.
- Foster a congenial working environment and implement a healthy work culture within the INMAS, Gopalganj.
- Ensure best and wastage free utilization of resources by administering regular servicing, quality control and appropriate operation of the state-of-the-art laboratory equipment and vigilant combat against the adverse maintenance conditions.
- Ensure regular training and education of the personnel working in the INMAS Gopalganj in order to keep their scientific knowledge and skills up to the mark.
- Continuous effort and research to improve the existing service delivery system both independently as well as through collaborative venture with science and technology universities.
- Conduct research of global standard using the patient data collected and generated during nuclear medicine and allied services in order to deepen the existing understanding about diseases and their management both independently as well as through collaboration with medical colleges and hospitals.

- Evolve into a centre of excellence for education and training of medical technologists, nurses, physicists, chemists and physicians who work or look forward to work in the field of nuclear medicine and allied sciences.

1. R&D Works

1.1 Evaluation of Thyroid Ultrasound Features in Patients with Deranged Thyroid Hormone Levels

Sanjida Akter, Nafisa K Tamanna, Sabuz Paul

Characterization of the patterns of ultrasound, color Doppler, elastography and radiomic features across the derangement of thyroid hormone levels.

1.2 Evaluation of Ovarian and Uterine Ultrasound Features in Patients with Deranged Sex Hormone Levels

Sanjida Akter, Nafisa K Tamanna, Sabuz Paul

Characterization of the patterns of ultrasound, color Doppler, elastography and radiomic features across the derangement of levels of estrogen, progesterone, follicle stimulating hormone, leutenizing hormone and anti-müllerian hormone.

1.3 Evaluation of Ultrasound Features in Male Infertility

Shahriar Muttakin, Azmal K Sarker

Characterization of the patterns of ultrasound, color Doppler, elastography and radiomic features in male infertility.

1.4 Evaluation of Renal Arterial Velocitometric Indices in Middle Aged and Elderly People in Health and Disease

Shahriar Muttakin, Azmal K Sarker

Characterization of the patterns of ultrasound, color Doppler, elastography and radiomic features across the derangement of levels of estrogen, progesterone, follicle stimulating hormone, leutenizing hormone and anti-müllerian hormone.

2. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	An introduction to nuclear medicine and allied sciences for intern physicians	14.07.2024	Conference room, INMAS Gopalganj	53
2.	ISUOG practice guidelines for sonologists	10.02.2025	Conference room, INMAS Gopalganj	13
3.	Obstetric ultrasound during 11-14th weeks of gestation for sonologists	03.03.2025	Conference room, INMAS Gopalganj	13
5.	Introduction to lower limb vascular ultrasound	12.04.2025	Conference room, INMAS Gopalganj	12
4.	Thyroid ultrasound for sonologists	07.05.2025	Conference room, INMAS Gopalganj	12

3. Oral/Poster Presentation in Seminar/Symposium/Conference (National/International)

Name of the participant	Title of oral/poster presentation	Tittle of the event	Organizer	Date	Place
Sanjida Akter	Additive Value of SPECT in the Characterization of skeletal lesions- A brief report	28th National Conference of Society of Nuclear Medicine, Bangladesh	Society of Nuclear Medicine, Bangladesh	7-8th February, 2025	Ocean Paradise Hotel & resort, Cox's Bazar

Name of the participant	Title of oral/poster presentation	Tittle of the event	Organizer	Date	Place
Sabuz Paul	Optimizing the acquisition protocol of I-131 post therapy scan- A brief report				
Nafisa Kaisar Tamanna	Workflow of radiomics analysis- A brief report				
Shahriar Muttakin	Additive Value of SPECT in the Characterization of Thyroid Nodules- interesting images from two cases				
Sanjida Akter	Findings in Soft Tissue Swelling Ultrasound- A Thirteen Months, Experience	36th National Conference of The Bangladesh Society of Ultrasonography	The Bangladesh Society of Ultrasonography	6-7th December, 2024	Bangabandhu International Conference Centre (BICC), Sher-e-Bangla Nagar, Dhaka, Bangladesh.
Shahriar Muttakin	Findings in Testicular Ultrasound- A Thirteen Months, Experience				
Farzana Rahman Adrita	Fetal Anomaly Scan: A report of Three Cases				

4. Service rendered

Sl no.	Number/ quantity of Sample/patient/service	Revenue income
1.	12101	8,447,820 BDT

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), SATKHIRA

Objective

- To facilitate peaceful application of nuclear medicine & radiation technology according to aims & objectives of BAEC.
- Provide excellent diagnostic and therapeutic services to patients using nuclear technology.
- To promote better understanding of nuclear medicine & radiation services among the medical professionals
- To facilitate research and development works in the relevant fields of nuclear medicine.

Activities

R&D work(s)

- Biochemical & hormonal outcomes of personnel exposed to radio-isotope working in a nuclear medicine facility.
- Assessment of myocardial perfusion injury through MPI among the patients admitted in CCU of Satkhira medical college hospital.

- Evaluation of outcome of high dose radio Iodine-131 among patients treated for DTC in INMAS - Satkhira.

1. Manpower Development

1.1 Attend in Training

Sl. no.	Title (training program/workshop/seminar/ symposium/conference)	Date	Place	No. of participant
1.	Training of BMD with accessories in Nimes France (Participant: Dr. Mohammad Simoon Salekin)	22-28.07.2024	France	01
2.	Training of 4D Color Doppler USG in India (Participant: Dr. Tasmia Shahid)	16-23.07.2024	India	01
3.	Training of 4D High Resolution Color Doppler USG (Participant: Dr. Md. Abdul Mazid)	18-26.08.2024	Japan	01
4.	Operational Training of Dual Head SPECT Gamma Camera at Mediso Medical Imaging Systems Ltd in Hungary(Participant: Md. Rifat Islam)	16.09-27.09.2024	Hungary	01

1.2 Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
a) Dr. Tasmia Shahid & Dr. Mehnaz Riffat	28TH Annual conference of Society of Nuclear Medicine. Bangladesh.	Society of Nuclear Medicine, Bangladesh	07.02.2025-08.02.2025	Cox's Bazar
b) Dr. Abdul Mazid& Dr. Shamim Mohammad	28TH Annual conference of Society of Nuclear Medicine. Bangladesh.	Society of Nuclear Medicine, Bangladesh	07.02.2025-08.02.2025	Cox's Bazar

3. Academic Activities

- Undergraduate students of Satkhira Medical College received training on DTPA renogram& Bone scintigraphy
- Arranged Seminar on Nuclear Medicine, Ultrasound procedures and related subjects monthly.
- To provide six (06) months honorary training on Nuclear Medicine & Ultrasound.

4. Service Rendered

Number of patients	Income (BDT)
7122	61,82,530/-

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), PABNA

Objective

- To facilitate peaceful application of nuclea rmedicine & radiation technology according to aims & objectives of BAEC.
- Provide excellent diagnostic and the rapeutic services to patients using nuclear technology.
- To promote better understanding of nuclear medicine & radiation services among the medical professionals
- To simplify research and development works in the relevant fields of nuclear medicine.
- To develop the Human resources.

1. R&D Work(s)

- Biochemical & hormonal out comes of personnel exposed to radio-isotope working in a nuclear medicine facility.
- Estimation of PSV at trigeminal artery of patients associated with head a cheresistantto conservative treatment.
- Evaluation of outcome of tubal inflation/irrigation following SIS.

2. Manpower Development

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title(training program/workshop/ seminar/symposium/ conference)	Date	Place	No. of participant
1.	Clinical Training of Dual Head SPECT Gamma Camera at Mediso Medical Imaging Systems Ltd	24.06.24-05.07.24	Hungary	01
2.	Training of BMD with accessories in Nimes France	22.07.24-28.07.24	France	01

2. Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Fahim Uddin Ahmad Dr. Md. Afraem Hossain Seam	7th Int. Endocrine Conference-2024	Bangladesh Endocrine Society (BES)	22-23 November-2024	Dhaka
Dr: Md: Mosharruf Hossain Dr. Fahim Uddin Ahmad Dr. Md. Afraem Hossain Seam Md. Rubel Alamin Pronoy Ghosh	28th National Conference of Society of Nuclear Medicine, Bangladesh	Society of Nuclear Medicine, Bangladesh	07-08-February-2025	Cox's Bazar
Md. Rubel Alamin Pronoy Ghosh	4th International Conference on Medical Physics in Radiation Oncology and Imaging.	Bangladesh Medical Physics Society & BRAC University.	13-14-February-2025	Dhaka

3. Service Rendered

Number of Patients	Income (BDT)
8036	6521300/-

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), KUSHTIA

Objective

- To assure modernized and specialized medical services to the people using the latest nuclear technology
- To improve and upgrade nuclear medicine facility in Bangladesh
- To conduct training of physicians, physicists, radio-pharmacists and technologists in the field of nuclear medicine
- To conduct updated academic and research activities
- To coordinate and standardize

1. R&D Work(s)

1.1 Radiation dose Assessment Around Patients in Single Photon Emission Computed Tomography Units During Bone Scintigraphy & DTPA Renogram

Bahalul Hasan, Md. Sunny Anam Chowdhury, Sujon Mahmud, Fariha Zerin, Yeasmin Akter, Nazmul Hossain, Md. Faruk Hossain, Rubel Alamin, Masud Parvej, Salim Reza

During imaging with Single Photon Emission Computed Tomography (SPECT) units, ionizing radiation is emitted by a patient's body after being injected with radiopharmaceuticals (Rph). Radiation protection as well as knowledge of safe regions around the working environment is essential for nuclear medicine (NM) occupational workers. The present study measured the dose rate at different points around the Rph-injected patients with different activities of 99m Tc-DTPA for renograms and 99mTc-HDP for bone scans, the two most common imaging procedures in the SPECT units of NM establishments.

During contact with radioactive patients, occupational exposure increases but significantly decreases by increasing distance, as well as the dose rate reduces greatly with respect to time. This study observed that the radiation dose was very low at 1 m distance from the radioactive patient.

The SPECT/CT occupational worker should remain at a distance of more than 1 m from the radioactive patients and carry TLD batches and wear lead shield aprons for their safety.

1.2 A Rare Case of Autoimmune Polyglandular Syndrome (APS) Type 3

Fariha Zerin, Md. Sunny Anam Chowdhury, MD. Nazmul Hossain, Bahalul Hasan, Sujon Mahmud, Yeasmin Akter, Tanvir Ahmad

Autoimmune Polyglandular Syndrome Type 3 is a rare condition where patients are diagnosed with more than one autoimmune disease having similarity in pathogenesis. Antibody detection with various imaging modalities, including nuclear medicine techniques, is crucial to confirm the diseases.

A 61-year-old elderly postmenopausal woman presented with vitiligo, features of hypothyroidism and systemic lupus erythematosus (SLE). After proper clinical evaluation, the anti-TPO antibody report came out positive, and a cold nodule was found in thyroid scintigraphy, thus confirming the diagnosis of autoimmune thyroiditis.

Autoimmune thyroiditis associated with vitiligo is more common in female individuals under APS Type 3, so screening is recommended for clinically manifested pathology.

1.3 Rare Report of a Familial Case of Lingual Ectopic Thyroid

Yeasmin Akter, Md. Sunny Anam Chowdhury, M Arif Hosen, MD. Nazmul Hossain, Sujon Mahmud, Fariha Zerin, Bahalul Hasan

Thyroid developmental defects lead to 85% cases of congenital hypothyroidism (CH). Among those, few (about 2%) cases are familial, having dominant genetic predisposition with low penetrance. A case of ectopic positioned lingual thyroid gland are reported in a little girl and her father, where a routine and simple nuclear medicine scintigraphy of thyroid gland using 99mTc-pertechnetate played a vital role. In vitro analysis of thyroid hormones and high-resolution ultrasound of neck aided the diagnosis. Screening of the family members and relatives in such cases appear to be essential.

1.4 Early Miscarriage of Unwanted Pregnancy After Radioiodine Ablation in a Patient with Graves' Disease

Fariha Zerin. Md. Sunny Anam Choudhury. Bahalul Hasan. Sujon Mahmud. Md. Sefat Meftaul Jannat.

Graves' disease in females of childbearing age is common. Radioiodine therapy (RAIT) is a definitive treatment for such a condition. The effect of radiation on germ cells and iatrogenic hypothyroidism following radioiodine therapy may cause a bad pregnancy outcome. We present an unfortunate case of miscarriage of early pregnancy in 7th gestational weeks following 7 months of RAIT and an approach to the clinical question ëHow to manage Gravesí disease with RAIT in women of childbearing potentialí. Maintenance of an adequate interval and achieving euthyroid status after RAI ablation in Gravesí disease in patients willing to conceive can reduce the risk of miscarriage and assure a good pregnancy outcome.

1.5 The Herlyn-Werner-Wunderlich Syndrome Complicated by Ovarian Cyst: A CASE Report

Yeasmin Akter, Md. Nazmul Hossain, Sujon Mahmud, Fariha Zerin, Bahalul Hasan, Md. Sunny Anam Chowdhury, Afroza Naznin.

The Herlyn - Werner - Wunderlich (HWW) syndrome is a rare congenital anomaly resultingfrom mesonephric duct-induced Mullerian abnormalities, namely uterus didelphys / bicomuate uterus, unilateral obstructed hemivagina and ipsilateral renal agenesis. This is why sometimes it is called obstructed hemivagina & ipsilateral renal anomaly (OHVIRA). This condition is usually found in post-menarche adolescents and young female with dysmenorrhea, irregular menstruation, abdominal pain and pelvic mass lesions (1). A high index of suspicion is required for diagnosis, and early detection is crucial to go for surgical treatment. Most of the patients with HWW syndromes are able to conceive. However, delay in diagnosis increases the risk of various complications like endometriosis and infertility (2). The current report features a unique case where uterine anomaly was accompanied by Unilateral renal agenesis, but there was no vaginal obstruction. The scenario was complicated with the presence of an adnexal cystic mass, and a rather interesting finding of IVC duplication.

1.6 Primary Amenorrhea with Sonographically Absent Uterus: A Rare Case Report- of Mayer-Rokitansky-Kuster-Hauser Syndrome

Fariha Zerin, Md. Sunny Anam Chowdhury, Md. Nazmul Hossain, Sujon Mahmud, Yeasmin Akter, Bahalul Hasan, Mirza Sharifuzzaman.

Primary amenorrhea is a common symptom leading towards various physical as well as psychological issues in an individual with diagnostic dilemma. Natural onset of menstruation or menarche occurs within two years of development of breast (1,2). In case of absence of menarche by the age of 15 or more than 3 years after the onset of secondary sexual characteristics, it is regarded as primary amenorrhea (3). Primary amenorrhea with absent uterus in healthy individuals can be caused by differences of sex development (DSD), including Mullerian agenesis, Complete Androgen Insensitivity Syndrome, and Testosterone Synthesis Defect. (1,2). In the case of patients presenting with primary amenorrhea but uterus in a hypoestrogenic state, although apparently absent in sonography.

1.7 Role of Ultrasonography in an Isolated Thyroglossal Duct Cyst Carcinoma: Case Discussion.

Sujon Mahmud, Md. Sunny Anam Chowdhury, Md. Nazmul Hossain, Fariha Zerin, Yeasmin Akter, Bahalul Hasan.

Thyroglossal duct cyst (TGDC) accounts for the majority of the anterior mid-neck pathologies. They are present in about 7% of the population worldwide (1). An imaging evaluation of a thyroglossal duct cyst may begin with an ultrasound. If there are atypical sonographic findings like a solid component or microcalcifications or high clinical suspicion for a tumor, other imaging modalities like CT or MR imaging are recommended to document an orthotropic thyroid gland and to evaluate for and characterize the features and extent of neoplastic processes (2). Most of these cancers are variants of papillary thyroid carcinoma (PTC), with a median age of initial diagnosis at 40 years. In 20 to 60% of cases, they coexist with thyroid gland PTC (4). Therefore, a diagnostic dilemma exists as to whether thyroglossal duct cyst carcinoma is a primary tumor or metastatic from the thyroid gland. Our case is an isolated thyroglossal duct cyst carcinoma that has intact thyroid parenchyma without any regional nodal involvement.

1.8 High Resolution Ultrasonographic Evaluation of a Case Report of Scrotal Lipoma.

Md. Nazmul Hossain, Md. Sunny Anam Chowdhury, Sujon Mahmud, Fariha Zerin, Yeasmin Akter, Bahalul Hasan.

Scrotal masses encountered in adult male patients are of clinical importance due to their dominant neoplastic risk if found originating from the testis. In contrast, para-testicular tumors are frequently benign with lipomas being the most commonly diagnosed pathology (1). Primary scrotal lipoma is a rare finding, where a tumor develops from the subcutaneous fat of the scrotal sac (2). Clinical examination of the scrotum is crucial in guiding the diagnosis, but further evaluation using imaging and cytological tests can aid in the proper identification of the etiology (3). High resolution ultrasonography (HRUS) plays an important role in this aspect. Here, we report a case of primary scrotal lipoma which was initially diagnosed by high resolution ultrasonographic scan and finally confirmed by fine needle aspiration cytology test guided by ultrasonography.

2. Manpower Development

2.1 Attend Training

Sl. no.	Title of the program	Date	Place	Participants
1.	Advanced Obs and Gyn Workshop	16 July to 18 July, 2024	Delhi, India	01
2.	Color Doppler Training	18 Nov. 2024 to 10 Feb, 2025	INMAS, Comilla	01
3.	TVS & Color Doppler Training	10 Jan to 10 April 2025	NINMAS Dhaka	01
4.	4D High Resolution Color Doppler	19 Aug. to 25 Aug. 2024	Japan	01

3. Organize Meeting

Sl. no.	Title of the program	Date	Place	Participants
1.	Coordinating Committee	22/08/24	INMAS, Kushtia	4
2.	Purchasing Committee	23/09/24	INMAS,Kushtia	4
3.	Evaluation Committee	12/04/25	INMAS,Kushtia	4

4. Oral/Poster Presentation in Seminar/Symposium/Conference (National & International)

Participant	Title of oral/poster	Title of the event	Date & plase
Dr. Fariha Zerin	High Resolution Ultrasonographic Evolution of Patients having Penetrating wound with suspicious impacted Foreign Bodies.	36th National Conf. of BD society of Ultrasonography	6 Dec,2024 Dhaka

5. Stakeholder Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Services of INMAS Kushtia	25/05/25	INMAS Kushtia	8
2.	Online appointment system & Report Delivery in INMAS Kushtia	17/06/25	INMAS Kushtia	9

6. Academic Activities

Title of the program	Name of participants	Date	Organizer & place
Approach to subclinical Hyperthyroidism & its Management	Dr. Md. Sujon Mahmud	25/05/25	INMAS, Kushtia
Portal vein Dopler	Dr. Md. Nazmul Hossain	17/06/25	INMAS, Kushtia
CME on Nuclear Medicine Services.	Dr. Md. Sunny Anam Chowdhury	14/01/2025	Kushtia Medical College Campas
	Dr. Md. Nazmul Hossain		
	Dr. Md. Sujon Mahmud		
	Mr. Bahalul Hasan		
CME on Management of Differentiated Thyroid Carcinoma	Dr. Md. Sunny Anam Chowdhury	23/06/2025	Kushtia Medical College Campas
	Dr. Md. Nazmul Hossain		
	Dr. Md. Sujon Mahmud		
	Mr. Bahalul Hasan		

7. Workshop

Title of the program	Participants	Date	Organizer & place
Parinatal a ultrasound: Mother's Perspective.	2	14,15 Feb 2025	31st WFUMB Center of Education workshop
Management of thyroid Disorder by BD Global Health & Research Institute.	1	27 Sept. 2024	NINMAS, Dhaka

8. Service Rendered

Sl. no.	Name of service provided	Number of patients	Revenue income (BDT)
1	BMD	18	33,000/-
2	CT scan	40	54,800/-
3	Gamma Camera	262	4,25,400/-
4	General	2212	4,51,300/-
5	In Vitro lab	11998	68,44,950/-
6	Thyroid facility	236	2,30,500/-
7	Ultrasonography	5188	22,81,200/-
Total		15515	1,05,45,680/-

9. Repair & Maintenance, Renovation Works etc.

Title: Electric Power Factor Issue

Description: Due to persistent deviations of the power factor from the acceptable standard threshold, a penalty of 10% has been consistently imposed on the total monthly electricity bills since the commencement of operations. Through multiple formal communications with the BAEC, Head Office about this issue and in consultation with the Executive Engineer of the local WZPDCL office, the matter was addressed and resolved through the engagement of qualified technical personnel. As a result, the power factor has been stabilized, and no further penalties are currently being levied on our electricity bills.

III. ENGINEERING AND GENERAL SERVICES

ENGINEERING DIVISION (ED), BAEC HQ

Bangladesh Atomic Energy Commission has been engaged in accelerating the research and development (R & D) activities in the various fields of Nuclear Science and Technology in the country. The Engineering Division (ED) is formed under approved charters of BAEC (e.g.,Enam Committee, BAEC Perspective Plan-1993-2010 and BAEC service rules & orders) as a main integral organ for conducting design and development infrastructure, facilities, technical services and appropriate engineering and technological research for promoting overall R& D program of BAEC.Engineering Division (ED) has been entrusted with the responsibilities for planning, designing, fabrication, installation, operation and supervision of various scientific, nuclear and engineering infrastructures, facilities and accomplishing of repair & maintenance works for smooth operation of overallR&D programs under both revenue and ADP budget.Currently engineering division is also engaged in conducting engineering and technological research activities with the limited resources it hasfor upgradation of the above engineering design and development activities and finding out sustainable solution of upcoming future problems of BAEC. This division is also responsible for procurement of works/goods/services by bidding national and international tender as per PPR-2008 for creating above facilities andtechnical services. Thus, this division is performing the key role for implementing the overall R&D program of BAEC for promoting nuclear science and technology and its peaceful applications in the country. Given below are the various contribution accomplished by the division in Finical Year 2024-25.

1. Contribution under implementationat various ADP projects.(On Going)

a. Works contributed under the project "Establishment of Positron Emission Tomography–Computed Tomography (PET-CT) with Cyclotron facilities" atSavar,Mymensingh and Chittagong.

- Planning, designing, estimating of six stories two new buildings under the project at Mymensingh and Chittagong.
- Planning, designing, estimating of ten stories new buildings under the project at Savar.
- Construction and supervision of total building.
- Civil construction management and other related mechanical, electrical works done for installation of Sub-Stations, Lifts, AC, Pumps etc.

b. Works contributed under the project "Enhance Capacity of Institute of Nuclear Medicine and Allied Sciences (INMAS) at Mitford, Comilla, Faridpur, Barisal and Bagura."
   - Planning, designing, estimating and construction forextension of old building, guard house under the project.
   - Planning, designing, estimating and supervision of renovation works of old INMAS buildings.
   - Construction and installation of lift, AC, sub-station are in progress.
   - Construction of new gate and guard room at INMAS Dhaka.
   - Construction and supervision of auditorium buildings under the project.

c. Modernization and Strengthening of Services and Research Facilities of the Institute of Tissue Banking and Biomaterial Research.
   - Planning, designing, estimating and construction of seven stories new buildings under the project.
   - Supervision of total construction work of buildings.
   - Civil construction management and other related mechanical, electrical works done for installation of sub-stations, Lifts, AC, Pumps etc.

d. Works contributed under the project "Establishment of Genome Sequencing Facilities." at NINMAS Dhaka and INMAS Chittagong.(Currently Stopped)

e. Works contributed under the project "Establishment of Institute of Nano Technology" at AERE, Savar.(Currently Stopped)

2. Contribution implementedunder various ADP projects of BAEC (Completed):

a. "Establishment of Institute of Nuclear Medicine and Allied Sciences (INMAS) at 8Medical Collage Hospital Campuses in the country "at Dhaka, Khustia, Jessore, Cox's Bazar, Gopalganj, Pabna, Satkhirah.

b. "Enhance Capacity of Institute of Nuclear Medicine and Allied Sciences (INMAS) at Dhaka, Chittagong, Khulna, Sylhet, Rajshahi, Dinajpur and Rangpur.

c. "Development of Human Resources & Establishment of Residential Accommodation Facilities for the Radiation Testing and Monitoring Laboratory", at Mongla.

d. "Establishment of Calibration and Quality Control Facilities for Radiotherapy, Diagnostic Radiology and Neutron".

e. Works contributed under the project "Capacity build-up of Nano and NanoBio-Technological laboratory" at Material Science Division, AEC, Dhaka.

f. "Establishment of Calibration and Quality Control Facilities for Radiotherapy, Diagnostic Radiology and Neutron".

g. Strengthening of existing gamma source of Bangladesh Atomic Energy Commission.

h. "Establishment of Water Supply Facilities at Rooppur Nuclear Power Plant Site Office."

i. Modernization of Laboratories and Enhancement of Service Capacity of 3 Divisions (Chemistry Division, Health Physics Division, Experimental Physics Division) of Atomic Energy Centre, Dhaka.

j. "Balancing, Modernization, Refurbishment and Extension (BMRE) of Safety Systems of the 3 MW TRIGA Mark-II Research Reactor Facilities".

3. Worksaccomplished by Engineering Division in (2024-2025) under Revenue Budget.

Engineering Division is one of the most important divisions of this organization, as it responsible to smoothly operate the overall R&D activities of BAEC by creating various facilities, work and serviceswithin the financial year 2024-2025 are given below:

4. At BAEC HQ, Dhaka

- Supply, installation,testing and commissioning of air conditioner for (Room #109) BAEC, HQ, Dhaka.
- Digital time attendance system and related works for (paramanu Bhaban-02 & Canteen Bhaban-01) BAEC, HQ.
- Supply and replacement of damaged AC compressor with new one and related works at administration and SID Division, BAEC, HQ, Dhaka.
- Refilling of fire extinguisher cylinder, cleaning of water reservoir/tanks, supplying new water tank and related works at BAEC, HQ.
- Supply, testing and fixing of maintenance free rechargeable sealed lead Acid battery at HQ, BAEC, Dhaka.

5. At BAEC Housing Colony,Banani,Dhaka

- Renovation, modification of civil and electrical works of Flat No C-16, D-05, D-06, HB-01, HB-02, HB-05, HB-00, ANNEX-07, SQ-04 at BAEC housing Colony, Banani, Dhaka (Lot-03).
- Renovation, modification of civil and electrical works of Flat No C-05, C-12, C-15, D-01, D-11, and D-12 at BAEC housing colony, Banani, Dhaka (Lot-01).

6. At AERE and Othercampus of BAEC

- Preparation and decoration of stall for Bangladesh Atomic Energy Commission in Amar Ekushey Book Fair-2025 at Bangla Academy Campus, Dhaka.
- Renovation, repair and maintenance works of Electronics division at AECD,4Kazi Nazrul Islam avenue, Shahbag, Dhaka.

7. At NINMAS & INMAS

- Supply and installation of AC compressor and related works at PET-CT lab, INMAS, Dhaka.

8. Preparation of Development Project Pro-forma (DPP) in 2025-2026

This division is also responsible for estimation and preparation of DPP of various government ADP projects under BAEC. But this year no DPP is found.

ENGINEERING AND GERNERAL SERVICE DIVISION, AECD

The Engineering & General Services Division (EGSD) plays a pivotal role in sustaining the infrastructure and operational backbone of the Atomic Energy Centre, Dhaka (AECD). With a commitment to excellence and safety, the division provides a wide range of engineering and technical services in support of AECD's diverse research and development activities.

Comprising five specialized sections—Electrical, Refrigeration & Air Conditioning (RAC), Plumbing, Workshop, and Glass Blowing—the division ensures uninterrupted utility services including electricity, water supply, air-conditioning, ventilation, and civil maintenance throughout the campus.

During the reporting period from 1 July 2024 to 30 June 2025, EGSD successfully processed and executed over 120 service requisitions from various departments within AECD.

1. **Electrical Section**: During this reporting period electrical section has completed over 40 jobs in AECD. This section has done various jobs in this period for AECD. A few are mentioned below:

- Installation of New HT Switchgear for 1000 KVA substation at AECD.
- Installation of two magnetic contactor, fuse and other accessories at PFI plant of 1000 KVA substation.
- Installation of overhead HRC fuse, heater coil at switchgear panel, exhaust fan at of 500 KVA substation room at AECD.

- Completed Servicing and maintenance works with cheeking all accessories of 500 KVA substation at AECD.
- Supervised and monitored the installation works of the Boundary lighting system around AECD boundary.
- Supervised and monitored the renovation of electrical works of XRD lab of Material Science division and TLD lab of Health Physics division at AECD.
- Maintenance of electrical works of Tracer labof Chemistry division.
- Prepared and installed the new line for the installation of the new A Cat the Auditorium of AECD.
- Repaired and fixing problems of some ceiling fans of the Administration Section.
- Repaired and fixing of some tube lights of different divisions and places at AECD.
- Fixing the problems of power line of TEM and FTIR machine placed at Material Science Division, AECD.
- Repair and maintenance of SDB board replacement of cable in the Health Physics Division.
- Repair the Fan and electrical line in the Accounts section.
- Repair and replace tube lights in the Scientist sitting room.
- Installation of various Tube lights in the preparing line according to the load in the Electronics lab.
- Repair and installation of Tube light in the synthesis lab.
- Repair Split type AC power and Light in ACL, Trace Analysis Lab.
- Fume Hood fan repair and fixed in Chemistry lab.
- Electrical line installation of AC in the Scientist sitting room.
- Preparing the electrical line for installation of AC in the Clinic section in AECDa.
- Repair AC power and circuit breaker in the Chemistry lab.
- Repair and installation of exhaust fan in the AEC, Canteen, Dhaka.
- Repair and maintenance of light and combined sockets in the Health Physics division.
- Repair an Electrical circuit in the Health Physics division
- Fixing the Light and Energy bulb in the NDT division.
- Installation of UPS with the existing load in MSD Lab.
- Modification of SDB placed in AECD.
- Refilled 67 Fire Extinguisher in AECD campus.

2. **Refrigeration & Air-Conditioning System Section**: During the period, this section has completed over 35 jobs. Installed, reinstalled, repaired (Refilled gas, replaced Compressure, Capacitor, Fan motor etc.) and maintained many Air-conditioners of AECD. A few are mentioned below:

- Annual servicing was done all of the AC's (175 AC) placed in AECD.
- 6 number of AC were repaired of different laboratories of Chemistry division.
- 9 number of AC were repaired of Material Science division.
- 4 number of AC were repaired of Health Physics division.
- 2 Dehumidifier were repaired of Chemistry division.
- 3 AC were repaired of Electronics Division.
- Repaired 1 AC of Accelerator Facilities division
- Repaired 3 AC of Administration and Establishment Section, 1 AC of AECD Clinic and 1 AC of Store Section.

3. **Plumbing Section**: During the session, the plumbing section completed 30 jobs.

A few are mentioned below:-

- Replaced 2 check valve of motors for continuous water supply in AECD.
- Repared flash set, Pillar tap of female washroom/toilet of the ground floor.

- Replaced a new Comod of female washroom of the ground floor.
- Solved the water leakage problem of the Over head tank at AECD.
- Total 6 number of maintenance and repair work of washroom of the NDT division.
- Repaired the different leakage of distribution pipe line.
- Repair and maintenance work of male washroom of the second floor, Store building and NDT Division.
- Repair and maintenance work of water pipe line and basin of Health Physics division and Chemistry division.
- There are 6 number of Basin and many water taps that were repaired in different establishment in AEC, Dhaka.
- Repaired 2 Gas Stoves at AECD canteen.
- Cleaned 1 underground and 6 overhead reserve water tanks.

4. Workshop Section: During the reporting period this section performed 13 jobs requisition and completed all the works successfully. A few of them are:-

- Resize Iron sheet for Material Science division.
- Made hole on Power board for Electronics division.
- Cutting PMS sheet according to sample for Electronics division.
- Made drill point to display board for the Administration section.
- Made a lid of bowl milk upper part, Nut alignment, knob switch setting of cylinder for Chemistry division.
- Made a solid Iron rod pusher for the Administration section.
- Made hole on standard sheet board for Accelerator Facilities division.
- Made punch holes for EGS division.
- Made patch cutting in a MS pipe according to sample in RAC section.

5. Glass Blowing Section: During the mentioned period, this section has performed 02 jobs. These are:

- Repaired a burette for Chemistry division, AECD.
- Fabricated 10 custom glass columns for Chemistry division, AECD.

CENTRAL ENGINEERING FACILITIES (CEF), AERE

CEF mainly works in construction of infrastructures and installation, repair & maintenance of the necessary equipments as well as providing the different services within Atomic Energy Research Establishment (AERE).

The fundamental works of CEF are to help all the institutions of AERE to carry out various sorts of R&D work by providing essential technical supports. It has been taking care of the engineering facilities within AERE campus as per requirements. CEF takes the responsibility of formulating all engineering related jobs like as designing, planning, installation, operation and maintenance of all facilities of AERE, the largest research complex of Bangladesh Atomic Energy Commission (BAEC). Electrical power supply system, gas supply system, water supply system, air conditioning system civil and sanitation system of AERE are the prime concern of CEF. In essence, it provides services in designing, development, construction, technical support, implementation and maintenance of the infrastructures developed at AERE. CEF also provide industrial attachment program, student of polytechnic and vocational training institute of Bangladesh.

1. Manpower Development (Training/Fellowship/Workshop/Meeting)

1.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Shielding Assessment of the Cyclotron Facility using Monte Carlo Simulation.	3 July, 2025	INST	40
2.	Advisory comity of Scientific Information Unit at AERE	16 March, 2025	SIU	12

2. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Committee meeting held for uninterrupted electricity supply through express feeder from AERE electric substation to the Biman poultry complex	09 April 2025	Beta hall, BAEC	10
2.	Drilling of fire extinguisher in all institute at AERE	10 April 2025	CEF	30

3. Service Rendered

Sl. no.	Service	Revenue income
1.	Continuous water supply to the Uttara Bank Plc.	Tk. 60000/-(Appr.) per year
2.	Provided water supply system and continuous water supply to the AERE office and residential area.	Not Applicable
3.	Provided natural gas supply system and assisted continuous gas supply to the AERE office and residential area.	Not Applicable
04.	Provided fire extinguisher system and trained up man power.	Not Applicable
5.	Provided electric supply system and assisted continuous electric supply to the AERE office and residential area.	Not Applicable
6.	Provided air condoning system and operated central air conditioning plant as per requirement of the different users at the AERE office campus.	Not Applicable
7.	Performed machining, welding, sheet-metal works, carpentry works etc. as per requisition of different institute and residential building at AERE.	Not Applicable

4. Construction, Repair, Maintenance, Operation and Renovation Works. etc.

Md. Borhan Uddin, M.M. Rana, Md. A. Mannan.

Every three months' observation report about natural gas & electricity supply system, fire extinguishers system, gas cylinder and sewerage system at AERE office campus. Report sent to the BAEC head quarter after three months as it is a continuous process.

Mechanical Engineering Division

Major activities of the mechanical engineering division are given below: -

1) Supply drinking water which is used in different Institute of the office side and residential area of AERE colony.
2) Repair, maintenance & replacement works of conceal stop cock, water pipe line, pillar cock and tiles of VIP bath room of training institute at AERE.
3) Repair, maintenance & installation works of high commode, pad stand basin, glass self, pillar cock, bibcock, lowdown flash, looking glass, etc. wash room of IFRB director, head CAD, IRPT room no. 110, officer's dormitory at AERE.
4) Installation works of new gas line, regulator and gas riser of training institute and officer's dormitory east side at AERE.
5) Installation new circuit breaker of colony pumps 3C at AERE residential area.
6) Repair & maintenance works of office side deep tube well building's roof.
7) Repair & maintenance works of sink conceal stop cock, sink waste etc. of training institute bath room no. 401.

8) Repair & maintenance works of natural gas line of $E_{3,}$ $F_{2,}$ $C_{3,}$ officer's, staff hostel, guest house and central cafeteria at AERE.

9) Replacement works of gas burner of $E_{1/2,}$ $C_{1/4,}$ $F_{3/8,}$ $F_{3/5,}$ $D_{1/4}$ building, 301,407,401 nos. dormitory unit and west side common kitchen of officer's hostel at AERE colony.

10) Replacement works of commode, basin, looking glass, lowdown flash and CI trap of $E_{4/10,}$ $F_{1/9}$ and $E_{1/3,}$ $E_{2/5}$ building at AERE colony.

11) Repair & maintenance works of water line of training institute, VIP guest house, central store division and SIUat AERE.

12) Repair, maintenance, cleaning & replacement works of 7 nos. wash room, 10 nos. inspection pet, safety tank, sewerage line etc. of different residential building at AERE.

13) Repair & maintenance works of 2HP submersible water pump of police camp and training institute at AERE campus

14) Repair & maintenance works and up gradation lubricating system of centrifugal pumps.

15) Repair & maintenance works of damage water heater of VIP guest house room no -2 and installed new water pipe line with modification.

16) Repair & maintenance works and replacement of damage gas burner and installed new gas burner from different residential building at AERE. Approximately 30 nos. gas burner repaired and new installed 35 nos.

17) Repair & maintenance works of natural gas line and gas regulator, lock wing cock, gas meter (4 nos.) Uzala key etc. as per requirement of different user at AERE.

18) Repair colony side 25 HP centrifugal pumps 3C, 3B& 3D.

19) Replacement of electric motor for colony pumps 3A.

20) Repair maintenance and modification works of basement, pump motor and electric line of office side pump 2A.

21) Installation and refilling works of fire extinguisher at AERE office and colony.

22) Check the gas regulator reading and gas bill at AERE office and colony.

23) Prepare the monthly water bill of Uttara Bank Ltd.

24) Installation & modification works of ball cock for overhead water tank of officer's dormitory, F_2 building, CEF, IRPT, central cafeteria and Uttara bank at AERE.

25) Repair underground water pipe line of $C_{1,}$central cafeteria, Ansar shed at AERE campus.

26) Painting works has done as per requirement of different institute.

27) Deign, estimate, parches and implementation of different mechanical works as per requirement.

28) Repair & maintenance works and check of sewerage line at AERE office and colony.

29) Replace & maintenance work has done of the gas regulator and lock wing cock at AERE campus.

30) Replace and installation works of basin, bibcock, pillar cock, sink, looking glass, glass self, moving shower and low-down set of different institute of office side and residential building at AERE colony.

31) Routine mechanical maintenance works has done as per requirements of different institute at AERE campus.

Electrical Engineering Division

1) Supervision works of electrical repair and servicing work of transformer oil centrifuging; silica gel replaces at TAF- INST at AERE.

2) Supervision works of repair and maintenance works 11 KV HT switchgear with VCB (Vacuum Circuit Breaker) CT, HT cable heat shrink and insulating IFRB at AERE, Savar, Dhaka.

3) Supervision works of Repair and Modification of the sitting room of Head CFD at AERE.

4) Routine repair and maintenance of laboratory instrument installation and power supply connection in Food Safety and Quality Analysis Division, Insect Biotechnology Division, Plant Biotechnology and Genetic Engineering Division, Radiation Entomology and Acarology Division, Microbiology and Industrial Irradiation Division, Agrochemical and Environmental Research Unit-IFRB, Isotope Hydrology Division, Reactor and Neutron Physics Division, Nuclear and Radiation Chemistry Division-INST, Health Physics and Radiation Waste Management Unit, Tandem Accelerator Facilities-INST at AERE.
5) Supervision works of electrical repair and servicing work of transformer CT, PT cable Heat Shrink and insulating TAF-INST, TI at AERE, Savar, Dhaka.
6) Repair and maintenance of HT & LT power supply in all institute and residential colony at AERE.
7) Verifying of electricity bill at AERE.
8) Repair and maintenance of 22 pcs. Three phase and single-phase circuit breaker for laboratory instrument and air condition power supply in all institute at AERE.
9) Replacement of 15 KVA Pole mounted transformer use only in DG banglo residential colony at AERE.
10) Installation of 30 pcs. new ceiling fan in all institute and residential colony at AERE.
11) Installation of 4 pcs. new exhaust fan in all institute and residential colony at AERE.
12) Repair and maintenance works of 35 pcs. building security light of office and residential colony at AERE.
13) Repair and maintenance works of 25 pcs. Street light of office and residential colony at AERE.

Civil Engineering Division

Major activities of the civil engineering division are given below:

1) Repair and maintenance works of Main gate visitors waiting room at AERE Savar, Dhaka.
2) Repair and maintenance works of Room No. 175 with making a new aluminum cube of radio isotope production division, INST at AERE Savar, Dhaka.
3) Repair and maintenance works of Room No.-205, 206, 206A, 207, 208, 209 and 211 of RPED, INST. at AERE Savar, Dhaka.
4) Repair and maintenance works of Lab No.- 138, NRCD, & Lab No.- 218, NRCD, INST at AERE Savar, Dhaka.
5) Repairing & maintenance work of various quarter No. C-2/8,C-3/4,C-3/7,E-1/4,E-1/6, E-1/7, E-1/8 , E-1/10 & E-1/12 E-2/3, E-2/5, E-2/10 & 2/16 - E-2, E-3/2, E-3/11, E-3/12, E-3/13, E-3/15 & E-3/16, E-4/2, E-4/3, E-4/4, E-4/8, E-4/12, E-4/18 & E-4/20, F-1/5, F-1/6, F-1/8, F-1/9, F-1/10 & F-1/11 F-2/5, F-2/6, F-2/11, F-2/14 , F-2/17 & F-2/18, F-3/3, F-3/4, F-3/5, F-3/6, F-3/11 & F-3/13 OD-301,OD-308, OD-312, OD 411, OH-204 at AERE housing colony, Savar, Dhaka.
6) Renovation, repair & maintenance works of IHD Lab Room No. 104, INST at AERE, Savar, Dhaka.
7) Work order for sub-soil investigation of boundary wall construction at AERE, Savar, Dhaka.
8) Repair and maintenance works of damaged various place of floor & wall tiles and bath room fitting etc. of TAFD, AERE, Savar Dhaka.
9) Work order for repair & maintenance works, supply, fitting, fixing and commissioning works of TV Room of officer's hostel at AERE Housing colony, of AERE, Savar, Dhaka.
10) Repairing & maintenance work of various quarter No. C-3/6, D-2/3, E-1/11, E-2/13, E-3/1, E-3/5, E-3/19, E-4/9, E-4/11, E-4/13, F-1/16, F-2/10, F-2/11, F-2/15, F-2/16, F-3/1, F-3/7, OD-308, OH-101, OH-106, OH-212 at AERE housing colony, Savar, Dhaka.
11) Repair and maintenance works of damaged security watch tower (6-Nos) and security shade (4-Nos) surrounding boundary side at AERE, Savar Dhaka.
12) Estimate for repairing & maintenance work of flat No-C-3/5 at AERE housing colony, Savar, Dhaka.
13) Estimate for repairing & maintenance work of staff club at AERE housing colony, Savar, Dhaka.
14) Repairing & maintenance work of damaged internal road front of IFRB at AERE, Savar, Dhaka.
15) Project work: Construction of 7 seven storied "Institute of Tissue Banking and Biomaterial Research" building with seven storied foundations and necessary other related works at AERE, Savar, Dhaka

Central Engineering Workshop Division

The major activities carried out by the Central Engineering Workshop Division during the reporting period are as follows:

1) Rainwater samples collected by the Isotope Hydrology Division, INST, at AERE from seven meteorological stations across the country under the IAEA's GNIP program have been prepared in a specially designed wooden box by the Central Engineering Workshop Division, CEF, for shipment to the IAEA in Vienna, Austria.
2) The MS sheet required for the fabrication of the collimator installed at the tangential beam port of the 3MW TRIGA Mark-II research reactor—used in the research activities of the Neutron Radiography Group, NRCD of INST at AERE—has been drilled and welded by the Central Engineering Workshop, CEF.
3) An ACP Sign-board has been installed in front of the CAD building, which displays the words "Director General's Office" in 3D LED letters in Bengali.
4) A scaffolding ladder has been manufactured and supplied for the works of Electrical Division, CEF at AERE.
5) A trolley has been manufactured and supplied for the works of A/C Division, CEF at AERE.
6) A tin shed has been built on the greaser installed on the roof of the VIP Guest House at AERE.
7) Four thin sample preparation cells made of Teflon have been created according to the sample for the research needs of the Tandem Accelerator Facilities Division, INST at AERE.
8) Three steel boxes have been made according to specific dimensions to provide radiation to the samples for the research work of the NRCD Division, INST at AERE.
9) The number of 15 A/C change over switch boxes of the RIC Division, IE at AERE's, plain sheets have been fitted at the back of the boxes and necessary holes have been drilled to specific dimensions to provide connectors and A/C supply.
10) Repaired the aluminium glass door frame of the INST main gate and east gate, INST at AERE.
11) A total of 15 door locks have been repaired or replaced on the doors of various rooms in the AERE Officers' Dormitory, Guest House, and Office Side.
12) At least 19 wooden doors have been repaired or replaced in various rooms such as colony residential buildings, officers' dormitories, employee hostels, hujrakhanas, and various rooms on the office side at AERE.
13) A total of 15 RFL plastic doors (commando/equivalent) have been replaced in various rooms such as colony residential buildings, officers' dormitories, employee hostels, hujrakhanas, and various rooms on the office side at AERE.
14) At least 15 door locks have been replaced in various rooms of AERE's officers' dormitories and AERE office sides at AERE.
15) At least 120 broken window glasses have been replaced in various buildings across ABRE's office and residential colonies.
16) Performed machining, welding, sheet-metal works, carpentry works, etc., as per requisitions from different institutes at AERE.

Air Conditioning Division

Major activities of the Air Conditioning Division are given below:

1) There are 76 Nos new split and window type Air coolers (2 tons 1.5 tons, & 1 ton) have been installed in various institutes of AERE.
2) A total of 216 Nos window and split-type air coolers are routinely serviced at various institutes of AERE.
3) There are 72 Nos window & split type Air coolers have been repaired & maintained in various institutes of AERE.

4) Other refrigeration systems such as cooling incubators, dehumidifiers etc. have been repaired in the laboratories of various institutes of this AERE.
5) As per routine the central air-cooler of the central auditorium of INST is operated once every week.
6) Replaced around 13 Nos blower motors of window & split type Air cooler in different institutes at AERE.
7) Replaced around 7 Nos compressors of window & split type Air cooler in different institutes at AERE.
8) Replaced around 17 Nos magnetic contactors of window & split type Air cooler in different institutes at AERE.
9) Replaced around 8 Nos indoor and outdoor circuit of window & split type Air cooler in different institutes at AERE.
10) Replaced around 21 Nos capacitors of window & split type Air cooler in different institutes at AERE.
11) Replaced around 15 Nos overload, relay of window & split type Air cooler in different institutes at AERE.
12) There are 2 Nos chillers have been repaired & maintained of IFRB & INMP institutes of AERE
13) Capacitor fittings and gas have been charged in windows and split type air coolers at various institutes of AERE.
14) Overhauling, repairing, servicing, testing and commissioning of central air conditioning Centre has been done at INST Auditorium, AERE.
15) A total of 16 Nos windows and split-type air coolers and refrigerators have been charged gas in R-22, R-410A, R-12 in all institute at AERE.
16) There are 7 Nos refrigerators have been repaired & maintained in various institutes of AERE.

IV. INTERNATIONAL AFFAIRS DIVISION (IAD), BAEC HQ

Introduction

International Affairs Division (IAD), Bangladesh Atomic Energy Commission (BAEC), has been maintaining assigned liaisons regularly with the international organizations and foreign countries since its inception. The liaison are bordered normally to the nuclear technology transfer, modernization of nuclear instrumentation, establishing nuclear power plants and development of human resources for the peaceful applications of nuclear science and technology in the country. Under the supervision of BAEC, IAD directly communicates with international organizations to get international projects and simultaneously monitors the progress of the projects under implementation. In order to strengthen the overall nuclear capability of the country, this division makes liaison for foreign trainings, fellowships and scientific visits for scientists, engineers, doctors, geologists, technicians as well as for administration personnel. In the financial year 2024-2025, IAD has processed nominations of approximately 236 participants for various international programmes in different countries. IAD also works to arrange expert missions, international meetings, trainings, workshops, seminars, etc. in BAEC as well as in the country. IAD plays an important role to execute bilateral and multilateral agreements with foreign countries for the enhancement of R&D (Research and Development) activities in the country. Moreover, to fulfill the international obligations related to nuclear safeguards and non-proliferation of nuclear weapons, IAD has also been in constant communication with the International Atomic Energy Agency (IAEA), United Nations Organization (UNO), etc. since the inception of BAEC. A brief description of the activities of IAD during the period of "July, 2024 – June, 2025" is presented below.

1. Activities

1.1 Technology Transfer

BAEC has been receiving technical assistances mainly from IAEA through Technical Cooperation (TC) Projects, Regional Cooperation Agreement (RCA) and Regional Cooperation Non-Agreement (Non-RCA) Projects, Coordinated Research Projects (CRP) and other special projects of IAEA. As the assigned liaison point of IAEA, IAD is liable to monitor the progresses and outputs of these projects, the reports and to submit the reports to the IAEA, to arrange expert visits, scientific visits, trainings and fellowships for the scientists

involved with these projects. IAD also helps the project counterparts to organize training courses, seminars, meetings, etc. in the country.

1.1.1 Technical Cooperation (TC) Projects

In the current TC cycle, there are 06 (six) TC projects under implementation. IAD is working for the successful implementation for these ongoing TC projects as well as simultaneously giving efforts to obtain new TC projects in different priority areas of development perspective of the country and hence to achieve the targets of SDGs. The TC projects are covering different thematic areas of IAEA including Nuclear Power, Nuclear Agriculture, Human Health, Environment and Water Resurces Education and training for Nuclear Power and non Power applications etc.

1.1.2 Regional Cooperative Agreement (RCA) Projects

RCA is an intergovernmental agreement among IAEA Member States in Asia and the Pacific region. Supported by IAEA, the projects developed and implemented by the countries of this region are commonly known as RCA projects. Such projects are involved in research & development and training activities in the related fields of nuclear science and technology through sharing of regional resources including facilities, equipment and expertise as well as exchange of knowledge. IAD performed liaison for 14 (fourteen) RCA projects covering different fields namely; Agriculture, Human Health, Industry, Environmental Protection and Water Resources.

1.1.3 Non-RCA Projects

The Non-RCA Projects are based on Asian Region supported by IAEA Technical Cooperation (TC) programme. In these projects, countries from Middle East are also involved along with the 22 (twenty two) RCA countries. In the reported year, IAD made liaison for 21 (twenty one) Non-RCA projects covering Nuclear Power Planning, Sustainability of Nuclear Institute, Nuclear Capacity Enhancement, Strengthening Radioactive Waste Management and Radioactive Exposure Control, Irradiation, Physical Protection, Strengthening Health Support, etc.

1.1.4 Coordinated Research Projects (CRPs)

Bangladesh avails IAEA research supports through the Coordinated Research Projects (CRPs) as well. Such research activities are normally run by the research institutes of both the developing and developed countries that are member of IAEA and working on the same research area of interest. For CRPs, IAEA funds a portion of the project's cost. IAD worked as a liaison body for a number of 20 (twenty) CRP projects covering the research area of Food and Agriculture, Human Health, Physical and Biological Sciences, Nuclear Installation Safety, Nuclear Fuel Cycle, Nuclear Security Culture and Waste Technology. In addition to BAEC, research institutes and Universities of Bangladesh such as ICDDRB, Dhaka University, Bangladesh Agricultural University (BAU), Radiation Oncology Department, Hospitals Centre for Woman and Child Health are involved with the CRPs.

1.2 Projects of the Forum for Nuclear Cooperation in Asia (FNCA)

IAD is the focal point to implement the FNCA projects. The framework of this forum specified to various vital nuclear fields such as: utilization of research reactors, utilization of radioisotopes in agriculture, application of radioisotopes and radiation for medical use, public information of nuclear energy and radiation safety and radioactive waste management, safety culture of nuclear energy, human resources development. The present members of this forum are Japan, Mongolia, Kazakistan, Australia, Bangladesh, China, Indonesia, Republic of Korea, Malaysia, Philippines, Thailand and Viet Nam. In the financial year 2024-2025, IAD Continued liaison for a number of 07 (seven) FNCA projects.

1.3 Exchange of Experience and Expertise

Under the Exchange Programs of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and Nuclear Safety Research Association (NSRA) of Japan, nuclear researchers from neighboring Asian countries are invited to Japan and Japanese experts are dispatched to other countries. As the focal point of this program, IAD provides support and processes necessary documents in favor of the selected scientists, engineers, doctors and technicians of BAEC. Both of these exchange programs are heplful to gather state-of-the-art technical knowledge and to perform high-level research work in Japan for contributing to build up and strengthening the nuclear base and nuclear safety culture in BAEC.

1.4 Instructor Training Courses (ITCs) and Advance Instructor Training Courses (AITCs)

Japan also provides support in developing Instructors (trainer) in different fields of nuclear science and technology. Under Instructor Training Course, the scientists from BAEC get opportunity to be trained up as an Instructor in Japan. Upon completion of the training course in Japan they work as an Instructor to train up scientists and contribute to the development of human resources in the respective fields back in Bangladesh. Japan also conducts AITCs for personnel previously trained up as Instructors. During the reporting period, about 04 (four) participants have completed ITCs and AITCs in Japan.

1.5 Database of Foreign Visitors

From July 2008, IAD has been maintaining database for the foreign visits of employees of BAEC. This includes various conferences, meetings, trainings, workshops organized by TC, RCA, Non-RCA, FNCA, Asia Nuclear Safety Network (ANSN), etc. Officials from BAEC, MoST and other organizations have attended conferences, meetings, workshops and availed significant number of trainings and fellowships in the reported period under TC, RCA, FNCA etc. projects.

V. NUCLEAR POWER AND ENERGY DIVISION (NPED), BAEC HQ

Objective

Nuclear Power and Energy Division (NPED) is one of the most important divisions of the Bangladesh Atomic Energy Commission. Since the very beginning of this division, it has been working on research and development for the implementation of the nuclear power program in Bangladesh through developing nuclear infrastructure and human resources. NPED is playing an important role in the assessment of the primary energy mix, and the assessing the possibility of implementing nuclear power projects in Bangladesh.

1. R&D Work(s)

1.1 Comparative Analysis on Fuel Types of SMRs in Operation and in Construction Stage

Shams Zinat Tasnim, Muhammed Mufazzal Hossen, Mahmud Hossain

Abstract: Small Modular Reactors (SMRs) are emerging as a promising technology in the global nuclear energy market. These innovative reactors offer several advantages over traditional large-scale nuclear power plants, including enhanced safety, flexibility, and economic efficiency. One crucial aspect of SMR technology is the diversity of fuel types employed. This study provides a comparative analysis of fuel types employed in Small Modular Reactors worldwide through a comprehensive review. The detailed information may be limited for certain reactors, general data on fuel types, including enrichment levels and fuel cycle characteristics, is presented in this study. The paper highlights the diverse range of fuel technologies utilized in SMRs, such as traditional uranium oxide fuel and innovative fuel designs like TRISO-coated particle fuel. Though, traditional uranium oxide fuel, a well-established choice for nuclear reactors, remains a popular option for many SMR designs. The primary focus is on SMRs that are either operational or under construction for commercial power generation. A comparative analysis of different fuel types reveals a diverse spectrum of advantages and challenges associated with each option. The choice of fuel type for SMRs is a critical decision with far-reaching implications. By understanding the advantages and challenges associated with different fuel technologies, policymakers, industry stakeholders, and researchers can make informed decisions to optimize the development and deployment of SMRs. As SMR technology continues to evolve, it is essential to explore innovative fuel solutions that can enhance safety, sustainability, and economic viability.

1.2 Transfer Factors of Naturally Occurring Radionuclides from Soil-to-rice Cultivated in Bangladesh and Associated Health Implications

Shahadat Hossain, Shikha Pervin, Laisee Lubna, Shanjib Karmaker, Selina Yeasmin, Mayeen Uddin Khandaker

This study investigates the uptake of naturally occurring radionuclides (^{226}Ra, ^{232}Th, and ^{40}K) from soil by rice plants in extensively cultivated regions in Bangladesh. It also evaluates the potential radiation risks associated with rice consumption by the Bangladeshi populace. High purity germanium (HPGe) gamma-ray spectrometry was employed to measure the concentrations of radionuclides in both soil and rice samples. For ^{40}K, our results agree with the International Atomic Energy Agency's (IAEA) published value; however, the

transfer factors (TF) for the other two radionuclides differ considerably. Despite the fact that the IAEA based its publication of TFs for ^{226}Ra and ^{232}Th on clay soil, the majority of the soil profile in the present study was silty clay with a little alkalinity. Moreover, the data obtained may have been impacted by the growing seasons, cultivation methods, and soil fertility. Additionally, the annual effective dose due to the ingestion of radioactivity resulting from rice consumption was evaluated and the results agree with UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation), 2000. With a few exceptions, the excess lifetime cancer risk (ELCR) values for ^{226}Ra, ^{232}Th, and ^{40}K were below the globally average permissible level (1×10^{-3}). In light of this, the current study indicates that consuming rice does not pose an immediate health risk to the general public. By studying TFs among various rice varieties and geographical areas, scientists can develop models to forecast the possible radiation exposure from rice consumption and pinpoint activities or areas that require additional attention.

1.3 Developing an Integrated Model of Resilience and System Dynamics for NPP Accident

Muhammed Mufazzal Hossen

The main objectives of this study are to analyze the Fukushima Daiichi nuclear power plant (FDNPP) accident from the perspectives of resilience and system dynamics approaches, and to develop an integrated model using these approaches during an NPP accident. The FDNPP accident highlights the role of resilience and system dynamics in maintaining the safety of nuclear power plants (NPP). A brief literature review is conducted regarding the FDNPP accident, and an integrated model of resilience and system dynamics (IMRSD) for an NPP accident is proposed. This IMRSD is developed based on four key elements of resilience: anticipating, monitoring, responding, and learning. These elements are influenced by thirteen factors. The identified factors in the proposed model are requisite imagination regarding expected initiating event, the organizational safety culture, the proper human resource with adequate training, the requisite interpretation regarding the progress of the event, the monitoring procedures during the accident, the proper support from the human resources, the proper system to notice the developments of the accident, the adequate resources, the responding procedures, the availability of flexibility of responses, the trained personnel for emergency responses, experiences from the past events and responses, proper modeling of accident and analyzing natural hazard. Responding is found as the most vital element for effective resilience in the event of an NPP accident. Decision-makers of operating management at an NPP can consider the identified factors and how they interact with various elements to ensure the safety of NPPs.

2. Manpower Development (Training/Fellowship/ orkshop/Meeting)

2.1 Attend in Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Technical Meeting of the Analysis Support for Enhanced Nuclear Energy Sustainability Pilot Study "Sustainable Deployment Scenarios for Small Modular Reactors" (ASENES SMR)	23-27 September, 2024	Virtual	01
2.	FNCA Online Seminar on Next-Generation Reactors	October 28, 2024	Virtual	01
3.	Technical Meeting on Decision Making for Sustaining Operational Excellence in Nuclear Power Plant Operating Organizations	05-08, November, 2024	Austria, Vienna	01
4.	Joint ICTP-IAEA School of Nuclear and Radiological Leadership for Safety	11-22 November, 2024	Trieste, Italy	01
5.	Consultancy Meeting to Review Reports of ASENES SMR Case Studies	22-24 April, 2025	Virtual	01

3. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Shams Zinat Tasnim	Comparative Analysis on Fuel Types of SMRs in Operation and in Construction Stage	International Conference on Electronics and Informatics 2024(ICEI2024)	Bangladesh Electronics and Informatics Society	28-29 December, 2024	Atomic Energy Centre, Dhaka
Mahmud Hossain	Current National Status on NPP in Bangladesh	FY2024 Steering Committee Meeting Between BAEC and JAEA	BAEC and JAEA	04 March, 2025	Virtual

4. Project Work (ADP/FNCA /RCA/TC/CRP/ S&T etc.)

ADP project on 'Establishment of Offsite Water Intake Facility for Roopppur Nuclear Power Plant', 01.07.2023-30.06.2026.

VI. CONSTRUCTION OF ROOPPUR NUCLEAR POWER PLANT PROJECT (CRNPP)

Roopppur Nuclear Power Plant (Roopppur NPP) is the first nuclear power plant of Bangladesh, currently under construction following the guidelines the IAEA and complying the regulatory requirement and terms and conditions of license issued by Bangladesh Atomic Energy Regulatory Authority. The Roopppur NPP contains two units with the capacity of 1.2GW each. The Plant is located on the bank of Padma in Pabna district of Bangladesh. Bangladesh is building Roopppur NPP under Ministry & Science and Technology with financial and technical support from the Russian Federation. With the commissioning of Roopppur NPP Bangladesh will become the third country in South Asia to have nuclear power. Nuclear power plant (NPP) generates low-cost electricity and meet modern society's demand for dependable and affordable electricity. The implementation of Roopppur NPP project with a total capacity of 2,400 MW is extremely important for the development of our country, as our goal is to turn on the lights in every Bangladeshi home, to achieve SDGs and development objectives of the nation. It will help in ensuring energy security and achieving energy independence of the nation.

1. Manpower Development

1.1 Attend in Training/Fellowship/Workshop/Meeting (Training in Russian Federation)

Sl. no.	Title of the program/ name of the group	Date	Place	Number of participants
1.	APCS and EE Service (I & C Shop)	12 August 2024- 4 February 2025	Russian Federation	8
2.	Technical Diagnostic Department)	13 August 2024- 17 December 2024	Russian Federation	7
3.	Production and Technical Department (PTD)	23 November 2024- 6 July 2025	Russian Federation	8
4.	Turbine Shop	23 November 2024- 20 July 2025	Russian Federation	8
5.	Common Plant Repair Shop	24 November 2024- 6 April 2025	Russian Federation	7
6.	Metal Non-Destructive Testing and Technical Inspection	30 November 2024- 22 June 2025	Russian Federation	2
7.	APCS and EE Service (Metrology Department)	14 December 2024- 21 February 2025	Russian Federation	5
8.	Support System shop	14 December 2024- 13 July 31, 2025	Russian Federation	13

Sl. no.	Title of the program/ name of the group	Date	Place	Number of participants
9.	Training Division	14 April 2025– 22 May 2026	Russian Federation	1
10.	Training Division	14 April 2025– 30 December 2025	Russian Federation	1
11.	Training Division	14 April 2025– 30 December 2025	Russian Federation	1
12.	Training Division	14 April 2025– 25 March 2026	Russian Federation	1
13.	Training Division	14 April 2025– 25 March 2026	Russian Federation	1
14.	Metrology department	14 April 2025- 17 June 2023	Russian Federation	4
15.	Radiation Safety Department	14th April 2025- 12 November 2025	Russian Federation	9
16.	NDT	30 August 2024- 27 September 2024	Russian Federation	15
17.	I & C	6 July 2024 – 18 September 2024	Russian Federation	1
18.	Metal Non-Destructive Testing and Technical Inspection (Recertification)	3 February 2025–28 February 2025	Russian Federation	1
19.	Metal Non-Destructive Testing and Technical Inspection (Recertification)	3 February 2025–28 February 2025	Russian Federation	1
20.	Metal Non-Destructive Testing and Technical Inspection (Recertification)	17 February 2025-28 February, 2025	Russian Federation	1
21.	Metal Non-Destructive Testing and Technical Inspection (Recertification)	3 February 2025- 28 February 2025	Russian Federation	1
22.	Metal Non-Destructive Testing and Technical Inspection (Recertification)	3 February 2025- 28 February 2025	Russian Federation	1
23.	Metal Non-Destructive Testing and Technical Inspection (Recertification)	3 February 2025- 28 February 2025	Russian Federation	1

2. Organize Training/Fellowship/Workshop/Meeting

Sl. no.	Title of the program	Date	Place	Number of participants
1.	Classroom Basic Course for VVER-type NPP	12-25 January 2025	Rooppur NPP Training center	141
2.	Regulatory Framework	26-30 January 2025	Rooppur NPP Training center	130
3.	Administrative issues of operation	2- 6 February	Rooppur NPP Training center	141
4.	Mechanics for Common plant repair shop personnel	9 February- 6 March, 2025	Rooppur NPP Training center	41
5.	Practical Training Program	9 -13 March 2025	Rooppur NPP Training center	11
6.	Electrical Shop Systems and Equipment		Rooppur NPP Training center	41
7.	Maintenance and Repair		Rooppur NPP Training center	45
8.	On-the-Job Training	16 March- 3 April 2025	Rooppur NPP Training center	44
9.	IT & Telecommunication	10-11 Dec'23	Rooppur NPP Training center	11

3. Oral/Poster Presentation in Seminar/Symposium/Conference

Name of the participant	Title of oral/poster presentation	Title of the event	Organizer	Date	Place
Fariha Anjum Noman Khasru		Nuclear Safety Assessment for Nuclear Power Plants	IAEA	9th May-20thFebruary 2025	Cairo, Egypt
SK Sayad Bin Bashir	Preparedness of Rooppur NPP to face the Pre-OSART mission.	Technical Meeting on Identifying good practices and improvement opportunities for the Operational Safety Review Team (OSART) Missions to Nuclear Power Plants.	IAEA	18th -20th February 2025	Vienna Austria
Md. Abdul Mottaleb	Current National Plan and Progress of Rooppur NPP	Training Course on Nuclear Energy Officials	JAEA	2nd -20th December, 2024	Wakasa Wan Energy Research Center, Fukui, Japan
MS Mahmud Arafat		Thirteen Meeting of the working Group on Radioactive Material Security	IAEA	12th May-16th May 2025	Vienna, Austria

VII. NUCLEAR SAFETY, SECURITY AND SAFEGUARDS DIVISION (NSSSD), BAEC HQ

Objective

- To fulfill the obligations under International Treaties, Agreements, Protocols and Conventions related to Nuclear Safety and Radiological Emergencies including Safeguards and Physical Protection of nuclear and radioactive material Facilities in the BAEC.
- To maintain safeguards procedures including the State Systems of Accounting for and Control of Nuclear Material (SSAC). and Nuclear Material Accountancy & Control (NMAC)
- To ensure the physical protection of nuclear material and radioactive sources and associated installations of BAEC.

On behalf of BAEC, this Division has been acting as the focal point of different well-known strategic partner namely International Atomic Energy Agency (IAEA), U.S. Department of Energy (U.S. DOE), Japan Atomic Energy Agency (JAEA), Forum for Nuclear Cooperation in Asia (FNCA) and Asia-Pacific Safeguards Network (APSN) for the issues of nuclear safeguards, safety, security and physical protection of radioactive materials and associated facilities.

Programme(s)

1. R&D Work(s)

NSSSD works as a scientific administration of the Commission in the areas of nuclear safety, security and safeguards. The primary function of the Division is to assists the Commission to undertake policy prepare policy documents, maintain communication with national and international parties and conduct collaborative activities (national/international) with a view to ensuring and continuous improvements of nuclear safety, security and safeguards in the nuclear/radiation facilities owned and operated by the BAEC.

VIII. PLANNING AND DEVELOPMENT DIVISION (PDD), BAEC HQ

Introduction

Planning and Development Division of Bangladesh Atomic Energy Commission is entrusted with the responsibility of devising and processing development project plans for institutional advancement. Since its formation, the division has been the harbinger for achieving the far-reaching goals of achieving excellence in the nuclear science and technology sector of the country through the assessment, review, refinement, processing and submission of research and development project proposals of BAEC. PDD's paramount objective is to provide assistance in preparation, implementation and monitoring of development projects. In addition to that, PDD plays pivotal role in facilitating development of skilled human resources in the science and technology sector. Apart from that, qualitative change in commission's activities is also intertwined in PDD's dominant objective. PDD frequently organizes trainings, workshops and seminars on E-Governance and 4th IR to accelerate people's access to services offered by BAEC and to promote scientists in innovation.

Activities

Planning and Development Division undertakes programs which comprises assessment, review, refinement, and processing of development projects aimed at Annual Development Program (ADP) and special allocation projects. In addition to that, PDD conducts administrative measures to forward Research and Development projects (R&D) and Science & Technology(S&T) projects to the line ministry. PDD also plays the role of superintendence and monitoring of R&D and S&T projects as per line ministry's directive. Incoherence with the programs PDD frequently arranges different ADP project implementation committee meetings and assists organizing steering committee meeting.

The total RADP allocation of the year 2024-2025 for implementation of ongoing projects of BAEC was Tk. 1004986.00 Lakh. Out of this granted allocation, Tk. 758765.41 Lakh had been spent up to 30 June 2025 making an implementation rate of 75.59%. The entire picture on the advancement of all the development projects currently under implementation is depicted in the following table.

1. Advancement of the Development Project of BAEC under RADP

(Taka in lakh)

Sl. no.	Name of the project, project implementation period	Estimated cost total (F.E)	Cumulative expenditure up to, June 2025 (F.E)	Revised allocation for the year 2024-2025 (F.E)	Expenditure during 1st Jul 2024 to 30th June 2025	% Of expenditure against allocation up to 30th June 2025	Achievement of the projects
1	2	3	4	5	7	9	10
	On-Going Projects:						
1.	Construction of Rooppur Nuclear Power Plant (Apr. 2016 - Dec. 2025)	11309291.27 1016000.00	8201654.68 5795975.54	945400.00 909291.00	703552.92 670676.15	74.41% 73.76%	Ongoing
2.	Establishment of Cyclotron & PET-CT at Institute of Nuclear Medicine & Allied Sciences (INMAS) Mymensingh & Chattogram and Cyclotron facilities at Institute of Nuclear Medical Physics (INMP), Savar, (July, 2018 - Jun. 2025)	77447.00 33923.00	63455.62 10647.31	25000.00 15210.00	12820.00 14741.87	97.93% 96.92%	Ongoing
3.	Balancing, Modernization, Refurbishment and Extension (BMRE) of Safety Systems of the 3 MW TRIGA Mark-II Research Reactor Facility at AERE, Savar, Dhaka. (July 2018 - June 2024)	9954.66 4180.14	9823.07 5031.00	1739.00 1040.00	1666.79 1040.00	95.85% 100%	Ongoing
4.	Strengthening of existing gamma source of Bangladesh Atomic Energy Commission. (January 2021-Jun 2024)	6336.00 4391.00	6029.12 5365.17	1506.00 1393.00	1196.07 1084.07	79.47% 77.82%	Ongoing

Sl. no.	Name of the project, project implementation period	Estimated cost total (F.E)	Cumulative expenditure up to, June 2025 (F.E)	Revised allocation for the year 2024-2025 (F.E)	Expenditure during 1st Jul 2024 to 30th June 2025	% Of expenditure against allocation up to 30th June 2025	Achievement of the projects
1	2	3	4	5	7	9	10
5.	Modernization and Strengthening of Services and Research Facilities of the Institute of Tissue Banking and Biomaterial Research (July 2021 – June 2025)	17380.14 1995.00	6183.82 0.00	3583.00 0.00	3522.83 0.00	98.32%	Ongoing
6.	Modernization of Laboratories and Enhancement of Service Capacity of 3 Divisions (Chemistry Division, Health Physics Division, Experimental Physics Division) of Atomic Energy Centre, Dhaka. (July 2021 – June 2024)	5093.00 3912.00	4929.70 4556.14	1990.00 1712.00	1898.79 1705.43	100% 99.61%	Ongoing
7.	Enhance Capacity of Institute of Nuclear Medicine and allied Sciences (INMAS) INMAS Mitford, Cumilla, Faridpur, Barishal and Bogura. (July 2022-Jun 2025)	23781.00 14400.00	20928.57 16897.15	7710.00.00 3565.00	6969.89 3565.00	90.40% 100%	Ongoing
8.	Establishment of Institute of Nanotechnology (January 2023 - December 2026)	38078.24 18737.00	206.34 0.00	2371.00 0.00	51.21 0.00	99.90%	Ongoing
9.	Establishment of Genome Sequencing Facilities at NINMAS, Dhaka and INMAS, Chittagong. (January 2023 - December 2025)	4711.00 3660.00	455.14 0.00	1823.00 1275.00	307.99 0.00	16.89%	Ongoing
10.	Establishment of offsite water Intake Facility for Rooppur Nuclear Power Plant. (July 2023-June-2025)	24177.00 0.00	15548.30	15024.00 0.00	150004.30 0.00	99.93%	Ongoing
	Total	11516249.31 1101198.14	8329214 5838472	1004986.00 933486.00	758765.41 692812.52	75.67% 74.21	

2. New Selected GOB Funded (Unapproved) Annual Development Projects (ADPs) of BAEC for the Fiscal Year 2024-25:

Sl no.	Project's name and period	Status of approval	Estimated cost (in lac taka)	Status of budget allocation	Opinion
1.	Establishment of Institute of Nuclear Medicine and Allied Sciences (INMAS) at 5 Medical College Hospital Campuses in the Country. Project Period: January 2023 - June 2028	In process of approval	69702.00 23295.00	0.00	Selected as GOB Funded (Unapproved) in RADP of FY 2024-25 and in the process of approval.
2.	Establishment of National Nuclear and Radiological Management Centre. Project Period: July 2024 - June 2027	In process of approval	36245.07 17533.61	0.00	Selected as GOB Funded (Unapproved) in RADP of FY 2024-25 and in the process of approval.

Sl no.	Project's name and period	Status of approval	Estimated cost (in lac taka)	Status of budget allocation	Opinion
3.	Establishment of Cyclotron & PET-CT Facilities in INMAS Khulna, Rajshahi, and Rangpur and Strengthening the Cyclotron & Molecular Imaging Facilities of National Institute of Nuclear Medicine and Allied Sciences (NINMAS). Project Period: July 2024-Jun 2028	In process of approval	77801.90 47817.00	0.00	Selected as GOB Funded (Unapproved) in RADP of FY 2024-25 and in the process of approval.

3. Manpower Development

3.1 Seminar/Symposium/Conference/Workshop/Meeting Attended

Sl. no.	Name of the participant	Title of the event	Organiser	Date	Place
1.	Dr. Mohammad Anwar-Ul-Azim	Interantional Conference of Hybrid Imaging (IPET 2024)	International Atomic Energy Agency (IAEA)	7-11 October 2024	Austria, Vienna
2.	Dr. Mohammad Anwar-Ul-Azim	28th National Conference of Society of Nuclear Medicine Bangladesh (SNMB)	Society of Nuclear Medicine Bangladesh (SNMB)	07-08 February 2025	Ocean Paradise Hotel & Resort, Cox's Bazar.
3.	Dr. Mohammad Anwar-Ul-Azim	Seminar on Guideline for Development Project Preparation, Processing, Approval & Revision	Ministry of Science & Technology (MOST)	02/06/2025	IFST Auditorium, BCSIR, Dhaka
4.	Dr. Mohammad Anwar-Ul-Azim	Workshop for Stakeholders on e-PMIS software	Digitizing Implementation Monitoring and Public Procurement (DIMAPPP Project, BPPA, IMED, Planning Ministry.	21/10/2024	NEC Auditorium, Planning Commission, Sher-e-Bangla Nagar, Dhaka.
5.	Dr. Mohammad Anwar-Ul-Azim	Daylong training on ADP/RADP Management System	Planning Commission	24/11/2024	Computer Laboratory Nazia Salam Building (building No. 19)

4. Stakeholder Meeting

PDD is responsible for regularly coordinating BAEC projects' PIC meetings. Stakeholders of PDD include project directors and PIC members. The following is a summary of the PIC meetings-related material belonging to fiscal year 2024-25.

Date	Place	Number of projects discussed
29-09-2024	Alpha Conference Hall	2
06-10-2024	Alpha Conference Hall	8
10-12-2024	Alpha Conference Hall	3
18-12-2024	Alpha Conference Hall	7

Date	Place	Number of projects discussed
11-03-2025	Alpha Conference Hall	2
12-03-2025	Alpha Conference Hall	5
17/06/2025	Alpha Conference Hall	10

5. Other Activities

Dr. Mohammad Anwar-Ul-Azim, Principal Scientific officer, Planning & Development Division as actively engaged in the following activities [2]

- Member, Technical Committee of Proprietary Item Confirmation.
- Member, the committee for the quantity and type determination of the kit and medical/scientific equipment for the center/institution, after verifying the demand received from the NINMAS and INMASes of BAEC within the limit of the budget allocation of each financial year.
- Member, "Monitoring Team", "Acceptance Committee" and "Execution Committee" of the ongoing ADP Projects of BAEC.

IX. QUALITY MANAGEMENT DIVISION (QMD), BAEC HQ

In the fiscal year 2024-2025 QMD was mainly involvedin activities in relation to post creation for different Institutionsunder proposed Organization Structure of BAEC. Besides, QMD continued to keep its participation in the implementation activities of RNPP Construction Project. QMD was also involved in some important committees pertaining to CPF, SDGs, High Power Multipurpose Research Reactor, APA, E-Governance & Innovation etc. QMD personnel also executed duties as other different Committee Members.

1. Activities

1.1 Activities Regarding Post Creationfor Different Institutions Under Proposed Organization Structureof BAEC.

Bangladesh Atomic Energy Commission has been playing a vital role in the field of research and development of Nuclear Science and Technology. By promoting nuclear science and technology through peaceful uses of atomic energy BAEC wants to attain self-reliance for overall socio-economic development. Thus, availability/sanctioning of required manpower is very much important for BAEC to achieve its missions like promoting nuclear science and technology based fundamental and applied as well as advanced research programmes in various fields of physical, biological and engineering disciplines; implementing nuclear power programmes; transferring nuclear technology based services to various stake holders; applying nuclear technology in agriculture, industry, health and environment; developing human resources in the area of nuclear science and technology, establishing radiation safety culture, applying nuclear technology in exploration and exploitation of mineral resources etc.

In reality in the past 41 years (after Enam Committee Organization Structure) the volume of work as well as expenditure of BAEC increased manifold as compared to previous ones. This is due to the fact that the number of Research and Service Institutions has increased from 04 to 39, a hopping growth by 35 Institutions. Furthermore, Three more Divisions were formed in the Head Office. Again, Workload of Administration, Establishment, Finance and Accounts has increased equally. But manpower did not increase proportionately with respect to volume of work. So, The Commission decided to propose some new posts for its different Institutions with some restructuring of its Divisions/Sections/Offices etc.

QMD wasactively involved in activities regarding post creation for different institutionsunder proposed Organization Structure of BAEC. Major events include-

- Drafting 60 (sixty) organograms for different institutions (Centres/Institutes/Facilities/Units/Divisions of Head Office etc.) of BAEC.
- Incorporating all individual organograms in 04 (four) major Structures given below:
  a. One for Head Office;

b. One for AERE;
c. One for AECD, AECC, BSMEC and RTML, Mongla and
d. One for NINMAS and INMAS(s).

- Drafting 60 Manpower lists for different institutions that include postwise proposed manpower with existing ones.
- Drafting List of Total Manpower for all posts (existing and proposed).
- Drafting recruitment criteria (for direct recruitment/promotion/assignment) for newly proposed posts.
- Identifying obsolete posts of BAEC.
- Drafting reasonable ladder/pyramid for different posts.
- Collecting Job Descriptions/Responsibilities for new proposed posts.
- Preparing several reports with recommendations regarding proposed Organization Structure of BAEC.

1.2 RNPP Construction Project Related Activities

QMD Scientists performed the following RNPP Construction Project related activities.

- Performed activities as Technical Committee Member for the Evaluation of Construction and Erection Works of Rooppur NPP implementation project.
- Involved in reviewing RNPP related documents.
- Participated in Milestone Achievement associated meetings of RNPP.
- Participated in Equipment Specification related meetings.

1.3 CPF, SDGs, High Power Multipurpose Research Reactor, APA, E-Governance & Innovation Committees Related Activities.

QMD Scientists performed their duties as members of the CPF, SDGs, High Power Multipurpose Research Reactor, APA, E-Governance & Innovation Committees.

2. Manpower Development

2.1 Seminar/Symposium/Conference/Workshop/Meeting Attended

Name of the participant	Title of the event	Organizer	Date	Place
Dr. Md. Quamrul Huda, CSO & Director, QMD	Technical visit to Russian Federation for demonstrating facilities related to the High Power Multipurpose Research Reactor (HPMRR)	Russian Federation	15-26 July, 2024	Russian Federation
Dr. Md. Mustafizur Rahman, CSO	Technical visit to Russian Federation for demonstrating facilities related to the High Power Multipurpose Research Reactor (HPMRR)	Russian Federation	15-20 July, 2024	Russian Federation

3. Other Activities.

QMD personnel delivered duties as members of some other committees.

X. SCIENTIFIC INFORMATION DIVISION (SID), BAEC HQ

The Scientific Information Division (SID) of the Bangladesh Atomic Energy Commission (BAEC) functions as the central hub for information management, communication, and knowledge dissemination. It ensures that BAEC's scientific research and development efforts are well-supported with accurate information, while also strengthening communication with government bodies, policymakers, researchers, media, and the public. SID is dedicated to building a Smart Integrated Information Management System to improve the sharing of knowledge and organizational data with all relevant stakeholders.

1. Major Roles and Responsibilities

- **Information and Documentation**
  - Collecting, archiving, and distributing scientific and technical information across various branches of science.
- **Public Communication and Media Relations**
  - Acting as BAEC's communication channel with the public and media to promote transparency and build public confidence.
- **Promotion of Nuclear Science and Technology**
  - Prepare informative materials and actively participate in science and technology fairs and events to promote nuclear science and technology in Bangladesh.
- **Publication Services**
  - Publishing *Nuclear Science and Applications (NSA) Journal*, Annual Reports, Brochures, Newsletters, BAEC Diary, Telephone Directory, and Service Profile Book.
- **Performance Agreement Management**
  - Coordinating the Annual Performance Agreement (APA) between BAEC and the Ministry of Science and Technology (MoST), along with agreements with BAEC's institutes, centers, and units.
- **Press and Publicity**
  - Preparing press releases, newspaper clippings, and publicity coverage of BAEC's training programs, workshops, events, and services.
- **Government Liaison**
  - Drafting reports and providing information to the National Assembly, MoST and other relevant government bodies on BAEC's activities.
- **Facilitating Scientific Participation**
  - Managing the nomination process for BAEC scientists to attend national seminars, symposia, conferences, and workshops.
- **Official Notices and Announcements**
  - Publishing tender notices, notifications, and press releases in daily newspapers.
- **Knowledge Sharing Tools**
  - Designing and printing BAEC's Annual Calendar and other institutional publications.
- **MoU Activities**
  - Assisting in the process, coordination, and record-keeping of Memoranda of Understanding (MoUs) with national and international organizations.
  - Supporting their overall implementation to strengthen collaboration, partnership, and knowledge sharing.
- **Digital Presence**
  - Managing BAEC's official Facebook page and sharing organizational news, updates, and activities.
- **Photographic Services**
  - Providing photographic documentation of BAEC's programs, including processing, printing, and supply.

2. Remarkable Achievement 2024-2025

Description of work	Quantity	Remarks
Publishing BAEC Annual Report 2023-2024	300	Published, distributed and uploaded to the BAEC website *www.baec.gov.bd*
Attending science and other fair to promote nuclear science and technology	2	Successfully participated
Publishing BAEC Diary 2025	1400	Published and distributed

Description of work	Quantity	Remarks
Publishing telephone directory 2025 in Bangla	1000	Published and distributed
Publishing Tender/Advertisement etc. to the newspaper	58	Published in 115 daily newspapers
Newspaper clipping	385	Successfully completed
Prepared and distributed the press release on different program and events conducted by BAEC.	08	Successfully completed
Condolence notices have been prepared and distributed	10	prepared and Successfully distributed
Prepared and provided inputs for Bangladesh Economic Review 2025	2	Successfully completed
Photographic service (processed, printed and supplied)		Distributed to the relevant divisions, organizations, etc.
Processed nominations of BAEC scientists to attend various scientific/technical/workshop/ seminar etc. arranged locally by different academic/professional institutes	456	456 number of participants attended in 19 programs and events
Provide BAEC information for Preparation of Ministry Annual Report	2	Successfully completed
Preparation of annual performance agreement 2024-2025 between BAEC and MOST and Different Inst./Centre/Unit with BAEC	40	Successfully completed
Preparing APA reports of BAEC	12	Successfully completed
Providing input for different bilateral contract/MoU/ international conference/meeting	5	Successfully completed
Preparing and providing opinions on the issues, acts, laws, etc.	6	Successfully completed
Preparing and providing monthly report to MOST	12	Successfully completed
Printing BAEC Annual Calendar 2025	2500	Successfully completed
Uploaded different programmes/video photographs in BAEC facebook upload of BAEC programmes	8	Successfully uploaded
Prepare and publish the BAEC Brochure	1000	Successfully published and distributed

XI. HUMAN RESOURCES DIVISION (HRD), BAEC HQ

The HR division aims to maximize the potential of BAEC's human capital to enhance the organizational performance to achieve its goals to the peaceful uses of atomic energy as well as contributing to the development of a research, innovation and knowledge-based society. The ultimate goal is to plan, develop and manage the human resources of BAEC effectively using approved procedures and tools.

1. Main Activities/Function

- To perform routine activities within the present scope of the HR division
- To formulate/update the organizational structure and scope of the human resources division
- To take initiatives to formulate/update HR policy/procedures, Training Policy/procedures under the guidance of the Commission.
- To monitor and facilitate the higher education and training programme and activities
- To take initiatives for the competency development of the employees of BAEC
- To facilitate scientists of BAEC for pursuing higher study both local and abroad especially MS and PhD from reputed universities.

- To develop or contribute in the preparation of strategic plan or policy documents – CPF (area: human resource development), Perspective Plan, Ministry Reports etc.
- To take initiatives to formulate/revise/update Annual Confidential Report (ACR) forms, resume forms, evaluation procedures/evaluation and promotion policies/procedures under the guidance of the Commission.
- To develop a relevant project proposal for the establishment of a national institute for nuclear education and training under the guidance of the commission
- To perform the activities related to Integrated Digital Service Delivery Platform (IDSDP), Smart Bangladesh, e-governance & innovation
- To perform other duties assigned by the commission

2. Manpower Development

The HR division takes the necessary steps to nominate suitable candidates for various national training programs. These trainings are mostly organized by Regional Public Administration Training Centre (RPATC), National Academy for Planning and Development (NAPD), Bangladesh Institute of Management (BIM), etc.

The government is in the process of making all public services available online so that they are available at the doorsteps of any citizen. Thus, an Integrated Digital Service Delivery Platform (IDSDP) is developed under the Ministry of Science and Technology (MoST).

2.1 Organize Training/Fellowship/Workshop/Meeting etc.

Sl. no.	Participant	Title of the program	Organizer	Date	Place
1.	Focal Point of Blue Economy in BAEC and other expert personnel working in Blue Economy.	Workshop on "Update and Recommendation of Blue Economy work plan executed by BAEC"	Bangladesh Atomic Energy Commission (BAEC)	23 April,2025	Dhaka, Bangladesh

3. Other Activities

- Actively working in Sustainable Development Goals (SDG) Target Implementation Progress
- To enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per **1 million** people, and public and private research and development spending
- Blue Economy Related Exchange Programme
- Information providing for the Economic and Social Commission for Asia and the Pacific (ESCAP) to present in the 81st summit of Regional Cooperation for Resilient and Sustainable Urban Development in Asia and the Pacific
- Report submitted on "Assessment of Science, Technology Innovation Sector in the BIMSTEC Member Countries 2022"
- Actively working on the e-Government Master Plan for Digital Bangladesh.
- Working on the online service activities of BAEC

XII. SCIENTIFIC INFORMATION UNIT, AERE

The main responsibilities of the Scientific Information Unit (SIU) are to furnish documentation of the scientific achievements attained in different Institute/Units of the Atomic Energy Research Establishment (AERE) and to collect and preserve scientific documents to be used primarily by the scientists of AERE conducting research and development (R&D) activities in nuclear science and technology. Another important

involvement of the Unit is to extend required co-operation and coordination in documenting (both electronic and traditional) seminars/symposiums/workshops etc. held in AERE. In the domain of public relation, the Unit gets involved in attending the official delegates both from home and abroad, and visitors to AERE. The activities/involvements of SIU during the reporting period are as follows:

Activities

- Publication of AERE Technical Report: The major documentation activity within the reporting period involves publication of the AERE Technical Report, vol. 29 by the SIU. The report covers the activities and achievements of AERE in 2023. The Unit has published a number of internal reports of different institutes/units of AERE.
- Acquisition of Books and Journals: In the period under report, the Unit collected 2 (two)books of different titles to be used by the scientists/researchers of AERE.
- Co-operation in Seminars/Symposium/Workshop held in AERE: The Unit extended technical co-operation (photography) in documenting seminars/symposium/workshops held in AERE.
- Attendance to Delegates/Visitors: During the period under report the Unit hosted as many as 13groups of delegates and visitors (comprising 473 visitors) from both home and abroad to AERE.
- E-journal Service: This Unit has been serving e-journal with the help of HINARI/AGORA/OARE since 2008. Users can download required articles from scientific books and journals from different publishers which are available in the internet.
- Database Service: The Unit provides on-line database & e-catalogue searching facilities.
- Fax Service: Fax services are available at the Unit with the modern fax machine for receiving and sending official documents to and from AERE.
- Current Awareness Service (CAS) and Selective Dissemination of Information (SDI) Service: To inform the scientists and researchers at AERE, where books/journals etc. are listed on the basis of recent collections.
- News Clipping Compilation and Perseveration: News concerning Bangladesh Atomic Energy Commission (BAEC), Rooppur NPP project and nuclear science and technology in general published in daily newspapers are clipped to the Notice Boards of different Institutes/Units of AERE for dissemination and awareness of scientists of AERE.
- Routine Service: The routine service rendered during the period under report includes (i) photography and documentation service in different national day ceremonies/programmes (ii) photographic service to the officials/employees of AERE for official purpose and reprography service etc.

The SIU has always been trying to perform all the assigned duties and responsibilities accordingly and timely and is going smoothly to achieve the target.

XIII. TRAINING INSTITUTE (TI), AERE

The Training Institute (TI) of Bangladesh Atomic Energy Commission (BAEC) is situated in Atomic Energy Research Establishment (AERE) campus, Ganakbari, Ashulia, Savar, Dhaka. It has been built for the Human Resource Development (HRD) for BAEC as well as for the country. The first Nuclear Power Plant (NPP) of Bangladesh is going to be run soon at Rooppur, Pabna. A good number of efficient manpower in different fields will be required in that plant. Besides this, now-a-days different types of radiation sources are being used in different sectors in our country especially for medical, industrial, research and development purposes. Considering all these necessities TI is conducting different kinds of training programs round the year as per the approval of BAEC. Followings are the activities proposed for the fiscal year of 2024-2025:

Sl. no.	Title of the event / training program	Date	No. of participants	Training hours
1.	Workshop on National Integrity Strategy (NIS) of Bangladesh	23 July, 2024	25	4
2.	Training Course on Radiation Protection for Radiation Workers and RCO's of BAEC, Medical Facilities & Industries	18-22 August , 2024	20	20

Sl. no.	Title of the event / training program	Date	No. of participants	Training hours
3.	FTC on Reactor Engineering Course at BAEC	29 Sep - 10 Oct 2024	15	40
4.	FTC on Nuclear and Radiological Emergency Preparedness Course at BAEC	03-14 Nov.2024	20	40
5.	FTC on Environmental Radioactivity Monitoring Course at BAEC	08-12 Dec.2024	15	20
6.	Training Course on Public Procurement Regulation-2008 (PPR-2008)	19-30 Jan, 2025	25	50
7.	In-house training course on general behavior	24-26 Feb 2025	25	12
8.	Basic Nuclear Orientation Course	20 Apr-26 Jun 2025	25	200
		Total	170	386 (H)

How but, due to some circumstances, these training program could not arranged by the training institute.

On the other hand, only one following training activity is performed in the reported period under the category of on-demand training program.

1. Training Programs Conducted for the Human Resource Development

Sl. no.	Title of the event / training program	Date	Place	No. of participants
1.	A Short Training Course on “Nuclear & Radiological Emergency Preparedness" for the fire fighter of RNPP.	25-29 May, 2025	TI, AERE	10
			Total	10

2. Revenue Income

Sl. No.	Source of Income	Income (Tk.)
1.	Course Fee	20,000.00
	Total	20,000.00

XIV. FINANCE AND BUDGET DIVISION (FBD), BAEC HQ

Activities

1. Revenue Budget Allocation, Fund Release and Source of Fund 2024-2025

	Head of accounts	Allocation from Govt.	Received from BAEC own income	Total revenue budget
3631101	Salary Support	9323.00	--	9323.00
3631102	Allowance Support	7137.00	--	7137.00
3631103	Goods and Service Support	3933.80	9345.57	13279.37
3631104	Pension and Retirement Support	5400.00	--	5400.00
3631108	Research Grant	1230.00	--	1230.00
3631109	Primary Healthcare Services Grant	10.00	--	10.00
3631199	Others Grant	128.00	15.00	143.00
Sub- total		27161.80	9360.57	36522.37
3632102	Machineries Grant	452.00	626.00	1078.00
3632104	Building & Structure Construction Grant	--	--	--

	Head of accounts	Allocation from Govt.	Received from BAEC own income	Total revenue budget
3632105	Information and Communication Technology Grant	10.00	64.00	74.00
3632106	Others Capital Grant	40.00	10.00	50.00
Sub- total		502.00	700.00	1202.00
Total		27663.80	10060.57	37724.37

2. Center/ institute wise revenue budget allocation (Taka in lac)

Name of the center/institute	Revenue budget allocation
Bangladesh Atomic Energy Commission, HQ	5048.00
Works Branch	544.37
Atomic Energy Centre, Dhaka	3152.00
Atomic Energy Research Establishment, Saver	9742.00
National Institute Of Nuclear Medicine & Allied Sciences, Shahbag, Dhaka	1916.00
Institute Of Nuclear Medicine & Allied Sciences, Chattogram	471.00
Institute Of Nuclear Medicine & Allied Sciences, Rajshahi	427.00
Institute Of Nuclear Medicine & Allied Sciences, Dinajpur	313.00
Institute Of Nuclear Medicine & Allied Sciences, Sylhet	299.00
Institute Of Nuclear Medicine & Allied Sciences, Dhaka	812.00
Institute Of Nuclear Medicine & Allied Sciences, Barishal	356.00
Institute Of Nuclear Medicine & Allied Sciences, Khulna	367.00
Institute Of Nuclear Medicine & Allied Sciences, Rangpur	454.00
Institute Of Nuclear Medicine & Allied Sciences, Mymensingh	591.00
Institute Of Nuclear Medicine & Allied Sciences, Bogura	390.00
Institute Of Nuclear Medicine & Allied Sciences, Cumilla	292.00
Institute Of Nuclear Medicine & Allied Sciences, Faridpur	276.00
Institute Of Nuclear Medicine & Allied Sciences, Mitford	333.00
Institute Of Nuclear Medicine & Allied Sciences, Suhrawardy	303.00
Institute Of Nuclear Medicine & Allied Sciences, Mohakhali	237.00
Institute Of Nuclear Medicine & Allied Sciences, Pabna	211.00
Institute Of Nuclear Medicine & Allied Sciences, Kushtia	194.00
Institute Of Nuclear Medicine & Allied Sciences, Jashore	196.00
Institute Of Nuclear Medicine & Allied Sciences, Cox’s Bazar	216.00
Institute Of Nuclear Medicine & Allied Sciences, Gopalganj	193.00
Institute Of Nuclear Medicine & Allied Sciences, Satkhira	194.00
Atomic Energy Centre, Chattogram	346.00
Beach Sand Minerals Exploitation Centre, Cox’s Bazar	160.00
Rooppur Nuclear Power Plant, Pabna	144.00
Radioactivity Testing And Monitoring Laboratory, Mongla, Bagerhat	97.00
Bangladesh Atomic Energy Commission (Foreign Exchange Branch)	4050.00
Bangladesh Atomic Energy Commission (Pension Branch)	5400.00
Total=	37724.37

XV. SUPERVISION OF THESIS

ATOMIC ENERGY CENTRE (AEC), DHAKA

Chemistry Division, AECD

1. Joint Supervision: Dr. S. B. Quraishi, "Exploration of Toxic Metal Content and the Environmental Health Challenges Associated with the Decomposition of Ready-To-Eat Food Packaging Materials in Dhaka, Bangladesh", M.Sc. Thesis (Nipa Akter), Department of Chemistry, Bodrunnessa College, Dhaka University Affiliated, January 2025.
2. Joint Supervision: Dr. S. B. Quraishi, "Assessing the Impact of Toxic Metals on Human Health: An Examination of Migration from Ready-to-Eat Food Packaging Materials in Dhaka, Bangladesh",M.Sc. Thesis (Tanjila Ara Mou), Department of Chemistry, Bodrunnessa College, Dhaka University Affiliated, January 2025.
3. Joint Supervision: Dr. Yeasmin Nahar Jolly, "Assessment of heavy metal concentration in sediment, water and fish samples in Payra River." B.Sc. Thesis (Md. AlomgirHossen), Department of Fisheries, Patuakhali Sciences and Technology University (PSTU),September, 2024.
4. Joint Supervision: Dr. YeasminNahar Jolly, "Comparative analysis of seaweeds, reared with oysters in captive environment." M.S. Thesis (Sadia Afrin), Department of Aquaculture, Chattogram Veterinary and Animal Sciences University (CVASU),, 2025.
5. Joint Supervision: Dr. YeasminNahar Jolly, "Heavy metal contamination gradient along anthropogenic activities on the coastline of Bangladesh." M.Sc. Thesis (Md. TarequeBhuiyan), Department of Fisheries & Marine Science, Noakhali Science and Technology University, December, 2024.
6. Joint supervisor: Dr. M. S. Rahman, "Pollution and Health Risk Assessment of Heavy Metals in Roadside Residential Dust with Height Variation in Dhaka City, Bangladesh," M.Sc. Thesis (Maria Haider), Department of Public Health and Informatics, Jahangirnagar University, June 2024.
7. Joint supervisor: Dr. M. S. Rahman, "Assessment of Surface Water Quality and Heavy Metal Contamination in Meherpur District, Bangladesh," M.Sc. Thesis (S.M. Samrat), Department of Environmental Sciences, Jahangirnagar University, 2025.
8. Joint supervisor: Dr. M. S. Rahman, "Evaluation of Groundwater Quality and Pollution Sources Distribution in JashoreSadar Using Multivariate Statistical Analysis," M.Sc. Thesis (Mahmud Hasan Prince), Department of Emergency Management, Faculty of Environmental Science and Disaster Management, Patuakhali Science and Technology University, 2025.
9. Joint supervisor: Dr. M. S. Rahman, "Ecological and Human Health Risks of Heavy Metals in Bagerhat Shrimp Aquaculture: A Multivariate Approach," M.Sc. Thesis (M. S. A. Emon), Department of Environmental Science and Disaster Management, Gopalganj Science and Technology University, Gopalganj-8100, 2025.
10. Joint supervisor: Dr. M. S. Rahman,"Elemental Analysis and Potential Health Risk of Indoor Dust in the Vicinity of Barapukuria Coal Mine, Bangladesh," M.Sc. Thesis (R. Tabassum), Department of Environmental Sciences and Disaster Management, Noakhali Science and Technology University, June 2024.
11. Joint supervisor: Dr. M. S. Rahman,"Heavy Metal Pollution and Risk Assessment in Water and Sediment of a Transboundary Aquatic System: Kalindi Canal and Titas River, Bangladesh," M.Sc. Thesis (Z. S. Teasa), Department of Environmental Sciences and Disaster Management, Noakhali Science and Technology University, June 2024.
12. Joint supervisor: Dr. M. S. Rahman, "Heavy Metal Contamination in Atmospheric Deposited Dust from Residential Areas Adjacent to Low and High Traffic Zones and Their Health Risk Implications", M.Sc. Thesis (NazifaNawyal), Department of Environmental Science & Management, North South University, June 2024.
13. Joint supervisor: Dr. M. S. Rahman, "Climate Change Implications for Metal and Metalloid Dynamics in Aquatic Ecosystems in the Kirtankhola River of Bangladesh", M.Sc. Thesis (M. S. Shefa), Department of Disaster Risk Management, Patuakhali Science and Technology University, June 2024.

14. Joint-supervisor: Dr. T. R. Choudhury, "Comprehensive Analysis of Heavy Metal inPoultry Chicken Feeds by Atomic Absorption Spectroscopy", B.Sc Thesis (student name: Afia Adiba, Kazi Amir Hamza), Department of Nuclear Science & Engineering, Military Institute of Science and Technology, Dhaka, Bangladesh, May 2025.
15. Joint-supervisor: Dr. T. R. Choudhury, "Assessment of Heavy Metal Concentration in Sediments and Fish Species of the Maheshkhali Channel: Sources, Distribution, and Ecological Impact", M.S. Thesis (student name: Christina Anchal Baidya), Dept. of Oceanography and Hydrography, Faculty of earth and ocean science, BSMR Maritme University, Dhaka, Bangladesh, December 2024.
16. Joint-supervisor: Dr. T. R. Choudhury, "A Study on Bioaccumulation of Chromium (Cr) in Seaweeds", B.Sc. Thesis (Arpita Saha), Dept. of Oceanography and Hydrography, Faculty of earth and ocean science, BSMR Maritme University, Dhaka, Bangladesh, December 2024.
17. Joint-supervisor: Dr. T. R. Choudhury, "Assessment of Toxic and Beneficial Heavy Metals in Soil, Water, Plant and Rice", M.S. Thesis (student name: Fariha Rahman Etu,Department of Environmental Sciences, Jahangirnagar University,Savar, Dhaka- 1342, May 2025.
18. Joint Supervision: Dr. Shirin Akter, "Assessment of the radioactivity and heavy metal contamination in Tobacco products, and radiation dose due to smoking in Bangladesh." B.Sc. Thesis (Nahid Hasan), Department of Chemistry, University of Dhaka, January, 2025.
19. Joint-Supervisor: A. R. M. Tareq, "Synthesis of Mn-Doped Zno Nanoparticles Using Co-Precipitation Method: Structural, Optical and Magnetic Properties", M, Sc Thesis (MeherinAfroz),Department of Electrical and Electronic Engineering, University of Chittagong, Chittagong, Bangladesh, 17 March, 2025
20. Joint-Supervisor: A. R. M. Tareq, "Responses Toward Structural, Optical and Magnetic Properties of Fe Doped ZnO by Co-precipitation Method"M, Sc Thesis (Rokeya Bhuiyan),Department of Electrical and Electronic Engineering, University of Chittagong, Chittagong, Bangladesh,17 March, 2025.
21. Joint-Supervisor: A. R. M. Tareq, "Contribution of Phenolic Compounds and Optical Properties of Water-Soluble Brown Carbon from Different Combustion Sources (Biomass and Mosquito Coil)"B.Sc(Mehedi Hasan Shakil), Department of Chemistry, University of Dhaka, Dhaka, 5th January, 2025.
22. Co-supervisor: Dr. Sushmita Hossain**,** "Bioavailability and Risk assessment of metal(lloids) from the sediment of Meghna Estuary using a modified sequential extraction technique"**,** B.Sc. Thesis (Sabiha Sultana), Department of Oceanography and Hydrography, Bangabandhu Sheikh Mujibur Rahman Maritime University, Dhaka, November 2024.
23. Joint Supervision: M. N. E Alam, "Impact of Environmental Pollution on Food Safety: AcomprehensiveStudy of Heavy Metals Contamination in Dhaka Street Foods", M.S. Thesis (Student Name: Fianaz Kobir), Department of Environmental Science, Bangladesh University of Professionals (BUP), February 2025.
24. Joint Supervision: M. N. E Alam, "Comparative Analysis of Groundwater and Tap Water Quality in Dhaka City, Bangladesh: Evaluating Indices, Corrosion Potential, Human Health Risk Assessment, and Pollution Source Appointmen", M.S. Thesis (Student Name: Tasrif Nur Ariyan), Environmental Science and Management, Independent University, November 2024.

Electronics Division, AECD

25. **Supervision of Thesis:** Co-supervision: Dr. Md. Abdullah Al Mamun, "Soil Quality Monitoring System for Smart Agriculture", B.Sc. Thesis (Orko Mustofi and Fahmida Rahman), Dept. of Electrical and Electronics Engineering (EEE), University of Dhaka., May 2025.

Experimental physics division, AECD

26. Supervisor: Tania Faruqe,"Investigation of the Chemical Bath Deposited Cu-doped Zinc Oxide (ZnO) Thin Film". MSc (Mohi Uddin, Session 2021-22),Department of Physics, University of Dhaka. 2024.
27. Supervisor: Tania Faruqe, "Study of Structural, Morphological, Optical and Electrical Properties of Undoped and Cu-doped Zinc Sulfide (ZnS) Thin Films Deposited by Chemical Bath Deposition (CBD) Method"., MSc (Md. Farhan Shahrear), Department of Physics, University of Dhaka.2024.

Health Physics Division, AECD

28. Joint-supervisor: Selina Yeasmin, "Evaluation of Radioactivity and Radiological Hazard in Sand Sample Collected from River Shore Adjacent to Rooppur Nuclear Power Plant, Bangladesh", M.Sc. Thesis, (Wayez Bin Zahid), Department of Physics, Mawlana Bhashani Science and Technology University, July, 2024.
29. Joint-supervisor: Selina Yeasmin, "Assessment of Radioactivity and Radiological Hazard in Soil Samples collected from Mymensingh 210 MW Combined Cycle Power Plant, Bangladesh", M.Sc. Thesis, (Md. Arafat Rahman Ananda), Department of Physics, Jagannath University, February, 2025.
30. Joint-supervisor: Selina Yeasmin, "Measurement of the Activity Concentration of Natural Radionuclides in Soil Samples and Associated Health Hazards in Tangail District using the High-Purity Germanium Detector", MS Thesis, (Tanzina Akter), Department of Physics, Jagannath University, February, 2025.
31. Joint-supervisor: Shikha Pervin, "Determination Of Natural And Artificial Radionuclides in Soil Samples Using High Purity Germanium Detector In Dhaka City", MS Thesis (Nadia Sarker), Department of Physics, Mawlana Bhashani Science and Technology University, March, 2025.
32. Joint-supervisor: Selina Yeasmin, "Assessment of Radioactivity and Radiological Hazard in Soil around BSCIC Industrial Area, Jhenaidah, Bangladesh", B.Sc. Thesis, (Md. Sozol Hossain), Department of Nuclear Engineering, University of Dhaka, May, 2025.
33. Joint-supervisor: Selina Yeasmin, "Radiological Risk Assessment of Quarry Pit Soil in Bangladesh", B.Sc. Thesis, (Md. Enamul Sardar), Department of Nuclear Engineering, University of Dhaka, May, 2025.
34. Co-supervisor: Dr. Mohammad Sohelur Rahman, "Estimation of radiological risk to healthcare workers and the public at Bangladesh Medical College Hospital campus, Dhanmondi, Bangladesh", 4th year B.Sc. Project Report, (Md. Mizanur Rahman), Department of Physics, JU, June 2025.
35. Co-supervisor: Dr. Mohammad Sohelur Rahman, "Estimation of radiological risk on medical staff and public inside & outside of BRB Hospital Limited, Panthapath, Dhaka", 4th year B.Sc. Project Report, (Md. Tanvir), Department of Physics, JU, June 2025.
36. Co-supervisor: Dr. Mohammad Sohelur Rahman, "Evaluation of radiation level and potential risk to patient, hospital worker and the general public around Green Life Medical College and Hospital", 4th year B.Sc. Project Report, (Md. Apon Ali), Department of Physics, JU, June 2025.
37. Joint-supervisor: Dr. A. K. M. Mizanur Rahman, "Delving into the Synthesis and Structural Features and Radiant Thermoluminescence Traits of LiF:Ti and LiF:Ti, Cu for TL Radiation Dosimetry Applications", M.Sc. Thesis, (Masud Faruque), Department of Physics, Begum Rokeya University, Rangpur (Completed).
38. Joint-supervisor: Dr. A. K. M. Mizanur Rahman, "Enhancement of Structural, Thermoluminescent (TL) and Kinetic Properties of LiF by Mn and Cu, Mn Doping for Dosimetry Applications", M.Sc. Thesis, (Md. Rifat-Ul Islam), Department of Physics, Begum Rokeya University, Rangpur.

Materials Science Division, AECD

39. Supervisor: Dr. Engr. Sheikh Manjura Hoque," Designation and Preparation Experimental Set up of Spray Pyrolysis, Spin Coating and Gas Sensing Devices to Synthesize of Ferrite Nanoparticles and Thin Films form Gas Sensor Applications", Post –Doctoral Reserch Thesis (Dr. Dinesh Kumar Chaudhury), Department of Physics, Amrit Campus Tribhuvan University, Kathmundu, Nepal, October 2024
40. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Degradation of Organic Dyes from Waste Water Using Magnetic Polymer-Supported Palladium Nanocatalyst'', M.S. Thesis (Shavihatun Samy),Department of Chemistry Begum Rokeya University, Rangpur, October 2024
41. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Electrochemical Detection of Heavy Metal Using Novel Magnetic Fe_3O_4 Nased Nanocomposite'', M.S. Thesis (Most. Farzana Mahmud),Department of Chemistry Begum Rokeya University, Rangpur, October 2024

42. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Fabrication and Characterization of CuO Coated Magnetic Polymer Nanocomposites for the Detection of Biomolecules by Electrochemical Approach '', M.Sc. Thesis (Md. Abu Shyed), Department of Chemistry Begum Rokeya University, Rangpur, October 2024
43. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Magnetically Responsive Synthetic Polymer Modifird Bio-composite Particlesfor the Seperation of Dyes from Wastewater'', M.Sc. Thesis (Ruhul Amin),Department of Chemistry Begum Rokeya University, Rangpur, October 2024
44. Supervisor: Dr. Engr. Sheikh Manjura Hoque,"Dysprosium-Doped Ni-Zn-Cu Ferrites: Insights into Structural, Magnetic and Electrical and Behavior", M.S. Thesis (Rezowanur Islam), Department of Physics, University of Dhaka, November 2024
45. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Development of Fe_3O_4 Magnetic Nanoparticles with Correlation between SLP and Tmax attained by RF-induction Heating for Different pH-controlled Particle Sizes", M.S. Thesis (Rabeya Chowdhury Alina), Department of Physics, University of Dhaka, November 2024
46. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Preparation of Zinc Ferrite Nanoparticles by Co-Precipitation Method and Coated with Chitosan for MRI Contrast of Barium and Treatment of Cancer by Hyperthermia", M.S. Thesis (Shadman Shaheen Moyeem),Department of Applied Chemistry and Chemical Engineering, University of Dhaka, October 2024
47. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Investigation of strucal and morphological properties of Mo-doped Vanadium Disulfide nanoparticles at various doping concentration", M. Sc. Thesis (Md. Kaisar Hamid), Department of Physics, University of Dhaka, November 2024
48. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque, "Spatio-Temporal Variation of Microplastics Concentriation in Urban Surface Water Bondies'', Master of Science in Civil Engineering. Thesis (MD MOSTAKIM BILLAH),Department of Civil Engineering Bangladesh University of Engineering and Technology, December 2024
49. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque, " Synthesis and Characterization of Mg and V Co-doped ZnO Nanoparticles for Photovltaic applications", B.Sc. Thesis (Fahimul Islam &Tufazzal Hossain Ujjal),Department of Materials and Matellurgical Engineering,Bangladesh University of Engineering and Technology, April, 2025
50. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque, "A Comprehensive Study on Multifunctional Properties of Mn-Doped Zn Fe2O4 Thin Films Synthesized by Chemical Bath Deposition Method", M. Sc. Thesis (Rahimanaznin Zim)Department of Physics, University of Chittagong, February, 2025
51. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque, "Investigation of Structural, Optical and Gas s Sensing Properties of Magnesium Doped Zinc Oxide Thin Films Synthesized by Spin Coating Method," M. Sc. Thesis (Sumaiya Alam Chowdhury), Department of Physics, University of Chittagong, February, 2025
52. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque, "Febrication, Characterization, Gas sensing Permformance: Nickel Doped Zinc Ferrite Thin Films Synthesized by Spray Pyrolysis Deposition Technique", M. Sc. Thesis (Nilufa Anjum), Department of Physics, University of Chittagong, February, 2025
53. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Synthesis and Characterization of$(1-x)K_{0.5}Na_{0.5}NbO_{3-x}Bi_{0.85}Ba_{0.15}Fe_{0.975}Al_{0.025}O_3$ Heterostructure as a Potential Piezocatalyst'', M.Sc. Thesis (Md. Kamal Uddin),Department of Materials and Metallurgical Engineering Bangladesh University of Engineering and Technology, July 2024
54. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Li-ion Conductivity in Ga Doped Li0.33La0.56TiO3 Solid Electrolyte for All Solid-State Li-ion Battery'', B.Sc. Thesis (Md. Nagib Mahfuz),Department of Bangladesh University of Engineering and Technology , July 2024
55. Co-supervisor: Dr. Engr. Sheikh Manjura Hoque,"Li-ion Conductivity in Ga Doped $Li_{0.33}La_{0.56}TiO_3$ Solid Electrolyte for All Solid-State Li-ion Battery'', B.Sc. Thesis (AppyFeroz Nura),Department of Materials and Metallurgical Engineering, Bangladesh University of Engineering and Technology , July, 2024

56. Co-supervisor: Dr. Rimi Rashid, "Effect of Bi Substitution on The Structural, Magnetic and Magnetocaloric Properties of La0.65Ba0.35-xBixMnO3-δ Perovskite", M.Sc. Thesis (Md Rasel Shikder),Department of Physics , BUET, November, 2024
57. Co-supervisor: Dr. Rimi Rashid, "Modifying the Multifunctional Properties of Zn-Mg Ferrite through Silver Doping: Structural, Optical and Magnetic Insights", M.Sc. Thesis (Sangeeta Kundu),Department of Physics , BUET, November, 2024
58. Co-supervisor: Md. Razibul Hasan, "Structural, Morphological, Magnetic and Transport Properties of $Ba_{0.5}Li_{0.1}Gd_{0.1}Sr_{0.3}Zr_xTi_{1-x}O_3$", M.Sc. Thesis (Akram Hossain Zulkarnine),Department of Physics , Jahangirnagar University, Saver, November, 2025

Medical Physics Division, AECD

59. Joint-Supervisor: Dr. Rajada Khatun and Shirin Akter, "Perfomance of RL/OSL Optical Fiber Dosimeters for Out-of-Field Dose Measurements in External Beam Radiotherapy*",* M. Sc. Thesis (Md. Masud Alam), Department of Physics, Jahangirnagar University, September 2024.
60. Joint-Supervisor: Dr. Rajada Khatun and Shirin Akter, "Characterization of Optical Stimulation and Luminescence readout of Single-Channel Fiber-coupled RL/OSL Dosimetry System", M. Sc. Thesis (Mir. Tahsin Ahmed), Department of Nuclear Engineering, University of Dhaka, October 2024.

Non-Destructive Testing Division, AECD

61. Joint Supervisor: Md. Saiful Alam, "A Comparative Analysis of Geometry Defects Affecting Dimensional Accuracy by Non-Destructive Testing Methods (NDT)", B.Sc. Thesis (Mohammad Rahiq Alam, Mahadi Hasan and Tamjid Islam) , Department of Nuclear Science and Engineering, Military Institute of Science and Technology, May 2025.

INSTITUTE OF NUCLEAR SCIENCE AND TECHNOLOGY (INST), AERE

Radioisotope Production Division (RIPD), INST

62. Supervisor: Dr. Fatema TujJahura, "In-Plant Training" B.Sc. (Eng.), (Tanvir Rahman Niloy), Nuclear Engineering Department, University of Dhaka,February2025.
63. Supervisor: Dr. Md. Sultanur Reza, "In-Plant Training" B.Sc. (Eng.), (Omar Bin Abdul Aziz), Nuclear Engineering Department, University of Dhaka,February2025.
64. Supervisor: Ruhul Amin,"In-Plant Training" B.Sc. (Eng.), (Md. Masum), Nuclear Engineering Department, University of Dhaka,February2025.

Nuclear Radiation and Chemistry Division, INST

65. Supervisors: Dr. Salma Sultana, "Preparation and Characterization of Quantum Beam InducedHydrogels for the Decontamination of Textile Effluents" Ph.D. Thesis, (student's name: Shah Md. Marzuk Hasnine), Department of Applied Chemistry and Chemical Engineering (ACCE), Faculty of Engineering & Technology, University of Dhaka, ongoing.
66. Supervisors: Dr. Salma Sultana, "Synthesis of modified hydrogel utilizing gamma radiation for removal of textile effluents", Ph.D. Thesis, (student's name: mohammad Shahriar Kabir), Department of Applied Chemistry and Chemical Engineering (ACCE), Faculty of Engineering & Technology, University of Dhaka, ongoing.
67. Supervisors: Dr. Nazia Rahman, "Preparation and characterization of a novel proton exchange membrane from sodium styrene sulfonate and acrylonitrile grafted ETFE film for fuel cell" M.S. Thesis, (student's name: Omme Maksutha Sultana), Department of Chemistry, Hajee Mohammad Danesh Science and Technology University, submitted on February 2025.
68. Supervisors: Dr. Nazia Rahman and Dr. Md. Ferdous Alam, "Fabricating modified surface non-woven polyethylene adsorbent using radiation induced grafting of binary monomers to efficiently remove Cr(VI) and Cu(II)" M.S. Thesis, (student's name: Shebly Akter), Department of Chemistry, Mawlana Bhashani Science and Technology University, submitted on December 2024.
69. Supervisors: Dr. Nazia Rahman and Md. Nabul Sardar, "Preparation and characterization of glycidyl methacrylate and acrylic acid radiation grafted non woven polyethylene adsorbent and its application in hazardous heavy metal and dye removal from industrial waste water" M.S. Thesis, (student's name:

Abdur Rahim Miah), Department of Applied Chemistry and Chemical Engineering, Islamic University, Kushtia, submitted on April 2025.

70. Supervisors: Dr. Nazia Rahman and Md. Nabul Sardar, "Characterization of a novel adsorbent prepared through radiation grafting of acrylamide and glycidyl methacrylate on non woven polyethylene fabric and its application in hazardous heavy metal and dye removal from industrial waste water" M.S. Thesis, (student's name:Fariha Anjum Mourin), Department of Applied Chemistry and Chemical Engineering, Islamic University, Kushtia, submitted on April 2025.
71. Supervisors: Dr. Md. Ferdous Alam, Nazia Rahman, "Fabricating modified surface nonwoven polyethylene (PE) adsorbent using radiation-induced grafting of binary monomers to efficiently remove Cr (VI) and Co (II)," M.S Thesis (Student name: Shiebly Akhter, Department of chemistry, Mawlana Bhasani Science and Technology University, Tangail, submitted on December 2024.
72. Supervisors: Dr. Salma Sultana, Dr. Md. Ferdous Alam, "Physico-chemical parameters of water samples collected from Jahangirnagar University areas," B.Sc. Industrial Training (Student name: Proma Rani Sarker, Jannatul Ferdousi, Mst. Fahmida Begum, Mohammad Angel), Department of chemistry, Jahangirnagar University, submitted on September 2024.
73. Supervisors: Dr. Salma Sultana, Dr. Md. Ferdous Alam, "Water Quality Monitoring of TRIGA Mark-II Research Reactor," B.Sc. Industrial Training (Student name: Nargis Pasha, Touhidur Rahman, Department of Nuclear Engineering, Dhaka University, submitted on February 2025.

Health Physics and Radioactive Waste Management Unit, INST

74. Supervisor: Dr. Md. Mosharraf Hossain Bhuiyan, Engr. Shampa Paul, "Radioactivity monitoring of surface soil and drinking water collected from different gas fields of Bangladesh", M.Sc Thesis (Student name: Hamima Habib), Department of Physics, Jahangirnagar University, October, 2024.
75. Supervisor: Dr. Md. Shamsuzzaman, K. M. MahabubMorshed, "Experimental Measurement of Backscattering Factor (BSF) for X-rays Calibration beam with Various Phantoms using Optically Stimulated Luminescence (OSL) Dosimetry", M.S, Thesis (Student name: Avijit Saha, Department of Physics, University of Chittagong, Year: 2024-2025.
76. Supervisors: Dr. Md. Shamsuzzaman, BushraNafrinSattar, ''Characterization of Radiotherapy Photon and Electron Beam from Medical Linear Accelerator with Optically Simulated Luminescence (OSL) Dosimetry'', M. Sc. Thesis (Student name: Md. Nur Islam), Department of Physics, Chittagong University, Year: 2024-2025.
77. Supervisor: Dr. Md. Mosharraf Hossain Bhuiyan, Bushra Nafrin Sattar , "Calibration and Performance Evaluation of Radiation Detectors Used for Radiation Protection at Various Radiological Facilities in Bangladesh", M.S. thesis (Student name: Afsana Akter Supti), Department of Physics, Chittagong University, Year: 2024-2025.

Reactor Physics and Engineering Division, INST

78. Supervisor: Dr.Mohammad Abdul Motalab, "Radiation Dose Estimation from Actinides of Bangladesh TRIGA Research Reactor", M.Sc. Thesis (Mominul Islam Momin) Department of Physics, Jahangirnagar University, December, 2024.

Tandem Accelerator Facilities Division, INST

79. Supervisor: Dr. Md. Shuza Uddin "Studies on Neutron Induced Nuclear Reactions on Strontium at TRIGA Reactor: Possibility of Production of the Useful Tracer ^{85g}Sr", (Mohammad Mezbah Uddin), Ph.D. Department of Physics, Jahangirnagar University. June, 2025

Isotope Hydrology Division, INST

80. Supervisor: Dr. Md Moniruzzaman. "Analysis of the Quality, Source Identification and Apportionment of the Groundwater in Paba-Mohanpur Upazilas, Rajshahi, Bangladesh." (Oindrila Sarkar Tithi), MS. Department of Geology and Mining, University of Rajshahi, May, 2025.
81. Supervisor: Dr. Md Moniruzzaman. "Isotopic and Hydrogeochemical assessment of groundwater in Barguna District, Bangladesh" (Sabekun Nahar) MS, Department of Geology and Mining, University of Rajshahi. May, 2025.

Reactor and Neutron Physics Division, INST

82. Joint Supervisor: Dr. Mohammad Amirul Islam, "Study of Sedimental Chronology, Elemental and Radiological Contamination of the Sundarban By Neutron Activation Analysis and Alpha Spectroscopy Techniques", Ph.D. Thesis, (Shaiful Kabir), Department of Physics, Chittagong University of Engineering and Technology, Chittagong, August 2024.
83. Joint Supervisor: Dr. Mohammad Amirul Islam, "Effects of Gamma and Neutron Irradiations on the Physical, Magnetic and Electric Properties of Co-Cu-Cd and Ni-Cu-Cd Nanoferrites", M. Phil. Thesis, (Md. Salauddin), Department of Physics, Chittagong University of Engineering and Technology, Chittagong, December 2024.
84. Joint-supervisor: Dr. Mohammad Amirul Islam, ""Evaluations of natural radioactivity and concomitant radiological risks in sediments of the Meghna River by using gamma-ray spectrometry", M.Sc. Thesis, (Md Tamim Jabed Khan), Department of Physics, Chittagong University, Chittagong, January 2025.
85. Joint-supervisor: Dr. Rahat Khan, "Mechanistic pathway of potentially toxic elemental dispersion in Dhaleswari river sediment from the leather tanning industrial zone", M.Sc. Thesis, (Shuvashish Das Shuvo), Department of Environmental Science, Bangladesh University of Professionals (BUP), Dhaka-1216, 2024.
86. Joint-supervisor: Dr. Rahat Khan, "Source specific sedimentary response towards the differential anthropogenic impacts in terms of potentially toxic elements in an urban river", M.Sc. Thesis, (Md. Samiun Basir), Department of Environmental Science, Bangladesh University of Professionals (BUP), Dhaka-1216, 2024.
87. Joint-supervisor: Dr. Rahat Khan, "Exploring the alteration of environmental radioactivity in terms of compositional elements of heavy minerals in an anthropogenically affected urban river: Radiological and ecological risks assessment", M.Sc. Thesis, (Sayma Zahan Akhi), Department of Environmental Science, Bangladesh University of Professionals (BUP), Dhaka-1216, 2024.
88. Joint-supervisor: Dr. Rahat Khan, "Radiochemical Profiling of Korotoa river sediment: Unraveling elevated radioactivity and health impacts", M.Sc. Thesis, (Md. Azizul Hakim Manik), Department of Environmental Science, Bangladesh University of Professionals (BUP), Dhaka-1216, 2024.
89. Joint-supervisor: Dr. Rahat Khan, "Quantitative analysis of radionuclides and heavy metals in cultivated fish and fish-feeds from Khulna District: Implications for environmental and public health", M.Sc. Thesis, (Emam Hasan), Physics Discipline, Science, Engineering and Technology school, Khulna University, Khulna 9208, 2024.
90. Joint-supervisor: Dr. Rahat Khan, "Distribution, Sources and Risks of Environmental Radioactivity in differential environmental components: Experimental findings and comprehensive review", M.Sc. Thesis, (Farzana Yasmin Nupur), Department of Environmental Sciences, Jahangirnagar University, Savar, Dhaka 1342, 2024.
91. Joint-supervisor: Dr. Mst. Sanjida Aktar, "Effect of La ion substation on the structural properties of Cu-Mg ferrite nanoparticle", M. S. Thesis, (Khndoker Tamim), Department of Physics, Mawlana Bhashani Science and Technology University, 2024.
92. Joint-supervisor: Dr. Mst. Sanjida Aktar, "Synthesis and structural characterization of Gd doped Ni-Mg-Co nanoferrite", M. S. Thesis, (Md. Ahnaf Tahmid Khan), Department of Physics, Mawlana Bhashani Science and Technology University, 2024.
93. Joint-supervisor: Dr. Shahzad Hossain, "Synthesis and structural characterization of Ytterbium and Tin doped Barium Zirconate for applications in solid oxide fuel cell", M. S. Thesis, (Md. Ridwanul Hasan), Department of Physics, Mawlana Bhashani Science and Technology University, 2024.

INSTITUTE OF ENERGY SCIENCE, AERE

94. **Supervisors:** Dr. Mohammed Tareque Chowdhury, Md. Abu Khaer, "The Study of Hypothetical Core Damage Accidents of the TRIGA Mark-II Research Reactor of Bangladesh", M.Sc. Thesis, (**Student name:**Most. AlemaAkter), Department of Physics, Hajee Mohammad Danesh Science and TechnologyUniversity (HSTU), Dinajpur., July, 2024.

INSTITUTE OF RADIATION AND POLYMER TECHNOLOGY (IRPT), AERE

95. **Superviser:** Md. Serajum Manir **"**Gamma induced synthesis and characterization of nanoparticles for photo-catalytic application." (Obaidullah**)** Department of Physics, MBSTU, Santosh, Tangail.
96. **Superviser:** Md. Serajum Manir. **"**Gamma induced synthesis and characterization of nanoparticles forphoto-catalytic application." (Md. Shakil Ahmed**)** Department of Physics, MBSTU, Santosh, Tangail.
97. **Superviser** Mohammaqd Zahirul Islam Mollah. **"**Fiber reinforcerd polymer synthesis and its radiation effect." (Md. Sujan**)** Department of Agricultural Chemistry, Sher-E- Bangla Agricultural University.

INSTITUTE OF NUCLEAR MEDICAL PHYSICS, AERE

98. Co-supervisor: Dr. Rafiqul Islam (PSO and Director), "Application of PHITS Monte Carlo Code for Shielding Verification of 6 MV Linear Accelerator", M.Sc., Thesis student's name: Mr. Mujahidul Islam, Department of Physics, Dhaka Kendriyo College, National University, Dhaka, Bangladesh - April, 2025
99. Co-supervisor: Dr. Rafiqul Islam (PSO and Director), "Modeling a Clinical PET-System using the Monte Carlo GATE Code" M.Sc. Thesis student's name: Mr. Sharif Miya, Department of Physics, Jagannath University, Dhaka, Bangladesh- March, 2025
100. Co-supervisor: Dr. Rafiqul Islam (PSO and Director), "Dosimetric Comparison of 3DCRT Four-Field and Five-Field Techniques in Cervical Cancer Threatment", M.Sc. Thesis student's name: Ms. Umme Habiba Nasrin, Department of Medical Physics and Biomedical Engineering, Gono Bishawbidyalay, Savar, Dhaka- March, 2025
101. Co-supervisor: Dr. Rafiqul Islam (PSO and Director), "Adaptive Radiotherpay in Three-Dimensional Conformal Radiation Therapy for Head and Neck Cancer: A Single-Institute Experience and Implications for Clinical Practice", M.Sc. Thesis student's name: Mr. Al-Amin, Department of Physics, Rajshahi University of Science and Technology, Pabna, Bangladesh - March, 2025
102. Co-supervisor: Dr. Rafiqul Islam (PSO and Director), "Mapping LET, Fluence and Dose Distribution for Particle Therapy using PHITS Monte Carlo Code", M.Sc. Thesis student's name: Mr. Sulaiman Ali, Department of Physics, Rajshahi University, Rajshahi, Bangladesh - December, 2024

ATOMIC ENERGY CENTER (AEC), CHATTOGRAM

103. **Co-Supervision:** Dr. Shahadat Hossain, "Study and Mapping of Baseline Data for Background Gamma Radiation, Natural Radioactivity in Soil, Water and Plants of Sylhet Division, Bangladesh." PhD. Student Name: DidarulAlam, PhD. in Physics, Chittagong University (CU), Registration Year 2021-22.
104. **Co-Supervision:** Dr. AKM Saiful Islam Bhuian, "Study of the Absorbed Dose and Associated Health Hazards due to the Background Radiation in the Coastal and Noncoastal Areas of South-East Part of Bangladesh." PhD. Student Name: Abadat Hossain, PhD. in Physics at Chittagong

Radioactivity Testing And Monitoring Laboratory (Rtml), Mongla.

105. Co-Supervision: Dr. Mst. Shafaly Khatun, "Assessment of radiation dose and heavy metal concentration in the soil of Sundarbans Eco Tourism Center, Bangladesh and its health effects on human" M.S. Thesis. (Sadia Afrin Swarna) Physics Discipline, Khulna University, June, 2024.
106. Co-Supervision: Dr. Mst. Shafaly Khatun, "Study of radioactivity dose and heavy metal concentration in the soil samples of Mongla port area, Bagerhat, Bangladesh and effects on human health" M.S. Thesis. (Moumita Das) Physics Discipline, Khulna University, June, 2024.

INSTITUTE OF FOOD AND RADIATION BIOLOGY (IFRB), AERE

Agrochemical and Environmental Research Division, IFRB

107. Supervisor: Dr. Muhammed Alamgir Zaman Chowdhury, Co-Supervision: Mir Shaon Reza "Bioaccumulation and transfer of Heavy metals in toabacco plants and market available tobacco products and post-harvest crops in cultivation field of Natore, Bangladesh" M.S Thesis, Department of Biochemistry and Molecular Biology, Jahangirnagar University.February, 2025.
108. Supervisor: Zeenath Fardous, Co-Supervisor: Meherun Nesha. "Phytoremediation of Heavy Metal (Cd, Cr, Cu, Pb) using different biosorbents and evaluation of their effect on Poultry" (Most .. Ferdausi Akter Tanni), M.S Thesis, Department of Biochemistry and Molecular Biology, Jahangirnagar University, February-2025.
109. Supervisor: Meherun Nesha, Co-Supervisor:Zeenath Fardous "Nutritional Composition, Heavy Metal Contents and Lipid Quality of Suckermouth Catfish from Different Rivers in Bangladesh" (Md. Abu Bokkar Siddik), M.S Thesis, Department of Biochemistry and Molecular Biology, Jahangirnagar University.

Food Safety and Quality Analysis Division, IFRB

110. Supervisor: Mst. Aiffa Khatun, "Microplastic in some commercial finish and selfish from Coxs Bazar fish landing centre of Bangladesh: Assessing abundance and public health hazard", M.Sc. Thesis, (Student name: Md. Shahariar Ahmed) Depertment of Fish Biology and Genetics. Sylhet Agricultural University,Syllet, December, 2024.
111. Supervisor: Md. Ashikur Rahman, "Valorization of citrus fruits peel: Nutritional composition, Antioxidant potential and Comparision with Commercial Flour", B.Sc. Thesis, (Student name: Nowshin Taranamum Orin) Department of Nutrition and Food Engineering. Daffodil International University, Dhaka, June, 2025.

Gamma Source Division, IFRB

112. Supervisor: Dr. Md. Firoz Mortuza, "Molecular Identification of Rice Weevil (*Sitophilus oryzae*) and Analysis of the Effect of Gamma Radiation Doses on Their Life cycle Stages for Phytosanitation", B.Sc. Thesis, (Tangia Tasnim Tania), M.Sc. Department of Biochemistry & Molecular Biology, Jahangirnagar University, February, 2025
113. Supervisor: Dr. Md. Firoz Mortuza, "Phytosanitary Irradiation Dose Determination, Molecular Identification and Developmental Analyses of Red Flour Beetle (*Tribolium castaneum*)", B.Sc. Thesis, (Md. Khairul Islam), M.Sc. Department of Biochemistry & Molecular Biology, Jahangirnagar University, February, 2025
114. Supervisor: Dr. Md. Firoz Mortuza, "Use of PhytosanitaryGamma Irradiation in Mtitigating Leucinodes arbonalies (Lepidoptera:Crambide)Infestation in *Solanum melongena* (Solanales: Solanaceae)", B.Sc. Thesis, (Md. Rakib Hasan), M.Sc. Department of Zoology, Dhaka University, June, 2025

Microbiology and Industrial Irradiation Division, IFRB

115. Supervisor: Dr. Abdullah-Al-Mahin, "Development of a Multiplex PCR Assay for the Simultaneous Detection of Three Foodborne Pathogens; *Salmonella enteritidis*, *Klebsiella pneumoniae* and *Staphylococcus aureus*", B.Sc. Thesis, (Asma Farid), M.Sc. Dept of Life Science, Independent University, June, 2025
116. Supervisor: Dr. Tabassum Mumtaz, " Isolation, Screening, and Potency of bioplastic (PHAs) producing bacteria from Amin Bazar Landfill Area, Bangladesh", B.Sc. Thesis, (Khadeja Akter Ria), M.Sc. Dept of Environmental Science and Disaster Management, Noakhali Science and Technology University, June, 2025
117. Supervisor: Dr. Md Kamruzzaman Pramanik, " Identification and Determination of the Bioactive Properties of Marine Algae Extracts and their Associated Microorganisms", B.Sc. Thesis, (Fahim Faysal), M.Sc. Gono Bishwabidyalay, June, 2025

Cytology and Biocontrol Research (CBR), READ, IFRB

118. Supervisor**:** Dr. Md. Hasanuzzaman, "Study on tephritid fruit flies (Diptera: Tephritidae) from the different region of Bangladesh", M.S. Thesis, (Student name: Md.Sanowar Hossain), Department of Zoology, Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka, Bangladesh., November, 2024.
119. Supervisor: Dr. Farzana Yesmin, "Chromosome study and effects of radiation on biology of *Bactrocerazonata*", Ph.D. Thesis, (Student name: Md Nazim Uddin), Department of Zoology, Life and Earth Science Group, National University, Gazipur, Bangladesh., December, 2024.
120. Supervisors: Dr. Farzana Yesmin, Dr. Md. Hasanuzzaman, "Characterization of larval habitats, species composition and factors associated with the seasonal abundance of mosquito fauna from the Sylhet and Khagrachhari region, Bangladesh", M.S. Thesis, (Student name: Nilotpal Dey), Department of Parasitology, Sylhet Agricultural University, Sylhet, Bangladesh., December, 2024.
121. Supervisor: Dr. Md. Hasanuzzaman, "Karyological study of chironomids (Family-Chironomidae) in relation to ecosystem health in the Surma river, Sylhet, Bangladesh", M.S. Thesis, (Diponkor Adikari), Department of Aquatic Resource Management, Sylhet Agricultural University, Sylhet, Bangladesh., March, 2025.

Veterinary Drug Residue Analysis Division, IFRB

122. Supervisor: Dr. Kazi Rasel Uddin, "Dose-Dependent Hepatic and Renal Alterations in Sonali Chickens Following Doxycycline Administration: A Histopathological Assessment Supported by Biochemical and Hematological Analysis", M.Sc. Thesis, (Md. Touhidur Rahman), Department of Biochemistry and Molecular Biology, Jahangirnagar University, February, 2025.
123. Supervisor: Darmin Chakma, " Evaluation of Amoxicillin-Induced Hepato-Renal Alterations in Sonali Chickens: A Dose-Dependent Histopathological Study Supported by Biochemical and Hematological Findings", M.Sc. Thesis, (ShahrinAkter), Department of Biochemistry and Molecular Biology, Jahangirnagar University, February, 2025.

Molecular Radiobiology and Biodosimetry Division, IFRB

124. Supervisor: Dr. A. Y.K. Md. Masud Rana. "A Study on Bacterial Composition of A Fermented Rice Sample with Isolation, Identification and Molecular Characterization of the Potential Probiotic Wiseella Confuse Mrbd". M.S. Thesis, (Student Name: Nomaiya Afrin Khan), Department of Biochemistry and Molecular Biology, Jahangirnagar University, Savar, Dhaka. February, 2025

INSTITUTE OF TISSUE BANKING AND BIOMATERIALS RESEARCH (ITBBR), AERE

125. Supervisor: Dr. S. M. Asaduzzaman, "Development of Nanoparticle Doped Hydroxyapatite-Based Composite Scaffolds for Maxillofacial Reconstruction," Ph.D. thesis **(**Mohammad Raziul Haque), Department of Biotechnology and Genetic Engineering, Jahangirnagar University, Savar, Dhaka 1342.
126. Supervisor: Dr. S. M. Asaduzzaman, "The Pre-clinical Trial of Platelet Rich Plasma (PRP) Combined with Decellularized Human Amniotic Membrane (dHAM) on Burn Wound Healing in Rat Model," M.Sc. Thesis (Anika Tabassum Upoma), Department of Biochemistry and Molecular Biology, Jahangirnagar University, Savar, Dhaka 1342.
127. Supervisor: Dr.S. M. Asaduzzaman, "Azadirachta indica Incorporated Decellularized Human Amniotic Membrane Gel with Pulsed Electromagnetic Field in Treatment of Burn Wound Healing in Diabetic Rat Model," M.Sc. Thesis (Shahrima Akter Rimi), Department of Biochemistry and Molecular Biology, Jahangirnagar University, Savar, Dhaka 1342.

NATIONAL INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (NINMAS) SHAHBAG

128. Supervisor: Prof. Dr. Fatima Begum, "Quality of Life and its Associated Factors in Radioactive Iodine Refractory Differentiated Thyroid Carcinoma Patients", MD Thesis (student name: Dr. Khadijatul Tushra), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.

129. Supervisor: Prof. Dr. Fatima Begum, "Assessment of Effective Dose of Levothyroxine in Treatment of Congenital Hypothyroid Babies: a pilot study.", MD Thesis (student name: Dr. Sirajum Munira), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.
130. Supervisor: Prof. Dr. Zeenat Jabin, "Association of Non –Alcoholic Fatty Liver Disease (NAFLD) with Carotid Atherosclerosis Evaluated by B-mode Ultrasonography.", MD Thesis (student name: Dr. Nasrin Sultana), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.
131. Supervisor: Prof. Dr. Sadia Sultana, "Added value of wall thickening score over LVEF in post stress myocardial Stunning evaluation by gated SPECT MPI.", MD Thesis (student name: Dr. Sumaiya Alam), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.
132. Supervisor: Prof. Dr. Shamim Momtaz Ferdousi Begum, "Role of 18F FDG PET–CT Scan and MRI for Predicting Pathological Response to Neoadjuvant Chemotherapy in Breast Cancer Management.", MD Thesis (student name: Dr. Shahnaj Hossain Dinu), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024
133. Supervisor: Prof. Dr. Nasreen Sultana, "Assessment of Myocardial Perfusion Abnormality Detected by SPECT MPI Among Long Covid Patients: Bangladesh Perspective.", MD Thesis (student name: Dr. Farida Yeasmin), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024
134. Supervisor: Asso. Prof. Dr. Pupree Mutsuddy, "Effects of Long Term TSH Suppressive Dose of Levothyroxine on Bone Mineral Density in Differentiated Thyroid Carcinoma Patients after Radioactive Iodine Ablation.", MD Thesis (student name: Dr. Mashrufa Sultana), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024
135. Supervisor: Prof. Dr. Sadia Sultana, "Factors Influencing Low Bone Mineral Density in Patients with Type -2 Diabetes Mellitus: Bangladesh Perspective.", MD Thesis (student name: Dr. Debobrata Aich Majumder), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.
136. Supervisor: Prof. Dr. Nasreen Sultana, "High Peak Systolic Velocity to End-Diastolic Velocity Ratio (S/D Ratio) of Umbilical Artery Determined by Doppler as a Predictor of Adverse Perinatal Outcome.", MD Thesis (student name: DR. Tapasi Sarker), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.
137. Supervisor: Prof. Dr. Nasreen Sultana, "Association of Vitamin D Level with Myocardial Perfusion Status by Gated-SPECT Myocardial Perfusion Imaging in Patients with Suspected or Diagnosed Coronary Artery Diseases.", MD Thesis (student name: Dr. Rumana Parveen), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on July 2024.
138. Supervisor: Prof. Dr. Nasreen Sultana, "Regional Cerebral Blood Flow Abnormality Detected by SPECT Imaging and its Association with Severity of ASD.", MD Thesis (student name: Dr. Sheikh Mohammad Adnan), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on January 2025.
139. Supervisor: Asso. Prof. Dr. Pupree Mutsuddy, "Effect of Suppressive Dose of Thyroxine and High Dose of Calcium-D3 on Bone Mineral Density in Post -Thyroidectomy DTC with Incidental Parathyroidectomy Patients.", MD Thesis (student name: Dr. Tania Sultana), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on January 2025.
140. Supervisor: Prof. Dr. Fatima Begum, "Association on Initial Thyroglobulin level at diagnosis with Recurrence in Non-Metastatic Papillary Thyroid Carcinoma Patients.", MD Thesis (student name: Dr. Faria Jisan), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on January 2025.

141. Supervisor: Prof. Dr. Zeenat Jabin, "Radioactive Iodine Therapy Responses in Children Compared to Adult Population Having Differentiated Thyroid Carcinoma with Lymphnode Metastasis.", MD Thesis (student name: Dr. Saleha Sultana), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on January 2025.

142. Supervisor: Prof. Dr. Shamim Momtaz Ferdousi Begum, "Frequency of Hibernating Myocardium detected by F-18 FDG PET among the CAD patient having Perfusion Defect Identified by SPECT MPI: Bangladesh perspective.", MD Thesis (student name: Dr. Mst. Fahmoda Akter), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on January 2025.

143. Supervisor: Prof. Dr. Fatima Begum, "Quality of life in Adults with Differentiated Thyroid Carcinoma Survivors Treated by Radioactive Iodine During Childhood.", MD Thesis (student name: Dr. Tanvir Ahmed), Department of National Institute of Nuclear Medicine & Allied Sciences, Bangladesh Medical University (BMU), submitted on June 2025

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), MYMENSHING

144. Supervisor: Prof. Dr Ratan Kumar Chacraborty, "Association between arteriovenous fistula blood flow and ventricular systolic function in patients with maintenance hemodialysis.", MD Thesis (Dr. Md. Mustafizur Rahman), Bangladesh Medical University (BMU), July, 2025.

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES (INMAS), SUHRAWARDY

145. Supervisor:Professor Dr. ZeenatJabin, "Association of Non-Alcoholic Fatty Liver Disease (NAFLD) with Carotid Atherosclerosis Evaluated by B-mode Ultrasonography." MD Thesis (Dr.Nasrin Sultana), Nuclear Medicine student, 2024-2025.

146. Supervisor:Professor Dr.ZeenatJabin,"Radioactive Iodine Therapy Responses in Children Compared to Adult Population Having Differentiated Thyroid Carcinoma with Lymphnode Metastasis." MD Thesis (Dr.Saleha Sultana), Nuclear Medicine student, 2024-2025.

XVI. INTERNATIONAL/NATIONAL PUBLICATIONS

Chemistry Division

International

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XVII. PAPER PRESENTED IN SEMINAR/SYMPOSIUM/CONFERENCE/WORKSHOP

ATOMIC ENERGY CENTRE, DHAKA

Medical Physics Division, AECD

1. “Standardization and Calibration of Neutron Fields for Detector Characterization”, S. Akter, H. M. Jamil, K. M. M. Morshed, M. M. Ahasan, M. S. Rahman & M. A. Kadir, PP083-209, International Conference on Electronics and Informatics 2024, 28-29 December 2024, pp. 197.
2. “Characterization Of Optical Stimulation And Luminescence Readout Of Single-Channel Fiber-Coupled RL/OSL Dosimetry System”, M. T. Ahmed, Dr. A. Shelly, Dr. R. Khatun, Ms. S. Akter, A. N. Monika, M. A. Hasnat, H.T. Zubair, OP-25, 4th International Conference on Medical Physics in Radiation Oncology and Imaging, 13-15 February 2025, pp. 107.
3. “6 MV Small-Field LINAC Beam Profile Characterization Using Optical Fiber Radioluminescence Dosimetry System”, M. M. Alam, M. K. U. Sikder, R. Khatun, S. Akter, A. N. Monika, M. A. Hasnat, H.T. Zubair, M. A. Kabir, OP-26, 4th International Conference on Medical Physics in Radiation Oncology and Imaging, 13-15

INSTITUTE OF NUCLEAR MEDICAL PHYSICS (INMP), AERE

4. “Brief Overview on Addressing Pitfalls In F-18 FDG Imaging: Interpretation Challenges, Confidence Enhancement and Diagnostic Strategies”, Pupree Mutsuddy, Tapati Mandal, Papia Akhter, S M Arifur Rahman, Fatema Tuz Zohra, Md. Abu Bakker Siddique, Fatima Begum, Shamim MF Begum, Bangladesh J. Nuclear Med.: 2025 .
5. “FDG PET-CT in Brain Malignancies: Exploring Metabolic Patterns and Anatomical Features in a Single-Center Study”, Fatema Tuz Zohra, Arshad Hossain, Nilufa Yasmeen, Bangladesh J. Nuclear Med.: 2025.

6. "Rapid Extensive Metastatic Spread in Advanced Renal Cell Carcinoma: Insights from FDG PET-CT Imaging", Arshad Hossain, **Fatema Tuz Zohra**, Nilufa Yasmeen, Rahima Akter, Iqbal, Humayra, Md Jahir Alam, Mahbuba Zaman, Sharmin Quddus, Bangladesh J. Nuclear Med.: 2025
7. "Study of R100, R90, R80, R50, and Rp with the Increase of Field Size in Small Field of Electron Beams and Photon Contamination Analysis in The Tail Region of The PDDs Of a Medical LINAC", M.A. Hasnat, Sadip Barua, Fatema Tuz Zohra, Priyanka Poddar, S.C.B. Sarma, Bangladesh J. Nuclear Med.: 2025
8. "Incidental Identification of Chilaiditi Sign During FDG PET-CT in a Patient with Advanced Squamous Cell Carcinoma", Rahima Akter Sharmin, Sharmin Quddus, **Fatema Tuz Zohra,** Humayra Tasnim, Arshad Hossain, Nilufa Yasmeen, Bangladesh J. Nuclear Med.: 2025
9. "Diagnostic Challenge in FDG PET-CT: Pulmonary Consolidation Masking as Malignant Lesion-A Case Report", Priyanka Podder, FatemaTuz Zohra, Rayhan Alam, Abul Hasnat, Bangladesh J. Nuclear Med.: 2025
10. "Pattern of 99mTc DTPA Renogram In Bilateral Nephrolithiasis with Cystinuria: A Rare Case Report", Humayra Tasnim, Rahima Akter Sharmin, **Fatema Tuz Zohra** , Sharmin Quddus, Bangladesh J. Nuclear Med.: 2025
11. "Navigating the Unknown: Evaluating the Role of FDG PET-CT in Cancer of Unknown Primary- A Five Years Institutional Perspectives in Bangladesh", FatemaTuz Zohra, Priyanka Podder, Rayhan Alam, Abul Hasnat, BICC, 13-14 December 2024.

INSTITUTE OF NUCLEAR SCIENCE AND TECHNOLOGY (INST), AERE

Nuclear Radiation and Chemistry Division, INST

12. Preparation of a Radiation Grafted Proton Exchange Membrane from ETFE Film for Fuel Cell, N. Rahman, S. Sultana, M. N. Sardar, Third International Conference on Applications of Radiation Science and Technology (ICARST-2025), 7–11 April 2025, Vienna, Austria.
13. Radiation Functionalization of Waste Plastic for Hazardous Metal Sorption, Md. Nabul Sardar, Nazia Rahman, Shahnaz Sultana, 6-7 February, 2025, University of Rajshahi.

Reactor and Neutron Physics Division, INST

14. Mohammad Amirul Islam (Invited Speaker), Natural Radioactivity and Concomitant Radiological Risks in Sediments of the Padma River Near Rooppur Nuclear Power Plant of Bangladesh: Pre-operational Status, National Conference on Physics-2025, Organized by Bangladesh Physical Society, 6-7 February, 2025, Department of Physics, Rajshahi University, Abstract Book (Page 64).
15. Md. Rahat Ali, Rani Das, Biplob Das, Mohammad Amirul Islam, Contamination and Ecological risk assessments of trace elements in sediments of an urban river, National Conference on Physics-2025, Organized by Bangladesh Physical Society, 6-7 February, 2025, Department of Physics, Rajshahi University, Abstract Book (Page 21).

INSTITUTE OF NUCLEAR MEDICINE AND ALLIED SCIENCES, DHAKA

16. Dr. Rawnak Afrin, Diagnostic efficiency of 18F-FDG PET/CT for detection of primary site in patients with Cancer of Unknown Primary (CUP) – initial experiences in Bangladesh, International Conference on Hybrid Imaging (IPET-2024) (CN-326/EVT2300043), Vienna, Austria.
17. Dr. Rawnak Afrin, Enhancing Lymphoma Diagnosis, Treatment and Follow-Up Using 18F-FDG PET/CT Imaging National Conference of Radiology; by Society of Radiology and Imaging, 2025, Hotel Intercontinental Dhaka.
18. Dr. Rawnak Afrin, Enhancing Lymphoma Diagnosis, Role of 18F-FDG PET-CT in Evaluation of Ca Lung Patients – Multicenter Experience in Bangladesh, 33rd Annual Conference and International Scientific Seminar (Faculty), By Associations of Physicians in Bangladesh, Hotel Intercontinental Dhaka.
19. Dr. Rawnak Afrin, Importance of FDG pet-CT and bone scan in bone tumor diagnosis and management, 37th Annual Scientific Congress; BOSCON by Bangladesh Orthopedic Society, International Convention City, Basundhara and NITOR.

Published by: **Scientific Information Division, Bangladesh Atomic Energy Commission**
Paramanu Bhaban, E-12/A, Agargaon, Sher-e-Bangla Nagar, Dhaka-1207
Phone: 880-2-58160534, Fax: 880-2-8181842, 8181845
E-Mail: sidbaec@yahoo.com, Web: www.baec.gov.bd

Printed by : **Natundhara Printing Press**
314/D, Elephant Road, Dhaka-1205