AVANGUARD
SHIPYARD

ENVIRONMENTAL IMPACT ASSESSMENT OF AVANGUARD SHIPYARD LTD. (DRAFT COPY)

Pankhali, Dacope, Khulna, Bangladesh

ABSTRACT

The AVANGUARD SHIPYARD LTD. intend to build a shipyard at Pankhali, Dacope, Khulna. Building of commercial vessels: passenger vessels, ferry-boats, cargo ships, tankers, tugs, hovercraft (except recreation-type hovercraft)

Prepared By
Global Environmental and textile Technological Services

October -2023

Declaration

This Environmental Impact Assessment (EIA) report has been prepared for the proposed **Avanguard Shipyard Ltd.** by Global Environmental and Textile Technological Services (GETTS). This report contains different types of Impact & Management plans for environmental issues for the project. It indicates the effects on the environment due to the settlement of the project and also the mitigation measurements for it.

GETTS is one of the renowned environmental consulting firms since 2011 in the country which has been providing services in the relevant fields last 12 years. We have experience in the field of design, drawing, installation, and consulting of numerous wastewater treatment plants (WWTP), effluent treatment plants (ETP), sewage treatment plant (STP), and any kind of environmental report like IEE, EIA, EMP, ZLD, etc. along with certification process from the DoE. We have more than 250 clients and 450 projects up to this.

The report has been guided by Engr. Md. Golam Kibria, Chief Executive of the said consultancy firm. Shumya Jannat and Md. Shaik Hassan Ashik are the prime author of the said report. The full team of GETTS has been assisted and coordinated to complete the EMP report successfully.

The Board of Directors of the project has been assisted with various data and information. We acknowledge all of them.

MD. Shaik Hassan Ashik
Senior Environmental Chemist
GETTS

Mr. Mohammed Imtiaz Hossain
Managing director
Avanguard Shipyard Ltd.

Engr. Md. Golam Kibria
Chief Executive
GETTS

Abstract

History of Bangladeshi shipbuilding' Since ancient period, Bengal had a glorious tradition of boat and ship building. Traditional ship and wooden boat were made in Chittagong. The Moroccan traveller ibn batuta who came to Bengal in the 14th century saw numerous boats in the river carrying men and mercandise and testified to the existence of gigantic fleet of war-boats. According to the European Traveller Caesar Frederick, Chittagong was the center of building ocean-going vessels in the mid-15th century. In the 17th century, the ship building institutions of Chittagong are reported to have built a complete fleet of war-boats for the Sultan of Turkey. During the Mughal period, Bengal is said to have taken the lead in building ships and boats.

This study

The AVANGUARD SHIPYARD LTD. intend to build a shipyard at Pankhali, Dacope, Khulna, Bangladesh. Geographically the project is located between 22°36'41.4"N latitude and 89°31'19.8"E longitudes. Total land area of the proposed project will be 42.4108 acre (4,241.08 decimal). The size of the yard is 3,960 decimal (161,617 m2 or 120 bigha) and we are in the final stages of processing a registered "Bayna Deed" at a strategically advantageous block of land. The draft is 10m+ all year round (Ref: Annex 22), and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Also, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all.

Mr. Mohammed Imtiaz Hossain, Managing Director of **Avanguard Shipyard Ltd.** has proposed to set up this project. According to the ECR 2023, the project is categorized as **RED** as per schedule 1 and serial number 68, therefore the project requires EIA study for its Site Clearance Certificate. The proponent of Avanguard Shipyard Ltd. has requested to '**Global Environmental & Textile Technological Services (GETTS)**' for preparing EIA report on this project as per the DoE guideline. Accordingly, this EIA report has been prepared.

Avanguard Shipyard Ltd. already got ToR approval from DoE vide memo number **22.02.0000.018.72.061.23.119**, dated-September 07, 2023 (copy attached).

শেখ হাসিনার বাংলাদেশ
পরিচ্ছন্ন পরিবেশ

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, Paribesh Bhaban
E-16 Agargaon, Sher-e-Bangla Nagar, Dhaka-1207
www.doe.gov.bd

Memo No: 22.02.0000.018.72.061.23. 119

Date: September 07, 2023

Subject: Approval of Terms of Reference (ToR) for EIA of Avangurd Shipyard Limited, 1 No. Pankhali Union, Dacope, Khulna.

Ref: Memo No. 22.02.4047.302.72.032.23.262; Dated: 16.08.2023

With the subject mentioned above, the Department of Environment hereby gives approval of the Terms of Reference (ToR) for Environmental Impact Assessment (EIA) Study of **Avangurd Shipyard Limited**, 1 No. Pankhali Union, Dacope, Khulna subject to fulfilling the following terms and conditions:

I. The project authority shall conduct a comprehensive Environmental Impact Assessment (EIA) considering the overall activity of the said project in accordance with the ToR submitted to the Department of Environment (DoE). The EIA study shall be conducted as per the provision laid down in the Environmental Conservation Rules, 2023.

II. The EIA report shall be prepared in accordance with the guidelines provided in the schedule-11 and Rules-15, 16 of the ECR, 2023.

III. Consultation with Stakeholders/Public Consultation should be done in accordance with the Rule 16 of the Environmental Conservation Rules, 2023.

IV. The project authority shall submit the EIA report to the Head Office of DoE in Dhaka.

V. Without approval of EIA report by the Department of Environment, the project authority shall not make any land and infrastructure development.

07.09.2023

(Masud Iqbal Md. Shameem)
Director (Environment Clearance)
Phone: 88-02-222218342

Managing Director
Avangurd Shipyard Limited
1 No. Pankhali Union, Dacope, Khulna

Copy Forwarded to:

1. Director, Department of Environment, Khulna Divisional Office, Khulna.
2. Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

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Abbreviation

IEE	Initial Environmental Examination
ECC	Environmental Clearance Certificate
NEQS	National Environmental Quality Standards
BOD	Biochemical Oxygen Demand
CDM	Clean Development Mechanism
COD	Chemical Oxygen Demand
CP	Cleaner Production
DO	Dissolved Oxygen
DoE	Department of Environment
EC	Electrical Conductivity
ECR	Environmental Conservation Rules
EMP	Environmental Management Plan / Environmental Monitoring Plan
EMS	Environmental Management System
SAARC	South Asian Association of Regional Cooperation
EIA	Environmental Impact Assessment
EQ	Equalization
ETP	Effluent Treatment Plant
GETTS	Global Environmental and Textile Technological Services
GoB	Government of Bangladesh
UNCED	United Nation Conference on the Environment and Development
AQI	Air Quality Index
KW	Kilowatt
HSE	Health & Safety Executive
OSHA	Occupational Safety and Health Administration
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
NEMAP	National Environmental Management Action Plan
NGO	Non-Government Organization
MSDS	Material Safety Data Sheet
PPE	Personal Protective Equipment
P^H	Potential of Hydrogen
ppm	Parts Per Million
PVC	Polyvinyl Chloride
PRSP	Poverty Reduction Strategy Paper
OWS	Oil Water Separator

Chapter 1: Executive Summary

AVANGUARD SHIPYARD LTD. is to be incorporated in Bangladesh as a limited company with a vision to establish as one of the most progressive and diversified shipbuilding service provider companies in the sub-continent. With long-term focus towards developing and establishing sustainable business footprint, AVANGUARD SHIPYARD LTD. will strive towards heavy technologically advance shipbuilding services aimed at numerous customers in Bangladesh and beyond. The company aspires to engage in long-term and sustainable business vision leading by talented team of leaders and professionals in the sector. With continuous focus on quality improvement and value addition, adoption of top-of-the-line technology, commitment towards maintain safe and healthy workplace for the workers and strict adherence to buyer requirements, this company will become one of the most preferred Shipbuilding service providers in future.

The Bangladesh shipbuilding industry is the upcoming player in global market for small and medium sea-going vessels. While the industry mainly caters to the domestic market, exports have been growing satisfactorily over the last decade. Bangladeshi companies have exported ro-ro vessel, multipurpose container vessel, tug boat, landing craft, bulk carrier, patrol vessel, catamaran water taxi, ferry, oily waste collection vessel and passenger vessels to various countries in Europe, Africa and Asia.

There are currently more than 100 ship builders and over 120 registered shipyards of varying size, located mostly on the river banks. In Bangladesh, almost 90% of fuels, 70% of cargos and 35% of passengers are moved by waterways, bringing about a huge domestic demand for vessels. Owing to steady economic and trade developments, and activated infrastructure projects, locally registered number of vessels has increased with average annual growth rate of 5.39%. Annual market value of local shipbuilding industry is currently valued around USD 1 billion, and the demand growth is forecasted to remain steady along with the economic growth. Annual building capacity for export orders is estimated as more or less 20 vessels currently. Vessels built locally for domestic usage include MPV, container, bulker, tanker, dredger, tug as well as passenger ferry, and ranges from 1,000 to 20,000 dwt in size.

The **AVANGUARD SHIPYARD LTD.** intend to build a shipyard at **Pankhali, Dacope, Khulna, Bangladesh.** Geographically the project is located between **22°36'41.4"N latitude and 89°31'19.8"E longitudes.** Total land area of the proposed project will be **42.4108 acre (4,241.08 decimal)**. The size of the yard is 3,960 decimal (161,617 m2 or 120 bigha) and we are in the final stages of processing a registered "Bayna Deed" at a strategically advantageous block of land. The draft is 10m+ all year round (Ref: Annex 22), and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Also, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all.

Mr. Mohammed Imtiaz Hossain, Managing Director, Founder and Shareholder: Mr. Mohammed Imtiaz Hossain, before incorporating ASL, served in a major shipbuilding company, Three Angle Marine, as its Director (Business Development), where he worked on Government contracts of more than BDT 800 crore (approx. USD 90 million), having a role that was quite vast and multi-faceted and it covered Commercial, Banking, International Procurement, Finance and Government Tenders. He is an alumnus of the prestigious Imperial College London, consistently ranked as one of the top 5 universities in the world. Before moving back to Bangladesh in 2011, he spent 7 years working with global giants of the financial services industry of London, UK such as Deutsche Bank (the 22nd largest bank globally with assets worth USD 1.5 trillion), Deloitte and PwC (the last 2 being the number 1 and number 2 Consulting Firms in the world, with revenues of USD 45.1 billion and USD 50.2 billion respectively). During his time at these prestigious organizations in London, his Business Advisory Services client portfolio included the biggest names from both the Government and Private Sectors, such as Office of the Deputy Prime Minister of UK (under Lord John Prescott's Administration during Prime Minister Tony Blair's regime), the National Health Service (UK), British Railways Board Residuary Limited, Shell, JP Morgan, Royal Bank of Scotland, Morgan Stanley, Banco Santandar, Schroders Investment Management, Charles Taylor Consulting plc, Legg Mason Investments, MAN Funds, Adam and Company plc, Lord Abbett, etc.

The Chief Technical Consultant, a South Korean national, is a decorated veteran of the industry and has an experience of almost 44 years, having started his career at Samsung Heavy Industries (the 3rd largest shipbuilder in the world) as an Assistant Manager (Production) in 1978. In 1983, he then went on to join Hyundai Heavy Industries, the number 1 shipbuilding company in the world in terms of revenue, where he spent 30 years, the final 10 years of which he was the Managing Director of Hyundai Mipo Shipyard. His specialism throughout his career is shipyard production/construction planning and management. In fact, he developed the ERP system that is now used by Hyundai Heavy Industries. Since 2013, he has been freelancing as a Technical Consultant with Sundong Shipyard and STX Shipyard (the 4th largest shipbuilder in the world).

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Avanguard Shipyard Ltd. already got ToR approval from DoE vide memo number 22.02.0000.018.72.061.23.119, dated-September 07, 2023. The said project will be very close to Pankhali, Dacope, Khulna, Bangladesh (On the Banks of River Rupsha (Previous name Japjapiya), on the opposite side of Rampal Power Plant). The project area has sorts of communication facilities. It is accessible through the Khulna to Chalna Road.

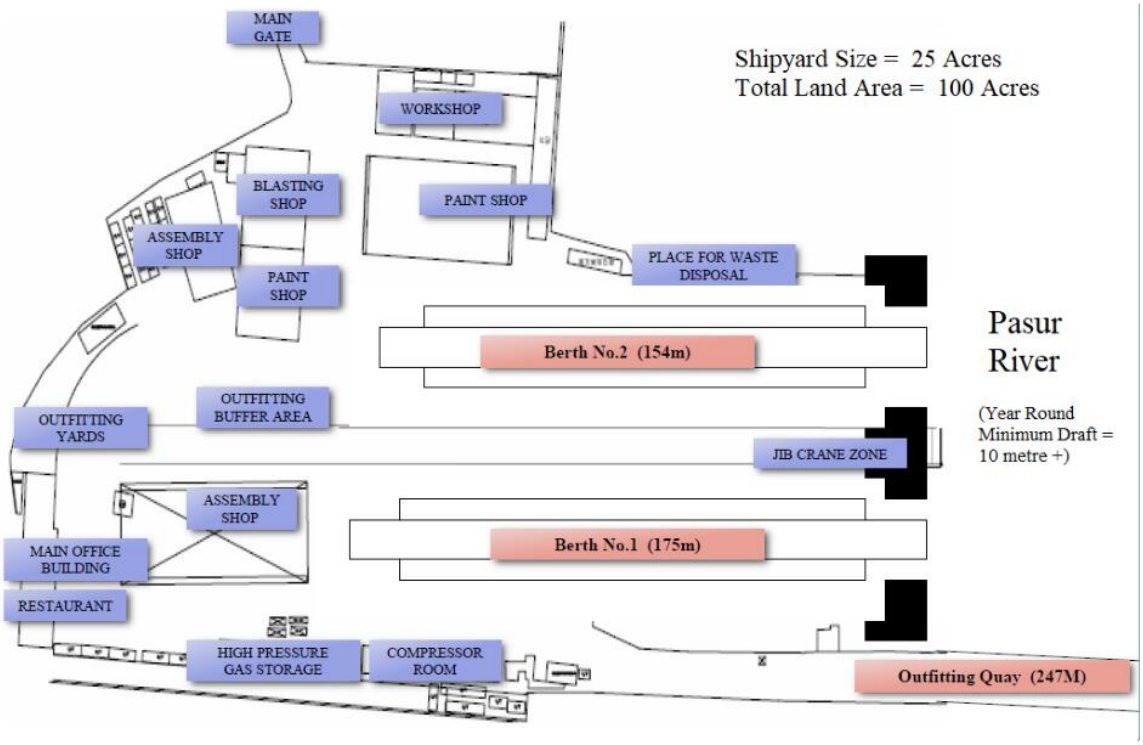

Figure 1:1 shipyard Lay-out with details

Salient feature of the proposed project-

Name of the Project	**AVANGUARD SHIPYARD LTD.**
Type of Company	Private Company Limited by Shares
Project Proponent	Mr. Mohammed Imtiaz Hossain
Designation	Managing Director
Project Cost	410,25,15,242 BDT (Four hundred and ten corer twenty-five lac fifteen thousand two hundred and forty-two taka only
Location	Pankhali, Dacope, Khulna, Bangladesh.
Coordinate of the project	**22°36'41.4"N latitude and 89°31'19.8"E longitudes**
Total land area	Total Land - 42.4108 acre (4,241.08 decimal)
The size of the yard	The size of the yard is 3,960 decimal (161,617 m2 or 120 bigha) and authority are in the final stages of processing a registered "Bayna Deed" at a strategically advantageous block of land. The draft is 10m+ all year round (Ref: Annex 22), and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability

	to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Also, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all.
Final Products	Building of commercial vessels: passenger vessels, ferry-boats, cargo ships, tankers, tugs, hovercraft (except recreation-type hovercraft) etc.
Production Capacity	Construction of Ships and other Water Borne Vessel or Hull Block= 40.67 (Piece) or 120269 ton per year. Repair Services 100 piece.
Sales	Local 44%, Foreign 56%
Locally procured raw materials	Furniture & fittings, consumables (welding's rod, Oxygen, LPG, electricity), steel pipes, Steels angles
Imported raw materials	Steel Plate, Steel Angles, Various Other Steel Structures, Main Engines, Gearbox, Thrusters, Propeller, Steering gear, Generator, Anchor Windlass, Towing Winch, Hydraulic Power Unit, Anchor, Anchor Chain with Accessories, Towline, Mooring Line, Capstan, Towing Hook, Deck Crane, External Fire Fighting System, Engine for External Firefighting Pump, Sewage Treatment Plant, Valves, Door, Windows, Pump with Engine, Oily Water Separator, General Service and fire pump, Bilge and ballast pump, Emergency Fire pump with Diesel Engine, Fresh Water Hydrophore System, Salt Water Hydrophore System, Fuel oil transfer pump, Sewage Pump, Oily Bilge Pump, Pumps For Liquids (With Or Designed To Be Fitted With A Measuring Device), Radar, Echo-sounder, DGPS, VHF, Inclinometer, Speed log (Doppler), Clearview Screen, Aneroid Barometer, SSB Set, Anemometer, Magnetic compass (with dimmer), Binocular, Thermometer, Window wiper, Public address system, General alarm system, Fog horn, Hand Mike, Air Horn, Fog Bell, Air Bag, Fender, Mooring Rope, Navigational Equipment, Transmission Shaft, Ships or Boats Propellers and Blades, Marine clock, Search Light, Deck Light with Frame & Fittings, Interior/Cabin light with frame & fittings, Electrical Board, Navigation Panel Board, Horn, Shadowless Operation Lamps, Aluminum Pipe, Aluminum Plates, Mast Light, Starboard Light, Port Light, Stern Light, Not Under Command Light, Anchor Light, Day Light (Black ball & Diamond Shapes), Fog Light, Walkie Talkie, Life buoy with support, Life Jacket, Life Jacket (infant), Life buoy with M line,

	Life buoy with self-igniting light, Self-igniting light, Life Line, First Aid box with medicine, Portable type Fire Extinguisher (Foam, DCP, CO2), Dry Powder fire extinguisher, Foam extinguisher, CO2 extinguishers, Foam Type fire extinguishers, Fire hydrant, Hose pipe with Nozzle (Jet + Spray), Fire hoses with combined fog/jet nozzle, Fire hose pipe cradle box, Self-contained breathing Apparatus, Fire men out-fit, Safety lamp, Fire Bucket, Fire axe, Sand box Engine room, Scoop, Fire men out-fit, Fire blanket, CO2 Welding Machine, Submerged Welding Machine, Auto Carriage, Gauging Welding Machine, Tig Welding Machine, Portable Welding Machine, Block Lifter, Fork Lift, Turbo Fan, Dehumidifier, Gas Heater, Vacuum Recovery, Dust Collector, Dehumidifier, Vacuum Recovery, Dust Collector Set, Air Blast Unit, Sand Blasting Unit, Gas Collector, Plasma Cutting Machine, Gas F/P Cutting Machine, Winch With Diesel Engine, Wire rope steel core, H.D.G Mooring Wire.
Manpower	Local 200 Persons, Foreign 4 Persons, Total 204 Persons
Power Requirement	96 KWH per 1 Ton steel
Alternative Source	Generator and Solar Power
Source of Water	Deep tube-well
Wastewater Treatment, STP	This project not produce any waste water but some spillage of oil will be treated by **oil water separator** and the human waste will be treated by septic tank and soke well than **1 m^3 per hour STP.**
Estimated Solid waste generation	All the solid waste is reused on the production and rest of the solid waste sell to the 3rd party.
Safety and Emergency Preparedness	Fire extinguisher, Fire alarming system, Fire pumps, Fire escape route, Fire hydrant and hose reel, Smoke detector, Wet risers, Sound screening mechanism, Ramp for handicapped people
By Product, If any	**The shipbuilding industry deals with the production of larger (mainly seagoing) vessels intended for the merchant fleet (cargo or passenger transport), the off-shore energy industry or military purposes. It also includes products and services supplied for the building, conversion, and maintenance of these ships.**

Proper mitigation measures will be taken to reduce waste generation and mitigate environmental pollution. The project proponent is very concerned about the environment and building an environmentally sustainable project.

Major concern's related to the project:

Shipbuilding, shipping, and ship recycling are three very distinct industrial operations, and are typically treated as such. However, they are highly interlinked activities when considering the impact that ships have on the environment over their life-cycle. Attempting to assess the environmental impact of shipbuilding and its associated activities on this basis is nonetheless a daunting task, not the least because there is so little environmental information available on so many of the industry 's activities. This also means that while it is possible to establish the importance and seriousness of many of the industry 's environmental challenges, it remains difficult to make judgements as to their significance in terms of magnitude and impact.

The proposed project will have its own environmental monitoring unit/cell with trained manpower with the necessary equipment and other logistics along with required budget. Avanguard Shipyard Ltd. is planning to develop a working relationship with the Department of Environment (DOE) by undertaking a joint monitoring program to monitor ambient environment.

The project authority will also have a well-planned fire safety and disaster management plan. They are obligated to have an expert team for executing the plan and train people emergency response actions for earthquake, landslide and other natural and manmade disasters.

Chapter 2: Introduction

2.1 Background

Shipbuilding in Bangladesh can be traced to the medieval era that underwent gradual expansion during the British colonial rule. At the start of the new millennium, Bangladesh already had a basic shipyard industry and availability of skilled workers. According to 'Bangladesh: Diagnostic Trade Integration Study' of the World Bank (2013), export of commercial ships from Bangladesh in modern times started in 2005. The exporters were Ananda Shipyards and Shipways Ltd. of Dhaka. Shipbuilding is primarily a capital-intensive industry with labour playing an important role due to dependence on skilled and semi-skilled manpower. China, the Republic of Korea and Japan are currently the major global players because of cost cum price competitiveness. Cost-effective human resources, simplified import facilities for raw materials and duty-free market accesses to potential markets have encouraged Bangladeshi entrepreneurs to come forward in the ship-building business. As the global demand is going up after a period of stagnation, this is the time for Bangladeshi entrepreneurs to prepare for meeting a surge in global cum local demand for small and medium-sized ships.

STATUS UP TO 2013: Following the footsteps of Ananda, the Chattogram-based Western Shipyard came forward by building on its experience of ship repair and maintenance of classed vessels. It entered the shipbuilding industry in 2008 and the first orders from Europe arrived very soon. More than 20 vessels were delivered by Ananda and Western Shipyards between 2008 and 2012 with an export value of over 100 million US dollar. Although Bangladeshi firms demonstrated the capacity to build different categories of vessels, only multipurpose vessels (MPV) and ferries were exported during the period (World Bank, 2013).

The steep upturn of the shipping cycle with increasing freight demand and subsequent increase in orders at shipyards across the world during 2008-09 stretched the capacity of Bangladeshi yards both on the commercial and technical fronts. Manufacture of export-oriented classed ships followed standards that were different from domestic shipbuilding. This skills-gap was minimized especially with the help of Bangladeshis who had worked in Singapore and Dubai, through transfer of knowledge. Technical assistance in the shipbuilding process was largely provided by the owners, which included training programs at the yards, hands-on teaching by classification societies, and counselling from overseas experts. Previous experience with classed vessels through repair and maintenance jobs was the basic enabler, as shipyards were already familiar with many regulations and quality standards (World Bank, 2013).

The question that arises now is how Bangladesh can further build up its capacity, broaden the shipbuilding value chain, and establish shipbuilding industry as important contributor to GDP and exports. Stable and growing domestic demand will undoubtedly help the sector upgrade its productivity and quality. With improved competitiveness in an expanding global market, Bangladesh can certainly increase the volume and quality of its ships in the long run.

Capacity of the Sector:

Despite significant improvements in the past decade, shipbuilding industry in Bangladesh is still in a budding stage. Production in most of the Bangladeshi shipyards is still directed mainly towards the domestic market. Around 200 yards (of which 124 were registered) existed in Bangladesh as of 2013, of which only two yards could manufacture export quality vessels of up to 7,000 DWT. In addition, some shipyards had the capacity for producing exportable ships, which included Highspeed Shipbuilding & Engineering, Khan Brothers, Khulna Shipyards, Meghna Shipyard and Narayanganj Shipbuilders.

Major types of vessels produced in Bangladesh up to 2013 included MPVs, container vessels, bulkers, tankers, passenger ferries and tugs, of whom only MPVs and ferries were exported. The yards that exported ships possessed equipment and shops for computer numerical control (CNC) machining, bending, welding, shot blasting and heavy lifting. However, it was only possible to build ships of up to 15,000 DWT due to space constraints in the shipyards.

The number of skilled and semi-skilled people employed in the shipbuilding industry of Bangladesh is estimated to be about 150,000. Total output was estimated to be about 250,000 gross tons (GT) per year in 2011, of which 185,000 GT were for the local market. In contrast, China employed 400,000 people in 2,000 shipyards and related industries with a production volume of 14 million GT, while Vietnam employed 110,000 people for a production volume of 600,000 GT (WB, 2013). Bangladeshi exporters have relied strongly on the services of foreign experts and local staffs with international experience, especially for transfer of knowledge.

The value chain for forward and backward linkages with shipbuilding industry has much potential for broadening. When produced for the domestic market, the share of value creation besides actual building is up to 25 per cent. But this share is usually only 1 per cent for exported ships. The main reasons why linkage industries have not grown satisfactorily are comparatively small size of the shipbuilding market and dearth of skills and technology. There are, however, potential areas where linkage industries can be developed with the help of foreign manufacturers.

Current Scenario

There has been no export of seagoing vessels from the country during the past two years. However, large industrial groups have now entered the fray and they are pressing into service one ship after another with carrying capacity of between 3 thousand and 5 thousand tons, mainly for the coastal routes. These ships are being used to fetch imported cargo including raw materials from the seaports and then carry those to the respective warehouses of the groups. Consequently, the country's status as a shipbuilding nation is fast on the rise. According to the latest report of UNCTAD, Bangladesh's ranking in the industry has shot up by 13 slots to 14th in the world, and the country has even overtaken India, Singapore, Spain, Romania, Malaysia, Norway and Indonesia. This ranking has been arrived at by collating relevant information on building world-class certified ships.

The industrial groups that have contributed towards bringing this laurel for Bangladesh are: Meghna Group, City Group, Bashundhara Group, and the Delta Shipyard Limited of TK-Seacom

(TK Group and Seacom Group). During 2019-21, the Meghna Shipbuilders and Dockyard of Meghna Group built 22 ships, Khan Brothers Shipbuilding of City Group 36, Bashundhara Steel and Engineering Limited 8, and the Delta Shipyard 7 ships. Besides, the Akij Group is also planning to come forward in the sector in a big way. According to insiders, the number of ships in coastal routes certified by the 12 member societies of International Association of Classification Societies (IACS) is fast rising. Ships have been built under the supervision of renowned entities like Bureau Veritas and IRCLASS. All these ships possess required technical and security features for plying on coastal routes, and over 70 such ships have been built during the past three years for carrying LPG, fuel, edible oil, consumer goods, and containers.

As a consequence of this latest surge in shipbuilding for coastal routes, the import of ships having 3,000-to-5,000-ton capacity is now declining. Five such ships were imported during 2018 at a cost of US$ 16 million. The number went down to merely two at US$ 6.1 million in 2019, and lastly one in 2020. Similarly, import of ships for carrying containers and LPG is also going down. Now, almost all ships meant for the coastal route are being manufactured within the country. According to observers, the local demand for ships per year is now over 100, commensurate with the rising import of raw materials required by factories and manufacturing plants.

According to industry insiders, there are now around 4,000 small-sized lighter ships in the country that have average carrying capacity of about 1,200 tons. The entrepreneurs are therefore tilting towards ships having between 3,000- and 3,500-tons carrying capacity. Considering the depth of navigation channels between Chattogram and Dhaka, ships of such carrying capacity can easily ply on the coastal cum inland routes. Consequently, the smaller ships are expected to be replaced gradually by the larger ones. As all shipbuilding facilities are currently located beside the rivers, experts are calling for setting up special zones beside the sea for facilitating the construction of larger ships.

Key Challenges and Opportunities:

Reliance on stable domestic demand and improvement of quality cum productivity for export are the two most viable strategies for local shipbuilding industry. Based on the experiences of China and Vietnam as well as other countries, there are also five key success factors that are applicable for the shipbuilding industry in Bangladesh. These are: (1) grow the industry during periods of increasing demand; (2) ensure government support; (3) attract FDI and foster joint ventures; (4) broaden the domestic supply industry; (5) and provide low-cost skilled workforce cum proper yard management.

There is no comprehensive master-plan for the shipbuilding industry in Bangladesh, which needs to be prepared urgently. Besides, the following measures by the government can lead to improved infrastructure and quality: (a) regulate the number and quality of new shipyards through issuance of 'No Objection Certificates'; (b) rigorously enforce Shipbuilding Industry Development Policy 2020 that was approved by the government in 2021; (c) evaluate shipyards every five years; (d) look after the interests of workers through supervision on safety, work environment, and health

issues; (e) take action to prevent environmental pollution; (f) facilitate utility connections including electricity, water and gas; (g) register all shipyards; (h) assist in the establishment of ship design firms and backward/forward linkages. Industry insiders report scarcity and high cost of suitable sites as major obstacles for developing large shipbuilding yards. Linkages with roads, railways and power are also major constraints for existing and potential yards.

Demand for additional tonnages from the growing domestic and coastal trades represent a significant opportunity for the local shipyards to deepen experience with classed vessels and broaden their capacity. Bangladesh's shipbuilding industry is also likely to benefit from enforcement of stringent rules and standards through increased workload and improved capacity aided by higher technical requirements. Expansion of maintenance, repair and renovation services will also create newer opportunities, as these are more stable and labor-intensive businesses compared to building new ships.

Dr. Helal Uddin Ahmed is a retired Additional Secretary and former Editor of Bangladesh Quarterly.

Avanguard Shipyard Ltd. will be a Ship building project in Bangladesh and intend to start its construction activities after obtaining Site Clearance from the DoE with the areas of **Avanguard Shipyard Ltd.** will be equipped with the latest shipbuilding's facilities with strong safety measures.

Mr. Mohammed Imtiaz Hossain, Managing Director of **Avanguard Shipyard Ltd.** has proposed to set up this project. According to the ECR 2023, the project is categorized as **RED** as per schedule 1 and serial number 53, therefore the project requires EIA study for its Site Clearance Certificate. The proponent of Avanguard Shipyard Ltd. has requested to '**Global Environmental & Textile Technological Services (GETTS)**' for preparing EIA report on this project as per the DoE guideline. Accordingly, this EIA report has been prepared.

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Every physical development project directly or indirectly interacts with various components of the environment in a complex manner and it has a significant impact on the environment. It is very important to assess the direction and magnitude of the impacts of a development project to avoid unforeseen harmful consequences which would be affected desired benefit and sustainability of the project. EIA is a useful tool for estimating potential Environmental Impacts of a proposed project with provider of mitigation measures and Environmental Management Plan (EMP) within a very short period based on the information from both primary and secondary sources.

This document is the Environmental Impact Assessment (EIA) has been prepared for **Avanguard Shipyard Ltd.** to address environmental impacts resulting from the project. It is based on review

and updating of the environmental impact assesses, mitigations and management plans. During the detailed design, the EMP shall be further updated as a stand-alone EMP for each of the procurement packages, and appended to the contract document. This will allow integration of environmental provisions and management measures in the document.

2.2 Introduction to EIA

Environmental impact assessment (EIA) is an environmental decision support tool, which provides information on the likely impacts of development projects to those who take the decision as to whether the project should be authorized. The purpose of an EIA is to determine the potential environmental, social, and health effects of a proposed development, so that those who make the decisions in developing the project and in authorizing the project are informed about the likely consequences of their decisions before they take those decisions and are thereby more accountable. It is intended to facilitate informed and transparent decision-making while seeking to avoid, reduce or mitigate potential adverse impacts through the consideration of alternative options, sites, or processes.

An EIA is conducted in response to a project proposal and therefore, the assessment procedure is project-centered. That is, the procedure is molded around the normal project planning process. This concept is called integrated project planning. Integrated project planning requires the project planner to assess and evaluate his planning decisions taking into account the technical, economic, social, and environmental factors. It implies that EIA should be a continuous process throughout the course of project planning.

EIAs and environmental management tools effectively complement other main planning tools such as economic analysis and feasibility studies, as they assist decision-makers (regulatory bodies, Project Proponents, etc.) to ensure their project plan is economically, environmentally, and socially sound and sustainable. Since project planning and development involve various stages of different scales, it is important to understand the role of each stage in the project planning and development cycle.

2.3 Steps in EIA Process

The EIA process comprises six key steps:

2.3.1 Screening

The first step in the process, screening helps to decide whether an EIA is required for a project. An appropriately designed screening system can, thus, prove to be an effective tool for preventing the squandering of time and money on assessing projects with insignificant environmental impacts.

2.3.2 Scoping

This step begins after screening has decided on the requirement for an EIA. Scoping is considered the backbone of the EIA process and is ideally undertaken at the project planning stage. The main objective of the scoping process is to establish the environmental and social priorities and set the boundaries for the study and define the Terms of Reference (ToR) for the impact assessment.

Systematic and well-planned scoping forms the basis for an effective and efficient EIA process. It also helps avoid unfocused and voluminous reports.

2.3.3 Baseline data generation:

Baseline data provides a detailed description of the existing status of various environmental and social components in the study area. Both primary and secondary data is collected to describe this status.

2.3.4 Impact assessment

In this step, the characteristics of potential impacts are identified, evaluated, and predicted using the baseline information on one hand and the features of the project on the other (cause-effect relationship). Impact predictions are normally done by using common methodologies and models. However, models can be used with care and prudence, as most of them are designed keeping in mind the requirements of the developed world; also, in most developing countries, the quality of data used to design these models is not always adequate.

2.3.5 Mitigation of impacts

At this stage, the possible preventive, remedial, and compensatory measures for each adverse impact are determined and recommended. The application of mitigation hierarchy (avoidance, minimization, mitigation, compensation/ offset) is adopted.

2.3.6 Environmental Management Plan

An environment management plan (EMP), also referred to as an impact management plan is prepared as part of the EIA reporting process. It translates recommended mitigation and monitoring measures into specific actions that have to be carried out by the proponent. Depending upon specific requirements, the plan may be included in the EIA report or can be prepared as a separate document.

EIA steps are shown in the flowchart:

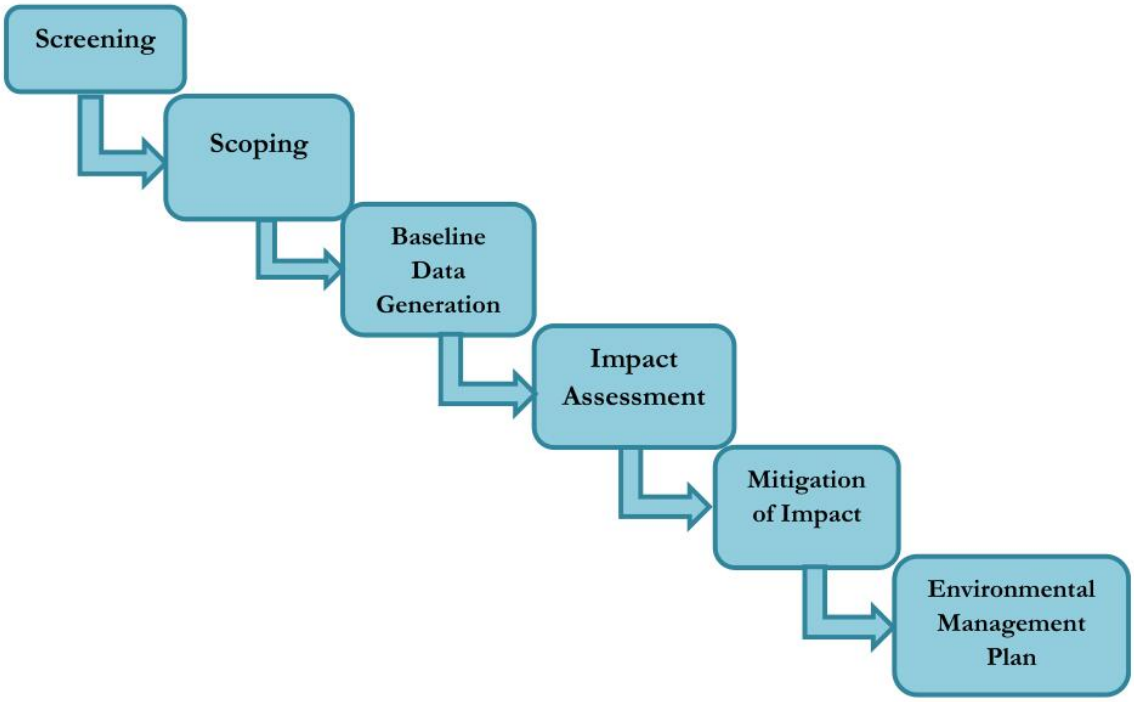


Figure 2:1 Flowchart of EIA Steps

2.4 Need of an EIA

The environment is composed of Biotic & A-biotic components. There is a dynamic equilibrium between these components. When a project is undertaken, it tends to disturb the environmental equilibrium. To maintain the quality of the environment it is essential to study the perspective impacts of the project on the natural environment on time and remedial measures are taken to promote the sustainable and holistic development of the project. Environmental Impact Assessment (EIA) is a process that identifies both the positive and negative environmental effects of significant developments before planning permission is considered. The EIA process is a method of ensuring that planning decisions are made with the full knowledge of the environmental effects and with full engagement of statutory bodies, local interest groups, and members of the public.

An EIA should allow decision-makers to assess a project's impacts in all its phases. It should also allow the public and other stakeholders to present their views and inputs on the planned development. Furthermore, to be truly effective, an EIA must contribute to and improve the project design, so that environmental, as well as socioeconomic measures, are core parts of it. Information used in the EIA needs to be based on good data, use accepted methodological approaches, and be summarized in plain language that is understandable for decision-makers.

Finally, the EIA does not end with the granting of a license to operate. It is critical that the approved practices and design are followed during the project operations and construction and that ongoing monitoring is in place during the lifetime of the project.

1. Identification of potential environmental impacts
2. Studying the significant environmental impacts
3. Assessing the probability of these impacts to be mitigated
4. Recommending preventive and corrective measures to reduce the negative impacts
5. Informing decision-makers and stakeholders on the environmental consequences
6. Giving opinion (council) on whether the development of the relevant investment proposal should continue (M. Sabeva, 2015).

2.5 Ideal EIA System

An Ideal EIA system would be

- Apply to all projects that are expected to have a significant environmental effect and address all impacts that are expected to occur due to that project.
- Compare alternatives to a proposed project, management techniques, and mitigation measures.
- This results in a clear EIS (Environmental Impact Statement) which conveys the importance of the likely and their specific characteristics to non-experts in the field.
- Include broad public participation and stringent administrative review procedures.
- Be timed to provide information for decision-making.
- Be enforceable.
- Include monitoring and feedback procedures.
- Therefore, the purpose of EIA is to help design projects which enhance the quality of the environment by examining alternative and remedial measures throughout the entire course of planning and designing of the development projects.

An ideal EIA system should be containing some necessary issues given in the following figure-

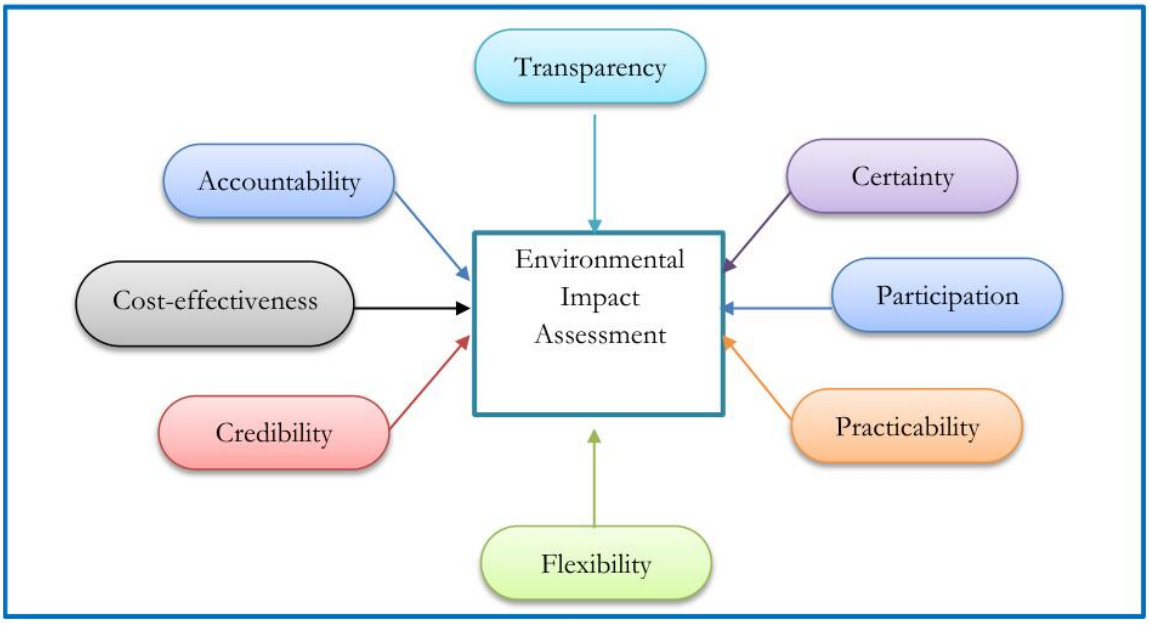


Figure 2:2 Components of an Ideal EIA

2.6 Aims and Objectives of the EIA

The objective of the study is to produce a report on the EIA study based on which Environmental Clearance from the Department of Environment (DoE) will be obtained.

The objective of this EIA study towards **Avanguard Shipyard Ltd.** is to identify and evaluate the potential impacts (beneficial and adverse) and prepare of impact statement following the existing guidelines of DoE. The study provides information on the environmental implications, which could be used for environmental safeguards.

The EIA report is a document for getting environmental clearance from statutory agencies. The EIA report also presents the existing environmental setting, contribution of pollutants, and other factors from the proposed facilities.

The specific objectives of this EIA are to**:**

- Present a general description of the project and its activities;
- Present a description of the pre-project environment, the physical and biological environment, Delineate the significant environmental issues found and believed to be involved in the project;
- Identify the environmental impacts of the project activities and quantify them to the extent possible;

- Suggest the plan for the management of the environment, during the implementation and operation stages of the project.
- Provide information and recommendations on procedures, processes, and practices that must be implemented to attain Environmentally Sound Management (ESM) in the project area.
- Assisting and facilitating the improved management of occupational health and safety issues in or about the workplace.
- Assessment of the socio-economic impacts due to the construction of the said 5-Star Hotel of the proposed project;
- Preparation of a detailed Environmental Management Plan (EMP) for the proposed projects to reduce the negative impacts and ensure sustainable development.
- Provide recommendations or guidelines on the successful implementation of the EMP.

The aims and objectives of the EIA study on the proposed **'Avanguard Shipyard Ltd.'** are as follows:

Immediate Objectives:

- Modify and improve the Environmental design of the proposal
- Ensure that resources are used appropriately and efficiently
- Identify key measures for mitigating the potential impacts of the proposal
- Facilitate informed decision-making and set the environmental terms and conditions.

Long-Term Objectives:

- Protect Human Health and Safety
- Avoid irreversible changes and serious damage to the environment
- Safeguard valued resources, natural areas, and ecosystem components; and
- Enhance the social aspects of the proposal

2.7 Performance of the Assessment

This report has been prepared on the following basis.

(a) Site Visit: The members of the compliance team of the factory and the consultant team have been visited the to determine the possible environmental impacts of the existing factory and recorded the prevailing conditions of the environment as it exists before the implementation of the project.

(b) Identification and Evaluation: The adverse and beneficial effects of the existing factory on the environment have been evaluated.

(c) Discussion of Alternatives: Various possible alternatives have been discussed.

(d) Preparation of Checklist: A checklist has been prepared to ensure complete coverage of all the possible consequences of the Existing factory so that it can be determined what administrative actions should be taken.

(e) Developed of Environmental Impact due to the project: For identifying the impact of the factory on the environment, a checklist of the environmental attributes has been developed that reflects the impact on the environment resulting from a particular action.

(f) Set mitigation measures and Environmental Management Plan: After identifying the Environmental Impacts, the expert team of the consultant has identified mitigation measures and detailed environmental management set for the factory.

2.8 Limitations of the Report

The impact assessment report (study) has been prepared for the proposed project is largely based on the project information from the client, discussion with the local community and other stakeholders, and observations from various surveys and investigations undertaken in the project area. Professional judgment and subjective interpretation of facts have been applied for this study. Any change in the project location, orientation, proposed factory components, proposed project activities is likely to result in variation in the impacts. It is to be noted that, any technological advances during the course of construction and Operation may change the impacts. EIA report is prepared based on hypotheses and proved the impact of similar activity. Although the time & resource limitations claim for more integration of report in future. Some limitations will be remaining after all efforts because of the following reasons.

First, it is difficult to predict which, if any of the potential environmental and social issues identified will become actual problems in the future, environmental regulations continually change, as do the enforcement priorities of the applicable governmental agencies involved.

Second, even for problems currently identified, it is often difficult and sometimes impossible to accurately estimate the liabilities that may be involved in mitigating the problem(s), for the legal and technological standards for evaluating, mitigating, and allocating liability for environmental issues are in a constant state of change. Moreover, the liability for mitigating environmental problems tends to be highly dependent upon agency negotiations and the sometimes arbitrary and unpredictable nature of agency officials charged with such negotiations.

2.9 Avanguard Shipyard Ltd. Commitments

We follow the rules and regulations of the land use as well as guided by the government and various codes. We always uphold the basic code of conduct that is stated below-

- Child labor is strictly prohibited;
- Providing pure drinking water to the customers;
- No Discrimination for hiring people;
- First aid treatment and legal minimum wages;

- Strictly maintained overtime hours and payments also safety;
- Deliver the social-economic benefits to employees and our dependents to uplift their livelihood;
- Complying with applicable environmental legislation and regulations;
- Conservation of natural resources through responsible management of energy and water use;
- Adopting cost-effective measures in the prevention of pollution from our processes;
- Motivating and preparing all employees to take personal accountability for protecting the environment;
- Planning, implementing, and reviewing environmental objectives and targets;

2.10 Consistency with DoE Guidelines

Environmental Conservation Act 1995 (ECA'95) is currently the main legislative document relating to environmental protection in Bangladesh. Under this act, 'No industrial unit or project shall be established or adopted without obtaining environmental clearance, in the manner prescribed by the rules, from Director General (DG). A set of the relevant rules to implement the ECA'95 has recently been promulgated (August 1997). The rules mainly consist of:

- Categorized list (green, yellow, orange, and red) of the project;
- Application format to take environmental clearance;
- Ambient standards in relation to water pollution, air pollution, and noise, as well as permitted discharge/emission levels of water and air pollutants and noise by industries.

The Rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation e.g., all the raw projects under the red category generally will require a two-steps assessment procedure, firstly an Initial Environmental Examination (IEE) for site clearance, and secondly, if warranted, a full Environmental Impact Assessment (EIA) for technical clearance.

2.11 Scope of the Work in Future

Based on the limitation, the scope of work in the future is the following:

- Further consultations with the local community and other key stakeholders of the project to understand public perception and their expectations from the project;
- Collection of additional secondary environmental, social and demographic information;
- Collection of information about flora and fauna that required conservation/scientific interest through a primary ecological survey of the study area;
- Identification and review of the applicable standards and identification of key issues;
- Evaluation of potential social impacts of the Project and its components (including associated facilities as per the details available);

- Suggest appropriate institutional arrangement and capacity-building needs for proper implementation of environmental and social management plans during the pre-construction, construction, and operation phase.

2.12 Methodology

The Environment and Social Impact Assessment study for the project has been carried out as per the requirements of the Environment Conservation Act and Rules, 2023. The environmental impact assessment study considers an area of 1 km around the project site as study area. Reconnaissance surveys were conducted to identify environmental and social issues in the project area. A detailed desk-based literature survey was also undertaken and relevant information was collected for environmental and social baseline assessment.

Social surveys were also conducted by Global Environmental & Textile Technological Services (GETTS) and the project-affected village was visited to collect information on the socio-economic and cultural aspects of the local community. Various government departments and other agencies were contacted to gather information relevant to the project or the project area.

Based on the proposed activities, impact analyses were carried out where potential direct and indirect impacts of the project activities have been considered. A detailed Environmental and Social Management and Monitoring Plan (ESMMP) have been formulated for the Project where measures are proposed to mitigate adverse impacts along with recommended good practices.

The following plans have been developed for the project along with impact assessment and mitigation measures identification.

- Construction Labor-Management Plan;
- Solid Waste Management Plan;
- Liquid Waste Management Plan;
- Gaseous Waste Management Plan;
- Occupational Health and Safety Plan;
- Emergency Response & Fire Management Plan;
- Environment Monitoring Plan;

The schematic diagram of the methods of the report is given in the following figure.

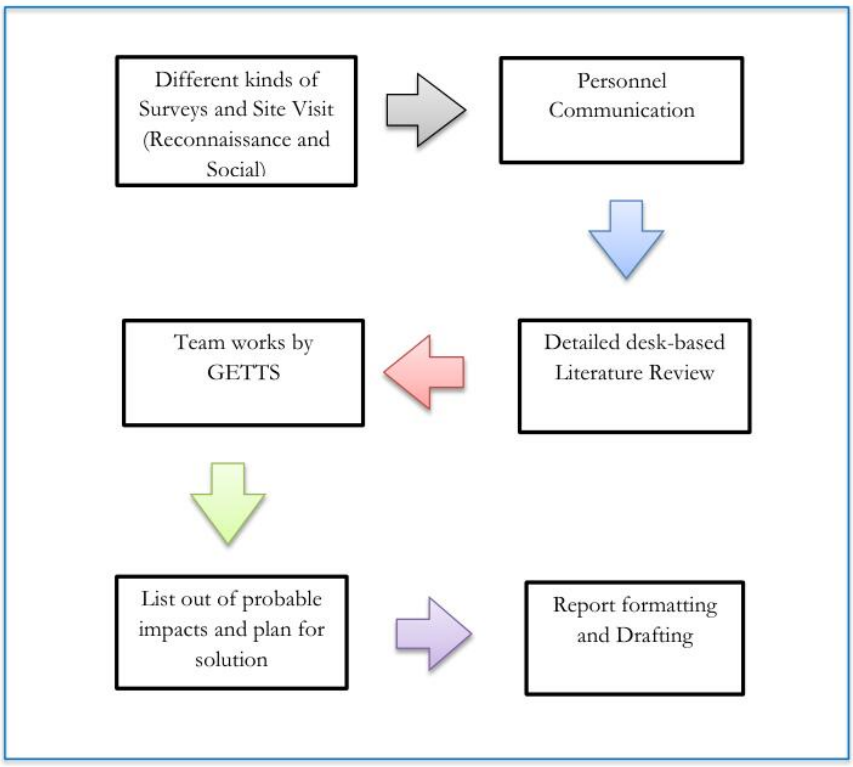


Figure 2:3 Schematic Diagram of the Methodology

2.13 About Project Proponent

Mr. Mohammed Imtiaz Hossain, Managing Director, Founder and Shareholder: Mr. Mohammed Imtiaz Hossain, before incorporating ASL, served in a major shipbuilding company, Three Angle Marine, as its Director (Business Development), where he worked on Government contracts of more than BDT 800 crore (approx. USD 90 million), having a role that was quite vast and multi-faceted and it covered Commercial, Banking, International Procurement, Finance and Government Tenders. He is an alumnus of the prestigious Imperial College London, consistently ranked as one of the top 5 universities in the world. Before moving back to Bangladesh in 2011, he spent 7 years working with global giants of the financial services industry of London, UK such as Deutsche Bank (the 22nd largest bank globally with assets worth USD 1.5 trillion), Deloitte and PwC (the last 2 being the number 1 and number 2 Consulting Firms in the world, with revenues of USD 45.1 billion and USD 50.2 billion respectively). During his time at these prestigious organizations in London, his Business Advisory Services client portfolio included the biggest names from both the Government and Private Sectors, such as Office of the Deputy Prime Minister of UK (under Lord John Prescott's Administration during Prime Minister Tony Blair's regime), the National Health Service (UK), British Railways Board Residuary Limited, Shell, JP Morgan, Royal Bank of Scotland, Morgan Stanley, Banco Santandar, Schroders Investment

Management, Charles Taylor Consulting plc, Legg Mason Investments, MAN Funds, Adam and Company plc, Lord Abbett, etc

2.14 EIA Team

A good qualified, knowledgeable and energetic team of Global Environmental and Textile Technological Services has participated to make this EIA report. They are experts in different fields of engineering, science, and sociology. During the preparation of this report, they have sat together, round table meetings, field visits, conversations with clients and people nearby the project, etc.

Table 2-1 EIA Team

S. L.	Profile	Details		Objects
1	**Engr. Md. Golam Kibria**	Designation	Chief Executive	Obtain a challenging leadership position applying creative problem-solving and fine management skills with 15 years of experience in this field. Passionate to achieve optimum utilization of its resources and maximum profits.
		Title	Supervisor	
		Qualification	B.Sc. Tech (Textile)	
		Experience	15 years	
		Institution	Bangladesh Textile University, Tejgaon	
		Contact No.	01711231512	
		Mail ID	engr.kibria_2010@yahoo.com	
2	**SK. Abdul Latif**	Designation	Mechanical Engineer	Dedicated individual with verse knowledge. Exceptionally good mechanical competence ·Excellent expertise in using CAD to explain and present the blueprints of the final structures
		Title	Team Member	
		Qualification	Dip. in Mechanical Eng., KPI	
		Experience	10 years	
		Institution	Khulna Polytechnical institute, Khulna	
		Mail ID	latif_pintu@yahoo.com	

3	**Md. Mizanur Rahman**	**Designation**	**Civil Engineer**	**An excellent academic record, ability to understand and work knowledge Civil Structure, and a strong field experience in ETP Installation**
		Title	Team Member	
		Qualification	Dip. in Civil Engr. PPI	
		Experience	10 years	
		Institution	Pabna polytechnical Institute, Pabna	
		Mail ID	mizanglobal14@gmail.com	
4	**Md. Shaik Hassan Ashik**	Designation	Team Member	Experienced chemist with strong math and data analysis skills. Seeking to utilize a working knowledge of chemistry and experience in the position of a Chemist.
		Title	Environmental Chemist	
		Qualification	MSc. In Chemistry	
		Experience	2 Years	
		Institution	Jagannath University, Dhaka	
		Mail ID	ashik111955@gmail.com	
5	**Shumya Jannat**	Designation	Environmental Executive	Performance-driven and motivated Environmental Engineer recognized for conducting professional site inspections and detailed project field assessments.
		Title	Team Leader	
		Qualification	B.Sc. &M. Sc. in Environmental Sciences	
		Experience	2 years	
		Institution	Jahangirnagar University	
		Mail ID	shumya.getts@gmail.com	

6	**Arifa Khatun**	**Designation**	**Environmental Engineer**	**Motivated problem solver with a bachelor's degree in engineering and a background in technical seeking Environmental Executive position**
		Title	Team Member	
		Qualification	Dip. in Env. Technology	
		Experience	6 years	
		Institution	Pabna polytechnical Institute, Pabna	
		Contact No.	01963367876	
		Mail ID	arifakhatun1997a@gmail.com	
7	**Saiful Islam Bivor**	Designation	Environmental coordinator	Provide technical & Management System Consultancy to organizations on Quality, Health Safety & Environment based on International Standard Requirements.
		Title	Team Member	
		Qualification	B. Sc. in Environmental Sciences	
		Experience	1 year	
		Institution	Independent University Bangladesh	
		Mail ID	bivorislam24@gmail.com	
8	**Laila Tul Zannat Jyoti**	Designation	Environmental Engineer	Inspect industrial or municipal facilities or programs to evaluate operational effectiveness or ensure compliance with environmental regulations.
		Title	Team Member	
		Qualification	B.Sc. in Civil Engineering	
		Experience	Fresher	
		Institution	Khulna University of Engineering & Technology	
		Mail ID	lzannat@yahoo.com	

Chapter 3: Acts, Policies, Rules & Regulations

3.1 Overview

Effective project planning requires not only good technical expertise but also proper understanding of government policies relevant to environmental protection and management. An understanding of these policies is useful to ensure that development projects are undertaken in a manner that does not conflict with stated policies but ideally complements them. Additionally, the legal and administrative requirements and procedures that affect a project are important considerations, especially during the stage of planning approval.

Various national policies and legislations that are prescribed in the country are of relevance to environmental protection and management. While there are those that are of direct relevance to environmental pollution control, many of the other policies and legislations relate to resource protection and conservation, and these include forest, fisheries, land, mineral resources, community and occupational safety & health, and others. Although these environment and social-related legislations fall within the responsibilities of other agencies and authorities, they nevertheless need to be understood as EIA requires a holistic approach to be adopted in order that a comprehensive assessment to be achieved.

It is good EIA practice to make it a point to review statutory and non-statutory requirements for a project, as this will provide a clear understanding of how best an EIA can proceed. Clearing the legal and administrative requirements of authorities is as important in project planning as does clearing the technical and financial concerns. A summary of the legal and administrative requirements for the project within an EIA report will assist the Project Proponent and the authorities keep into focus on environmental objectives during the EIA review process.

This chapter highlights some of the more important statutory and non-statutory requirements that may directly or indirectly affect the planning and development of a project in the industrial sector. It is, however, incumbent on the Project Proponent, and the Consultant/ assessor engaged to undertake an EIA, to review these and other legislation and authority requirements each time a project is undertaken, as changes in the form of new legislation or amendments to older ones may be made from time to time.

3.2 Legal Enforcement Agencies

The responsibility for formulation, implementation, and modification of national-level environmental laws in Bangladesh lies with the Ministry of Environment, Forests and Climate Change (MoEFCC). The Department of Environment (DoE) was established under the Environmental Pollution Control Ordinance, 1977 which functions under the MoEFCC. It is responsible for carrying out the purposes and provisions of the Environment Conservation Act, 1995 as amended till 2010 (hereinafter referred to as ECA) which is the umbrella legislation regulating environmental issues in the country. A brief description of the relevant legal enforcement agencies has been described below-

3.2.1 Ministry of Environment, Forests, and Climate Change (MoEFCC)

The MoEFCC is the nodal agency in the administrative structure of the Central Government, for the planning, promotion, coordination, and overseeing the implementation of environmental and forestry programs. It oversees all environmental matters in the country and is a permanent member of the Executive Committee of the National Economic Council.

It plays a pivotal role as a participant of the United Nations Environment Programs (UNEP). Its principal activities include:

- Conservation & survey of flora, fauna, forests, and wildlife;
- Prevention and control of pollution; and
- Forestation & regeneration of degraded areas and protection of the environment in the framework of legislation.

3.2.2 Department of Environment (DoE)

An Environment Pollution Control Board was set up under the Environment Pollution Control Ordinance, 1977. It underwent a series of subsequent restructuring and was finally renamed as Department of Environment in 1989. It is headed by a Director-General appointed by the Government.

The DoE through its head, divisional, and district-level offices conduct the following principal activities:

- Advising the Government to avoid such manufacturing processes, commodities, and substances which are likely to cause environmental pollution;
- Advisory and issuing directions to the concerned person regarding the environmentally sound use, storage, transportation, import, and export of a hazardous substance or its components;
- Conducting inquiries and research activities on conservation, improvement, and pollution of the environment and helping any other authority/organization regarding the same;
- Collection and publication of information about environmental pollution;
- Conducting programs for observation of drinking water quality and issuing directives if necessary for adherence to drinking water quality standards;
- Formulation of environmental guidelines;
- Prescribing and modifying environmental quality standards regarding air, water, noise, vehicular emissions, etc.;
- Issuing Location Clearance and Environmental Clearance Certificates to projects; and
- Implementation of provisions of ECA and rules made thereunder.

3.2.3 Water Resources and Planning Organization (WARPO)

It was established under the Water Resources Planning Act, 1992. Its core functions include:

- Monitoring the implementation of the National Water Management Plan (NWMP);
- Upkeep of water resource assessments;

- Maintenance, updating, and dissemination of the National Water Resources Database (NWRD) and MIS;
- Secretariat to the National Water Resources Council (NWRC) and the Executive Committee of the National Water Resources Council (ECNWRC);
- Responding to the NWRC/ECNWRC requests for information and advice;
- Periodic update of the NWMP;
- Assisting other agencies in planning, monitoring, studies, and investigations;
- Adhoc advice on policy, strategy, institutional and legal issues;
- Laying down effluent discharge standards into the river in consultation with DoE; and
- Special studies and research as required.

3.2.4 Ministry of Fisheries and Livestock (MoFL)

The main functions of the MoFL include:

- Preservation of fisheries resources;
- Fulfilling the requirement of animal protein through proper management and planned development;
- Increasing socio-economic conditions of fishermen;
- Creating employment opportunities for rural unemployed and landless people;
- Expanding foreign exchange earnings by exporting fish and fishery products;
- Developing innovative technologies through research for fisheries development and preservation; and
- Protection of fishes through the implementation of the Protection and Conservation of Fish Act, 1950 as amended to date.

3.2.5 Bangladesh Power Development Board (BPDB)

It is a statutory body created on May 1, 1972, and is responsible for the major portion of the generation and distribution of electricity mainly in urban areas except for Dhaka and the West Zone of the country.

It has undertaken a massive capacity expansion plan to add about 10500 MW generation capacities in the next 5 years to achieve 24000 MW Capacity according to Power System Master Plan (PSMP) 2021.

3.2.6 Bangladesh Energy Regulatory Commission (BERC)

It was established under the Bangladesh Energy Regulatory Commission Act, 2003. Some of its key functions include:

- The issue, cancel, amend and determine conditions of licenses, exemption of licenses, and determine the conditions to be followed by such exempted persons;
- Regulation of generation, storage, supply, and transmission of energy;
- Determine tariff for electricity distribution etc.;
- Ensure control of the environmental standard of energy under existing laws;

- Extend cooperation and advice to the Government, if necessary, regarding electricity generation, transmission, marketing, supply, distribution, and storage of energy.

3.2.7 Ministry of Labor and Employment (MoLE)

It was established with the following objectives:

- Creation of employment opportunity;
- Creation of semi-skilled and skilled manpower;
- Enhancement of productivity of factories by creating friendly working environment between workers & employers;
- Ensuring the welfare of workers in different industrial areas;
- Implementation of labor laws;
- Fixing up minimum wages of labor; and
- Ensuring justice through Labor Court.
- It has been divided into four departments, viz:
- Directorate of Labor
- Chief Inspector of Factory and Establishment
- Minimum Wages Board
- Labor Appeal Tribunal

3.2.8 Ministry of Law and Parliamentary Affairs

This ministry is divided into the Law and Justice Division and the Parliamentary Affairs Division for functional purposes.

The Law and Justice Division of the Ministry of Law, Justice, and Parliamentary Affairs has the responsibility of providing legal advisory services to other ministries, divisions, departments, and organizations of the Government.

The parliamentary affairs division is assisted by the law commission and the human rights commission and its main function lies in formulating, scrutinizing, and preparing legislation. When needed, it provides legal opinions and translations for other ministries.

3.2.9 Ministry of Land

The ministry of land is in charge of land administration, management, and development for the overall growth of the nation. The Ministry manages Government-owned lands, vested properties, and abandoned properties. It is responsible for the collection of land development tax, land surveying, and record-keeping and updating. Land Acquisition and requisition fall under the responsibilities of this ministry.

3.2.10 Bangladesh Investment Development Board (BIDA)

The Board of Investment was established in 1989 by the Investment Board Act. The specific functions of the board are:

- Implementation of all provisions as lay down under The Investment Board Act, 1989.

- To promote domestic and foreign investment as well to enhance the international competitiveness of Bangladesh;
- To identify the hindrance of investment and provide necessary facilities and assistance in the establishment of industries.

3.2.11 Union Parishad

Union Parishad (UP) currently is the only elected statutory local government body for rural Bangladesh. A UP consists of a chairman and twelve members. They are elected based on adult franchises. Each UP has a full-time Secretary, appointed by the Deputy Commissioner (DC). The functions of UP are:

- Maintenance of law and order and conduction of censuses of all kinds.
- Registration of births, deaths, blind people, beggars, and destitute.
- Planning and implementation of development schemes in the field of agriculture, forestry, fisheries, livestock, education, health, small and micro enterprises, communications, irrigation, and flood control.
- Protection and maintenance of public property such as roads, bridges, canals, embankments, markets, telephones, and electricity lines.

3.3 Project Background

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. There is a need to integrate the environmental consequences of the development activities and for planning suitable measures in order to ensure sustainable development. The environmental considerations in any developmental process have become necessary for achieving sustainable development. To achieve such goals the basic principles to be adopted are:

- To enhance the quality of environment in and around the project area by adopting proper measures for conservation of natural resources;
- Prevention of adverse environmental and social impact to the maximum possible extent;
- To mitigate the possible adverse environmental and socio-economic impact on the project-affected areas.

The proposed project, the **Avanguard Shipyard Ltd.**, is covered under several environmental Policies & legislations pertained with the Government of Bangladesh. All the policies or legislation aimed at the conservation and protection of the environment. The existing policies and legislation, which are relevant to the environment, are described in the following sections.

3.4 Shipbuilding Industry Development Policy 2021

Chapter 1 Introduction

Bangladesh has a rich history of shipbuilding industry dating back to the early modern era. In the 15th to 16th centuries, Bangladesh became the center of sea-going ship manufacturing industries in Asia. In the first half of the nineteenth century, several ship manufacturing companies in Chottogram started building of commercial ships in Bangladesh with a capacity of 1000 DWT.

At present, more than 12,500 small and large vessels are transporting goods and passengers throughout the country. More than 20 internationally accredited shipyards as well as 100 local quality ship and dockyards are engaged in building these vessels. International standard shipyards are capable of building nearly 100 ships a year. The country is currently building ships with a maximum capacity of 10,000 DWT. There are about 700 small and large rivers in Bangladesh in addition to a long coastal boundary of the Bay of Bengal. The length of these rivers is about 22,155 Km. Three-fourth quarter of goods are transported in such river routes of the country.

Shipbuilding is a labor-intensive industry. It requires more investment, advanced technology and longer period of time to build a ship. Bangladesh's current position is very much traditional compare to other leading shipbuilding countries in the world in regard to provide financial investment, resource allocation and providing other facilities to encourage ship building sector.

The government has undertaken a massive development program, along with making an export oriented vibrant ship building industry, with a vision to brand the country a high-income country by 2041. The country's ship manufacturing yards are playing a significant role in providing heavy engineering and logistical support to government's development projects.

From 2008, Bangladesh has started exporting modern ships abroad. In the last few years, the domestic ship builders' industrial sector of country. If such potential sector gets governments all out support, it will be possible to earn about 4 billion US dollar annually through exporting ships in the next 5 years and accommodate one hundred thousand employments in this field.

The present government is providing varieties types of assistance to accelerate industrialization of the private sector in order to accomplish desired economic growth. In this regard, increase production in several industrial sectors, promotion of various sub-sectors, expansion of employment opportunities, reduction of import dependence, continuous growth of export earnings are some of the basic initiatives for accelerating industrialization.

Government is trying to expedite national growth by formulating policies and adopting strategies for the advancement of various industrial subsectors. Various countries of the world have pursued their growth through successfully adopting sector-based industry promotion policies. So far no distinct policy has been formulated for the advancement of domestic ship building industry in the country whereas policy formulation to support shipbuilding industry is essential for the sake of accelerating country's massive development activities, especially for the sake of forging effective partnership with on-going mega projects, expansion of shipping industry at the domestic, regional and international levels.

At present, the government has been given special importance on maximizing potentialities of 'Blue- Economy'. Exploration and extraction of marine resources through planned management is the main objective of Blue Economy. This requires long term planning, infrastructural development, and ensuring sustainable development in both coastal and offshore areas. In fact, it has opened the door to a new possibility for prosperity, and using this opportunity, it is possible to make the Bay of Bengal a center of economic progress and prosperity. The country's potential

blue economy/marine resource industry like sea fishing, oil and gas extraction, exploration of marine biology, Submarine mining, and tourism, researched can play a vital role. By best utilizing of these resources, the country's export and foreign exchange earning can be enhanced substantially. However, shipbuilding industry has already participated in various development projects successfully, both public and private sectors.

The importance of advanced technology-based fishing trawlers is immense for accruing fish from the sea. As there is no high-tech fishing trawler in our country, Bangladeshi ships cannot go for fishing at the deep sea. At present, despite having a maritime boundary of 664 km wide Bangladesh can navigate only an area of 60 km, which means it can use only 10 percent of its total accessible area. Even the country has not yet developed its capacity for fishing or other economic activities in the Exclusive Economic Zone and in the Continental Shelf Area of the sea. It is worth mentionable that usual capacity of the Developed Countries' Fishing Vessels' is 2000 DWT or more whereas the maximum capacity of Bangladeshi fishing vessels is 300 DWT. It is to be noted that an international standard trawler with a capacity of 2000 (+) DWT for the fishing sector of Norway has already been built at the shipyard of Bangladesh. Thus the industry may serve as a major partner in infrastructure development, including producing high-tech fishing vessels. Besides, it can take the ship building industry further ahead by ensuring creation of proper design and following it aptly during construction time.

Therefore, the government envisages that a policy formulation for the desired expansion and growth of the shipbuilding industry is highly essential.

Chapter 2

Vision, Mission, Goal and Objectives

Vision: Developing shipbuilding as a sustainable robust industry.

Mission: Raising the contribution of export-oriented shipbuilding industry to USD 4 Billion by 2026 through attracting more investment and promoting advanced technology in this sector.

Goal

Sustainable development of ship building industry through joint collaborations of government and private sector, increase in export revenue and employment, development of socio-economic condition of the country by gradual reduction of import dependence;

Ensure active cooperation in national development growth partnership of shipbuilding industry though providing engineering and logistical support to the mega projects to solicit smooth realization of Vision 2041 of the government;

Elevate shipbuilding industry to an international level by integrating domestic, regional and international shipping industry with it due to its immense potential and demand in the country and abroad;

Preparation of master plan for proper development of shipbuilding industry; as well as undertaking appropriate activities for the development of the ship repair industry.

To develop shipbuilding industry as a sustainably robust source of export revenue.

Objectives

Increase skills of shipbuilding industry of Bangladesh and upgrade it to international standard through acquiring technical knowhow, skills and expertise and thereby attaining capabilities of manufacturing LCT, LNG Tanker, Crude Oil Carriers and Chemical Tankers, Coal Carriers, Deep Sea Mining Vessels and Oceanographic Survey Ships, apart from building conventional ships and vessels. Assure diversified types of ship manufacturing and production of various equipments used in ship;

Reduce import dependency and simultaneously meeting the inland shipping demand by increasing production capacities of domestic shipyards;

Create employment opportunity for one lakh people by year 2026 in place of currently employed 30 thousand people in this sector;

Elevate Bangladesh shipbuilding industry at per with international shipbuilding industries and to create a pool of skilled manpower in order to export abroad;

Provide different incentive packages, tariff facilities and loans at a lower rate of interest so that the industry may survive competing in the global market;

Incorporate "Green Technology System" in large modern shipbuilding and ship repairing industry in an appropriate manner on the basis of public-private partnership;

Identify of possible obstacles, calamities and risks in the shipbuilding industry and taking appropriate measures to eliminate identified bottlenecks, obstacles and risks;

Create a conducive environment through proper coordination of public and private initiatives for attracting domestic and foreign investments in this sector;

Assist implementation of government's large-scale projects under Blue-Economy Program through shipbuilding industry on a partnership basis;

Ensure participation of the shipbuilding industry in execution of mega development projects of the government.

Chapter 3 Implementing Strategies

Strategic Action

In order to achieve the goals of this policy, four specific strategic actions and some basic programs will be undertaken to ensure development of globally competitive ship building industry in the country and they are as follows.

Strategies

Partnership: Effective coordination and partnership between different stakeholders is essential for the development of this industry. Therefore, the participatory role of the different stakeholders will be encouraged, especially the role of private sector, professionals and organizations involved in this industry, will be invigorated. The private sector is given special importance in actualization of the economic policy of the present government. Therefore, the private sector will play a key role in achieving the objectives of this policy.

Capacity Building: To survive in the present competitive market, there is no alternative but to ensure qualitative development of this industry. Special emphasis will be given on capacity building of individuals and organizations involved in this industry. Necessary coordination will be made between the public and the private sector to increase capacity of the industry and to make it sustainable. However, in order to increase capacity, special emphasis will be given on the policy support as well as institutional support of the government by ensuring a more active and leading role of the private sector. Special importance will be given on the government and private initiatives to impart institutional and practical training for enhancing the skills and expertise of professionals, such as, engineers, naval architects and workers associated and involved in shipbuilding industry.

For development of shipbuilding industry, it will be asserted that each shipyard must have a SWP (Standard Working Procedure) and proper adherence to SWP will be monitored by Ministry of Industries' approved organizations.

Maintaining the quality of shipbuilding, importance will be attached to increasing productivity in the sector. Simultaneously efforts will be made to focus creating a Bangladeshi Brand through forming a Bangladesh Ship Classification Society.

Market Expansion: The growth and sustainability of any industry depends on the merchandizing scope and selling capacity of the products in a specific market. Necessary steps will be taken to enhance merchandizing capacity of this industry in the domestic and international markets. Proper actions will also be taken to ensure easy and sustainable access to market of the domestic products of ship building industry.

Special attention will be given to create opportunities for the entrepreneurs to sell their products easily. Although the private sector will play a major role in the export of goods, the supportive role of the government in market expansion will always be carried through.

Banking Assistance: For continued survival of shipbuilding industry and for sustainability of its enterprises, it is unavoidably essential to follow a policy of low interest rate loan facility and a long

term loan repayment opportunities in this sector as soon as possible. Loans for building export oriented ships can be provided against buyers letter of credit/contracts. To overcome and resolve the banking challenges in shipbuilding industries, a provision of issuing sovereign guarantees at minimal cost along with creating a dedicated fund comprising with adequate finance for providing bank guarantees, bid bond guarantees, performance guarantees, letter of credit facilities, all non-funded and revolving in nature will be instituted as a policy support to boost up this sector.

Chapter 4: Incentives

Revenue support

Production of various types of vessels and other goods along with ships as per domestic, regional and international demand;

Adopting required improved infrastructure and necessary program for building national and international standard ships;

Undertaking appropriate time driven quality assurance measures for developing quality of shipbuilding and ship repair;

Effective programs will be undertaken and implemented for export development, diversification of export products and creation of new markets;

For discouraging import of ships and equipment initiatives will be undertaken for capacity building of domestic shipbuilding industries side by side banning imports of all/any types of ships and vessels below 5500DWT or of length less than 100.00 meters;

Forming a special Fund for development of shipbuilding industries;

A specific action plan for developing necessary infrastructures for forward and backward linkage industries as well as to produce skilled manpower will be undertaken, and setting up a training academy concerning shipbuilding industries;

Allocating plots to genuine entrepreneurs for shipbuilding and ship repairing by selecting a special economic zone;

Providing various types of financial facilities in line with the investment friendly facilities available in other competing countries;

Extending assistances and supports to those companies in shipbuilding industry which adopt an appropriate technology to minimize and control harmful wastes, such as, greenhouse gas, Sulphur-di- oxide and others and side by side ensure eco-friendly atmosphere and labor conducive management;

Rendering all possible incentives to women entrepreneurs and to develop skilled manpower;

Providing necessary assistances to attract large foreign shipbuilders through developing entrepreneurs interested in partnership;

Facilitating all possible supports by identifying and evaluating on priority basis the present challenges in the shipbuilding industry;

Undertaking initiatives to set up research and development cells to develop shipbuilding as a technology-based industry;

Allocating financial resources and undertaking action plan to utilize the benefits of Blue Economy;

Giving priority and preference to shipbuilding industry to provide heavy engineering and logistics supports in mega development projects of the government;

Adopting unified risk management plan to waive and mitigate risks and uncertainties;

Reducing risks and accidents in the workplace of professionals involved in shipbuilding i,e. engineers, naval architects and works, and arranging due compensation from the respective organization;

Financial investments and incentives

It is unavoidable for shipbuilding industry but to use foreshore and seashore. Local district Administration/Local land administration/ BIWTA/Ministry of shipping will take necessary steps on priority basis to allow use of foreshore and seashore on easy terms for longer period to facilitate smooth growth of this industry.

In line with other competing shipbuilding countries, the rate of interest on investment working capital along with all other types of loans will be kept at minimal level;

Fixing long term debt repayment period;

Creating a special working capital fund for this sector to enhance capabilities and efficiency of shipyards and to facilitate continuity of development projects involved as partners in ongoing mega development projects of the government;

Allowing a tax holiday facility to export-oriented shipyards and domestic shipyards facilitating Government Infrastructure Development Projects;

Amount of cash incentives will be increased from the existing rates for encouraging export of ships and other ship-related accessories;

Continuing paying cash incentives for exporting ships and ship related products;

Allowing the shipbuilding industry to use special facility like other export-oriented industries to import raw materials for building export-oriented ships;

Assisting participations in international business fairs;

Extending cash support, in line with other competing shipbuilding countries, to shipyards participating in international tenders in manufacturing ships, dredgers, fishing trawlers, tugs and ferries etc.;

Arranging necessary investments and financial incentives for the shipbuilding industry for its contribution to Blue Economy;

Export Promotion Bureau and other institutions like Ministry of Commerce, Bangladesh Embassies and Missions abroad will take long term program for expanding market of exporting ships;

Policy/Institutional Support

Confirming supply and availability of electricity, fuel and gas including other services;

Awarding CIP status, Export Trophies and Industry Medals;

Strengthening the share market;

Providing special facilities through making Special Economic Zones for this sector;

Employing Alternate Dispute Resolution (ADR) program to quickly resolve conflicts in shipbuilding industries;

Providing maximum cooperation and assistance to private entrepreneurs in this sector to encourage to follow environmental laws, rules and regulations as well as to practice green production technology;

Maintaining a harmonious balanced relationship with different Ministries, Departments and Agencies in order to facilitate better linkage;

Continuing Bonded Ware House facilities;

Engaging foreign experts to enhance efficiency, productivity of local industries and technology transfer, when necessary, arrangement of foreign training for upgrading skills and capabilities of local manpower;

Market development by using information and communication technologies;

Attaching priority to industries following green production methodology and management;

Sending manpower engaged in shipbuilding industries abroad for higher training through government initiative;

Rendering necessary encouraging support for setting up environment-friendly Ship Building industries;

Devising short, medium and long term action plans to enhance efficiency of industrial management of the private sector;

Imparting necessary training to increase skilled work force engaged in domestic shipbuilding industries;

Trading Facilities

To ensure proper protection and sustainability of Bangladesh shipbuilding industry, appropriate steps will be taken to encourage export of different types of water craft, such as, Cargo Ships, Oil Tankers, Container Vessels, Bulk Carriers, Tug Boats, Offshore Dredgers, Patrol Craft, Fishing Trawlers, Survey Vessels, Passenger Ferry, Passenger Ship LCT (Landing Craft Tank), Port Utility Craft etc. along with up to 20,000 DWT ships.

Policy of domestic preference will be ensured for the use of locally made product to build quality ships and vessels at a lower cost;

Creation of Backward Linkage Industry

A Backward Linkage Industry Incentive Guideline will be formulated to facilitate proper development and growth of the shipbuilding industry.

Chapter 5: Development of Entrepreneurs for Shipbuilding Industries

Steps will be taken to develop a pool of creative skilled artisans as well as a class of knowledgeable innovative entrepreneurs to secure positions in the present fast changing global competitive market.

A Design Institute for the shipbuilding industry will be set up for designing varieties types of new ships matching the demand of domestic and international markets.

Necessary assistance will be provided for development of research in shipbuilding industry, training/education in design formulation, design development and procurement of design resources and technical layout.

Measures will be taken to enrich the knowledge of entrepreneurs and exporters to gain ideas about the world market. Special program will be adopted to activate various trade bodies those can play important role in this regard.

Training will be imparted on increasing productivity, value addition, compliance standards for product quality assurance, development of business activities and business methods in the shipbuilding industry. An initiative will be taken to provide necessary training on quality control to the existing ship-building industries to receive international certificate.

Assistance will be pursued from Bangladesh Institute of Management (BIM), Bangladesh Bank Training Academy, Bangladesh Institute of Bank Management and other concerned government

and non- government organizations on entrepreneurship development, pre and post-investment counseling, financial and market management etc. in the shipbuilding sector.

Various promotional activities will be undertaken to create significant demand of locally made ocean going ships to be used by the domestic shipping line Companies or their Owners;

Effective measures will be taken to ensure proper marine and other insurance policies to support appropriate growth and advancement of domestic shipbuilding industries.

With an aim to develop educated and skilled manpower in domestic shipbuilding industries, appropriate monetary and other facilities will be increased.

Implementation of Labour law will be ensured in this Sector. Using necessary safety gears will be encouraged to ensure physical and mental safety of manpower working in shipbuilding industries.

Implementation, Monitoring and Review

Implementation, monitoring and review

There will be a Council headed by the Hon'ble Minister for Industries to coordinate implementation of the Shipbuilding Industry Development Policy 2021. The Council will be constituted comprising following members. This Coordination Council will be considered as the highest body for the implementation, monitoring and evaluation of the policy framework related to development of the shipbuilding industry.

S.N	Designation	Defined Role
1	Hon'ble Minister, Ministry of Industries	President
2	Hon'ble State Minister, Ministry of Industries	Vice President
3	Secretary, Ministry of Industries	Member
4	Secretary, Ministry of Shipping	Member
5	Secretary, Finance Division, Ministry of Finance	Member
6	Executive Member, Bangladesh Investment Development Authority	Member
7	Secretary, Road Transport and Highways Division	Member
8	Secretary, Financial Institutions Division, Ministry of Finance	Member
9	Chairman, National Board of Revenue	Member

10	Secretary, Ministry of Commerce	Member
11	Secretary, Ministry of Environment, Forests and Climate Change	Member
12	Secretary, Power Division, Ministry of Power, Energy and Mineral Resources	Member
13	Secretary, Ministry of Science and Technology	Member
14	Secretary, Ministry of Water Resources	Member
15	Secretary, Energy Division, Ministry of Power, Energy and Mineral Resources	Member
16	Secretary, Ministry of Labour and Employment	Member
17	Member, Industry and Energy Division, Planning Commission	Member
18	Vice Chancellor, Bangladesh University of Engineering and Technology (BUET)	Member
19	Additional Secretary (Policy, Law and Intl. Coop), Ministry of Industries	Member
20	Chairman, Bangladesh Steel Engineering Corporation	Member
21	Director General, Bangladesh Standards and Testing Institution	Member
22	Director General, Department of Shipping	Member
23	Deputy Governor, Bangladesh Bank	Member
24	President, Federation of Bangladesh Chambers of Commerce and Industries	Member
25	President, Bangladesh Shipbuilders Association	Member
26	President, Association of Export Oriented Shipbuilding Industries of Bangladesh (AEOSIB)	Member
27-28	Shipbuilding industry experts nominated by the government (2 persons)	Member
29	Joint Secretary (Policy)/Deputy Secretary (Policy), Ministry of Industries	Member

Scope for work of the Council

The council will meet once in every 06 (six) months. The council will monitor whether the shipbuilding industry development policy has been complying properly or not, and will also take

action or recommend appropriate suggestion if any problem arises during the implementation period of the policy.

The Council may co-opt any number of new members whenever necessary.

6.2.3 The Council will regularly monitor the progress of implementation of shipbuilding industry development policy, 2021 and will advise or recommend expediting the production process on the basis of analyzing necessary information or data.

Executive Committee for Implementation of the Shipbuilding Industry Development Policy, 2021

S.N	Designation	Defined Role
1	Secretary, Ministry of Industries	President
2	Additional Secretary (Policy, Law and Intl. Coop), Ministry of Industries	Member
3	Additional Secretary, Finance Division, Ministry of Finance	Member
4	Additional Secretary, Ministry of Shipping	Member
5	Additional Secretary, Ministry of Science and Technology	Member
6	Additional Secretary, Financial Institution Division, Ministry of Finance	Member
7	Additional Secretary, Ministry of Commerce	Member
8	Chairman, Bangladesh Inland Water Transport Authority (BIWTA)	Member
9	Chairman, Bangladesh Steel and Engineering Corporation (BSEC)	Member
10	Member, National Board of Revenue	Member
11	Representative, Bangladesh Bank	Member
12	Representative, Federation of Bangladesh Chambers of Commerce and Industries (FBCCI)	Member
13	President, Association of Export Oriented Shipbuilding Industries of Bangladesh (AEOSIB)	Member
14	President, Bangladesh Ship Builders Association	Member
15-16	Two Prominent Shipbuilding Industry Entrepreneurs	Member

17	Deputy Secretary (Policy), Ministry of Industries	Member-Secretary

Scope for works of the Implementation Committee:

Meetings will be held in interval of every three months. A meeting may be called upon at any time in case of emergency.

The committee will supervise existing labor market, working environment, health and safety, investment facilities, financing modes, incentives scheme and availability of fund in shipbuilding industry and above all, carry out all activities necessary for the successful implementation, monitoring and evaluation of this policy.

The Implementation Committee will carry out necessary actions in line with the recommendations of the Council and report progress of activities to the Council from time to time.

The Policy wing of Ministry of Industries will provide secretarial support to the Council and the Committee.

The committee may, if necessary, co-opt or invite any new member.

Technical Committee

A technical committee will be constituted under the leadership of Additional Secretary (Policy, Law and Intl.Coop) of Ministry of Industries for subject-wise evaluation and preparation of specific proposals/recommendations. In case of necessity, representative of concerned company/agency may be co-opted as member.

Ensuring Effective Management

Quick steps for the sake of smooth development of the shipbuilding industry in the country will be taken to execute effective implementation of action plans of this policy. More emphasis will be given on regular monitoring and review matters. Effective coordination will be made under the leadership of the Ministry of Industries with all other ministries, departments and associations.

Effectiveness of this Policy

This policy will remain valid for 5 years from the date of Gazette publication and will subject to amend, update, modify or change time to time in accordance with the necessity of development of this industry

Time Bound Action Plan for Implementation of the Shipbuilding Industry Development Policy 2021

The following action plan will be adopted through united participation of the public and private sectors:

Sl.No	Subject	Activities	Implementing Ministries/Departments/ Agencies/Others	Implementation period
1	Various shipbuilding materials including ships (4.1.1)	Take initiative to develop infrastructure and quality in order to build internationally Standard ships in the Country.	Ministry of Shipping/Ministry of Commerce/Ministry of Industries/ Concerned Departments & Agencies/ National Board of Revenue/Directorate of Environment/Ship building Industries/Financial Institutions	2021-2026
2	Engineering and logistics supports to the mega development projects (4.1.16)	Priority of the shipbuilding industry in providing heavy engineering and logistics supports to mega development projects of the country.	Ministry of Shipping/Ministry of Commerce/Ministry of Industries/ Concerned Departments/Agencies/ National Board of Revenue/Directorate of Environment/Shipbuilding Industries/Financial Institutions	2021-2026
3	Export development (4.1.4)	Modernizing of production of good/ diversification/identification of potential markets/developing new markets/participating various fairs & international events/participating in tenders including various other competitions/bilateral, multilateral agreements/negotiations	Ministry of Shipping/Ministry of Commerce/Ministry of Industries/ Relevant Departments/Agencies/ National Board of Revenue/Shipbuilding Industries/Financial Institutions/ Export Promotion Bureaus/Embassies/ Associations/International & Regional Organizations including WTO	2021-2026

4	Product quality Up gradation and Quality assurance (4.1.3)	Obtaining all types of certificates including, IACS/ directorate of environment/health/safety arranging training/workshop to ensure National/International Standards.	Ministry of Industries/Ministry of Shipping/Ministry of Commerce/ Ministry of Environment, Forest and Climate Change/Ministry of Health and Family Welfare/Relevant Departments/ Agencies/Educational Institutions/ Research Institutions/ BSTI/Other	2021-2026
5	Investment facilities/ Incentives for export oriented and local shipbuilding industries (4.2.2, 4.2.9)	Providing all types of loans including working capital loans on easy terms/ Reducing rate of interest to lowest at per annum/waiving loans of export oriented shipbuilders affected by world recession/ Creating Block Account/Introducing Moratorium Facility/Arranging Special Fund/Proving Subsidy/Subsidies in cost of Insurance Premium/Investment of Foreign Funds/Creating standing Non-Funded Investment Facilities in Banks/Increasing Cash incentives	Finance Division/Ministry of Commerce/Export Promotion Bureau/ Ministry of Shipping/Shipbuilding Companies/National Board of Revenue/Tariff Commission/ Bangladesh Bank/Associations	2021-2026
6	Duty reforms on imported raw materials/ machinery/ equipment (4.2.9)	Taxes & Duties Exemption/Tax Holiday & Duty Depreciation/Withdrawal/ Reduction/Rationalization of Value Added Taxes	Finance Division/National Board of Revenue/Shipbuilding Companies/ Tariff Commission	2021-2026

7	Linkage Industries/ Sub-sectors (4.5)	Providing loans at minimal rate of interest/Tax- and duty-free raw materials import facilities/Lending without collateral securities/Imparting training/ Adopting incentive-oriented action plan for Linkage Industries/Sub-sectors which are partners in shipbuilding industries.	Finance Division/National Board of Revenue/Tariff Commission/Export Promotion Bureau/Shipbuilding industries/Directorate of shipping/ Private Associations	2021-2026
8	Developing skilled manpower including women (4.1.11)	Opening departments relevant to the Shipbuilding Industry in Universities/ Colleges/Polytechnic institutions/ Introducing vocational training/ Arranging foreign training/ Establishing Training Institutes.	Secondary and High Education Division, Ministry of Education/ Directorates of Technical Education/Shipbuilding industries/ Directorate of shipping/Ministry of Industries/Training Academy	2021-2026
9	Identifying appropriate areas (4.1.8, 4.3.4)	Declaring appropriately selected suitable places as Shipbuilding Economic Zones in coastal backward areas for development of shipbuilding industries outside existing shipbuilding industrial areas.	Bangladesh Economic Zone Authority (BEZA)/Ministry of Shipping/ Shipbuilding Companies/Ministry of Industries/Relevant Divisions/ Agencies/Others	2021-2026
10	Appropriate preservation of Environment (4.1.10)	Complying environment, forest and weather change as well as environment preservation laws/Elimination of climate change/Barring pollution of land and water/Undertaking appropriate action plan to preserve rivers and marshy land's ecology, maintain balance of environment, enhance awareness in these regards.	Ministry of Environment, Forest and Climate Change/Directorate of Environment/Ministry of Industries/ Bangladesh Steel and Engineering Corporation/Directorate of Shipping/ Shipbuilding Industries & Companies/ Concerned	2021-2026

			Departments/Associations.	
11	Ultra-modern Technology and Modernization (4.1.14)	Innovating and applying the latest modern technology in shipbuilding & repairing/adopting/approval/research/ education/training/workshop/venture/ investment. Encourage and practice latest and innovative technology in Research, Education, Training, Workshops as well as ensuring Venture Capital Investment in this sector.	Ministry of Industries/Ministry of Shipping/Port Authorities/Shipbuilding Industries/Ministry of Commerce/Tariff Commission.	2021-2026
12	Skill Enhancement (5.9)	Introducing practical programs in the field of training, studies, research, workshops to develop skilled workforce.	Ministry of Finance/Ministry of Shipping/Shipbuilding Industries & Companies/ Ministry of Industries/ Tariff Commission/ Ministry of Education/Directorate of Technical Education	2021-2026
13	Implementation, Monitoring and Evaluation (6.3.2)	Skill Verification/Manpower Development/Modernization/Investment /Environment Review and Data Collection	National Shill Development Authority/ Ministry of Shipping/Ministry of Finance/ Ministry of Environment, Forest & Climate Change/Ministry of Industries/Shipbuilding Industries & Companies/ Bangladesh Bank/National Board of Revenue/Department of	2021-2026

			Environment/Concerned Departments and Agencies.	

3.5 The Shipbreaking and Recycling Rules, 2011

The Shipbreaking and Recycling Rules, 2011 was passed in pursuance of the Hon'ble High Court Division of the Supreme Court of Bangladesh and under section 13 & 87 of the Factories Act, 1965. Upon writ petition No. 7260 of 2008 dated May 24, 2011, the Hon'ble High Court Division passed Order with some directions regarding the shipbreaking and recycling which reflect in the Shipbreaking and Recycling Rules, 2011. The Shipbreaking and Recycling Rules, 2011 has introduced the Ship Building and Ship Recycling Board (SBSRB) under the Ministry of Industry in Rule 3 which possess the authority to provide NOC (No Objection Certificate) for facilitating LC (Letter of Credit) to import vessels for recycling. According to the Rule 9, for obtaining permission for beaching a ship, the recycler has to submit documents as per Annexure–II, to the Port Authority along with documents or certificates obtained through SBSRB (The Shipbreaking and Recycling Rules, 2011). At the anchorage, the ship would be boarded and physically inspected by Shipbuilding and Ship Recycling Board Officials and other designated members of associate departments (The Shipbreaking and Recycling Rules, 2011). Rule 13 says after BMJ Vol 3 Issue 1 ISSN 2519-5972 99 obtaining beaching permission if it is found that the particular ship is not recycled and operating as cargo vessel domestic or Ocean going to be treated as a criminal offence by the yard owner or company to whom beaching permission was granted. (The Shipbreaking and Recycling Rules, 2011). Furthermore, the ship recycling plan is essential which contains two parts as the Ship recycling plan and Ship Recycling Facility's Plan. The shipbreaking yard must have enough space for movement while cutting ship. "Gas-free and fit for hot work" certificate is also essential which is issued by the Department of Explosive for avoiding accidents concerned with fire, explosion and deficiency of oxygen. However, Rule 18 notifies that the ship recyclers are required to strictly provide the environmental compliance in line with soil, water, air under Environment Conservation Act 1995 (Act 1 of 1995 amended in 2010) and other related national environmental act or law (The Shipbreaking and Recycling Rules, 2011). So these Rules are very important for governing the shipbreaking industries of Bangladesh.

3.6 The Hazardous Wastes and Shipbreaking Waste Management Rules, 2011

The Hazardous Wastes and Shipbreaking Waste Management Rules, 2011 was passed under section 20 of the Environment Conservation Act, 1995 for managing hazardous wastes and shipbreaking waste. Many toxic materials are found in a dead ship while breaking. Such materials can be hazardous for the workers and the environment. Asbestos, while extracting asbestos workers can become the victim of lung cancer, mesothelioma and asbestosis. Mercury can damage the nervous system of the human body. Lead can cause hearing impairment and loss of vision.

These are the facts behind the regulatory framework to govern the shipbreaking industries of Bangladesh. Any ships scheduled for dismantling must have clearance under Rule 19 (1) of the Hazardous Wastes and Shipbreaking Waste Management Rules, 2011 and no ships can be dismantled without such clearance (The Hazardous Wastes and Shipbreaking Waste Management Rules, 2011). To get such clearance, applicants have to disclose information regarding hazardous material including asbestos, gasohol and lubricant which may be involved in dismantling. The applicants also have to disclose detail waste management process.

3.7 The Bangladesh Ship Recycling Act, 2018 (Act No. 08 of 2018)

Bangladesh is the leading shipbreaking country in the world although it has some negative impacts on the marine environment. Bangladesh has ratified many international legal instruments regarding shipbreaking activities. For implementing such instruments and controlling marine environment, the Parliament of Bangladesh has recently passed an Act named "the Bangladesh Ship Recycling Act, 2018 (Act No. 08 of 2018)" in its 19th Session of 10th parliament. Section 7 of the Act says that this Act is passed to give effect to the provisions of the Hong Kong International Convention for safe and environmentally sound recycling of ships, 2009 (The Bangladesh Ship Recycling Act, 8 2018). Section 4 of the Act has mentioned about the establishment of a zone for ship-recycling industry where Section 25 specifies that whoever establishes any shipbreaking yard without permission of the government shall be punished with imprisonment of either description for a term which may extend to two years or with fine which may extend to Taka ten to thirty lac, or with both. Section 8 of the Act was intended to constitute a new authority named "Bangladesh Ship Recycling Board" to supervise the ship recycling industry (The Bangladesh Ship Recycling 100 A national and international regulatory frameworks for establishing sustainable shipbreaking industry in Bangladesh Act, 2018). Under the law, a 13-member board would be formed headed by an Additional Secretary of the Industries Ministry would administer the activities of the ship recycling industry and sit for meetings at least thrice a year. The punishment for importing a ship without No Objection Certificate (NOC) provided by the shipping ministry is imprisonment not exceeding two years or a fine which may extend to Taka ten to thirty lac or with both and the punishment for creating a fake NOC is a fine between Taka 5 lakh to 20 lakh. As per the law, the government would set up the Treatment Storage and Disposal Facility (TSDF) within three years after enacting the law for proper management of wastage produced from ship recycling.

3.8 Other Sectoral Policies and International Law for ship building

3.8.1 Basel Convention

The Basel Convention on the control of trans-boundary movement of hazardous wastes and their disposal was adopted in Basel (Switzerland) in March, 1989. It is basically dealing with ship having hazardous materials.

3.8.2 The London Convention

The London Convention is the main treaty regime that relates to marine pollution. The London Convention requires parties to take effective measures to prevent marine pollution by disposal of

waste into the sea. In fact, the fundamental obligation under the London Convention is to prohibit the deliberate disposal of waste from vessels at sea.

3.8.3 The International Convention for the Prevention of Marine Pollution from Ships (MARPOL)

The MARPOL Convention deals prevention of pollution of the marine environment including discharges from ships. In the issue of crude oil processing MARPOL would apply to the discharges that occur from ship loading and unloading of crude oil, which take place within the territorial waters of the importing country. Practically this means that once the ship is anchored for loading and unloading the oily substances, any discharge notably of oil or oily mixtures will be prohibited. Such oily wastes must be retained on board or discharged to reception facilities in port. States are in turn obliged to ensure the provision of the necessary reception facilities for these oily discharges.

3.8.4 The United Nations Convention on the Law of the Seas (UNCLOS)

The United Nations Convention on the Law of the Sea (UNCLOS) signatory countries are obliged to establish global and regional rules, standards and recommendation practices and procedures to protect the marine environment.

Besides the aforesaid laws, convention and regulations, the others crude oil processing/industries and sea laws are practiced by International Maritime Organization (IMO), United Nations Environmental Program (UNEP), International Chamber of Shipping (ISC) and Stockholm Convention on Persistent Organic Pollutants (POPs) Article 3.2.

3.8.5 International Maritime Organization (IMO)

The role of IMO is an overall responsibility for coordinating issues associated with ship-recycling and responsibility for monitoring issues arising during ship design, building and operation which may have an impact on recycling, including preparations for recycling on board.

The subject of ship scrapping was brought to IMO's Marine Environmental Protection Committee (MEPC) in 1998, when Norway proposed to add the topic to IMO's agenda. The issue has since been on the agenda at every committee meeting, and a correspondence group (CG) was established at the 44th MEPC session in March 2000; its role consists in:

-Identifying all stakeholders and their perceived roles during the life-cycles of a ship. •Identifying and elaborating on the role of the IMO in ship recycling.

-Identifying the existing international, national and additional industrial and/or the relevant standards/guidelines, which possibly apply to ship-recycling within the role of IMO.

-Recommending possible courses of action for further consideration by the Committee, and to identify the pros and cons associated with each option.

The IMO drafted guidelines in 2004 on ship recycling under the auspices of its Maritime and Environmental Protection Committee. The Guidelines identify voluntary measures that need to be taken by ship owners as well as by relevant actors in ship breaking countries. The recently developed guidelines are half a step forward in the campaign to clean up the shipping industry. Ships are now required to carry a Green passport specifying the hazardous substances that are on board, and shipbuilders now have to start building clean ships. Greenpeace believes that the IMO guidelines will not at all change the current practices of ship owners. The IMO failed to accept and complement the existing legislations and regulations (mentioned above) dealing with the export of hazardous wastes (Basel Convention).

The guidelines are therefore outside international law. Greenpeace is concerned that the new guidelines could be misused to cover up the illegal business. It is likely that the environment and people in Asia will still continue to be exposed to hazardous substances.

3.8.6 United Nations Environmental Program (UNEP)

UNEP provides the secretariats for the Basel and Stockholm Conventions. UNEP and the UN Food and Agriculture Organization (FAO) jointly provide the Rotterdam secretariat, which is located in Geneva and in Rome.

UNEP is responsible for the implementation of the Basel Convention. It is currently drafting guidelines on the environmentally sound management for the full and partial dismantling of ships, in order to provide recommendations on procedures and practices to be implemented to attain Environmental Sound Management (ESM).in ship breaking yards. The guidelines also provide advice on monitoring and verification on environmental performance. The guidelines are expected to present a "model facility", the realization of which should be reached within 5 years. These guidelines will "make provisions for the proper removal of hazardous wastes and substances, including the collection, sorting and disposing/recycling of wastes in an environmentally sound manner". These guidelines will not, however, cover issues of health and safety.

3.8.7 The International Chamber of Shipping (ICS)

The aim of ICS to encourage high standards of operation and the provision of high quality and efficient shipping services. It also strives for a regulatory environment which supports safe shipping operations, protection of the environment and adherence to internationally adopted standards and procedures. ICS also promote properly considered international regulation of shipping and oppose unilateral and regional action by governments. ICS also remain committed to the promotion of industry guidance on best operating practices.

Issues relevant to ship building and breaking:

ICS took the initiative to establish an "Industry Working Party on Ship building and Recycling" 23 in February 1999. The IWPSR established an Industry Code of Practice on ship recycling in August 2001. This Code of Practice is the basis for the IMO's own guidelines. It is aimed at the ship owners, and encourages for the present all shipping companies to initiate and complete a programme to identify and record, as far as is practicable, on each of their existing ships, any

potentially hazardous material, as well as to make every effort to minimize the amount of potentially hazardous materials on board the ship.

For the future, it seeks to encourage naval architects and ship builders to fake due account of the ship's ultimate disposal when designing and constructing a ship, and suggest the creation of a "green passport" for new ships. Here too, the voluntary and non-enforceable nature of these guidelines seriously weakens their domain and potential effect.

3.8.8 Stockholm Convention on Persistent Organic Pollutants (POPs)

There has been a significant level of debate on production, trans boundary movement and impact of POP's at the international level, particularly during the 1990's. This culminated in the development of the Stockholm Convention on Persistent Organic Pollutants on 22 May 2001; in response to the urgent need for global action to protect human health and the environment from persistent organic pollutants (POPs). This was a major milestone in the efforts to curb the impacts of POPs. At this time, there are] 51 signatories and 11 parties to this convention.'

The Convention seeks the elimination or restriction of production and use of all intentionally produced POPs (i.e. industrial chemicals and pesticides). It also seeks the continuing minimization and, where feasible, ultimate elimination of releases of unintentionally produced POPs such as dioxins and furans. Stockpiles must be managed and disposed of in a safe, efficient and environmentally sound manner. The Convention also imposes certain trade restrictions. The chemicals slated for elimination under the Stockholm Convention are the pesticides oldrin, chlordane, dieldrin, eldrin, heptachlor, hexachloro benzene (HCB), mirex and toxaphene, as well as the industrial chemical polychlorinated biphenyls (PCBs).The Convention also seeks the continuing minimization and, where feasible, elimination of the releases of unintentionally produced POPs such as the industrial byproducts dioxins and furans. The Convention come into effect from 17 May 2004.

3.9 Applicable Environmental and Social Laws, Regulations, and Policies

The requirements for compliance with environmental regulations are laid down by the policy, legal & regulatory framework in the country. A large number of laws are related to environmental issues. Some dating based on the 19th century exist in Bangladesh. The most important of these are the Environmental Conservation Act, 1995 (ECA95) and the Environmental Considerations rules (under the ECA, 1995), ECR 1997 (ECR97), and ECR 2023.

The provision made in the Environment Conservation Act 1995 and Environmental Conservation Rules 1997 are adopted procedures in carrying out the task of Environmental Impact Assessment (EIA) study for the RED Category industry/factory. Including these, other Policies, Acts, and Regulations applicable and consulted for the preparation of the EIA study during the accomplishment of the assignment areas are given below:

3.9.1 National Environmental Policy 1992

In 1992 the Bangladesh Government developed the National Environmental Policy (NEP) which defines the overall environmental framework and assigns responsibility for regulatory

development, administration, and enforcement. This responsibility has been given to the Department of Environment (DOE) which is under the Ministry of Environment, Forest and Climate Change. The National Environment Council, with the head of the government as chairperson, provides the overall policy direction.

In 26 years since the adoption of the Environment Policy, 1992, the nature and level of environment and ecological degradation have been changed. In order to address all those changes and with a view to protect and conserve the environment and ecosystem in a rigorous, pragmatic and sustainable manner as well as to bring the climate change to the mainstream of the environment and development, the government has revised the National Environment Policy, 1992 and adopted the revised National Environment Policy, 2018.

Following are the key subject matters covered under the National Environment Policy, 2018:

- Ensuring sustainable development through reducing human pressure on nature and natural resources
- Considering environmental protection as an integral part of the development programs planned to meet the need of the present and future generation
- Making natural resources extraction, use, environmental conservation, etc. to be based on science
- Considering environmental impacts and risks in extracting and using natural resources
- Evaluating the economic contribution of ecosystem services simultaneously to that of natural resources
- Giving priority to poor and underprivileged group of people in order to ensure their participation, equity, justice, accessibility to the use of natural resources, and getting ecosystem services on which, they are dependent
- Taking initiatives to prevent misuse and ensure the optimum of water, land, natural gas, and other natural resources in the production process as well as for day-to-day purposes
- Encouraging sustainable use of new and renewable resources
- Enhancing long-term poverty alleviation and food security through conserving biological diversity
- Realizing compensation from persons and institutes those who are liable for environmental pollution through applying the polluter pay principle
- Including environmental conservation and preservation in all national policies and ensuring implementation of the environment policy at both government and non-government levels
- Giving priority to preventive measures over curative measures in environmental conservation
- Including adaptation and mitigation programs in all development projects in order to address the adverse impacts of climate change
- Ensure sustainable utilization of ecosystem goods and services
- Implementation of the 3R principle in the utilization of resources

- Strengthening the institutional and legal capacity of institutions (Government, local, private, and technical) relevant to the enforcement and implementation of rules and regulations relating to environmental policy and environment conservation
- Ensuring considerations of climate change and challenges of calamities in all kinds of infrastructure projects
- Reducing all SLCP (Short-Lived climate pollutants) that are harmful to health and the environment
- Taking development programs considering sustainable production and consumption as an integral part of environmental conservation to meet the need of present and future generation
- Allocating necessary funds to all areas of environmental conservation, preservation, and control
- Taking up programs in favor of a flourishing environment-friendly economy
- Including environmental and ecological conservation particularly to introduce the environmental and ecological concept in the environmental academic curriculum and textbooks of schools and colleges

The policy has provided sector-wise policy coverage for 24 different sectors along with their plan of implementation, identification of respective implementing agencies, legal and institutional framework, and directives on compliances.

3.9.2 National Environmental Management Action Plan -1995

The National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faceted plan, which builds and extends the statements, set out in the National Environmental Policy NEMAP was developed to address Issues and management requirements during the nod 1995 to 2005 and set out the framework within which the recommendations of the National Conservation Strategy are to be implemented.

- Identification of key environmental issues affecting Bangladesh,
- Identification of actions necessary to halt or reduce the degradation;
- Improvement of the natural environment;
- Conservation of habits and bio-diversity,
- Promotion of sustainable development,
- Improvement of the quality of the life of the people.

One of the key elements of concerns of NEMAP is that the sectoral environmental concerns are adequately identified. In outline, the environmental issues of the industrial sector include-

- Pollution arising from various industrial processes and plants throughout the country causes varying degrees of degradation of the receiving environment (air, water, and soil),
- A general absence of pollution abatement in terms of waste minimization and treatment,
- Low level of environmental awareness amongst industrialists and entrepreneurs,

- Lack of technology appropriate for efficient use of resources and waste minimization, leading to unnecessary pollution of the environment,
- Economic constraints on pollution abatement and waste minimization such as the cost of the new technology, the competitiveness of labor, and intensive production methods as compared to more modern methods,
- The concentration of Industry and hence pollution in specific areas exacerbate localized environmental degradation and exceed the carrying capacity of the receiving bodies,
- Unplanned Industrial development has resulted in several industries located within or close to the residential area, which adversely affects human health and the quality human environment,
- Establishment of industries at the cost of good agricultural lands and in a residential area,
- Lack of incentives for industrialists to incorporate emission/discharge treatment plants in their industries.

3.9.3 Bangladesh Environment Conservation Act 1995

Environment Conservation Act 1995 (ECA-95) is currently the primary legislative framework document related to environment protection in Bangladesh, which repeated the earlier environmental pollution control ordinance of 1977.

The main strategies of the act can be summarized as:

- Declaration of ecologically critical areas, and restriction on the operation and processes which can be caped out or cannot be initiated in the ecologically critical areas,
- Regulation concerning vehicles emitting smoke harmful to the environment,
- Environmental clearance
- Regulation of the industries and provision of other development permits;
- Promulgation of standards for quality of air, water, noise, and soils for different areas for different purposes;
- Promulgation of standard limit for discharging and emitting waste
- Formulation and declaration of environmental guidelines

The first sets of rules to implements the provisions of the Act have been promulgated in 1997 The Department of Environment (DoE) is implementing the Act. A Director General (DG) heads DoE. The DG has complete control over the DoE. The power of DG, as given in the Act, may be outlined as follows:

- Identification of different types and causes of environmental degradation and pollution;
- Instigating the investigation and research into information regarding environmental conservation, development, and pollution,
- Power-to-close down the activities considered harmful to human life or the environment. The operator does have the right to appeal, and procedures are in place for this. However, if the incident is considered an emergency, there is no opportunity for appeal,

- Power to declare an area affected by pollution as an ecologically critical area. DoE regulates the type of work or process which can be undertaken in such an area.
- Similar to the aforementioned clause, if any part of the environment is polluted/damaged by operations, the Director-General can request or force the operator to take remedial measures,
- Operators must inform the Director-General of any pollution incident or 'near miss.'

According to Environmental Conservation Act 1995 (Amendment, 2010) rule 6(Kha)-

In the event of an accidental (pollution) event, the Director-General may take control of an operation, and the respective operator is responsible for costs incurred (and possibly compensation).

Before any new project can go ahead as stipulated under the rules, the operator must obtain an Environment Clearance from the Director-General. An appeal procedure does exist for those promoters who fail to obtain clearance.

3.9.4 National Conservation Strategy, 1992

The national conservation strategy-1992 was endorsed to balance a country's economic development with the conservation and use of its natural resources. The strategy has three overriding objectives: conservation of natural resources, sustainable development, and improved efficiency in the use and management of resources.

The NCS recommended 14 core program areas for priority implementation:

- Maintaining soils in croplands
- Increasing irrigation efficiency;
- Protecting watersheds;
- Supporting forestry and plantations;
- Restoring rangelands and improving livestock;
- Protecting water bodies and sustaining fisheries;
- Conservation of biodiversity;
- Increasing energy efficiency;
- Developing and deploying renewable;
- Preventing/abating pollution;
- Managing urban waste;
- Supporting institutions for common resources;
- Integrating population and environment programs;
- Preserving the cultural heritage.

3.9.5 Environment Conservation Rules, 2023

These are the first set of rules, promulgated under the Environment Conservation Act 1995, among other things, these rules set-

- The National Environmental Quality Standards (NEQS) for ambient air, parlous types of water, Industrial effluent, emission, noise, vehicular exhaust, etc.
- Requirement for and procedures to obtain environmental clearance
- Requirement for IEE according to categories of industrial and other development interventions.

The proposed project falls presently under the Orange Category of Environmental Conservation Rules, 2023. According to the rules, all Red category industry has to submit an Initial Environmental Examination in the initial phase of the project start. An Environmental Impact Assessment (EIA) will have to submit before the project operation along with detailed Environmental Management Plan.

3.9.6 The Environmental Conservation Rules (ECR), 2023

The Environmental Conservation Rules, 2023 are the first set of rules promulgated under the Environment Conservation Act, 1995. ECR, 23 provides additional guidance for specific components of the Act. The rules mainly consist of:

- The National Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise, and vehicular exhaust;
- Categorization of industries, development projects, and other activities based on pollution activities of the existing or proposed industries/development projects/activities.
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities;
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

The Rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation.

5 | Classification of industrial establishments and projects for the purpose of granting location and environmental clearances. - (1) For the purpose of granting locational and environmental clearances by the Department, considering the extent of activities of the industrial establishments or projects and the scope, extent and possible harmful effects on the environment and human health caused by the same. Industrial establishments and projects shall be divided into the following categories, namely: -

(A) Green;

(B) Yellow;

(C) Orange; And

(D) Red.

Explanation: - as mentioned in this rule –

(A) Green class industrial establishments or projects shall mean all such industrial establishments or projects which have relatively little impact on the environment and human health and there is an opportunity to take environmental pollution mitigation measures for such industrial establishments or projects;

(B) Yellow class industrial establishments or projects shall mean all such industrial establishments or projects which have a moderate impact on the environment and human health, and to avoid such impacts, these industrial establishments or projects need to take environmental pollution mitigation measures;

(C) Orange class industrial establishments or projects shall mean all such industrial establishments or projects which have significant impact on the environment and human health, which need to be avoided for the purpose of environmental protection and the environmental impact of these industrial establishments or projects must be reduced by adopting appropriate environmental pollution mitigation measures. And

(D) In the red category, all the industrial establishments or projects that have severe impact on the environment and human health, which need to be avoided to an appropriate extent for environmental protection, and significant environmental pollution mitigation measures must be taken to reduce the environmental impact of the industrial establishments or projects of the said category.

(2) The list of various categories of industrial establishments and projects mentioned in sub-rule (1) shall be determined as per Schedule-1:

Provided that any industrial establishment or project which is not included in the Green, Yellow, Orange and Red categories mentioned in Schedule-1 shall be classified as per Schedule-14.

3.9.6.1 Procedure for granting locational clearance to red class industrial establishments and projects

(1) Red category industrial establishments or project promoters shall apply to the relevant office of the Directorate by filling the applicable sections as per Form-3 for location clearance.

(2) In the case of making an application mentioned in sub-rule (1), the application processing fee mentioned in schedule-6, related documents, details, draft terms of reference of environmental impact assessment should be submitted and applicable mentioned in schedule-9 Guidelines must be followed.

(3) The draft terms of reference for environmental impact assessment should be formulated as per the guidelines mentioned in Schedule-10.

(4) After receiving the application, the relevant office of the directorate shall conduct a site visit to the proposed site of the relevant industrial establishment or project and after reviewing the documents and all relevant matters, a report with an opinion on the rationale of issuing the site clearance and the draft environmental impact assessment (terms of reference) of the head office of the directorate Clearance will be forwarded to the Committee and copies thereof to the Regional and Divisional Offices, as applicable.

(5) After receiving the documents under sub-rule (4), the concerned office of the directorate shall evaluate and consider all the contents and submit the related report to the Director General for approval.

(6) After receiving the report under sub-rule (4), if the Director General is satisfied, within 15 (fifteen) working days, he shall grant the positional clearance in favor of the concerned applicant.

(7) With the approval of the Director General, the concerned industrial establishment or the project promoter shall be given approval of the draft terms of reference for environmental impact assessment from the concerned office within 30 (thirty) working days of receiving the application:

Provided, however, that if any additional information or documents are required, the applicant may be directed to submit the same within seven (7) working days:

It is further provided that if the application is rejected after reviewing the overall aspects, the applicant shall be informed in writing stating the reasons within not more than 7 (seven) working days of taking the said decision.

(8) After obtaining the locational clearance, the concerned industrial establishment or project promoter can start related activities including land development, construction of infrastructure or facilities, and opening of Letters of Credit (L, C).

3.9.6.2 Environmental Impact Assessment (EIA) Survey

(1) A red-category industrial establishment or promoter of a project shall prepare an environmental impact assessment report by conducting an environmental impact assessment survey by a registered environmental consultant in accordance with the guidelines laid down by the Department:

Provided that the environmental impact assessment guidelines of any international or development aid organization shall be followed for conducting the environmental impact assessment survey of those sectors for which the department does not have environmental impact assessment guidelines and in this case considering whether it is contrary to the plans, policies or decisions adopted by the government. have to do

(2) Enrolled environmental consultants shall carry out their activities independently and impartially in consultation with all concerned in conducting environmental impact assessment studies;

Provided, however, that the entrepreneur shall be consulted and consulted in formulating the environmental management plan and monitoring program.

(3) The Enlisted Environmental Consultants shall follow the guidelines set out in Schedule-11 in preparing the Environmental Impact Assessment Report and the Environmental Management Plan Report as part of this report.

(4) All the activities, steps, plans or monitoring programs mentioned in the environmental management plan of a red class industrial establishment or project shall be properly followed to the concerned entrepreneur shall be given a declaration in accordance with Form-6.

Certain criteria and conditions have also been established by the DoE for an industrial plant or project. These are as follows:

- The location of the industry should be in an area that is/will be designated as an industrial zone, under the town and country planning regulations.
- While selecting sites for red and orange categories, a few considerations are to be kept in mind environmentally/otherwise sensitive areas: nearest human settlement, highway/railway boundary, and high tide line (coastal regions) or natural/modified flood plain boundary.
- Forest land and prime agricultural land should be avoided as far as practicable.
- The plant should adequately provide for storage of solid wastes, treatment of wastewater, use of treated wastewater (if feasible), and a green belt around the perimeter.
- Highly polluting industrial plants should not be located in the vicinity of a recharge area/aquifer, catchment areas prone to floods/earthquakes, and areas of frequent inversions.
- Other factors also need to be considered like induced growth around the industrial site, views of the likely project-affected people, effects on the availability of existing infrastructural facilities to the local population, and assimilative capacity of the receiving body of water.
- It is advisable to shortlist a few potential sites keeping in mind the above criteria, and then select a site with minimal environmental impacts.

Environmental standards in operation in Bangladesh are also promulgated under the Environment Conservation Rules 2023. There are standards prescribed for varying water sources, ambient air, noise, odor, industrial effluent, emission discharges, vehicular Emission, etc.

The Bangladesh standards intend to impose restrictions on the volume and concentrations of wastewater/solid waste/gaseous emission etc. discharged into the environment. In addition, a number of surrogate pollution parameters like Biological Oxygen Demand, Chemical Oxygen

Demand; Total Suspended Solids, etc. are specified in terms of concentration and/or total allowable quality discharged in case of wastewater/solid waste. Additionally, specific parameters depending on the manufacturing process are specified such as phenol, cyanide, copper, zinc, chromium, etc. Air emission-quality standards refer mostly to the concentration of mass emission of various types of particulates, sulfur dioxide, and oxides of nitrogen and in some cases volatile organic compounds and other substances.

The Bangladesh standards in general are less stringent compared to the developed countries. This is in view to promote and encourage industrialization in the country. The Bangladesh standards are not for any specific period. There is no provision for partial compliance too.

Standards for water, ambient air, noise, etc. are shown in Table.

3.9.7 The Ground Water Management Act, 2018

The Ground Water Management Act, 2018 has repealed the previous Ground Water Management Ordinance, 1985. This Act is to manage the groundwater resources for agricultural production. This document describes the effects of the law that are inconsistent with the ordinance, Upazila irrigation committee, license for tube well and existing tube well, suspension and revocation of license, cancellation of license, supply of tube well by corporation, power to make rules and power to exempt.

But this Act has no provision related to civil society participation. The Act does not address industrial, commercial and other abstraction, protection of groundwater (e.g. recharge, conjunctive use of surface and groundwater, rainwater harvesting, long term planning, punishment of water mining, etc.), integrated use of ground and surface water, absence of central monitoring/regulation mechanism, safe and sustainable abstraction of groundwater monitoring of quantity and quality of groundwater, water pollution, and water safety issues.

3.9.8 Water Supply and Sewerage Authority Act, 1996

Water Supply and Sewerage Authority Act, 1996 was enacted to develop water supply and sanitation systems and to deliver water supply, sewerage, and stormwater drainage services. It provides for autonomous corporate management structures of Water Supply and Sewerage Authority (WASAs) which are answerable to their respective Boards of Directors representing a range of stakeholders. No person can abstract, treat, pump, preserve or supply of water or construct sewerage, pumping, and treatment plant within its jurisdiction. But the authority is not at all concerned about the industrial effluents. The matter of ensuring water quality has been neglected in this act. There is no provision for monitoring the water table, collecting data, maintaining databases, and long-term planning for sustainable use and management of water resources.

3.9.9 National Energy Policy 1995

The National Energy Policy (1995) addresses both energy conservation and environmental issues. The National Energy policy suggests the utilization of energy for sustainable economic growth, supply to different zones of the country, development of indigenous energy sources and ensuring

environmentally sound and sustainable energy development programs causing minimum damage to the environment.

The Environment Policy and the Energy Policy have seven recommendations; three of these are relevant to the proposed project:

- Environmental Impact Assessment should be made mandatory and should constitute an integral part of any new energy development project.
- Use of economically viable environment-friendly technology is to be promoted.
- Popular awareness to be promoted regarding environmental conservation.

3.9.10 Solid Waste Management Regulations, 2021

The **Solid Waste Management Regulations 2021** were published in Bangladesh on December 23, 2021, under the Bangladesh Environmental Protection Act, 1995. The Regulations define the responsibilities of businesses involved in solid waste management and impose collection, recycling, and disposal obligations according to **Extended Producer Responsibility (EPR)** on manufacturers of non-biodegradable products such as glass, plastic, and bottles. The Regulations also include provisions for the treatment of solid waste such as composting and energy recovery.

The main provisions of the Regulations are as follows.

- When recovering resources from waste, the principles of management that consider the waste hierarchy, such as the 3Rs, segregation, and reduction, must be followed at all stages from waste generation to final disposal.
- Responsibilities of waste generators, consumers, and users:
  a) Dispose of waste in accordance with the regulations of authorities including local government.
  b) Dispose of waste separately.
  c) Do not dump, store, or burn waste outdoors.
- Responsibilities of manufacturers (*not defined) and importers of products Collect non-biodegradable products such as glass, plastic, polyethylene, multi-layered packaging, bottles, and cans from consumers and recycle or dispose of them if appropriate.
  a) Determine work plans and implementation procedures for recycling and disposal.
  b) Ensure that EPR is properly implemented.
  c) Submit an annual report to the Department of Environment (DOE) on the amount of plastic recycled.
- Raise public awareness of proper waste management.

Any violation of the above provisions shall be subject to imprisonment for not more than two years or a fine not exceeding 200,000 taka (approximately 270,000 yen), or both. The Regulations also include provisions for the treatment of solid waste such as composting and energy recovery.

3.9.11 Hazardous Waste (e-waste) Management Rules, 2021

Bangladesh's Department of Environment (DOE) published the Hazardous Waste (e-waste) Management Rules, 2021 under the Bangladesh Environmental Protection Act, 1995. The E-waste rule covers the products listed in the Schedule (home appliances, monitoring and control equipment, medical equipment, automatic machines, IT and communication equipment), and establishes obligations for manufacturers, assemblers, collectors, sellers, and consumers of the products. The rule also sets provisions to limit the use of the 10 substances covered by the EU RoHS Directive. This regulation entered in force upon publication.

The main provisions of this regulation are as follows.

- Manufacturers, traders, sellers, transporters, repairers, collection centers, recyclers, dismantlers, etc. of the subject products are required to register with a prescribed form to the DOE. When applying for registration, they shall also submit WEEE management plan.
- Registered manufacturers, recyclers, etc. shall obtain environmental clearance in accordance with the Bangladesh Environmental Protection Rules, 1997.
- Manufacturers have to establish individual or joint collection centers and set aside funds for the management of WEEE.
- For fluorescent lamps and mercury incandescent lamps, if they cannot be recycled, they need to be handed over to collection centers for storage and disposal.
- Manufacturers, importers, etc. shall meet the collection targets for WEEE as specified in the Schedule (10% in the first year of the implementation, 20% in the second year, 30% in the third year, 40% in the 4th year, and 50% in the fifth year and thereafter).
- In order to facilitate the proper management of WEEE, the name, address and contact information of the trader or seller as well as the information on the registered collection center shall be displayed on the product or on the product label, or this information shall be provided to consumers or large consumers.
- Traders, sellers and collectors of WEEE shall receive them from consumers at designated points and transport them to collection centers.

In case of violation of the provisions of these rules, the offender shall be liable to imprisonment for a maximum period of two years or to a fine of up to two hundred thousand taka, or to both, in accordance with Section 15(1) of the Bangladesh Environmental Protection Act, 1995. In case of repeat offenders, they shall be punished with imprisonment for a term ranging from two to ten years or a fine ranging from Taka 200,000 to Taka 1,000,000 or both.

3.9.12 Noise Pollution Control Act, 2006

Noise Pollution (Control) Rules 2006 were adopted under Section 20 of the Bangladesh Environment Conservation Act 1995 with a view to laying down the specific guidelines regarding noise pollution and the degree of allowable noise in different areas.

The rules categorize noise levels for five types of areas, those are silent areas, residential areas, mixed areas, commercial areas, and industrial areas. This Act also permitted a certain level of noise for these areas.

The permitted noise level for residential areas is 55 decibels at day and 45 decibels at night.

In industrial areas, the limit is 75 decibels at day and 70 decibels at night. 6 am and 9 pm is considered as daytime while the remaining hours are considered as night-time. However, these rules do not apply to religious events, Mosques or Temples.

The Rules also mentioned that no construction machines used to process and break down building materials (bricks, stones, etc.) shall be used within 500 meters of any residential areas and such types of machinery cannot be used between 7 pm and 7 am except without the permission of the concerned authorities.

Violation of these Rules is a punishable offense, with imprisonment up to 1 month and/or fine up to 5,000 BDT. For repeated offense, one may be imprisoned up to 6 months and/or fined up to 10,000 BDT. Loud horns and excessive honking is not yet punishable but it should be, it is one of the major cause of excessive noise.

This Act defined a set of regulations for controlled noise in some ways, but it is largely ignored by most of the people in our country, as we are seeing a gross violation of this Law everywhere in Bangladesh.

3.9.13 Air Pollution Control Rules, 2022

The Ministry of Environment, Forest and Climate Change (MoEF) of Bangladesh released the draft Air Pollution Control Rules 2021, which aims to manage air pollution for environmental conservation and sustainable development on March 18, 2021 and is inviting public comments. The draft Rules are regarded as subordinate regulations of the Bangladesh Environment Conservation Act, 1995 and its main provisions are as follows.

- The Rules stipulate environmental air quality standards (general standards), emission standards for vehicles, emission standards applicable to industries or projects, and odor standards.
- After the promulgation of the Rules, the Department of Environment (DoE) shall prepare a National Air Quality Management Plan that includes an organizational working framework and efficient management of indoor air quality. When preparing the National Air Quality Management Plan, the standards and methods specified in the Rules shall be followed.
- The DoE shall prepare and publish a list of industries, projects, and activities that are harmful to the environment and human health. For the industries and activities included in the list, the DoE shall establish emission standards and conditions for management as appropriate.

- In order to control air pollution from motor vehicles, the regulatory authority for motor vehicles shall comply with the standards and control methods specified in the Rules and follow the work procedures recommended in the National Air Quality Management Plan.
- The DoE may inspect the emissions of motor vehicles and restrict the movement of old motor vehicles that give off emissions exceeding the standards. The DoE may also regulate and prohibit certain engines in order to enforce the standards and control methods specified in the Rules.
- Local government organizations, construction management authorities, and other relevant organizations shall comply with the standards and control methods specified in the Rules and follow the work procedures recommended in the National Air Quality Management Plan.

The Rules also provide for the prevention of air pollution from hazardous waste, excessive emissions of air pollutants, air quality monitoring and warning, data management, establishment of a national executive committee for air pollution control, measures to prevent damage to ecosystems caused by air pollution, awards for contributions to air pollution control, and penalties for violations.

3.9.14 Standing Orders on Disaster, 2010

The Standing Orders on Disaster is designed to enhance capacity at all tiers of government administrative and social structures for coping with and recovering from disasters. The document contains guidelines for construction, management, maintenance, and use of the cyclone shelter center. Accordingly, to the guideline, geographical information system (GIS) technology will be applied at the planning stage to select the location of cyclone shelter considering habitation, communication facilities, and distance from the nearest cyclone center.

The advice of the concerned District Committee is to be obtained before the final decision. The cyclone shelters should have easier communication facilities so that in times of distress delay does not occur to go there. For this reason, the road communication from the cyclone shelters should not only link up with the city or main road but also with neighboring village areas. Provision of emergency water, food and sanitation, and shelter space for livestock during the period should also be kept in view for future construction of shelters.

3.9.15 National Land-Use Policy, 2001

The Government of Bangladesh has adopted the national Land use Policy, 2001. The salient features of the policy objectives relevant to the proposed are as follows:

- To prevent the current tendency of gradual and consistent decrease of cultivable land for food production to meet the demand of explaining populations.
- To ensure that land use is in harmony with the natural environment,
- To use land resources in the best possible way and to play a supplementary role in controlling the consistent Increase In the number of landless people towards the elimination of poverty and the increase of employment,

- To protect natural forest areas, prevent river erosion and destruction of hills;
- To prevent land pollution, and
- To ensure the minimal use of land for construction of both government and non-government.

3.9.16 Acquisition and Requisition of Immovable Property Ordinance, 1982

The 1894 Land Acquisition Act and the 1948 East Bengal (Emergency) Requisition of Property Act were replaced by the comprehensive 1982 acquisition and requisition of Immovable Property Ordinance (Ordinance □ of 1982). This 1982 Ordinance governs all cases of acquisition and requisition of immovable property by the Government for any public purpose or Public Interest.

Salient features of Acquisition and Requisition of Immovable Property Ordinance of 1982.

Matters to be cons/dared in determining compensation include,

- The market value of the property;
- Damage to standing crops or trees due to acquisition,
- Damage due to severance of acquired property from other property at the time of the actual taking of permission by concerned authorities;
- Damage due to lowering 01-profit to the property acquired between tile serving of acquisition notice and actual acquisition.

3.9.17 Property (Emergency) Acquisition Act, 1989

Following the devastating floods of 1987 and 1988, the Government passed a new land acquisition law entitled Property Emergency Acquisition (Act ix of 1989). This is 1989 Act was promulgated to expedite land acquisition in an emergency for flood control purposes and to prevent river erosion. The 1989 Ordinance is only in special content. The 1989 Act was meant to remain in force for five years. There are no additional provisions in the 1989 Act to ensure faired payment of compensation. However, stricter time limits may be applied under the 1989 Act to enable the prompter payment of compensation monies.

Salient features of Acquisition and Reacquisition of Immovable Ordinance of 1982 the relevant points of the 1982 law are as follows:

- Property means only immovable property (land and buildings) and includes any right in such property.
- Owners include the occupiers.

Matters to be considered in determining compensation include;

- The market value of the property.
- Damages to standing crops or trees due to acquisition.
- Damages due to severance of acquired property from other property at the time of the actual taking of permission by concerned authorities.

- Damage due to other properties or earnings.
- Expensed for relocating of residence.
- Damage due to lowering of profit, the property to be acquired between the serving of acquisition notice and actual acquisition.

3.9.18 Town Improvement Act, 1953

This act prevents the haphazard construction of buildings and development of housing or industrial complexes or any similar activities in the areas not specifically classified for that purpose. Master plans for different cities have been prepared where specific regions have been identified for particular activities in such a way so that it causes minimum problems and maximum advantages.

3.9.19 ECA (Ecologically Critically Area) Provision

An Ecologically Critical Area (ECA) is an environmental protection zone in Bangladesh. In 1995, specific areas in Bangladesh could be deemed Ecologically Critical Areas as a result of the Environmental Conservation Act. There is a multitude of areas that have been considered ECAs. Cox's Bazar is on the border of Bangladesh and Myanmar in the southeast corner of Bangladesh. The Teknaf Peninsula is 80 km of sandy beach and holds a variety of species as one of the longest beaches in the world. The Sonadia Islands are home to some of the last mangrove forests that house distinct species that can tolerate the high salinity of the mangrove forests in this area. The **Sundarbans** also contain mangrove forests and was named an ECA because it continues to suffer from over-exploitation and illegal urban development. St. Martin's Island is known for its coral algal that overwhelms its rocky reefs. The island is a refuge for globally threatened marine species. Finally, the Hakaluki Haor found in greater Sylhet is an ECA because it has an extensive amount of wetland habitats that support a wide variety of life.

3.9.20 Investment Board Act, 1989

Board of Investment, established under this act, is the principal private investment promotion and facilitation agency of Bangladesh which is responsible for the implementation of provisions of the above-said policy.

Under the provision of this act as per Schedule 11, All industries established in non-governmental sectors licensed by the Board shall be registered in the prescribed manner.

As per Schedule 15 of this act, any industrial undertaking licensed transgresses any provision of this Act or any rule made thereunder or breaks any condition relating to the license, the Board may, in such manner as may be prescribed, cancel the license of the industrial undertaking.

3.9.21 Convention on Biological Diversity (CBD)

Fifth National Report of Bangladesh (2015) to the CBD has been considered while preparing this IEE report. The coastal and marine ecosystems along with aquatic biodiversity (aquatic flora and fauna) have been emphasized in conducting this IEE report.

3.9.22 Environment Court Act, 2010

In 2010 the Environment Court Act, 2010 has been passed and the Act of 2000 has been repealed. The present Act is aimed to establish one or more Environment Court/s in each district & to establish Environment Appellate Court. It defines the jurisdiction of the Environmental Court for trial of offence or for compensation under environmental law (ECA 1995). The enacted ECA and ECR did not appear to be suitable for traditional Court (Adalat) system in Bangladesh where huge number of cases needed to be disposed in quick time.

Guiding legislations: ECA1995, ECR1997, The Code of Civil Procedure 1908, The Code of Criminal Procedure, 1898, Penal Code 1860.

Salient Features of the Environment Court Act

- Environment court constitutes one Judge of the rank of Joint District Judge.
- Provides for the establishment of one or more Special Magistrate Court/s with the Magistrates of the first class or Metropolitan Magistrates in each District to deal with offences punishable with less than 5 (five) years imprisonment or 5 (five) lac taka as fine or both
- DG, DoE can file the case directly with the special magistrate's court or file a complaint with the police station under criminal procedure.
- DG, DoE or anyone directed by the court can enter any place for inspection, search, collect evidence or seizure.
- Investigation carried out by an Inspector or any officer subordinate to the DG, DoE. He will have the same powers as an OC of a police station.

3.10 Local Government Laws

Corporations shall make adequate arrangements for the removal, collection, and proper disposal of refuse (Section 77 of the Chittagong City Corporation (CCC) Ordinance, 1982; Dhaka City Corporation sec. 78; Rajshahi City Corporation sec. 77; Khulna City Corporation sec. 75; Barisal City Corporations sec. 85 and Sylhet City Corporation sec. 85).

- Local Government (Union Parishad) Act 2009 (Lowest level of local government). This Act has given Union Parishad a few tasks of water management in its 2nd schedule.
- Local Government (Pourashava) Act 2009 (District Level Local Government). By the Act Pourshava has been given some of the authority of water management. Article 11 of the 2nd schedule of the Act says about permission for personal source of water in Pourashava area. Discharge of water is discussed in Article 12 and provision of government water body is mentioned in Article 16.
- Local Government (City Corporation) Act 2009. City Corporation has been entrusted with some of the authority of managing water resources in the areas under its jurisdiction.
- Upazila Parishad Act 1998. Upazila Parishad is entitled under 2nd schedule of the Act to manage water resource to a small context.

- District Council (Zila Parishad) Act 2000. District Council has been authorized to manage water resources (water supply, discharge of water, conservation of water and water resources etc.) in the areas under its jurisdiction by this Act.

As local public representatives are included in the IWRM committees under Water Rules 2018, they should be more empowered by law.

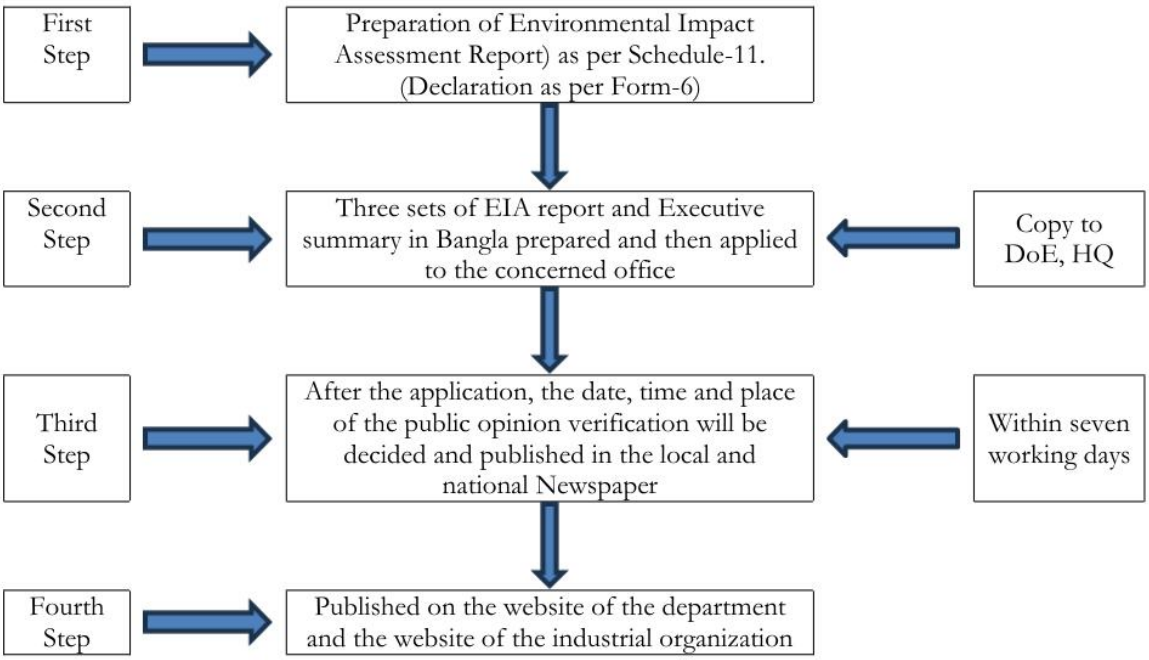
3.11 Procedure for Obtaining Site/Environmental Clearance

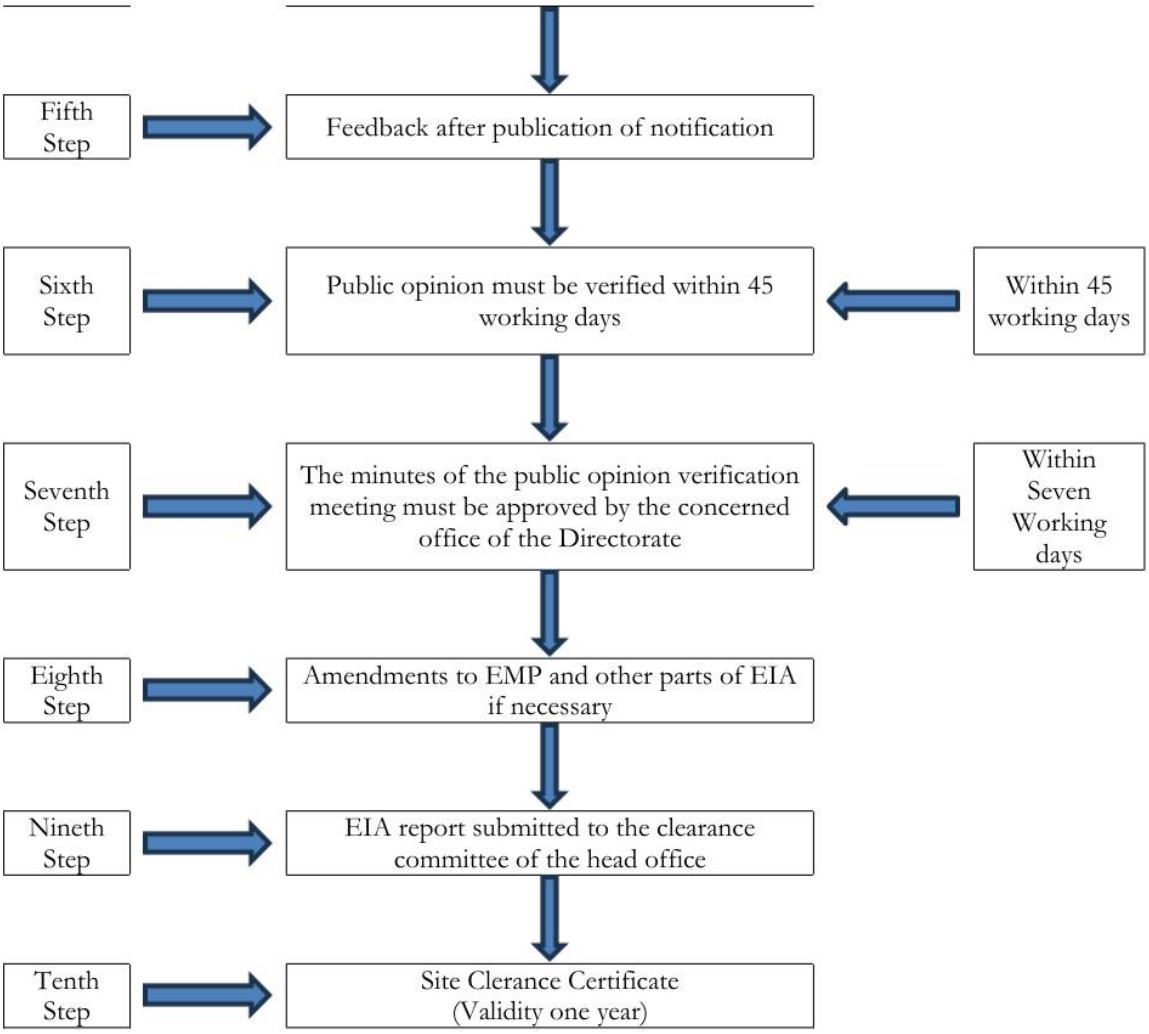
3.11.1 Requirement for Initial Environment Examination (IEE) Report

All industries and projects in the Red category has to conduct EIAs which help in understanding the potential extent of environmental changes and in finding mitigation measures by considering the available information of past experience or standard operating practices. The steps for conducting EIAs are:

- Collection of baseline information in respect of the project and the environmental setting of the project and its site.
- Setting of boundaries of an IEE by identifying the significant issues.
- Impact assessment suggesting mitigation measures, Environmental Management Plan (EMP) or alternative sites or other project modifications.
- In the event the IEE of the project or industry reveals that further investigation is to be carried out, the sponsors will have to carry out a detailed EIA.

3.11.2 Procedure





After completion of the EIA Report the project proponent should apply to the DOE in the prescribed format for site/ environmental clearance. The application for environmental clearance for the project classified in the Red Category should be accompanied by the following documents:

- Feasibility Study Report of the industry (project)
- IEE report
- An NOC (No Objection Certificate) from the local authorities concerned
- Pollution minimization plan including emergency plan for mitigation of adverse environmental impacts
- Outline of relocation plans (where applicable)
- Other information as deemed necessary

It is also mentioned in the Environment Conservation Rules that the Director General of the Department of Environment can issue environmental clearance directly without issuing any site

clearance to any industry or project if he (the Director General) finds appropriate reason for doing so. As the proposed Construction of Shipbuilding project is red category, all necessary requirement mentioned above will be adopted for the project.

Under the condition specified in the Environmental Conservation Rules-2023, the DoE divisional authority must issue an environmental site clearance letter within 60 working days from applying or the refusal letter with appropriate reasons for such refusal. The clearance issued remains valid for one year and is required to be renewed 30 days before the expiry of the period.

Environmental Conservation Rules-2023 ensures the right of any aggrieved party to appeal against the notice order or decision to the appellate authority. The appeal should be made to the appellate authority with clear justification and the attested copy of the DoE office against, which the appeal is to be made. The focus of the ECR, 2023 lies with the classification of industries into three main categories, i.e., Green, Orange, and Red, based on their pollution potential. Documents require by respective DoE divisions for different categories are as follows:

For Green Category:

- General information about the industrial unit or project;
- The exact description of the raw materials and the manufactured product;
- No objection Certificate from the local authority.

Orange listed industries fall under two sub-categories:

For Yellow Category:

- General information about the industrial unit or project;
- The exact description of raw materials and manufactured products;
- No objection Certificate from the local authority;
- Process flow diagram;
- Layout Plan (showing location of Effluent Treatment Plant);
- Effluent discharge arrangement;
- Outline of the plan for relocation and rehabilitation (if applicable)
- Other necessary information (if applicable).

For Orange Category:

- Report on the feasibility of the industrial unit or project (applicable only for proposed industrial unit or project)
- Report on the Initial Environmental Examination (IEE) of the industrial unit or project, and also the process flow diagram, Layout Plan (showing the location of Neutralization

Treatment Plant), design of the Neutralization Treatment Plant (NTP) of the unit or project (these are applicable only for a proposed industrial unit or project);

- Report on the Environmental Management Plan (EMP) for the industrial unit or project, and also the Process Flow Diagram, Layout Plan (showing the location of Neutralization Treatment Plant), design of the Neutralization Treatment Plant, and information about the effectiveness of NTP of the unit or project, (these are applicable only for an existing industrial unit or project);
- No objection certificate from the local authority;
- Emergency plan relating adverse environmental impact and plan for mitigation of the effect of pollution;
- Outline of the relocation, rehabilitation plan (where applicable);
- Other necessary information (where applicable).

For Red Category:

- Report on the feasibility of the industrial unit or project (applicable only for proposed industrial unit or project);
- Report on the Environmental Impact Assessment (EIA) relation to the industrial unit or project, and also the terms of reference for the Environmental Impact Assessment of the unit or the project and its Process Flow Diagram; or Environmental impact Assessment report prepared based on terms of reference previously approved by the Department of Environment, along with the Layout Plan (showing the location of Neutralization Treatment Plant), Process Flow Diagram, design and schedule of the Neutralization Treatment Plant of the unit or project, (these are applicable only for a proposed industrial unit or project);
- Report on the Environmental Management Plan (EMP) for the industrial unit or project, and also the Process Flow Diagram, layout Plan (showing the location of Neutralization Treatment Plant), design, and information about the effectiveness of the Neutralization Treatment Plant of the unit or project (these are applicable only for an existing industrial unit or project);
- No objection Certificate of the local authority;
- Other necessary information

The process of getting Environmental Clearance is given in the following figure-

3.12 International and National Environmental Standards/Guidelines

Bangladesh Environmental standards and guidelines relevant to the construction and operation of the project cover the following issues:

- Water Quality

- Atmospheric emissions and ambient air quality;
- Liquid effluent discharges
- Noise emissions and ambient noise levels.

3.12.1 Water Quality

Table 3-1 Standard for Inland Surface Water

Best practice-based classification		Parameter											
		PH	DO mg/l	BOD mg/l	NO_3-N mg/l	NH_4-N mg/l	PO_4-P mg/l	Total Cr mg/l	Pb mg/l	Hg mg/l	Total Coliform Number/100 ml	TDS mg/l	COD mg/l
1.	Source of drinking water for supply only after disinfecting	6.5 - 8.5	≥6	≤2	7	0.1	0.1	0.02	0.03	0.001	≤100	1000	10
2.	Water usable for recreational activity	6.5 - 8.5	≥5	≤3	7	0.3	0.5	0.2	0.05	0.001	≤50	1000	10
3.	Source of drinking water for supply after conventional treatment	6.5 - 8.5	≥5	≤3	7	0.3	0.5	0.02	0.03	0.001	≤5000	1000	25
4.	Water usable by fisheries	6.5 - 8.5	≥5	≤6	7	0.3	0.5	0.05	0.1	0.004	≤5000	1000	50
5.	Water usable by various process and cooling industries	6.5 - 8.5	≥1	12	-	2.7	-	0.1	0.1	0.05	-	1000	100

6.	Water usable for irrigation	6.5 - 8.5	-	≤12	5	1.5	2.0	0.1	0.1	0.002	≤50000	1000	100

Source: Schedule 2, Environmental Conservation Rules-2023, Inland surface water parameter

Notes:

1. Electrical conductivity for irrigation water –2250 µmhoms/cm (at a temperature of 25°C); Sodium less than 26%; boron less than 0.2%.

Table 3-2 Standards for Drinking Water

S.N.	Parameter	Unit	Standards
1.	Fecal Coliform	CFU/100 ml	0
2.	Total Coliform	”	0
3.	Free Residual Chlorine	mg/l	0.20
4.	Nitrate (NO_3^-)	mg/l	45
5.	Arsenic (As)	mg/l	0.05
6.	Turbidity	NTU	5
7.	Aluminum	mg/l	0.20
8.	Ammonia (NH_3)	”	1.50
9.	Barium (Ba)	”	0.70
10.	Benzene (C_6H_6)	”	0.01
11.	Boron (B)		1.0
12.	Cadmium (Cd)	”	0.003
13.	Calcium	”	75
14.	Chloride	”	250*
15.	Carbon Tetra-chloride (CCL_4)	mg/l	0.005
16.	1,1 Dichloro Ethylene (1,1 $C_2H_4Cl_2$)	”	0.03
17.	1,2 Dichloro Ethylene (1,2 $C_2H_4Cl_2$)	”	0.03
18.	Tetrachloro Ethylene ($C_2H_4Cl_2$)	”	0.04
19.	Trichloro Ethylene ($C_2H_3Cl_3$)	”	0.02
20.	Pentachlorophenol	mg/l	0.09
21.	2,4,6 trichlorophenol	”	0.20
22.	Chloroform	”	0.09
23.	Total Chromium (Total Cr)	”	0.05
24.	Color	Hazen Unit	15
25.	Copper	mg/l	1.5
26.	Cyanide (CN)	”	0.05
27.	Fluoride	”	1.0
28.	Hardness (as $CaCO_3$)	”	500
29.	Iron (Fe)	”	0.3-1.0
30.	Total Kjeldhl Nitrogen	”	1.0
31.	Lead (Pb)	”	0.01
32.	Magnesium (Mg)	”	30-35
33.	Manganese (Mn)	”	0.4

34.	Mercury (Hg)	”	0.001
35.	Nickel (Ni)	”	0.05
36.	Nitrite (NO_2^-)	”	1.0
37.	Odor	-	Odorless
38.	Oil and grease	mg/l	0.01
39.	P^H	-	6.5-8.5
40.	Phenolic compounds	mg/l	0.002
41.	Potassium (K)	”	12
42.	Radioactive materials (gross alpha activity)	Bq/l	0.1
43.	Radioactive materials (gross beta activity)	”	1.0
44.	Selenium (Se)	mg/l	0.01
45.	Silver	”	0.02
46.	Sodium (Na)	”	200
47.	Suspended Solid (SS)	”	10
48.	Sulfide as H_2S	”	0.05
49.	Sulfate (SO_4^{-2})	”	250
50.	Total dissolved solids (TDS)	”	1000
51.	Temperature	℃	20-30
52.	Tin (Sn)	mg/l	2.0
53.	Zinc (Zn)	mg/l	5.0
54.	Aldrin/Dieldrin	µg/l	0.03
55.	Anionic detergent	mg/l	0.2

Source: Environmental Conservation Rule-2023, Schedule-2, Standards for drinking water

Note

***For estuarine area 1000 mg/l

Table 3-3 Standard for Sewage Discharge

Parameter	Unit	Standard Limit
Temperature	Degree Centigrade	30
pH	-	6-9
BOD_5 at 20°C	mg/l	30
COD	mg/l	125
Suspended Solids (SS)	mg/l	100
Oil & Grease	mg/l	10
Nitrate (NO_3)	mg/l	50
Phosphate (PO_4)	mg/l	15
Total Coliform	Number/100 ml	1000

Source: Environmental Conservation Rule-2023, Schedule-6, Standards for sewage discharge

Note: 1. The limit shall be applicable to discharges into surface and inland water bodies.

2. Sewage shall be chlorinated before final discharge.

3.12.2 Ambient Air Quality

Table 3-4 Standards for Air

S.N.	Categories of Area	Suspended Particulate Maters (SPM)	Sulphur-dioxide (SO_2)	Carbon Monoxide (CO)	Oxides of Nitrogen (NOx)
		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
a.	Industrial and mixed	500	120	5000	100
b.	Commercial and mixed	400	100	5000	100
c.	Residential and rural	200	80	2000	80
d.	Sensitive	100	30	1000	30

Source: Schedule 2, Environmental Conservation Rules, 1997

Notes:

1. At national level, sensitive area includes monuments, health center, hospital, archeological site, educational institution, and government designated areas (if any).
2. Industrial units located in areas not designated as industrial areas shall not discharge pollutants which may contribute to exceeding the standard for air surrounding the areas specified at Sl. nos. c and d above.

Suspended Particulate Matter means airborne particles of a diameter of 10 micron or less.

Table 3-5 Standard for Odor

Sl. No.	Parameter	Unit	Value
1	Acetaldehyde	Ppm	0.5-5
2	Hydrogen sulfide	Ppm	0.02-0.20
3	Methyl disulfide	Ppm	0.009-0.10
4	Methyl mercapted	Ppm	0.02-0.20
5	Methyl sulfide	Ppm	0.01-0.20
6	Styrene	Ppm	0.4-2
7	Tri-methyl-amine	Ppm	0.005-0.07
8	Ammonia	Ppm	1-5

Source: Environmental Conservation Rule-1997, Schedule-8, Standards for odor.

Table 3-6 Standard for Emission from motor vehicles

Parameter	Unit	Standard Limit
Black Smoke	Hartridge Smoke Unit (HSU)	**65**
CO	gm/km percent area	**24** **04**
Hydrocarbon	gm/km ppm	**02** **180**
NOx	**gm/km** **ppm**	**02** **600**

Source: Environmental Conservation Rule-1997, Schedule-6, Standards for emission from motor vehicles *As measured at two thirds of maximum rotating speed.

Table 3-7 Approved Air Quality Index (AQI) for Bangladesh

Air Quality index (AQI) Range	Category		Color
	In English	In Bangla	
0-50	Good	Bhalo	Green
51-100	Moderate	-	Yellow Green
101-150	Caution	-	Yellow
151-200	Unhealthy	Ashasthykar	Orange
201-300	Very Unhealthy	Khub Ashasthykar	Red
301-500	Extremely Unhealthy	Ottanta Ashasthykar	Purple

Source: ECR, 1997

3.12.3 Ambient Noise Standards

The MoEF under the provisions of ECR, 1997 is responsible for laying down ambient noise standards. Noise Pollution (Control) Rules, 2006 were laid down by the Ministry through a Gazette notification dated September 7, 2006. Ambient noise standards established as per the provisions Rule 5(2) of the aforementioned Rules have been furnished in the following table.

Table 3-8 Standards for sound

SN	Category for sound	Standards determined (dBA)	
		Day	Night
a.	Silent Zones (Sensitive areas such as parks, school, hospitals and mosques)	45	35
b.	Residential areas	50	40
c.	Mixed areas (mainly residential area, and also simultaneously used for commercial and industrial purposes)	60	50
d.	Commercial areas	70	60
e.	Industrial areas	75	70

Source: Schedule 4, Environmental Conservation Rules, 1997

Notes: *The time from 6 a.m. to 9 p.m. is counted as daytime.*

- *The time from 9 p.m. to 6 a.m. is counted as night time.*
- *Area up to a radius of 100 meters around hospitals or educational institutions or special institutions/ establishments identified/ to be identified by the Government is designated as Silent Zones where use of horns of vehicles or other audio signals, and loudspeakers are prohibited.*

Chapter 4: Project Description

4.1 General Information

AVANGUARD SHIPYARD LTD. is to be incorporated in Bangladesh as a limited company with a vision to establish as one of the most progressive and diversified shipbuilding service provider companies in the sub-continent. Avanguard shipyard Ltd. Mainly build new ship for export and also for local buyer. With long-term focus towards developing and establishing sustainable business footprint, AVANGUARD SHIPYARD LTD. will strive towards heavy technologically advance shipbuilding services aimed at numerous customers in Bangladesh and beyond. The company aspires to engage in long-term and sustainable business vision leading by talented team of leaders and professionals in the sector. With continuous focus on quality improvement and value addition, adoption of top-of-the-line technology, commitment towards maintain safe and healthy workplace for the workers and strict adherence to buyer requirements, this company will become one of the most preferred Shipbuilding service providers in future.

The Bangladesh shipbuilding industry is the upcoming player in global market for small and medium sea-going vessels. While the industry mainly caters to the domestic market, exports have been growing satisfactorily over the last decade. Bangladeshi companies have exported ro-ro vessel, multipurpose container vessel, tug boat, landing craft, bulk carrier, patrol vessel, catamaran water taxi, ferry, oily waste collection vessel and passenger vessels to various countries in Europe, Africa and Asia.

The **AVANGUARD SHIPYARD LTD.** intend to build a shipyard at **Pankhali, Dacope, Khulna, Bangladesh.** Geographically the project is located between **22°36'41.4"N latitude and 89°31'19.8"E longitudes.** Total land area of the proposed project will be **42.4108 acre (4,241.08 decimal)**. The size of the yard is 3,960 decimal (161,617 m2 or 120 bigha) and we are in the final stages of processing a registered "Bayna Deed" at a strategically advantageous block of land. The draft is 10m+ all year round (Ref: Annex 22), and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Also, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all.

Mr. Mohammed Imtiaz Hossain, Managing Director, Founder and Shareholder: Mr. Mohammed Imtiaz Hossain, before incorporating ASL, served in a major shipbuilding company, Three Angle Marine, as its Director (Business Development), where he worked on Government contracts of more than BDT 800 crore (approx. USD 90 million), having a role that was quite vast and multi-faceted and it covered Commercial, Banking, International Procurement, Finance and Government Tenders. He is an alumnus of the prestigious Imperial College London, consistently ranked as one of the top 5 universities in the world. Before moving back to Bangladesh in 2011, he spent 7 years working with global giants of the financial services industry of London, UK such as Deutsche Bank (the 22nd largest bank globally with assets worth USD 1.5 trillion), Deloitte and PwC (the last 2 being the number 1 and number 2 Consulting Firms in the world, with revenues

of USD 45.1 billion and USD 50.2 billion respectively). During his time at these prestigious organizations in London, his Business Advisory Services client portfolio included the biggest names from both the Government and Private Sectors, such as Office of the Deputy Prime Minister of UK (under Lord John Prescott's Administration during Prime Minister Tony Blair's regime), the National Health Service (UK), British Railways Board Residuary Limited, Shell, JP Morgan, Royal Bank of Scotland, Morgan Stanley, Banco Santandar, Schroders Investment Management, Charles Taylor Consulting plc, Legg Mason Investments, MAN Funds, Adam and Company plc, Lord Abbett, etc.

The Chief Technical Consultant, a South Korean national, is a decorated veteran of the industry and has an experience of almost 44 years, having started his career at Samsung Heavy Industries (the 3rd largest shipbuilder in the world) as an Assistant Manager (Production) in 1978. In 1983, he then went on to join Hyundai Heavy Industries, the number 1 shipbuilding company in the world in terms of revenue, where he spent 30 years, the final 10 years of which he was the Managing Director of Hyundai Mipo Shipyard. His specialism throughout his career is shipyard production/construction planning and management. In fact, he developed the ERP system that is now used by Hyundai Heavy Industries. Since 2013, he has been freelancing as a Technical Consultant with Sundong Shipyard and STX Shipyard (the 4th largest shipbuilder in the world).

Mr. Mohammed Imtiaz Hossain, Managing Director of **Avanguard Shipyard Ltd.** has proposed to set up this project. According to the ECR 2023, the project is categorized as **RED** as per schedule 1 and serial number 53, therefore the project requires EIA study for its Site Clearance Certificate. The proponent of Avanguard Shipyard Ltd. has requested to '**Global Environmental & Textile Technological Services (GETTS)**' for preparing EIA report on this project as per the DoE guideline. Accordingly, this EIA report has been prepared.

Avanguard Shipyard Ltd. will start its construction after getting site clearance from the DoE and it will be finished within 1 years. The location is suitable for project. General information of the project is shown in below:

4.2 Objectives of the Project

The main objective of the proposed project is

- Construct best quality ship and provides after sales services.
- Produce expeditions and memories that would satisfy each and every single of the customers.

4.2.1 Project Outcome

The possible project outcomes are-

- The project will enhance Shipbuilding sector in Bangladesh.
- Provide job opportunity to the indigenous people.
- The project will help improving the socio-economic condition of the Project site

4.3 Investment of the project

Initial Investment	
Particulars	Price in BDT
Preliminary Costs (Company Formation, Foreign Trips to Korea, Feasibility Report, Soil Test Report, Land BRS Documents Collection)	BDT 20,000,000
Land & Land Development	BDT 84,544,400
- Land, (incl. Registration)	BDT 525,798,000
- Land Development (Sand Filling Only)	BDT 258,746,400
Engineering and Construction	BDT 1,077,624,609
- 12 month of Tech Support Including All GA Diagrams, 3D Layouts and Design and Engineering	BDT 37,100,000
- Civil Works	BD 968,240,805
- Construction Cost of Floating Dock	BDT 72,283,804
Imported Machineries, Material & Other Local CAPEX	BDT 2,127,779,428
- Imported Machineries	BDT 1,939,766,928
- Steel Material for Floating Dock	BDT 147,096,200
- Other Local Capital Expenditure	BDT 40,916,300
TTI & Carriage Inwards Charge for Imported Machineries & Steel Materials	BDT 92,566,806
Total Initial Investment	BDT 4,102,515,242

Investment sources

Serial No.	Purpose	Amount	Parentage
1.	Local equity	1113.293604	85.00% of total equity
2.	Foreign equity	196.463577	15.00 % of total equity
3.	Local loan	2792.758062	100.00% of total equity
4.	Foreign loan	0	0.00 % of total equity
5.	Total financing (BDT)	4102.51524 Taka in Million (4102515240.00 Taka)	

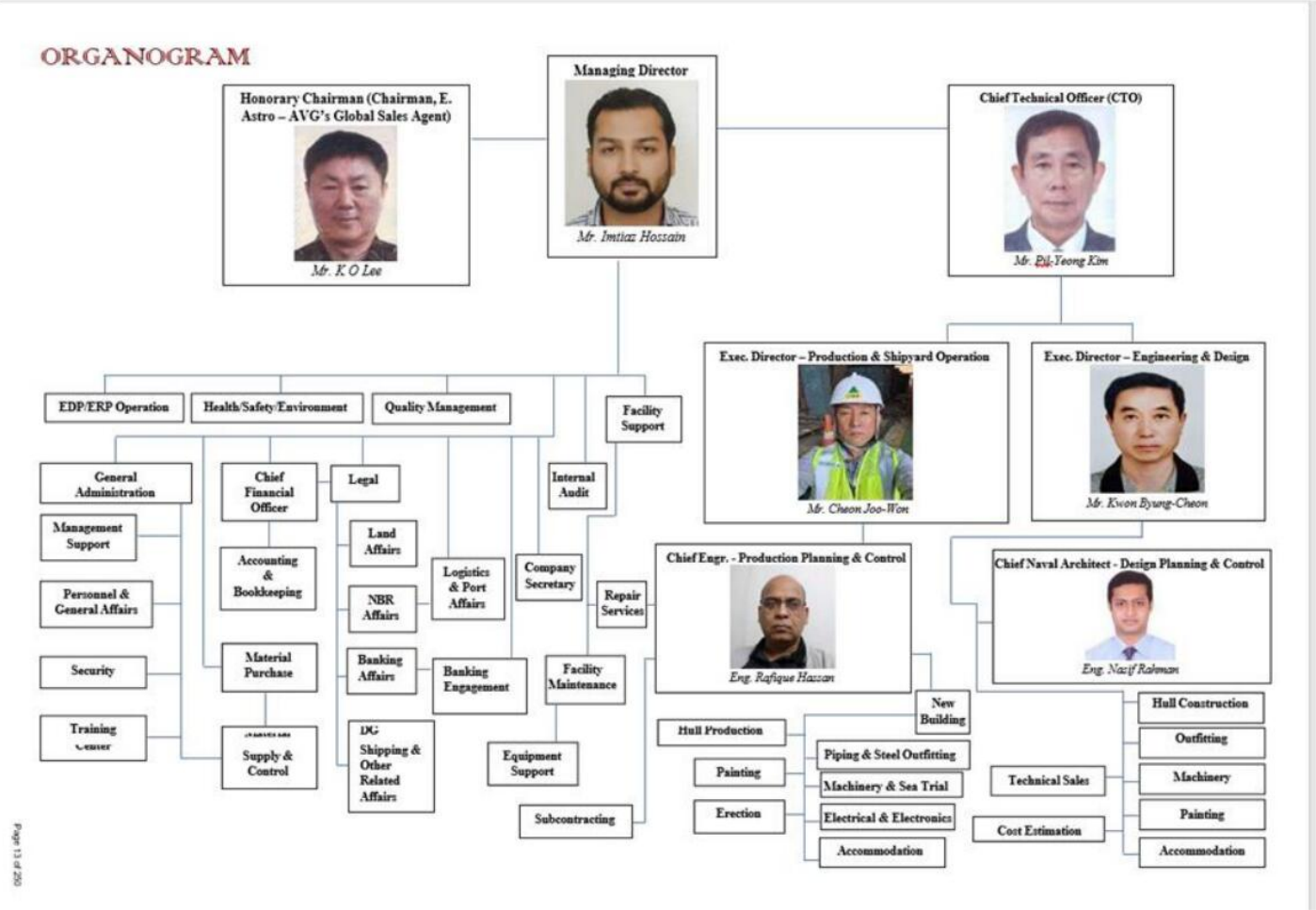


Figure 4:1 Organogram of the project

4.4 Basic Information

The basic data of **Avanguard Shipyard Ltd.** is furnished in Table 4.1.

Table 4-1 Basic Information of Avanguard Shipyard Ltd.

Name of the Project	**AVANGUARD SHIPYARD LTD.**
Type of Company	Private Company Limited by Shares
Project Proponent	Mr. Mohammed Imtiaz Hossain
Designation	Managing Director
Project Cost	410,25,15,242 BDT (Four hundred and ten corer twenty-five lac fifteen thousand two hundred and forty-two taka only
Location	Pankhali, Dacope, Khulna, Bangladesh.
Coordinate of the project	**22°36'41.4"N latitude and 89°31'19.8"E longitudes**
Total land area	Total Land - 42.4108 acre (4,241.08 decimal)
The size of the yard	The size of the yard is 3,960 decimal (161,617 m2 or 120 bigha) and we are in the final stages of processing a registered "Bayna Deed" at a strategically advantageous block of land. The draft is 10m+ all year round (Ref: Annex 22), and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Also, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all.
Final Products	Building of commercial vessels: passenger vessels, ferry-boats, cargo ships, tankers, tugs, hovercraft (except recreation-type hovercraft) etc.
Production Capacity	Construction of Ships and other Water Borne Vessel or Hull Block= 120269 ton per year. Repair Services 100 piece.
Sales	Local 44%, Foreign 56%
Locally procured raw materials	Furniture & fittings, consumables (welding's rod, Oxygen, LPG, electricity), steel pipes, Steels angles
Imported raw materials	Steel Plate, Steel Angles, Various Other Steel Structures, Main Engines, Gearbox, Thrusters, Propeller, Steering gear, Generator, Anchor Windlass, Towing Winch, Hydraulic Power Unit, Anchor,

	Anchor Chain with Accessories, Towline, Mooring Line, Capstan, Towing Hook, Deck Crane, External Fire Fighting System, Engine for External Firefighting Pump, Sewage Treatment Plant, Valves, Door, Windows, Pump with Engine, Oily Water Separator, General Service and fire pump, Bilge and ballast pump, Emergency Fire pump with Diesel Engine, Fresh Water Hydrophore System, Salt Water Hydrophore System, Fuel oil transfer pump, Sewage Pump, Oily Bilge Pump, Pumps For Liquids (With Or Designed To Be Fitted With A Measuring Device), Radar, Echo-sounder, DGPS, VHF, Inclinometer, Speed log (Doppler), Clearview Screen, Aneroid Barometer, SSB Set, Anemometer, Magnetic compass (with dimmer), Binocular, Thermometer, Window wiper, Public address system, General alarm system, Fog horn, Hand Mike, Air Horn, Fog Bell, Air Bag, Fender, Mooring Rope, Navigational Equipment, Transmission Shaft, Ships or Boats Propellers and Blades, Marine clock, Search Light, Deck Light with Frame & Fittings, Interior/Cabin light with frame & fittings, Electrical Board, Navigation Panel Board, Horn, Shadowless Operation Lamps, Aluminum Pipe, Aluminum Plates, Mast Light, Starboard Light, Port Light, Stern Light, Not Under Command Light, Anchor Light, Day Light (Black ball & Diamond Shapes), Fog Light, Walkie Talkie, Life buoy with support, Life Jacket, Life Jacket (infant), Life buoy with M line, Life buoy with self-igniting light, Self-igniting light, Life Line, First Aid box with medicine, Portable type Fire Extinguisher (Foam, DCP, CO2), Dry Powder fire extinguisher, Foam extinguisher, CO2 extinguishers, Foam Type fire extinguishers, Fire hydrant, Hose pipe with Nozzle (Jet + Spray), Fire hoses with combined fog/jet nozzle, Fire hose pipe cradle box, Self-contained breathing Apparatus, Fire men out-fit, Safety lamp, Fire Bucket, Fire axe, Sand box Engine room, Scoop, Fire men out-fit, Fire blanket, CO2 Welding Machine, Submerged Welding Machine, Auto Carriage, Gauging Welding Machine, Tig Welding Machine, Portable Welding Machine, Block Lifter, Fork Lift, Turbo Fan, Dehumidifier, Gas Heater, Vacuum Recovery, Dust Collector, Dehumidifier, Vacuum Recovery, Dust Collector Set, Air Blast Unit, Sand Blasting Unit, Gas Collector, Plasma Cutting Machine, Gas F/P Cutting Machine, Winch With Diesel Engine, Wire rope steel core, H.D.G Mooring Wire.

Manpower	Local 200 Persons, Foreign 4 Persons, Total 204 Persons
Power Requirement	96 KWH per 1 Ton steel
Alternative Source	Generator and Solar Power
Source of Water	Deep tube-well
Oily water Treatment	The oily water will treat by oil water separator.
Wastewater Treatment	**The human waste will be treated by septic tank and soke well after that treated with STP (Drawing, Design and Calculation attach in annexure)**
Estimated Solid waste generation	All the solid waste which are produce from ship building activity like steel, part of block hull etc. will reuse in the production and rest of the solid waste will sell to 3rd party.
Safety and Emergency Preparedness	Fire extinguisher, Fire alarming system, Fire pumps, Fire escape route, Fire hydrant and hose reel, Smoke detector, Wet risers, Sound screening mechanism, Ramp for handicapped people
Jetty Facilities	The proposed dimension of the jetty is 148 m in length with a walkway of 14.30 m in width. The authority used (50 ×165) meters =8250 square meters foreshore for the jetty.
Jetty Facilities	Purpose: To receive Construction materials and Raw materials and also to deliver finished products. Structural Details: Jetty and trestle columns will be made by driving precast piles. Jetty near Riverside Purpose: To receive Construction materials and other purposes after the construction period. Components of the Jetty: Jetty Platform: 148 meters X 14.30 meters
By Product, If any	**The shipbuilding industry deals with the production of larger (mainly seagoing) vessels intended for the merchant fleet (cargo or passenger transport), the off-shore energy industry or military purposes. It also includes products and services supplied for the building, conversion, and maintenance of these ships.**

4.5 Location of the project

The **AVANGUARD SHIPYARD LTD.** intend to build a shipyard at **Pankhali, Dacope, Khulna, Bangladesh.** On the Banks of River Rupsha (Previous name Japjapiya), on the opposite side of Rampal Power Plant. Geographically the project is located between **22°36'41.4"N latitude and 89°31'19.8"E longitudes.**

The location of the project is shown in different maps and the layout plan of the said project attached in the Annexure.

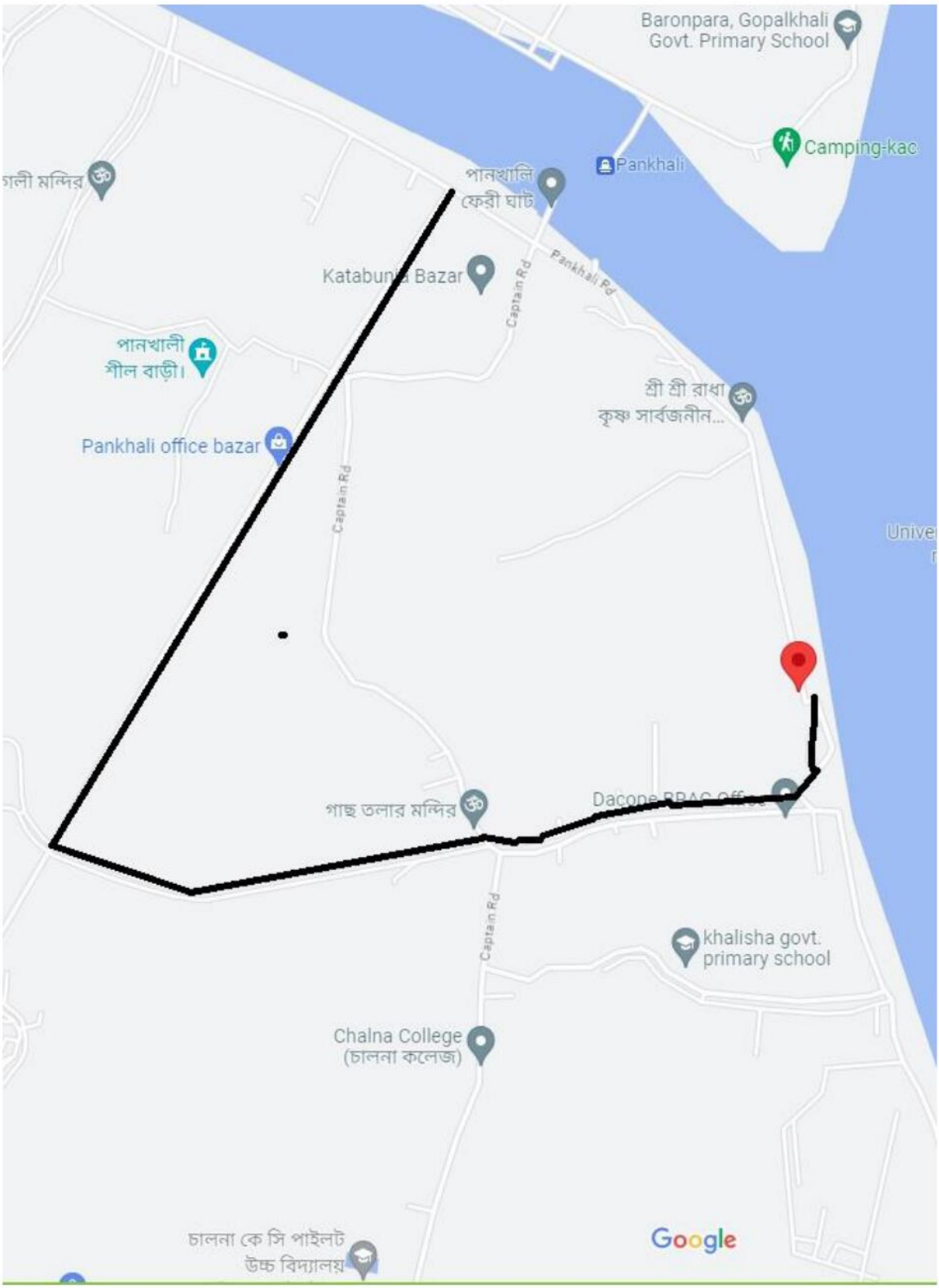


Figure 4:2 Location map from google map 2d

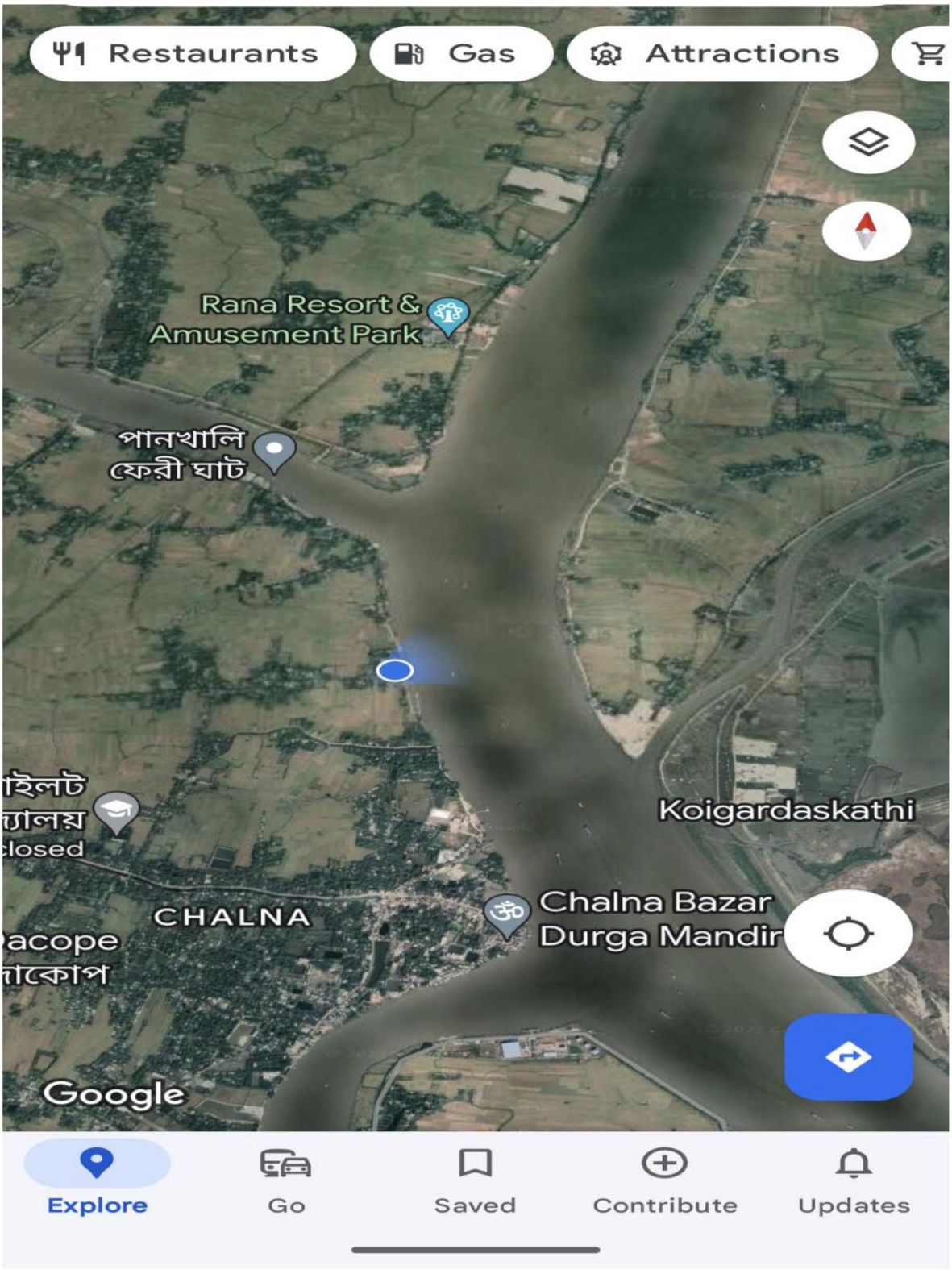


Figure 4:3 Location map 3d

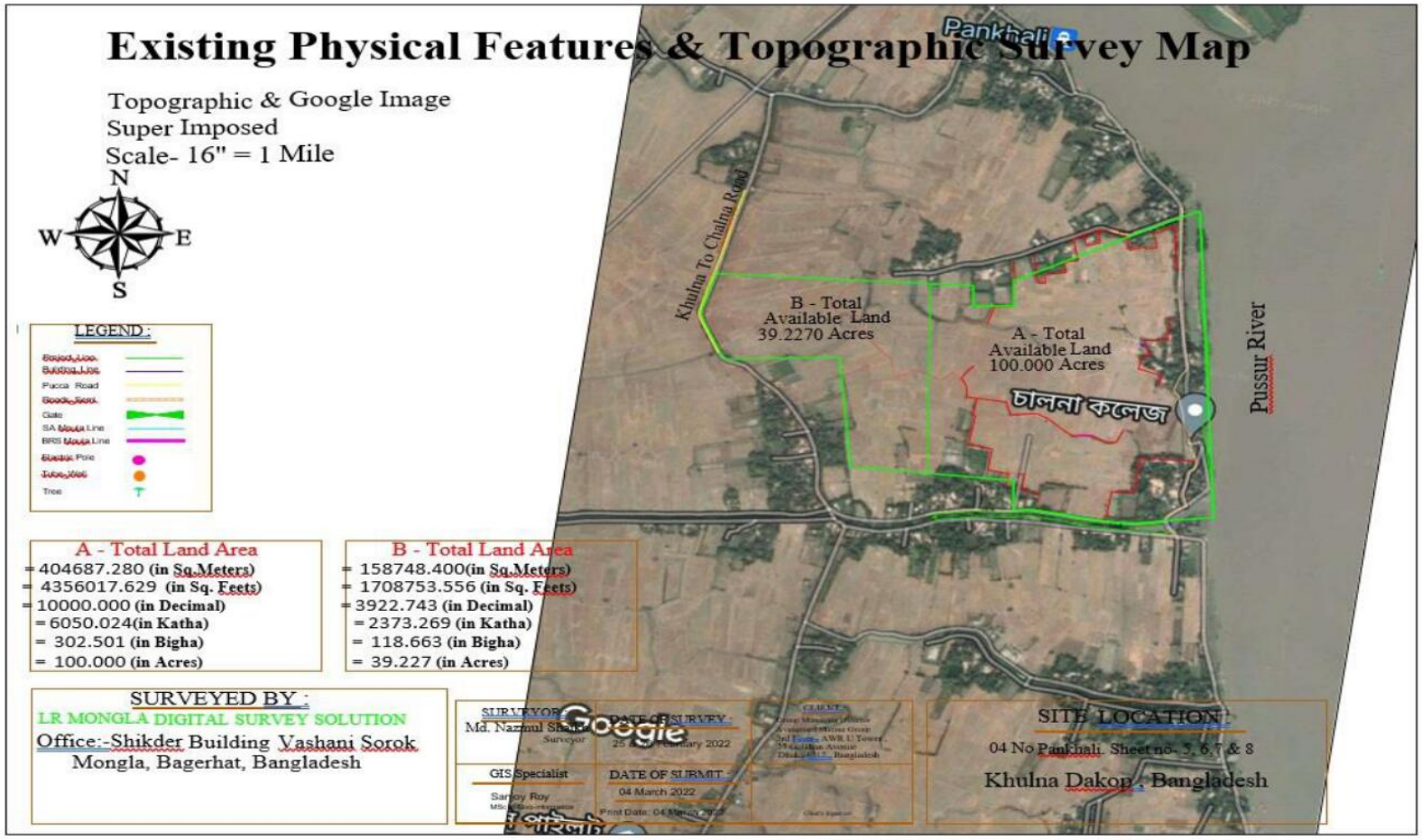


Figure 4:4 Physical Features and Topographic survey map

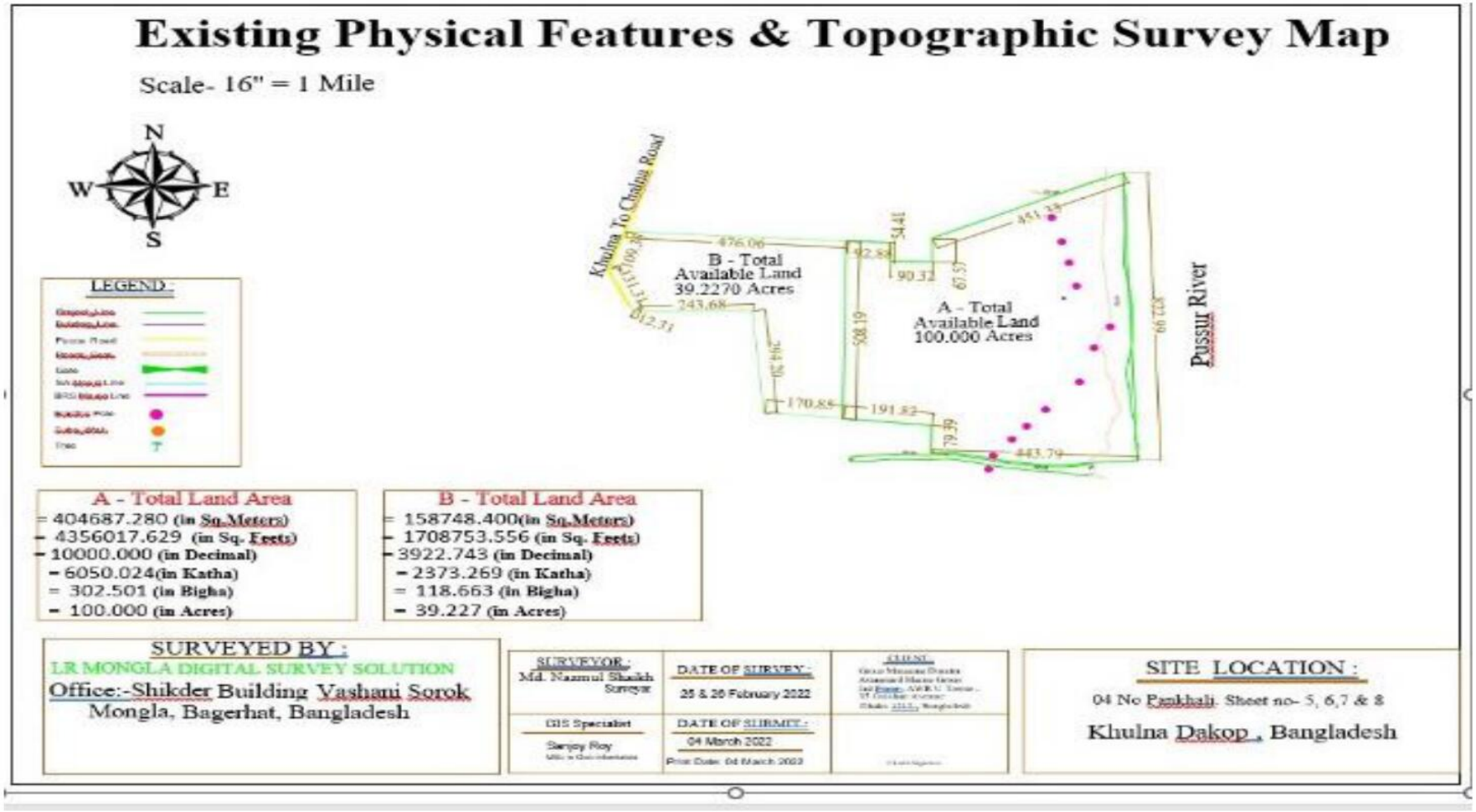


Figure 4:5 Physical Features and Topographic survey map 2

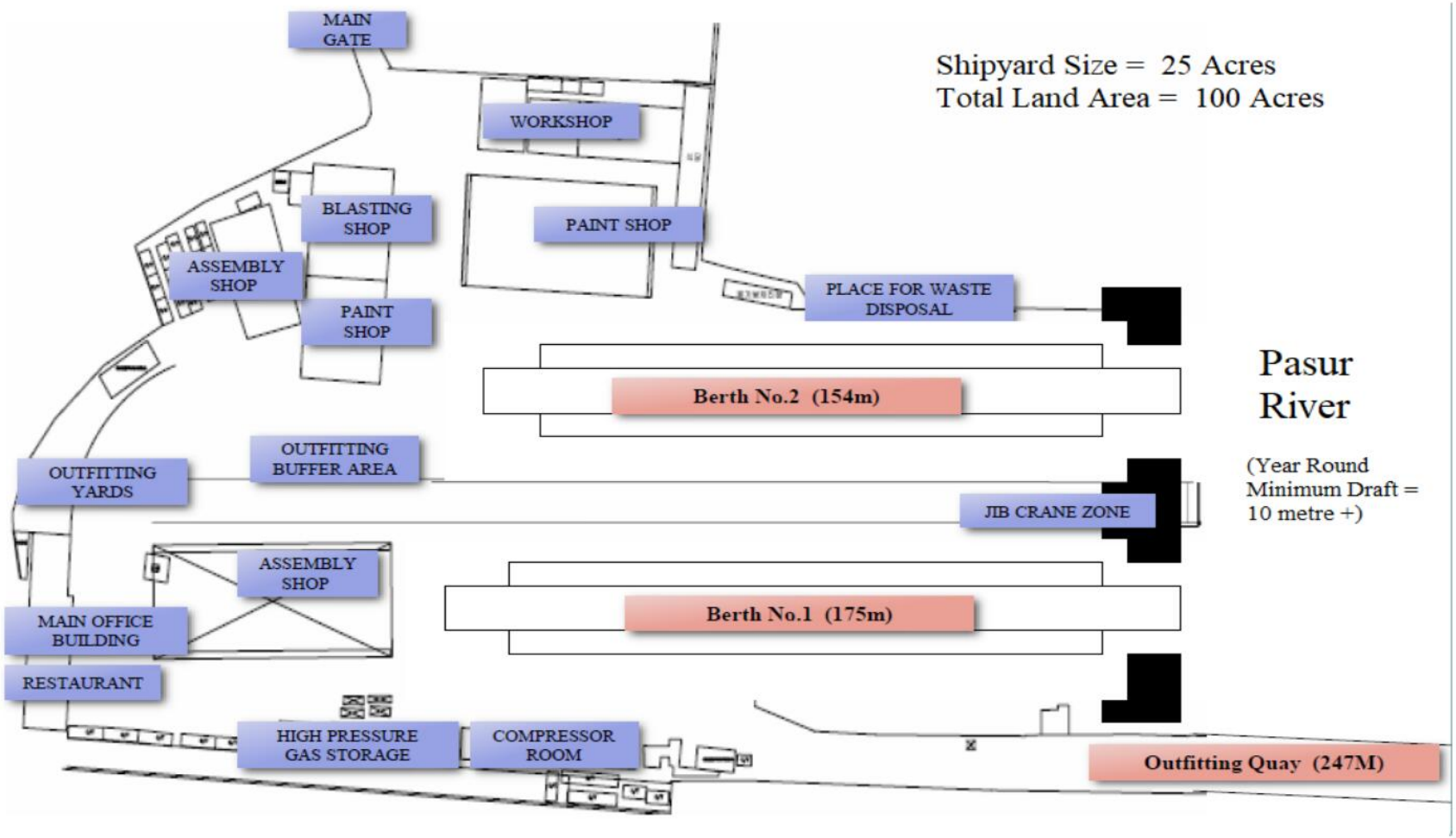


Figure 4:6 Lay-out map

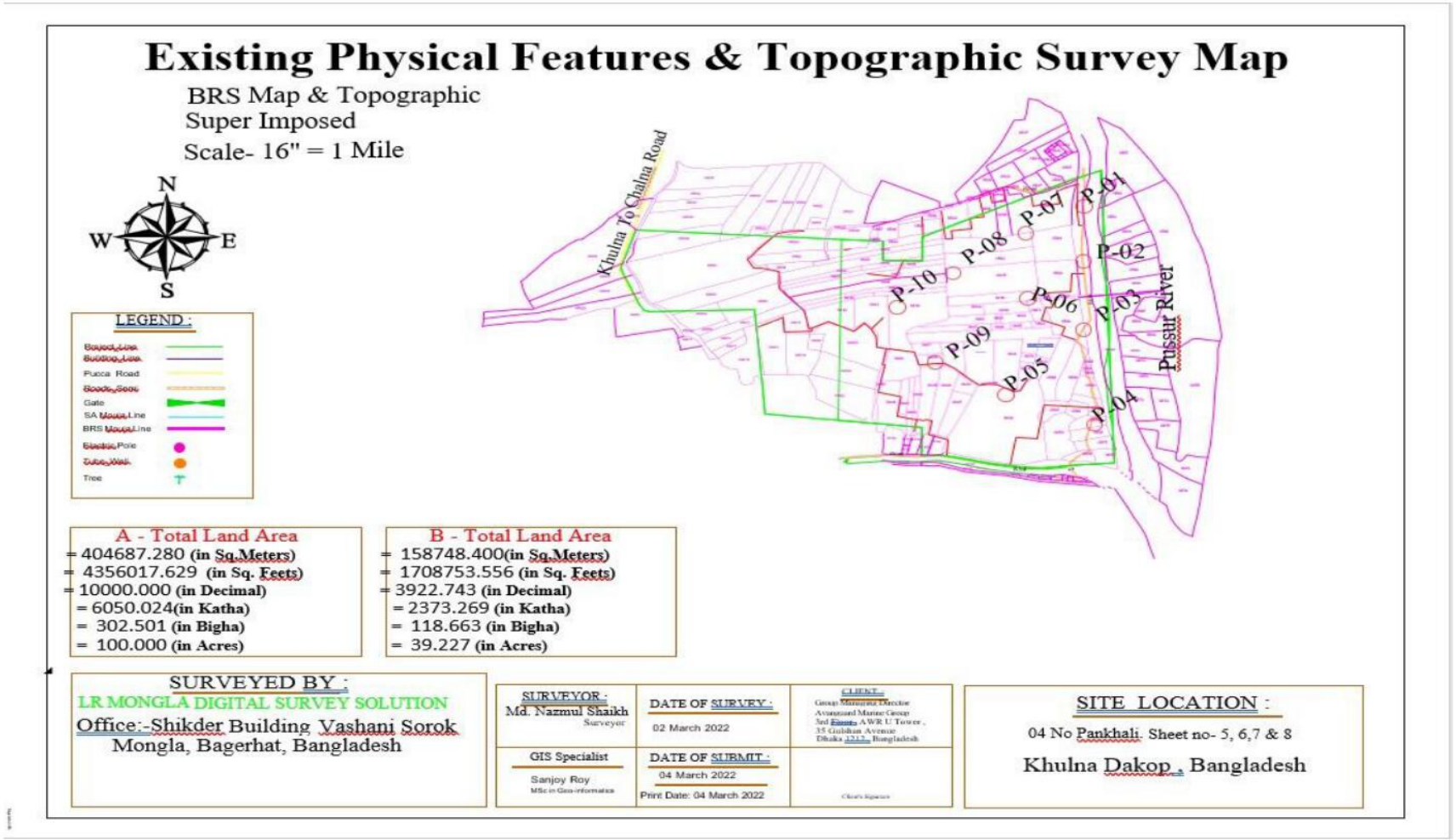


Figure 4:7 Physical Features and Topographic survey map

4.6 Surrounding and Accessibility

AVANGUARD SHIPYARD LTD. is located at Pankhali, Dacope, Khulna, Bangladesh. The site is surrounded by vacant land, green hilly area and road.

- **North:** To the north of the proposed project site, approximately 100-200 meters of vacant land followed by approximately 200-220 meters of Pankhali 1 Union No. 2 Ward No. 80-90 houses. Then Kazi Bacha River and Pankhali Ferry Ghat and Bazar are located approximately 1.4 km away from the project area.
- **South:** To the south of the proposed project site, approximately 70-80 meters of vacant land followed by approximately 40 houses and roads and canals of Ward No. 1 of Union No. 1 of Pankhali.
- **East:** To the east of the proposed project site, Wapda road then vacant land then Jhapjhpia river then Baranpara and Maitvhanga villages exist.
- **West:** To the west of the proposed project site, 400-500 meters of mostly vacant land and later detached houses.

North Side

South Side

East Side (existing road)

West Side

Figure 4:8 Surroundings of the Project

4.7 Project Site Imagery

visual representation of the project site is presented below-

Figure 4:9 Entrance Road of the Proposed Project

This road will be rebuilt during the construction and operation phase of the proposed project.

Figure 4:10 Rupsha (Previous name Japjapiya) river beside the project site

Figure 4:11 Temporary residance of local people on project site

Figure 4:12 Project Site

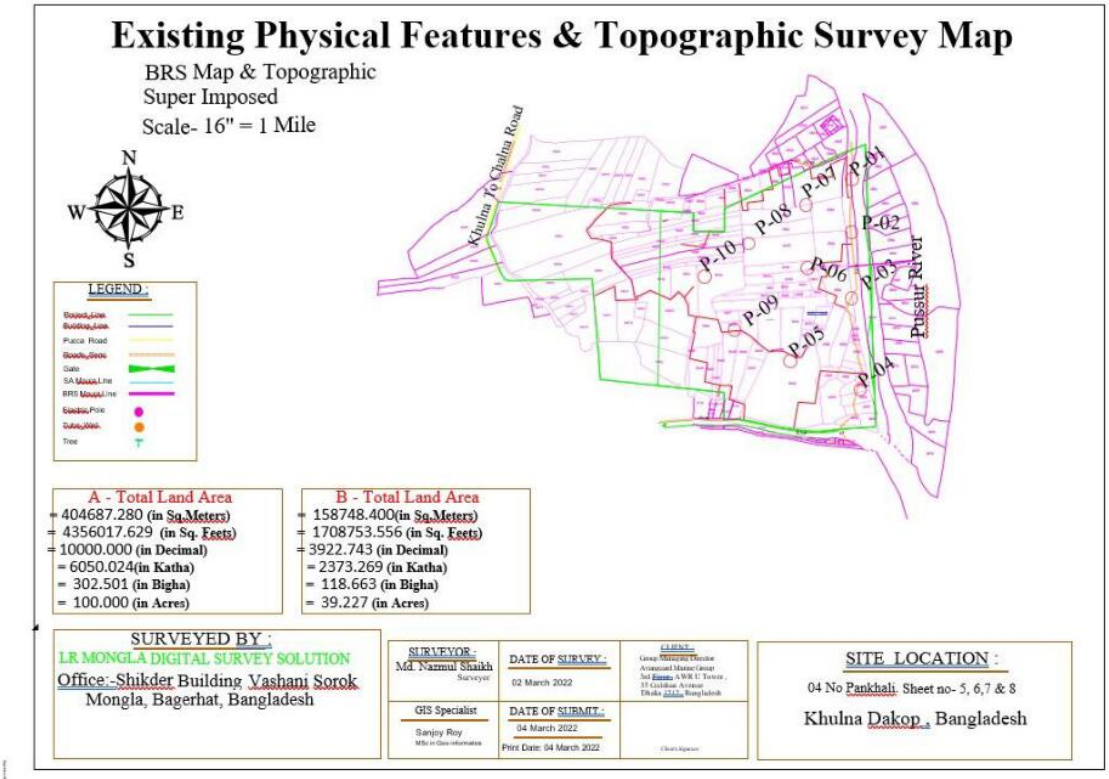
Figure 4:13 Project Site

4.8 Land Area

AVANGUARD SHIPYARD LTD. Project and Agro Ltd. has been proposed to be located at **Pankhali, Dacope, Khulna, Bangladesh** Geographically the project is located between **22°09'41'' N latitude and 92°12'55'' E longitudes and at 468ft. altitude.** Total land area of the proposed project will be **42.4108 acre (4,241.08 decimal)**.

Table 4-2 Land Details

District	Thana	Mouza	B. R. S. Khatian No.	B. R. S. Dag No.	Land Type	Total Land Area
Khulna	Dacope	Pankhali	129, 130, 525, 685, 803, 806, 833, 834, 1023, 1157, 1199, 1457, 1480, 1481, 1919, 1965, 2044, 2047, 2204, 2205, 2261, 2268, 2439, 2576, 2596, 2836, 3047, 3061, 3232, 3516	3578, 3579,3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3602, 3609, 3614, 3617, 3618, 3623, 3627, 3628, 3629, 3630, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3645, 3646, 3647, 3648, 3649, 3650	Bastu bilan	42 acres



4.9 Requirement of the Project

4.9.1 Human Resource

During construction phase a approx. 150 skilled and semi-skilled temporary human resources will be needed. While in operation phase, there will be need of 204 staffs (direct/indirect) mainly working in project. Local people will be prioritized for job opportunity upon qualification.

4.9.2 Materials to be Required

Locally procured raw materials	Furniture & fittings, consumables (welding's rod, Oxygen, LPG, electricity), steel pipes, Steels angles
Imported raw materials	Steel Plate, Steel Angles, Various Other Steel Structures, Main Engines, Gearbox, Thrusters, Propeller, Steering gear, Generator, Anchor Windlass, Towing Winch, Hydraulic Power Unit, Anchor, Anchor Chain with Accessories, Towline, Mooring Line, Capstan, Towing Hook, Deck Crane, External Fire Fighting System, Engine for External Firefighting Pump, Sewage Treatment Plant, Valves, Door, Windows, Pump with Engine, Oily Water Separator, General Service and fire pump, Bilge and ballast pump, Emergency Fire pump with Diesel Engine, Fresh Water Hydrophore System, Salt Water Hydrophore System, Fuel oil transfer pump, Sewage Pump, Oily

	Bilge Pump, Pumps For Liquids (With Or Designed To Be Fitted With A Measuring Device), Radar, Echo-sounder, DGPS, VHF, Inclinometer, Speed log (Doppler), Clearview Screen, Aneroid Barometer, SSB Set, Anemometer, Magnetic compass (with dimmer), Binocular, Thermometer, Window wiper, Public address system, General alarm system, Fog horn, Hand Mike, Air Horn, Fog Bell, Air Bag, Fender, Mooring Rope, Navigational Equipment, Transmission Shaft, Ships or Boats Propellers and Blades, Marine clock, Search Light, Deck Light with Frame & Fittings, Interior/Cabin light with frame & fittings, Electrical Board, Navigation Panel Board, Horn, Shadowless Operation Lamps, Aluminum Pipe, Aluminum Plates, Mast Light, Starboard Light, Port Light, Stern Light, Not Under Command Light, Anchor Light, Day Light (Black ball & Diamond Shapes), Fog Light, Walkie Talkie, Life buoy with support, Life Jacket, Life Jacket (infant), Life buoy with M line, Life buoy with self-igniting light, Self-igniting light, Life Line, First Aid box with medicine, Portable type Fire Extinguisher (Foam, DCP, CO2), Dry Powder fire extinguisher, Foam extinguisher, CO2 extinguishers, Foam Type fire extinguishers, Fire hydrant, Hose pipe with Nozzle (Jet + Spray), Fire hoses with combined fog/jet nozzle, Fire hose pipe cradle box, Self-contained breathing Apparatus, Fire men out-fit, Safety lamp, Fire Bucket, Fire axe, Sand box Engine room, Scoop, Fire men out-fit, Fire blanket, CO2 Welding Machine, Submerged Welding Machine, Auto Carriage, Gauging Welding Machine, Tig Welding Machine, Portable Welding Machine, Block Lifter, Fork Lift, Turbo Fan, Dehumidifier, Gas Heater, Vacuum Recovery, Dust Collector, Dehumidifier, Vacuum Recovery, Dust Collector Set, Air Blast Unit, Sand Blasting Unit, Gas Collector, Plasma Cutting Machine, Gas F/P Cutting Machine, Winch With Diesel Engine, Wire rope steel core, H.D.G Mooring Wire.

Figure 4:14 Floating Dock-based shipyard with Operation Multi-direction MOvement for Vessels

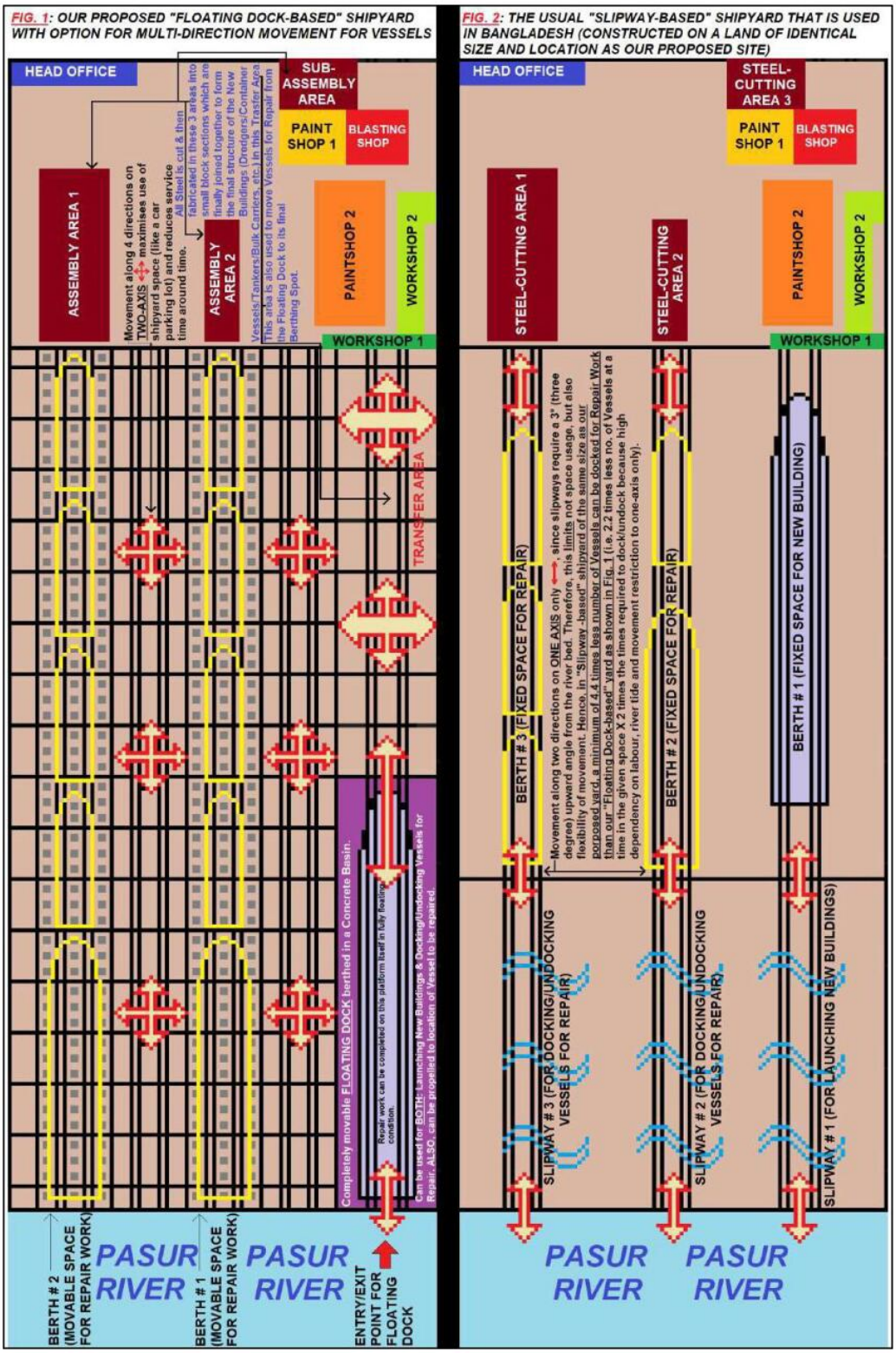


Figure 4:15 Floating Dock-yard vs usual dock yard

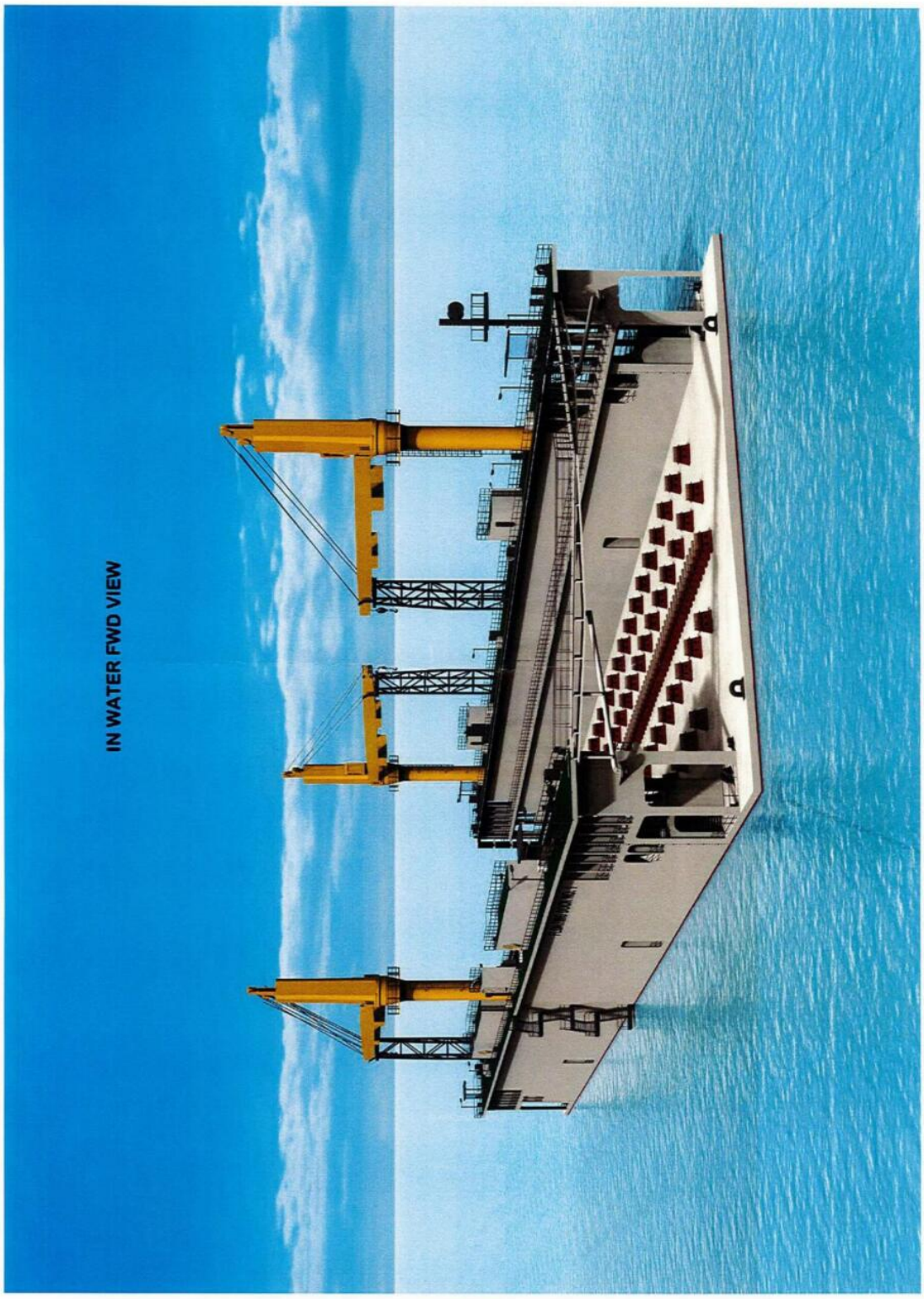


Figure 4:16 In Water FWD view

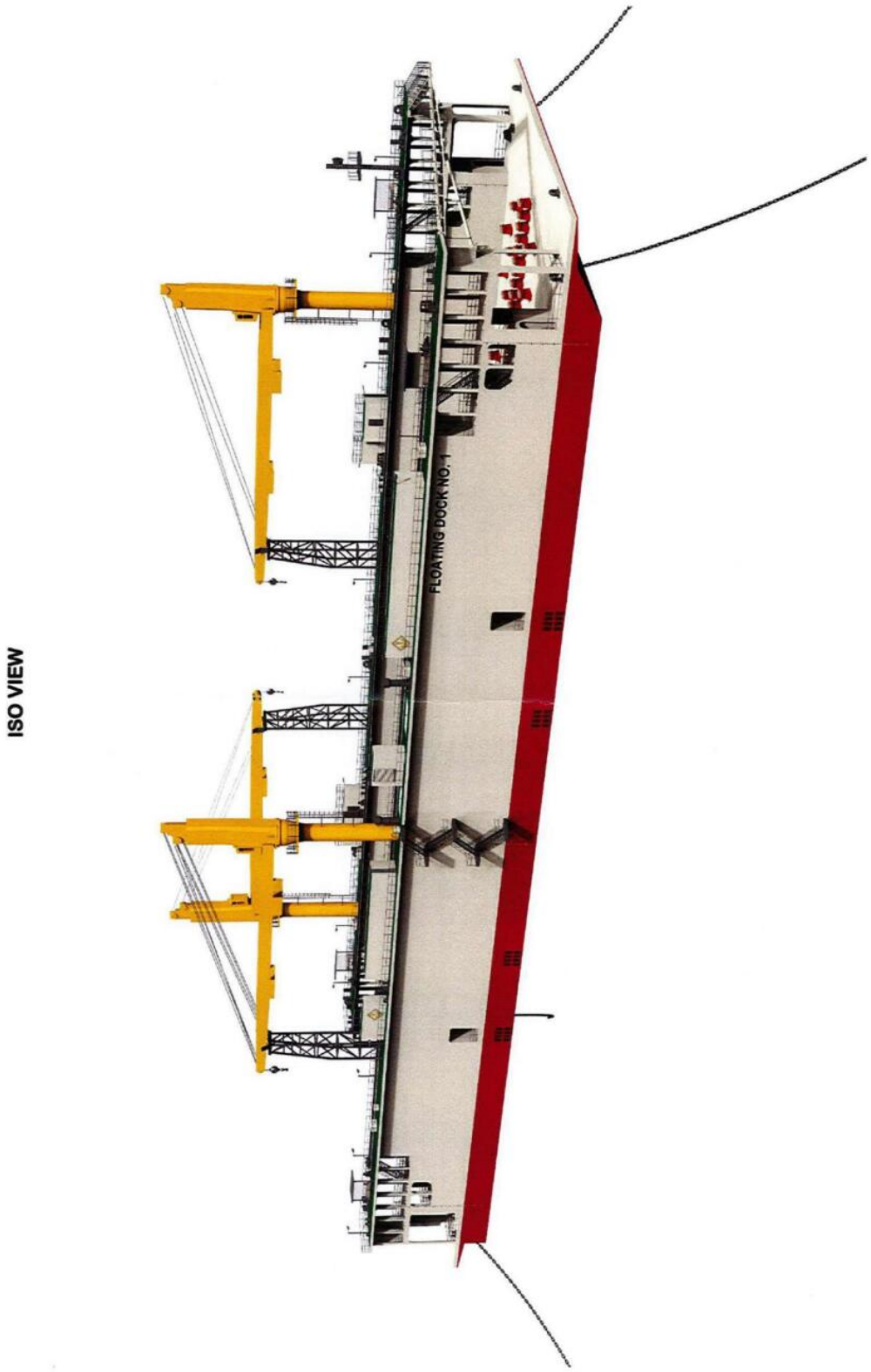


Figure 4:17 ISO View

The materials used for the construction of project are Wood, Ply board, base material, cement, admixture, coarse aggregate, fine aggregate, reinforcement etc. These construction materials will not be placed in the public place. The project proponent will manage the site for the stockpiling of construction materials within its own land and the stockpiling materials will be placed after covering them to avoid the pollution in the site.

4.9.3 Power Supply

On this case of asserting the requirements of raw materials for a shipyard- it is impossible to give an opinion on the energy, fuel or consumable requirements of a shipyard as it is totally dependent on order basis. However, below table show as estimate of the energy consumables power etc. required for the proposed project.

Consumable	Quantity	Energy	MJ
O_2 gas	100 cu. Met. / 1 ton net steel	5.04 MJ/m^3	504.00
CO_2 gas	33kgs / 1 ton net steel	10204 MJ/ ton	336.73
LPG	10 kgs/ 1 ton net steel	45845 MJ/ ton	458.45
Paint	7.9 kgs / 1 ton net steel	514 MJ/ ton	514.00
Electrodes	625 nos. or 3 kgs / 1 ton net steel	34.3 MJ/ ton	566.37
Electrical Power	96 KWH / 1 ton net steel	3.60 MJ/ ton	354.60

4.10 Jetty

Avanguard Shipyard Ltd. will use the latest technology to develop the Jetty facilities. Jetty facilities will be developed for receiving the raw materials and delivering the finished products. Construction materials will also be loaded and unloaded through this Jetty. Avanguard Shipyard Ltd will be constructed a T-HEAD Jetty which will be

148 meters × 14.30 meters = 2116.4 square meters. The authority used (50 ×165) meters =8250 square meters foreshore for the jetty.

The jetty design is attested with master layout plan.

Already the Mongla Port Authority approved their proposal and give permission to use the foreshore of rupsha river under pankhali mouza, according to the vide memo no. 18.14.0158.115.13.004.23-547, date – 27 / 08/2023.

মোংলা বন্দর কর্তৃপক্ষ
মোংলা, বাগেরহাট -৯৩৫১
বাংলাদেশ।
টেলিফোন ঃ ০২৪৭৭৭৫৩৮২৫
ফ্যাক্স ঃ ০২৪৭৭৭৫৩৭৭৮
ই-মেইল ঃ da@mpa.gov.bd
ওয়েব সাইট ঃ www.mpa.gov.bd

নং-১৮.১৪.০১৫৮.১১৫.১৩.০০৪.২৩- ৫৪৭

তারিখ ঃ ২৭/০৮/২০২৩ খ্রিঃ।

প্রাপক

জনাব মহম্মদ ইমতিয়াজ হোসেন
ব্যবস্থাপনা পরিচালক
অ্যাভেনগার্ড শিপইয়ার্ড লিঃ
৪৯/সি, ব্লক সি, নুরেরচালা
ভাটারা, ঢাকা-১২১২।

বিষয় ঃ অ্যাভেনগার্ড শিপইয়ার্ড লিঃ এর অনুকূলে মোংলা বন্দর কর্তৃপক্ষের নিয়ন্ত্রণাধীন, খুলনা জেলার দাকোপ উপজেলার পানখালী মৌজায়, রুপসা নদীর তীরভূমি (ফোরশোর) ব্যবহারের অনুমতি।

সূত্র ঃ AVG/MPA/FS2023/199, তারিখ : ২৫/০৬/২০২৩ খ্রিঃ।

উপর্যুক্ত বিষয় ও সূত্রের পরিপ্রেক্ষিতে মবক'র ২৯৬তম সাধারণ বোর্ড সভার ৩৪৬৩ নং সিদ্ধান্তের আলোকে অ্যাভেনগার্ড শিপইয়ার্ড লিঃ এর অনুকূলে ড্রাই ডক নির্মাণের লক্ষ্যে নিম্নবর্ণিত শর্তাবলি প্রতিপালন সাপেক্ষে মোংলা বন্দর কর্তৃপক্ষের নিয়ন্ত্রণাধীন, খুলনা জেলার দাকোপ উপজেলার পানখালী মৌজায়, রুপসা নদীর তীরভূমি (ফোরশোর) ব্যবহারের অনুমতি প্রদান করা হলো ঃ

"শর্তাবলি"

১। নিরাপদ নৌ চলাচলের জন্য বিদ্যমান চ্যানেল নদীর পশ্চিম তীর সংলগ্ন হওয়ায় জাহাজের নিরাপত্তার সুবিধার্থে নির্মিতব্য শিপইয়ার্ড এর কোন পন্টুন/রুজওয়ে যাতে চ্যানেলের মধ্যে না পড়ে সে দিক লক্ষ্য রেখে প্রস্তাবিত শিপইয়ার্ড নির্মাণ করতে হবে।

২। প্রস্তাবিত এলাকা ভাঙ্গন প্রবণ এলাকা হওয়ায় নদীর পাড় ভাঙ্গন রোধকল্পে শিপইয়ার্ড কর্তৃপক্ষ কর্তৃক উপযুক্ত ব্যবস্থা (নদী শাসন) গ্রহণ করতে হবে।

৩। জেটি নির্মাণের অনুমোদন প্রাপ্তির লক্ষ্যে নকশা অনুমোদনের জন্য উপযুক্ত প্রকৌশলী/স্থপতি দ্বারা প্রস্তুতকৃত এবং স্বাক্ষরিত জেটির বিস্তারিত ড্রইং ডিজাইনের ৬ কপি সরবরাহ করতে হবে।

৪। জেটি নির্মাণের জন্য নদীর মুখের পশ্চাতে প্রয়োজনীয় ভূমির মালিকানা অ্যাভেনগার্ড শিপইয়ার্ড লিঃ এর থাকতে হবে।

৫। পরিবেশগত ছাড়পত্র দাখিল করতে হবে।

৬। প্রস্তাবিত জেটি নির্মাণের ফলে ভবিষ্যতে নদীর তীর ভাঙ্গন, পলিজমা, নদীর স্বাভাবিক স্রোতধারার পরিবর্তন এবং নদীতে নৌ চলাচলে উপযোগিতার বিষয়ে BUET/Public Engineering University / IWM কর্তৃক Mathematical Model Study করে প্রতিবেদন মবক এ জমা প্রদান করতে হবে।

৭। প্রস্তাবিত জেটিতে মালামাল উঠানামার কাজে ব্যবহৃতব্য হান্ডেলিং যন্ত্রপাতি এবং জেটির পশ্চাতে ইয়ার্ডের সুবিধাদির বিশদ বিবরণী মবক এ দাখিল করতে হবে।

৮। জেটি নির্মাণ সংক্রান্ত আবেদনের ক্ষেত্রে আবেদন ফি ৫০,০০০.০০ (পঞ্চাশ হাজার) টাকা এবং এককালীন লাইসেন্স/অনাপত্তি ফি বাবদ ২,০০,০০০.০০ (দুই লক্ষ) টাকা পরিশোধ করতে হবে।

৯। জেটি নির্মাণের ক্ষেত্রে নিম্নরূপ ভাড়া পরিশোধ করতে হবে;

ক) নদীর মুখের ০১ (এক) হতে ০৫ (পাঁচ) দৌড় ফিট পর্যন্ত প্রতি দৌড়ফিটের জন্য ৬৫০.০০ (ছয়শত পঞ্চাশ) টাকা।

খ) নদীর মুখের ০৬ (ছয়) হতে ১০ (দশ) দৌড় ফিট পর্যন্ত প্রতি দৌড়ফিটের জন্য ১৩০০.০০ (তেরোশ) টাকা।

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গ) নদীর মুখের ১১ (এগার) হতে ২০ (বিশ)দৌড় ফিট পর্যন্ত প্রতি দৌড়ফিটের জন্য ২৬০০.০০ (দুই হাজার ছয়শত) টাকা।

ঘ) নদী মুখের ২১ (একুশ) হতে তদুর্ধ দৌড় ফিট প্রতি দৌড়ফিটের জন্য ৫২০০.০০ (পাঁচ হাজার দুইশত) টাকা।

১০। মোংলা বন্দর কর্তৃপক্ষের নিয়ন্ত্রণাধীন খুলনা জেলার দাকোপ উপজেলার পানখালী মৌজায় রুপসা নদীর তীরভূমিতে জেটি নির্মাণ ও তীরভূমি ব্যবহারের পূর্বেই ৩০০/- টাকা মূল্যের স্ট্যাম্পে জেটি ব্যবহার সংক্রান্ত চুক্তিনামা সম্পাদন করতে হবে।

২৭/০৮/২০২০

মোঃ শাহীনুর আলম
উপসচিব
পরিচালক (প্রশাসন)
মোংলা বন্দর কর্তৃপক্ষ

অনুলিপি (সদয় জ্ঞাতার্থে/জ্ঞাতার্থে ও কার্যার্থে) ঃ

১। সদস্য (হাঃ ও মেঃ)/(অর্থ)/(প্রঃ ও উঃ), মবক, মোংলা।
২। প্রধান প্রকৌশলী (মেরিন), মবক, মোংলা।
৩। হারবার মাস্টার, মবক, মোংলা।
৪। প্রধান প্রকৌশলী (সিঃ ও হাঃ), মবক, মোংলা।
৫। চেয়ারম্যান মহোদয়ের একান্ত সচিব, মবক, মোংলা।

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4.10.1 Dimensions and Construction Materials

The proposed dimension of the jetty is 148 m in length with a walkway of 14.30 m in width. The authority used (50 ×165) meters =8250 square meters foreshore for the jetty. The layout of the Jetty is shown in master Layout of the project. The construction materials which will be used for the construction of the T-Head Jetty include cement, steel bars, and aggregates.

4.10.2 Construction Procedure

Jetty and gangway columns will be made by driving precast piles. Jetty and gangway floors will be constructed through civil and steel structures. E-Crane will be installed on Jetty and Conveyor belt will be installed on Jetty and Gangway.

4.10.3 Method, Equipment & Justification

The footing of the jetty will be made from concrete columns placed on pre-cast concrete footings. The footing will be made on land and placed using the barge. The columns will be transported to the jetty area on trucks or excavators. Since the pre-casting and temporary construction, the area is near the project area and it's an area within the beach zone no vegetation clearance will be involved. Once the concrete columns are in place, in-situ beams will be cast to receive the concrete deck.

The aforementioned method for the construction of the T-Head Jetty is considered to have limited impacts on the environment. There will be no land clearance or removal of any tree involved in the project.

4.10.4 Water Requirement

The source of water of the project is its deep tube well. This water is used for total project, daily purposes, drinking, and sanitation. In production purpose no water will be used.

Particulars	Calculation of water required	Unit/day
Drinking Purpose	Total project manpower = 204 Total Drinking Water requirement =204×2 = 408 liters/day	**0.4 m³/day**
Sanitary and purposes	1.Office Staff = 200 Persons. Water required = 200 × 30 liter/person = 6000 liter/day 2. Office staff with 24-hour duty = 50 Persons (approximate) Water required = 50 × 120 liter/person = 6000 liter/day Total waste water = 6000+6000 = 12000 liter/day 10% adding as free board in basic design= 12000 + 1200 = 13200 liter/day = 825 liter/hr. Less Contaminated effluent is 0% Operated continuously for 16 hours a day Final design envisaged is 1000 lit/hr.	**13.2 m³/day**
Road and Pavement	1000 liters/day	**1 m³/day**

watering, car washing		
Total Water Requirement		**14.6 m^3/day**

The project will maintain good sanitation with clean adequate number of toilet/bath room services together with soap and hand wash and maintain disable friendly structures. Wastewater Generation and Treatment

4.11 Possible Date of Implementation

The Following schedule is the possible date of the project.

- Probable date of starting Construction: 1st September 2023
- Probable date of Completion: 31st September 2024

4.12 Description of the Project Activities

The project activities are divided into two phases one is design and construction phase and other one is operation phase. Shipbuilding the main purpose of the project. Sip buildings is complex process but the summery of the project is given below.

- Target requirements: This phase defines the type and function of the vessel. Dimensions and preliminary powering: This phase determines the vessels, design requirements, and dimensions in terms of numbers and ranges. The owner will set forward a list of requirements which can be in terms of length, range, capacity, and so on. Lines and General Arrangement Plan: Once the dimensions are stated, the designers start off by developing the plans for the hull. These drawings define the shapes of the hull in all directions and how they relate to each other. This stage is important as it defines the vessel's performance, capacity, and so on in the later stages. A general arrangement plan is also developed which defines how the vessel is going to be segregated in terms of space and utility. This gives the owner a clear idea of how the spaces inside his vessel are divided according to his requirements.
- Hydrostatics and Bonjean Curves: A series of calculations are performed with the help of the lines plan to compute the shape coefficients and parameters which define the volume, draft, and so on. These values will serve as the base data for further steps like stability calculations.
- Arrangements (Hull and Machinery): A plan is developed to determine the optimum location of various machinery within the vessel like engines, shaft lines, generators, and so on, and how they can function with each other without any complications.
- Structure: Loads are calculated on the hull and deck from different aspects like slamming into waves during operations, so as to bring forward with design solutions in terms of structural design, which can withstand these loads.

- Resistance and Powering: The total drag forces are calculated which acts on the hull with the help of computational tools, which can help in calculating the power requirements needed to push the vessel.
- Lightship weight: The weight of components like plating, structures, machinery, and equipment are calculated along with their position to get initial values of weight can the center of gravity which is crucial in calculating stability in the next stages
- Stability calculations: The stability of the vessel is the primary aspect that determines the safety of life and cargo on board. For specified initial conditions like draft and trim the calculations are done so as to compute values of the righting moment for different heel angles. Stability is calculated for the vessel in its static and dynamic condition and also in terms of unfavorable events such as flooding, due to collision or grounding of the vessel. Cost and material estimates: Once all of the above is calculated we move on to the costing stage, where overall costs in terms of design and production are summed up and compared to existing vessels in the market. A preliminary estimate of the total material is also calculated, along with supplier details so as to make the procurement process much easier.

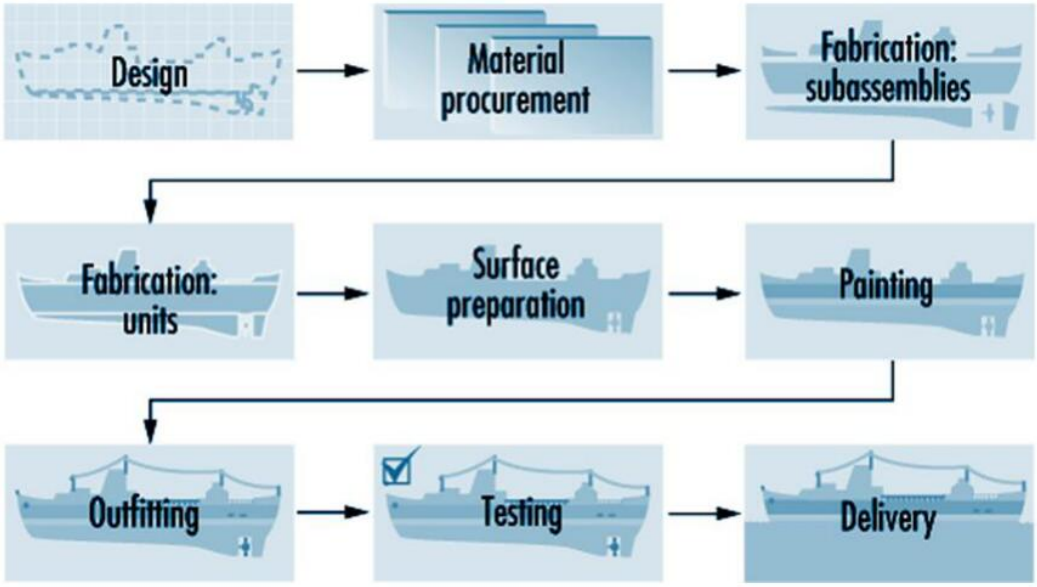


Figure 4:18 Production process of shipbuilding

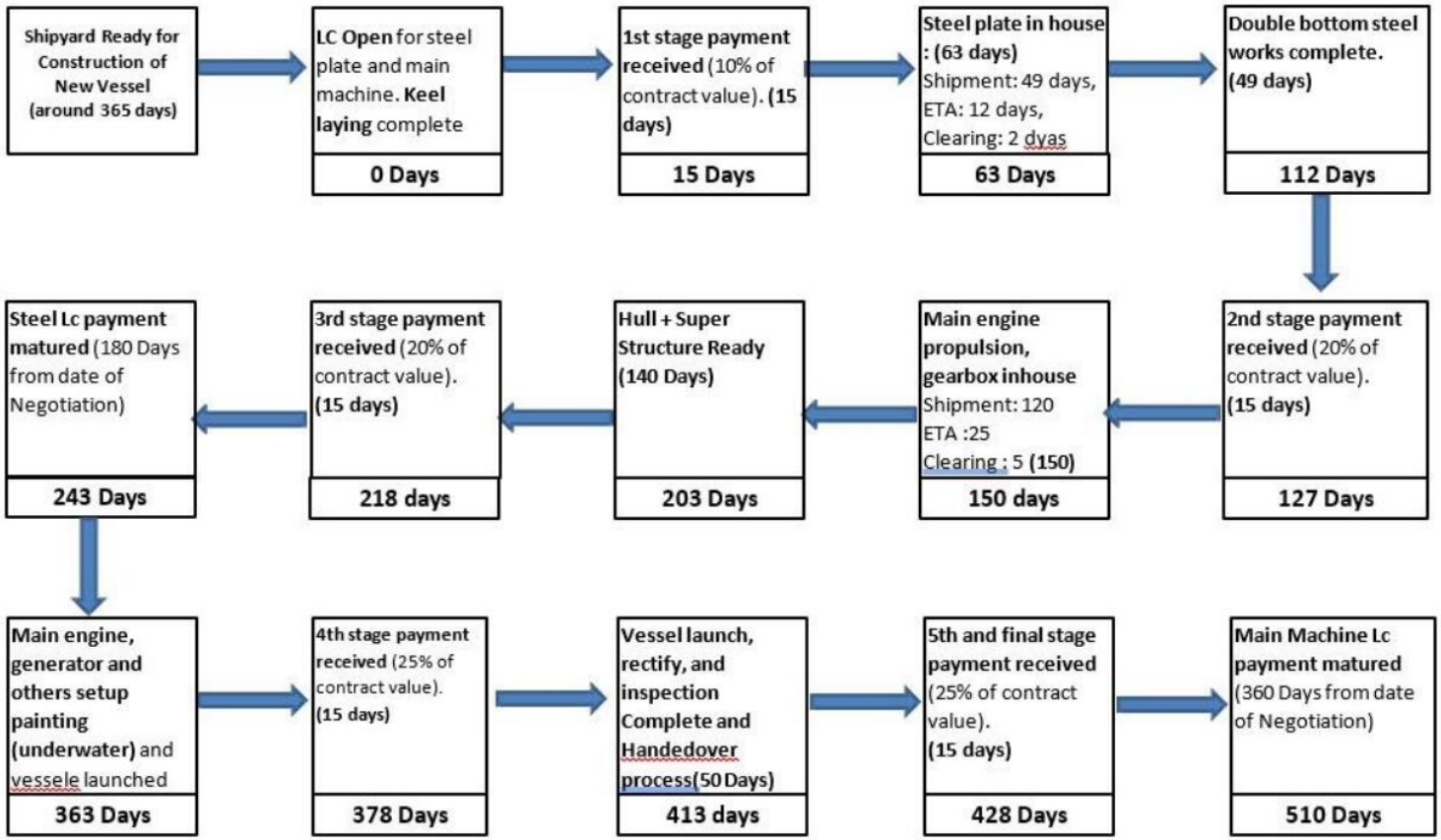


Figure 4:19 Process flow diagram

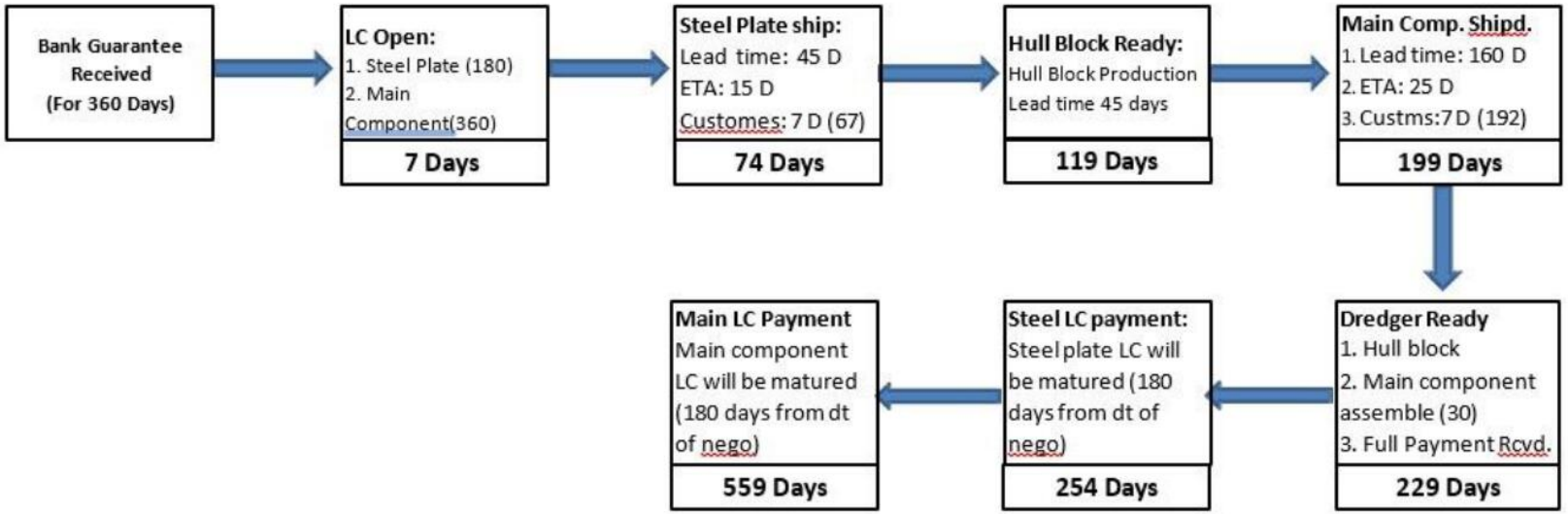


Figure 4:20 work flow gram

4.12.1 Construction phase

4.12.2 Step involves in ship building Processes in details

The basic component of ship building is steel plate. The plates are cut, shaped, bent or otherwise manufactured to the desired configuration specified by the design. Typically the plates are cut by an automatic flame cutting process to various shapes. These shapes may be then welded together to form I and T beams and other structural members.

(a) Steel fabrication

A detailed discussion of the steel fabrication process follows. It is discussed in the context of cutting, welding and painting.

(b) Cutting

The "assembly line" of the shipyard starts in the steel storage area. Here, large steel plates of various strengths, sizes, and thicknesses are stored and readied for fabrication. The steel plate then is transported to a fabrication facility. Here the steel plate is cut by burners to the desired size. The resulting strips are then welded together to form the structural components of the vessel.

(c) Welding

The most popular welding processes in shipbuilding industry are-

- Shielded metal arc welding (SMAW), often called stick welding
- Submerged Arc Welding
- Gas metal arc welding (GMAW)
- Gas tungsten arc welding (GTAW)
- Oxyacetylene Welding (OAW)

(d) Gas welding

The most common gas welding process is oxyfuel welding, also known as oxyacetylene welding. It is one of the oldest and most versatile welding processes, but in recent years it has become less popular in industrial applications. It is still widely used for welding pipes and tubes, as well as repair work. The equipment is relatively inexpensive and simple, generally employing the combustion of acetylene in oxygen to produce a welding flame temperature of about 3100 °C. The flame, since it is less concentrated than an electric arc, causes slower weld cooling, which can lead to greater residual stresses and weld distortion, though it eases the welding of high alloy steels. A similar process, generally called oxyfuel cutting, is used to cut metals.

(e) Painting and finish coating

Khan Brothers Slipways & Engineering Works Limited uses sand paper for surface finishing process that creates a smoother and more even texture.

Painting is performed at almost every location in the shipyard. The nature of shipbuilding requires several types of paints to be used for various applications. Paint types range from water-based coatings to high-performance epoxy coatings. The type of paint needed for a certain application depends on the environment to which the coating will be exposed. Paint application equipment ranges from simple brushes and rollers to airless sprayers and automatic machines. In general, shipboard paint requirements exist in the following areas: -underwater (hull bottom), waterline, topside superstructures, internal spaces and tanks, weather decks, loose equipment.

4.12.3 Step involves in ship repairing Processes

Ship repair generally includes all ship conversions, overhauls, maintenance programmes, major damage repairs and minor equipment repairs. Ship repair is a very important part of the shipping and shipbuilding industry. The ship repair process is much like the new construction process, except that it is generally on a smaller scale and is performed at a faster pace. The repair process requires a timelier coordination and an aggressive bidding process for ship repair contracts.

(a) Repair planning, engineering and production

Although some preliminary planning is performed at the proposal stage of the contract, much work is still needed to plan and execute the contract in a timely manner. The following steps should be accomplished: read and understand all contract specifications, categorize the work, integrate the work into a logical production plan and determine the critical path. Planning, engineering, materials, subcontracts and repair production departments must work closely together to perform the repair in the most timely and cost-effective manner. Prefabrication of piping, ventilation, electrical and other machinery is performed, in many cases, prior to the ship's arrival. Pre-outfitting and prepackaging of repair units takes cooperation with the production shops to perform work in a timely manner.

(b) Common types of repair work

Ships are similar to other types of machinery in that they require frequent maintenance and, sometimes, complete overhauls to remain operational. Many dockyards have maintenance contracts with shipping companies, ships and/or ship classes that identify frequent maintenance work. Examples of maintenance and repair duties include:

- Repainting the ship's hull, freeboard, superstructure, interior tanks and work areas
- Major machinery rebuilding and installation (e.g., diesel engines, generators and pump stations)
- Systems overhauls, maintenance and installation (e.g., flushing, testing and installation of a piping system)
- New system installation, either adding new equipment or replacing systems that are outdated (e.g., navigational systems or updated piping systems)
- Creation of new machinery spaces on the ship (e.g., cut-out of existing steel structure and adding new walls, stiffeners, vertical supports and webbing).

- Cutting the old plate and attach the new plate to the ship

In many cases, repair contracts are an emergency situation with very little warning, which makes ship repair a fast moving and unpredictable environment. Normal repair ships will stay in the shipyard from 15 days to 30 days, while major repairs and conversions can last more than six months.

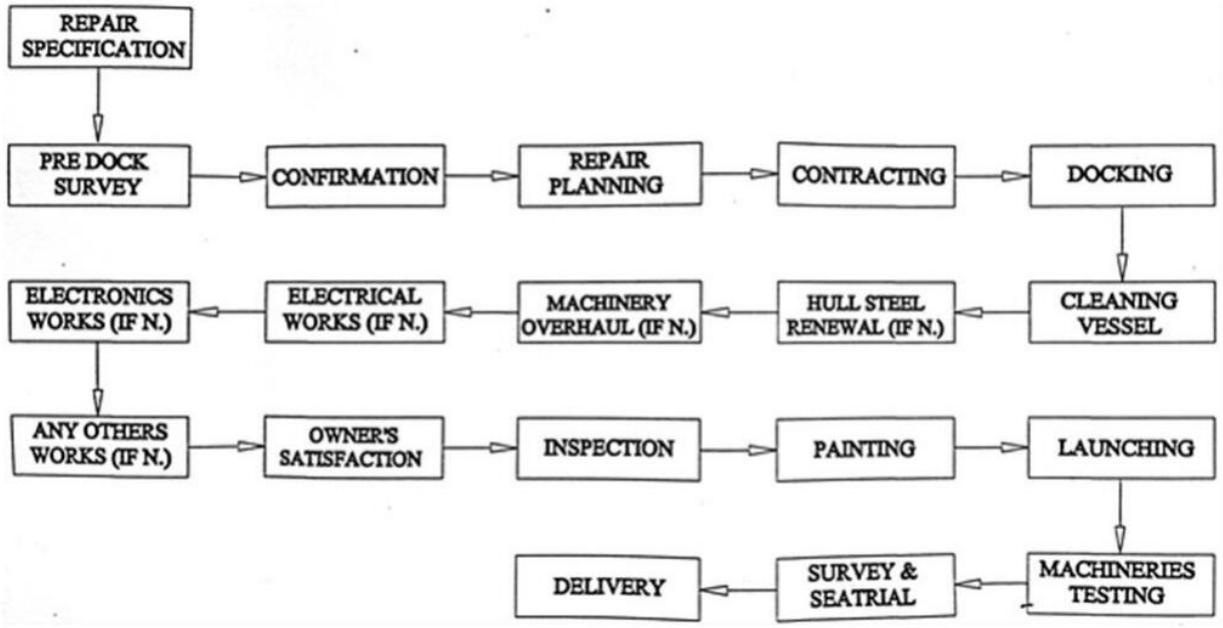


Figure 4:21 Repair Process

4.12.3.1 International Co-operation:

The Company has a Manufacturing Franchisee Agreement with one of the most renowned European Dredger Manufacturers in the world – Italdraghe SpA. Under this agreement, AVG will be building the hull blocks of Italdraghe Cutter Suction Dredgers, while Italdraghe will be supplying the machineries and dredge components and also carrying out supervision of construction. The final product will be branded as a Italdraghe Dredger with the relevant ITD SGT model code.

The Company has an Exclusive Master Service Agreement (Ref: Annex 13) with AMTech, a company based in South Korea, who will be overseeing the total Technical Aspects of the Project. The Chief Technical Consultant of the project will be from AMTech. They have already designed the shipyard layout, provided the GA for the Floating Docks and carried out the feasibility of the project.

The Company has an Exclusive Global Sales Agency Agreement (Ref: Annex 12) with E. Astro, a company based in South Korea, the number 1 shipbuilding nation in the world, who will be overseeing the International Sales of AVG. They have already gained success with this project by arranging the MSA with AMTech, as well as securing an order of USD 10 million.

4.12.4 Roads

Roads should be designed so that they can transport all the vehicles that are likely to be used during construction and during the life of the project. Road and pavements must be in accordance with the National Building Code of Practice or equivalent. The existing road in the entrance will be re-build.

4.12.4.1 Generator building

The dimension of all buildings must be such that it provides a generous space for the safe installation and proper operation and maintenance of the project. In particular, a generous space must be provided immediately in front, behind and next to all the elements of the floor. The design of all cottages must guarantee that the noise, vibration and temperature levels are within the allowed limit.

4.12.5 Operation Phase

4.12.5.1 Traffic

The entrance to the project has been designed to facilitate the easy exit and from Khulna Road and to prevent traffic congestion at the entrance.

4.12.5.2 Water demand

The total estimated demand for water by the project during operation will be approximately 14.6 **m^3/day.** This will be met from their own Deep Tube-well.

4.12.5.3 Heavy metal protection

Shipyard activities have a risk of environmental pollution, especially during the ship repair process. Shipyard industrial waste is one of the industrial groups that produce hazardous and toxic waste. Because activities such as repairing ships produce hazardous and toxic waste, namely heavy metals from disposal of work materials. Heavy metals in the waters that will drop and settle on the bottom of the water. Heavy metals cannot be destroyed and will accumulate in water to form deposits. The disruptive effects of heavy metals on human health depend on which parts of the heavy metal content are protected in the body and the dose of exposure. Toxic effects caused by heavy metals are able to block the work of enzymes so that they can interfere with the body's metabolism, are mutagenic, cause allergies, teratogens, or are carcinogenic to humans or animals. Heavy metals in general are essential for aquatic organisms for the growth and development of life, including in forming hemocyanin's in the enzymatic system and blood in marine biota.

As an effort by the company to eliminate / reduce the negative impacts arising from ship repair activities, the company is equipped with units in the processing of liquid waste, temporary toxic and hazardous material waste shelters, periodic monitoring carried out on site. **The Authorities will not discharge any waste water directly outside the factory. The waste water is treated through closed drainage system and oil and water separator and then discharged**. Sources of raw materials are obtained from both local and imported, while the workforce is quite varied both in terms of education, gender and origin. The quality of the PT.X shipyard waters from the measurement results (dissolved metals) of surface water quality, there are often findings regarding

the higher level of heavy metal quality standards. Because according to heavy metals that often pollute the environment and are dangerous, the main ones are copper (Cu), zinc (Zn) and lead (Pb). Aquatic environmental factors such as water pH can affect the toxicity (toxicity) of lead metal (Pb) in shipyard waters because a decrease in water pH will cause heavy metal toxicity to increase because heavy metals in water are able to form complex compounds that can settle on the bottom of the water.

The developer has a concern for the effects of low-frequency electromagnetic radiation on humans. Therefore, the architectural design of the shipyard incorporates a minimum waste from the project.

4.13 STP (Sewage Treatment Plan)

Details Calculation of Sewage:

1.Office Staff = 200 Persons.

Water required = 200 X 30 liter/person = 6000 liter/day

2. Office staff with 24-hour duty = 50 Persons (approximate)

Water required = 50 × 120 liter/person = 6000 liter/day

Total waste water = 6000+6000 = 12000 liter/day

10% adding as free board in basic design= 12000 + 1200 = 13200 liter/day = 825 liter/hr.

Less Contaminated effluent is 0%

Operated continuously for 16 hours a day

Final design envisaged is 1000 lit/hr.

Details drawing design calculation attested with annexure

4.14 Oily Water Separator: Construction and Working

A shipyard and also ship produces oil and water mixture on a daily basis which needs to be separated from each other before discharging the dirty water out of the shipyard using equipment such as an oily water separator.

OWS consists of mainly three segments:

1. Separator unit

- This unit consists of catch plates which are inside a coarse separating compartment and an oil collecting chamber.

- Here the oil has a density which is lower than that of the water, which makes the former rise into the oil collecting compartment and the rest of the non-flowing oil mixture settles down into a fine settling compartment after passing between the catch plates.
- After a period of time, more oil will separate and collect in the oil collecting chamber. The oil content of water which passes through this unit is around 100 parts per million oil.
- A control valve (pneumatic or electronic) releases the separated oil into the designated OWS sludge tank.
- The heater may be incorporated into this unit for smooth flow and separation of oil and water.
- A heater may be incorporated in this unit either in the middle or sometimes in the bottom part of the unit (depending upon the area of operation and capacity of the separator equipment) for smooth flow and separation of oil and water.
- The first stage helps in removing some physical impurities to achieve fine filtration in the later stage.

2. The Filter unit

- This is a separate unit whose input comes from the discharge of the first unit.
- This unit consists of three stages – filter stage, coalescer stage and collecting chamber.
- The impurities and particles are separated by the filter and are settled at the bottom for removal.
- In the second stage, the coalescer induces a coalescence process in which oil droplets are joined to increase their size by breaking down the surface tension between oil droplets in the mixture.
- These large oil molecules rise above the mixture in the collecting chamber and are removed when required.
- The output from this unit should be less than 15 ppm to fulfil legal discharge criteria.
- If the oil content in water is more than 15 ppm, then maintenance work such as filter cleaning or renewal of filters is to be done as required.
- A freshwater inlet connection is also provided to the filter unit to clean and flush the filter. This is usually done before and after the operation of an oil separator unit.

3. Oil Content Monitor and Control Unit

- This unit functions together in two parts – monitoring and controlling.
- The ppm of oil is continuously monitored by Oil Content Monitor (OCM); if the ppm is high, it will give an alarm and feed data to the control unit.
- The control unit continuously monitors the output signal of OCM, and if an alarm arises, it will not allow the oily water to go overboard by operating a 3-way solenoid valve.

- There usually are three solenoid valves commanded by the control unit. These are located in the first unit oil collecting chamber, second unit oil collecting chamber and one on the discharge side of the oily water separator, which is a 3-way valve.
- The 3-way valve inlet is from the OWS discharge, where one outlet is overboard and the second outlet is to the OWS sludge tank.
- When OCM gives an alarm, the 3-way valve discharges the oily mixture in the sludge tank.

4.14.1 Spillage Response and Strategy

Once Avanguard shipyard ltd. has been established to unilaterally understand the nature and extent of spillage, the following methods may be employed to control the effects of the spillage. Whatever course of action is chosen, it must be with approval from the BIWTA Authority.

Since instantaneous effective action is necessary. all possible contingency-responding vessels must be fitted with equipment appropriate for applying methods below-both for immediate response and post-incidents actions as soon as possible and upgraded with time. This must be achieved through the cooperation of relevant ministries and national and international agencies.

Mechanical Recovery at waterbody: Mechanical recovery constitutes the most common approach for combat marine oil/chemical spills assuming the chemical does not mix well with water). The mechanical recovery operation will typically involve the following components:

- Booms and oil suction mechanism for containment of oil/chemical
- Skimmers for recovery of oil/chemical
- Pumps
- Oil/water/chemical separators
- Temporary storage
- Vessel for towing of booms and operation of recovery units
- The operation may involve three or two vessels, depending on how the boom is deployed. The purpose of the boom is to concentrate and contain to avoid spreading the oil/chemical to a thick enough layer for effective recovery to take place. The effectiveness of booms to accumulate the oil is highly dependent on wave conditions, tow speed, boom configuration, and oil properties

Mechanical removal at the shore: Shoreline cleanup by mechanical removal involves a wide range of different tools and techniques, reflecting the highly variable conditions that a shoreline area can represent. Techniques may be ranging from manual removal of oil/Chemical using simple tools to the use of more advanced beach cleaning machinery, provided below is a non-exhaustive list of techniques/tools commonly applied to remove oil/chemical at a shoreline:

- Manual sorbent application
- Manual removal of oiled/chemical entangled materials (hand. Shovel, rakes, etc.)
- Manual cutting of vegetation
- Low-pressure flushing at ambient temperature
- Vacuum trucks
- Warm Water / low-pressure washing

- High-pressure flushing
- Manual scraping
- Beach cleaners

Leave alone, but monitor: Sometimes the best course of action is a decision not to clean up the spilled oil/chemical If the oil/chemical is at sea, and not threatening shore or sensitive areas, it may be sufficient to monitor the spill while allowing the natural process of dispersion and biodegradation to take the course. This decision. of course, has to be taken after careful consideration of all the other alternatives.

Bioremediation: Bioremediation is the application of nutrients (fertilizers containing nitrogen and phosphorous) to the shoreline to accelerate the natural biodegradation of the oil. Oil/chemical biodegradation is the natural process by which microorganism oxidizes hydrocarbons, ultimately converting them to carbon dioxide and water. The process is limited by the availability of oxygen. moisture and nutrients needed by microbes. The use of non-native bacteria is not recommended as most areas have indigenous bacteria that are capable of degrading oil. Bioremediation is typically used as a final treatment step after completing conventional shoreline treatment or in areas where other methods are not possible or recommended.

In-situ burning: In case of flammable spillage: in-situ burning is carried out at shorelines by igniting the upwind end of the spread area and allowing the oil/chemical to burn downwind. The method is typically used on substrate or vegetation where sufficient oil/chemical has been collected to sustain ignition if oil/chemical of a type that will sustain burning and local air pollution regulations allow. The method will kill surface organisms in the burn area and residue may be somewhat toxic. The method will also cause local and time-limited air pollution.

Dispersant: The use of dispersants will break up the oil film physically, thus reducing the smothering effect of a slick in plants and animals and they will also accelerate the oil biodegradation process. The use of dispersant is not recommended where physical recovery of oil is feasible. The choice of dispersant must be approved in writing by DoE. EO, EA. FS and OSC follow the national contingency plan as well as regional plan. The Air Force and all agencies with required aircraft must help in the efforts.

For these methods to be chosen and applied, the plan recommends dedicated oil and chemical contingency response vessels are stationed at Chattogram, Mongla, and Payra Ports locations. Further vessels may be procured in time to serve other major locations.

These vessels must be fitted with state-of-the-art oil and chemical response equipment as required to apply the methods aforementioned.

Adopted Oil Spillage Mechanism from Avanguard Shipyard Ltd.: Among all the techniques, the adopted technique should be according to the existing availability. So SPCL has decided to adopt the following oil spillage mechanism:

- Booms and oil suction mechanism for containment of oil/chemical

- Oil/water/chemical separators

4.15 Project Components

1) Berth No. 1
2) Berth No. 2 Transfer Area Jetty/Quay
3) Tower Crane # 1
4) Dry Docking Area Entry/Exit Point for Ships Jib Crane Zone # 1 Tower Crane # 2
5) Tower Crane # 3
6) Tower Crane # 4
7) Jib Crane Zone #2
8) Compressor Room # 1
9) Compressor Room # 2
10) Compressor Room # 3
11) High Pressure Gas Storage Room # 1
12) High Pressure Gas Storage Room #2
13) High Pressure Gas Storage Room # 3
14) Turnover Area
15) Assembly Area # 1
16) Assembly Area # 2
17) Assembly Area # 3
18) Plate Cutting Area # 1
19) Head Office (Including Staff Accommodation and Medical Station)
20) Public Toilet
21) Restaurant
22) Sewage Treatment Plant
23) Steel Material
24) Stockyard # 1
25) Blasting Shop # 1 Paint Shop # 1 Sub-Assembly Area # 1
26) Outfitting and Overhauling Shop # 1 Consumables Store # 1
27) Machine Shop # 1
28) Galvanizing and Foundry Shop # 1
29) Carpentry Shop # 1
30) Worker's Shed # 1
31) Worker's Shed # 2
32) Storehouse #1
33) Main Power Supply and Generator Room # 1
34) Workshop # 1
35) Workshop # 2
36) Paint Shop # 2
37) Paint Shop # 3 Workshop # 3 Workshop #4 Storehouse #2 Paint Shop #4
38) Blasting Shop # 2
39) Steel Material Stockyard # 2

40) Sub-Assembly Area # 2
41) Outfitting and Overhauling Shop # 2 Generator Room #2
42) Galvanizing and Foundry Shop # 2 Carpentry Shop #2
43) Consumables Store # 2
44) Machine Shop #2
45) Workshop # 3 Workshop # 4
46) Shed for Security Guard and Check-post # 1 Shed for Security Guard and Check-post # 2 Shed for Security Guard and Check-post # 3

4.16 Project Plan

Machineries list of the project which will be used after construction and operation.

SL#	Equipment Name	Capacity/Rating	Qty
1	Jib Crane	60 Ton	1
2	Jib Crane	10 Ton	1
3	Crawler Crane	145 Ton	1
4	Crawler Crane	120 Ton	1
5	Gantry Crane	10 Ton	3
6	Tower Crane	12 Ton	2
7	Tower Crane	8 Ton	1
8	Tower Crane	25 Ton	1
9	Transporter, Model : ST-1	200 Ton	1
10	CO2 Welding Machine	600A	200
11	CO2 Welding Machine	800A	20
12	Submerged Welding Machine	1500A	3
13	Submerged Welding Machine	1000A	1
14	Auto Carriage		15
15	Gauging Welding Machine	800A	3
16	Tig Welding Machine	500A	5
17	Portable Welding Machine	5kW	1
18	Portable Welding Machine	7.5kW	1
19	Block Lifter	800 Ton	2
20	Block Lifter	500 Ton	4
21	Fork Lift	7 Ton	2
22	Fork Lift	3 Ton	1
23	P.B.M.		1
24	Turbo Fan		25
25	Dehumidifier		3
26	Gas Heater		8
27	Vaccum Recovery		7
28	Dust Collector		5
29	Dehumifidier		1
30	Vaccum Recovery		2
31	Dust Collector Set		1
32	Air Blast Unit		4

33	Gas Collecter		1
34	P.B.M.		1
35	Plasma Cutting Machine	KT-790PMX[500A]	3
36	Gas F/P Cutting Machine	CG1-100	1
37	WINCH W/ Diesel Engine (capable to haul in ship ligt ship weight 2000t) - should have space to put wire like windlass)	2000 Ton	2
38	65mm 1 coil wire rope steel core (for pulling in vessel)		3
39	H.D.G MOORING WIRE	Dia: 38mm, Length: 1000m/Coil, Structure: 6x19+IWRC Tensile Strength: 2160, Break Load: 929kN, Unit Weight: 4938kgs/Coil (Steel Core)	3
40	Diesel Generators	1 MW	2
41	Overhead Magnet Crane	10 Ton	4
42	Overhead Magnet Crane	15 Ton	2
43	Overhead Grab Crane	20 Ton	1
44	Gantry Grab Crane	20 Ton	1
45	S.G. Magnet Crane	10 Ton	8
46	Gantry Magnet Crane	10 Ton	6
47	Overhead Crane	5 Ton	6
48	Semi Gantry Crane	2.8 Ton	1
49	Automated Transfer Bogies	155 Each (310 per Pair)	20

4.16.1 Image of some Equipment

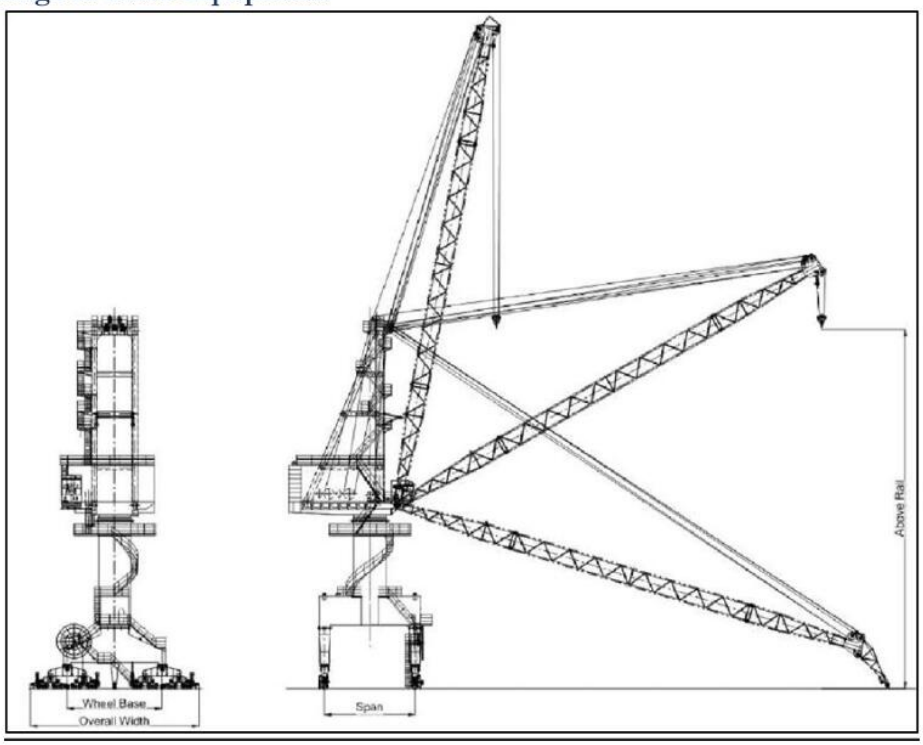


Figure 4:22 Jib Crane

Figure 4:23 Crawler Crane

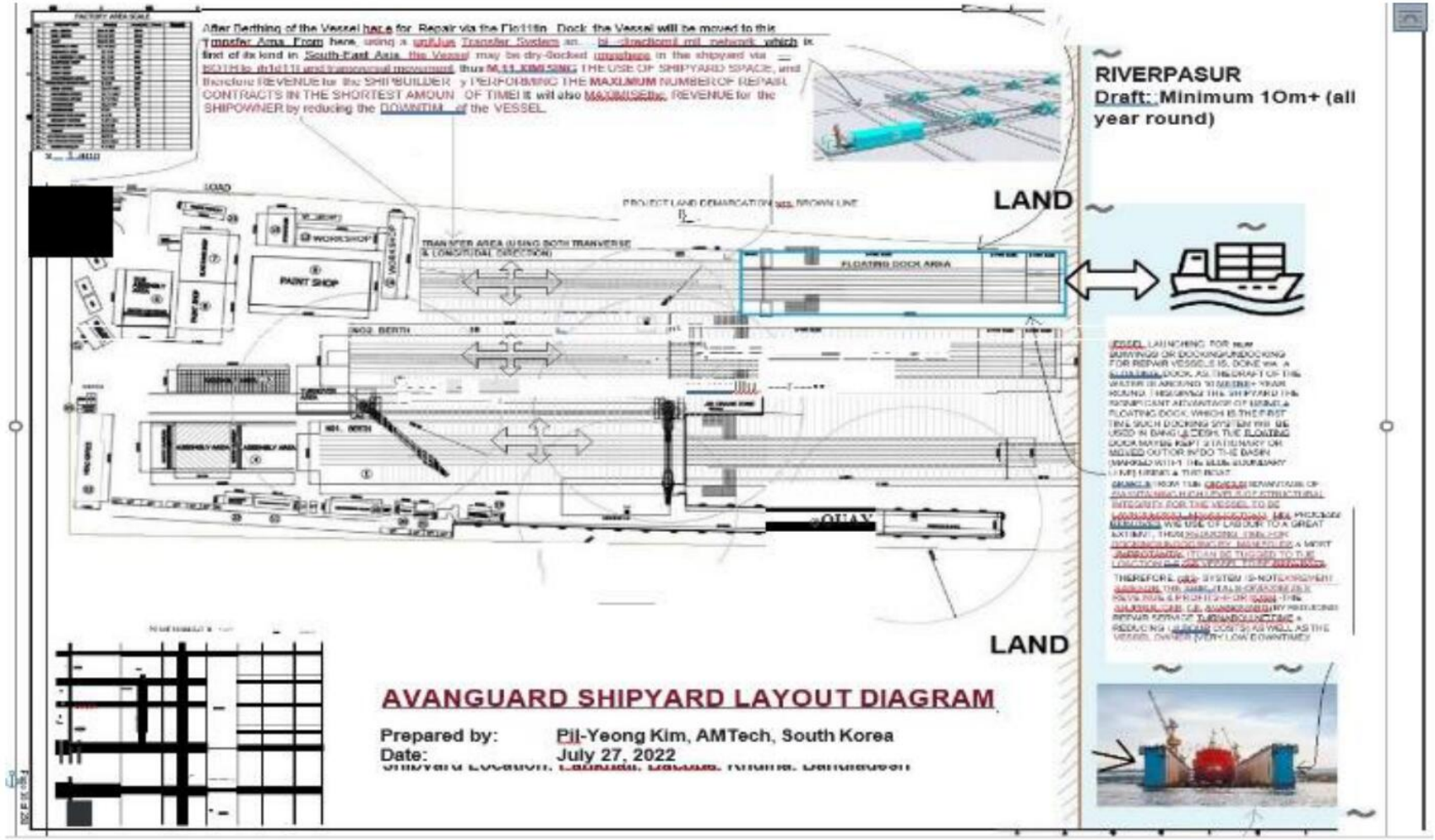
Figure 4:24 Gantry Crane

Figure 4:25 Tower crane

Figure 4:26 Transporter

Figure 4:27 Blocaklifter

Detailed master layout plan of the proposed project is attached in Annexure.


RIVERPASUR
Draft: Minimum 10m+ (all year round)
LAND
LAND
AVANGUARD SHIPYARD LAYOUT DIAGRAM
Prepared by: Pil-Yeong Kim, AMTech, South Korea
Date: July 27, 2022

4.17 Fire Protection systems

Following fire protection system will establish in the proposed project-

a) Fire water network,
b) Foam extinguishing system,
c) Spray water system and
d) Portable fire extinguishers.

4.18 Pollution potential: Generation of Solid, Liquid Waste

Key Environmental, Health and Safety Risk/Liability Issues

4.18.1 Water Pollution

Oil spills during fitting operations may contaminate the waters surrounding the shipyard. Runoff water is likely to capture oils and debris that has accumulated on the dock area. The bottoms of vessels that have prolonged seawater contact commonly are coated with "anti-fouling" paints containing chemicals that inhibit the attachment of fouling organisms to hulls. The active ingredients commonly found in anti-fouling paints are metal-based such as cuprous (copper) oxide or tributyltin (TBT). The pesticides are harmful to many types of marine life as well as fouling organisms. Metals can enter the water through discharge of anti-fouling paint chips and paint removal materials during vessel maintenance activities. TBT is now banned globally but still remains as a hazardous substance on the hull of older vessels and is a concern during maintenance and servicing of hulls in shipyards.

Authority will install oil-water separator to treat the waste water, and use closed drainage system and STP for sewage treatment

4.18.2 Solid Waste

Spent grit needs to be tested for toxicity. If it is regarded as toxic, it must be managed and disposed of as hazardous waste. The likelihood that grit will fail the tests depends on how it has been used. Grit that has been used to remove anti-fouling bottom paints is more likely to fail the tests than grit that has been used to strip topside surfaces.

Sludge from waste water treatment, possibly with a heavy metal content, will dispose through licensed contractors.

4.18.3 Hazardous Materials

Solvents are commonly used to formulate both bottom paints and coatings used for topside applications such as corrosion resistance.

Solvents are sources of hazardous waste and of volatile organic compounds (VOCs). These compounds are hazardous air pollutants.

Hazardous materials, such as solvents, present a health and safety risk, will incorrectly handle, stored and disposed of.

4.18.4 Liquid Wastes

• Wash water, oily water from bilges and tank cleaning, and engine fluids such as oil, hydraulic fluids, lubricants, and anti-freeze are among the waste liquids generated by during maintenance shipyard activities.

• Fueling facilities are another potential generator of waste liquids. Hydrocarbons, glycols and other pollutants in these liquids can come into contact with waterways and aquatic life through spills and leaks from storage tanks.

Authority will install oil-water separator to treat the waste water, and use closed drainage system.

4.18.5 Noise

Pneumatic hammers, gouging tools and chipping machines are sources of significant noise exposure in shipyards.

Falls from height

Falls from height occur on shipyards while vessels are being constructed.

Falling objects

As vessels are being constructed in many levels falling objects are a hazard. In addition, personnel can be hit by falling/moving objects during fabrication where failure of fixtures and conveyance gantries can occur.

Confined spaces

Many areas on a vessel are designated as confined spaces, which can result in vapor build up.

Slips, trips and falls

There is a high incidence of slips, trips and falls at shipyards as a result of uneven surfaces, unsteady walk ways and wet decks.

Poor management of materials, waste and discharges from production presents a potential risk of soil contamination. Heavy metals and accidental discharges from spills and storage tank leakages may also contaminate groundwater in areas where soils beneath the site are permeable.

Contamination could arise from deteriorating drainage networks.

Other Potential Environmental and Health And Safety Risks/Liability Issues

Ground Contamination

Machinery

All equipment should have safety guarding and workers should be issued with appropriate personal protective equipment to protect against unavoidable sharp items and edges. Particular attention should be paid to metal cutting equipment.

Inhalation

Use of solvents in the process, creation of dust during shot blasting, machining and welding activities can result in respiratory disease.

Occupational Dermatitis

This can occur as a result of contact with antioxidants, chromates and solvents.

To protect worker and surround from Noi's pollution, authority changes in the workplace that reduce or eliminate worker exposure to noise hazards such as:

- Operate noisy machines during shifts when fewer people are exposed;
- By applying job rotation policy;
- Limit the amount of time a person spends near a noise hazard;
- Provide quiet areas where workers can gain relief from noise hazards;
- Restrict how close a worker can get to a noise hazard. Therefore, controlling noise hazard exposure through maintaining a distance from the noise hazard is often an effective, simple and inexpensive administrative control
- Provide worker PPE

4.19 Protection Across the river

4.19.1 Pashur River

The Pashur river is a river in southwestern Bangladesh and a distributary of the Ganges. It continues the Rupsa River. All its distributaries are tidal. It meets the Shibsa River within the Sundarbans and near to the sea the river becomes the Kunga River. For monitoring of water quality, water samples were collected from one location of Pashur river comprising three different points e.g., Monglaport Bank, Middle and Opposite bank. For analysis, average values of three points were taken. In 2015, pH level varied from 7.54 to 8.2 (Fig.17a) and was within the EQS (6.5 to 8.5) though slightly alkaline. In 2014, pH level varied from 7.62 to 8.2. DO level was above the EQS (>5 mg/l) for fisheries all over the year. The maximum and the minimum concentration of DO was 6.8 and 5.0 mg/l respectively (Fig/17b). In 2014, DO varied from 5.2 and 6.7 mg/l. In 2015, BOD level was within the EQS (<6 mg/l) for fisheries during the sampling period. The maximum and the minimum value of BOD was 1.2 and 0.8 mg/l respectively (Fig.17c). In 2014, BOD level varied from 0.8 and 1.1 mg/l. High level of TDS was found at Pipeghat compare to other points of the river. TDS varied from 144 to 16376 mg/l (Fig.17d). In 2014, TDS level varied from 256 to 15500 mg/l.

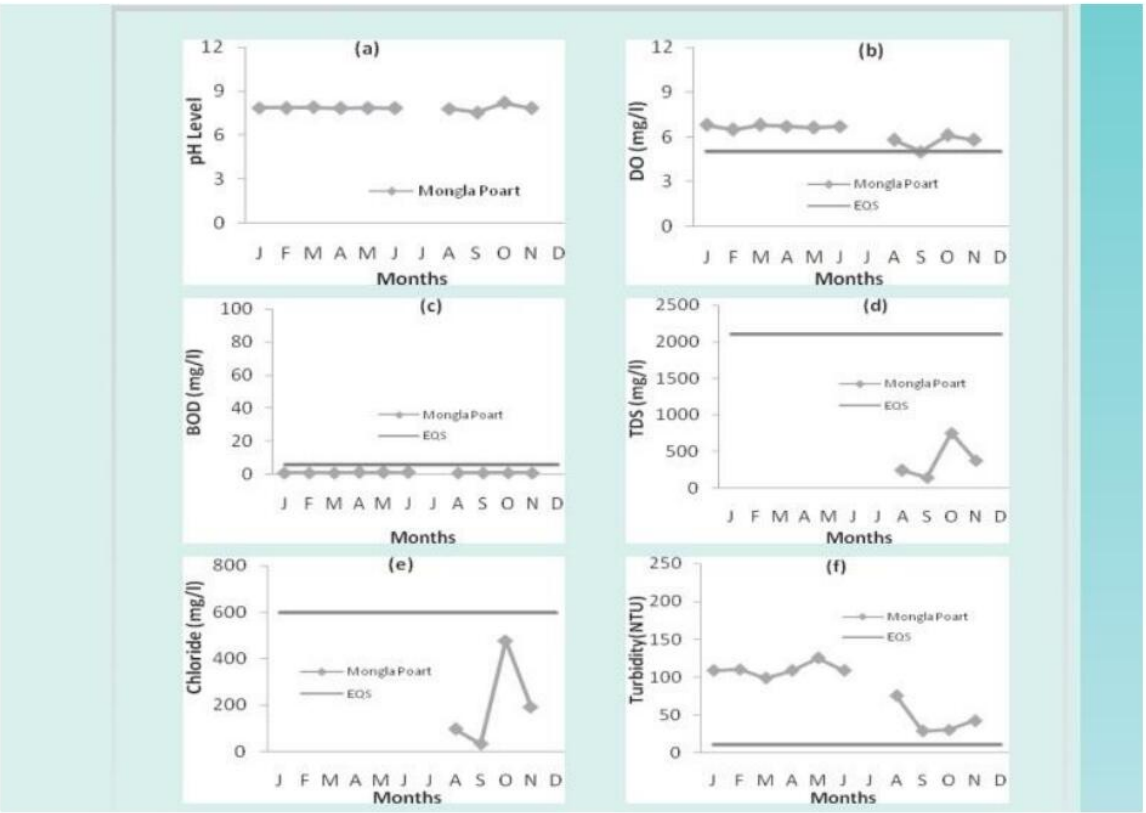


Figure 4:28 Fig.17. Graphical presentation of pH, DO, BOD, TDS, Chloride and Turbidity of Pashur River

Chloride level of Pashur river water varied from 32 to 12692 mg/l. Chloride concentration was higher at all points during March to June compare to rest of the period (Fig.17e) where EQS of chloride is 600 mg/l. In 2014, Chloride level varied from 124 to 12646 mg/l. Turbidity level varied from 30.2 to 125.3 NTU (Fig.17f) against the EQS(10 NTU) for drinking water. Turbidity concentration was very high all over the year. In 2014, Turbidity level varied from 28.3 to 128.3 NTU.

Sampling Locations	Salinity (ppt)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mongla port	3.3	5.8	13.3	17.6	21.3	17.9	-0.6	0.1	1.1	0.3	-	
EQS for water after treatment from industrial units 400 ppt												

Source: water quality report department of Environment

Salinity varied from 0.3 ppt to 21.3 ppt. The maximum and the minimum salinity was 21.3 ppt in May and 0.3 ppt in November while EQS for Salinity is 400 ppt.

4.20 Key Improvements to protect River

- ✓ Development of an innovative method to safely reduce the risk of toxic particulates from hull cleaning and maintenance activities which, would greatly improve occupational health and safety, increase productivity and decrease overall cost. **Authority will install oil water separator and closed drainage system.**
- ✓ Wash wastewater treatment facility to reduce contaminant loading and potential release into watercourses and drainage systems. Have closed drainage systems on site.
- ✓ Consider application of TBT removal methodologies to treat waste waters from ship hull maintenance discharges to reduce environmental risk.
- ✓ Introduce maintenance, housekeeping, materials management and chemical and materials inventory control practices that aim to minimize wastes from activities such as hull stripping and painting, dry dock and marine railway maintenance, engine maintenance, and handling of hazardous materials during shipbuilding and other waste liquids.
- ✓ Apply closed-loop recycling for processing waste water, with oil/water separation and waste oil reclamation.
- ✓ Investigate environment friendly spent grit recycling and disposal and the application of alternative hull stripping methods such as use of high-pressure water, wetted grit, and media such as steel shot, plastic particles or wheat starch.
- ✓ Note the condition of the river around the shipyard, is there evidence of oil and/or debris in the water;
- ✓ Regular inspection should be carried out of all bulk containment on site to prevent leakage and product loss;
- ✓ Provision of secondary spill containment for bulk storage tanks and silos;
- ✓ Good housekeeping should be maintained at all times in all areas;

4.21 Alternative Analysis

There is little scope for the consideration of alternatives in a project which is linking an existing distribution service to individual household and commercial users. However, during the planning stage and preliminary design, alternatives were considered in the selection of the site in the present location. Skill manpower is available in the area. The site is enriched with all facilities, which is most important for this project. The project is also capable for easy to access. It is away from flood plains, wetlands, and other environmentally sensitive areas. It has been considered for the sake of public safety, places such as schools, hospitals, and places of worship were avoided as where all public utilities wherever possible.

The Business Model of AVG is based on the principal that the yard, like money, is an asset that needs to be rolled fast to generate the highest possible revenue in the shortest possible time. This led to the design proposal by its technology partners, AMTech (S. Korea), wherein, AVG is to build a "Floating Dock-based" yard for the first time in Bangladesh which also allows multi-directional movement of vessels along the yard area, that will maximize the use of shipyard space like a car-parking lot, minimize service turnaround time & therefore maximize revenue. Our

unique design will result in a revenue of minimum 3 to up to 10 times more than the conventional slipway-based shipyards in Bangladesh, which (because of its requirement of 3° angular elevation from river to berth level) allows for movement only along one-axis, and also uses around 30% of the land for slipway that remains under water (thus not usable for repair work that requires bottom plate blasting and painting). Therefore, AVG will concentrate heavily on repair/conversion and construction project that have short cash conversion cycles (CCC), to ensure high levels of liquidity. Long CCCs is the single-most prominent reason along with financial indiscipline why shipbuilding companies have done so poorly in Bangladesh (with the exception of Karnafuly Ship Builders Ltd, Highspeed Shipbuilding and Heavy Engineering Ltd., Khulna Shipyard and Dockyard and Engineering Works, who have done fantastically). In consideration of that principle, AVG will also supply hull blocks or superstructure blocks to South Korean Shipyards on mass production basis. In South Korea, just like other advanced Shipbuilding Nations, most shipyards – similar to the aircraft manufacturing industry, do not build the whole vessel themselves. Usually, Hull Blocks are built in one yard, Superstructures are built in another yard, Outfitting done in yet another plant, and so on and so forth. If we break down the production cost of a whole ship, the most competitive advantage the low labour cost-based economy of Bangladesh provides over the rest of the world is the fabrication of the hull blocks or superstructure of the ship. So, to further expedite the revenue generation cycle, once our shipyard construction is complete, our South Korean based Sales Team will concentrate not only on Ship Owners but the hundreds of numerous shipbuilders of all grades in South Korea itself to get sub-contracts for these Hull Blocks or Superstructures where we can provide them almost 15-22 times pricing advantage! Therefore, the revenue generation capacity of Avanguard Shipyard, which, thanks to the automated bogies, floating dock and sectional block building technology, is already much higher than any existing shipyards in Bangladesh, will multiply manifold due to the mass production type approach to shipbuilding as an outsourced shipyard by manufacturing smaller components which may be tugged/or shipped via bulk carriers to South Korea or Singapore or any other shipyard in the world – something that none of the yards practices within Bangladesh nor do they have access to such markets.

Considering all of these factors, **as the site is perfect for the project in terms of facilities, no plan of the authority of Avanguard Shipyard Ltd. to look into an alternative site.**

Chapter 5: Site Details

5.1 Location of the Project Site

AVANGUARD SHIPYARD LTD. will be located at **Pankhali, Dacope, Khulna, Bangladesh (Opposite Rampal Power Plant on the shores of River Parus).**

The size of the yard is 3,960 decimal (161,617 m2 or 120 bigha) and we are in the final stages of processing a registered "Bayna Deed" at a strategically advantageous block of land. The draft is 10m+ all year round (Ref: Annex 22), and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Also, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all.

The draft at the location of the shipyard is 10m+ all year round, and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Panama Size Ships has the most demand in the global market. Finally, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all. Also, Mongla Port is just 1.5 hrs. away by river route which would save our yearly logistics cost by 75% and also give access to thousands of repair customers who uses the Port.

The location of the project is shown in different maps in the following figures and the layout plan of the said project attached in the Annexure.

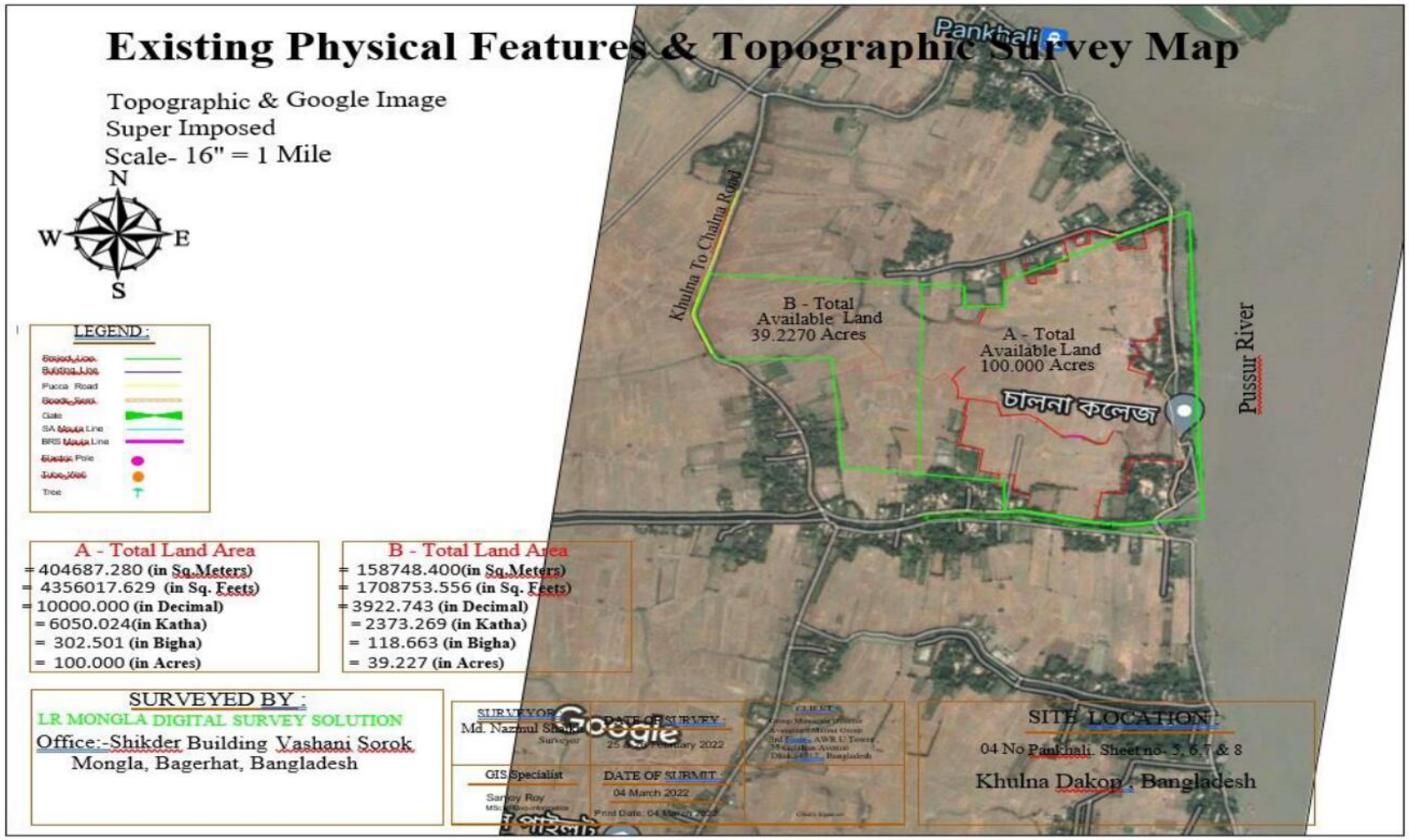


Figure 5:1 Site location of Avanguard Shipyard Ltd.

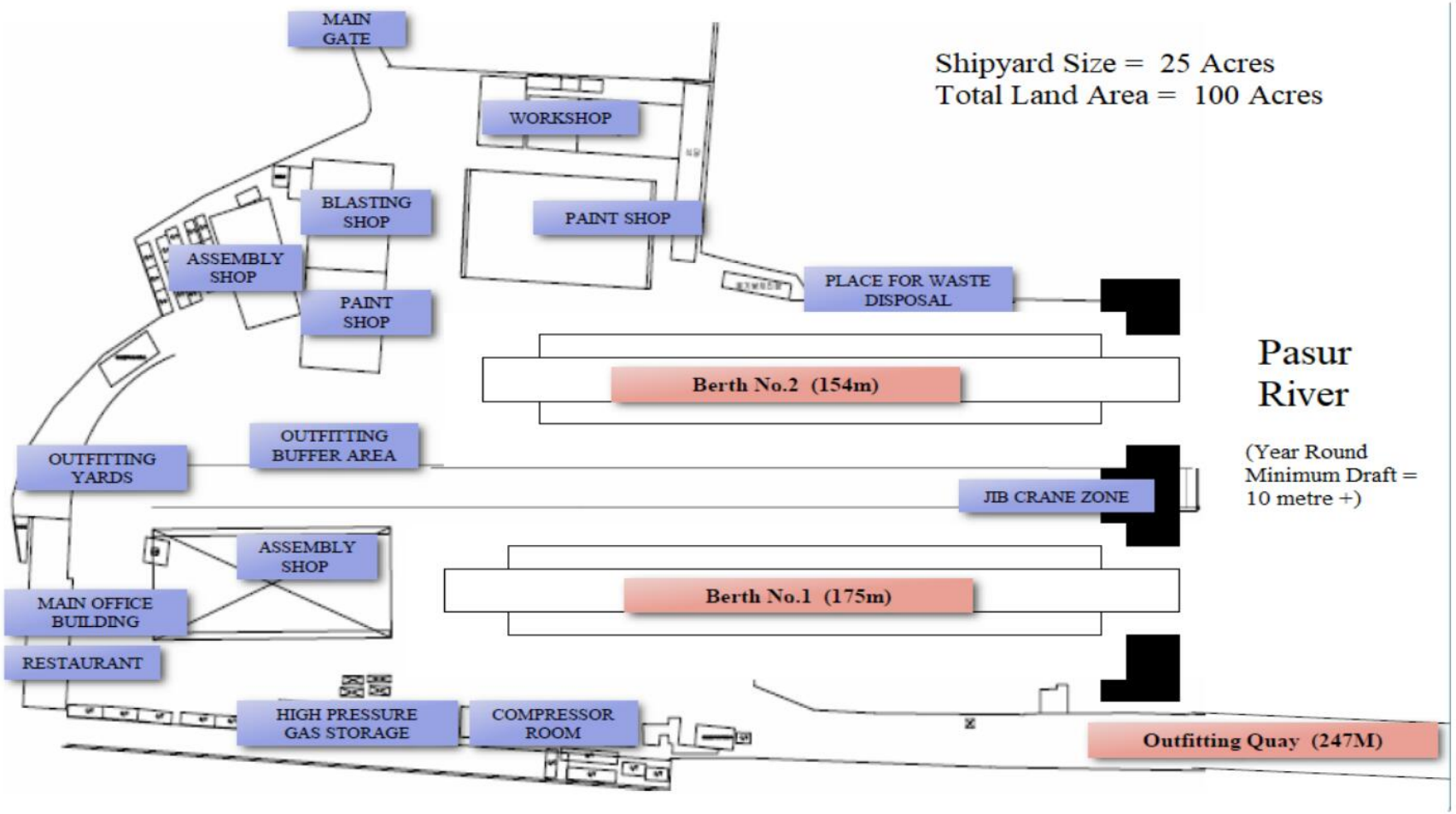


Figure 5:2 lay-out of the project

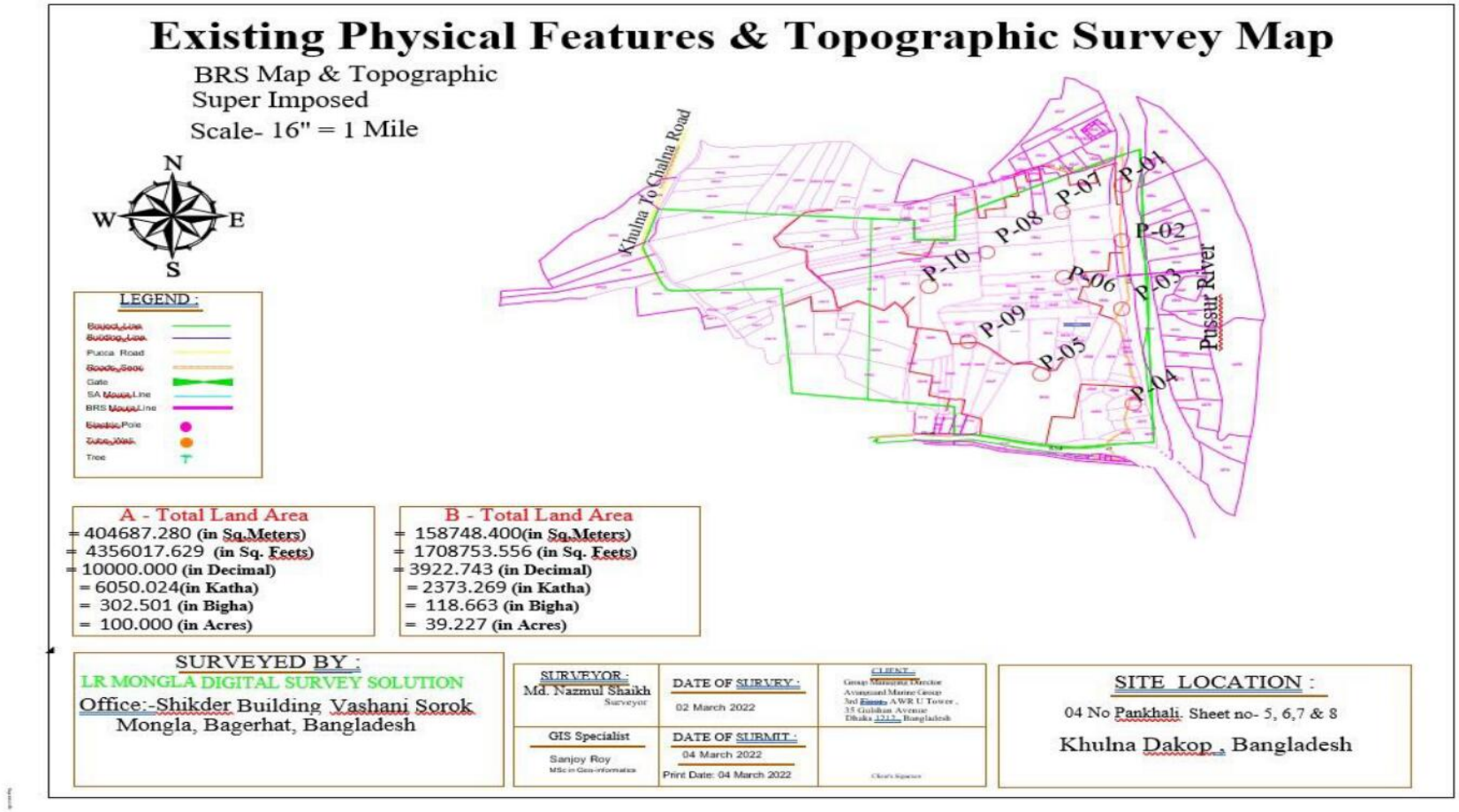


Figure 5:3 Site Topography

5.2 Justification for Selecting the Site

Avanguard Shipyard Ltd. will be located at **Pankhali, Dacope, Khulna, Bangladesh (Opposite Rampal Power Plant on the shores of River Rupsha (Previous name Japjapiya)).** The project location is well suited for the project because-

1. Connectivity- Ship equipment is heavy, involving 40 ft trailers even, so highway connection.
2. Sheltered location- this location is on calm waters. Thats why many shipyards are near river mouths or creeks.
3. The water depth at this area is suitable for shipyard (minimum 6-8 meters at low tide).
4. Accessibility to the port- The location is perfect to handles container and bulk traffic. This reduces logistic costs of bringing steel and equipment.

5.3 Layout Maps Indicating Existing and Proposed Unit

Avanguard Shipyard Ltd. is proposed to start its construction of project in 2024 after obtaining site clearance from DoE.

The Company has a Manufacturing Franchisee Agreement (Ref: Annex 14) with one of the most renowned European Dredger Manufacturers in the world – Italdraghe SpA. Under this agreement, AVG will be building the hull blocks of Italdraghe's Cutter Suction Dredgers, while Italdraghe will be supplying the machineries and dredge components and also carrying out supervision of construction. The final product will be branded as a Italdraghe Dredger with the relevant ITD SGT model code.

-The Company has an Exclusive Master Service Agreement (Ref: Annex 13) with AMTech, a company based in South Korea, who will be overseeing the total Technical Aspects of the Project. The Chief Technical Consultant of the project will be from AMTech. They have already designed the shipyard layout, provided the GA for the Floating Docks and carried out the feasibility of the project

Layout map indicating existing and proposed unit are shown below-

Figure 5:4 Floating dock based

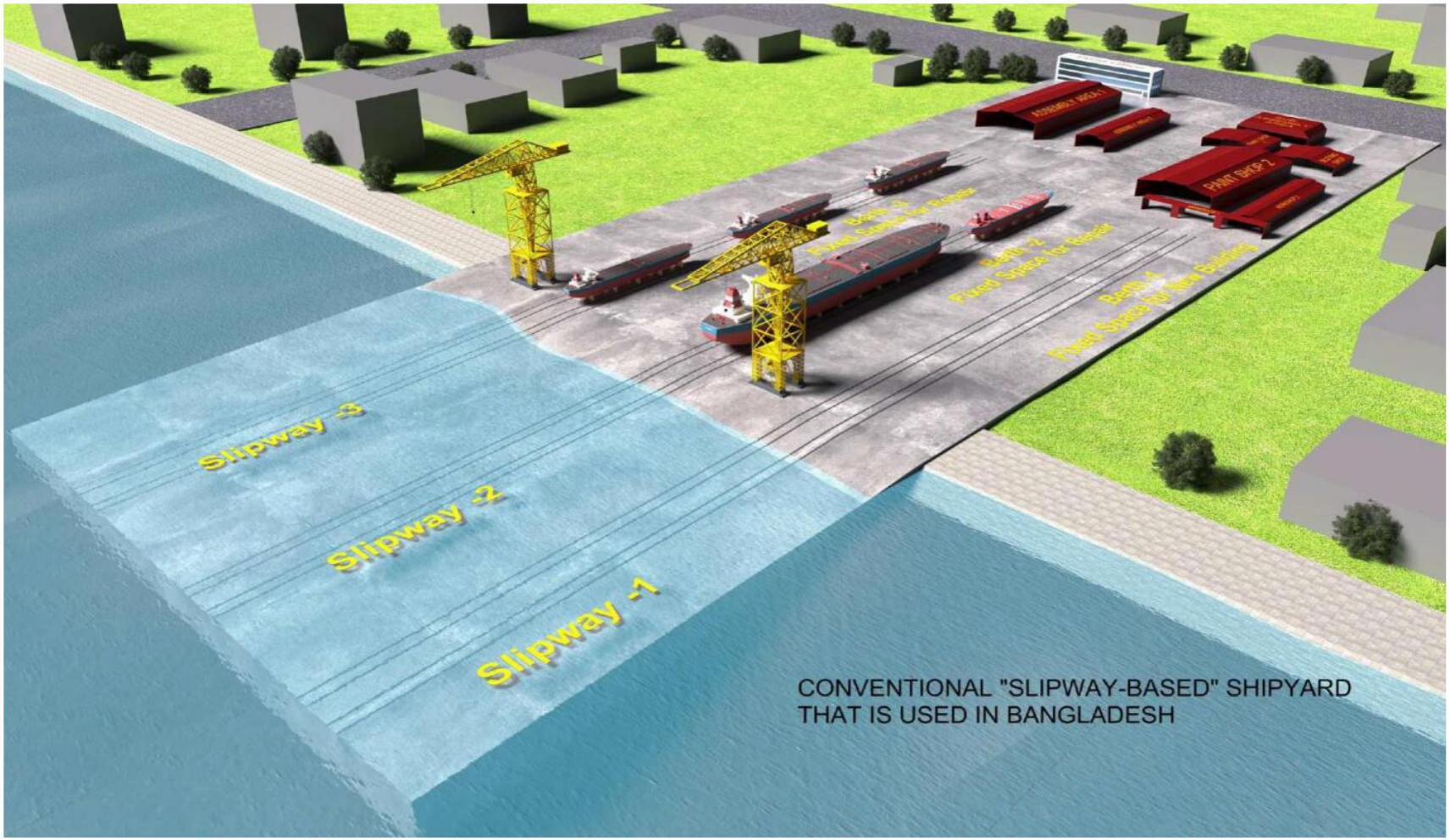


Figure 5:5 Master Layout of the Project

5.4 Projects within the Study Area and Land Use

BM Energy (BD) Limited is incorporated in 2012. It was founded with an aim to assist and develop the country to be more energy eficient with an onset of depletion of Natural Gas. To achieve this vision, BM Energy has constructed a LPG plant with jetty facility for Importing, Storing and Bottling

To achieve this vision, BM Energy has constructed a LPG plant with jetty facility for Importing, Storing and Bottling in Barabkunda, Sitakunda, Chittagong. This was in operation from 3rd July 2015. This plant has a capacity of handling 2,50,000 MT LPG per year. It has all the European standard, top of the line LPG Storing and Bottling equipment. It's ultra-modern automated firefighting system is capable to protect the plant from any major fire related disaster.

Figure 5:6 Distance from the project site of the existing jetty of BM eEnergy (BD)

The Rampal power station which is only 3.5 km far from Avanguard shipyard. The Rampal project would involve the government acquiring 2000 acres of farm land to install the plant under a Memorandum of Understanding (MoU) signed between Bangladesh's Power Development Board (PDB) and India's state-owned National Thermal Power Corporation (NTPC) in August 2010; they have been designated to implement the project by 2016.

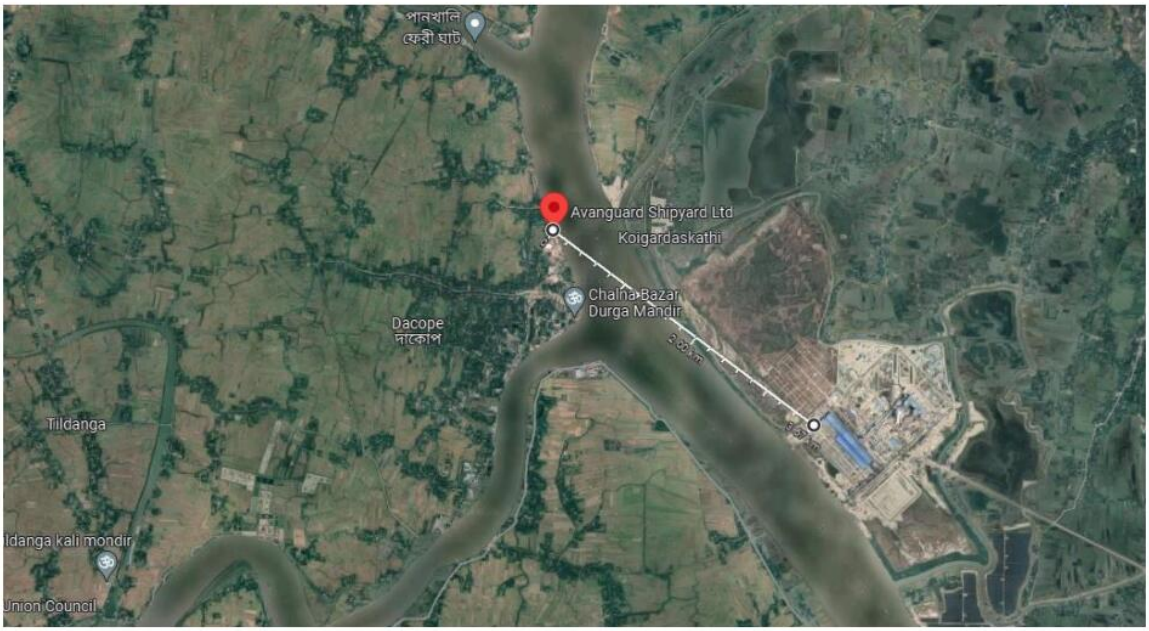


Figure 5:7 Rampal Power Plant Distance from the project is 3.5 km

On January 29, 2012, the India Power Development Board (PDB) signed an agreement with NTPC to build the 1,320-megawatt Rampal plant. The PDB and the NTPC will implement the $1.5 billion project on a 50:50 equity basis.[2] The NTPC will set up and operate the plant.

According to a July 2014 report, the project will start commercial generation by December 2018. Three companies – Marubeni Corporation from Japan, Harbin Electric International Company from China and Bharat Heavy Electricals Limited from India – have submitted bids to construct the project. The contract is planned to be awarded by January 2016.

Chapter 6: Baseline Environment

6.1 General Consideration

The details of the existing environmental settings and socio-economic baseline condition of the project site are presented in this chapter. The baseline environmental and socio-economic conditions have been established in respect of physical environment, water resources, land resources and socio-economic settings of the selected study area using both primary and secondary data. This information forms the basis to analyze the probable impacts of the project activities.

6.2 Study Area

AVANGUARD SHIPYARD LTD. will be located at **Pankhali, Dacope, Khulna, Bangladesh (Opposite Rampal Power Plant on the shores of River Rupsha (Previous name Japjapiya)).**

The base line study records are required for environmental settings against which potential impacts from construction and operational phase of the project can be compared. In the present study, the different environment components examined for setting base line.

S. No.	Point	Time & date	Noise level
01	22°37'15.84"N, 89°31'5.08"E	2.00 pm, 05/08/2023	56.1 dBA
02	22°37'10.91"N, 89°31'6.30"E	2.00 pm, 05/08/2023	57.4 dBA
03	22°37'13.16"N, 89°31'4.50"E	2.00 pm, 05/08/2023	55.6 dBA
04	22°37'24.31"N, 89°31'3.40"E	2.00 pm, 05/08/2023	52.0 dBA
05	22°37'13.16"N, 89°31'8.97"E	2.00 pm, 05/08/2023	49.7 dBA
06	22°37'14.02"N, 89°30'56.95"E	2.00 pm, 05/08/2023	54.8 dBA
07	22°37'32.36"N, 89°30'57.94"E	2.00 pm, 05/08/2023	60.3 dBA
08	22°37'6.40"N, 89°30'57.76"E	2.00 pm, 05/08/2023	58.4 dBA

ENIRONMENTAL ALLIANCE BD LTD.
A House of Perfect Environmental Monitoring
Research, Training, & Awareness.

LABORATORY ANALYSIS REPORT

EABDL/LAB CODE (TR) : 0156

Factory Name : Avanguard Shipyard Ltd

Factory Address : Pankhali, Dacope, Khulna, Bangladesh.

Location (GPS) Coordinate: 22°37'13.1"N 89°31'08.9"E

Sample Collector : Environmental Alliance BD Limited (EABDL Monitoring Team)

Description of Sample : Noise Level Measuring

Sampling date : 5th September, 2023

Reporting date : 12th September, 2023

Description of Analysis

SN.	Sampling Location	Test Method	Time Interval	Leq dB (A)
01	22°37'15.84"N, 89°31'5.08"E	IS : 9989 - 1981	2.00 pm to 7.00 pm	56.1
02	22°37'10.91"N, 89°31'6.30"E	IS : 9989 - 1981		57.4
03	22°37'13.16"N, 89°31'4.50"E	IS : 9989 - 1981		55.6
04	22°37'24.31"N, 89°31'3.40"E	IS : 9989 - 1981		52.0
05	22°37'13.16"N, 89°31'8.97"E	IS : 9989 - 1981		49.7
06	22°37'14.02"N, 89°30'56.95"E	IS : 9989 - 1981		54.8
07	22°37'32.36"N, 89°30'57.94"E	IS : 9989 - 1981		60.3
08	22°37'6.40"N, 89°30'57.76"E	IS : 9989 - 1981		58.4

Comments: The above tested parameters are conforming to standards.

Engr. Md. Aminul Islam
Chief Executive Officer
Environmental Assessment & Development
Environmental Alliance BD Ltd. (EABDL)

Md. Eleash Alam
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Rregistered & Lab Office: Plot # 189/1, Al-Buruz Tower (5th Floor), Road # 2, West Agargaon, Sher-E-Bangla Nagar, Dhaka-1207.
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02-58155039, 01714-079290, 01716-068464 info@eabld.com.bd, info.eabdl@gmail.com eabld.com.bd

ENIRONMENTAL ALLIANCE BD LTD.

A House of Perfect Environmental Monitoring Research, Training, & Awareness.

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02-58155039, 01714-079290, 01716-068464 info@eabld.com.bd, info.eabdl@gmail.com eabld.com.bd

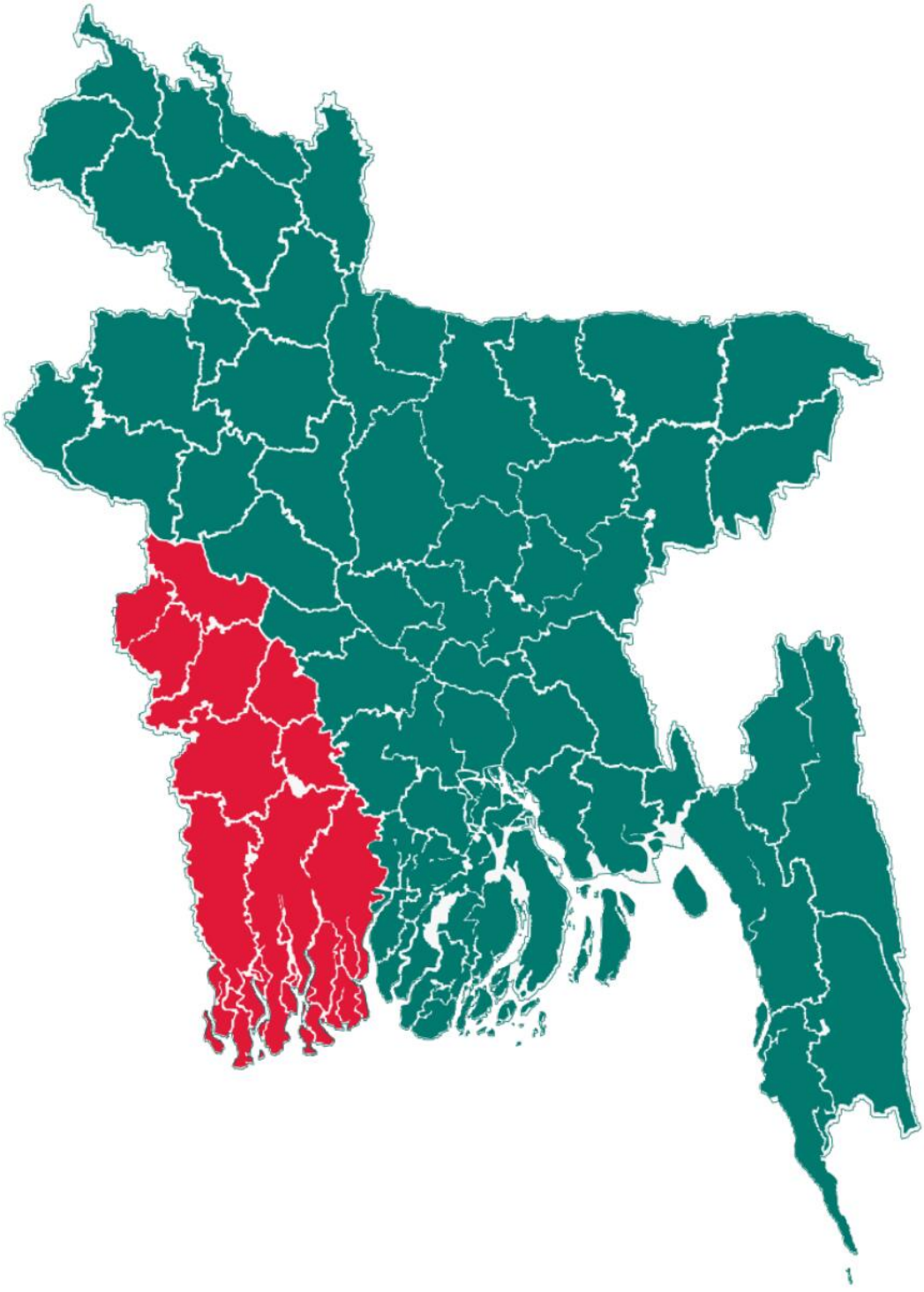


Figure 6:1 map of khulna district

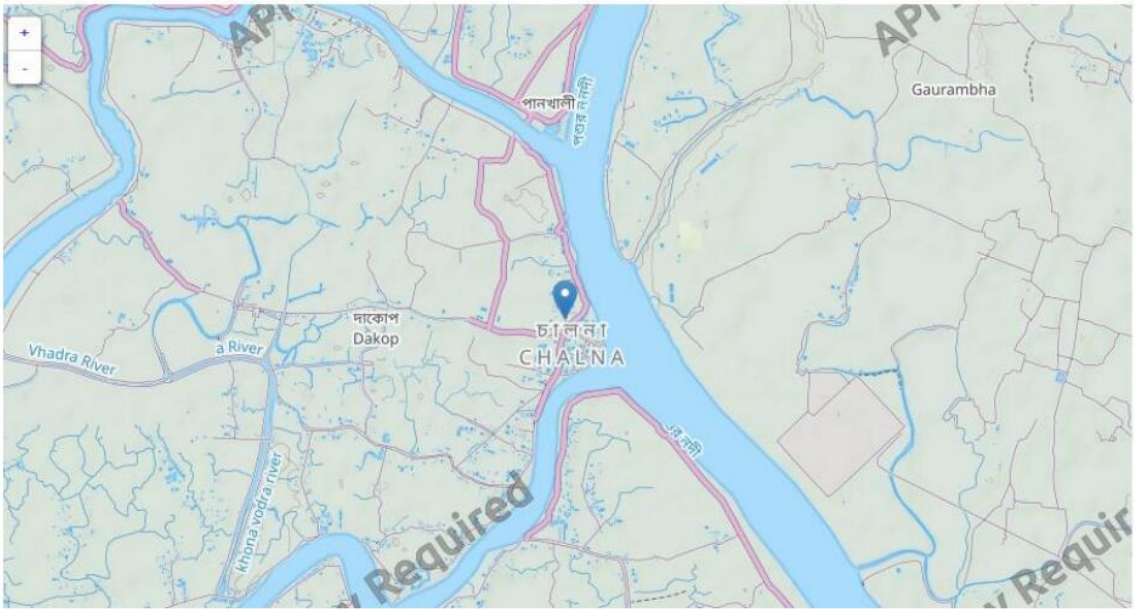


Figure 6:2 Project Location Map

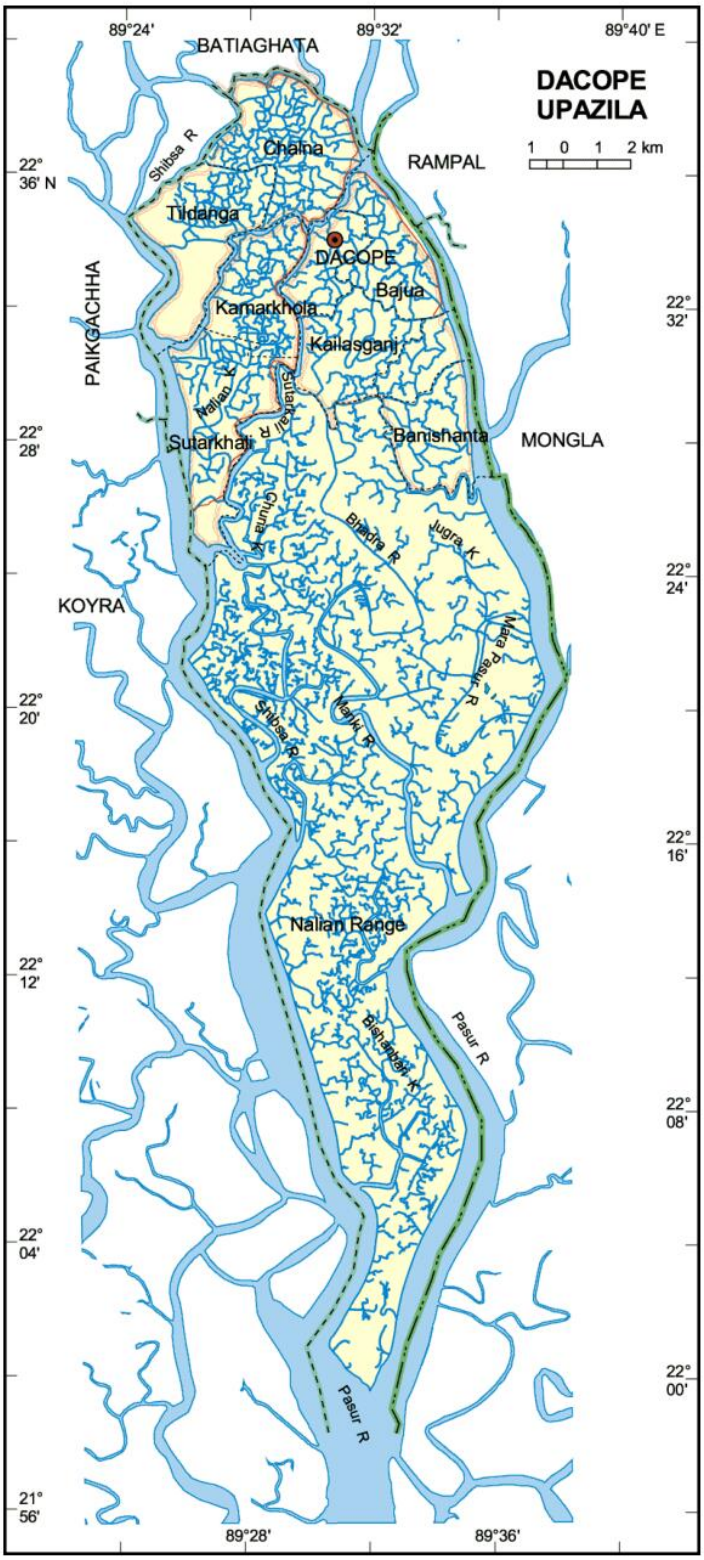


Figure 6:3dacope upazila map

6.3 Topography, Soil and Geology

6.3.1 Topography

Puddling of clay soils for rice transplanting causes a loss of soil structure and vertical shrinkage cracks that are hypothesized to hamper sunflower root growth in the following dry season. To alleviate soil constraints for sunflower root growth and yield, we examined the effects of three levels of mulch and two irrigation regimes in the dry season on a clay-textured soil in the coastal zone of Bangladesh. These treatments were no-mulch, rice straw mulch at 5 t ha−1 and 10 t ha−1, irrigation applied to the field capacity (I1) and a water supply double that of the I1 treatment (I2). The rice straw mulch significantly increased soil water content by 3–9% and decreased soil penetration resistance by 28–77% and crack volume by 84–91% at A 0–30 cm soil depth relative to the no-mulch treatment. The better root development with the rice straw mulch increased sunflower yield by 23%. No benefit or further reduction in soil penetration resistance or yield improvement was obtained from increasing the level of mulch from 5 to 10 t ha−1 or the volume of irrigation water. It is concluded that ameliorating soil constraints by mulch application led to better root growth in the upper root zone and the increased yield in the clay soil.

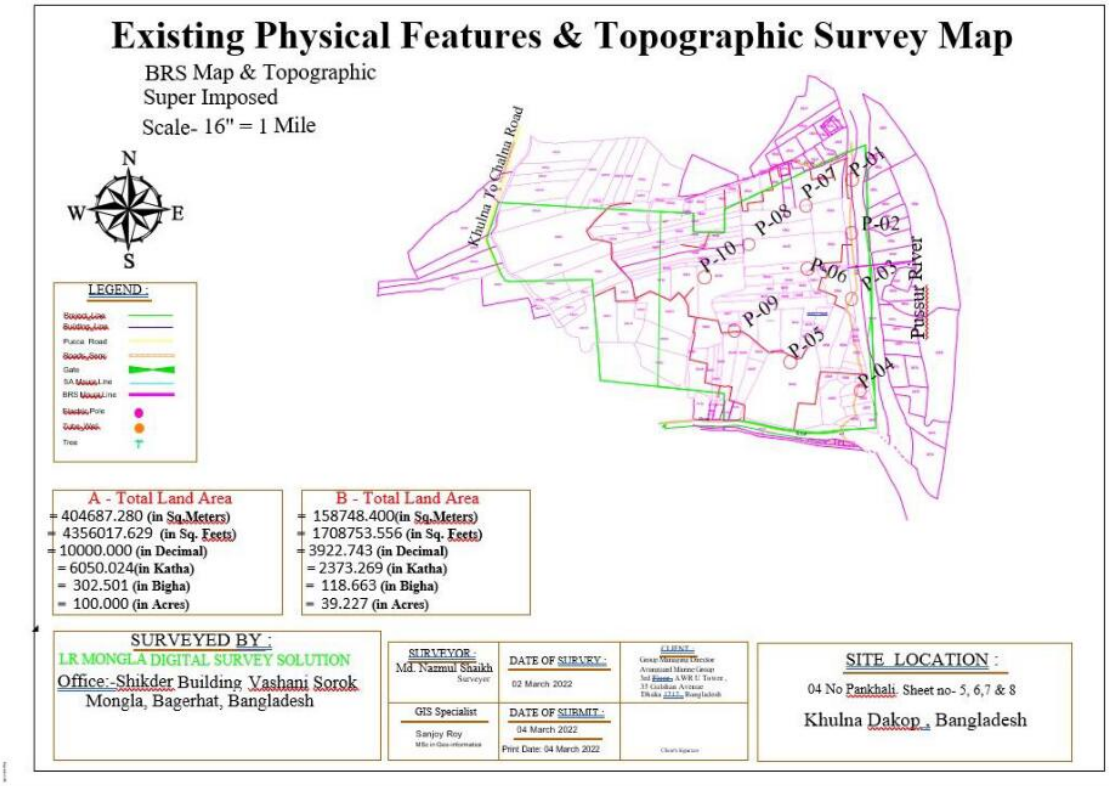


Figure 6:4 Topographic map of the project

6.3.2 Soil Characteristics

GEOLOGICAL SET-UP AND SOIL COMPOSITION:

6.3.2.1 Regional Geology:

Geologically, the project area is located in the central edge of Khulna terrace. The elevation of Khulna Terrace is bounded by number of faults. The Terrace is formed of elevated dome shaped low hillocks and dish shaped depressions resulted due to erosion. The depressions are Interconnected by intricate streams of deep valleys. The present Site is located at a Shallow depression of the Terrace. The site is located in the deeper part of Bengal Basin. No Surface Folding or Faulting could be identified in and the area. The project area is located in the Seismic Zone-ii of Seismic zoning map of Bangladesh Where the Basic Seismic Co-efficient may be considered around 0.05.

Description of soil Composition:

The following terms are used in this report for description of soil composition;

Trace: 1 to 10%

Little: 11 to 20%

Some: 21 to 35%

Sandy: 36 to 50% Sand

Clayey: 36 to 50% Clay

Silty: 36 to 50% Silt

All the test report is already described on the feasibility report which is already submitted to DoE.

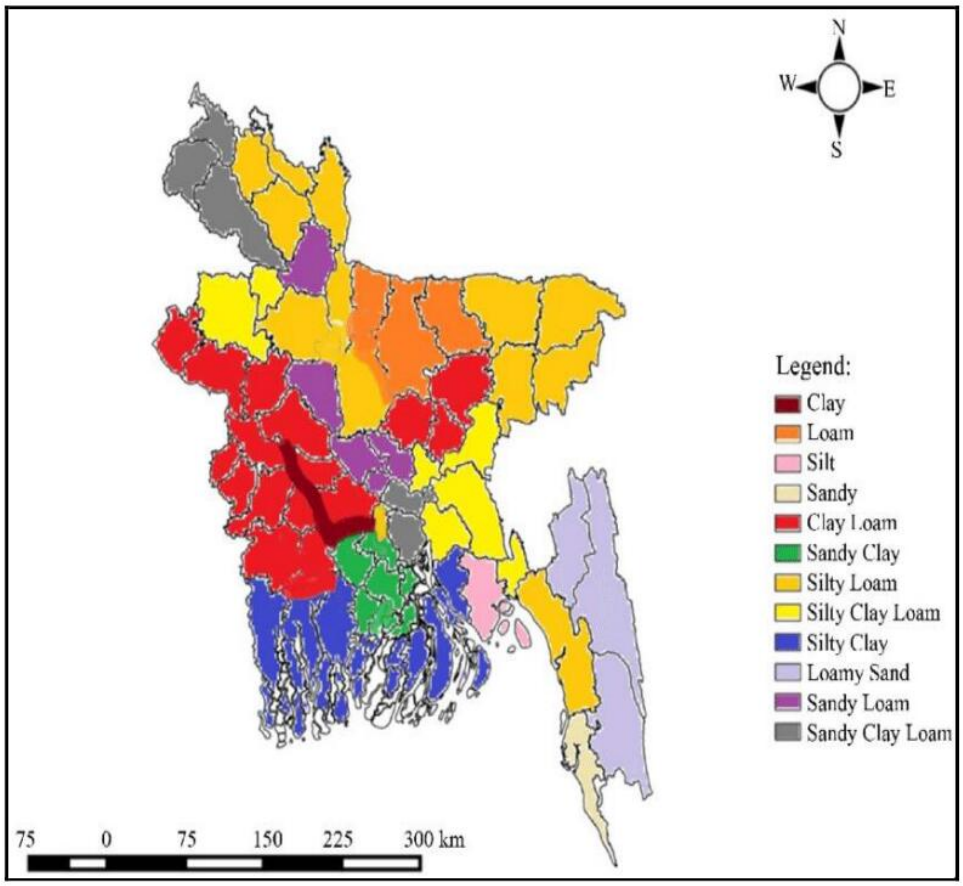


Figure 6:5 Soil Texture of Bangladesh

6.4 Land Use of the Study Area

Correlation Table of Soils Based on SPT Values:

Two tables for Non-Cohesive and Cohesive Soils Based on N-values as below: Values of unit Weight and Angle of Internal Friction of Non-Cohesive soil based on N-values (After K. Terzaghi and R.B. Peck):

Table 6-1 Correlation Table of Soils Based on SPT Values

N-Values	Condition	Relative Densit	Angle of Internal friction	Moist unit wt. In pcf.
0 to 4	Ve Loose	0.0-.2	25-30	-100
4 to 10	Loose	0.2-0.4	30-35	-115
10 to 30	Medium	0.4- 0.6	35-40	0-130
30 to 50	Dense	0.6-0.85	40-45	110-140
Over SO	Ver Dense	1.00	45	130-150

The tabulated values apply for dry / moist cohesionless sand. For Silty sands the bearing capacity values must be reduced by study of grain size classification and applying judgement. Correction for water table close to bottom of foundation the bearing values should reduce to half. The bearing values are, however, not affected by the water table at a depth greater than I.SB below foundation level, B is the least dimension of the bottom of foundation. Bearing values for intermediate position of water tabie may be reduced by linear interpolation.

Values of Approximate Unconfined Compressive Strength Based on N-values for Cohesive Soil (After K. Terzaghi and R.B. Peck):

Table 6-2 Values of Approximate Unconfined Compressive Strength Based on N-values for Cohesive Soil

N-values	Condition	Unconfined Compressive Strength in Tsf.
0-2	Very soft	Below0.25
2-4	Soft	0.25-0.50
4-8	Medium	0.50-1.00
8-15	Stiff	1.00-2.00
15-30	Very Stiff	2.00-4.00
Over 30	Hard	Over 4.00

In the above table the shear strength of cohesive soil is equal to ½ of unconfined compressive strength and the angle of shearing resistance is equal to zero. It should be remembered that the correlation for cohesive soil is always much reliable.

PHYSICAL PROPERTIES:

The physical properties of the sub-soil formation of the project area have been evaluated by the execution of borings overall physical properties may be summarized as follows:

Table 6-3 Range of Variation in Laboratory Tests Results:

Name of the Soil Test	No of Tests	Range of variation
Unconfined Compression Test		Pl. See the Test Summary
Direct Shear Test		do
Liquid Limit Test		do
Plastic Limit Test		do
Specific gravity Test		

ENGINEERING PROPERTIES:

The engineering properties of soil, including the cohesion, compressibility and the angle of granular friction have been determined by performing laboratory tests on the soil samples collected during field investigation. These are as follows:

Cohesion: The values of cohesion, as reported from the performance of unconfined compression tests.

Compressibility The top layer of firm clay has been observed moderately compressible in nature by consolidation tests .

Angle of lnternal Friction: The angle of internal friction values of the Investigated values of soil, as reported from the performance of direct shear tests.

EVALUATION OF BEARING CAPACITY:

Bearing capacity of the shallow condition from the SPT:

The bearing capacities of the shallow foundations particularly for the top of cohesive soil may be estimated from the SPT values, as suggested by Terzaghi according to the following table:

Table 6-4 Bearing Capacities of the shallow Foundation (Values in Tsf F.S. = 3):

SPT range	Allowable Bearing Capacity (Tsf)	
0-2	Continuous footing B=4ft	Isolated Column footing B=8ft.
2-4	0.00-0.225	0.00-0.36
4-8	0.225-0.45	0.30-0.60
8-15	0.45-.90	0.60-1.20
15-30	0.90-1.80	1.20-2.40
>30	1.80-3.60	2.40-4.80
	>3.60	>4.80

Note : a. Width = 1.22m for strip footing and width = 2.44m for isolated footing respectively.
b. The above values are the net allowable Bearing capacities.
c. The cohesive soil has been considered in a saturated condition.

Bearing capacity of the shallow foundations from the soil parameters:

The bearing capacities of the shallow foundation may more appropriately be determined from the parameters of soil such as the values of cohesion and the internal friction as obtained from the performance of laboratory tests. These have been done considering the general equations of the bearing capacity of the foundation as Suggested by Terzaghi.

Table 6-5 Bearing Capacities of the shallow foundation from field and laboratory tests (Values in Tsf, F.S.= 3):

Bore Hole	Depth in ft.	Field SPT	Cohesion kg/cm2	Bearing Capacity	
				For Circular or Square footing.	For Continuous footing
BH-1	5	1		-	-
	10	1		-	-
	15	1		0.37	0.31
	20	1		**0.44**	0.38
BH-2	5	1		-	-
	10	1		-	-
	15	1		-	-
	20	1		-	-
BH-3	5	1		-	-
	10	1		-	-
	15	1		-	-
	20	1		**0.44**	0.38
BH-4	5	1		-	-
	10	1		-	-
	15	1		0.37	0.31
	20	1		0.44	0.38

The soil test report executed by Sohel Soil Engineering. Details of the report is described in feasibility report which is already submitted to DoE.

6.5 Spatial and Climatic Features

AVANGUARD SHIPYARD LTD. will be located at **Pankhali, Dacope, Khulna, Bangladesh (Opposite Rampal Power Plant on the shores of River Rupsha (Previous name Japjapiya)).**

The draft at the location of the shipyard is 10m+ all year round, and therefore if this project receives the necessary funding and is implemented, it would be the only shipyard in Bangladesh that has the capability to build Panama Size Ships (65,000 to 80,000 Deadweight Ton and Length (OA) of 1,200 ft). Panama Size Ships has the most demand in the global market. Finally, there is a total of 417+ bigha of land available for sale in one continuous block – therefore, expansion should not be a problem at all. Also, Mongla Port is just 1.5 hrs away by river route which would save our yearly logistics cost by 75% and also give access to thousands of repair customers who uses the Port.

6.5.1 Climate and Average Weather Year-Round in

6.6 Temperature and Precipitation

The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Khulna. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years. For vacation planning, you can expect the mean temperatures, and be prepared for hotter and colder days. Wind speeds are not displayed per default, but can be enabled at the bottom of the graph.

The precipitation chart is useful to plan for seasonal effects such as monsoon climate in India or wet season in Africa. Monthly precipitations above 150mm are mostly wet, below 30mm mostly dry. Note: Simulated precipitation amounts in tropical regions and complex terrain tend to be lower than local measurements.

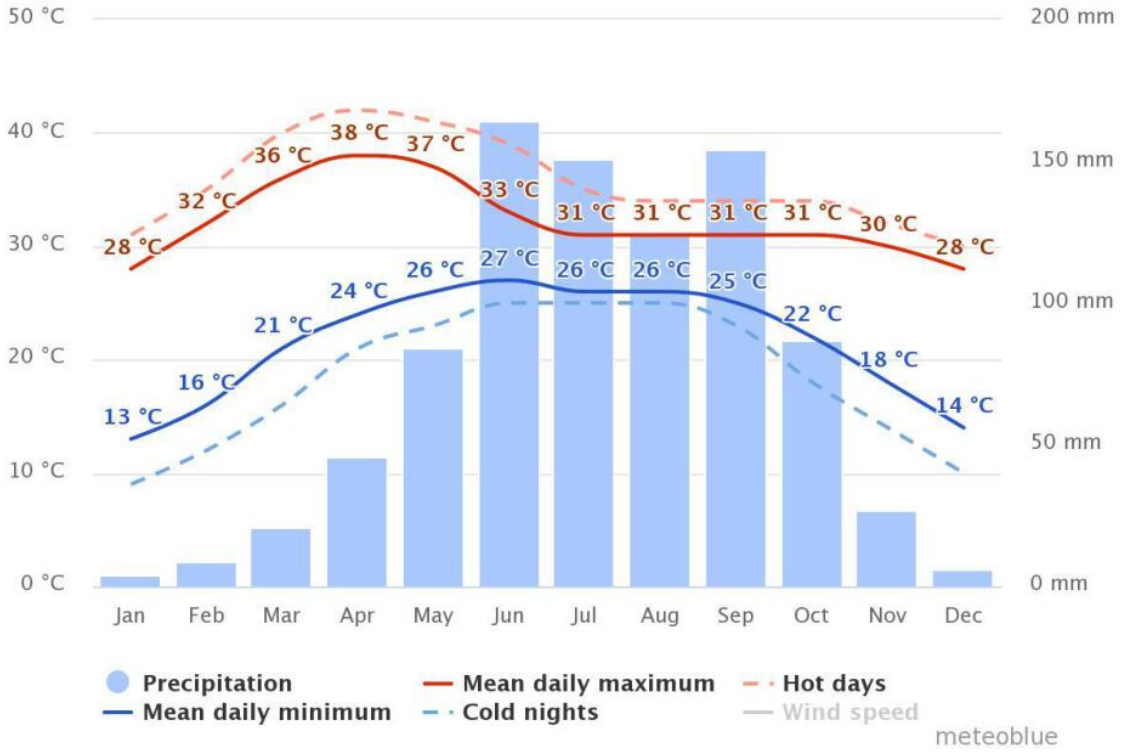


Figure 6:6 Temperature and Precipitatio Curve

Bangladesh Meteorological Department

Climate Division, Agargaon, Dhaka-1207

Station: Khulna

Monthly average Dry-bulb Temperature in degree Celsius of Khulna

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2011	17.3	21.9	26.3	28.5	29.7	29.3	29.3	28.5	28.6	28.7	24.1	19.2
2012	18.8	21.9	27.5	29.5	31.1	31.1	29.3	29.2	29.1	27.5	23.4	18.4
2013	17.5	21.7	27	29.4	28.8	30.1	29.3	28.9	29.1	27.3	23.6	20.1
2014	17.5	21	26.4	31.1	30.8	29.9	29.4	29.2	29.2	27.9	23.8	18.9
2015	18.8	22.5	25.9	28.5	31	29.6	28.2	29.2	29.3	28	24.8	20.6
2016	18.7	24.3	27.6	31	29.7	29.8	28.8	29.2	29.6	28.4	23.8	20.3
2017	18.8	22.5	25.8	29.4	30.6	29.9	28.9	29.4	29.4	27.6	23.8	20.5
2018	16.7	23.1	27.4	28.4	28.9	29.9	29.3	29.7	29.8	27.5	24.2	18.9
2019	18.5	21.7	26.2	29.3	31.1	30.7	29.8	29.6	28.9	27.6	24.5	19.2
2020	18.3	20.6	26.3	28.6	29.4	29.7	29.8	29.4	29.7	29	24.5	19.4
2021	19.1	22	28.2	30.5	30.2	28.9	29.3	29.3	28.8	28.7	24.1	20.3

6.6.1 Rainfall

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in Khulna, Dacope varies very significantly throughout the year.

The wetter season lasts 5.0 months, from May 9 to October 7, with a greater than 34% chance of a given day being a wet day. The month with the most wet days in Khulna, Dacope is July, with an average of 20.1 days with at least 0.04 inches of precipitation.

The drier season lasts 7.0 months, from October 7 to May 9. The month with the fewest wet days in Khulna, Dacope is January, with an average of 0.8 days with at least 0.04 inches of precipitation.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. The month with the most days of rain alone in Khulna, Dacope is July, with an average of 20.1 days. Based on this categorization, the most common form of precipitation throughout the year is rain alone, with a peak probability of 66% on July 9.

The rainy period of the year lasts for 9.1 months, from March 4 to December 6, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Khulna, Dacope is July, with an average rainfall of 16.4 inches.

The rainless period of the year lasts for 2.9 months, from December 6 to March 4. The month with the least rain in Khulna, Dacope is January, with an average rainfall of 0.2 inches.

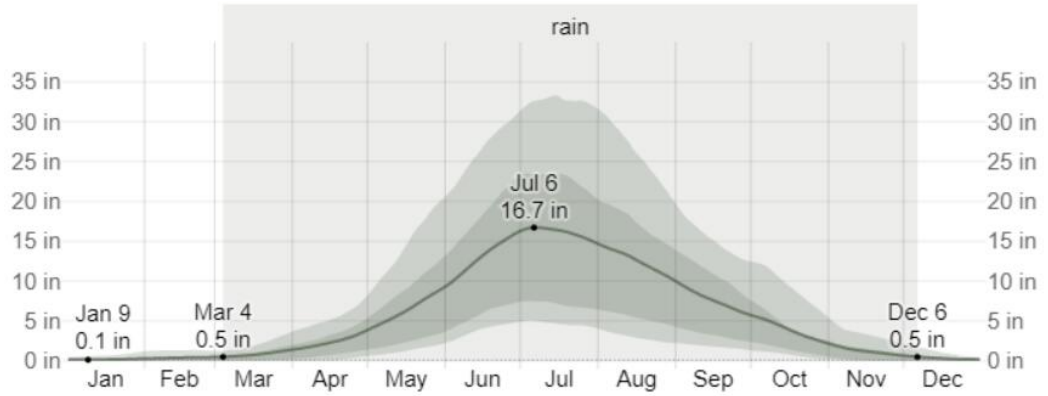


Figure 6:7 Average Monthly Rainfall in Khulna, Dacope

The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands.

Table 6-6 Average Monthly Rainfall in Khulna, Dacope

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	0.2"	0.4"	0.8"	2.2"	6.3"	13.1"	16.4"	12.6"	7.7"	3.9"	1.2"	0.3"

Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Spt.	Oct.	Nov.	Dec.	Annual
2011	0	1	16	28	145	381	387	614	367	3	6	0	1948
2012	66	18	1	52	63	255	391	254	374	89	80	2	1645
2013	1	7	19	62	430	212	313	482	278	260	0	0	2064
2014	0	24	5	0	118	447	394	258	205	10	0	0	1461
2015	41	35	28	107	128	318	922	353	293	83	3	6	2317
2016	0	97	5	54	350	353	413	646	148	81	75	0	2222
2017	0	2	59	99	200	356	690	313	175	322	19	51	2286
2018	0	0	1	64	226	266	264	107	106	36	0	3	1073
2019	0	166	74	102	104	114	335	370	283	187	175	15	1925
2020	30	2	10	179	243	350	223	265	172	90	6	0	1570
2021	0	3	0	2	124	468	525	203	339	234	3	66	1967

6.6.2 Humidity

Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. Khulna, Dacope experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 8.8 months, from March 7 to December 1, during which time the comfort level is muggy, oppressive, or miserable at least 26% of the time. The month with the fewest muggy days in Khulna, Dacope is January, with 0.5 days that are muggy or worse.

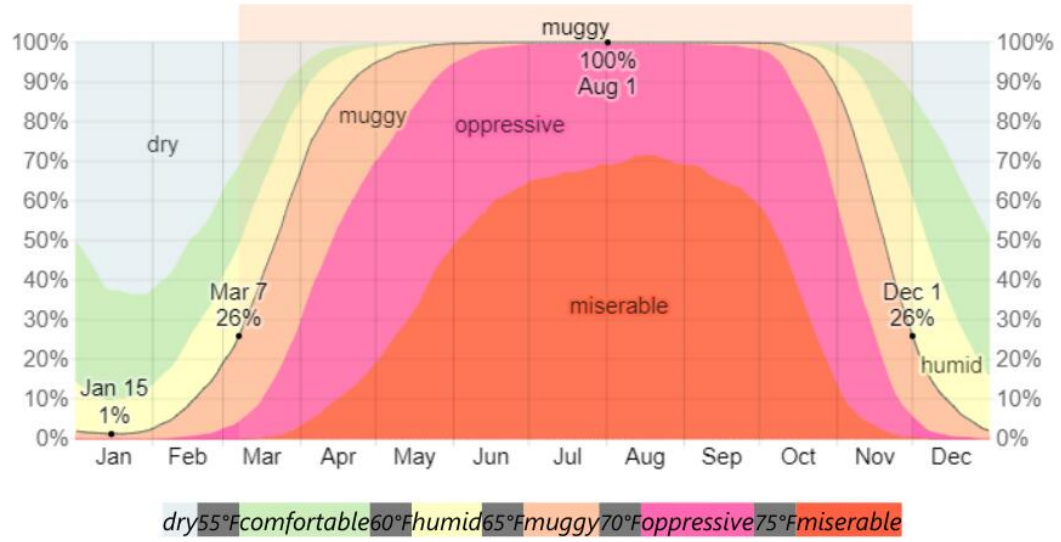


Figure 6:8 Humidity in Khulna, Dacope

Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
2011	76	70	70	72	78	84	84	88	87	79	81	83	79
2012	80	71	73	77	79	84	90	90	90	85	81	87	82
2013	83	77	70	71	82	84	90	91	85	86	75	78	81
2014	81	73	68	66	74	83	86	85	84	79	75	82	78
2015	80	74	68	76	76	83	90	86	85	81	79	84	80
2016	79	77	74	74	77	83	87	85	82	81	80	82	80
2017	77	72	74	74	75	83	87	86	85	86	79	84	80
2018	78	73	71	73	79	82	86	83	83	80	77	76	78
2019	74	72	72	73	76	81	85	84	86	85	82	81	79
2020	80	72	66	72	76	83	84	85	84	82	74	79	78

2021	78	72	69	66	72	84	85	85	85	82	75	80	77

6.6.3 Wind

The diagram for Khulna shows the days per month, during which the wind reaches a certain speed. An interesting example is the Tibetan Plateau, where the monsoon creates steady strong winds from December to April, and calm winds from June to October.

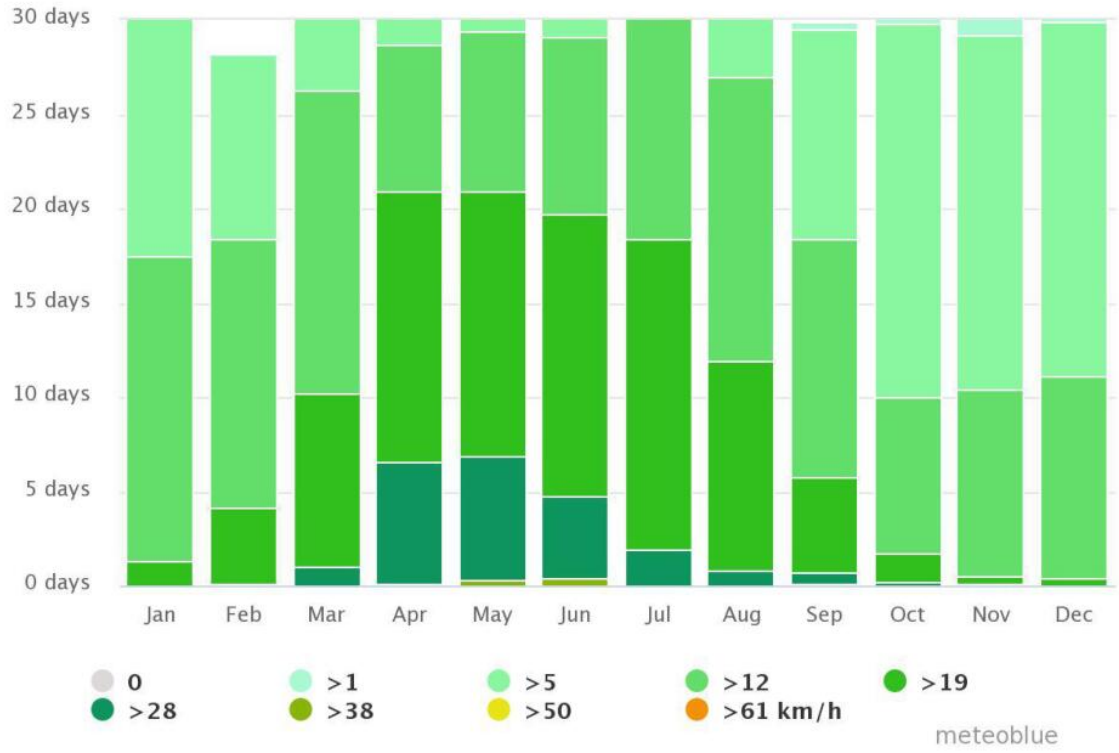


Figure 6:9 Wind speed units can be changed in the preferences (top right).

The wind rose for Khulna shows how many hours per year the wind blows from the indicated direction. Example SW: Wind is blowing from South-West (SW) to North-East (NE). Cape Horn,

the southernmost land point of South America, has a characteristic strong west-wind, which makes crossings from East to West very difficult especially for sailing boats.

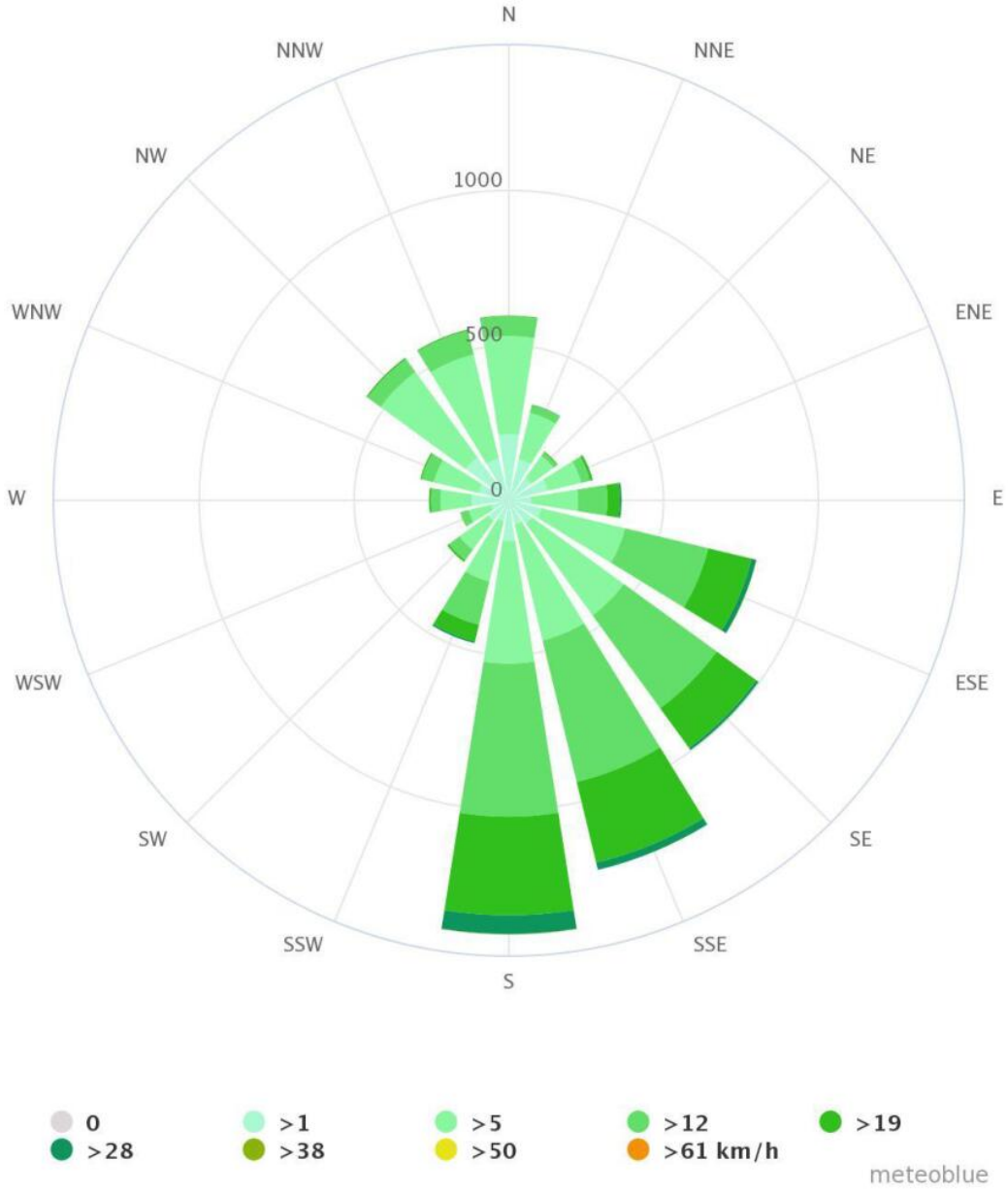


Figure 6:10 The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

Table 6-7 Average Wind Speed in Khulna, Dacope

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed (mph)	4.5	4.5	4.7	5.1	5.3	6.5	6.6	5.7	4.4	3.8	3.9	4.1

The predominant average hourly wind direction in Khulna, Dacope varies throughout the year.

The wind is most often from the west for 1.2 months, from February 16 to March 21, with a peak percentage of 40% on March 5. The wind is most often from the south for 6.6 months, from March 21 to October 10, with a peak percentage of 91% on July 10. The wind is most often from the north for 4.2 months, from October 10 to February 16, with a peak percentage of 59% on January 1.

Year	Jan.		Feb.		Mar.		Apr.		May		Jun.		Jul.		Aug.		Sep.		Oct.		Nov.		Dec.	
	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir	Spd	Dir
2011	2.1	NW	1.9	NW	4.1	S	2.3	S	2.4	S	3	SE	2.1	S	3	SE	2.6	SE	1.2	NW	1.7	NW	1.2	N
2012	2.1	NW	1.9	NW	1.9	S	2.4	S	2.4	S	2.8	S	2.1	S	2.2	SE	2.1	SE	2	S	1.6	NE	1.6	NW
2013	1.9	NW	2.2	NW	2.1	S	2.4	S	2.6	S	2.3	SE	2.3	SE	2.2	S	2.2	S	3.9	SE	1.9	NW	2	N
2014	1.9	NW	2.4	NW	2	NW	2.4	S	2.3	S	2.3	S	2.5	SE	1.9	S	1.9	SE	1.8	SE	1.6	NW	1.5	NW
2015	1.5	NW	1.9	S	2.4	S	2.6	S	2.8	S	3.7	S	2.7	S	3.2	S	3.7	SE	2.8	SE	2.4	NW	2.4	N
2016	2.7	NW	2.6	S	3.1	S	3.2	S	3	S	2.2	S	2.8	S	3.9	SE	2.4	S	2.3	SE	2.3	N	2.2	NNW
2017	1.8	NW	3.5	S	2.8	S	2.7	S	2.6	S	2.8	S	2.7	S	2.8	S	2.3	S	3.2	S	2	W	1.7	N
2018	2.2	NW	1.8	NW	2.5	S	3.1	S	2.7	S	2.3	S	2.5	SE	2.6	SE	2.4	SE	2.5	SE	2.5	S	1.6	N
2019	1.9	NW	2.2	NW	2.3	SW	2.7	S	2.7	S	2.1	S	2.4	S	2.3	S	2.3	S	2.3	S	4.9	E	1.9	N
2020	1.9	N	1.9	NW	2.2	NW	2.5	S	3.4	S	2.8	S	2.4	S	2.6	S	2.2	S	2.2	SE	2	NNW	1.5	NNW
2021	3.3	SE	2.5	S	3.1	S	2.8	S	2.7	S	2.6	S	2.8	S	2.5	S	3.5	SE	2.3	S	1	NW	2	N

6.7 Hydrology of the Study Area

Due to the increasing population and fast industrialization, the demand for freshwater is increasing. Water pollution not only affects the water quality but also threaten human health and economic development. There is a scarcity of fresh water in Khulna, Dacope area.

6.7.1 Water quality of Dacope

6.7.2 DACOPE UPAZILA

Location, Extent and Accessibility

Dacope Upazila one of the Upazila under Khulna district is situated on southern part of Khulna district which under Coastal region as per hydrogeological zone and geologically in coastal belt of Bangladesh. It is bounded by Batiaghata upazila on the north, Rupsha (Previous name Japjapiya) river on the south, Rampal and Mongla upazilas on the east, Paikgachha and koyra upazilas on the west. The main rivers here are; Rupsha (Previous name Japjapiya), Shibsa, Manki, Bhadra;

Palashbari, Churia, Nalian and Jugra canals are notable. The southern part of this upazila is surrounded by Sundarban. Dacope Upazila was turned into an upazila in 1983. It consists of 10 union Parishad, 26 mouzas and 107 villages. The study area includes Dacope Upazila of Khulna District covering from 22.5722°N to 89.5111°E Annual average temperature is maximum 34.30C and minimum 20.80C.

The study area is situated in the coastal belt and geologically subsurface is very critical and hydrogeologically four Upazila is under Zone -06 (Tidal delta deposited area) and found different types of hydrogeological character. Shyamnagar and Kaliganj is situated south-western part of Bangladesh. One branch river of Padma falls in to Bay of Bengal in down (southern part) part of Kaliganj Upazila, this river carries fresh water and some areas of Kaliganj bear fresh water. Fresh aquifer found at different depth and aquifer thickness is 10m to 15m and rest of other underground water is contaminated by salinity. Some sea channels are found in Kaliganj area which bear saline water.

western side of of Koyra Upazial. Geologically this the main corridor for underground water source of Koyra Upazila. During assessment of water supply technology through available secondary data and FGD - it is come to our observation that confined aquifer may be available in few areas like: Moharajpur, Koyra sadar, North Betkasi, South Betkasi and Bagali union butin southern part like Amadi and Moheswaripur of the upazila there is no availability of groundwater.

Dacope Upazila under Khulna district is situated on southern part of Khulna district which under Coastal region as per hydrogeological zone and geologically in coastal belt of Bangladesh. It is bounded by Batiaghata Upazila on the north, Rupsha (Previous name Japjapiya) river on the south, Rampal and Mongla upazilas on the east, Paikgachha and Koyra Upazilas on the west. The main rivers here are; Rupsha (Previous name Japjapiya), Shibsa, Manki, Bhadra; Palashbari, Churia, Nalian and Jugra canals are notable. The southern part of this

upazila is surrounded by Sundarban. In four study Upazila. Dacope is the most critical and vulnerable area for water supply. Subsurface geology is very critical. No confined aquifer (Shallow and deep aquifer) is found in Dacope Upazila. Shallow sandy layer is contaminated by salinity and PSF also contaminated by salinity. Main challenge to fix up water supply technology. Desalination plant is costly for poor people. Another source Rain Water Harvesting System (RWHS) is accepted technology but its maintenance is very difficult.

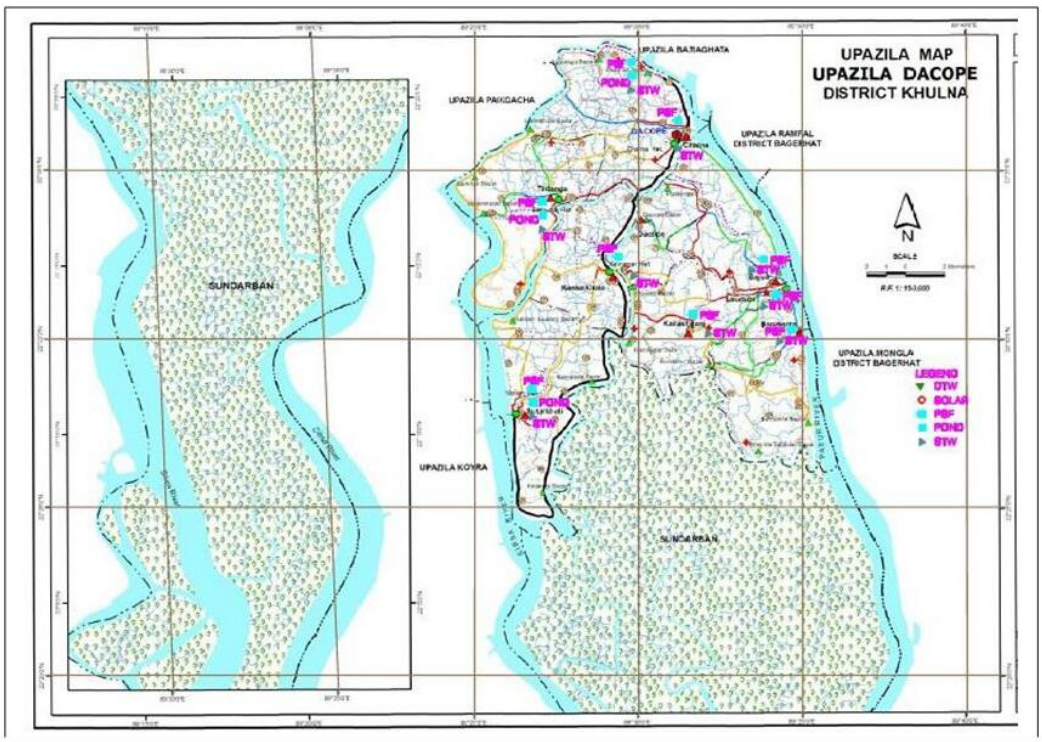


Figure 6:11 Assessed water technology under dacope upazilla

6.7.3 Sampling and Water quality analysis

In study areas, water samples were collected from different types of water options. Detail information about the location, type of water options, date of water sampling is given in Annexure. After collection, the water samples were tested for the parameters including iron (Fe), arsenic (As), salinity (as Cl-), fecal coliform (FC), Manganese (Mn), EC and TDS in field using field arsenic kit, spectrophotometer for iron, field test box for chloride (Cl-) and a pocket pH meter. To verify the field test data, more than 10% of the samples were tested at DPHE Lab.

Serial No.	Location Point	Location Coordinates
01	**Mondol Sheikh** **Vill-Katabunia, Union-Pankhali**	**22°38'28.72"N, 89°28'52.52"E**
02	**Gopal Gain** **Vill- Lakshmikhola Union-pankhali**	**22°37'10.03"N, 89°28'20.44"E**
03	**Bhbunath Roy** **Vill- chalna, Union-Dacope**	**22°36'13.39"N, 89°31'15.39"E**
04	**Rahim Uddin** **Vill- pankhalil, Union- pankhali**	**22°37'47.98"N, 89°30'47.75"E**

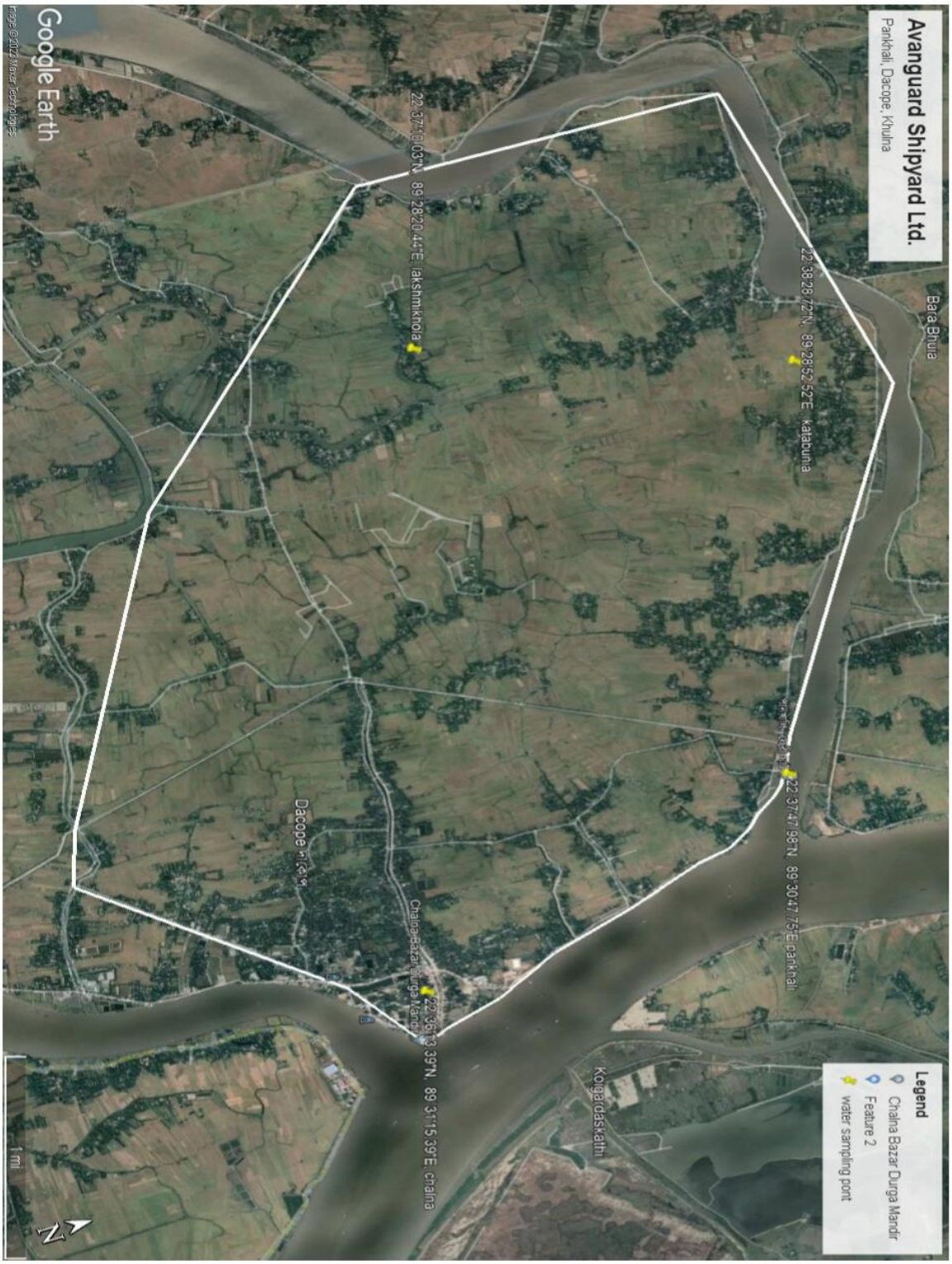


Figure 6:12 water sapling point

6.7.4 Water Quality Test & Results analysis

The study area (Dacope-Pankhali) is situated in the southern zone and hydrogeological is situated under zone-06 (Coastal deltaic region) where sea water is always contaminated underground fresh water by trans-gyration and re-gyration process. Maximum portion of the study area is contaminated by salinity. Groundwater of some areas under lakshmikhola, saheber abad, katabunia, and Pankhali is found fresh water where Salinity and Iron concentration percentage is within Bangladesh Standard Drinking Water Level and also WHO standard level. Highest and lowest level concentration of water parameters (during field test and Laboratory test) are shown in the table-

6.7.5 Dacope Upazila Water Quality test and analysis:

Laboratory test result of PSF

Table 6-8 Laboratory test result of PSF

Sl	Area	Cl mg/l	Fecal Coli form CFU/100ml	EC mg/l	pH	TDS mg/l	Color (TCU)	Remarks
01	**Mondol Sheikh Vill-Katabunia, Union-Pankhali**	**1110**	**0**	**3920**	**8.0**	**1965**	**0**	**Salinity is high. Need re-excavation, Repair all pipe line, cleaning filter bed**
02	**Gopal Gain Vill-Lakshmikhola Union-pankhali**	**850**	**0**	**3200**	**7.9**	**1605**	**0**	**Salinity is high. Need re-excavation, Repair all pipe line, cleaning filter bed**
04	**Bhbunath Roy Vill-Saheberabad, Union-Dacope**	**203**	**0**	**1374**	**8.0**	**680**	**0**	**Safe, need strong monitoring**
05	**Rahim Uddin Vill- pankhalil, Union-pankhali**	530	0	2800	8.0	1400	0	**Salinity is high. Need re-excavation, Repair all pipe line, cleaning filter bed**
06	Bimol Krisno Vill-Dhopadihi Union-Kailasganj	216	0	1409	7.8	706	0	Good
07	Khokon Vill-Horintana Union-Kailasgonj	65	0	633	7.9	319	0	Good

08	Moddopara Govt.Pukur Vill-Horin Tana Union-Kailasgonj	46	0	357	7.6	180	0	Good

Table 6-9 Laboratory test result of shallow tube well

Sl	Area	As mg/l	Cl mg/l	EC µS/cm	Fe mg/l	Mn mg/l	pH	TDS mg/l	Remarks
01	**Bakkar Molla Vill-Pankhaali Union-Pankhali STW-70'-0"**	**0.008**	**2680**	**9400**	**0.21**	**0.03**	**7.7**	**5200**	**Salinity is high**
02	Anando Torofdar Vill-badalbunia Union-Tildanga	0.062	970	3550	0.68	0.03	7.7	1778	Salinity is high, As is more than permissible limit

As per detail Geological, Hydrogeological study including water quality test, it is found that the working area of Dacope upazila is really very critical in terms of safe water options. Shallow tube-well water is highly contaminated by salinity. No deep aquifer is found. Most of the people depend on PSF, Rain water, RO and treated water.

Additionally, some water options are identified for water quality test and have been tested using field test kit at the field level and considered the parameters like pH, EC, TDS, Fe, As etc. (tube well, PSF, RWHS etc.) had been considered in four Upazila. As per water quality test results, our findings are-

Dacope- Groundwater is not potential due to salinity and critical geological formation. People of other union collect water from PSF, RWHS, treatment plant.

Source: This Surface - Ground Water Evaluation Study is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of World Vision Bangladesh and do not necessarily reflect the views of USAID or the United States Government.

6.8 Air Quality

As there are no major industries in Khulna, Dacope the main sources of air pollution are vehicles and non-point sources such as open burning. There are currently no air quality monitoring stations are in operation within the project limit. The baseline air quality will be measured by the project contractors prior to commencement of work. The results will be provided in the updated EIA and all other measurements during implementation will be reported as part of EMP implementation.

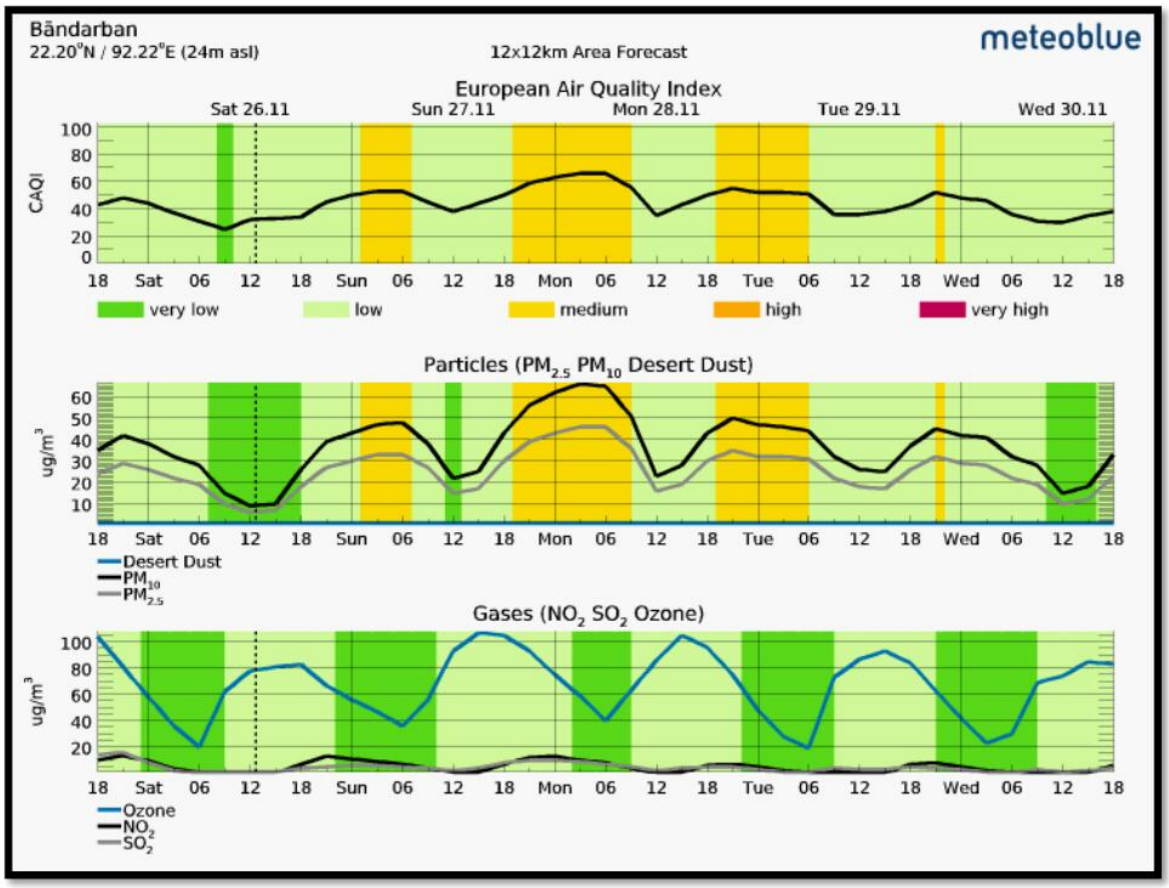


Figure 6:13 Ambient Air Quality of Khulna, Dacope

6.9 Acoustic Environment

Vehicular movement can be considered as major cause of noise pollution. However, the volume of traffic that passes through these sections is not significant and traffic jams are not frequent. The baseline noise level will be measured by the sub-project contractors prior to commencement of work. The results will be provided in the updated EIA and all other measurements during implementation will be reported as part of EMP implementation.

6.10 Ecological Baseline

6.10.1 Introduction

The ecological baseline is the ecological value of a site before construction works are undertaken. It can be compared to the ecological value of the site after construction works are complete to determine where there have been changes. The survey of the ecological status is the first step of the implementation. This study has two main outputs: In one hand it is a baseline for the monitoring of the ecological result of the project. In the other hand it provides data for the Environmental Impact Assessment (EIA).

The survey covers the whole target area from the terrestric habitats to the water body, including either the Hungarian or the Croatian side regarding to the fact that the habitats are divided only by the state border.

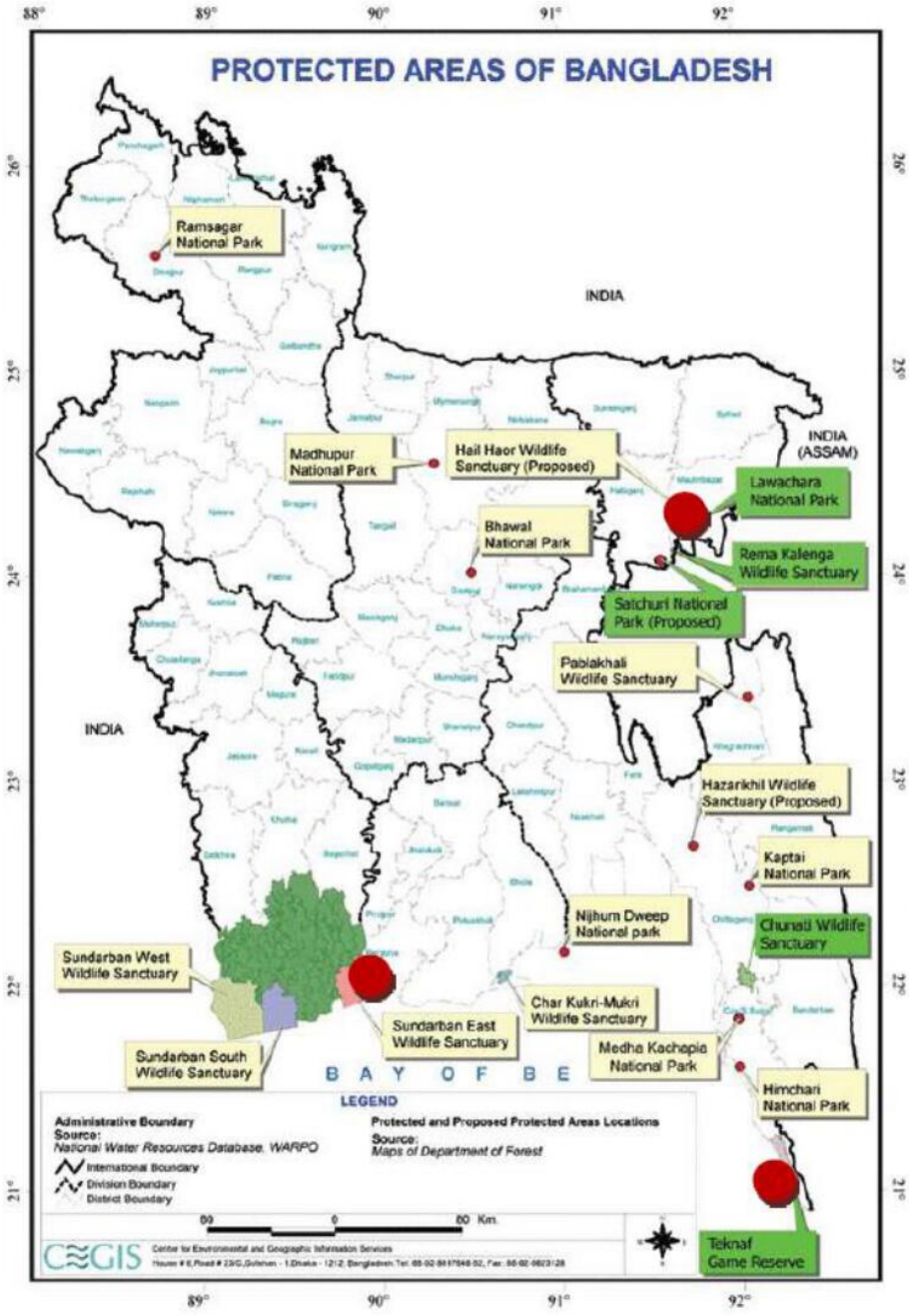


Figure 6:14 Protected Areas of Bangladesh

6.10.2 Ecological and Conservation Designations

6.10.2.1 Overview

There are 19 protected areas in Bangladesh, covering 2,458 sq. km and representing 1.68% of the land area (FD record as on July 2007). The Forest Department has the mandate for the management of these protected areas. The protected areas are declared in the country under the "Bangladesh Wildlife (Preservation) (Amendment) Act, 1974". The protected areas are divided into following categories-

6.10.2.2 National Parks

National Park is a relatively large area of scenic and natural beauty created for the preservation of scenery, flora, and fauna in a natural state to which access of the public for recreation and educational and research purposes is allowed. There are 10 national parks available in our country.

No National Parks are located near the project site.

6.10.2.3 Wildlife Sanctuary

Wildlife Sanctuary is an area closed to hunting, shooting or trapping of wild animals and maintained undisturbed for breeding of wildlife and vegetation, soil and water is protected from public interference. There are 8 wildlife sanctuaries present.

No Wildlife Sanctuary is located near the project site.

6.10.2.4 Game Reserves

Game Reserves are created for protection of wildlife and increasing their number were capturing of wild animals is unlawful. There is only one game reserve present in our country named Teknaf Game Reserve, Cox's Bazar which area is 11,615 ha. and notified on 1983.

No Game Reserve is located near the project site.

6.10.2.5 Ecologically Critical Area

An Ecologically Critical Area (ECA) is an environmental protection zone in Bangladesh. In 1995, specific areas in Bangladesh could be deemed Ecologically Critical Areas as a result of the Environmental Conservation Act.

Bangladesh has a wide variety of ecosystems that include over 300 rivers that creates marine and fresh water environments. There are a multitude of areas that have been considered ECAs. Cox's Bazar is on the border of Bangladesh and Myanmar in the southeast corner of Bangladesh. The Teknaf Peninsula is 80 km of sandy beach and holds a variety of species as one of the longest beaches in the world. The Sonadia Islands are home to some of the last mangrove forests that house distinct species that can tolerate the high salinity of the mangrove forests in this area. The Sundarbans also contain mangrove forests and was named an ECA because it continues to suffer from over-exploitation and illegal urban development. St. Martin's Island is known for its coral-algal that overwhelms its rocky reefs. The island is a refuge for globally threatened marine species. Finally, the Hakaluki Haor found in greater Sylhet is an ECA because it has an extensive amount of wetland habitats that support a wide variety of life.

Gulshan-Baridhara Lake was declared an ECA in 2001. In September 2009, the four rivers around the capital city Dhaka—Buriganga River, Shitalakshya River, Turag River and Balu River—have been declared by the Department of Environment as ECAs.

The project site does not locate in any Ecologically Critical Area. The said proposed project is 3.5 KM far from the ECA area line.

6.10.2.6 Eco Park

Eco Park a short form of Ecological Park. It is exploited as an amusement park without hampering its natural environment so that the bio-diversity remains unaffected there. Generally, a particular area of a forest is demarcated and brought under intensive management for this purpose. Sometimes forest areas having special natural features are selected as eco parks. Flora of the concerned area gets preference for such consideration. However, protection and preservation of both flora and fauna get top priority. Beauty offered by the nature is opened to the visitors. Moreover, efforts to attract and entertain the visitors are also visible in the Eco parks.

Eco Park is not only a mere component of forest management. It facilitates to enjoy the beauty of the jungles as well as to acquire firsthand knowledge on its ecology, particularly the growth and development of flora and fauna. Eco Park also helps to increase public awareness about the necessity of maintaining bio-diversity. The Department of forest has set up nine eco parks throughout Bangladesh considering their natural beauty and specific features like geographical location. These are: Sitakunda Botanical Garden and Eco Park, Bashkhali Eco park, Madhavkundo Eco park, Madhutila Ecopark, Bangabandhu Jamuna Eco Park, Kuakata Eco park, Tilagarh Eco park, Jafflong Garden Park and Barshijora Eco park.

The project site does not locate in any Eco Park Area.

6.11 Terrestrial Ecology

6.11.1 Flora

The project site falls within the "IUCN Bangladesh" designated 'Bio-Ecological zone: Zone-8b-Coastal Plains' which have undergone significant reduction in faunal diversity in recent times (Nishat et. al, 2002). The Coastal Plains is rich in bio-diversity. This Coastal Plains is characterized by mixed vegetation. Homestead forests, on the other hand, include both cultivated and wild plant species. The dominant floral types are: Narikel (Cocos nucifera), Supari (Areca catechu), Khejur (Phoenix sylvestris), Bhadi (Lannea coromandelica). The common Shrubs and Herbs are Bashak (Adhatoda vasica), Paresh (Thespesia populnea), Ulu (Imperata cylindrica), Hargoza (Acanthus illicifolius).

Nearly all the major groups of the oriental birds are represented in this zone by one or more species. Dominant species of birds seen are Ashy bulbul (Hemixos flavala), Gull-billed tern (Gelochelidon nilotica), Spot-throated babbler (Pellorneum albiventre), Asian glossy starling (Aplonis panayensis).

Among the Reptiles Slender coral snake (Callophis melanurus), Green pit viper (Trimeresurus gramineus), Banded krait (Bungarus fasciatus), Ring lizard (Varanus salvator are widely available. The amphibian species found in this zone include Ornate microhylid (Microhyla ornata), Bull frog (Hoplobatrachus tigerinus) (Nishat et al., 2002).

Sl. No.	Local Name	Status	Sl. No.	Local Name	Status
1	Tezpata	Common	12	Narikel	Common
2	Amgas	Common	13	Jambura	F. Common
3	Kathal	Common	14	Tetul	F. Common
4	Supari	Common	15	Lukluki	F. Common
5	Lichu	Common	16	Jalpai	Rare
6	Khezur	Common	17	Tal	Rare
7	Satni	Common	18	Kamla	Rare
8	Kalagas	Common	19	Anarosh	Rare
9	Lebu	Common			
10	Bel	Common			
11	Peara	Common			

6.11.2 Fauna

The big deer samber and the small barking deer (Muntiacus mungjak) are found in the forests of Khulna, Dacope . Elephants (Elephas maximus) are also seen in these forests. Jungle cat (Felis chaus) and fishing cat (Felis viverrina) are common; the beautiful clouded leopard (Panthera Pardus) and cats are also found. Wild boar (Sus Scrofa), wild dog, jackals (Canis aureus), fox (Vulpes bengalensis), weasals, honey badger (Arctonyx collaris), hog badger and scaly anteaters are also found. Rodents are represented by different species of squirrel (Funambulus pennanti), rat (Rattus rattus).

Khulna, Dacope has very rich avifauna. It supports large number of birds with its rich rainforests. Most of the 600 species of birds that are found in Bangladesh are also seen in Khulna, Dacope except the marine and the shore birds.

Sl No	Species	Local Name	Status	Sl No	Species	Local Name	Status
1	Reptiles	Anjila	Common	16	Birds	Choroi	Common
2		DhuraShap	Common	17		Doyel	Common
3		MatiaShap	Common	18		Kak	Common
4		Tiktiki	Common	19		Bagari	Common
5		Kari Katta	Common	20		Ghughu	Common
6		DaraishShap	Common	21		Shalik	Common
7		Gokhra	F.Common	22		Kokil	Common
8		Kassap	F. Common	23		Bok	Common
9		GuiShap	Rare	24		Tuntuni	Common
10	Mam	Babur	Common	25		Badur	Common

11		Idur	Common	**26**		Chil	Common
12		Shial	Common	**27**		Machranga	F.Common
13		Chika	Common	**28**		Tota	F.Common
14		Bagdash	Common	**29**		Haludakhi	F.Common
15		Khekshial .	F. Common	**30**		Katthokra	F.Common
Source: Field survey database; F=Fairly				**31**		Pecha	Rare
				32		Shakun	Rare
				33		Tia	Rare

6.12 Seismicity

Bangladesh, a densely populated country in South Asia, is located in the north-eastern part of the Indian sub-continent at the head of the Bay of Bengal. Tectonically, Bangladesh lies in the north-eastern Indian plate near the edge of the Indian carton and at the junction of three tectonic plates– the Indian plate, the Eurasian plate, and the Burmese microplate. These form two boundaries where plates converge– the India-Eurasia plate boundary to the north forming the Himalaya Arc and the India-Burma plate boundary to the east forming the Burma Arc.

Active faults of regional scale capable of generating moderate to great earthquakes are present in and around Bangladesh. These include the Dauki fault, about 300km long trending east-west and located along the southern edge of Shillong Plateau (Meghalaya- Bangladesh border), the 150 km long Madhupur fault trending north-south situated between Madhupur Tract and Jamuna flood plain, Assam-Sylhet fault, about 300km long trending northeast-southwest located in the southern Surma basin and the Chittagong-Myanmar plate boundary fault, about 800km long runs parallel to Chittagong-Myanmar coast.

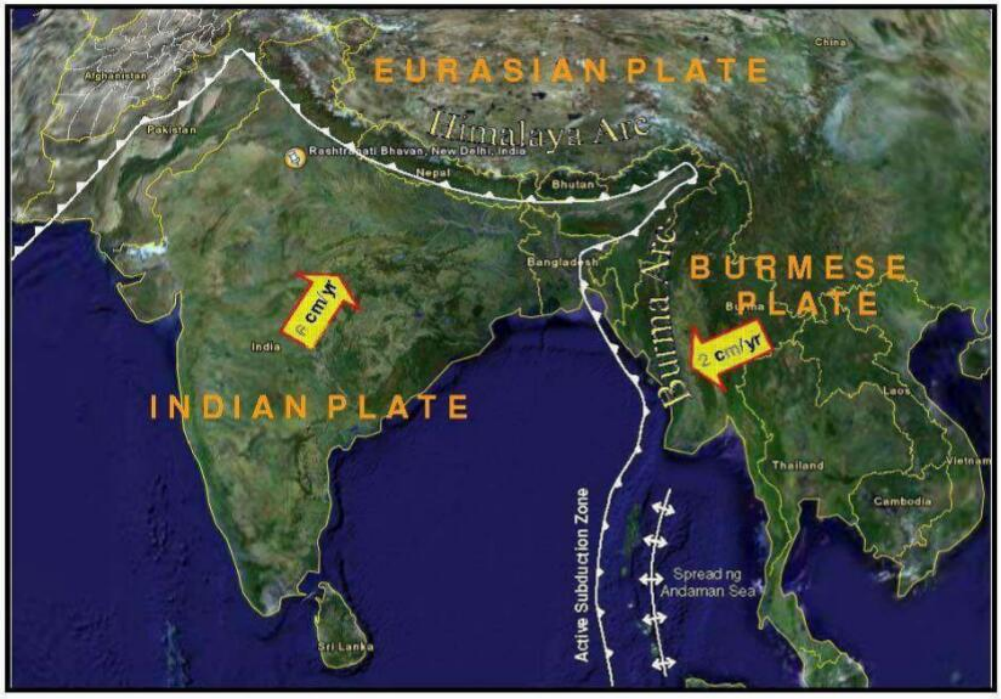


Figure 6:15 Regional tectonic setup of Bangladesh with respect to plate configuration

Based on earthquake epicenters and morpho-tectonic characteristics, Bangladesh is divided into three seismic zones, namely zone-I, zone-2, and zone-3 (Table 4.15). The northeastern folded regions of Bangladesh are the most active zone and it belongs to zone-I. Zone-II consists of recent uplifted Pleistocene blocks of the Barind and Madhupur Tract and the western extension of the folded belt. Southwest Bangladesh is referred to as zone-III and it is a seismically quiet zone. The Bask coefficients of these three zones are 0.08, 0.05, and 0.04, respectively.

Table 6-10 Seismic zones of Bangladesh

Zoning	Area Mercalli Scale
I	North and eastern regions of Bangladesh (Seismically most active)
II	Lalmai, Barind, Madhupur Tracts, Dhaka, Comilla, Noakhali, and western part of Chattogram Folded belt.
III	Khulna division S-E Bangladesh (Seismically relatively quiet)

The factory will be located in Zone-III of earthquake zones (Figure 6.12) which is a seismically moderate risk zone. During seismic or earthquake delineation, ground condition (firm or soft) has not been taken into consideration in Bangladesh. Though the project is located within zone- II special precaution is needed in considering the risk from earthquakes.

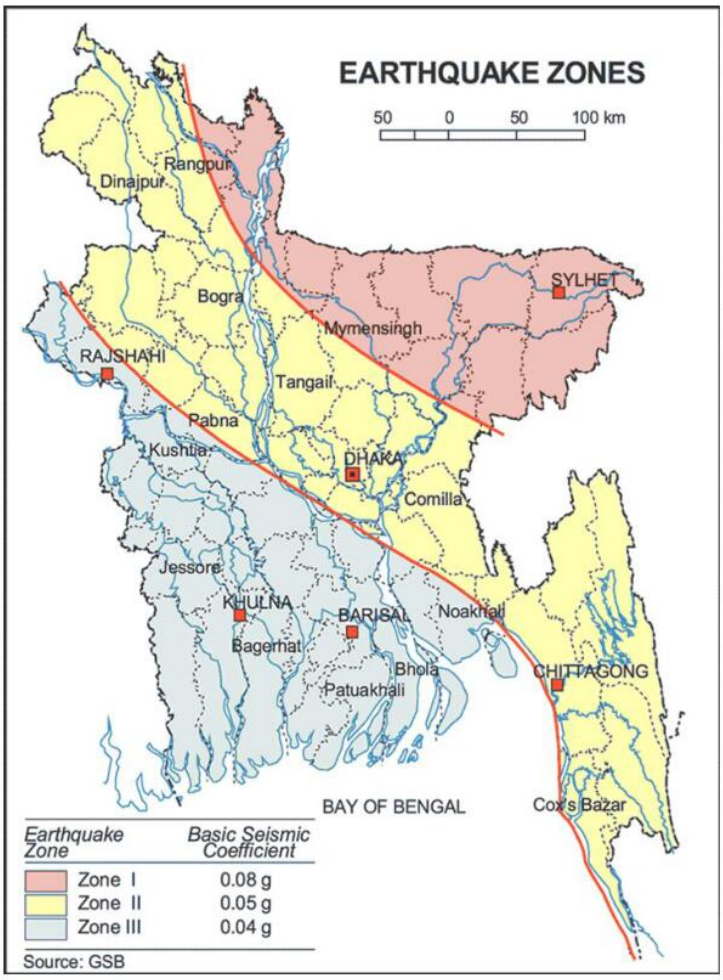


Figure 6:16 Earthquake zones of Bangladesh

6.13 Pashur (Previous name Japjapiya) River

6.13.1 Pashur River

The Pashur river is a river in southwestern Bangladesh and a distributary of the Ganges. It continues the

Pashur River. All its distributaries are tidal. It meets the Shibsa River within the Sundarbans and near to the sea the river becomes the Kunga River. For monitoring of water quality, water samples were collected from one location of Pashur river comprising three different points e.g. Monglaport Bank, Middle and Opposite bank. For analysis, average values of three points were taken. In 2015, pH level varied from 7.54 to 8.2 (Fig.17a) and was within the EQS (6.5 to 8.5) though slightly alkaline. In 2014, pH level varied from 7.62 to 8.2. DO level was above the EQS (>5 mg/l) for fisheries all over the year. The maximum and the minimum concentration of DO was 6.8 and 5.0 mg/l respectively (Fig/17b). In 2014, DO varied from 5.2 and 6.7 mg/l. In 2015, BOD level was within the EQS (<6 mg/l) for fisheries during the sampling period. The maximum and the minimum value of BOD was 1.2 and 0.8 mg/l respectively (Fig.17c). In 2014, BOD level varied

from 0.8 and 1.1 mg/l. High level of TDS was found at Pipeghat compare to other points of the river. TDS varied from 144 to 16376 mg/l (Fig.17d). In 2014, TDS level varied from 256 to 15500 mg/l.

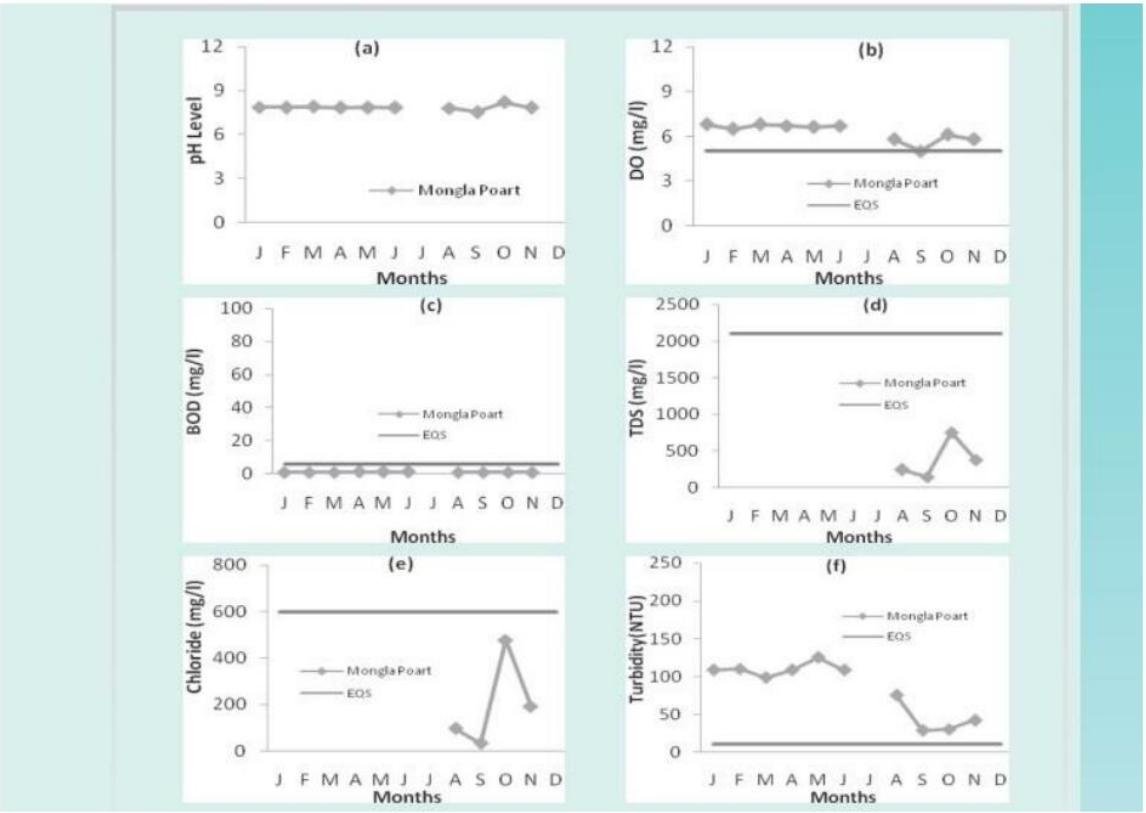


Figure 6:17 Fig.17. Graphical presentation of pH, DO, BOD, TDS, Chloride and Turbidity of Pashur River (Source: water quality report department of Environment)

Chloride level of Pashur river water varied from 32 to 12692 mg/l. Chloride concentration was higher at all points during March to June compare to rest of the period (Fig.17e) where EQS of chloride is 600 mg/l. In 2014, Chloride level varied from 124 to 12646 mg/l. Turbidity level varied from 30.2 to 125.3 NTU (Fig.17f) against the EQS (10 NTU) for drinking water. Turbidity concentration was very high all over the year. In 2014, Turbidity level varied from 28.3 to 128.3 NTU.

Sampling Locations	Salinity (ppt)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mongla port	3.3	5.8	13.3	17.6	21.3	17.9	-0.6	0.1	1.1	0.3	-	
EQS for water after treatment from industrial units 400 ppt												

Source: water quality report department of Environment

Salinity varied from 0.3 ppt to 21.3 ppt. The maximum and the minimum salinity was 21.3 ppt in May and 0.3 ppt in November while EQS for Salinity is 400 ppt.

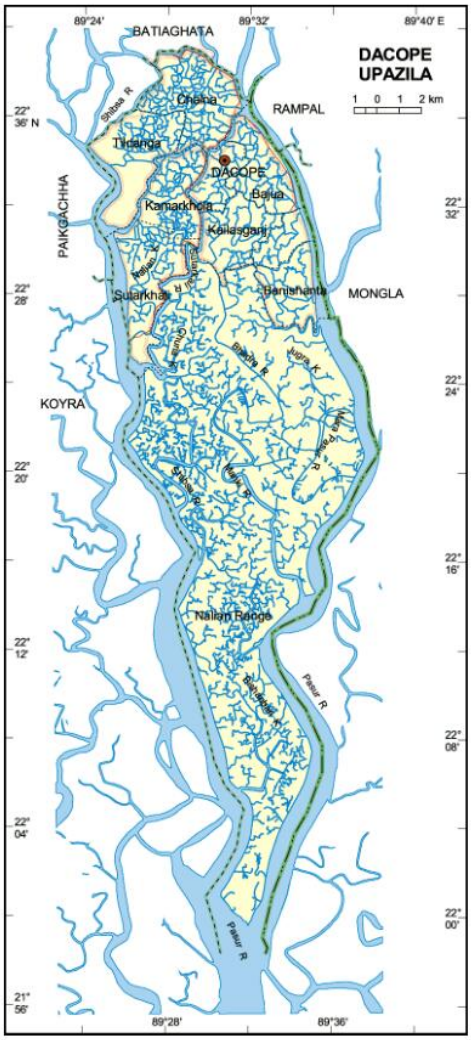


Figure 6:18 water body

Locations in Khulna, Dacope

Source: Geospatial model result, 2018

6.14 Socio-economic Condition

6.14.1 Geographic Area and Location

Khulna, Dacope district is bounded on the north by Rangamati district, on the east by Rangamati district and Myanmar, on the south of Myanmar and on the west of Chittagong and Cox's Bazar districts. It lies between 21° 11" and 22° 22" north latitudes and between 92° 04" and 92° 41" east longitudes. The total area of the district is 4,479.03 sq. km (1729.36 sq miles) of which 2653.54 sq.km is under forest. The area of Khulna, Dacope town is 51.80 sq.km.

6.14.2 Demographics

Vulnerability to hazards not only relies on the extent of natural hazards but also depends on the social and economic conditions of the communities. Therefore, this study intends to construct a household-level social vulnerability at the microscale in the nine wards of Chalna Municipality (CM), Dacope upazila, in southwest coastal Bangladesh by employing the social vulnerability index (SoVI). We surveyed 30 households from each ward to collect data on 33 vulnerability indicators. Of these, seven indicators were extracted by principal component analysis (PCA), which explained 96.34% of the total variance. The PCA results indicate that high population density, poor economic condition, the presence of vulnerable groups, unstable income generating sources, unplanned urban and poor infrastructure, lack of services, and lack of adequate sewage systems are the key drivers of social vulnerability of the CM. The SoVI score was generated using seven PCA outcomes for the respective wards. Results revealed that 44.45% of the areas are medium-high to high (wards 2, 4, 5, and 6) vulnerable. The highest level of social vulnerability was distributed in ward 5, while ward 8 was identified as the least vulnerable. About 33.33% of the CM was found as medium vulnerable areas (wards 1, 7, and 9). Ward 3 was categorized as a low-medium vulnerable area. The findings of the study will provide useful information for decision-makers and disaster managers to develop sustainable disaster management plans for coastal Bangladesh to reduce social vulnerability as well as to decrease the impacts of natural disasters beautiful destination.

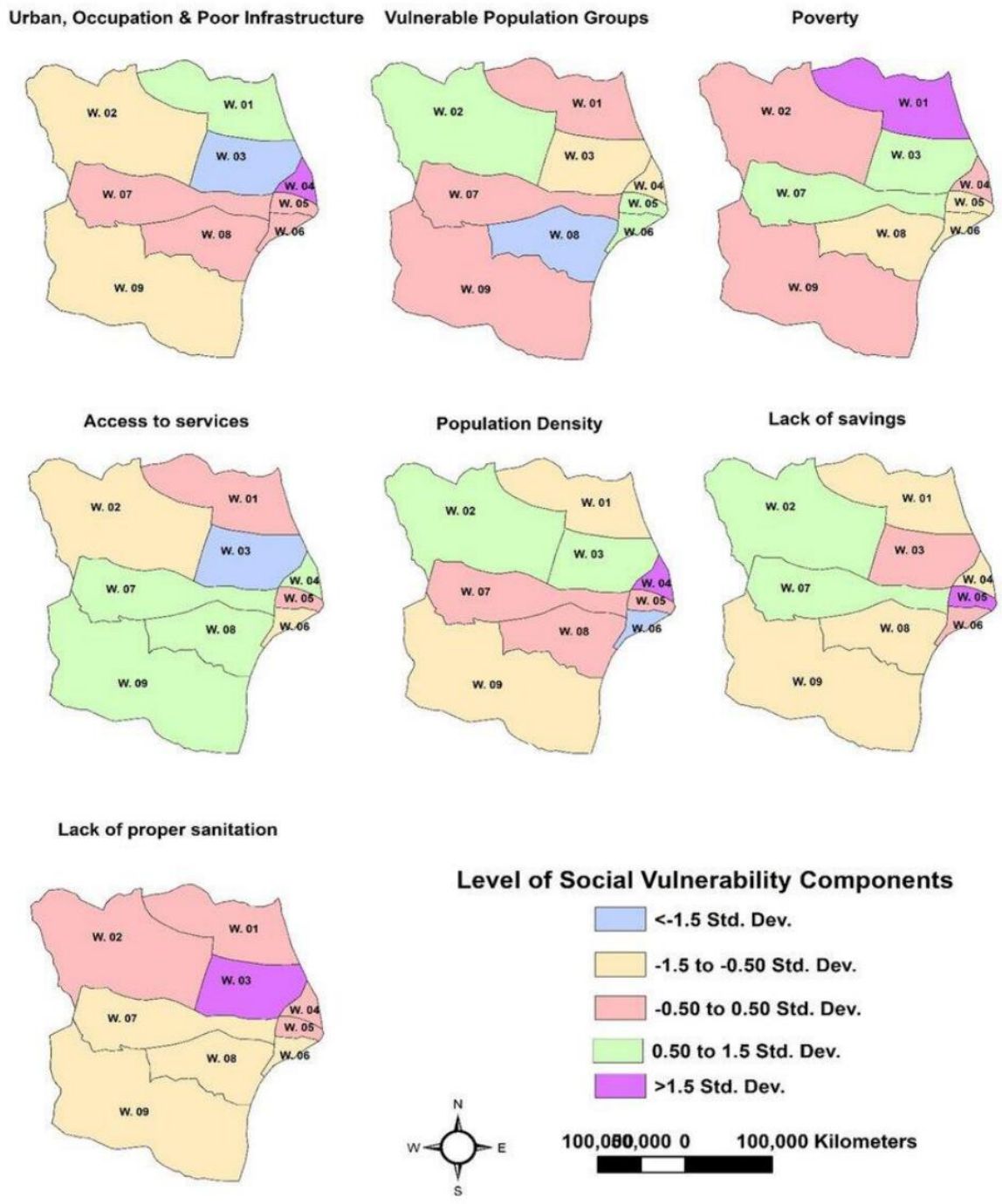


Figure 6:19 Level of social Vulnerability Components

6.14.3 Land use

The study of the land use pattern is based on extensive physical survey which was accomplished through GPS system. The Upazilla is surrounded by water body and some are still rural in nature. The river Rupsha (Previous name Japjapiya) or Rupsha through the union. The surrounding area

is flat with panoramic view.. Some of the areas are low-lying and subjected to flash flood. The area is subjected to other natural calamities like flood as well. dacope Pourashava is connected by good road communication system with the neighboring districts including the capital city Khulna but its internal road communication is not up to the desired standard. The main reason for that is expansion of industry, rapid urbanization and increase in trade and commerce and due to migration of people from neighboring Upazilas and zilas to live in this naturally beautiful district. As a result, demand for infrastructure is also increasing rapidly.

Table 6-11 The major agriculture products and the land used for the production in Khulna, Dacope district.

Production of Agriculture Product and Used area			
Serial no	Name of Items	Area(acre)	Production (Metric Ton)
1.	Fish Catch	539	299
2.	Onion	66	64
3.	Rice	44,344	50,057
4.	Eggs(pcs)		360,169
5.	Milk		52
6.	Pulse	307	128
7.	Vegetable	4143	6212
8.	Sweet Meat	2	211

Source: Zila profile of Khulna, Dacope; Bangladesh Bureau of Statistics. 2007

6.14.4 Literacy

Khulna, Dacope Sadar has an average literacy rate of 56.8% (7+ years), and the national average of 32.4% literate. (BBS, 2011).

6.14.5 Cultural

The Sundarbans, in Khulna District, is home to the Bengal tiger and the world's largest virgin mangrove forest. It is a UNESCO World Heritage Site.[29] The Mosque City of Bagerhat, in Bagerhat District about 15 miles (24 km) south-east of Khulna, is also a World Heritage Site.[30]

Rabindra Complex is in the village of Dakkhindihi, 19 kilometres (12 mi) from Khulna. The home of Rabindranath Tagore's father-in-law, Beni Madhab Roy Chowdhury, Tagore visited several times. The museum has been renovated and is administered by Bangladesh's Department of Archaeology.[31] The Khulna Divisional Museum, founded in 1998, was established by the country's Department of Archaeology. Educational Institutions

The numbers of educational institutions of this district are government college 5, government secondary school 9, non-government secondary school 28, residential school 3, government primary school 219, registered primary school 87, non-registered primary school 36, madrasah 10.

6.14.6 Archaeological Heritage and Relics

khulna was part of the ancient kingdoms of Vanga and Samatata. It became a part of the Sena dynasty during the 12th-century reign of Ballala Sena, and formed part of the Bagri division of Bengal. During the 14th century, Shamsuddin Firoz Shah was the first Muslim ruler to arrive in the city. Muslim settlements increased during the time of Shamsuddin Ilyas Shah, and many mosques and shrines were established. A Muslim saint, Khan Jahan Ali, acquired a jagir (fiefdom) encompassing a large part of Khulna Division from the king of Gauḍa during the 15th century and renamed the region as Jahanabad. Ali ruled until he died in 1459. After Ali's death, the city became part of the Bengal Sultanate. During the reign of Daud Khan Karrani in the 16th century, Vikramaditya (one of Karrani's chief ministers) obtained a grant in southern Bengal—including Khulna—when Karrani was fighting the Mughals. Vikramaditya established a sovereign kingdom with its capital at Iswaripur (in present-day Satkhira District). He was succeeded by his son, Pratapaditya, who gained preeminence over the Baro-Bhuyans and controlled southern Bengal. Vikramaditya was defeated by Raja Man Singh I, a Hindu Rajput general of the Mughal emperor Akbar, in 1611. Khulna was ruled by autonomous Bengali nawabs until 1793 when the British East India Company abolished nizamat (local rule) and took control of the city. Becoming part of Jessore District in 1842, it became the headquarters of Khulna District (the Khulna and Bagerhat subdivisions of Jessore District, the Satkhira subdivision of 24 Parganas district, and the Sundarbans) in 1882.[10] Khulna had a pouroshava (municipal council) in 1884, which became a municipal corporation in 1984.

Before 19 August 1947, Khulna District was part of undivided Bengal. Khulna first declared itself as part of India in 1947, and the Indian flag was flown on 15 August. Syed Mohammad Abdul Halim (an official of the Bengali civil service) requested Khulna's inclusion in Pakistan, and the boundary commission declared that the city was part of East Bengal. Sher e Bangla A.K.Fazlul Haq, Muslim League leaders Khan A Sabur, Advocate Hamidul Haq Chowdhury, A. F. M. Abdul Jalil, and Abdul Mojid Khan were also involved in the process.

6.14.7 Roads, existing provisions for pedestrians, and transport-related facilities

Rickshaws are the most popular means of public transport in Khulna for short trips, and auto rickshaws are also common. Nagar Paribahan buses have frequent service between Rupsha and Phultala, with stops throughout Khulna. Motorcycles are popular among the middle class, but wealthier people prefer a private car.

The N7 highway connects Khulna with the rest of Bangladesh, and the Khulna City Bypass is a major road. The R760 connects Satkhira and western Khulna Districts. There are several nationwide bus services available in Khulna (most privately owned), and the Bangladesh Road Transport Corporation operates inter-district buses from the city. Sonadanga Bus Terminal is Khulna's main bus terminal. Major bus routes include Khulna-Jessore-Dhaka; Khulna-Goplaganj-Dhaka; Khulna-Jessore-Kushtia; Khulna-Satkhira; Khulna-Bagerhat; Khulna-Mongla; Khulna-Narail; Khulna-Barisal; Khulna-Rajshahi; Khulna-Faridpur; Khulna-Kuakata, and Khulna-Dhaka-Chittagong.

Figure 6:20 Bandhan Express at Khulna Railway Station

Khulna Railway Station is the city's main station. Bangladesh Railway operates six intercity trains: the Sundarban and Chitra Expresses (to Dhaka), the Kapotaksha and Sagardari Expresses (to Rajshahi), and the Rupsa and Seemanta Expresses to Chilahati. Two commuter express trains serve Benapole, in addition to mail trains to Parbatipur, Chapainawabganj and Goalanda. The international Bandhan Express runs to Kolkata. The city has four other railway stations, and two more (in addition to the Rupsha Rail Bridge) are under construction as part of the Khulna–Mongla Port Railway project.

Figure 6:21 S2-AFE United Airways ATR-72 at Jashore Airport

Jessore Airport, 50 kilometers (31 mi) north of Khulna, has flights to Dhaka on Biman Bangladesh Airlines, US-Bangla Airlines and NoVo air, with air-conditioned bus service from the airport to the city. Khan Jahan Ali Airport, in Bagerhat Sadar Upazilas, was planned but it is no longer a priority project for the government.

Water

Several passengers launches and cargo services operate from the Bangladesh Inland Water Transport Authority launch terminal in the city.

Public transport

There are being public transportation in Khulna city through the mid 19's. Buses of that urban transportation of Khulna city were called 'Murir Tin'. Today besides the urban transportation buses, Cycle rickshaw, auto rickshaws are playing a vital role in transport within Khulna city and the adjoining metro area. Famous ride sharing services like Uber, Pathao, Obhai also available in the city. There are also bus and mini-bus services on some routes, connecting sub-urban areas of the city. Plenty of rental car agencies operate within the city and metro area, where sedans, SUVs, and micro-buses are available to hire on an hourly or daily basis.

6.14.8 Economic Situation

Khulna is the third-largest city in Bangladesh, after Dhaka and Chittagong. It is the administrative centre of Khulna District and Khulna Division. Khulna's economy is the third-largest in Bangladesh, contributing $53 billion in gross state product and $95 billion in purchasing power parity (PPP) in 2020. In the 2022 census, the city had a population of 718,735. Khulna is on the Rupsha and Bhairab Rivers. A center of Bangladeshi industry, the city hosts many national companies. It is served by the Port of Mongla, Bangladesh's second-largest seaport. Khulna River Port is one of the country's oldest and busiest river ports. A colonial steamboat service, which includes the Tern, Osrich and Lepcha, operates on the river route to the city. Khulna is considered the gateway to the Sundarbans, the world's largest mangrove forest and home of the Bengal tiger. It is north of the Mosque City of Bagerhat, a UNESCO World Heritage Site.

Chapter 7: Potential Environmental Impacts and Mitigation Measures

7.1 General

Anticipated environmental impacts associated with the proposed project activity of the unit have been identified in this study. Various activities during the construction and operation phase of the project, which are likely to cause an impact on various environmental components, have been listed.

For evaluation of impacts due to proposed activities of the unit, the baseline data generated for environmental parameters presented in chapter-4 of this report has been utilized. Changes in the environmental parameters and their impact whether short term or long term, positive or negative are identified & predicted as well as reversible nature of impacts are described in this chapter.

For identification, prediction, and quantification of the impacts due to the proposed project, an assessment task is performed for both Construction as well as Operation stages. All possible care to maximum extent is taken for assessment of temporary, short term, long term, direct, indirect as well as reversible and irreversible in nature of impacts. It is also borne in mind that the impact caused by activities of the construction phase will be temporary and restricted to a period of construction of the project. In this chapter, the effect due to construction & Operational activity of the proposed project is explained. Finally, the description in tabular form which is commonly known as the "Impact matrix" is illustrated.

During this assessment, it is revealed that implementing proper Management measures for all major predicted impacts, can be eliminated or can be minimized to a negligible extent of damage /hazard to the environment.

7.2 Environmental Sensitivity Investigation

The proposed project area is not environmentally sensitive due to its geographical location. All the environmentally sensitive issues were investigated by a selected consultant's group through carrying out primary and secondary data analysis. The main hindrances of the proposed project sustainability are natural calamities like cyclones, floods, etc. Design consultants should consider this sensitive issue in the design structure to make the project environmentally sound and sustainable. The structure should be maintained at an adequate height to protect from cyclones, earthquakes, landslides, etc. A disaster management plan has to be developed by the project proponent to protect from natural calamities.

7.2.1 Natural Hazard

A vulnerability map gives the precise location of sites where people, the natural environment, or property are at risk due to a potentially catastrophic event, often induced by climate change, which could result in death, injury, pollution, or other destruction. Such maps are made in conjunction with information about different types of risks. It could delineate the commercial, tourist, and residential zones that would be damaged in case of natural disaster.

Vulnerability mapping can allow for improved communication about risks and what is threatened. It allows for better visual presentations and an understanding of the risks and vulnerabilities so that decision-makers can see where resources are needed for the protection of these areas. The vulnerability maps will allow them to decide on mitigating measures to prevent or reduce loss of life, injury, and environmental consequences before a disaster occur. Those preparing the maps can overlap flood inundation and slope stability zones with property maps to determine which properties and buildings are at risk. They can then notify the landowners and inform them of government subsidies or other support available for undertaking a measure that would protect their homes from potential damage by, for example, water inundation or slope failure.

The following figure shows the vulnerability map of different hazards of Bangladesh. From the figure, it is understood that the study area is fall in storm surge affected area. Strom surges are generally caused due to cyclones. So, any infrastructure development in this area should be followed precaution to resist this event. It would help the decision-maker to take decisions during the design period.

Figure 7:1 Hazard Map of Bangladesh

7.2.2 Seismicity

Seismic structural strength assessment of existing buildings, strengthening of existing proposed foundation system and superstructures of critical structures, incorporation of liquefaction potential criteria in the structural design process for structures are a few of the considerations to be in mind. A preventive measure can be coordinated by ensuring anti-seismic design (end-bearing pile foundation including bored or driven piles and use reinforced concrete raft for shallow foundation), quality control (selection of adequate material and appropriate workmanship) under expert supervision. The project site lies in seismic zone II which is also called moderate intensity seismic zone with a basic seismic coefficient of 0.15g. Having a location in Zone-II the land buildings and land-based structures for this project should be designed to withstand the maximum lateral load of 50% of gravity load.

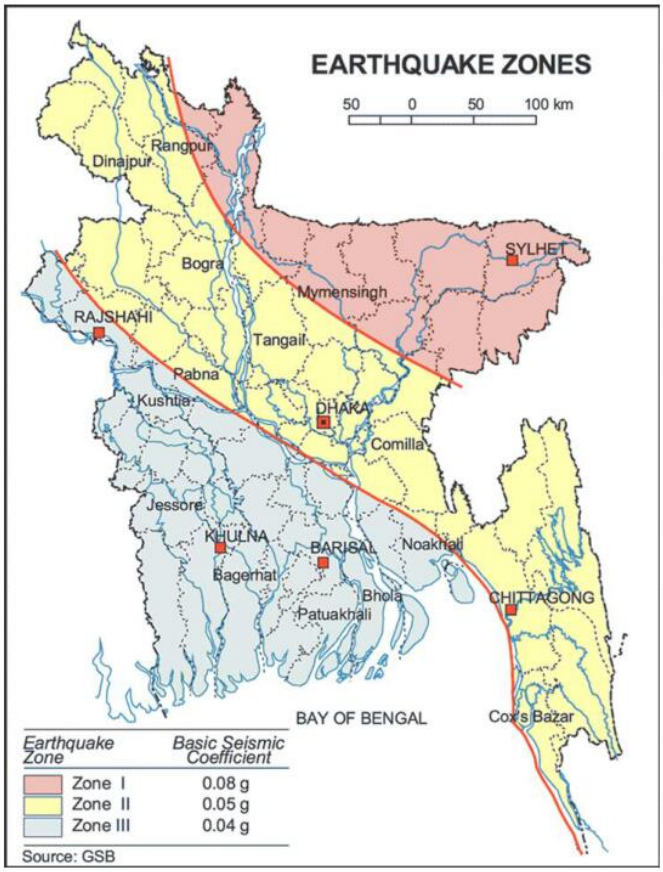


Figure 7:2 Earthquake Zoning Map

7.2.3 Landslide

Khulna, Dacope District has 348 landslides vulnerable locations. Among them, 6 are extremely vulnerable and 342 are highly vulnerable to landslides. About 91 percent of the landslides will occur flat. Ten landslide triggering factors including land use, rainfall, e, elevation, , soil types, geology, distance to rivers, roads and stream orders, population density, income, education of the inhabitants were chosen as effective factors on a land in the area.

7.3 Identification of Potential Impacts

One of the important elements of Environmental Impact Assessment (EIA) is the identification of impacts, as it helps in quantification and evaluation of impacts. Although, in general, a number of impacts have been identified while describing the baseline environmental status, it is necessary at this stage to identify the critical impacts positive/negative on various components of the environment that are likely due to installation of **Avanguard Shipyard Ltd.** Generally, the environmental impacts can be categorized as either primary or secondary. Primary impacts are attributed directly to project activities whereas secondary impacts are indirectly induced and typically include the associated investment and changed patterns of social and economic activities due to the proposed project activities. The construction and operational phase of the proposed **Avanguard Shipyard Ltd.** comprises various activities, each of which may have either positive or negative impact on some or other environmental attributes. The proposed project activities would impart impact on the environment in two distinct phases:

- During construction phase which may be regarded as temporary or short term and reversible effect; and
- During operational phase which may have long term effects.

The evaluation of environmental impacts due to installation of **Avanguard Shipyard Ltd.** considering the baseline status within a radius of 3 km around the proposed plant and the mitigation measures are as under:

7.4 Identification of Impacting Activities

I. Various activities involved in the proposed project are:

A. Construction phase activities

B. Operation phase activities

II. The activities identified for the proposed project under each phase are:

A. Construction phase:

1. Excavation
2. Foundation & Civil work
3. Transportation of construction materials, equipment & machineries
4. Construction of project.

B. Operation phase:

1. Handling and Transfer of Solid waste
2. Movement of the Vehicle

3. Operation of Project

4. Sewage water Management

7.5 Likely Beneficial Impacts

The project will bring in much direct and indirect positive impact on the social wellbeing of the locality. The likely benefits from the construction and operation of the proposed development project are listed as below:

7.5.1 Construction Phase

7.5.1.1 Employment opportunity in construction and supervision work

Skilled and semi-skilled human resources will be used in the construction activities of the project which will generate the employment. The direct employment during the construction phase has been estimated to 60-70 (daily average basis) which will increase in income level.

The impact will be direct, high magnitude, site specific and short term; therefore, it will be significant in nature.

7.5.1.2 Skill and knowledge development through training and orientation

The human resource involved in the project construction will gain experience and skills that enhances their capability in respective field which will increase in income generating activities and employment opportunities.

The impact will be direct, medium magnitude, local and long term; therefore, it will be significant in nature.

7.5.1.3 Increase in economic activities due to supply of goods and services

Different commercial activities will be increased in project area due to the construction works. Local suppliers will get an opportunity to supply construction materials like cement, steel, bar, gravel, sand etc. which definitely benefits the local market and help to boost the economic activities.

The envisaged direct impact is medium in magnitude, site specific in extent, and long term in duration and hence significant in nature.

7.5.2 Operation Phase

7.5.2.1 Employment generation and promotion

A number of professionals will be involved in project to provide shipbuilding services to the people. 115 peoples will get direct/indirect employment opportunity during the operation of project. Besides this, adjacent area of the project and many people will be engaged to provide other necessary facilities to the project visitors through opening of groceries or commodity stores and restaurants. This employment generation will increase the income of locals.

The envisaged direct impact is high in magnitude, local in extent, long term in duration and hence very significant in nature.

7.5.2.2 Increase in revenue generation

With operation of project, revenue generation will be increased at district and upazilla level.

The envisaged direct impact is medium in magnitude, local in extent, long term in duration and therefore very significant in nature.

7.5.2.3 Promotion of local business

The project operation will increase the daily activities like, animal husbandry through food waste supply, vegetable and fruit supply to project, electronics and furniture supply, human resource enrollment, promotion of handicraft shops, vehicle hire services provider and so on within the premises of project. The demand of local goods, markets, food and other basic requirement certainly increases at the project site. The large number of visitors especially tourist from different countries and other staff will significantly increases the economic transaction in and around the vicinity, which will attract people to migrate around the area. This will lead to urbanization of the area and will improve the socio – economic status of the local people.

The envisaged direct impact is medium in magnitude, local in extent, long term in duration and hence significant in nature.

7.5.2.4 Cultural exchange between locals and tourists

To and flow of large number of visitors especially tourist from different countries and other staff will significantly increases the economic transaction in and around the vicinity will help in exchanging culture.

The envisaged direct impact is medium in magnitude, local in extent, long term in duration and hence significant in nature.

7.5.2.5 Corporate Social Responsibility (CSR) Activities

During the operation phase of the project, beside commercial activities, project will support various community programs on the basis of public interest. Project will organize different welfare programs for the wellbeing of the society to minimize the effect of the complex to the possible extent. Furthermore, the proponent will also take full responsibility for the any kind of adverse impact of its activities on the environment, communities, stakeholders and all other members of the society. In gist, it will help in enhancement in the skill of local and promotion in the small-scale business.

The envisaged direct impact is medium in magnitude, site specific in extent, long term in duration and therefore will be significant in nature.

7.5.3 Beneficial Impact Identification and Evaluation Matrix

The beneficial impacts during construction and operation phase are presented in following table as;

Table 7-1 Beneficial Impact Identification and Evaluation Matrix

S.N.	Issues	Impacts	Impact Rating				
			Nature	Magnitude	Extent	Duration	Rating
	Beneficial Impacts						
	Construction Phase						
1	Employment Opportunity	Employment generation and local employment	D	H	SS	ST	Significant
2	Skill Enhancement	Skill and knowledge development through training and orientation	D	M	Lo	LT	Significant
3	Increase in Economic Activities	Increase in economic activities due to supply of goods and services	D	M	SS	LT	Significant
	Operation Phase						
1	Employment Generation and Promotion	Increases in economic status of employer Growth of local economy	D	H	Lo	LT	Significant
2	Income and revenue generation	Income and revenue generation for the both proponent and Khulna, Dacope Upazilla	D	M	Lo	LT	Significant

3	Promotion of local business	Establishment of small-scale business leading to growth of economic condition of local	D/ID	M	Lo	LT	Significant
4	Cultural Exchange	Cultural exchange between locals and tourists	D	M	Lo	LT	Significant
5	Corporate Social Responsibility activities	Enhancement in the skill of local and promotion in the small-scale business	D	M	SS	LT	Significant

Notes: D= Direct; ID= Indirect; H= High; M=Medium; SS= Small scale; Lo= Local; R= Regional; ST= Short Term; LT= Long Term

7.6 Community Recommendations

The following recommendations were made during public consultation -

- As positive externalities, the proposed project should improve and create a livelihood for the local people;
- Local people should be employed by the contractor during construction work;
- Adequate safety measures should be taken during construction work;
- Concerns were also raised on possible traffic and population pressure caused by external employed personnel;
- Finally, local people have appreciated the Project and employment generation; and have promised that they will cooperate with the executing agency during project implementation.

7.7 Identification of Environmental Attributes

Before environment impact assessment it is necessary to focus on environmental parameters, the major concern of selecting the environmental parameters is for Impact identification, prediction, and quantification. These parameters may be independent or inter-related with each other as well as related to the proposed project. The selected parameters for the Environmental Impact Assessment are illustrated below.

7.7.1 Ecological Parameters

Floral Communities, Faunal Communities, Aquatic Ecosystem, and Marine ecosystem.

7.7.2 Physio-Chemical Parameters

Water quality, Air quality, Soil quality, and Land use.

7.7.3 Socio-Economic Environment

Aesthetic Conditions, Local Housing Structures, Public Services, Health & Safety, Socio-economic activities, Employment.

7.8 Identification of Potential Physical Environmental Impact

7.8.1 Construction Phase

7.8.1.1 Impact on Land Use

The construction of the project will bring change in the existing land use of the area are permanent as well as temporary. The permanent land use conversion will be due to the construction of main block, pool facilities and utilities and generator house. No hill cutting activities will be occurred during the construction of the project. The storage of construction materials may change the land temporarily but will be reversed to previous state. **Slope Management Plan is described briefly in chapter 8.**

The envisaged direct impact is low in magnitude, site specific in extent and long term in duration and hence insignificant in nature.

7.8.1.2 Impact due to Spoil Disposal

Construction works require huge quantity of materials from excavation work. The spoil generated during the construction period will temporarily burden the project environment. Stockpiling of those construction materials will create aesthetic pollution and can cause health hazards when mixed with water sources. The spoil and muck disposed during these activities will be managed within the project premises.

The envisaged direct impact is low in magnitude, site specific in extent, short term in duration and hence insignificant in nature.

7.8.1.3 Impact on Air

During construction phase mixing of cement, sand, and aggregate, transport of materials etc. which may make the environment dusty and pollute the air in and around the construction site.

The envisaged direct impact is medium in magnitude, local in extent, short term in duration and hence significant in nature.

7.8.1.4 Impact due to Noise Generation and Vibration

The major impact on the noise level of the proposed project, during the construction phase, is envisaged due to the noise generated by the operation of the machineries, equipment, and some mechanical works. There are many equipment and machineries likely to be used during the construction. These are mainly recognized to be Dozers, Cranes, Trailers, Generators, etc. It is envisaged that the noise level due to this equipment will be 70-85 dB (A) at the receptor point at the associated work/construction area. The impacts due to noise of these equipment will be local and temporary

7.8.1.5 Issues Concerned with Construction Waste

The mostly generated solid wastes during the construction phase includes debris, broken brick pieces, left out/non-usable reinforcement bars, sand, stone, waste cement and sand mix and packing materials which will adversely affect the area at and around if not handled and managed properly cause health hazards.

The envisaged direct impact is medium in magnitude, local in extent, short term in duration and hence significant in nature.

7.8.1.6 Impact on Ground Water

During the construction phase the water requirement will be fulfilled from ground water. The water requirement during the construction phase will be supplied by ground water extraction.

The envisaged direct impact is low in magnitude, site specific in extent and short term in duration and hence insignificant in nature.

7.8.1.7 Impact due to Waste Generation

A number of people required for the construction will approach to the project site. Waste generated during construction phase when not treated carefully, it will degrade the environment from foul smell and rodents. This will have adverse impact to the surrounding.

The envisaged indirect impact is low in magnitude, local in extent, short term in duration and hence insignificant in nature.

7.8.1.8 Impact due to Water Pollution

The waste water, lubricating oils used in the machineries, construction equipment and vehicles, liquid waste coming out from cleaning, paint, solvent and other chemicals which may pollute the land, contaminate the soil and in the long run may pollute and contaminate the surface water and ground water, if not handled properly. If proper care is not taken, oil may be spilled from the construction equipment or chemicals used may come in contact with water during the construction activities. This can contaminate surface and ground water.

The envisaged direct impact is high in magnitude, site specific in extent, and short term in duration and hence significant in nature.

7.8.1.9 Issues Concerned with Fire Hazard

During use of electrical machines, electrical equipment's handling may cause the fire hazards.

The envisaged indirect impact is Medium in magnitude, site specific in extent and long term in duration and hence significant in nature.

7.8.1.10 Energy Alternatives

The energy required during the construction phase of proposed project will be supplied from national electricity grid. During the power cutoff energy will be supplied through generators.

The envisaged direct impact is characterized as direct, low, site specific and short term and hence significant in nature.

7.8.1.11 Soil Stability and Safety of Neighboring Properties

There will be slight excavation work for the construction of basement piling during the construction time of project which envisaged possible sliding or failure of ground attached to the neighboring houses and roads.

The envisaged direct impact is medium in magnitude, local in extent, short term in duration and hence significant in nature.

7.8.1.12 Effect of Heavy Equipment on Road Surface

There will be significant increment in the movements of heavy vehicles like excavator, tipper, tractor, concrete mixture for the transportation of raw materials to project area. This activity may increase pressure on road surface.

The envisaged direct impact is low in magnitude, site specific in extent, short term in duration and hence significant in nature.

7.8.1.13 Road Congestion, Traffic and Parking Issues

There will be significant increment in the movements of vehicles for the transportation of construction materials to project area. This activity may increase the traffic congestion in Khulna, Dacope- Chalna road.

The envisaged direct impact is medium in magnitude, local in extent, short term in duration and hence significant in nature.

7.8.2 Operation Phase

7.8.2.1 Solid Waste Generation and its Management Issues

The operation of the project will produce only domestic solid waste. The waste will include food packages, empty water bottles, used tissues, paper waste, food remains etc. This solid waste will be collected in waste bins and will be transferred to Municipality.

When wastes are not treated separately and carefully, it will have significant impact. For the case of project, the estimated generation of solid waste will be minimal and as low as 8 kg (full occupancy) in final stage after reuse and composting. Based on this scenario, the issues related with management is concerned with waste collection system.

The envisaged direct impact is high in magnitude, local in extent, long term in duration and hence very significant in nature.

7.8.2.2 Waste Water Management Issues

No wastewater will be generated from production process but at repair process wastewater like oil spillage will be generated which will treated by oil water separator. The project will set up sock pit & septic tank which will connected by 1 cubic meter STP for treatment of sewage water.

The envisaged direct impact is high in magnitude, local in extent, long term in duration and hence very significant in nature.

7.8.2.3 Ground Water Availability and Recharge Issues

The project will require more water during operation phase of water per day for various purposes. The project will use groundwater for its drinking & sanitation purpose. From this, if the withdrawal rate exceeds the recharge rate, there will be a chance of ground water depletion in the surrounding area.

Hence, increment in use of water will not create significant pressure on water sources and its availability.

The envisaged direct impact is low in magnitude, local in extent, long term in duration and hence significant in nature.

7.8.2.4 Fire, Accidental Hazard and Emergency Preparedness

Project might get fire at any time by any cause like electric sorts, lightening, carelessness of project staffs, visitors, from kitchen, smoking cigarettes. If proper extinguisher systems are not installed in project, project will be in great risk.

The envisaged indirect impact is low in magnitude, site specific in extent and long term in duration and hence insignificant in nature.

7.8.2.5 Noise pollution

Different noise sources will be present due to various activities of the resource operation like increased human inflow, parties and functions, operation of generators and pumps. The noise generated from mobility of guests and workers may be insignificant in comparison to vehicular movement, operation of diesel generators and pumps.

The envisaged direct impact is low in magnitude, site specific in extent, medium in duration and hence insignificant in nature.

7.8.2.6 Traffic congestion and obstruction

The traffic density will be insignificantly high during the operation phase of the project due to increase in flow of project guests. Since the entrance of the proposed project leads to the Khulna, Dacope- Highway, the inflow of vehicles is likely creating traffic obstruction and congestion which will affect the locality.

The envisaged direct impact is low in magnitude, site specific in extent, medium in duration and hence insignificant in nature.

7.8.2.7 Drainage Management

The project site is located in Khulna, Dacope. This Hilly area still retains its natural topographic features of land and water infiltration rate with very low concrete structures. Storm water drainage will not be affected for the development of the project.

The envisaged direct impact is medium in magnitude, site specific in extent, and long term in duration and hence significant in nature.

7.8.2.8 Higher Energy Requirements

The energy required during the operation phase of proposed project will be supplied from national electricity grid. Also, HVAC-Heating, ventilation and air conditioning related issues will demand more energy that will create pressure on electricity demand. During the load shedding energy will be supplied through generators. At that time operation of generator will create air and noise pollution at the project site.

The envisaged direct impact is high in magnitude, site specific in extent, short term in duration and hence significant in nature.

7.9 Identification of Potential Biological Environmental Impact

7.9.1 Construction Phase

7.9.1.1 Impact on Flora and Fauna

There is not any significant amount of endangered flora and fauna determined on the project site; therefore, construction would have no adverse effects on endangered flora and fauna. There would have been some impacts on fauna due to the construction of the project.

7.9.1.2 Impact on Ecosystem

Impacts of construction on the ecosystem are negligible since there are;

- No removal or interference with the prey of predatory animals.
- No significant siltation from run-off, altering aquatic and marine flora and fauna populations and hence population dynamics of dependent organisms;
- No noises disrupting breeding behavior or use of breeding grounds, resulting in shifts in population dynamics; and
- No removal of predatory animals resulting in increased prey populations that exceed the carrying capacity of the local environment.

7.9.2 Operation Phase

7.9.2.1 Impact on Flora and Fauna

It is assumed that the air emissions majority may affect the land biota, whereas the fauna species can be moved away from the discomforting sources, and plants will have to respond physiologically. Operation of the project will supply reliable electrical energy to the users in the region which will limit the use of any systems that could have adverse impact on the environment.

7.9.2.2 Impact on Ecosystem

There will be no significant impact on operation of the project on the ecosystem as no hazardous effluent will be discharged to receiving bodies. The noise generated from the project may cause disturbance to several animals which is insignificant.

7.10 Impact on Socio-Economic and Cultural Environment

7.10.1 Construction Phase

7.10.1.1 Demographic

The construction of the project will have limited effects on the demographic conditions. There are no permanent living quarters associated with the proposed project. The project wouldn't cause any displacement of individuals whose livelihood depends on the land that will be occupied by the project.

7.10.1.2 Conflict in or with nearby host communities

Influx of the construction workers from other parts of the area may increase conflict. In general, conflict among the workers due to the difference in opinions and interests may arise during the construction phase in the project area.

The envisaged indirect impact is low in magnitude, site specific in extent, short term in duration and hence insignificant in nature.

7.10.1.3 Gender Related Issues

During the construction work of project, use of female labor might be lower as beliefs of that male can do more work in same time interval in construction activities of project. For this case, there can be chance of wage discrimination and opportunity.

The envisaged indirect impact is low in magnitude, site specific in extent, short term in duration and hence insignificant in nature.

7.10.1.4 Health and Sanitation in and around project site

The biodegradable and non- degradable wastes generated from the labor camps will pollute the surrounding environment, if not managed properly. The haphazard disposal or storage of biodegradable wastes will increase foul odor, can provide favorable habitat for disease vectors like rodents, mosquitoes, flies and can impact community health.

The envisaged direct impact is moderate, site specific and short term and hence insignificant in nature.

7.10.1.5 Pressure on Utilities and Infrastructures

During the construction phase, the project area will have around above 60-70 workers (direct or indirect) at least on daily basis. Improper management of drinking water facilities and sanitation of the workers may create disputes among the locals and the project workers.

The envisaged direct impact is moderate, site specific and short term and hence insignificant in nature.

7.10.1.6 Occupational health and Safety

Working without use of safety measures during excavation work, spoil management work, electrical equipment handling activities, constructional activities may call the risk of accidents. From many accidents, primary victims may be the workers involved in the construction.

The envisaged direct impact is medium in magnitude, local in extent, short term in duration and hence significant in nature.

7.10.1.7 Grievances Management

Influx of the construction workers from other parts of the project area may increase conflict. In general, conflict among the workers due to the difference in opinions and interests may arise during the construction phase in the project area. If the construction phase grievances are not recorded properly then it may arise conflict with hereby local residents.

The envisaged indirect impact is low in magnitude, site specific in extent, short term in duration and hence insignificant in nature.

7.10.2 Operation Phase

7.10.2.1 Demographic

The operation of the project will have limited effects on the demographic conditions since there is no permanent living quarters associated with this proposed project. Hence there will be no increased demand on local infrastructures, such as utilities, housing medical facilities, schools, water, and food. The project will not cause any displacement of individuals whose livelihood depends on the land that will be occupied by the proposed project. The labor force for the operation of the plant will be supplied also from local area, which will result in increased disposable income for project employees. The proposed project will contribute in the GDP of the country which is a positive impact of the project.

7.10.2.2 Occupational health and Safety

Working without use of safety measures may call the risk of accidents. The workers from different departments have different risk factors and with various health impacts ranging from burning, skinning and cutting. The employees working in the food and beverage department and kitchen utilize machines with electrically driven and extremely sharp knives to chop hard fruits and vegetables. Workers deal with wastes could have caught with communicable diseases. Employees working in high noise areas like pump and generator operators will be impacted by high level of noise and electrocutions. The other health risks are burning due to accidental firing inside kitchens, possible accidents due to slipping in wet floors etc.

The envisaged impact is direct in nature, site specific in extent, moderate in magnitude and long term and hence significant in nature.

7.10.2.3 Grievances management

The mis-management of during operation phase like increased noise level in surrounding from party, water scarcity during dry season, unmanaged waste generated from the project, disturbance to nearby roads due to haphazard parking practice from guests and employees will raise grievances in nearby community.

The envisaged impact is characterized as direct in nature, site specific in extent, moderate in magnitude and long term in duration.

7.11 Chemical Environment

7.11.1 Construction Phase

7.11.1.1 Impact due to chemicals for curing and protection of materials

The chemicals used during the construction period like concrete curing, protective and decorative coatings, floor hardener and dust proofer, water proofing chemicals will cause water, soil and air pollution leads to cause health problem and environmental hazard.

The envisaged direct impact is high in magnitude, local in extent, long term in duration and therefore very significant in nature.

7.11.2 Operation Phase

7.11.2.1 Impact due to use of chemical like pesticides and detergents

Chemicals like pesticides are widely used for maintenance and protection of the ornamentals plant. From this, pesticides runoff to the surrounding area and water sources will cause water and soil pollution. Also, soap, detergent and chemical used for dishwashing from bathroom, toilet are not managed with care will pollute the surrounding.

The envisaged indirect impact is low in magnitude, local in extent, long term in duration and hence significant in nature.

7.12 Oli spillage

7.12.1 Spillage Response and Strategy

Mechanical Recovery at waterbody: Mechanical recovery constitutes the most common approach for combat marine oil/chemical spills assuming the chemical does not mix well with water). The mechanical recovery operation will typically involve the following components:

- Booms and oil suction mechanism for containment of oil/chemical
- Skimmers for recovery of oil/chemical
- Pumps
- Oil/water/chemical separators
- Temporary storage
- Vessel for towing of booms and operation of recovery units
- The operation may involve three or two vessels, depending on how the boom is deployed. The purpose of the boom is to concentrate and contain to avoid spreading the oil/chemical to a thick enough layer for effective recovery to take place. The effectiveness of booms to accumulate the oil is highly dependent on wave conditions, tow speed, boom configuration, and oil properties

Mechanical removal at the shore: Shoreline cleanup by mechanical removal involves a wide range of different tools and techniques, reflecting the highly variable conditions that a shoreline area can represent. Techniques may be ranging from manual removal of oil/Chemical using simple tools to the use of more advanced beach cleaning machinery, provided below is a non-exhaustive list of techniques/tools commonly applied to remove oil/chemical at a shoreline:

- Manual sorbent application
- Manual removal of oiled/chemical entangled materials (hand. Shovel, rakes, etc.)
- Manual cutting of vegetation
- Low-pressure flushing at ambient temperature
- Vacuum trucks
- Warm Water / low-pressure washing
- High-pressure flushing
- Manual scraping
- Beach cleaners

Leave alone, but monitor: Sometimes the best course of action is a decision not to clean up the spilled oil/chemical If the oil/chemical is at sea, and not threatening shore or sensitive areas, it

may be sufficient to monitor the spill while allowing the natural process of dispersion and biodegradation to take the course. This decision. of course, has to be taken after careful consideration of all the other alternatives.

Bioremediation: Bioremediation is the application of nutrients (fertilizers containing nitrogen and phosphorous) to the shoreline to accelerate the natural biodegradation of the oil. Oil/chemical biodegradation is the natural process by which microorganism oxidizes hydrocarbons, ultimately converting them to carbon dioxide and water. The process is limited by the availability of oxygen. moisture and nutrients needed by microbes. The use of non-native bacteria is not recommended as most areas have indigenous bacteria that are capable of degrading oil. Bioremediation is typically used as a final treatment step after completing conventional shoreline treatment or in areas where other methods are not possible or recommended.

In-situ burning: In case of flammable spillage: in-situ burning is carried out at shorelines by igniting the upwind end of the spread area and allowing the oil/chemical to burn downwind. The method is typically used on substrate or vegetation where sufficient oil/chemical has been collected to sustain ignition if oil/chemical of a type that will sustain burning and local air pollution regulations allow. The method will kill surface organisms in the burn area and residue may be somewhat toxic. The method will also cause local and time-limited air pollution.

Dispersant: The use of dispersants will break up the oil film physically, thus reducing the smothering effect of a slick in plants and animals and they will also accelerate the oil biodegradation process. The use of dispersant is not recommended where physical recovery of oil is feasible. The choice of dispersant must be approved in writing by DoE. EO, EA. FS and OSC follow the national contingency plan as well as regional plan. The Air Force and all agencies with required aircraft must help in the efforts.

For these methods to be chosen and applied, the plan recommends dedicated oil and chemical contingency response vessels are stationed at Chattogram, Mongla, and Payra Ports locations. Further vessels may be procured in time to serve other major locations.

These vessels must be fitted with state-of-the-art oil and chemical response equipment as required to apply the methods aforementioned.

Adopted Oil Spillage Mechanism from Avanguard Shipyard Ltd.: Among all the techniques, the adopted technique should be according to the existing availability. So SPCL has decided to adopt the following oil spillage mechanism:

- Booms and oil suction mechanism for containment of oil/chemical
- Oil/water/chemical separators

7.12.2 Adverse Impact Identification and Evaluation Matrix

Table 7-2 Adverse Impact Identification and Evaluation Matrix

S.N.	Issues	Impacts	Impact Rating				
			Nature	Magnitude	Extent	Duration	Rating
A	**Adverse Impacts**						
Physical Environment							
A6.8.1	**Construction Phase**						
A6.8.1.1	Change in land use	Change in land use due to construction of project	D	L	SS	LT	Insignificant
A6.8.1.2	Impact due to spoil disposal	Water, soil and air pollution	D	L	SS	ST	Insignificant
A6.8.1.3	Impact due to air	Air pollution	D	M	Lo	ST	Significant
A6.8.1.4	Impact due to noise and vibration	Noise pollution	D	M	Lo	ST	Significant
A6.8.1.5	Issues concerned with Construction waste	Water, soil and air pollution	D	M	Lo	ST	Significant
A6.8.1.6	Impact on ground water	Reduce the water table	D	L	SS	ST	Insignificant
A6.8.1.7	Impact due to waste generation	Reduction on drainage and waste disposal quality	ID	L	Lo	ST	Insignificant
A6.8.1.8	Impact due to water pollution	Water Pollution	D	L	Lo	ST	Insignificant

A6.8.1.9	Issues concerned with fire hazard	Accident, loss of lives and property	ID	M	SS	LT	Significant
A6.8.1.10	Energy alternatives	Sound pollution	D	L	SS	ST	Insignificant
A6.8.1.11	Soil stability and safety of neighboring properties	Sliding or failure of ground	D	M	Lo	ST	Insignificant
A6.8.1.12	Effect of heavy equipment on road surface	Damage on road surface	D	L	SS	ST	Insignificant
A6.8.1.13	Road congestion, traffic and parking issues	Congestion around the road, traffic and parking area	D	M	Lo	ST	Significant
A6.8.2	**Operation Phase**						
A6.8.2.1	Solid Waste management issues	Soil, water and air pollution	D	H	Lo	LT	Significant
A6.8.2.2	Waste water management issues	Water quality and pollution	D	H	Lo	MT	Significant
A6.8.2.3	Ground water availability and recharge issues	Reduction in ground water table	D	H	SS	LT	Significant
A6.8.2.4	Fire, accidental hazard and	Accident and loss of life andproperties	ID	L	SS	LT	Insignificant

	emergency preparedness						
A6.8.2.5	Noise pollution	Noise pollution	D	L	SS	MT	Insignificant
A6.8.2.6	Traffic congestionand obstruction	Congestion around the road sidetraffic jam, parking area	D	L	SS	MT	Insignificant
A6.8.2.7	Drainage Management	Inundation of water from urbanstorm water	D	M	SS	LT	Significant
A6.8.2.1	Higher energy requirements	High energy demand due to operation of many electronic appliances	D	H	SS	LT	Significant
Biological Environment							
A6.9.1	**Construction Phase**						
A6.9.1.1	Impact on flora and fauna	Loss of biodiversity	D	M	SS	MT	Significant
A6.9.1.2	Impact on ecosystem	Ecosystem disruption	D	M	SS	MT	Significant
A6.9.2	**Operation Phase**						
A6.9.2.1	Impact on flora and fauna	No impact is identified	-	-	-	-	-
A6.9.2.2	Impact on ecosystem	Ecosystem disruption	ID	L	SS	LT	Significant
Socio-economic and Cultural Environment							

A6.10.1	**Construction Phase**						
A6.10.1.1	Demographic	No impact is identified	-	-	-	-	-
A6.10.1.2	Project associated conflict	Conflict in or with nearby host communities (between local and outsiders)	ID	L	SS	ST	Insignificant
A6.10.1.3	Gender related issues	Discrimination in opportunity and wage	ID	L	SS	ST	Insignificant
A6.10.1.4	Health and sanitation around project sites	Incident of diseases	D	M	SS	ST	Insignificant
A6.10.1.5	Pressure on utilities and infrastructures	Pressure on public infrastructures and facilities	D	M	SS	ST	Insignificant
A6.10.1.6	Occupational health and Safety	Accident to the labors and loss of life	D	M	Lo	ST	Significant
A6.10.1.7	Grievances management	Conflict and dispute among the workers	ID	L	SS	ST	Insignificant
A6.10.2	**Operation Phase**						
A6.10.2.1	Demographic	No impact is identified	-	-	-	-	-
A6.10.2.2	Occupational	Probability of accident	D	M	Lo	ST	Significant

	health and Safety	and loss of life					
A6.10.2.3	Safety and security of visitors	Crime and disharmony in the society	IN	M	SS	LT	Significant
A6.10.2.4	Grievances management	Dispute and conflict among the staff and nearby society	ID	L	SS	ST	Insignificant
Chemical Environment							
A6.11.1	**Construction Phase**						
A6.11.1.1	Impact due to chemicals for curing and protection of materials	health problem and environmental hazard	D	H	SS	LT	Significant
A6.11.2	**Operation Phase**						
A6.11.2.1	Impact due to chemicals like pesticides and detergents	Pollute surrounding area and water sources	D	L	SS	LT	Insignificant

Notes: D= Direct; ID= Indirect; H= High; M=Medium; SS= Small scale; Lo= Local; R= Regional; ST= Short Term; LT= Long Term

7.13 Impact Analysis by Leopold Matrix Method

The impacts of the man-made, unlike its type, can be assessed by matrix analysis, which is very well known as the Leopold Matrix System among the environmentalists of the world.

The impacts of the plant construction, it was assessed by a method adapted from the Leopold method, and the outcomes of the analysis are tabulated on subsequent pages.

The criteria for evaluation of the qualitative matrix are presented here:

1) No Impact (0)

This indicates that the project activity is unlikely to have any impact on an environmental attribute.

2) Negligible Adverse Impact (-1) / Negligible Beneficial Impact (+1)

It signifies that the actions have a minor effect, adverse or beneficial, on the environmental parameters concerned.

3) Significant Adverse Impact (-2) / Significant Beneficial Impact (+2)

The activities and their environmental Impacts are judged to be significant if they create, or have the potential to create concern in the public or professional community.

4) High Adverse Impact (-3) / High Beneficial Impact (+3)

The action can create, or have the potential to create controversy in the public or professional community, due to its long-term effect. They may be at times irreversible.

The matrices for both the construction and operation phases are presented below considering the environmental attributes discussed in the previous section.

Table 7-3 Impact Matrix for Construction Phase

Sl. No.	Project Activities	Water Requirements	Civil Works	Mechanical Works	Operation of Machineries and Equipment	Transportation activities	Total
PARAMETERS							
Physical Parameters							
1	Water Quality	0	-1	0	0	0	-1
2	Air Quality	0	-1	0	0	-1	-2
3	Soil Quality	0	-2	0	0	0	-2
4	Noise	0	-1	0	0	0	-1
Social Parameters							
5	Aesthetic	0	0	0	0	0	0
6	Local Housing Structure	0	0	0	0	0	0
7	Activities of Local People	0	2	2	1	0	5
8	Health and Safety	0	-1	0	0	0	-1
Ecological Parameters							
9	Flora and Fauna	0	-1	0	0	0	-1
10	Agriculture	0	-2	0	0	0	-2
11	Ecosystem	0	-1	0	0	0	-1
Economic Parameters							
12	Employment	0	3	3	3	3	12
Total		0	-5	5	4	2	6

Table 7-4 Impact Matrix for Operation Phase

Sl. No.	Project Activities	Operational activities	Water Requirement	Domestic activities and waste disposal	Electricity Consumption	Transportation activities	Total
PARAMETERS							
Physical Parameters							
1	Water Quality	-1	-1	-1	0	0	**-3**
2	Air Quality	0	0	0	0	0	**0**
3	Soil Quality	0	0	0	0	0	**0**
4	Noise	0	0	0	-1	0	**-1**
Social Parameters							
5	Aesthetic	3	0	0	0	0	**3**
6	Activities of the local people	1	0	0	0	0	**1**
7	Health and Safety	0	1	0	0	0	**1**
Ecological Parameters							
8	Flora and Fauna	0	0	0	0	0	**0**
9	Marine Ecology	0	0	0	0	0	**0**
	Agriculture	3	0	0	0	0	**3**
10	Environmental Sustainability	3	0	0	0	0	**3**
Economic Parameters							
11	Employment	3	0	2	0	3	**8**
12	GDP Growth	2	0	0	0	0	**2**
	Total	**14**	**0**	**1**	**-1**	**3**	**17**

Table 7-5 Potential impacts due to project construction and operation

No	Impacts	Negative		Positive		No Impact	Magnitude Low – L Medium - M High - H	Mitigation Measures
		Short Term	Long Term	Short Term	Long Term			
A	General							
	Displacement of People					√	-	-
	Change of Land use			√			L	N/A
	Loss of trees/vegetation	√					L	Plantation Around the land
	Shifting of utilities					√	-	-
	Impact on archeological property					√	-	-
B	Construction Phase							
	Pressure on local infrastructure	√					L	N/A
	Impact on water quality	√					L	Proper drainage, use substances that protect leaching of oil
	Impact on air quality (including dust generation)	√					M	Tarpaulin or jute sheet use during construction
	Noise pollution	√					M	Use Earplug for personnel, use modern machinery, Cover the area

	Traffic congestion	√					L	Traffic management and permit heavy vehicle in the early morning or night
	Disposal of construction debris/material	√					L	Do not dispose anywhere, sell or store
	Public health and safety	√					M	Strictly follow to use PPE
	Social Impact			√			L	-
C	Operational Phase							
	Change in ambient air quality	√					L	Water spray around the project sites
	Impact on water quality		√				L	Proper drainage
	Increase in noise level					√	L	Cover the area and machinery
	Water harvesting and recharge				√		L	-
	Disposal of solid waste		√				L	Proper waste management as per BD guidelines and other solid waste will be sold to the third party.
	Quality of life				√		M	-
	Contribution to National GDP				√		L	-
	Increment in green cover	√					L	-

7.14 Conclusion

It has been noticed from both matrix that the proposed project is basically construction of project namely **Avanguard Shipyard Ltd.** Hence there is no activity found accountable to create any major adverse impact on environmental quality. The impact matrix revealed that, noise will be the major environmental issue regarding the construction of the factory. Adverse impacts on soil erosion and workers health & safety due to Factory construction and operation were found among all the adverse impacts. However, those impacts can be reduced to a negligible amount by proper Management measures. Civil works during construction phase may alter the soil structure of the surrounding area. In furtherance to these, the study and evaluation of impacts, has shown that the proposed project would have major encouraging impacts due to social economic and environmental developments in terms of getting sustainable alternative to natural gas, growth in GDP and creating employment opportunity.

It can be concluded that the overall negative impact from various activities on different environmental parameters is negligible with proper Environmental Management Plan (EMP) in place. Even the negative impacts can be converted into positive beneficial impact with proper and timely implementation of EMP. **Hence, project can be considered environmentally safe & fit.**

Chapter 8: Environmental Management Plan

8.1 Environmental Management Systems (EMS)

An environmental management system is the process used by an organization to manage, review, correct, and improve the organization's approach to business. An Environment Management System (EMS) is a tool for managing the impacts of project activities on the environment. An EMS offers a structured way to incorporate environmental considerations into day-to-day operations; it promotes continual improvement of the environment. The concept of EMS is very much similar to financial management system. As management system monitors, regulate and audit the income and expenditure thus ensuring a regular check on the project performance and take positive steps if any diversion from the objective and criteria is found with an aim of ensuring better management of financial resources to provide aid in the growth and development of the company, similarly an EMS monitors and check the environmental performance, integrate and implement the environmental management and its performance with and along the routine operations of a company, long and short term planning, quality management system and take positive steps in case of any diversion with a view to ensure better and enhanced performance.

8.2 Components of an Environmental Management System

In order to develop an EMS an organization has to identify the impacts, set targets to reduce the negative impacts, plan and decide the targets and set proper and appropriate steps to achieve the targets effectively and efficiently.

The most important component of an EMS is commitment towards an organization which is a two-fold process and has in a symbiotic manner by both the staffs and the organization. Apart from the other vital component which form part of EMS considered are:

8.2.1 Environmental Impact Identification:

Any economic development project, whether it is a simple and small or a large and complex it has some environmental implications. The environmental implications may be beneficial or adverse, but the main objective of impact identification is to specify areas that are likely to be affected by the implementation of a project. Environmental impact, by definition, implies an alternation of environmental conditions or creation of a new set of adverse or beneficial environmental consequences caused by the action under consideration. It refers to identification and documentation of the actual and potential environmental impacts of an organization's operations need to be undertaken. This can be achieved through undertaking an environmental audit. Impact identification starts at the early stage of scoping when data on both the project and surrounding environment are made available. The preliminary identification of impacts from scoping may be confirmed or new impacts may be identified as requiring investigation.

8.2.2 Objectives and Targets

Decision of objectives and targets are of prime consideration which is possible only after environment audit. A sound and marked environmental audit can only enable in the determination of positive and feasible objectives and targets. While fixing objectives and targets it should be kept

in mind that they should be feasible, specific and effective. It is always advisable for an organization to formulate stringent long-term objectives so as to encourage and enhance stable and continuous growth and performance.

However, it is also advised that the targets and objectives should be continuously and timely revised so as to ensure better results. Such objectives and targets are dependent on the impacts identified and observed at the time of procession of the activity of the proposed project and are set as per the impacts observed and recorded.

8.2.3 Consultations

This component mainly aims at ensuring committed staffs to the organization. A proper and sound consultation with community and staffs should be done before implementation of EMP. This is very essential in order to assure that the staffs are completely devoted, committed and focused to EMP. In order to develop the commitment of staffs an organization can also take steps like providing a copy of the environmental policy as part of orientation to the employees, conducting of awareness training, each employee is expected to identify to their supervisors training that they feel would help to improve their performance, etc. which shall not only encourage commitment of staffs but also increase their competence level. It can also help to improve public perception of the company, one of the benefits of implementing an EMS.

Consultation with staff, local communities, associated experts/contractors, relevant organization and managerial bodies should be conducted at regular intervals or as and when required with a view of reviewing EMS work, discuss the problems concerned, share opinions and provide suggestive measures for the possibility of further improvement of EMS and EMP.

8.2.4 Operational and Emergency Procedures

Operational and emergency procedures mainly aim at ensuring that they are congruent with organization's environment objectives and targets and suggest required steps in case of any diversion. However, any changes if any should be included in the document and clearly specified.

8.2.5 Environmental Management Plan

An Environmental Management Plan (EMP) describes the processes that an organization shall follow to maximize its compliance and minimize harm to the environment.

8.2.6 Documentation

This is one of the most crucial and important components which focuses on having a documented proof for all objectives, targets, policies, responsibilities and procedures along with information on environmental performance and its impacts. This is mostly useful in verifying environmental performance to staffs, regulatory and community and can also be used at a later stage f or any further study as and when required.

8.2.7 Training

This component mainly focuses on developing trained and competent staffs. This mainly deals with familiarizing the staffs with all their responsibilities, duties and tasks associated with them for

implementation of EMS. For this purpose, different organizations follow various measures in order to infuse them with necessary skill and motivation required for effective and efficient implementation of EMP.

8.2.8 Review Audits and Monitoring Compliance

This component mainly targets towards smooth and subtle functioning of an activity. Prior and essential reviewing of audit and monitoring compliance should be done so as to achieve the stated objectives and to modify and steer the policies laid down with time in order to meet its goals. Monitoring is also one of the vital components which ensures whether all the requirements are met or not and everything is carried on in a systematic and planned way.

8.2.9 Continual Improvement

This is the most important component as everything is based on the concept of continuous development. An EMS as said to be most efficient only when it is responsible for providing continual growth and improvement to the organization by reviewing and monitoring the targets and objectives set by the company. The policy and procedures laid down in this direction should be constantly monitored and checked and any changes if required should be ensured if the objectives are to be met in the most efficient way.

8.2.10 Environment Management Plan

An Environmental Management Plan (EMP) can be defined as "*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced*". EMPs are therefore important tools for ensuring that the management actions arising from Environmental Impact Assessment (EIA) processes are clearly defined and implemented through all phases of the project life-cycle. This plan also helps an organization map its progress toward achieving continual improvements.

Each organization is unique and, as a result, so is Environmental Management Plans. The level of detail and length of an EMP shall vary depending on the type of organization, the complexity of its processes and the maturity of the organization in understanding its environmental responsibilities. Some plans may end up being only a few pages long, while others could become extensive documents. An EMP consists of:

- Environment Protection Plan to reduce impacts and risks. Issues related to existing legislation, codes of good engineering practice, proponent commitment
- Summary of Impacts and Risks. These are the actual expected impacts and risks of the projects, which shall need to be managed, monitored, and reported.
- Impact Management and Environmental Enhancement to balance adverse impacts by providing alternate benefits to adversely impacted persons or biophysical systems.
- Environmental monitoring plans.
- Impact Reporting.

The emphasis is on identifying issues and options, to guide the detailed design of specific EMP measures as part of program and project feasibility studies. Environmental Management Planning gives the tools to assess and manage environmental issues during every phase of your project or operations. The outcome shall minimize the risk of costly, time-consuming environmental issues, while maximizing productivity and performance. It provides a framework through which environmental priorities, responsibilities and risks are systematically managed. EMPs, which are often a key component of a project's regulatory filings, provide the basis for assurance that environmental factors shall be carefully managed throughout the project lifecycle.

An EMP also includes the Management measures and other environmental management activities for any project. This is an important aspect to preserve & improve the environmental quality of project area.

8.3 Management of different Environmental Aspects based on Identified Impacts

8.3.1 Management measures for Air Environment during

Construction phase

- Diesel driven construction machinery and equipment shall be fitted with appropriate silencers, will not be left idle for prolonged periods of time, and be subjected to regular scheduled maintenance to minimize the exhaust emission.
- Vehicle engines shall not be left running when not in use.
- Improperly functioning equipment and vehicles shall be removed from the project site or shall be repaired before returning to service.
- The contractor working for the project shall ensure that waste arising from the construction activity on site, shall not be burnt in the premises.
- Water sprinklers will be used to control the fugitive dust.

Operation phase

- Burning of solid wastes or waste oils shall be strictly prohibited. The entire solid waste generated shall be disposed of.
- All the roads should be paved to reduce the pollution level.
- Emission from the equipment/machineries & transportation vehicles shall be monitored on regular basis.
- All necessary equipment/machineries shall be in good condition for proper operation.
- Employees shall be provided with sufficient environmental management & safety materials. They shall be given proper training as well as display of the summarized Environmental management & Safety Procedures shall be made available at site through signboard.

- Regular Air monitoring and inspection of the environmental management practices shall be carried out and the necessary documents & records shall be maintained.
- The Project authority should check the quality of the emitted gasses from generator after regular interval, to monitor the performance of generator. If in any case the result found that the emitted air doesn't comply with the any standard mitigation measures has to be taken according to the situation.
- The sources of air pollutants are burning fuel. During operation, these sources would emit the exhaust gases containing CO_2, NOx, SO_2, and negligible quantity of particulate matter (PM_{10}). Control of air pollutants from these sources would be achieved by safe dispersal, providing adequate heights to the respective exhaust ducts, improving the combustion process and installing air pollution controller system if necessary.

8.3.2 Management Measures for Water Environment

Construction phase

- During concrete work, care should be taken that no mortar or cementing material should fall in the water as this will not only pose impacts but also would lead to loss of material.
- As a precautionary measure these circumstances lead to providing of plastics sheet or tarpaulin in order to avoid any chance of dumping of construction materials into the water.
- Storage area of the construction material shall be at adequate distance from the coastal area to prevent any chances of contamination of coastal/marine environment as well as to facilitate efficient construction work.
- Runoff (Wastewater) from the construction work shall be carefully managed to ensure the prevention of entry of contaminants arising from construction work/site.
- Spillage or leakage of construction material in the nearby aquatic habitat is envisaged. Care shall be taken to minimize the chances of the Spillage or leakage of construction materials.

Operation Phase

Waste Water Generation

The production process will not produce any waste water. Some sewage waste will be produced some spillage of oil will be treated by oil water separator which will be treated by sock pit and septic tank. And Sewage waste will be treated by 1 cubic meter per hour.

8.3.3 Management Measures for Land Environment

Construction phase

- The small amount of construction debris and excavated material shall be disposed of in suitable pre-identified areas.
- Storage & handling of construction materials shall be done properly to avoid spillage or leakage which may cause release of the material in environment causing adverse impacts.

- Major contamination shall never occur beyond the periphery of construction site to prevent any effects on the marine & coastal ecology, human, terrestrial biota and avian community.

Operation phase

- Operational area of concern for soil contamination by spillage/leakage of materials or fuel shall be lined to prevent entering of contaminating materials in the soil under the area.
- The used oil & discarded drums/empty containers shall be sold to the approved recycler/scrap dealers.
- Dumping of solid wastes or waste oils on land shall be strictly prohibited. The entire solid waste generated shall be disposed of.
- A designated solid waste storage area shall be provided.

8.3.4 Management Measures for Noise

No significant noise will be generated in this project. The project will provide a noise free calm environment. In this project, the noise is created from a stand-by generator will not hinder the peaceful ambiance.

Noise level must have to be less than 85 dBA because working under a condition more than 85 dBA is harmful for health in short and long term. Mainly personnel working at the generator, Boiler is at high risk because the noise level found higher than the acceptable limit of both Department of Environment Bangladesh (DoE) and World Health Organization.

Construction phase

- All vehicles shall be equipped with the horn of low noise level which is recommended by authority to avoid impacts on noise level. Further, adequate silencers must be attached with all vehicles to reduce the noise.
- Machineries/equipment causing high noise level shall not be operated during the night time.
- It would be ensured that the equipment used during construction is properly maintained to keep noise emissions within the permissible limits.
- Construction machinery should be in good working condition and engines turned off when not in use.

Operation Phase

- The generator will be with canopy and silencer to reduce noise.
- The generator room will be covered by sound proof wall to reduce sound level in surrounding.
- Periodic monitoring of sound level at suggested places will be carried out.

8.3.5 Management Measures for Terrestrial biodiversity

Construction phase

On regular basis monitoring shall be done to avoid contamination of natural habitats. The major impacts would be on terrestrial ecology. Care should be taken during the construction activity so that it will not affect the terrestrial habitants.

Operation phase

- Disposal of effluent & sewage shall not be made into the nearby/adjacent waterbody as well as other ecological habitats to prevent impacts on the ecological structure & habitat of the area.
- Any kind of solid waste shall not be dumped into the marine environment as well as on the land of premises /surrounding area.
- Contamination of marine water caused by any means of project operation shall be avoided to prevent adverse impacts on ecology.
- Regular monitoring of the local area shall be done to inspect any residual impacts on ecology caused by the project operation. Necessary technologies/facilities for prevention of such impacts shall be provided immediately by the project proponent.

8.4 Management Measures for Socio-economic Environment

Construction Phase

Significant opportunity of direct & indirect employment and uplifting of the economic status of the people living in nearby area will be the major affirmative impact of the proposed project. Local population would also get opportunities in related services activities like small contractors, sub-contractors, supply of construction materials, supply of basic facilities like eatables to the site etc. The construction activities will generate lot of employment in the ancillary activities.

Operation Phase

The proposed project shall result in significant employment during the operation. The proponent shall give priority to the appointment of local people to the maximum extent during the employment process for the proposed project. Safety training shall be provided to all the workers. The workers shall pass through the medical examination prior to recruitment and periodic medical checkup shall also be carried out. An emergency response plan and disaster management plan shall also be placed to take care of adverse impact in case of any incident of accident. Such plans shall also be helpful to the local area during the incidence of Natural Disaster.

8.5 Occupational Health and Safety

The construction and operational procedures shall in general ensure minimal disturbance to the ambient ecosystem during the construction/operation phase. Some of the aspects, by the virtue of the code as well as good engineering practice to be adopted by the client in their construction contracts, which shall ensure minimization of the impact during the construction phase through third-party inspection.

The proponent shall require all its contractors and their subcontractors to maintain their work areas properly. The construction contract shall include the provision of penalties and disciplinary action for contractors or subcontractors who do not maintain proper sanitation and environmental conditions in their working areas. The contractors shall also be briefed on the conditions imposed by regulating agencies on the project, the potential problems and Management measures and their obligations in the meeting those requirements. Proponent shall ensure that the contractors implement their instructions properly while constructing by incorporating appropriate conditions in the contract documents. Some of the safety aspects to be implemented are as under:

- Monitoring safe working procedures through safety work permit system and provided safety supervision.
- Safety audit of mechanical equipment and electrical installations.
- Distribution and keeping of personnel protective equipment and first-aid items to all working groups and at offices.
- Preparation and updating of safety standards and safe working procedures.
- Accident investigation, emergency handling and documentation of accident reports.
- Planning, organizing and conducting training programs for employees on safety, safe working procedures for various related activities.
- Planning, organizing and conducting safety awareness program for contractors and community.
- Welding, Painting will be carried out after providing temporary enclosures against wind, etc., if necessary.

8.5.1 Cloakrooms

Cloakrooms must be provided for workers at easily accessible places; With suitable facilities for drying wet clothes and not be used for any other purpose and for hanging clothing including where necessary to avid contamination suitable lockers separating working from street clothes. Suitable arrangements must be made for disinfecting cloakrooms and lockers in conformity with the requirements of the competent authority.

8.5.2 Work-related injuries

All occupational accidents should be notified to the family of the accident victim which should be informed as soon as possible and as required by national laws or regulations to the authority, the labour inspectorate the appropriate insurance or any other.

(a) Immediately after reporting of an occupational accident-causing loss of life.

(b) Within a prescribed time for other occupational accidents. with a view to meeting the requirements of labour inspectorates, insurance institutions and the statistics producing body the forms prescribed in either a specific or single format should include at least the following minimum information on

(a) Facility and employer

(b) Injured person (name, address, sex, and employment status, occupation,

(c) Type nature and location of injury, (d) accident and its sequence (geographical location of the place of the accident, date and time, action leading to injury-type of accident).

National laws or regulation should provide for the specification of the relevant necessary information to be notified for commuting accidents and of more detailed information if available.

8.6 Implementation of the Management Measures

The responsibilities for the implementation of the Management measures are delegated to the project-promoting institution. They must mobilize appropriate expertise to design diverse types of Management measures, not all of which may be available within the institution. They can collaborate with other institutions in the public and private sectors. Effective results in this regard can be obtained if the collaborators cooperate in the implementation of the Management measure.

8.7 Solid Waste Management

Environmental Management with respect to solid waste management may be summarized as under:

- ✓ Separated bin should be provided
- ✓ Store waste and don't throw here to there.
- ✓ Burning wastes should be strictly prohibited.
- ✓ Wastes should be handled and disposed by Khulna, Dacope Municipality.

8.8 Afforestation

Trees and plants are well known for trapping noise, particulate matters, and gaseous pollutants, in controlling soil erosion and ground water charging. Green Belt has to be developed outside of plant premises adjacent to northern, western and southern boundary of the plant. The selection of plant species shall be made in consultation with local forest officials. Grassy lawns and gardens

shall be developed in vacant areas within the plant premises under beautification scheme to increase the aesthetic value.

8.9 Safety & Fire Fighting

Safety

The main safety features associated with the proposed development will be as follows:

a) The layout and firefighting systems will be upgraded as per NFPA and Bangladesh Fire code.
b) Inner boundary of 1.0 m height, brick masonry wall with 0.6 m height barbed wire fencing have been provided in all directions.
c) Approach roads of adequate width shall be provided and to avoid congestion and to have safe exit in emergencies.
d) All electrical fittings should be provided in licensed areas are flame proof and intrinsically safe.
e) No smoking should be allowed inside the diesel storage tank.
f) Fixed Water Spray system will have been installed for Bitumen handling area.
g) Suitable storm water drain will have been provided.
h) Adequate ventilation should be provided to reduce temperature near the heater.

Fire Fighting Facilities

The firefighting system in the proposed facilities consists of Fire extinguisher, Fire Hydrant System and Emergency fire exit. Fire Hydrant rings covering all facilities will be upgraded as per NFPA.

Security

The following security arrangement should be provided within the project-

a) The facilities should be guarded round the clock by efficient security personnel. They prevent any unauthorized entry inside the plant.
b) Watch towers should have been provided and manned round the clock to watch unauthorized entry from outside.
c) 3.0 m high boundary wall should be provided around the installation to resist any unauthorized entry.

8.10 Environmental Audit

In view of the high hazard potential of the plant, extreme care should be taken to maintain the safety needs of the installation. Safety and Environmental audits should be carried out regularly by a team consisting of experts from different discipline. The safety audit will include operating procedures, housekeeping, provision of firefighting and safety gadgets, mock drills etc.

Green Light Program

It involves installation of energy efficient lighting system which reduces indirectly generation of oxides of Carbon, Nitrogen and Sulphur. However, there shall not be any comprise with required illumination at working places.

Golden Carrot Program

This program involves super-efficient refrigeration cooling system and installation without the use of CFC. (No CFC)

Energy Star Program

Use of energy efficient electrical appliances including computer etc. are adopted. The plant authority should pay proper attention to improve the working environment by adopting the principle of Ergonomics in the following line of action in order to maximize the working and skill capability of the work-men, the Environmental Management Plan considers the strategy and goal of Ergonomics. The application of ergonomics will reduce the Muscular Skeletal Disorder (MSD). Attempts shall be made to make the Working Environment to fit the Workmen instead of forcing a workman to adopt the Working Environment."

8.11 Costing of EMP

Costing of EMP includes:

- Capital cost for installation of sock pit and septic tank and oil water separator for implementation other mitigation measures require for the project-
- Waste water and Air quality Monitoring
- Organizational management cost.

As mentioned earlier that no major source of environmental pollution from **Avanguard Shipyard Ltd.** occurred. So, capital investment cost required for organizational management cost for implementation of EMP.

Organizational management cost for implementation of EMP include-

- Installation of Sock pit and septic tank and STP
- Cost for technical personnel

Resource cost which consists of mainly laboratory equipment for monitoring.

Table 8-1 Environmental Management Action plan for Construction Phases

Environmental Impact	Mitigation Measures	Time Frame	Location	Responsibility
Air pollution	➢ All materials transported to and from the construction site should be covered; ➢ Temporary stockpiles of soil or other material should be covered or sprayed with water on a regular basis, particularly during dry or windy conditions; ➢ Water should be used to suppress dust on temporary roadways and other exposed areas; ➢ The project site should be surrounded by boundary wall (If possible); ➢ Workers in the site should be issued with dust masks during dry and windy conditions; ➢ Vehicles and other machinery should clear off mud before leaving the site;	Throughout construction phase	Project site	Contractor
Soil Erosion and siltation	➢ Prefer dry season for starting construction work in case of working in rainy season install barrier net; ➢ Re-cover exposed soils with grass and other appropriate species as soon as possible; ➢ Pile up spoil soil on flat surface away from drain;	Throughout construction phase	Project site	Contractor

Noise and vibration	➢ Construction activities that will generate disturbing sounds should be restricted to normal working hours; ➢ If required local residents should be given noticed of indeed noise activities so as to reduce the degree of annoyances; ➢ Worker use ear plug while working with noise device;	Throughout construction phase	Project site	Contractor
Impact on ground water	➢ Ensure minimum extraction of ground water; ➢ Wastage of water should be avoided through monitoring;	Throughout construction phase	Project site	Contractor
Solid waste	➢ Provide space for temporary disposal of solid waste in the site and dispose of the waste properly; ➢ Arrange adequate sanitation facilities for workers; ➢ Follow up to ensure appropriate waste disposal and sanitation practices by contractor and construction workers;	Throughout construction phase	Project site	Contractor
Impact on Biodiversity	➢ Avoid unnecessary cutting of trees; ➢ Allocate space for green belt development;	Throughout construction phase	Project site	Contractor

Impact on traffic volume	➢ Control vehicle movement in an organized way and follow local traffic instructions;	Throughout construction phase	Material Transport Route	Driver

Fire/Explosion	➢ Establish own firefighting system and maintain collaboration with government firefighting and civil defense department locally; ➢ Organize fire drills and training for construction staff;	Throughout construction phase	Project site	Contractor
Employment generation	➢ Employment only construction workers;	Throughout construction phase	Project site	Contractor
Occupational Health and safety risk	➢ Create awareness of safety issues among workers and contractors; ➢ Monitoring the practice of following safety guidelines by workers and contractors; ➢ Ensure the use of appropriate PPE while working on the construction site and display proper safety signs in the project site;	Throughout construction phase	Project site	Contractor

Table 8-2 Environmental Management Action plan for Operation Phases

Environmental Impact	Mitigation Measures	Time Frame	Location	Responsibility
Air pollution	➢ Provide adequate ventilation and exhaust fan in the workplace; ➢ Spry water on bare soil; ➢ Maintain open air exhaust for generator and set catalytic converter and faulty engine would be repair as soon as possible; ➢ Plant tree near boundary line or in the green area; ➢ Monitoring SPM every 06 Months;	Throughout Operation phase	Project site	Representative of project proponent
Solid waste	➢ Apply 3R method for waste management of the project; ➢ Train employees on waste control and disposal procedures; ➢ Segregates wastes at source and stores in demarcated places; ➢ Spent lube oil will be sold to DoE approved vendor only;	Throughout Operation phase	Project site	Representative of project proponent
Noise and Vibration	➢ Air plug will be provided to workers while near to noise generating equipment or working in noise area; ➢ Conduct periodic maintenance of generator; ➢ Will procure noise monitoring device and monitor noise condition in and outside the project premises;	Throughout Operation phase	Project site	Representative of project proponent

	➢ Monitoring noise conditions every 06 months;			
Impact on soil or land	➢ Trained employees on spillage control; ➢ Maintain Cleanliness of the yard and store solid waste in waste bin; ➢ Green belt development for enhancing the natural aesthetic of the site;	Throughout Operation phase	Project site	Representative of project proponent
Impact on traffic volume	➢ Control vehicle movement in an organized way and follow local traffic instructions;	Throughout Operation phase	Project site	Representative of project proponent
Fire/Explosion	➢ Establish own firefighting system and maintain collaboration with government firefighting and civil defense department locally; ➢ Organize fire drill and training for construction staffs;	Throughout Operation phase	Project site	Representative of project proponent
Occupational health and safety risk	➢ Conduct job safety analysis; ➢ Use of personal protective equipment such as hard helmet, musk, boot, eye glass, etc.; ➢ Aware and train employees on using safety devices;	Throughout Operation phase	Project site	Representative of project proponent
Statutory requirements	➢ Meet all statutory requirements with DoE within the time frame;	Throughout Operation phase	Project site	Representative of project proponent

Table 8-3 Environmental Management Action plan

Issue/Concern	Potential negative environmental impacts	Mitigation measures	Environmental Monitoring	Responsible actors	Time frame
Water Pollution	- Surface and ground water pollution -Occupational illness	- water filtration - Will establish septic tank and oil water separator and 1 m^3 per day STP	-Monitoring of water quality	-Authority & workers - Health and safety officer	- Quarterly reporting
Solid waste	- Air, water and soil pollution -Poorly disposed waste may block drainage	- Proper solid waste management system - Sale of solid waste to third party. - Solid waste collection, storage and transportation system - Awareness and training campaign	- Regular monitoring of the solid waste management facilities	-Authority & workers - Health and safety officer - Neighbors and - The general Public	-Must be keep inventory/daily register for solid waste - Quarterly reporting

Issue/Concern	Potential negative environmental impacts	Mitigation measures	Environmental Monitoring	Responsible actors	Time frame
Air Pollution	- Deterioration of indoor air quality -Occupational illness/health impact	- Proper stack height for generator -Regular maintain of Generators -Use of PPE	-Monitoring of AIR quality	-Authority & workers - Health and safety officer	- Half yearly Air quality monitoring (Only SPM)
Noise Pollution	- Hearing loss -Reduced productivity and efficiency -Fatigue, headache, nervousness, irritability and high pretension resulting in accidents at workplace	- Implementation an effective noise control and hearing conservation program -Noise measurement -Providing suitable hearing protection to all workers -Training of workers	-Determine Noise levels from time to time	-Authority & workers - Health and safety officer - Neighbors and - The general Public	- Half yearly Noise level monitoring

Issue/Concern	Potential negative environmental impacts	Mitigation measures	Environmental Monitoring	Responsible actors	Time frame
Occupational hazards	- Injury to employees on site -Injury to visitors - Reduced productivity - Plant and equipment damage -Negative corporate image	- Good and sound housekeeping practices -Provision of appropriate working tools and equipment -Use of PPE -Timely repair and maintenance of plant and equipment -Employee training -Use appropriate elevators and other lifting machinery	-Accident and incident records -Record of employee training	-Authority & workers - Health and safety officer	- The mitigation measures proposed should be put in alongside project implementation and daily operations, continuously improved on and sustained throughout the operation life of the project.

Table 8-4 mitigation measure

Project Phase	Potential Impacts	Mitigation/Benefit Enhancement Measures
Plant Location	Disruption of earth surface	Cutting and filling of earth should be prohibited. Adequate drainage system should be constructed for the ease of natural drainage system of the area.
	Inadequacy of buffer zone	Plantation of trees should be done at all possible open space of the dockyard premises.
Construction Phase	Run of erosion	Proper compaction should be done after each layer of earth filling. Avoid earth filling in rainy season
	Worker accident	Set up warning signs. Signals and provide helmets for workers in accordance with relevant accident prevention and work safety procedure. Restrict access to work site.
	Sanitation diseases hazard	Supply good quality drinking water to the workers. Provide well-planed sanitary facilities. Provide regular health inspection among workers. Promote health education campaign among workers.
	Noise/vibration hazard	Make working program according to the local situation.
	Traffic congestion	Avoid carrying of construction materials in peak hour of road traffic.
	Employment	Employ local land less labors.
Operation Phase	Liquid Discharge	Take care of Plumbing system of the project. Taking necessary steps for waste water disposal. Liquid Waste- Not applicable for ship building. Little bit liquid waste generated domestic purpose only around 400-500 liters/per day. Waste water from domestic activities, it is expected that there will not have any significant pollution problem to the river and will not contribute to the degradation of the river water. The sewerage water has disposed through soak pit and soak-well.
	Air quality	Provide proper stack height.
	Surface preparation, sanding, and paint removal	•Enclose, cover, or contain blasting and sanding activities to the maximum extent practical to prevent abrasives, dust, and paint chips from reaching storm sewers or receiving water. • Where feasible, cover drains, trenches, and drainage channels to prevent entry of blasting debris to the system. • Prohibit uncontained blasting or sanding activities over open water.

		• Prohibit blasting or sanding activities during windy conditions which render containment ineffective. • Inspect and clean sediment traps to ensure the interception and retention of solids prior to entering the drainage system. • Sweep accessible areas of the drydock to remove debris and spent sandblasting material prior to flooding. • Collect spent abrasives routinely and store under a cover to await proper disposal.
	Painting	• Enclose, cover, or contain painting activities to the maximum extent practical to prevent overspray from reaching the receiving water. • Prohibit uncontained spray painting activities over open water. Prohibit spray painting activities during windy conditions which render containment ineffective. • Mix paints and solvents in designated areas away from drains, ditches, piers, and surface waters, preferably indoors or under a shed. • Have absorbent and other cleanup items readily available for immediate cleanup of spills. • Allow empty paint cans to dry before disposal. •Keep paint and paint thinner away from traffic areas to avoid spills. •Recycle paint, paint thinner, and solvents. •Train employees on proper painting and spraying techniques, and use effective spray equipment that delivers more paint to the target and less overspray.
	Dock maintenance	• Clean and maintain dock on a regular basis to minimize the potential for pollutants in the storm water runoff. • Sweep accessible areas of the dock to remove debris and spent sandblasting material prior to flooding. • If hosing must be used as a removal method, collect wash water to remove solids and potential metals. • Clean the remaining areas of the dock after a vessel has been removed and the dock raised. • Remove and properly dispose of floatable and other low-density waste (wood, plastic, insulations, etc.).
	Engine maintenance	• Maintain an organized inventory of materials used in the maintenance shop. • Dispose of greasy rag, oil filters, air filters, batteries, spent coolant, and degreasers properly. • Label and track the recycling of waste material (i.e., used oil, spent solvents, batteries). • Plug floor drains that are connected to the storm or sanitary sewer; if necessary, install a sump that is pumped regularly.

		• Inspect the maintenance area regularly for proper implementation of control measures. • Train employees on proper waste control and disposal procedures.
	Boat process water handling	•Keep process and cooling water from contact with spent abrasives and paint to avoid pollution of the receiving water. •Inspect connecting hoses for leaks.

Chapter 9: Emergency Response and Disaster Management Plan

9.1 Disaster Impact Assessment

9.1.1 Overview

Accidental risk involves the occurrence or potential occurrence of some accident consisting of an event or sequence of events resulting in fire, natural calamities like flood and cyclone, explosion, or toxic hazards to human health and environment. Risk Assessment (RA) provides a numerical measure of the risk that a particular facility poses to the public. It begins with the identification of probable potential hazardous events in the industry and categorization as per the predetermined criteria. The consequences of major credible events are calculated for different combinations of weather conditions to simulate the worst possible scenario. These consequence predictions are combined to provide numerical measures of the risk for the entire facility. MCA stands for Maximum Credible Accident or in other words, an accident with maximum damage distance, which is believed to be probable. MCA analysis does not include quantification of the probability of occurrence of an accident. In practice, the selection of accident scenarios for MCA analysis is carried out based on Engineering judgment and expertise in the field of risk analysis, especially in accident analysis. The detailed study helps in plotting the damage contours on the detailed plot plan to assess the magnitude of a particular event. A disastrous situation is the outcome of fire, natural calamities, and explosion or toxic hazards in addition to other natural causes that eventually lead to loss of life, property, and ecological imbalances.

9.1.2 Methodology of MCA Analysis

The MCA analysis involves ordering and ranking various sections in terms of potential vulnerability. The data requirements for MCA analysis are:

- Operating manual
- Flow diagram and P&I diagrams
- Detailed design parameters
- Physical and chemical properties of all the chemicals
- Detailed plant layout
- Detailed area layout
- Past accident data

Following steps are involved in the MCA analysis:

- Identification of potential hazardous sections and representative failure cases.
- Visualization of release scenarios considering the type and the quantity of the hazardous material.
- Damage distance computations for the released cases at different wind velocities and atmospheric stability classes for heat radiations and pressure waves.

- Drawing of damage contours on plot plan to show the effect due to the accidental release of chemicals.

9.1.3 Past Accident Data Analysis

Analysis of events arising out of the unsafe conditions is one of the basic requirements for ensuring safety in any facility. The data required for such an analysis has either to be generated by monitoring and/or collected from the records of the past occurrences. This data, when analyzed, helps in the formulation of the steps towards mitigation of hazards faced commonly. Trends in the safety of various activities can be evaluated and actions can be planned accordingly, to improve safety.

9.1.4 Hazard Identification

Identification of hazards is an important step in Risk Assessment as it leads to the generation of accidental scenarios. The merits of including the hazard for further investigation are subsequently determined by its significance, normally using a cut-off or threshold quantity. Once a hazard has been identified, it is necessary to evaluate it in terms of the risk it presents to the employees and the neighboring community. In principle, both probability and consequences should be considered, but there are occasions where either the probability or the consequence can show to be sufficiently low or sufficiently high, decisions can be made on just one factor. During the hazard identification component, the following considerations are taken into account.

- Location of process unit facilities for hazardous materials.
- The types and design of process units
- The quantity of material that could be involved in an airborne release and
- The nature of the hazard (e.g., airborne toxic vapor or mists, fire, explosion, large quantities stored or processed handling conditions) is most likely to accompany hazardous materials spills or releases.

9.1.5 Fire and Explosion Index (FEI)

Fire and Explosion Index (FEI) is useful in the identification of areas in which the potential risk reaches a certain level. It estimates the global risk associated with a processing unit and classifies the units according to their general level of risk. FEI covers aspects related to the intrinsic hazard of materials, the quantities handled, and operating conditions. This factor gives index value for the area which could be affected by an accident, the damage to property within the area, and the working days lost due to accidents.

9.1.6 MCA Analysis

MCA analysis encompasses defined techniques to identify the hazards and compute the consequent effects in terms of damage distances due to heat radiation, toxic releases, vapor cloud explosion, etc. A list of probable or potential accidents of the major units in the complexities arising due to the use, storage, and handling of the hazardous materials are examined to establish their credibility. Depending upon the effective hazardous attributes and their impact on the event, the maximum effect on the surrounding environment and the respective damage caused can be assessed. Hazardous substances, on release, can cause damage on a large scale. The extent of the

damage is dependent upon the nature of the release and the physical state of the material. In the present report, the consequences for flammable hazards are considered and the damages caused due to such releases are assessed with recourse to MCA analysis.

Flammable substances on release may cause Jet fire and less likely unconfined vapor cloud explosion causing possible damage to the surrounding area. The extent of damage depends upon the nature of the release. The release of flammable materials and subsequent ignition result in heat radiation waves or vapor clouds depending upon the flammability and its physical state. Damage distances due to the release of hazardous materials depend on atmospheric stability and wind speed. It is important to visualize the consequence of the release of such substances and the damage caused to the surrounding areas.

9.1.7 Fire Scenarios

Combustible materials within their flammable limits may ignite and burn if exposed to an ignition source of sufficient energy. On the proposed project, fire may cause from Gas cylinder explosion or electric short-circuit.

9.1.8 Natural Calamities

Natural calamities like flash floods, earthquakes, and landslide can occur within the zone. The project site falls under earthquake zone II which indicates the medium intensity of the earthquake.

In 2021 Flash flood and landslide occurred in Khulna, Dacope district due to excessive monsoon rainfall. Lama, Alikadam, Nakhongchori and Thachi sub-districts of Khulna, Dacope Districts wew greatly affected. The water levels have increased by 12-15 feet from normal levels at the Rupsha (Previous name Japjapiya) Rivers in Khulna, Dacope district affected homes, livelihoods, crop fields and infrastructures.

In 1897, an earthquake of magnitude 8.7 (recently modified to be 8.0) caused serious damages to buildings and lives in the southeastern part of India including Bangladesh. Historical records have revealed that there are areas of high seismic activity over the north and east of Bangladesh and some of the major earthquakes originating in these areas affect adjacent parts of Bangladesh.

9.2 Disaster Management Plan (DMP)

9.2.1 Approach to Disaster Management Plan

Onsite Emergency or disaster is an unpleasant sudden event of such a magnitude that may cause extensive damage to life and property, due to in-plant emergencies resulting from deficiencies in operation, maintenance, design, and human error; natural calamities like flood, cyclone and earthquake; and deliberate and other acts of a man like sabotage, riot, war, etc. Every industry needs to have a well-documented Emergency Plan to meet any major untoward incident or disaster. Because of this, an approach to Disaster Management Plan (DMP) to tackle the emergencies', Proposed project has been delineated in the following sections. The roles and responsibilities of key personnel have also been defined in the plan.

9.2.2 Formulation of DMP and Emergency Services

Proposed **AVANGUARD SHIPYARD LTD.** will formulate a Disaster Management Plan for better and safe management of their plants. The DMP is related to the final assessment and it is the responsibility of the plant management document including the following elements.

- Assessment of the size and nature of the events foreseen and the probability of their occurrence;
- Formulation of the plan and liaison with authorities, including the emergency services.
- Procedures for raising the alarm and communications both within and outside the works;
- Appointment of key personnel and their duties and responsibilities, especially for works incident controller and works main controller;
- Emergency control center;
- Action on-site;
- Action off-site;

The plan is prepared to set out how designated people at the site of the incident can initiate supplementary action both inside and outside the works at an appropriate time. An essential element of the plan must be the provision for attempting to make safe the affected unit, for example by shutting it down. On a complex site, the plan includes the full sequence of key personnel to be called in from other sections or from off-site.

9.2.3 Need for Disaster Management Plan

The proposed project will not produce any potentially hazardous material to human beings, flora, and fauna, and environment as a whole. Despite these, the possibility of accidents cannot be ruled out. Human errors and mechanical, electrical, instrumental, or system failures have, on occasion, led to severe disasters. Following are the general types of Emergency /Disaster that lead to the preparation of a disaster management plan:

- Fire from gas cylinder explosion
- Fire from electric short circuit
- Earthquake
- Flash flood
- Landslide

9.2.4 Objectives of Disaster Management Plan

The purpose of DMP is to give an approach to detail organizational responsibilities, actions, reporting requirements, and support resources available to ensure effective and timely management of emergencies associated with production and operations on the site. The overall objectives of DMP are to:

- Ensure the safety of people, protect the environment and safeguard commercial considerations
- Immediate response to the emergency scene with effective communication network and organized procedures
- Obtain early warning of emergency conditions to prevent impact on personnel, assets, and environment
- Safeguard personnel to prevent injuries or loss of life by protecting personnel from the hazard and evacuating personnel from an installation when necessary.
- Minimize the impact of the event on the installation and the environment, by:
  - Minimizing the hazard as far as possible
  - Minimizing the potential for escalation
  - Containing any release
- To guide to help stack holders take appropriate action to prevent accidents involving hazardous substances and to mitigate adverse effects of accidents that do nevertheless occur.

9.3 Emergency Response and Disaster Management Plan

The initial response to an incident is a critical step in the overall emergency response. Like all other industries and installations. Project authorities must have adequate measures against accidents or incidents to meet the emergency. The purpose of having an Emergency Response Plan (ERP) is to:

- Assist personnel in determining the appropriate response to emergencies.
- Provide personnel with established procedures and guidelines.
- Notify the appropriate company emergency response team personnel and regulatory Govt. agencies.
- Manage public and media relations.
- Notify the next-to-kin of accident victims.
- Promote inter-departmental communications to ensure a "Companywide" Coordinated emergency response.
- Minimize the effects that disruptive events can have on company operations by reducing recovery times and costs.
- Respond to immediate requirements to safeguard the subtending environmental and community.

Generally, the initial response is guided by three priorities Ranked in importance these priorities are:

1. **People**
2. **Property**
3. **Environment**

Emergency response procedures will identify who does what and when in the event of an emergency. Responsibility for who is in charge and their coordination of emergency actions shall be identified. Nature of emergency& Hazardous situations may be of any or all of the following categories:

I. Emergency

- Fire,
- Explosion
- Medical emergency,

II. Natural Disasters

- Flash Flood,
- Earthquake,
- Landslide

III. External factors

- Food poisoning/water poisoning
- Sabotage

9.3.1 Six Steps in Emergency Response

First Step:

This step determines the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards.

It also determines potential hazards stemming from local conditions such as inclement weather water bodies etc. and ensure that the initial response team is aware of these conditions.

Second Step:

Determine the source/cause of the event resulting to the emergency and prevent further losses.

Third Step:

Conduct an assessment of the incident site for any further information on hazards or remedies.

Fourth Step:

Initiate redress procedures.

Fifth Step:

Report the incidence its nature cause impact applied redress procedures and any further assistance required etc. to the appropriate company, government and/or land owner.

Sixth Step:

Take appropriate steps with respect to hazards to wildlife, other resources and addressing public and media concerns and issues, as applicable. Response priorities are to protect human lives, property and the environment.

9.3.2 Emergency Response and Fire Management Plan

If a small fire cannot be extinguished with the use of a portable extinguisher or a fixed extinguishing system, or the smoke presents a hazard to the operator, then leave the fire area, ensure the fire department has been notified, and wait in a safe area for the fire department. Attempting to extinguish a fire is a voluntary act. Only persons who are properly trained and feel confident in the use of a portable extinguisher should contemplate their use. Improper use of a portable extinguisher can lead to severe injury or death.

9.3.2.1 Types of Fire

There are five types of fire such as

Class A – Ordinary combustibles (wood, paper, plastics, etc.)

Class B – Combustible liquids (oils, gas, cooking oil, etc.)

Class C – Electrical (energized equipment – appliances, wiring, etc.)

Class D – Combustible metals (aluminum, magnesium, zinc, etc.)

Class E – Commercial cooking equipment (Cooking oils, Animal fats, Vegetable fats)

It is extremely important to choose the properly rated fire extinguisher for the class of fire that is burning.

A		Ordinary Combustibles	Wood, Paper, Cloth, Etc.
B		Flammable Liquids	Grease, Oil, Paint, Solvents
C		Live Electrical Equipment	Electrical Panel, Motor, Wiring, Etc.
D		Combustible Metal	Magnesium, Aluminum, Etc.
K		Commercial Cooking Equipment	Cooking Oils, Animal Fats, Vegetable Oils

Figure 9:1 Pictorial View of Different Types of Fire

9.3.3 Fire Safety Risk Assessment

A fire safety risk assessment is an organized and methodical look at the premises, the activities within the premises, the potential for a fire to occur, and the harm it could cause to the people in and around the premises. The prescribed process is available for inside or indoor fire risk assessment. The following fire risk assessment process can be followed and executed twice a year.

Table 9-1 Fire Risk Assessment Process

	Fire Risk Assessment
1	Identify fire hazards Identify: Sources of Ignition Sources of Fuel Sources of Oxygen
2	Identify People at Risk Identify: People in and around the premises People especially at Risk
3	Evaluate, Remove, Reduce and Protect from Risk Evaluate the risk to people from fire Remove or Reduce the Risks to people Detection and warning Fire-fighting Escape routes Lighting

	Signs and notices Maintenance
4	Record, Plan, Inform, Instruct, and Train Record significant findings and action taken Prepare an emergency plan Inform and instruct relevant people co-operate and co-ordinate with others Provide training
5	Review Keep assessment under review Revise where necessary
	Source: Pronab Kumar Debnath, Project Paper, IDM, KUET

9.4 Emergency Response Plans to Disaster

Emergency response plans are developed to address a range of plausible risk scenarios and emphasize the tasks required to respond to a physical event. The emergency response plan (ERP) for the proposed factory has been developed listing various actions to be performed in a very short period in a pre-determined sequence if it is to deal effectively and efficiently with any emergency, major accident, or natural disaster. The primary objective of the plan is to keep the loss of life, material, machinery/equipment damage, and impacts on the environment to a minimum.

9.4.1 Alarm system

The alarm system varies and will depend on the size of the works area - simple fire bell, hand-operated siren – break open type, fire alarm, etc.

9.4.2 Communication System

Communication is a key component to control an emergency. The following communication system may be provided in the project:

- Walky-talky
- Telephone
- Cell phone
- Intercom/paging
- Runners (verbal or written messages)

9.4.3 Siren for emergency

Siren for emergency should be different from a normal siren. The emergency siren should be audible to a distance of 5km radius. The emergency siren should be used only in case of an emergency.

9.4.4 Escape Route

The escape route from each and every plant should be clearly marked. The escape route is the shortest route to reach out of the factory area to the open area, which leads to assembly point. This route should be indicated on the layout plan attached to the on-site management plan.

9.4.5 Evacuation

All non-essential staff should be evacuated from the emergency site. As soon as the emergency siren rings the workers have to shut down the units and move to the assembly point. The shutdown procedure in case of emergency should be prepared and kept ready and responsible persons should be nominated for the purpose.

9.4.6 Counting of personnel

All personnel working in the industry should be counted. Time office persons should collect the details of personnel arriving at the assembly point. These should be checked with the attendances of regular workers; contract workers present in the site on the day of emergency. The accident control should be informed and arrangement should be made for searching missing persons in the emergency affected area. The employees address, contact number of next to kin should be maintained in the time office so that during emergency relatives of those affected due to emergency may be informed accordingly. Information in respect of emergency should be given to the media and other agency.

9.4.7 All clear signal

After control of emergency the work incident controller will communicate to the works main controller about the cessation of emergency. The main controller can declare all clear by instructing the time office to sound "All Clear Sirens".

9.4.8 Emergency facilities

The following facilities should be provided to tackle any emergency at any time.

- ✓ Fire protection and firefighting facilities
- ✓ Emergency lighting and standby power
- ✓ Emergency equipment and rescue equipment
- ✓ Breathing apparatus with compressed air cylinder
- ✓ Fire proximity suit
- ✓ Resuscitator
- ✓ Water gel blanket
- ✓ Low-temperature suit
- ✓ Fire aid kit
- ✓ Stretchers

Chapter 10: Public Consultation

10.1 General

The process of public participation and consultation was endorsed in the United Nations Conference on the Environment and Development (UNCED) in 1992 through one of the key documents of the conference - Agenda 21. Stakeholder consultation is a means of involving all stakeholders in the project's decision-making process to address their concerns, improve project design, and give the project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of enhancing project sustainability.

Listening to stakeholder concerns and feedback can be a valuable source of information that can improve project design and outcomes and help a company to identify and control external risks. It can also form the basis for future collaboration and partnerships. For stakeholders, a company's consultation process is an opportunity to get information, as well as to educate company staff about the local context in which a project will take place, to raise issues and concerns, ask questions, and potentially help shape the project by making suggestions for the company to consider and respond to.

Avanguard shipyard authority already consult with local people and willingly buy the local people land. Local people willingly sell their land and very happy after selling because every year they lost their land for river erosion.

The Project Director will organize the public opinion survey subject to the permission of the Department of Environment and undertake to complete the public opinion survey program by taking appropriate measures.

Through the public consultation process, **Avanguard Shipyard Ltd.** hopes to:

- Promote a better understanding of the project, its objective, and its likely impact;
- Identify and address concerns of all interested and affected parties of the project area;
- Provide a means to identify and resolve issues before plans are finalized and development commences, thus avoiding public anger and resentment and potentially costly delays;
- Encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership.

Chapter 11: Environmental Monitoring Plan

11.1 Monitoring Requirement

Environmental monitoring is an essential tool in relation to Environmental Management System as it provides the basic information for rational management decisions. The prime objectives of monitoring are –

- To check on whether mitigation and benefit enhancement measures are actually being adopted and are providing effective in practice.
- To provide a means whereby impacts that were subject to uncertainty at the time of preparation of IEE, or which were unforeseen, can be identified, and steps to be taken to adopt appropriate control measures.
- To provide information on the actual nature and extent of key impacts and the effectiveness of the mitigation measures which, through a feedback mechanism, can be taken into account in the planning and execution of similar projects in the future.

There are two basic forms of monitoring:

- Visual observation or checklist, coupled with inquiries
- Physical measurement of selected parameters.

In the case of industrial projects in general, monitoring is done by physical measurement of some selected parameters like air, water, soil, noise, etc. It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the project does not create adverse environmental changes in the area and providing a database of operations and maintenance, which can be utilized if unwarranted complaints are made.

11.2 Monitoring Indicators

Environmental monitoring requires set of indicators that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environment quality. A list of parameters to be tested, sample number and sampling frequency are given in Table-11.1. Here it may be mentioned that parameters are selected according to the requirement of DOE as indicated in the environment quality standard (EQS) for concerned industries.

Table 11-1 Monitoring Parameter and Frequency

Issue	Parameters	Location	Monitoring Frequency
Stack Emissions Generator	SPM	Final exhaust	Half yearly
Ambient air quality	PM10	Around the project site	Half yearly

Noise level	Noise at different locations at day & night	Around the project site	Half yearly
Drinking water quality	Total Coliform	Drinking water outlet	Half yearly
Work place noise level	Noise level at work place	Noise at different locations at work place	Half yearly
Sewage Treatment Plant outlet parameter	pH, BOD_5 at 20°C, COD, Suspended Solids (SS), Oil & Grease, Nitrate (NO_3), Phosphate (PO_4), Total Coliform	STP outlet	Half yearly

To be an environmentally acceptable project, the proposed project should have its own environmental monitoring unit/cell with trained manpower with the necessary equipment and other logistics along with required budget. **Avanguard Shipyard Ltd.** should develop a working relationship with the Department of Environment (DOE) by undertaking a joint monitoring program to monitor above parameters.

11.3 Monitoring Plan

All monitoring activities should be carried out by the plant Authority unless specified otherwise. A network should be formed with the workers and employees of the plant for specific purposes.

Water Pollution

- Monitor and control wastewater discharge to the natural drain.
- Monitor compliance of water quality with DoE Standards during construction and operational period.

Table 11-2 DoE Water Quality Standard for Inland Surface Waters

Parameter	Unit	Recreation activity	Fisheries
pH	-	6.5-8.5	6.5-8.5
BOD mg/l	mg/L	3 or less	6 or less
DO mg/l	mg/L	5 or more	5 or more

Total Coliform	No. /100mL	200 or less	-

Table 11-3 Sewage Water Parameter

Parameter	Unit	Standard Limit
Temperature	Degree Centigrade	30
pH	-	**6-9**
BOD_5 at 20°C	mg/l	**30**
COD	mg/l	**125**
Suspended Solids (SS)	mg/l	**100**
Oil & Grease	mg/l	**10**
Nitrate (NO_3)	mg/l	**50**
Phosphate (PO_4)	mg/l	**15**
Total Coliform	**Number/100 ml**	**1000**

Air Quality

Monitor actions taken by the plant authority to reduce dust and meet DoE guidelines.

Table 11-4 DoE Standards for Air

Categories of Area	Microgram per cubic meter			
	SPM	**Sulphur dioxide**	**Carbon monoxide**	**Nitrogen**
Industrial and Mixed	500	120	5000	100
Commercial and Mixed	400	100	5000	100
Residential and rural	200	80	2000	80
Sensitive	100	30	1000	30

Noise Pollution

Monitoring actions taken by the authority of plant to reduce noise and meet DoE guidelines.

Table 11-5 DoE Standards for Sound

Category of areas	Standard determined at dBa unit	
	Day (6AM-9PM)	Night (9 PM-6AM)
Silent zone	45	35
Residential area	50	40
Mixed area	60	50
Commercial area	70	60
Industrial area	75	70

Solid Waste Management

Solid waste management system should be well developed to carry the hazardous and non-hazardous waste. Solid waste collection, transportation and dumping in proper way should be ensured by the authority of the **Avanguard Shipyard Ltd.**

Proper Drainage

Proper drainage system should be maintained for both the sewerage water, household water and storm water. Separate drainage system should maintain for the sewerage water and household and storm water.

Health and Safety

Monitor Environmental compliance and provide health and safety measures to the workers during operational period.

Chapter 12: Cost Estimation for Environment Mitigation Measures and Monitoring

12.1 Environment Management Cost

Most of the mitigation measures require contractors/project authorities to accept good practices, which should be part of the usual procedures, so the cost of compliance is unlikely to be high. Relaxation, which is the proponent's and the contractor's responsibility, is given as part of the management of the project. The following table shows the cost estimate of environmental mitigation measures and annual cost monitoring.

Table 12-1 Cost estimation of mitigation measure

SI No	Potential Environment Management Measure	Cost (Annual)
Preconstruction Phase		
01	Land acquisition, Losses of land, livelihood and income source	Already been done by Proponent
02	Resettlement Action Plan & Monitoring	No resettlement Need
03	Side boundary wall	Included in construction cost
Construction Phase		
04	Provision of Personal Protective Equipment to all labor involved in the construction of proposed off-site developments	Included in construction cost
05	Construction of Labor camps	Included in construction cost
06	Construction of Toilets & Septic Tanks/Soak Pits	Included in construction cost
07	Construction of Temporary stormwater drainage system	Included in construction cost
08	Safety & Quality inspections	Included in construction cost
09	Construction of oil water separator tank	Included in construction cost

Table 12-2 Environmental Monitoring Cost

Parameters	Est. Number of Samples/Sites (Per year)	Unit cost @ (BDT)	Total cost (BDT)/year
Ambient air quality (SPM; SO_x; NO_x)	4	12,000.00	48000.00
Surface water quality: BOD, COD, DO, pH, TDS, TSS, Ammonia, Nitrate, TC, FC, heavy metals, and other pollutants	4	13,000.00	52000.00
pH, BOD_5 at 20°C, COD, Suspended Solids (SS), Oil & Grease, Nitrate (NO_3), Phosphate (PO_4), Total Coliform	4	50,000.00	200000.00
Groundwater quality/Drinking Water (Arsenic, Iron, Coliform, etc.)	4	4,000.00	16000.00
Noise level	12	1,600.00	19200.00
Waste management system	-	-	100000.00
STP			000000
Quality of effluent	12	5000.00	60000.00
Establishment of Greenbelt	-	-	200000.00
Total cost per year			**695200.00**

Chapter 13: Conclusions and Recommendations

13.1 Conclusions

The **Avanguard Shipyard Ltd.** is a private owned company intends to build and operate Commercial project at **Pankhali, Dacope, Khulna, Bangladesh.**

This EIA has been prepared for the construction of project according to the requirement of DoE for necessary environmental clearances as it is made mandatory in ECA'95 for any new industrial set up. This report has been prepared through identifying the potential impacts, assessing them and recommendation of possible mitigating and enhancing measures for negative and positive impacts, respectively.

The environmental analysis has revealed that the project can be set-up according to the proposed design and configuration in the proposed site and location. The environmental impacts are of limited nature, whereas the benefits of the project are more than the negative impacts.

The impact analysis revealed that, noise and dust will the major environmental impact for the construction of the project. Adverse impacts on workers' health & safety due to construction and operation were found very negligible among all the adverse impacts. However, these impacts can be reduced to a negligible amount by proper Management measures.

It is expected that the construction and operation of the proposed project namely **Avanguard Shipyard Ltd.** will comply with all the guidelines provided by the Department of Environment (DoE).

13.2 Recommendations

Given that the potential impacts are somewhat significant to environmental degradation, this EIA report presents a 'findings of some significance impacts' that can be effectively mitigated. It is therefore recommended that the proposed development project be allowed to proceed on strict condition that the impact mitigation measures that highlighted below:

- The proponent will comply with the occupational health and safety especially in construction phase and operation phase.
- The plant authority should provide appropriate personal protective equipment (PPE) and they should strictly monitor this PPE during the construction period.
- Follow the Management measures suggested in the chapter-7 during the construction and operation of the project.
- **Avanguard Shipyard Ltd.** should undertake and expanded the tree plantation program inside the project area and surrounding environment.
- Disaster Management Plan should be prepared in case of emergency situations.
- A Fire safety plan needs to be prepared in case of emergency situations.

- The project proponent should conduct a post operational environmental study to evaluate the environmental impacts from the project and compare the findings with the outcomes of this EIA report.
- The authority should maintain regular incident register and proper corrective action plan.
- The plant authority should install automatic fire/heat detecting system in each area.
- The authority should declare the project a "no smoking zone".
- The factory authority should arrange regular mock drills by the firefighting cells/groups.
- Arrange awareness program for the workers and employee for earthquake and landslide emergency also arrange proper training of the employees about the importance of safety codes.
- Solid waste from processing is the major source of adverse impact to be associated during operation phase of the project. This may create long term and irreversible effects to a limited degree on the receiving environment if no mitigation measures are adopted. However, in the case of **Avanguard Shipyard Ltd.** a full-fledged isolated collecting system has to install to collect and dispose the solid waste from the project.
- They should regular monitor and record drainage system of the project.
- The impact due to air emission, there are no environmental issues of sensitive nature, which might have any potential of serious ill effects due to the plant in this area. Since it is understood that the authority is committed to take necessary steps to address any environmental problems, the selected location of Avanguard Shipyard Ltd. is acceptable for the present project. Therefore, the authority should regular monitor and record the ozone depleting substances (ODS) and Green House Gases (GHGs) from AC, refrigerators and other machineries in the facility premises.
- The company has to appoint skilled personnel to take care and advice about the Environmental Management System.
- The authority should develop Environmental Management System Team in the facility.
- The project proponent should conduct a post operational environmental study to evaluate the environmental impacts from the project and compare the findings with the outcomes of this EIA report.

However, no development can be expected without any adverse impact on the environment. The beneficial impacts on the nation as well as human beings would only be meaningful and sustainable development would only be possible if adverse impacts are minimized through strict maintenance and control measures as mentioned for this project. All this would need vigilant care and cost money, and the project authority should take these into consideration.

References

1. Mamnun, M. and Hossen, S. (2020). Spatio-temporal analysis of land cover changes in the evergreen and semi- evergreen rainforests: A case study in Chittagong Hill Tracts, Bangladesh. International Journal of Forestry, Ecology and Environment, 02(02), 87-99.
2. Mamun, M. M. A. A., Emon, S. B. T. A. and Alam, M. S. (2021). Soil properties under eight different land uses in Khulna, Dacope hill district of Bangladesh. International Journal of Forestry, Ecology and Environment, 05(01), 202-214.
3. https://weatherspark.com/y/112063/Average-Weather-in-B%C4%81ndarban-Banglades
4. Initial Environmental Examination of Third Urban Governance and Infrastructure Improvement (Sector) Project – Khulna, Dacope Roads and Drains Improvement Subproject (Phase 2), LGED, 2016.
5. Syed Rashidul Hasan, (2013). Rapid assessment of the context and current status of tourism development and management in Khulna, Dacope.
6. BBS. (2011). Bangladesh Disaster-related Statistics 2015: Climate Change and Natural Disaster Perspectives, Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh.
7. Md. Sofi Ullah (2019). Geospatial Modeling of Landslide Vulnerability and Simulating Spatial Correlation with Associated Factors in Khulna, Dacope District. The Dhaka University Journal of Earth and Environmental Sciences, Vol. 8.
8. DEAT (2004b) Environmental Auditing, Integrated Environmental Management Information. Series 14, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
9. DOE (1995) "The Bangladesh Environment Conservation Act", Department of Environment, Govt. Of Bangladesh.
10. DOE (1997) "The Environmental Conservation Rules", Department of Environment, Govt. Of Bangladesh.
11. ECR 1997: Environmental Conservation Rules 1997. Retrieved from Https://www.elaw.org/system/files/Bangladesh+Environmental+Conservation+Rules, +1997.pdf.
12. GOB, (1992), "Bangladesh Environmental Policy".
13. GOB, (1995), "National Environmental Management Action Plan (NEMAP)".
14. Debnath, P. K, 2018, Fire Risk Assessment in Sonadanga Residential Area of Khulna by Risk Value Index method, Thesis paper, Institute of Disaster Management, Khulna University of Engineering and Technology, Khulna. DOI: 10.13140/RG.2.2.35569.22888
15. Banglapedia. http://en.banglapedia.org/index.php?title=Sreepur_Upazila
16. IEE Report, 2018. Municipal governance and services project (MGSP), Improvement of Road and Drain at Different Location of Sreepur Pourashava.
17. Haque S.E. (2018) An Overview of Groundwater Quality in Bangladesh. In: Mukherjee A. (eds) Groundwater of South Asia. Springer Hydrogeology. Springer, Singapore

18. Hossain, M. E., Chowdhury, M. M., and Iqubal, K. F., 2008. A Survey on the Faunal Diversity of Savar Upazila, Dhaka, Bangladesh. Pakistan Journal of Biological Sciences, 11: 373-379.
19. Islam, R. 2017. Environmental Laws in Bangladesh. Retrieved from
20. https://lawhelpbd.com/international-law/environmental-law/environmental-law Bangladesh/
21. Khatun, M. A., Rashid, M.B., and Hygen, H. O., 2016. Climate of Bangladesh, Met Report. ISSN 2387-4201. Retrieved from https://www.coursehero.com/file/45300068/MET-report-08 2016pdf/
22. M. Sabeva, 2015. Environmental Impact Assessment – Necessity, Principles and Specificities, akia Journal of Sciences, Vol. 13, Suppl. 2, pp 339-345, 2015
23. Mohammad, N. (2013). Development of environmental law and policy in Bangladesh: An overview. International Journal of Applied Mathematics and Statistics, 38(8), 96-106. Retrieved from
24. Draft Initial Environmental Examination, 2013. Prepared by Dhaka Water Supply and Sewerage Authority, Government of Bangladesh for the Asian Development Bank.
25. Dr. Bennett S., Huq M., Mclean d., 'Initial Environmental Evaluation, appendix to the Northeast regional water Management Plan, Bangladesh Flood Action Plan 6 (IEE NERP FAP 6).'
26. ENVIRONMENTAL ASSESSMENT GUIDELINES, 2003. Asian Development Bank
27. Initial Environmental Examination (IEE) Report for Hotel Project at Amata Garden Project, BAGAN, Prepared by E Guard Environmental Services Company Limited.
28. https://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/publications/b1ed783d_9b05_4f36_a83e_2173d8698023/River%20Water%20Quality%20Report%202015.pdf
29. https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/khulna bangladesh_1336135
30. Employing social vulnerability index to□ assess household social vulnerability of□ natural hazards: an□ evidence from□ southwest coastal BangladeshAnjum□ Tasnuva1□ · Md. Riad□ Hossain1□ · Roquia□ Salam2□ · Abu□ Reza□ Md.□ Tow□ qul□ Islam2 □ · Muhammad□ Mainuddin□ Patwary3□ · Sobhy□ M.□ Ibrahim4
31. https://en.wikipedia.org/wiki/Khulna
32. https://www.ebrd.com/downloads/policies/environmental/transport/shipbuilding.pdf
33. Introduction to Marine Engineering- By D.A Taylor
34.

Annexure

1. **BIDA Papers**
2. **STP Drawing design Calculation**

Bangladesh Investment Development Authority (BIDA)

Prime Minister's Office

Ref No: BR-02Sep2023-00001

Date: 13 September, 2023

Subject: Registration of Proposed industrial project under the title Avanguard Shipyard Ltd.

Dear Sir/ Madam,

With reference to your application received on 13.09.2023 concerning the above subject, I am pleased to confirm that your proposed industrial project has been duly registered with the Bangladesh Investment Development Authority (BIDA). The Registration number for this project is **J-20230913009202-H** and the particulars of the terms and conditions of which are appended.

If we could be of any further assistance to you, please do not hesitate to call our service center representative who could be reached at telephone # +880255007241

In the meantime, we would like to take this opportunity to extend our best wishes to you in your future endeavors.

Your Faithfully

(M. Jashim Uddin Khan)
Director
Phone:
Email: khan.mopa@gmail.com

Mohammed Imtiaz Hossain
Managing Director
Avanguard Shipyard Ltd.
Concord Hamid Hafiz, Level 8(B), House 93, Road 4, Block B, Banani, Dhaka 1213, Banani TSO, Banani, Dhaka-1213

Copy forwarded for information and necessary action (Not according to seniority):

1. Director General, Department of Environment, Poribesh Bhaban, Sher-e-Bangla Nagar, Dhaka
2. Registrar, Registrar of Joint Stock Companies & Firms, TCB Bhaban, Karwan Bazar, Dhaka
3. General Manager, Statistics Department, Bangladesh Bank, Motijheel, Dhaka
4. Chairman, National Board of Revenue, Segunbagicha, Dhaka
5. Commissioner, Customs Bond Comissionarate, Segun Bagicha, Dhaka
6. Cheif Controller, Office of The Chief Controller of Imports & Exports (CCI&E), Level 15, National Sports Counsil Tower, Palton, Dhaka

Bangladesh Investment Development Authority (BIDA)

Prime Minister's Office

This industrial Project is registered with BIDA on the basis of the following information submitted by the investor's

Registration No : J-20230913009202-H
Dated: 13 September, 2023

1. Name of the Organization: Avanguard Shipyard Ltd.
2. Title of the Registered Project: Avanguard Shipyard Ltd.
3. Office address: Concord Hamid Hafiz, Level 8(B), House 93, Road 4, Block B, Banani, Dhaka 1213, Banani TSO, Banani, Dhaka-1213
4. Factory Address: 1 no. Pankhali Union, Pankhali, Dacope, Khulna-9270
5. Type of industry: (30111) Building of commercial vessels: passenger vessels, ferry-boats, cargo ships,tankers, tugs, hovercraft (except recreation-type hovercraft) etc.
6. Date of Commercial Operation: 01 December, 2024

Product Name	Quantity/ Pieces	Sales Value
Construction of Ships and other Water Borne Vessel or Hull Block	40.67 (Piece)	2410 Taka (Million)
Repair service	1300 (Piece)	417 Taka (Million)

8. Sales: Local 44%, Foreign 56%
9. Investment (Taka in Million):

SL	Description	Value (Million)
1	Land	468 Taka (Million)
2	Building	1040.524609 Taka (Million)
3	Machinery & Equipment	2097.779428 Taka (Million)
4	Others	416.211205 Taka (Million)
5	Working Capital	80 Taka (Million)
Total Investment (BDT)		4102.51524 Taka in Million (4102515240.00 Taka)

10. Equity (Taka in Million):

1	Local Equity	1113.293604 Taka (Million)	85.00% of total equity
2	Foreign Equity	196.463577 Taka (Million)	15.00% of total equity
3	Local Loan	2792.758062 Taka (Million)	100.00% of total equity
4	Foreign Loan	0 Taka (Million)	0.00% of total equity
Total Financing (BDT)		4102.51524 Taka in Million (4102515240.00 Taka)	

11. Number of Employee: Local 200 Persons, Foreign 4 Persons, Total 204 Persons.
12. Principal Promoter's Information:
Name: Mohammed Imtiaz Hossain, Country: BANGLADESH
Address: Concord Hamid Hafiz, Level 8(B), House 93, Road 4, Block B, Banani, Dhaka 1213, Banani TSO, Banani, Dhaka-1213
13. List of share holders/Directors (Please see the enclose)

(M. Jashim Uddin Khan)
Director
Phone:
Email: khan.mopa@gmail.com

Bangladesh Investment Development Authority (BIDA)

Prime Minister's Office

Registration No : J-20230913009202-H
Dated: 13 September, 2023

1. As per the industrial policy the sub-sector is neither in the reserved list nor discouraged list. Therefore the proposal of the project may be registered on the following conditions:

Investors should be aware that:

(a) They are free to procure infrastructural and other services/utilities (including environment clearance) needed for the implementation and operation of their projects directly from the concerned agencies/departments. Alternatively, the BIDA will also assist investors in obtaining requisite services/utilities from the concerned government agencies/departments on request from your company. In this connection, investors shall have to contact the BIDA Utility services cell.

(b) BIDA is ready to assist/provide a range of services, including advice, information and clarification on a range of investment related issues, government polices procedures and regulations.

(c) The project, eligible for various tax incentives, as articulated in the government's industrial and economic policies and in public notices issued from time to time by relevant government agencies, may obtain copies from BIDA Utility Services Cell.

(d) Certain products are required to conform to standards established by the Bangladesh Standards & Testing (BSTI), prior to marketing. Please check your product standard.

2. Investors shall have to follow/take the under mentioned conditions/measures:

3. You shall have to take necessary safety measures as per Factories Act, 1965.

4. You shall have to import the machinery, spare parts and raw materials as per existing import policy order of the Government.

5. You shall have to arrange sufficient fire fighting equipments as safety measure to the project

6. You shall have to obtain necessary clearance from the Department of Environment before implementation of your project.

7. A half yearly project performance report (PPR) in prescribed format must be submitted on or before 30th June and 31st December every year till the project goes into commercial operation/production. After commencing commercial operation/production an annual PPR must be submitted by 31st December every year through OSS portal.

8. You shall have to arrange preservation of rain water for using in your factory to reduce pressure on ground water.

9. You shall have to take prior permission from BIDA in case of any amendment of this registration letter including ownership or location of the project.

10. Any effluent of the industrial unit should not be discharged into the river connecting lake or general water reservoir without proper treatment

11. You shall have to provide/create the following facilities, if applicable;

(a) Day care center (b) Maternity leaves

(c) Low cost & safe housing facilities for the low paid female works, near & around the establishment

(d) Equal pays & allowance for male & female workers in your organization

(e) Low priced canteen for workers

(f) Enact effective rules of conduct to enable working atmosphere among the male & female workers.

12. You shall not be allowed to do any business/trade other than services at column No. 7 under this registration.

13. You shall have to abide by the guidelines of the government in case of employment of expatriate personnel in your project.

* You shall have to market 44% and export 56% of your products

* You shall have to implement your project within 01 December, 2024

14. As per decision of National Disaster Management Council a disaster response team along with contingency plan will have to be made and required equipment will have to be procured.

The Bangladesh Investment Development Authority reserves the right to cancel the registration of the investment if any of the above conditions or any part of the conditions is violated. You are requested to mention Registration Number in all your future correspondence with BIDA

(M. Jashim Uddin Khan)
Director
Phone:
Email: khan.mopa@gmail.com

PROPOSAL FOR WWTP (WASTEWATER TREATMENT PLANT)

CLIENT NAME:	***AVANGUARD SHIPYARD LTD.***
ADDRESS:	*Pankhali, Dacope, Khulna.*
TREATMENT TYPE:	*STP (Sewage Treatment Plant)*
CAPACITY:	*1000 LPH or 16 m^3/16hr*

HUMAN WASTE WATER GENERATION CALCULATION

Details Calculation of Sewage:

1.Office Staff = 200 Persons.

Water required = 200 X 30 liter/person = 6000 liter/day

2. Office staff with 24-hour duty = 50 Persons (approximate)

Water required = 50 × 120 liter/person = 6000 liter/day

Total waste water = 6000+6000 = 12000 liter/day

10% adding as free board in basic design= 12000 + 1200 = 13200 liter/day

= 825 liter/hr.

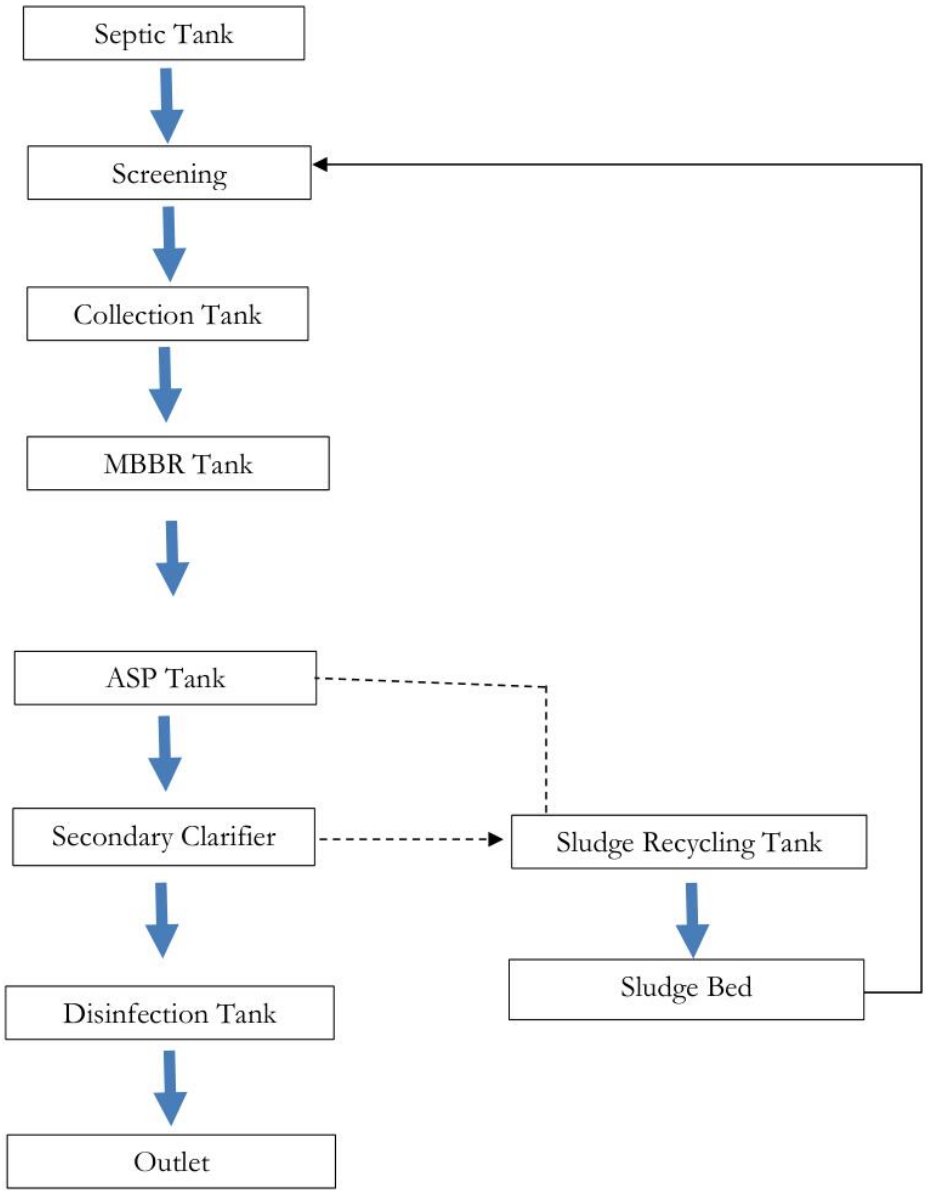
Less Contaminated effluent is 0%

Operated continuously for 16 hours a day

Final design envisaged is 1000 lit/hr.

	Capacity:	1.0 m^3/hr.								
S/L	Unit	Qty	Size					Volume m^3	RT-hr.	SOR $m^3/m^2/h$
			L - m	W-m	H-m	FB -m	Area			
1	Collection Tank	1	2.0	1.2	2.5	0.5	2.4	6.0	6.0	
2	MBBR Tank	1	2.0	1.2	2.5	0.5	2.4	6.0	6.0	
3	ASP Tank	1	2.0	1.2	2.4	0.6	2.4	5.76	5.76	
4	Secondary Clarifier	1	2.0	1.2	1.7	0.7	2.4	4.08	4.08	0.42
6	Disinfection	1	1.2	1.2	2.1	0.3	1.44	3.02	3.02	
7	Sludge Recycling Tank	1	1.0	1.0	2.3	0.7	1.0	2.3	2.3	
8	Sludge Drying Bed	3	1.2	1.2	1.2					

PROCESS CHART



COLLECTION TANK SIZING:

Collection tank Sizing= (2.0 m X 1.2m X 2.5 m)

Design Basis:

Volume of Collection Tank = (2.0 m X 1.2 m X 2.5 m)

= 6.0 m^3

Hydraulic Retention Time (RT) = (6.0 m^3 ÷ 1 m^3/hr.)

= 6 hr.

Free Board = 0.5 m

1. MBBR TANK SIZING;

MBBR Tank Sizing = (2.0 m X 1.2 m X 2.5 m)

Design Basis:

Volume of MBBR Tank = (2.0 m X 1.2 m X 2.5 m)

= 6.0 m^3

Retention Time (RT) = (6.0 m^3 ÷ 1 m^3/hr.)

= 6 hr.

Free Board = 0.5 m

BIOLOGICAL OXIDATION (MBBR):

MBBR Media Detail and Design Consideration:

Where,

Q = Flow Rate = 16 m^3/day

S0 = Inlet BOD = 280 mg/1

MBBR Media:

Specific Surface Area: 500 m^2/m^3

Size of MBBR Media: 12 mm X 25 mm

Void % = 80%

Fill % = 15 % – 65 %

BOD LOADING RATE:

BOD Loading Rate: $= Q \times S_o$

$= 16\ m^3/day \times (280\ g/m^3)$

$= 4480\ g/day$

REQUIRED MBBR MEDIA SURFACE AREA:

Considering BOD Removal 90 %, SALR = 7.5 $g/m^2/Day$

Required MBBR Media Surface Area = BOD Loading Rate / SALR

$= 4480\ g/day \div 7.5\ g/m^2/Day$

$= 597.33\ m^2$

TOTAL VOLUME OF MBBR MEDIA:

MBBR Media Specific Surface Area = 500 m^2/m^3

Total Volume of MBBR Media = (Required Media Surface Area) ÷ (MBBR Media Specific Surface Area)

$= 597.33\ m^2 \div 500\ m^2/m^3$

$= 1.19$ m3

REQUIRED MBBR TANK VOLUME

Required MBBR Tank Volume = (Total Volume of Media) ÷ (Carrier Fill %)

$= 1.19\ m^3 \div 20\ \%$

$= 1.19\ m^3 \div 0.2$

$= 5.97\ m^3$

LIQUID VOLUME IN MBBR TANK

Liquid Volume in Tank = Required Tank Volume - [Required Carrier Volume × (1 - Carrier % Void Space)]

$= 5.97\ m^3 - [1.19\ m^3 \times (1\text{-}80\%)]$
$= 5.97\ m^3 - [1.19\ m^3 \times (1\text{-}.80)]$

$= 5.97\ m^3 - [1.19\ m^3 \times 0.2]$

= 5.97 m^3 – 0.238 m^3

= 5.73 m^3

HYDRAULIC RETENTION TIME (HRT) OF MBBR TANK

MBBR Tank HRT = (Liquid Volume in MBBR Tank m^3) ÷ (Flow Rate , Q)

= 5.73 m^3 ÷ 1 . 0 m^3/hr

= 5.73 hr

CALCULATED AIR FOR BIOLOGICAL OXIDATION

$$Actual\ Oxygen\ Requirement = \frac{BOD * Flow\ rate * 1.8}{1000}$$

AOR = (280 g/m^3 X 16 m^3/day X 1.8) ÷ 1000

= 8064 ÷ 1000 Kg O_2 / day

= 8.06 Kg O_2 / day

$$Standard\ Oxygen\ Requirement = \frac{AOR}{0.50}$$

Standard Oxygen Requirement SOR = (AOR ÷ 0.5) Kg O_2 / day

= 8.06 / 0.5 Kg O_2 / day

= 16.12 Kg O_2 / day

SOTE = 20 %

$$SOTE = \left(\frac{SOR}{Q}\right) * \left(\frac{1}{\rho}\right) * \left(\frac{1}{23.17\%}\right)$$

20 % = (16.12 kg/day ÷ Q) × (1 ÷ 1.27 Kg/m^3) × (1 ÷ 23.17 %)

Or 0.2 = (16.12 ÷ Q) × 0.787 × 4.316 (kg/day ÷ Kg/m^3)

Or Q = 273.77 m^3/day ÷ 16 hr. / day
Or Q = 17.11 m^3/**hr.**

Supplied blower flow Rate= 17.11 m^3/hr. @5000mm Aq

DIFFUSER NUMBER CALCULATION FOR BIOLOGICAL OXIDATION:

Diffuser Type: Coarse Bubble Diffuser

Size: 6 Inch

Air Flow Per Diffuser = 10 m^3/hr./Nos of Diffuser = 0.166 m^3/min/no's of Diffuser

Total Air for MBBR Tank = 17.11 m^3/hr

Total No of Diffuser Required = 17.11 m^3/hr ÷ 10 m^3/hr/Nos of Diffuser

= 1.7 Nos of Coarse Bubble Diffuser

ASP TANK SIZING;

ASP Tank Sizing = (2.0 m X 1.2m X 2.4m)

Design Basis:

Volume of ASP Tank = (2.0 m X 1.2 m X 2.4 m)

= 5.76 m^3

Retention Time (RT) = (5.76 m^3 ÷ 1.0 m^3/hr)

= 5.76 hr.

Free Board = 0.6 m

SECONDARY CLARIFIER TANK SIZING

Flow Rate = 16 m^3/16hr..

Secondary Clarifier Sizing = (2.0 m × 1.2 m × 1.7 m)

Desgin Basis:

Secondary Clarifier Vol = (2.0 m × 1.2 m × 1.7 m)

= 4.08 m^3

Free Board = 0.7 m

Waste Water Flow Rate= 1.0 m^3/hr..

I. Surface overflow rate (SOR)

SOR= 1.0 m^3/hr./ (2.0m ×1.2m)

= 1.0m^3/hr. ÷ 2.4 m^2

= 0.42 m^3/m^2/hr.

As per "Waste Water Engineering Treatment and Reuse" by Metcalf &Eddy (Fifth Edition)

II. Hydraulic retention time (HRT)

HRT= (2 m × 1.2 m × 1.7 m) ÷ 1.0 m^3/hr.

= 4.08 m^3 ÷ 1.0m^3 /hr.

= 4.08 hr.

As per "Waste Water Engineering Treatment and Reuse" by Metcalf &Eddy (Fifth Edition)

III. Weir Overflow Rate (WOR)

WOR = 16 m^3/day / (2 m Weir Length)

= 16 m^3/day /2 m

= 8.0 m^3/m/day

As per "Waste Water Engineering Treatment and Reuse" by Metcalf &Eddy (Fifth Edition)

DISINFECTION TANK:

Disinfection tank Sizing = (1.2 m X 1.2 m X 2.1 m)

Design Basis:

Volume of Disinfection Tank = (1.2 m X 1.2 m X 2.1 m)

= 3.02 m^3

Retention Time (RT) = (3.02 m^3 ÷ 1.0 m^3/hr..)

= 3.02 hr.

Free Board = 0.3 m.

SLUDGE RECYCLING TANK:

Sludge Recycling tank Sizing = (1.0m X 1.0m X 2.3m)

Design Basis:

Volume of Sludge Recycling Tank = (1.0 m X 1.0 m X 2.3 m)

= 2.3 m^3

Retention Time (RT) = (2.3 m^3 ÷ 1.0 m^3/hr.)

= 2.3 hr.

Free Board = 0.7 m.

SLUDGE DRYING BED:

Sludge Drying bed Sizing= (1.2 m X 1.2 m X 1.2 m)

SLUDGE MANAGEMENT

Plant Data:

WWTP Capacity: 16 m^3/day

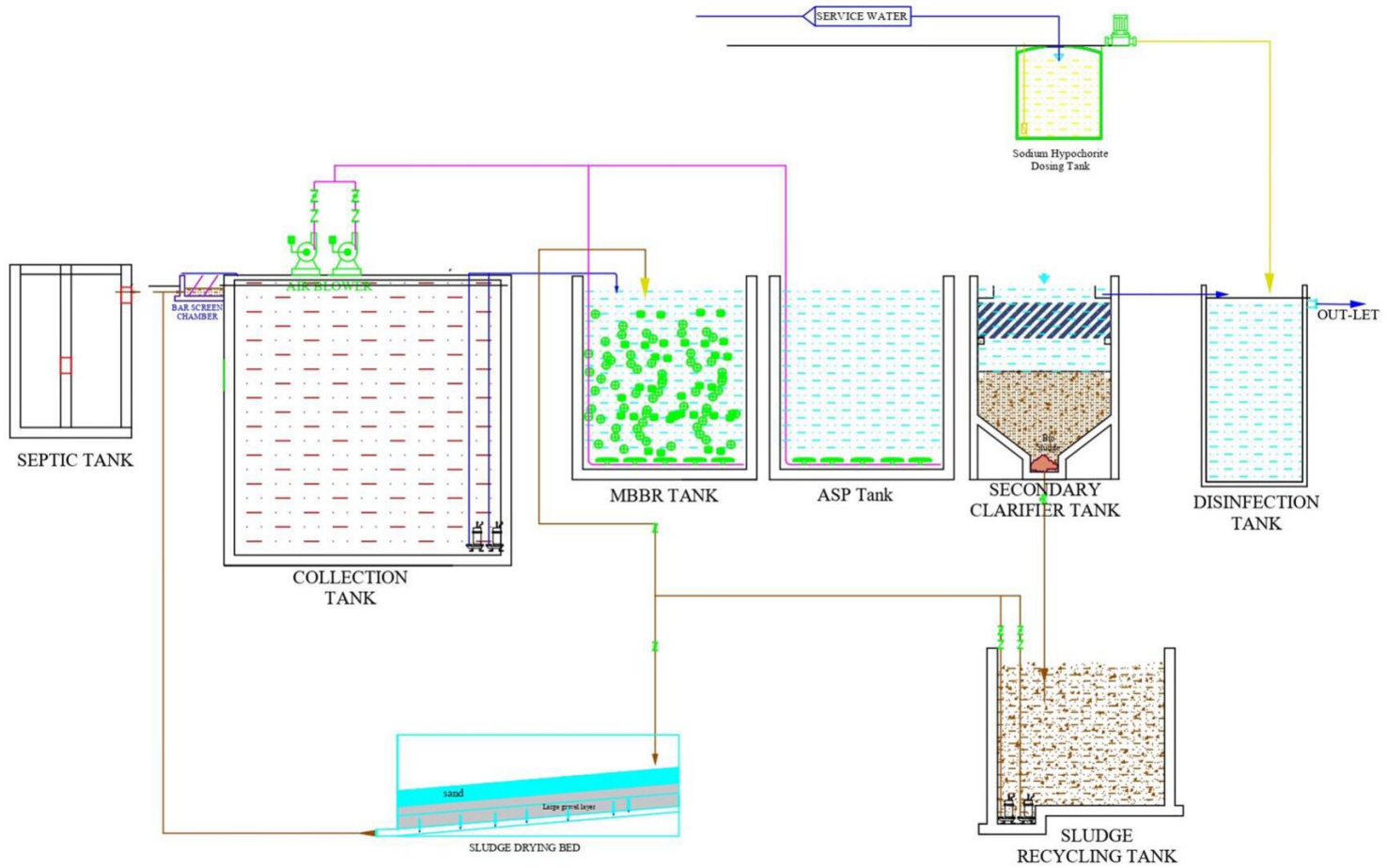
BOD Load: 280 mg/L

Sludge Can be dewatered Yearly or Can be Cleaned Along with Septic Tank Septage or can be managed by sludge drying bed. managed by sludge drying bed.

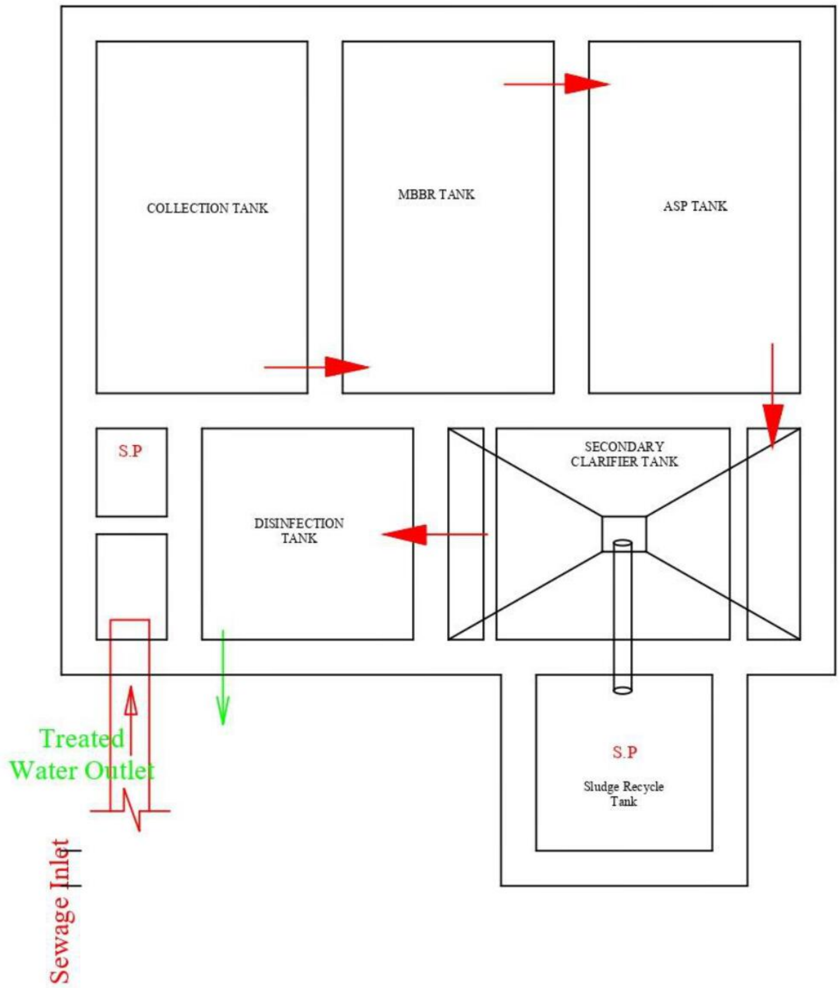
2. SCOPE OF SUPPLY & TECHNICAL DATA

S/L	SCOPE OF SUPPLY	DESCRIPTION	QTY	VENDOR	ORIGIN	IMAGE
1.	*Wastewater Transfer pumps*	Capacity: 1.0 m^3/hr.Head: 6 m H Type: Submersible Mud Pump MOC: Cast iron Power: 0.5 HP/ 0.35 kw.	1 W + 1 S	Grampus	Taiwan	
2.	*Diffuser for MBBR Tank*	Type : Coarse BubbleDia : 6 ″ MOC: EPDM, Mounting: Included	2 set	---------	Taiwan	
3.	*Biochip Media for MBBR tank*	Diameter: 25 mm Length: 12 mm Surface Area: 500 m^2/m^3 MOC: High Virgin HDPE	1.5 m^3	GGEL	China	
4.	*Air Blower*	Capacity: 50 m^3/hr. Type: Roots Type Tri Lube Pressure: 5000 mmAq Power: 2 HP / 1.5 kw.	1 W + 1 S	Goldentech	Taiwan	
5.	*Sludge Recycle pumps*	Capacity: 1.0 m^3/hr.Head:6 m H Type: Submersible MudPump MOC: Cast iron Power: 0.5 HP/ 0.35 kw.	1 W + 1 S	Grampus	Taiwan	
6.	*Sludge Transferpumps*	Capacity: 1.0 m^3/hr.Head: 6 m H Type: Submersible Mud Pump MOC: Cast iron Power: 0.5 HP/ 0.4 kw.	1 W + 1 S	Grampus	Taiwan	

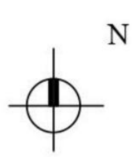
7.	*Sodium Hypochlorite Dosing Pump*	Capacity : 14 LPH Pressure : 8 bar max, Type: Metering Dosing Pump MOC: PVDF Motor: 20 W	2 Set	SEKO	Italy	
8.	*Outlet Flow Meter*	Type : Electromagnetic Cable Size : 25 mm Capacity : 5 – 10 m^3/hr. Make : China . Temp Max : 80ºC Display : English LCD display Function: Multi-function PTFE Linear (integrated)	1 Set	----------	China	
9.	*Inlet Flow Meter*	Type : Electromagnetic Cable Size : 25 mm Capacity : 5 – 10 m^3/hr. Make : China Temp Max : 80ºC Display : English LCD display Function: Multi-function PTFE Linear (integrated)	1 Set	----------	China	
10.	*MCC Board*	Major Item, Magnetic Contact Circuit Breaker Overload Relay Timer Major Equipment: Mitsubishi/Schneider/Siemens	1 Set	GGEL/Equivalent	Assembling / Similar	
11	*Inter Connecting Pipe, Fittings, Valves, cables etc.*	Immersed Air Line: PVC, uPVC Air Line: MS/UPVC Water Line: PVC, uPVC Fittings: SS, MS, uPVC, PVC, CI & GI		GGEL/Equivalent	Local/ Similar	



PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY : 1.0 M^3/ hr SEWAGE TREATMENT PLANT-2	**Global Environmental and Textile Technological Services** Address: 102/1 West Agargaon, Darul Yussuf Apartment(5A).Sher-e-Bangla Nagar, Dhaka-1207. Tel : 01711-231512, 01716765329. E-MAIL: engr.kibria_2010@yahoo.com	***Avanguard Shipyard Ltd.***		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MIZANUR RAHMAN (CIVIL ENGINEER)	PROCESS FLOW DIAGRAM SHEET NO : A-1 | DATE : 23-08-2023	CHEMICAL DOSING LINE EFFLUENT FLOW LINE AIR FLOW LINE SLUDGE LINE EQUIPMENT REVISION : 00 | SCALE : MM



	Tank Name	Tank Size	F.B	Area	Volume	H.R.T	SOR
01	Collection Tank	2000mmX1200mmX2500mm	500mm	2.4m²	6.0m³	6.0hr	
02	MBBR Tank	2000mmX1200mmX2500mm	500mm	2.4m²	6.0m³	6.0hr	
03	ASP Tank	2000mmX1200mmX2400mm	600mm	2.4m²	5.76m³	5.76hr	
04	Secondary Clarifier Tank	2000mmX1200mmX1700mm	700mm	2.4m²	4.08m³	4.08hr	0.42m³/m²/hr
05	Disinfection Tank	1200mmX1200mmX2100mm	300mm	1.44m²	3.02m³	3.02hr	
06	Sludge Recycle Tank	1000mmX1000mmX2300mm	700mm	1.0m²	2.3m³	2.3hr	
07	Sludge Drying Bed-1,2,3,4	1200mmX1200mmX1200mm					



PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY 1.0m³/hr SEWAGE TREATMENT PLANT-2	Global Environmental and Textile Technological Services Address: 102/1 West Agargaon, Dewl Yousuf Apartment(3A), Sher-e-Bangla Nagar, Dhaka-1207. Tel : 01711-231512, 01716765329.	Avanguard Shipyard Ltd.		MAHMUD AL HASAN B.SC ENGINEER (CHEMICAL) GENERAL MANAGER	MD. MIZANUR RAHMAN (CIVIL ENGINEER)	LAY-OUT PLAN	
						SHEET NO : A-0 DATE : 23-08-2023	REVISION : 00 SCALE : MM