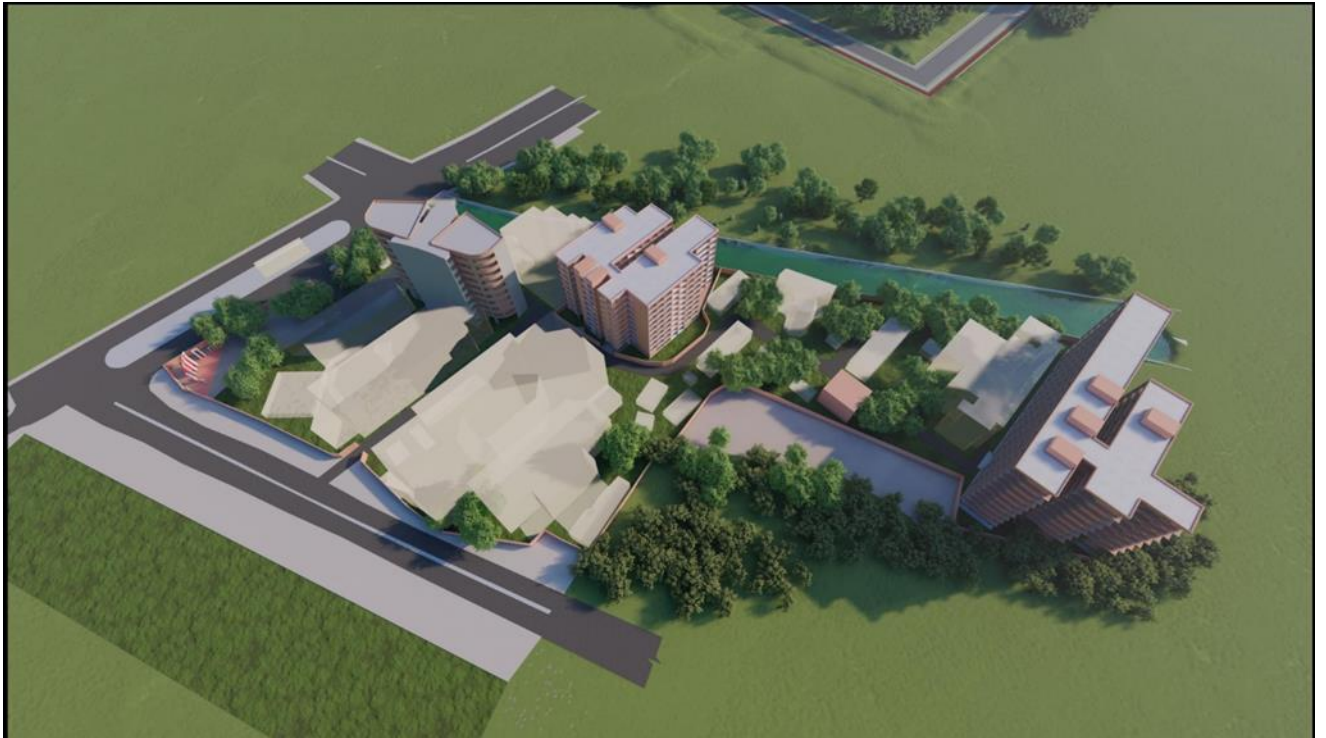




Medical Education and Family Welfare Division Ministry of Health
and Family Welfare

Government of the People's Republic of Bangladesh

Feasibility Study for Establishment of Infrastructure Development of Dhaka Dental College



Prepared by:

WASO Engineers & Consultants (BD) Ltd.

June 20, 2023

Acknowledgement

We would like to extend our sincere appreciation to the Medical Education and Family Welfare Division of the Ministry of Health and Family Welfare, Government of Bangladesh, for generously providing the necessary funds to carry out the feasibility study. Our utmost gratitude goes to the Secretary of the Medical Education and Family Welfare Division, Ministry of Health and Family Welfare, for their kind cooperation and unwavering support throughout the study.

We would also like to express our profound gratitude to the Director General of Medical Education (DGME) for their invaluable assistance in facilitating the study. The guidance and advice offered by the Director, Planning, DGME played a pivotal role in envisioning Dhaka Dental College as a research-oriented institute, and for that, we extend our heartfelt thanks.

We are indebted to the Additional Director General of Medical Education for their sincere cooperation during the course of the study. The Principal of Dhaka Dental College deserves special recognition for his active support in ensuring the successful completion of the study within the stipulated time frame.

We are grateful to the Deputy Commissioner of Dhaka for their active support and cooperation throughout the study.

A special note of thanks goes to the Project Director of the "Feasibility Study for the Establishment of Infrastructure Development of Dhaka Dental College" for their invaluable guidance and support throughout the study.

Last but not least, we would like to express our deep gratitude to the Honorable Minister of the Ministry of Health and Family Welfare, Government of Bangladesh, for their invaluable advice and active support, which played a key role in the success of this study.

Finally, we extend our heartfelt thanks to all the team members involved in this feasibility study for their dedicated efforts and valuable contributions.

Team Leader

Zillur Rahman Biswas
Management & Strategic Consultant
WASO Engineers & Consultants (BD) Ltd.

LIST OF ACRONYMS:

ADP- Annual Development Program

DDC- Dhaka Dental College

DGME- Director General of Medical Education

DR-Disaster Recovery

EIA-Environmental Impact Assessment

EMP-Environmental Management Plan

EMS- Environmental Management Systems

FDG- Focus Group Discussion

GDP- Gross Domestic Product

KII- Key Informant Interview (KII)

MOHFW-The Ministry of Health & Family Welfare

PGD-Preferred Group Discussion

PRA-Participatory Rural Appraisal

SDG- Sustainable Development Goal

SWOT- Strength, Weakness, Opportunity and Threat

TIA- Traffic Impact Assessment

TOR- Terms of Reference

UHC- Universal Health Coverage

WHO- World Health Organization

TABLE OF CONTENTS

S.L	Topic Contents	Page No
*	Executive Summary	01-03
01	Section 1: Basic Information	04
02	Section 2: Introduction	05
	a) Project Background Rationale and Genesis	05-6
	b) Objectives of the feasibility study	06-7
	c) Approach and methodology of the feasibility study	07-08
	d) Organization of the feasibility study	08-09
03	Section 3: Market/Demand analysis	10
	a) Problem statement	10-11
	b) Relevance of the Project Idea	11
	c) Proposed Project Interventions	11-12
	d) Stakeholders	12-15
	e) Demand Analysis	15
	i) Current Demand	15-17
	ii) Future Demand	17-19
	iii) Various Constrains	19-21
	f) SWOT Analysis	21-22
04	Section 4: Technical/Technological & Engineering analysis	23
	a) Location	23-24
	b) Technical design	24-28
	c) Output plan	28
	d) Costs Estimates	29
	e) Implementation Timeline	29
05	Section 5: Environmental, Sustainability, Climate Resilience and Disaster Risk Analysis	30
	5.1 Environmental, Climate Change and Disaster Risk Analysis	30-43
	a) The likely environmental, disasters and climate change impacts or risks from the project	30-35
	b) Counter measures are taken to reduce these impacts	36-40
	c) The cost for reducing/mitigating the negative impacts	41-42
	d) Alternative ways of delivering the required services or goods without incurring these environmental costs	43
	e) Types of assessments are required for the project	43
	f) Resettlements issues to be addressed	43
	5.2 Assessment of Disaster Resilience of the Project	43-46

	a) Contingency Plan for Emergency Disaster Management	43-44
	b) Business Continuity Plan	44-45
	c) Time of Recovery	45
	d) Reporting of residual risks	46
06	Section 6: Cost-Benefit Analysis	47
	Financial Analysis -	47-49
	Economic analysis-	50-54
07	Section 7: Human Resources and Administrative Support Analysis	55-57
	a) Managerial and skilled workforces are needed during implementation and operational phases of the project	55
	b) The project entity have ability to provide the managerial and skilled workforces needed for implementation of the project	55
	c) The implementing agency have institutional capacity	56
	d) The project entity equipped with skilled & experienced workforces to operate the project output	56
	e) The entity have adequate funds under its recurring budget to incur the operational expenditure of the project output	56-57
	f) The timing of the project consistent with organizational capacity	57
08	Section 8: Institutional and Legal Analysis	58-59
09	Section 9: Risk (Uncertainty) and Sensitivity Analysis	60-61
10	Section 10: Alternative/ Options Analysis	62
11	Section 11: Recommendation and Conclusion	63-64
12	Section-12: Annexes	65
	Financial and Economic Models	66-68
	Technical Engineering Designs	Annex
	Traffic Impact Analysis	Annex
	Environmental Impact Analysis	Annex

EXECUTIVE SUMMARY

The feasibility study conducted for the establishment of infrastructure development of Dhaka Dental College in Mirpur-14, Dhaka, Bangladesh, encompasses a comprehensive analysis of various aspects, including Traffic Impact Assessment, Environmental Resilience Analysis, Economic Analysis, and Financial Analysis. In addition to addressing the market demand for dental education and strategies to attract foreign students, the study recognizes the significant contribution that the implementation of this project can make towards achieving the Sustainable Development Goals (SDGs) in Bangladesh, particularly in the realm of healthcare.

Bangladesh's medical and dental education system has undergone significant advancements, and the establishment of Dhaka Dental College seeks to further fortify the country's healthcare sector. Situated in the bustling and traffic-prone area of Mirpur-14, the college's strategic location presents both opportunities and challenges that warrant meticulous consideration.

Dhaka Dental College, situated in the picturesque surroundings of Mirpur-14 in Dhaka, Bangladesh, acknowledges the limitations of its current infrastructure in catering to the academic activities and hostel needs for both male and female students. In response to this, a momentous and ambitious project for expansion has been undertaken to address these inadequacies.

Apart from its main campus in Mirpur, Dhaka Dental College also has a building in Sobhanbagh, Dhanmondi, where approximately 200 students are accommodated. To accommodate the growing number of students and to enhance the learning environment, Dhaka Dental College (DDC) has wisely chosen to embark on this expansion journey. An expert consultant has meticulously explored the existing infrastructure and provided valuable insights to guide the construction process.

In the Mirpur campus, a one-story boys' hostel will be replaced by a splendid ten-story building, significantly augmenting the capacity to house male students. Additionally, the two-story boys' hostel will undergo vertical expansion up to the fifth floor, further increasing the accommodation capacity by 400 students. Similarly, the current girls' hostel, comprising of a 9-story building, will make way for an impressive 10-story building, accommodating 450 more female students. These developments will provide the college with much-needed additional residential spaces.

The visionary plan also includes the construction of a two-story, 3000 square feet principal's bungalow, adding to the administrative charm of the institution.

In the Dhanmondi, Sobhanbagh area, the existing 5-story boys' hostel will be replaced with a remarkable 12-story building. This structure will feature two basements for convenient parking facilities. The ground floor will serve as a functional space, while the subsequent two floors will house the Research Centre for medical and dental education. The following four floors will be thoughtfully designed to accommodate postgraduate students and doctors, providing a living space for approximately 232 individuals. The top five floors will offer spacious residential units for officers, doctors, and executives. These residential units will come in three categories - 1000 square feet (15 units), 1200 square feet (20 units), and 1500 square feet (15 units), each with a separate entry to ensure privacy.

The architectural design of these proposed structures has been thoughtfully integrated into the college's expansion plan. For further details and illustrations of the buildings, please refer to the annexed section of the report.

With these grand plans for expansion, Dhaka Dental College is poised to uplift its academic and residential facilities, reinforcing its commitment to fostering excellence in dental education and medical research. The proposed developments stand as a testament to the college's dedication to providing its students and faculty with an exceptional learning and living experience.

The Traffic Impact Assessment scrutinizes the potential implications of the college on the existing traffic conditions in Mirpur-14. In order to ensure seamless movement of vehicles and pedestrians, it is imperative to implement measures that mitigate potential traffic congestion. Thoughtful planning of transportation infrastructure, including road networks and traffic management systems, coupled with close coordination with relevant authorities, will be paramount in achieving this objective.

The Environmental Resilience Analysis underscores the importance of striking a harmonious balance between the proposed infrastructure development and the environment. By implementing rigorous environmental management measures, including effective waste management systems and sustainable energy practices, the college can minimize its ecological footprint. Regular monitoring and the establishment of an Environmental Management and Monitoring Cell will ensure compliance with environmental regulations and foster a sustainable operation.

The Economic Analysis underscores the significant economic benefits associated with investing in Dhaka Dental College. Beyond the production of skilled healthcare professionals, the college's establishment will generate employment opportunities and yield cost savings for the community by reducing outbound medical tourism. The study also recognizes the potential to attract foreign students to Dhaka Dental College, enhancing its economic value and augmenting its reputation as a global center of dental education. Strategic marketing efforts and partnerships with international educational institutions can help draw foreign students to the college.

The Financial Analysis assesses the financial feasibility of the project, considering aspects such as initial investment costs, operational expenses, revenue projections, and potential funding sources. By adopting prudent financial strategies, including efficient resource allocation, cost optimization, and exploring revenue generation avenues such as research collaborations and continuing education programs, the college can ensure its long-term financial sustainability.

Bangladesh has made remarkable strides in its healthcare system, and the establishment of Dhaka Dental College aligns with the country's commitment to attaining the SDGs. The proposed infrastructure development of the college will serve as a crucial catalyst in improving health outcomes and strengthening the dental health system. By increasing access to quality dental care, enhancing efficiency, and promoting equity, the college will contribute to SDG targets related to good health and well-being (SDG 3) and universal health coverage (SDG 3.8).

The project's impact extends beyond the immediate benefits of dental education. By generating a pool of skilled dental professionals, Dhaka Dental College will address the critical shortage of

healthcare workers, as outlined in the SDGs. The college's production of competent dental graduates and nurses will significantly contribute to SDG 3.4, which aims to increase the availability of qualified healthcare professionals.

Furthermore, the establishment of the expansive infrastructure of Dhaka Dental College will have far-reaching socio-economic implications. It will create employment opportunities, promote economic growth, and reduce the burden of medical tourism, thus contributing to SDG 8 on decent work and economic growth. The study emphasizes the potential to attract foreign students to the college, fostering cultural exchange and global cooperation in achieving the SDGs.

By ensuring the sustainability of the project's environmental impact through effective environmental management measures, the college will align with SDG 13 on climate action. The implementation of sustainable practices, such as waste management and energy conservation, will help mitigate the college's ecological footprint and contribute to building a resilient and environmentally conscious healthcare institution.

This establishment of Dhaka Dental College, as proposed in this feasibility study, represents a significant step towards achieving the SDGs in Bangladesh, particularly in addressing health-related challenges. By improving access to quality dental care, producing skilled healthcare professionals, and fostering economic growth, the college aligns with multiple SDGs, including SDG 3 (good health and well-being), SDG 8 (decent work and economic growth), and SDG 13 (climate action). The successful implementation of this project calls for collaborative efforts among stakeholders, recognizing the transformative impact it can have on the nation's healthcare landscape and its progress towards the SDGs.

Overall, the findings of the feasibility study strongly advocate for the establishment of infrastructure development for Dhaka Dental College. Despite the traffic challenges posed by its location, thorough planning and effective implementation of traffic management measures can mitigate the impact and ensure smooth transportation flow. The study highlights the need for a comprehensive approach that caters to the demands of the local market while strategically targeting and attracting foreign students, thus elevating the college's global standing and reputation.

Given the market demand for dental education in Bangladesh and the potential to draw foreign students, Dhaka Dental College has the unique opportunity to become a preeminent center of excellence in dental education. By investing in this transformative endeavor and fostering collaboration among relevant stakeholders, including government authorities, educational institutions, and community members, we can shape a future where exceptional dental education and high-quality oral healthcare converge seamlessly in the heart of Mirpur-14, Dhaka. This endeavor will leave an indelible mark on the nation's well-being, elevating healthcare standards and promoting a thriving dental industry.

SECTION: 1
BASIC INFORMATION

1. Basic Information:

1.	Name of the Project	:	Conducting Feasibility Study for Establishment of Infrastructure Development of Dhaka Dental College						
2.	(a) Sponsoring Ministry/Division (b) Implementing Agency	:	a) Medical Education and Family Welfare Division, Ministry of Health and Family Welfare b) Directorate General of Medical Education (DGME)						
3.	Project Objectives (Project to be taken based on the study)	:	To assess the viability of establishment of further infrastructure development of Dhaka Dental College						
4.	Estimated Project Cost (Taka in Crore)	:	Approximately 501.38 Crore BDT						
5.	Sector & Sub-Sector	:	ADP/RADP Sector: Health (11), Sub-sector: Health education (51)						
6.	Project Category (Based on Environment Conservation Rules 1997)	:	Orange						
7.	Project Geographic Location (a) Countrywide (b) Division (c) District (d) Upazila (e) Others (City Corporation/Pourashava)	:	<table><tr><td></td></tr><tr><td>a) N/A</td></tr><tr><td>b) Dhaka</td></tr><tr><td>c) Dhaka</td></tr><tr><td>d) DNCC (Dhaka North City Corporation)</td></tr><tr><td>e) Dhaka Sadar</td></tr></table>		a) N/A	b) Dhaka	c) Dhaka	d) DNCC (Dhaka North City Corporation)	e) Dhaka Sadar
a) N/A									
b) Dhaka									
c) Dhaka									
d) DNCC (Dhaka North City Corporation)									
e) Dhaka Sadar									
8.	Project Duration	:	July 2023-2026						

SECTION: 2

INTRODUCTION

2. **Introduction: Project Background, Objectives, Approach and Methodology**

a) Project Background: Rationale and genesis (Mention the sources of information through reviewing the relevant documents)

Establishment of Infrastructure Development of Dhaka Dental College (DDC) is a proposed project that aims to address the increasing demand for dental healthcare services in Dhaka, Bangladesh.

The establishment of the new expansive infrastructure of Dhaka Dental College (DDC) will play a crucial role in meeting the dental needs of the city's growing population and contribute to the development of the dental profession.

The already high-quality education imparted by Dhaka Dental College (DDC) is not only a dream institution for the students at home but also for the regional countries. Every year, the demand of foreign students is increasing. In addition to this the government's commitment to provide high quality healthcare for all citizens of Bangladesh necessitates such expansion of Dhaka Dental College.

The following instruments were used for data collection:
Checklist for collecting data/information from secondary sources.

- Semi-structured Questionnaire for conducting key informant interviews (KII).
- Five-day training program for Research Assistants to ensure consistent data collection techniques and approaches.

The team would perform the following tasks to achieve the objective of the assignment:

- Reviewed secondary documents, reports, and plans such as Perspective Plan (PP 2021-2041), Sustainable Development Goals (2016-2030), 8th Five Year Plan (2021-2025), Annual Development Program (ADP), etc.
- Conducted in-depth Key Informant Interviews (KII), Focus Group Discussions (FGD), and Preferred Group Discussions (PGD).
- Collected quantitative and qualitative information for the feasibility study through observation, Participatory Rural Appraisal (PRA), and questionnaires.
- Captured the present status of activities and identified gaps in Human Resources for Health needs.

The proposed feasibility study will cover the following aspects:

- Analysis of the existing challenges for establishing the infrastructure of Dhaka Dental College.
- Conducting physical analysis through PRA and RRA, digital, topographic, and contour surveys of the new site to assess their suitability for planning and implementation of the buildings.
- Assessing social/cultural impacts and sustainability issues through project stakeholders' analysis.
- Technological analysis regarding the availability of land and other physical facilities.
- Conducting financial and economic analyses of the relevant costs and benefits

- to determine the project's viability.
- Assessing environmental/ethical/legal effects.
- Assessing the internal strengths, weaknesses, external opportunities, and threats.
- Identifying main sources of risks and preparing a business continuity plan and disaster preparedness plan to mitigate key risks.
- Preparing organograms for the establishment and functioning of the newly constructed Dental College and Hospital.

The study utilized both primary data (consultation meetings, FGDs, and Community Surveys) and secondary data to assess all aspects of feasibility, including demographic data, geographic data, meteorological data, existing facilities data, facility utilization data, disease patterns, and medical and nursing education data.

b) Objectives of the feasibility study

The primary objectives of the feasibility study entails finding the rationales in favour of the establishment of infrastructure of Dhaka Dental College where there is already a huge infrastructure that would address on the following subjects:

- Establishing a modern and expanded facility for dental college in Dhaka.
- Providing high-quality dental education and training.
- Improving access to dental healthcare services in the country.
- Fostering research and development in dental education.
- Producing skilled and competent dental professionals.
- Contributing to the overall growth and advancement of the dental sector in Bangladesh.

Project Scope:

The project requires:

- Construction of a state-of-the-art dental college facility equipped with advanced facilities for the lecture halls, students-staffs-doctors accommodation and accommodating related administrative areas.
- Recruitment of experienced faculty members and staff to ensure quality education and training.
- Implementation of advanced dental technologies and practices to enhance treatment outcomes, as part of the dental research studies.
- Collaboration with local and international dental institutions for knowledge exchange and research opportunities.

Project Implementation:

The implementation process involves several key steps, including:

- Preparation of detailed project plans and obtaining necessary approvals.
- Initiation of the construction phase, including site preparation, infrastructure development, and building construction.
- Procurement and installation of dental equipment and technologies.
- Recruitment of qualified faculty members and staff.
- Development and finalization of the curriculum.
- Establishment of partnerships and collaborations with relevant stakeholders.
- Adherence to regulatory requirements and standards for the successful execution of the project.

Project Benefits:

The establishment of DDC is expected to yield various benefits, such as:

- Improved accessibility to dental healthcare services for residents of Dhaka neighboring areas, and the country as a whole.
- Enhanced educational opportunities for aspiring dental students in Bangladesh.
- Creation of a skilled workforce to meet the growing demand for dental professionals.
- Potential reduction in the dependence on foreign dental treatments.
- Contribution to the overall development and advancement of the dental sector in Bangladesh.
- Economic benefits through job creation and the retention of foreign currency.

Conclusion:

The Dhaka Dental College (DDC) project holds significant importance in addressing the existing gaps in dental healthcare and education in Dhaka.

Its successful implementation will lead to improved oral healthcare services, produce competent dental professionals, and contribute to the overall development of the dental sector in Bangladesh.

The establishment of DDC is a step towards ensuring accessible and high-quality dental care for the people of Dhaka and beyond.

c) Approach and methodology of the feasibility study

Feasibility Study for Establishing Infrastructure for Dhaka Dental College: Comprehensive Analysis and Mitigation

Introduction:

This feasibility study aims to assess the viability and potential of establishing infrastructure for Dhaka Dental College. The scope of work encompasses several key areas, including needs assessment, spatial analysis, economic analysis, environmental impact assessment, social-economic impact assessment, and risk analysis. The study will provide valuable insights and recommendations to ensure the successful implementation of the project while mitigating potential risks.

Needs Assessment

A thorough needs assessment will be conducted to identify the demand for dental education and healthcare services in Dhaka and its surrounding areas. This assessment will involve analyzing demographic data, population growth trends, dental healthcare access, and the existing capacity of dental institutions in the region. The findings will help determine the necessity and potential impact of establishing Dhaka Dental College.

Spatial Analysis

Spatial analysis will focus on identifying the optimal location for Dhaka Dental College based on various factors such as accessibility, infrastructure availability, proximity to healthcare facilities, and potential for future expansion. GIS technology and relevant data will be utilized to evaluate different potential sites and select the most suitable one that meets the requirements of the college.

Economic Analysis

An economic analysis will be conducted to evaluate the financial viability of establishing Dhaka Dental College. This analysis will include a detailed assessment of project costs, revenue projections, operational expenses, funding options, and potential economic benefits. It will also consider the impact of the college on the local economy, employment opportunities, and potential revenue generation.

Environmental Impact Assessment

To ensure sustainable development, an environmental impact assessment will be carried out to evaluate the potential ecological consequences of establishing Dhaka Dental College. This assessment will analyze factors such as land use, waste management, energy consumption, and potential pollution. Mitigation strategies will be proposed to minimize adverse environmental effects and promote environmentally friendly practices.

Social-Economic Impact Assessment

A comprehensive social-economic impact assessment will be conducted to analyze the potential effects of Dhaka Dental College on the local community. This assessment will examine aspects such as access to dental healthcare, improved health outcomes, educational opportunities, and socio-economic development. The findings will help gauge the positive social impact and identify measures to maximize community benefits.

Risk Analysis and Mitigation Strategies

A risk analysis will be conducted to identify potential risks and challenges associated with establishing Dhaka Dental College. This analysis will consider factors such as financial risks, regulatory compliance, operational challenges, and unforeseen events. Mitigation strategies will be formulated to address each identified risk and ensure a robust and resilient infrastructure development process.

In conclusion, this feasibility study will provide a comprehensive analysis of the establishment of infrastructure for Dhaka Dental College. By conducting a needs assessment, spatial analysis, economic analysis, environmental impact assessment, social-economic impact assessment, and risk analysis with mitigation strategies, the study will lay the foundation for a successful and sustainable project implementation. The findings and recommendations will guide the decision-making process and ensure that the infrastructure development aligns with the needs of the community while minimizing potential risks.

d) Organization of the feasibility study

The feasibility study for establishing infrastructure for Dhaka Dental College (DDC) comprises several key components. These components outline the essential concepts and steps involved in assessing the feasibility of the project. The framework includes the following components: need assessment, site information, economic analysis, environmental impact, social impact, risk analysis and management, and stakeholders' engagement. The detailed contents considered in this feasibility study are described below.

i. Need Assessment

The need assessment section focuses on gathering information related to public health facilities and medical education. It provides insights into the demographic profile of the residents in the proposed regions, including healthcare needs, affordability status, extent of

coverage required, residents' beliefs, attitudes, practices, and cultural aspects. Additionally, it examines other socio-demographic characteristics, utilization of existing healthcare facilities, supply and demand for dental medical education, shortages of physicians nationwide, opportunities for medical education to address physician shortages, and the scope of dental medical education in both public and private dental colleges. The assessment also considers increasing the supply of qualified dental graduates, addressing affordability issues, and estimating the future needs of dental graduates both nationally and internationally.

ii. Spatial Planning

Spatial planning focuses on determining suitable land availability based on the size of the college and its potential for future expansion. It considers factors such as proximity to approaching roads, soil conditions suitable for construction, proper drainage systems for rainwater and subsoil water, availability of water supply and electricity, well-maintained sewerage systems, nearby biomedical waste disposal facilities, electric substations, dedicated electric supply lines, standby generators, transportation and communication facilities, and easy transport access. The project location, Dhaka, offers excellent connectivity, available facilities, and affordable costs. The site has wide road access, options for water supply from deep-tube wells or other sources, and recommended waste disposal units.

iii. Economic Analysis

The economic analysis section focuses on evaluating the financial aspects of the project, considering it as a social project. It involves identifying suitable approaches for estimating costs and benefits, valuing relevant inputs, estimating costs and benefits, describing data inputs, estimation techniques, and assumptions used. Cost-benefit analysis is performed to assess the economic viability of the project.

iv. Environmental Impact Assessment

The environmental impact assessment section analyzes the potential environmental consequences resulting from the establishment of Dhaka Dental College (DDC). It assesses the environmental impacts of the proposed area and describes the social impacts, both positive and negative, associated with the project.

v. Risk Analysis and Management

The risk analysis and management section identify the main sources of risk for the project and assesses their impact and likelihood. A comprehensive risk management plan is developed, including mitigation measures, to address and manage the key risks associated with the establishment of Dhaka Dental College (DDC).

SECTION: 3

MARKET/DEMAND ANALYSIS

3. **Market/Demand Analysis:** This section assesses the need for public investments and involves the elements listed below:

- a) **Problem Statement:** Provide an explicit definition of the problem to be addressed, identify the likely causes (both direct and indirect) of the problem and give a brief insight of the likely consequences if no intervention in the public sector is made.

Dhaka Dental College, located at 21°41' and 23°00' north latitudes and 89°14' and 89°45' east longitudes in Mirpur 14, Dhaka North City Corporation, Bangladesh, requires infrastructure expansion to address the growing demand for dentistry services. This expansion aims to enhance the capacity and facilities of Dhaka Dental College.

Bangladesh has witnessed considerable progress in various sectors, including healthcare. However, the availability of dentists is relatively limited. With only approximately 7,000 registered dental doctors throughout the country, there is a shortage of dental professionals, in Bangladesh. Additionally, there is an influx of students from other countries. This shortage hampers the ability to meet the immense demand for dentistry facilities across the nation.

To alleviate this challenge, the expansion of Dhaka Dental College's infrastructure is essential. By increasing its capacity, the college can produce a larger number of dental graduates annually, thereby addressing the shortage of dental professionals in the country. It is important to note that this expansion pertains solely to Dhaka Dental College.

The expansion of Dhaka Dental College will contribute to overcoming several primary challenges associated with dentistry in Bangladesh:

Insufficient dental educational facilities in Dhaka: Currently, there is a lack of a dedicated dental medical college in Bangladesh. Expanding Dhaka Dental College will bridge this gap and provide local students with the opportunity to pursue their dental education conveniently.

Limited availability of specialized dental services: There is a lack in the tertiary level dental colleges that can provide advanced dental care and specialized treatments. The infrastructure expansion of Dhaka Dental College will include the establishment of state of the art facilities academic building, multi-storied buildings for boys and girls hostel in its main campus in Mirpur 14 to cater for the growing demand, and a complex in Sobhanbag, Dhaka that would house the research wings in dentistry, dentists and senior students dormitories and some residential accommodation for the dentists and the dental professionals ensuring comprehensive dental services for the community, and allied facilities for the dental professionals.

Inadequate research facilities for dental healthcare: Currently, there is a lack of institutional facilities for conducting research on dental healthcare treatments and quality care. The expansion project for Dhaka Dental College will incorporate dedicated research facilities, enabling dental professionals to contribute to the advancement of dental healthcare through research and innovation.

Promoting awareness of dental health: The establishment of an expanded dental college in Dhaka will have a positive impact on the community by raising awareness about dental health issues. The college can actively engage in educational programs and initiatives to promote oral health and hygiene practices among the population.

The proposed infrastructure expansion of Dhaka Dental College in Mirpur 14, Dhaka, aims to meet the growing demand for dentistry services in Bangladesh. By increasing its capacity and facilities, the college will play a vital role in producing a larger number of dental graduates, addressing the shortage of dental professionals, and promoting dental healthcare awareness in the country.

And such a huge infrastructure would only be feasible at the government level from the considerations of economic and social perspectives and the long-term healthcare development in Bangladesh.

b) Relevance of the Project Idea: Justify the need for the proposed project by linking the project(s) goals, outcomes and outputs to Global/National Development Plans/Policies and Sector Strategic objectives.

The present need for dental services has outgrown the capacity of the existing infrastructure at Dhaka Dental College. In accordance with clause 4(1) of the Para-party titled "Formulation, processing & approval of development projects in the public sector and procedure of their revisions," issued by the Planning Division, and the Format for the Feasibility Study issued by the ECNEC section-1 on 31st January 2021, it is mandatory to conduct a feasibility study for development projects costing over Tk. 25 crores.

Recognizing the disparity between the current demand and the available resources, the Ministry of Health & Family Welfare (MOHFW), Bangladesh has initiated the Dhaka Dental College Expansion Project. The objective is to enhance the infrastructure and facilities of Dhaka Dental College to align with the growing need for dentistry services in the area. And such initiative is also compatible to the Sustainable Development Goal (SDG) of the Government of the Peoples Republic of Bangladesh.

c) Proposed Project Interventions: Describe the interventions (project inputs & outputs) that need to be undertaken by the government through the proposed project to address the problem, describe the interventions undertaken earlier to solve this.

To ensure the successful resolution of the Dhaka Dental College infrastructure expansion project, the government needs to allocate adequate resources, including finance, human resources, and essential utilities such as electricity, gas, power supply, water supply, and telecommunication with internet facilities. Additionally, the government should develop and implement comprehensive procurement plans to construct various types of infrastructure within the institute's specified timeline.

In order to facilitate the smooth implementation of the project, the government should establish key oversight committees, such as a steering committee and a Project Implementation Committee. These committees will monitor the progress and address any challenges that may arise during the expansion process.

Considering the absence of similar interventions in the past, it is crucial to proactively address potential issues that may arise during the expansion project. By adopting a well-

structured approach, including resource allocation, procurement planning, committee formation, and governance measures, the government can ensure the efficient and successful execution of the Dhaka Dental College infrastructure expansion project.

d) Stakeholders: Identify the key stakeholders that are likely to be associated with the project interventions.

Introduction:

When embarking on a new project, it is crucial to consider the interests and perspectives of stakeholders. Stakeholders are individuals, groups, or organizations that have a vested interest in the outcome of a project and can significantly impact its success. Understanding and engaging stakeholders throughout the project lifecycle is essential for several reasons.

Identifying project requirements:

Stakeholders possess valuable knowledge, expertise, and diverse perspectives that can help identify and define project requirements. By involving stakeholders early on, project managers can gather insights, clarify objectives, and ensure that the project aligns with the needs and expectations of those who will be affected by it.

Assessing project feasibility:

Stakeholders provide input on the feasibility of a project. Their expertise and experience can shed light on potential obstacles, risks, or constraints that may impact the project's success. By involving stakeholders, project managers can assess the viability and practicality of the project, avoiding costly mistakes and improving overall project planning.

Enhancing decision-making:

Stakeholders often represent different interests and viewpoints. Engaging them in the decision-making process promotes transparency, inclusivity, and accountability. Gathering input from various stakeholders allows for a more comprehensive understanding of potential impacts, trade-offs, and alternative approaches. This collaborative approach fosters informed decision-making and increases the chances of project success.

Managing expectations:

By involving stakeholders, project managers can effectively manage expectations. Regular communication and engagement with stakeholders enable the project team to provide updates, share progress, and address concerns or questions. This helps build trust, reduces resistance to change, and ensures that stakeholders remain supportive throughout the project.

Mitigating risks and conflicts:

Stakeholders often have different goals, priorities, and requirements. Ignoring or neglecting stakeholder perspectives can lead to conflicts and resistance, derailing the project. Engaging stakeholders proactively allows project managers to identify potential conflicts, address concerns, and mitigate risks early on. It also provides an opportunity to foster collaboration, find common ground, and build consensus among stakeholders.

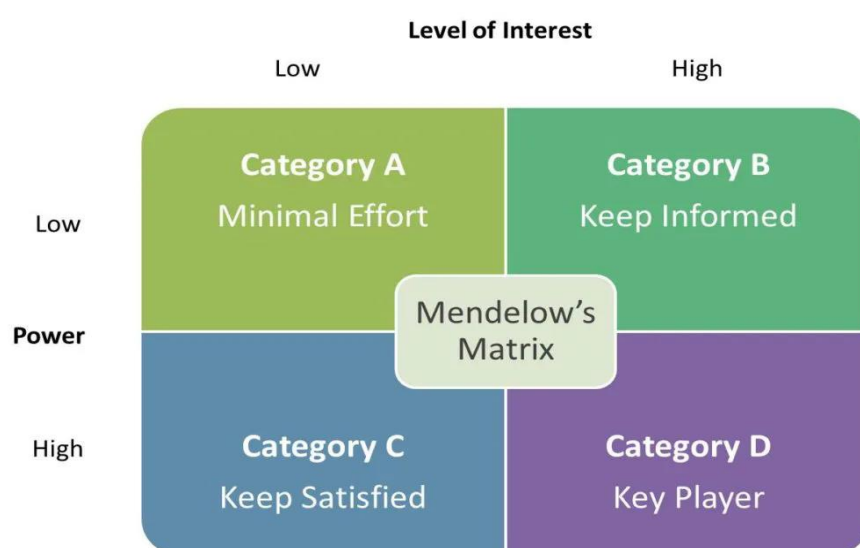
Considering stakeholders in any new project is crucial for its success. Engaging stakeholders throughout the project lifecycle allows project managers to tap into their expertise, align project objectives with stakeholder needs, manage expectations, make informed decisions, and mitigate risks. By recognizing the importance of stakeholders,

project teams can enhance project outcomes, build strong relationships, and ensure long-term success.

Mendelow's Stakeholders Analysis Matrix, a Rationale:

The Mendelow's Stakeholders Analysis Matrix provides a structured framework for categorizing stakeholders based on their levels of power and interest in the Dhaka Dental College Infrastructure Expansion Project. This analysis helps project managers and implementers better understand stakeholder dynamics and develop targeted strategies to effectively engage and manage stakeholders throughout the project lifecycle. By assessing stakeholders' power and interest, the matrix enables prioritization of efforts, allocation of resources, and mitigation of potential challenges. This approach enhances stakeholder communication, alignment of goals, and overall project success.

Mendelow's Stakeholders Analysis Matrix:¹



The Mendelow's Stakeholders Analysis Matrix categorizes stakeholders based on their levels of power (P) and interest (I) in the Dhaka Dental College Infrastructure Expansion Project. The analysis helps identify key stakeholders and develop appropriate strategies for engaging with them.

Key Players (C) - High Power, High Interest:

This group consists of influential stakeholders with significant power and a strong interest in the project. They include administrators of the Directorate General of Medical Education (DGME), local elected representatives such as the City Mayor, Members of Parliament (MP), and local government officials. Their support and active involvement are crucial for the successful implementation of the project.

¹ <https://www.mbaknol.com/strategic-management/stakeholder-analysis-mendelows-matrix/>, accessed on June 23, 2023

Keep Satisfied (D) - High Power, Low Interest:

Stakeholders in this category possess high power but may have relatively lower interest in the project. They may include journalists, financiers from the Planning Commission, and officials from the Ministry of Finance. Although their interest may be limited, maintaining their satisfaction and garnering their support are important to ensure smooth project operations.

Key Informed (B) - Low Power, High Interest:

Stakeholders in this group exhibit high interest in the project but have limited power to influence outcomes directly. Public health professionals, dental experts, faculty members, and community representatives fall into this category. Engaging and informing these stakeholders is crucial to benefit from their valuable insights, maintain their interest, and ensure the project meets the needs of the community.

Minimal Effort (A) - Low Power, Low Interest:

Stakeholders in this category have minimal power and interest in the project. They may include local communities, individuals associated with private clinics or hospitals, and those with conservative viewpoints. While their impact may be limited, addressing any concerns they may have and keeping them informed through effective communication is essential for maintaining a positive project environment.

By leveraging the insights provided by the Mende low's Stakeholders Analysis Matrix, project managers can tailor communication, engagement, and mitigation strategies specific to each stakeholder group. This holistic approach facilitates effective stakeholder management and ensures a smoother and more successful implementation of the Dhaka Dental College Infrastructure Expansion Project.

Consideration of Key Stakeholders:

a) Government: As a major stakeholder, the government's support and commitment are essential for the establishment of infrastructure. Their financial assistance, policy support, and coordination with relevant departments play a vital role in the success of the project.

b) Local Community: The local community should be considered to ensure that the infrastructure development aligns with their needs and expectations. Engaging community leaders, conducting public consultations, and addressing any concerns or impacts are crucial for fostering community support.

c) Students and Faculty: Involving students and faculty in the planning process ensures that their input is considered, and their specific requirements are addressed. Their perspectives can help identify the necessary facilities and features to create an optimal learning and teaching environment.

d) Dental Professionals and Associations: Engaging dental professionals and associations is vital to understanding the current trends, best practices, and requirements in the dental field. Collaboration with these stakeholders can help design infrastructure that meets the industry standards and supports professional development.

e) International Education Bodies: Collaboration with international education bodies and organizations can provide insights into global standards, accreditation requirements, and opportunities for partnerships. Engaging with these stakeholders can help in aligning

the infrastructure development with international benchmarks and attracting international students.

By considering the perspectives and interests of these key stakeholders, the infrastructure development of Dhaka Dental College can be tailored to meet the needs of the government, local community, students, faculty, dental professionals, and international education bodies. This inclusive approach ensures a well-rounded and successful project outcome.

e) Demand Analysis: Identify the need for public investments by assessing:

i) Current demand (based on statistics provided by service providers/regulators' ministries/national & regional statistical offices for the various types of users):

Introduction:

The demand analysis for the establishment of infrastructure for Dhaka Dental College aims to address the pressing need for expanded facilities to meet the growing demand for dental healthcare services in Bangladesh. This analysis recognizes the significant gap between the World Health Organization (WHO) recommended number of doctors and the existing number of medical graduates in the country. By expanding the infrastructure of Dhaka Dental College, we can bridge this gap, improve dental healthcare, and cater to both local needs and international demand for dental professionals.

Need for More Dental Graduates in Bangladesh:

Bangladesh has made significant strides in the medical sector over the past few decades. However, there remains a substantial disparity between the World Health Organization's (WHO) recommended number of doctors (10 doctors per 10,000 population) and the current number of medical graduates in the country. As per this recommendation in 2020, we required 164,827 graduate doctors, whereas we are currently having around 93,358. Furthermore, there is a need for approximately 70,000 additional dental doctors, given the limited presence of just over 7,000 dentists in Bangladesh. This pronounced shortage places a heavy burden on the existing healthcare system, adversely affecting service delivery and the quality of dental care. By analyzing population data from the World Bank (2010-2019), we have estimated that by 2040, we will need around 199,309 medical graduates in accordance with WHO guidelines, thereby reflecting the demand for dentists. Alarming trends reveal that the scarcity of dental graduates will escalate in the coming years due to population growth, exacerbating the demand-supply gap for dentists in our country.

International Demand for Students:

The establishment of Dhaka Dental College can attract international students seeking dental education in Bangladesh. As the global demand for dental professionals grows, there is an opportunity to position Dhaka Dental College as a center of excellence, providing quality education and training to students from abroad. This will not only contribute to the international reputation of the college but also generate revenue for the institution and the country.

Improvement of Dental Health Across Bangladesh:

Expanding the infrastructure of Dhaka Dental College will have a far-reaching impact on the improvement of dental health across Bangladesh. By producing a greater number of dental graduates, the college can address the inadequate access to dental healthcare services, particularly in underserved areas. The establishment of a strong referral system with district hospitals will ensure the provision of quality dental care services to a larger population.

Current Number of Dental Graduates:

Currently, Bangladesh has a significant gap between the recommended number of dentists by the World Health Organization (WHO) and the existing number of dental graduates. With 93,358 graduate doctors and only around 7,000 dental doctors, there is a substantial shortage of dental professionals. This scarcity puts a burden on the existing healthcare system and compromises the quality of dental healthcare in the country. The expansion of Dhaka Dental College will contribute to bridging this gap.

Need and Scope of Research in Dental Studies:

The field of dental studies requires continuous research to advance knowledge, techniques, and treatments. By establishing Dhaka Dental College, we can create a platform for conducting research in dental healthcare and promoting evidence-based practices. Research findings from the college will contribute to the overall improvement of dental care in Bangladesh and support the development of innovative solutions to dental health challenges.

Dhaka as an Education Hub:

Dhaka, being the capital city of Bangladesh, serves as a major education hub in the country. The expansion of Dhaka Dental College will further enhance Dhaka's reputation as a center for quality education and attract students from all over the country. The college can leverage the existing educational infrastructure, resources, and facilities in Dhaka to create a conducive learning environment for dental students.

Government Commitment and SDG Requirements:

The establishment of Dhaka Dental College aligns with the government's commitment to providing quality healthcare and achieving the Sustainable Development Goals (SDGs). With the population data from World Bank (2010-2019), we have estimated the number of medical graduates required by 2040 as per the WHO guideline and consequently the demand for dentists. The government's support and investment in the infrastructure expansion project will ensure the availability of adequate resources, including finance, human resources, utilities, and infrastructure. The college will contribute to the government's efforts in strengthening the healthcare sector and fulfilling the healthcare needs of the population.

Shortage of Student Accommodation:

The existing shortage of student accommodation in Dhaka poses a challenge for dental students. With the expansion of Dhaka Dental College, the demand for student housing will increase. It is crucial to address this issue by allocating resources and planning the construction of suitable accommodation facilities to ensure a conducive living environment for the students.

Conclusion:

The demand analysis for the establishment of infrastructure for Dhaka Dental College emphasizes several key issues:

- **Urgent need for expansion:** The significant gap between the recommended number of doctors by the WHO and the current number of medical graduates underscores the critical need to expand the infrastructure of Dhaka Dental College promptly.
- **Bridging the gap in dental healthcare:** By investing in the infrastructure of Dhaka Dental College, we can bridge the gap between the demand for dental healthcare services and the availability of qualified dental professionals, thereby improving the accessibility and quality of dental care in Bangladesh.
- **Meeting local and international demand:** The expansion of Dhaka Dental College not only caters to the local needs for dental healthcare services but also taps into the international demand for skilled dental professionals in countries such as the USA, UK, Middle East, and European territories.
- **Government commitment and SDGs:** The establishment of Dhaka Dental College aligns with the government's commitment to providing quality healthcare and achieving the Sustainable Development Goals (SDGs), reinforcing the importance of investing in the college's infrastructure.
- **Opportunities for employment and economic growth:** Bangladeshi dental graduates possess a reputation for proficiency and dedication, making them sought-after professionals in the global market. By strategically supporting the establishment of Dhaka Dental College, the government can facilitate the entry of Bangladeshi dental graduates into international markets, leading to employment opportunities and contributing to the growth of the dental healthcare sector, ultimately boosting the country's economy.

In fine, the expansion of Dhaka Dental College is crucial to address the increasing demand for dental healthcare services in Bangladesh. By addressing the shortage of dental professionals, meeting international demand, and aligning with the government's commitment to healthcare and the SDGs, the establishment of infrastructure development of Dhaka Dental College will enhance the overall dental healthcare sector, create employment opportunities, and contribute to the country's progress.

ii) **Future demand (based on reliable demand forecasting models) in both the scenarios with and without the project:**

Market Research and Surveys: Conducting market research studies, customer surveys, and collecting feedback from consumers can provide valuable insights into future demand. Analyzing consumer preferences, purchase intentions, and behavior can help forecast demand accurately.

Through the conduction of FGD (Focus Group Discussion) the consultant draws the conclusion that the expansion of infrastructure of Dhaka Dental College (DDC) is a demand of time and government commitment. The present capacity for the students'

hostel is far way below the minimum requirement, the adequacy of lecture theatre and classroom & tutorials are in a very tight arrangement. And the number of students capacity needs to be increased due to local and international demand.

Delphi Method: The Delphi Method is a structured forecasting technique that involves gathering and aggregating expert opinions to make predictions or reach a consensus on a specific topic. It was developed in the 1950s by the RAND Corporation to facilitate decision-making in complex and uncertain situations.

The Delphi method typically follows these steps:

Selection of Experts: A panel of experts with knowledge and expertise in the subject matter is identified. These experts can be professionals, academics, or individuals with practical experience relevant to the topic being addressed.

Questionnaire Design: The facilitator or researcher prepares a series of questionnaires or surveys that are used to gather input from the experts. The questions are typically open-ended or structured with multiple-choice options.

Round 1: The first questionnaire is sent to the experts, who independently provide their opinions, forecasts, or responses. They may also provide justifications or explanations for their answers.

Feedback and Iteration: The facilitator compiles the responses from Round 1 and provides a summary of the group's responses without revealing individual identities. This feedback report is shared with the experts in subsequent rounds.

Round 2 and Subsequent Rounds: Experts review the feedback report and are given the opportunity to revise their initial responses based on the insights from other participants. The process continues with multiple rounds until a level of consensus or convergence is reached among the experts.

Consensus Analysis: The facilitator analyzes the responses from each round, identifies areas of agreement or disagreement, and may conduct further iterations to address any remaining divergent opinions.

Final Report: Once consensus is achieved or the desired level of convergence is attained, a final report is prepared summarizing the findings, including the range of expert opinions, areas of agreement, and any dissenting viewpoints. The report may also provide recommendations based on the collective expertise of the panel.

The Delphi method aims to reduce biases, overcome individual dominance, and promote anonymity to ensure that expert opinions are provided without undue influence. It allows for the systematic exploration of complex issues, enables the consideration of multiple perspectives, and can be particularly useful when there is limited or uncertain data available. The method is commonly employed in various fields, including technology forecasting, policymaking, risk assessment, and strategic planning.

Judgmental Forecasting: In some cases, expert judgment and qualitative inputs are used to forecast demand. The Delphi method, scenario analysis, and market intelligence are techniques that involve gathering expert opinions and subjective assessments to predict future demand.

Many of the patients from our country seek treatment abroad due to lack of proper medical facilities at home; this drains out a good sum of foreign currency that is hard-earned by the wage earners living abroad. Through the establishment of the expansive infrastructure for Dhaka Dental College (DDC) would develop the existing dental healthcare system in Bangladesh, meet the SDG guidelines, facilitate more research and development at the tertiary level, attract more students and patients from the neighboring countries and the South Asian region. This will certainly have a positive economic impact, the GDP growth and thereby enhance our capacity to serve better and bring long-term confidence among our people in Bangladesh.

It is important to note that the choice of forecasting model depends on various factors, including the availability of data, nature of the industry, and the specific characteristics of the demand being forecasted. Often, a combination of multiple models or a hybrid approach is used to achieve more accurate and robust demand forecasts.

iii) Various constraints and means to meet the demand including government regulations, technological developments etc.

The proposed infrastructure development for Dhaka Dental College (DDC) is definitely a big challenge in terms of environmental impact, traffic congestion, land scarcity and equitable natural resources and the usage of utilities. The present location of Dhaka Dental College is already crumpled with so many buildings. And few of the buildings would need to be dismantled which would create a havoc on the air pollution, resettlement of the students as the hostel buildings would be demolished for the new plan for high rise structures. All these would require a grand Spatial Planning for the Establishment of the new and quite expansive infrastructure for Dhaka Dental College.

To ensure the effective establishment of Dhaka Dental College and optimize its accessibility and functionality, a well-thought-out spatial planning approach is crucial. Currently, the college is situated in two locations in Dhaka: Mirpur 14 in Dhaka North City Corporation, spanning 6.77 acres, and Sobhanbag in Dhanmondi, covering 0.93 acres.

Site Selection:

Selecting an appropriate site within Dhaka for the proposed expansion and development of Dhaka Dental College is vital. The chosen site should accommodate the required infrastructure and offer convenient access to the local population. Consideration should be given to factors such as proximity to transportation hubs, availability of utilities, and potential for future growth.

Spatial Design:

The spatial planning for Dhaka Dental College infrastructure should prioritize efficient land utilization, ensuring optimal functionality and convenience for all stakeholders. The design should encompass the following key components:

Academic Building:

A dedicated facility for academic activities, including classrooms, laboratories, lecture halls, and administrative offices. The design should allow for future expansion and growth.

Research Center:

A designated area for dental research and innovation, fostering collaboration among faculty and students. The design should incorporate research laboratories and equipment.

Student Accommodation:

Residential facilities such as hostels or dormitories to accommodate students pursuing dental education. The design should provide a conducive living environment and support student well-being.

Recreational Areas:

Spaces for recreational activities, including sports facilities, green spaces, and common areas for students and staff. These areas contribute to the overall well-being and satisfaction of the college community.

Parking Facilities:

Adequate parking spaces for students, faculty, staff, and visitors to ensure convenient access to the college. The design should prioritize safety, accessibility, and efficient traffic flow.

Infrastructure Development:

Provision of essential infrastructure, including water supply, electricity, sewage systems, and waste management facilities, to support the smooth functioning of the institution.

The spatial planning for the establishment of Dhaka Dental College infrastructure requires careful consideration of the available land areas in Mirpur 14 (6.77 acres) and Sobhanbag (0.93 acres). By strategically designing the layout and incorporating key components, the college can provide academic excellence and a conducive learning environment for students. This spatial planning approach will contribute to the successful implementation of the infrastructure development project, addressing the growing demand for dental services in Dhaka.

Land condition:

The land is owned by Dhaka Dental College (DDC), so it does not require any land acquisition. The land is at the road level so land filling is not required. The land is already under the possession of DDC, and well-developed.

Land acquisition displacement:

Since the land is already owned by DDC, there is no need for land acquisition or displacement of any families. The sites are ready for development with some tree cutting in Sobhanbag will be a requirement.

Utilities, Drainage and Sanitations:

Electricity: The DDC site is already connected to the national grid for electricity supply. However, the capacity needs to be increased to a minimum of 11 KVA to meet the project's requirements.

Water Supply: Deep tube-wells should be installed within the college premises to fulfill the water demand of the DDC, if it is permitted by the government's regulatory authority.

Sanitary Works: A properly designed sewer system needs to be built for efficient sanitation at the DDC site.

Waste Management: DDC should establish its own waste management system to ensure the proper disposal of medical waste in compliance with regulations.

Other Infrastructure: In addition to the above, provisions need to be made for laundry facilities, fire safety measures, and maintenance sections at the DDC site.

f) SWOT Analysis: Identify the Strengths, Weaknesses, Opportunities and Threats to the project

A comprehensive SWOT (strengths, weaknesses, opportunities, threats) analysis reveals that the strengths and opportunities of Dhaka Dental College (DDC) far outweigh the potential threats and weaknesses. While there may be some challenges, they are relatively minor compared to the positive aspects of the project. It is crucial to identify and mitigate potential threats to ensure the success and sustainability of DDC. These threats include the possibility of traffic congestion, noise pollution from adjacent roads and highways, and the risk of unplanned construction in the surrounding areas. By implementing appropriate measures and closely monitoring these aspects, the potential threats can be effectively addressed.

Strengths:

- The project is located on a prime area Dhaka.
- Strong government support for the establishment of Dhaka Dental College.
- Significant demand for dental education and services, benefiting both students and patients.
- Extensive support from relevant stakeholders.
- Availability of suitable land for construction with favorable acquisition conditions.
- No displacement of homesteads or unemployment due to the project.
- Well-connected road infrastructure to Dhaka Dental College and nearby areas.

Weaknesses:

- The proposed site is located in an area that has high population density, so traffic stagnant and congestion would be expected there.
- Resettlement of the students and intern doctors will be required during the project implementation phase, as one of the existing Boys' Hostel and the Accommodation in Sobhanbag will be demolished.

Opportunities:

- Strong demand for dental education and related services.
- Favorable political environment, including land acquisition support.
- Social acceptance and demand for dental education and tertiary healthcare services.
- Ample employment opportunities.
- Potential for commercial ventures, private hostels, and other businesses due to the project.

Threats:

- Vulnerability to storms and earthquakes.
- Noise pollution from nearby roads and highways.
- Potential traffic congestion in the area.
- Risk of unplanned construction in the surrounding areas.
- Possibility of increased road traffic congestion.
- Environmental pollution from improper medical waste disposal if not properly addressed.

SECTION: 4

TECHNICAL/TECHNOLOGICAL & ENGINEERING ANALYSIS

4. Technical/Technological & Engineering analysis

A summary of the proposed project shall be presented with the following headings:

- a) **Location:** Description of the location of the project including a geographical illustration (map and/or geo-coordinates) with justification. Availability of land is a key aspect; evidence should be provided that the land is owned (or can be accessed) by the organization which has the full title to use it, or has to be purchased (or rented) through acquisition/requisition process. Besides, it should address if any kind of utility shifting is required. Identify the issues of disaster risks (existing and future) in the proposed location along with project site on hazard map.

The expansion of Dhaka Dental College's infrastructure aims to meet the growing demand for dental education and healthcare services in Bangladesh. The project involves two locations: Mirpur 14, Dhaka, and Sobhanbagh, Dhanmondi, Dhaka.

Mirpur 14 Campus : Area Calculation

DHAKA DENTAL COLLEGE _AREA CALCULATION				
S.NO	NAME OF ALLOCATION	AREA OF ALLOCATION GROUND COVERAGE	STORIED	TOTAL AREA
01.	Academic Building Extention	730 SQM	10+Basement	8,030 SQM
02.	Boy's Hostel	1573 SQM	10	15730 SQM
03.	Girls Hostel	1365 SQM	10	13650 SQM
04.	Principle Residence	208 SQM	02	416 SQM
	TOTAL BUILD AREA =	3,876 SQM		37,826 SQM

DHAKA DENTAL COLLEGE (MULTIPURPOSE BUILDING) _AREA CALCULATION				
S.NO	NAME OF ALLOCATION	AREA OF ALLOCATION GROUND COVERAGE	STORIED	TOTAL AREA
01.	Multipurpose building	2100 SQM	12+02 Basement	29,400 SQM
	Office	2000 SQM	02 Floors	Medical Education wing Dental Research wing
	Dormitory	10200 SQM	04 Floors	232 PG Students
	Apartment	10500 SQM	05 Floors	150 sqm Apartment 15 nos 125 sqm Apartment 20 nos 100 sqm Apartment 15 nos

Location:

Mirpur 14 Campus:

Dhaka Dental College has two campuses. The main campus is located near Mirpur 14 Bus Stand, covering an area of 6.77 acres. The other campus is situated in Sobhanbagh area of Dhanmondi, covering an area of 0.93 acres.

Mirpur Land area: 6.77 acres.

Existing facilities: General college campus, boys' and girls' hostels, academic building, and administrative offices.

Proposed buildings: Boys Hostel Expansion, Girls Hostel Expansion, Academic Building Expansion, and Principal's Bungalow.

Objectives: Enhance existing facilities and accommodate the increasing student and staff population.

At the Mirpur 14 campus, there are now a hospital, a medical college, a dormitory, and other facilities available. Due to the educational environment and the increasing number of students, there is a demand for new facilities. It has been suggested to construct a new extension building of the existing academic building, consisting of a ground floor and 9 additional floors. Additionally, a new accommodation building with ground floor and 9 additional floors is required to accommodate 450 female students. There is also a need for a hostel for 300 students and a separate residence for the principal.

Sobhanbagh, Dhanmondi Land Area: 0.93 acres:

This site is owned by Dhaka Dental College, and it has an old building. It houses the senior students of the college. The proposition for this site is to demolish the existing building and develop a 20 storied one that would accommodate the Dental Research Center, Students' Dormitories and Officers' Quarters.

- b) **Technical design:** Description of the main components, technology adopted, design, standards and specifications. Key output indicators should be defined as the key physical quantities produced (e.g. meters, sq. meters, kilometers, numbers, man months, etc.). If the project is in disaster prone areas and has the probability of climate change impact, disaster and climate change risks related information should be integrated in technical design in order to address the impact of hazards on the project.

Boys Hostel Expansion:

Capacity: 15,730 square meters.

Accommodation: A 10-storey building for an accommodation of additional 400 beds for boys.

Design features: Modern amenities, common areas for indoor games, and facilities for personal grooming.

Girls Hostel Expansion:

Capacity: 13,650 square meters.

Accommodation: A 10-storey building with space for approximately 450 girls.

Design features: Spacious rooms, common areas for recreational activities, and facilities promoting a conducive learning environment.

Academic Building Expansion:

Size: A 10-storey building with a space of 8,030 square meters.

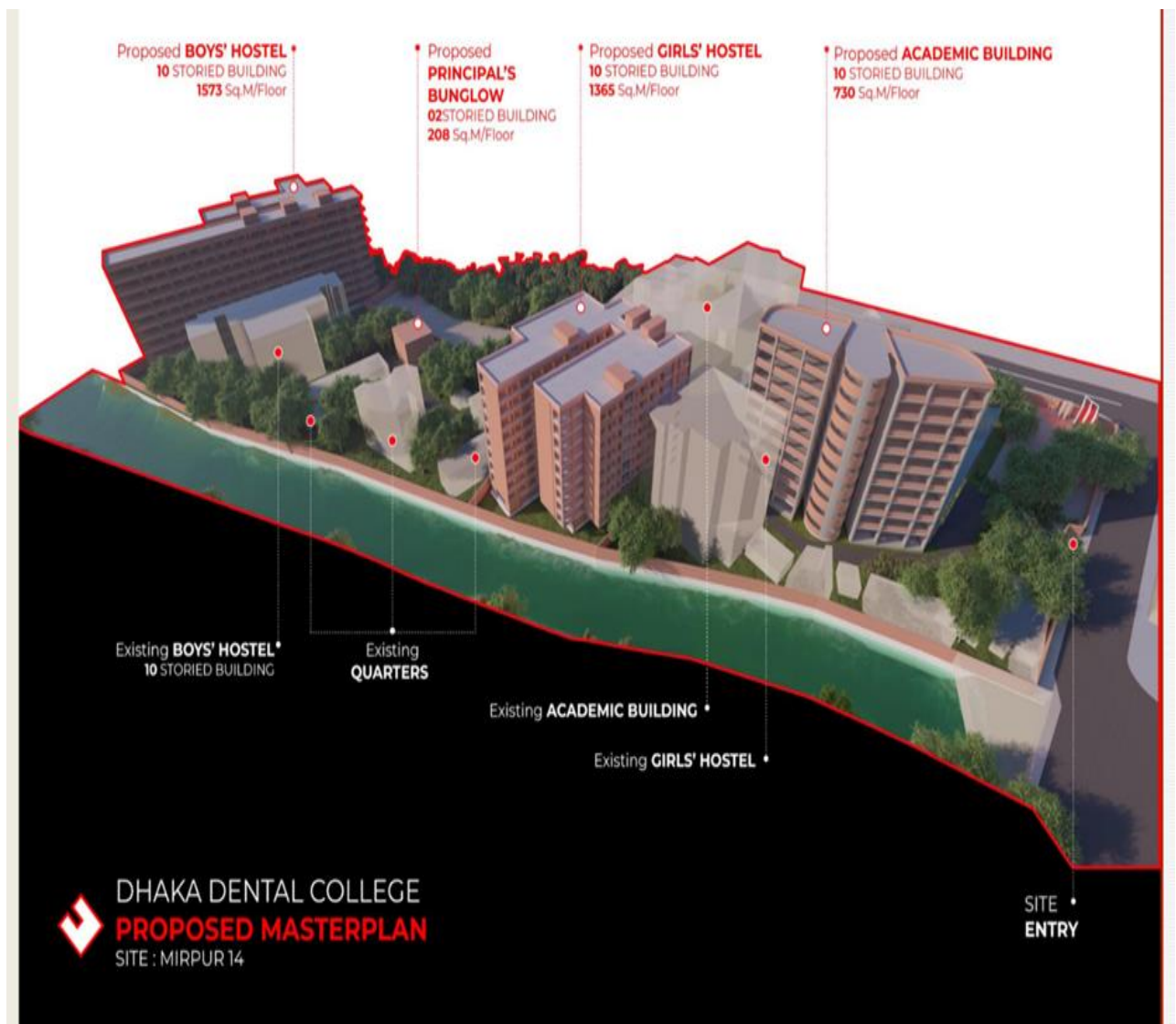
Design features: State-of-the-art lecture theaters, classrooms, library, administrative offices, conference rooms, and common facilities.

Objectives: Provide adequate space for lectures, facilitate interactive learning, and promote academic excellence.

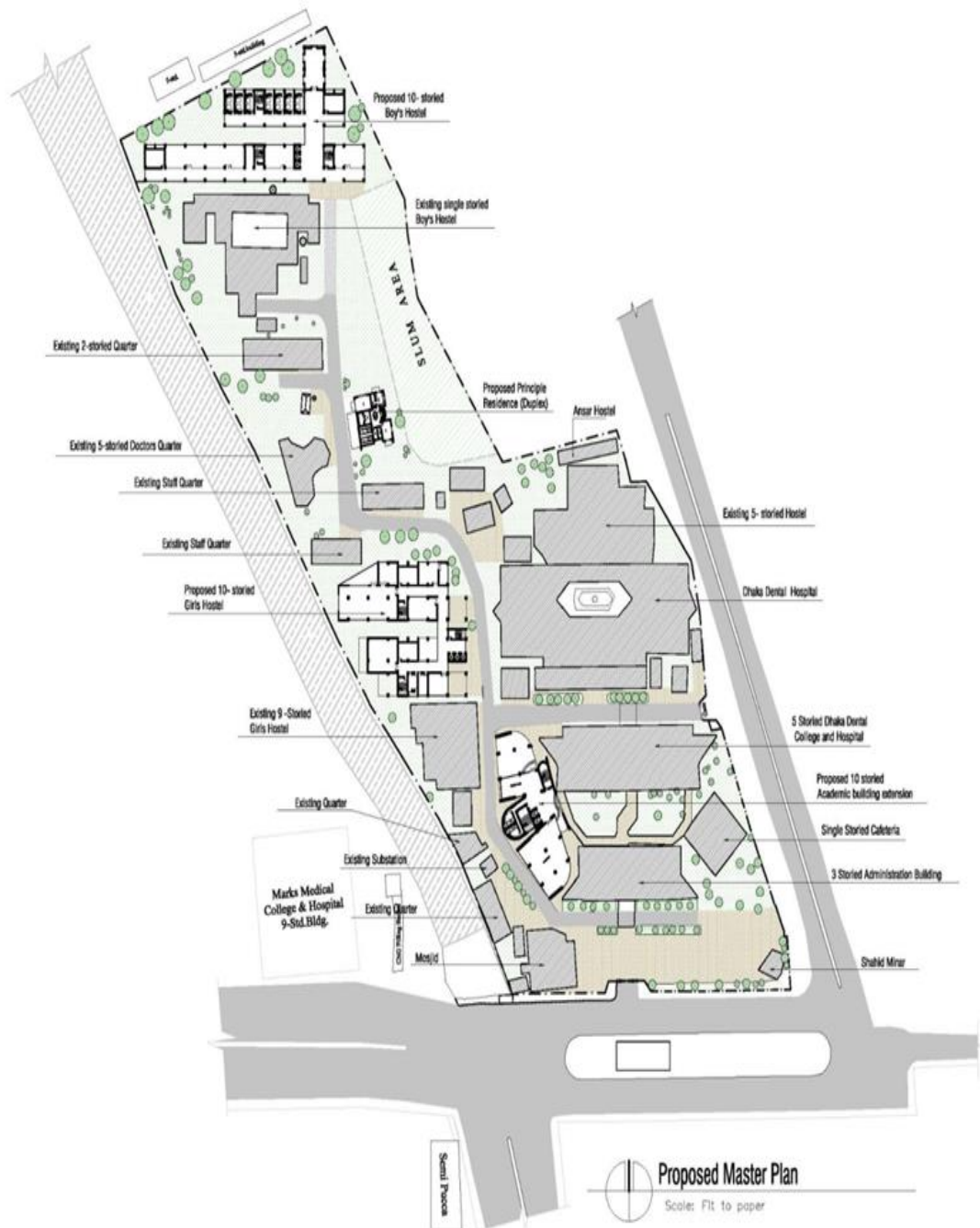
Principal's Bungalow:

Size: 416 square meters.

Design features: A 2-storey duplex building, well-equipped residence for the principal, ensuring comfort and privacy. The total floor space is around 2500 sft.



PROPOSED MASTER PLAN AT MIRPUR 14



PROPOSED MASTER PLAN AT MIRPUR 14

Sobhan Bagh Campus:

This site is located right next to Mirpur Road, near bus stand number 27 on Mirpur Road. It is considered a compact area within the site, with an overpass in front. This site has certain requirements in terms of civil aviation height restrictions and building rules and regulations.

Based on the initial present app analysis, we have maximized the footprint of the total building and accommodated their requirements. This building is designed to be multipurpose, which means it will house medical education and teacher accommodation apartments for postgraduate doctors. According to the teacher accommodation

requirements, there will be some apartments of 1000 square feet, some departments of 1250 square feet, and some apartments of 1500 square feet.

Within this complex, we have divided it into public and private zones. The residential units will be completely private, while certain sections will have some academic facilities, which are divided for public use. This division is a common practice in this project since we do not have any additional land for our dental college. If we could maximize the land within this plot, we have tried our best to incorporate it into the project. We refer to it as maximum compromise. We are not sure about the future extension of this project; it will depend on further analysis and building codes. Currently, we have designed it to be maximized according to the building code.

The expansion of Dhaka Dental College's infrastructure at Mirpur 14 and Sobhan Bagh locations will significantly enhance the college's capacity, improve educational and residential facilities, and support the delivery of quality dental healthcare services. The technical design ensures the provision of modern amenities, conducive learning environments, and comfortable accommodations. The output plan focuses on increasing capacity, promoting academic excellence, and facilitating research and professional growth. The project aligns with the college's vision of providing high-quality education, research opportunities, and improved dental healthcare services to meet the growing demand in Bangladesh.

Considerations for Flood and Earthquake Hazards

Location:

The proposed infrastructure development for Dhaka Dental College is focused on two locations: Mirpur 14 in Dhaka and Sobhanbag in Dhanmondi. Both locations are generally free from flood hazards but are equally prone to earthquake risks.

Architectural Formulation and Structural Design:

To ensure the highest standards in architectural formulation and structural design, renowned architects from WASO Engineers & Consultants (Bd) Ltd. have been engaged in the project. Their expertise will contribute to the development of a robust and resilient infrastructure that can withstand potential earthquake events.

Flood Hazard Mapping and Future Hazard Atlas:

While flood hazards are not significant in the selected locations, it is crucial to consider regional-scale flood-hazard mapping for the future hazard atlas in Bangladesh. This mapping will provide valuable insights into flood-prone areas and help in devising appropriate measures for flood protection and mitigation.

Nature and Causes of Floods:

Floods can occur in various ways, including river/stream overflow, excessive rainfall, breaches in flood-protection structures, and rapid ice melting in the mountains. Apart from flash flooding, which is limited to foothills, most floods typically take hours to days to develop. In recent decades, the frequency of high-magnitude hundred-year floods worldwide has increased due to global climate change, including in Bangladesh.

Probability of Flooding:

Although flood-prone areas are more common in rural regions, the probability of floods in other areas cannot be overlooked. Seasonal and flash floods have been experienced in various parts of the country, including Dhaka. The frequency and magnitude of these floods highlight the need for robust infrastructure and flood-resilient design. However, the proposed sites can be considered as flood free regions. The Mirpur site was inundated with the flood water only in year 1988 in the recent past when the country was almost submerged except the high lands in greater Mymensingh, some parts of greater Jashore, Chottogram, Cox's Bazar, the other parts of the Hill Tracts. And thereafter, the flood water has not reached Mirpur. Sobhanbag was not affected by the 1988 flood, so this site can be considered as flood free location.

Conclusion:

While the proposed locations for the establishment of infrastructure for Dhaka Dental College are relatively free from flood hazards, the project must consider potential earthquake risks. Engaging reputable architects and engineers specialized in structural design and construction supervision is vital to ensure the safety and resilience of the infrastructure. Additionally, ongoing efforts in flood-hazard mapping and understanding the nature and causes of floods will contribute to better preparedness and mitigation strategies. By incorporating appropriate measures and design considerations, Dhaka Dental College can establish a resilient infrastructure that withstands potential hazards and provides a safe and conducive environment for dental education and healthcare services.

- c) **Output plan:** Description of the output and the expected utilization rate. These elements describe the service provision from the supply side in the context of the forecasted demand.

Mirpur 14 Campus- salient features:

- **Increased capacity:** Accommodation for an additional 400 boys and 450 girls.
- **Improved infrastructure:** Expanded academic building with modern facilities.
- **Enhanced residential facilities:** Upgraded boys and girls hostels for a comfortable and conducive living environment.
- **Administrative efficiency:** Dedicated principal's bungalow for effective leadership and management.

Sobhanbag Complex: Research Wing, Dormitory and Residential Complex:

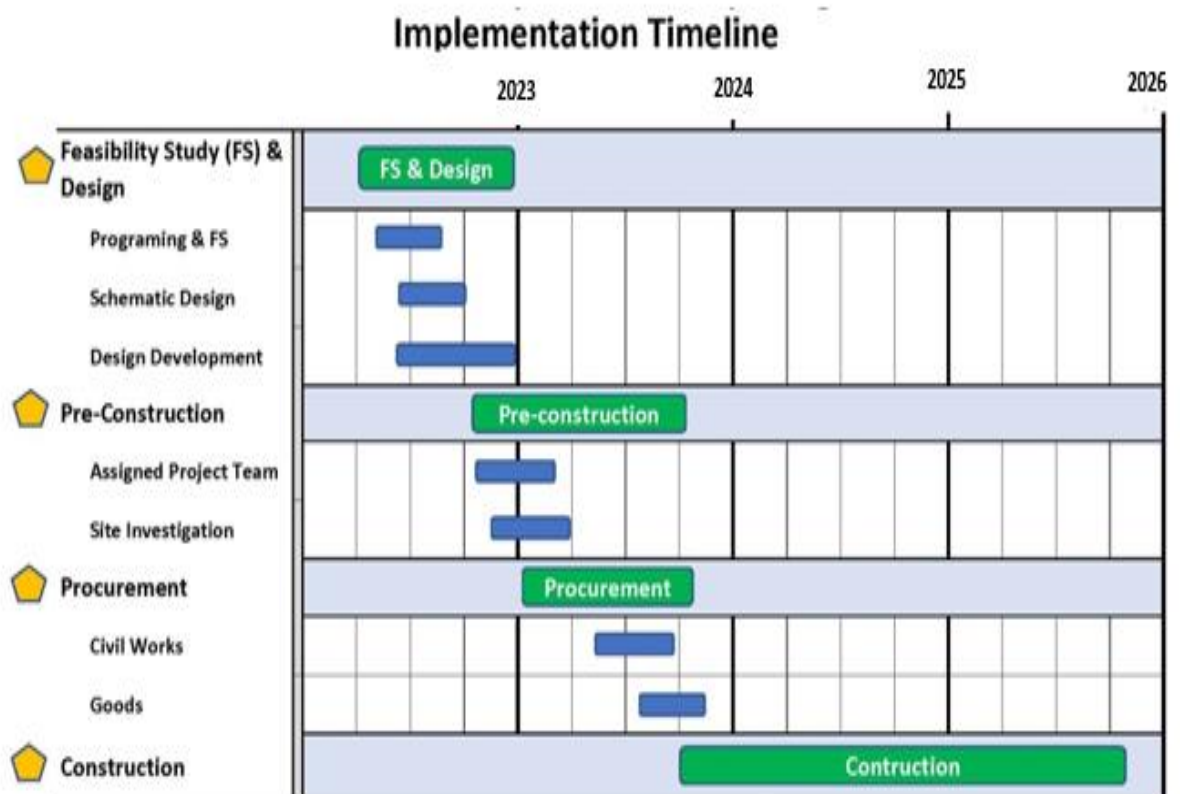
- **Redevelopment:** Demolition of the existing six-story building.
- **New complex:** A 20-story modern building with a built-up area of 16,940 square meters. The building is proposed to have basement parking.
- **Purpose:** Research facilities, medical education facilities, and residential accommodations for doctors.
- **Residential units:** Varied apartment sizes to cater to the diverse needs of approximately 200 doctors' dormitories, 60 apartments for the doctors, executives and staff, with the varying sizes of 1000 sft, 1250 sft and 1500 sft.

- d) **Cost estimates:** Estimation of the financial needs for project design, implementation and operations, component-wise cost estimates should be provided based on evidence.

Year-wise estimated expenditure:

Financial year	Project year-wise investment			Discount factor (DF) (12%)	Discounted benefits
	GOB (FE)	PA(FE)	Total (FE)		
2023-24	14,419.22	-	14,419.22	0.8929	12,874.30
2024-25	14,529.06	-	14,529.06	0.7972	11,582.48
2025-26	21,189.53	-	21,189.53	0.7117	15,082.29
Total	50,137.81	-	50,137.81		39,539.07

- e) **Implementation timeline:** Considering the volume of works, capacity of implementing agency, budget flow (MTBF ceiling), project priority etc. a realistic project timeline along with the implementation schedule should be provided (for example, a Gantt chart with the work plan).



SECTION: 5

ENVIRONMENTAL SUSTAINABILITY, CLIMATE RESILIENCE AND DISASTER RISK ANALYSIS

5. Environmental Sustainability, Climate Resilience and Disaster Risk Analysis

5.1 Environmental, Climate Change and Disaster Risk Analysis

Specify and describe the economic effects/impacts of environmental, disaster and climate change and possible compensations for ecological damages. Key issues to be addressed:

- a) **What are the likely environmental, disasters and climate change impacts or risks from the project (any impact of project to increase the existing disaster and climate change related risks and/or contribute to create new risks)?**

Environmental Impact Assessment for DDC Project:

Every project, including the DDC project, has inherent environmental implications, which are contingent upon the project's location and specific criteria. The main objective of evaluating and examining the present environmental condition is to provide a baseline that can be used to compare the potential impacts of the project during construction and operational phases. Moreover, establishing baseline parameters for land, air, and water quality will ensure that any problems arising from the existing sources are not erroneously attributed to the proposed project.

The current study focused on different environmental components to set the baseline conditions of the project area, encompassing the physical, biological, and socio-economic environment. To gain a comprehensive understanding of the environmental issues at the specific site, it is necessary to consider the surrounding areas in Dhaka. Therefore, specific attention was given to key environmental attributes within the broader vicinity of the proposed site in Dhaka. By adopting this approach, we ensure a thorough assessment of the environmental context in which the DDC project will be implemented, providing valuable insights for sustainable development.

Physical Environmental Component Assessment:

The physical environmental component of the DDC project encompasses crucial aspects such as land, water quality, air quality, and climate. Each of these elements plays a significant role in determining the environmental impact and sustainability of the project. Here is a detailed description of each component:

(i) Land: The assessment of land examines the existing conditions, including topography, soil characteristics, and land use patterns. It considers factors such as land stability, suitability for construction, and potential for erosion or land degradation. By understanding the land attributes, appropriate measures can be taken to mitigate any adverse effects on the environment.

(ii) Water Quality: The evaluation of water quality focuses on the chemical, physical, and biological parameters of water bodies in the project area. This includes rivers, streams, lakes, and groundwater sources. The assessment determines the existing water quality, including factors such as pollution levels, presence of contaminants, and overall ecological health. It enables the implementation of measures to protect and preserve water resources.

(iii) Air Quality: The assessment of air quality analyzes the ambient air composition, pollutant levels, and potential sources of air pollution in the project area. It examines factors such as emissions from nearby industries, traffic, and construction activities. By identifying potential air quality issues, appropriate measures can be devised to minimize emissions, improve air quality, and ensure a healthy living environment.

(iv) Climate: The assessment of climate considers the prevailing weather patterns, including temperature, rainfall, humidity, and wind conditions in the project area. It also evaluates the potential impacts of climate change, such as increased frequency of extreme weather events. Understanding the local climate dynamics aids in designing infrastructure that is resilient to climate variability and contributes to overall environmental sustainability.

By comprehensively assessing these physical environmental components, the DDC project can effectively address any environmental challenges, implement appropriate mitigation measures, and contribute to the preservation and enhancement of the natural environment in Dhaka.

Atmospheric conditions

Bangladesh experiences a tropical climate characterized by three distinct seasons: the hot and humid summer, the rainy season, and the mild, relatively dry winter. Spring and autumn are relatively short but exhibit noticeable changes in vegetation and mean daily temperatures. The highest and lowest monthly total rainfall amounts are typically recorded in July and January, respectively.

The tropical climate of Bangladesh brings about various climatic conditions throughout the year. During the hot and humid summer, temperatures rise to their peak, accompanied by high levels of humidity. The rainy season follows, bringing substantial precipitation and contributing to the country's lush greenery and agricultural productivity. Finally, the mild winter season offers relief from the heat, with cooler temperatures and reduced humidity.

Although spring and autumn are fleeting in Bangladesh, they are still discernible through changes in the surrounding vegetation and slight fluctuations in the average daily temperature. These transitional seasons add further diversity to the climatic patterns experienced in the country.

In terms of rainfall distribution, July stands out as the month with the highest total rainfall, contributing to the replenishment of water bodies and agricultural activities. On the other hand, January records the lowest total rainfall, reflecting a relatively drier period.

The understanding of Bangladesh's climatic variations and seasonal characteristics plays a crucial role in various aspects of life, including agriculture, infrastructure planning, and overall adaptation to weather patterns. By recognizing and adapting to these climatic conditions, Bangladesh can harness its natural resources effectively and develop sustainable strategies for the well-being of its population and the environment.

Biological Environment

The Biological Environment within the study area can be classified into two categories: terrestrial and aquatic habitats. Terrestrial habitats: The study area in Dhaka City exhibits a diverse range of trees, including indigenous species such as Sal, Teak, Neem, and various ornamental trees. These trees contribute to the greenery and aesthetic appeal of the region. The project site is mainly vacant land with limited vegetation.

Aquatic Habitats

In Dhaka City, the aquatic habitats are primarily composed of lakes, ponds, and canals. These water bodies provide habitat for various aquatic flora and fauna. Common aquatic species found in these habitats include different types of fish, frogs, turtles, and water plants such as water lilies and lotus. These aquatic ecosystems play a crucial role in maintaining biodiversity and supporting the local ecosystem.

Socio-economic & Cultural Environment

Dhaka City is a vibrant center of socio-economic and cultural activities in Bangladesh. It is known for its rich history, architectural heritage, bustling markets, and diverse cultural events. The city is home to numerous historical landmarks, religious sites, museums, art galleries, and theaters, attracting both locals and tourists alike. The establishment of Dhaka Dental College (DDC) will contribute to the growth of the city's healthcare and educational infrastructure, providing employment opportunities and enhancing the overall socio-economic fabric of the region.

Livelihood Practices

Dhaka City has a diverse range of livelihood practices. While urbanization has led to a shift away from traditional agricultural practices, there are still pockets within the city where small-scale farming and gardening activities persist. Additionally, the city offers employment opportunities in various sectors such as commerce, industry, services, and the informal sector. The establishment of Dhaka Dental College (DDC) will create job opportunities for local skilled and semi-skilled workers during the construction phase and further contribute to employment generation in the healthcare and education sectors during its operational phase.

Identification and Evaluation of Potential Impacts during the Construction Phase:

This section examines the potential impacts of the proposed project on the physical, biological, and socio-economic environment. The assessment considers the construction and operation stages of the project.

Impacts during the Construction Phase

The evaluation of adverse effects during this phase reveals that the project activities will have minimal and temporary adverse impacts on the environmental quality in Dhaka City.

Impacts on Air Quality

The construction phase may lead to potential dust generation from earth cutting activities, which can temporarily affect the air quality in the vicinity of the project site. Adequate dust mitigation measures, such as water spraying and covering of loose materials, should be implemented to minimize these impacts.

Impacts on Water Quality

During the construction phase, proper sediment and erosion control measures should be in place to prevent potential runoff and contamination of nearby water bodies. This will help ensure that the water quality remains unaffected.

Impact on Soil and Land

Careful earthwork planning and implementation should be carried out to minimize soil erosion, particularly during the rainy season. Sedimentation ponds and proper drainage systems can be employed to prevent soil runoff and maintain the stability of the land within the project site.

Impact on Biological Resources

Efforts should be made to protect and preserve any existing trees and vegetation within the project site during the construction phase. Tree protection measures, such as fencing and designated exclusion zones, should be implemented to prevent damage to these resources.

Impact on Socio-economic Environment

During the construction phase, the project will provide employment opportunities for local skilled and semi-skilled labor, contributing to the local economy. Additionally, the presence of construction activities may attract small-scale traders and vendors, supporting the local business ecosystem.

Please note that the specific environmental conditions and impacts can vary based on the actual location and characteristics of the proposed site in Dhaka City.

Environmental impacts during operational phase:

Impacts on Air Quality

During the operation phase, there may be an increase in dust along the evacuation route, which can affect air quality. Dust settling on plants and crops in surrounding agricultural fields may also impact agricultural production. Measures such as the setup of tube-wells will help reduce dust. The project's sanitary nature ensures that latrines will not generate any odor. Limited vehicular movement along the evacuation route means vehicular emissions will be absent. Since the project does not cause air pollution, a detailed assessment of air quality degradation is unnecessary.

Impacts on Water Quality

The proposed evacuation route does not cross natural channels and does not affect groundwater quality. The availability and quality of groundwater are sufficient. The project does not involve underground structures for waste disposal or activities that alter groundwater flow, quality, or sources. It does not impact major uses or users of groundwater.

Impacts on Ambient Noise Standards

The project does not use heavy machinery, resulting in minimal noise production. Therefore, it does not affect ambient noise standards.

Solid Waste Impact

The project does not generate solid waste that could cause environmental pollution. Waste generation varies daily based on patient numbers, operations performed, maternity cases, and OPD flow. Waste segregation and collection facilities are implemented, including separate dustbins for medical waste. Proper medical waste management practices, including treatment and disposal, are followed using a microwave waste management system.

Impact on Biological Resources

On Vegetation: The project is not expected to affect homestead forestry, agriculture, or aquatic vegetation. On Wildlife: The absence of wildlife sanctuaries or protected areas nearby eliminates the possibility of impacting wildlife. On Aquatic Species and Habitat: The project does not hamper water bodies or cause waterlogging, thereby maintaining the river ecology and preventing modification or destruction of aquatic habitats.

Impact on Socio-economic Environment

The evacuation route has positive economic impacts, providing fast communication, improved transportation, access to growth centers and markets, and increased services and commercial activities for local residents. Improved transport services increase land value. The project offers temporary and permanent employment opportunities, improving living standards and stimulating the local economy.

Impact on Occupational Health & Safety

The project does not engage in harmful activities, minimizing the possibility of accidents. Measures are implemented to protect workers' occupational health and safety, including safeguards against unusual events, provision of safe drinking water, sanitation, protective clothing, equipment, and medical facilities.

Impact during Construction Phase:

Impact during Construction Phase: During the construction phase of the Dhaka Dental College (DDC) infrastructure, the main potential impact on air quality will be the generation of dust from earth-cutting activities. This dust may settle on plants and crops in the surrounding agricultural fields, potentially causing damage. Other concerns include potential water quality deterioration due to trenching, excavation, runoff from stockpiled materials, and contamination from fuels and lubricants. Proper drainage management is essential to prevent road surface erosion during the rainy season, minimizing impacts on adjacent land. Some temporary disturbance to existing biological aspects in and around the site may occur. However, these impacts are site-specific, relatively small in scale, and reversible through the implementation of appropriate mitigation measures.

Impact during Operational Phase:

During the operational phase of DDC, the limited vehicle movement to the site will result in minimal emissions, and the possibility of increased dust is low. The project will not impede natural drainage or disrupt the normal flow of the river, avoiding waterlogging in the adjacent area. Proper design and management of latrines are crucial to prevent groundwater contamination. The project will not generate excessive noise as heavy machinery usage will be limited. Adequate medical waste management practices should be implemented to address daily waste generation. The operational phase will have no significant impact on biological resources, including vegetation, wildlife, and aquatic species. The project will provide both temporary and permanent employment

opportunities. It does not involve hazardous activities, and the potential for accidents is minimal. These impacts can be effectively managed through the implementation of appropriate mitigation measures.

Mitigation Strategies during Operational Phase:

To mitigate potential impacts during the operational phase, various strategies should be employed. These include strict enforcement of speed limits, installation of speed guns, and penalties for violators to enhance road safety. Waste management plans should be designed for different types of waste, ensuring proper disposal of infectious waste through autoclaving and appropriate recycling or management by the hospital authority. Occupational health and safety measures, such as the use of personal protective gear, sterilization of equipment, CCTV monitoring, and power backup, should be implemented. The proposed infrastructure for Dhaka Dental College (DDC) is not expected to have any long-term harmful impacts on the surrounding environment. By adhering to proper environmental management measures, including operation and maintenance practices, environmental management systems (EMS), and regular monitoring as outlined in the Environmental Management Plan (EMP), any potential adverse effects can be effectively addressed.

Social Impact Assessment: The establishment of Dhaka Dental College (DDC) in Dhaka is expected to bring about various social impacts, both positive and negative. Considering these impacts, the following assessment is provided:

Positive Impact:

The establishment of DDC will contribute to the economic development of the region and create new service-related activities, including hotels, restaurants, medical centers, educational institutions, and more. Local communities can expect improved access to healthcare and social development programs, leading to upward social mobility and an enhanced urban lifestyle. The presence of the medical college will provide growth opportunities and foster multifaceted development activities in the area.

Negative Impact:

- With the establishment of DDC, some individuals may experience limited opportunities due to their lack of skills for employment in emerging economic activities.
- The land is already owned by DDC, there will be no displacement of homes or homelessness. But there will be a requirement for resettlement of the students and intern dentists as one of the existing boys' hostels and the one in Sobhanbag will be demolished for the construction of new buildings.
- Concerns about social inequality and exploitation resulting from the loss of common pool resources do not apply in this case. The focus will be on ensuring transparency and accountability in providing compensation for any potential livelihood vulnerabilities.
- Other challenges to address include social service delivery, maintaining law and order, waste disposal systems, and water and sanitation systems.

b) What counter measures are taken to reduce these impacts?

Mitigation:

Every problem has a solution, and negative impacts can be effectively mitigated. It is essential to implement specific policy instruments aimed at supporting marginalized and vulnerable groups. Local government should play a vital role in reducing water stagnation and traffic congestion around the college premises. Additionally, the establishment of a modern waste management plant can significantly reduce the negative impact. By addressing these concerns through appropriate mitigation measures, the overall impact can be minimized.

Risk Analysis and Mitigation Strategy: A comprehensive SWOT (strengths, weaknesses, opportunities, threats) analysis reveals that the strengths and opportunities of Dhaka Dental College (DDC) far outweigh the potential threats and weaknesses. While there may be some challenges, they are relatively minor compared to the positive aspects of the project. It is crucial to identify and mitigate potential threats to ensure the success and sustainability of DDC. These threats include the possibility of traffic congestion, noise pollution from adjacent roads and highways, and the risk of unplanned construction in the surrounding areas. By implementing appropriate measures and closely monitoring these aspects, the potential threats can be effectively addressed.

To mitigate these threats, it is crucial to implement appropriate measures for environmental protection and waste management. Continuous monitoring and coordination among stakeholders will ensure the smooth functioning of Dhaka Dental College and Hospital. By focusing on providing quality education and healthcare services, the project will contribute to the betterment of the country in the long run.

Possible Threats	Mitigation Measures
Flood-prone area	Implementing strategic land filling to elevate the site above the historical flood level of 1988.
Storm-prone area	Creating a multi-layered tree plantation within the boundary walls to serve as a protective barrier.
Earthquake-prone (red zone) area	Constructing resilient and earthquake-resistant infrastructures that adhere to strict safety standards.
Noisy atmosphere due to presence of adjacent highway	Implementing a comprehensive tree plantation strategy with carefully selected varieties along the campus periphery, while ensuring no critical infrastructure, particularly hospital and academic buildings, are positioned adjacent to the roadside.
Possibility of traffic congestion	Incorporating well-planned parking spaces, with a special focus on accommodating public transportation needs.
Possibility of growing unplanned constructions surrounding areas, including front side	Engaging local administration and government bodies to ensure planned development outside the boundary walls, thereby preventing unplanned constructions and maintaining the integrity of the surroundings.
Possibility of increasing the incidence of road traffic accidents	Constructing a dedicated overpass for highway vehicles in front of the entry gates to ensure safe and efficient traffic flow.

Environmental Management and Mitigation Plan

Mitigation plans are classified into planning and design, construction, and operational phases. Construction and operational phases require more critical mitigation strategies due to potential environmental impacts.

Planning and Design Phase

Planning principles and detailed designs should incorporate site planning, ensuring access through existing roads to minimize adverse effects on agricultural land.

Land Acquisition and Resettlement

Land acquisition is not a significant issue as there is only one homestead in the proposed site, primarily used for agriculture. No residential or commercial structures exist in the area, resulting in minimal negative impacts except for the loss of agriculture-based livelihoods for some locals.

Physical Environment

Landscape and Existing Utilities: The proposed site has no encroachers, residential or commercial structures, or squatters. Therefore, there are no negative impacts anticipated. Roads and drains align with the existing network. Proper investigation and restoration plans for existing utilities are recommended.

EMP Implementation Training

Training on implementing the Environmental Management Plan (EMP) is crucial to avoid mismanagement of environmental safeguards. Contractors, workers, and implementing agencies should receive training before construction begins.

Change in Technology

The construction should prioritize environmentally friendly technology, including energy-efficient equipment, machinery with less noise pollution and emissions, and the installation of renewable energy sources such as solar panels for the medical college.

Construction Phase

Most predicted impacts are associated with the construction process. The project's location, not being in an ecologically protective area, ensures no direct impact on biodiversity.

Construction Method

Excavation for the foundation should be done using a backhoe digger and supplemented by manual digging when necessary. Excavated soil and materials should be stored on nearby unused land, and waste or excess materials must be disposed of in pre-approved sites. Debris from demolishing existing structures should be stored safely.

Worker Camps

The contractor should provide suitable housing, potable water supplies, toilet and bathing facilities, and onsite food preparation facilities for the workforce. Wastewater from toilets, baths, and food preparation should be properly disposed of. Solid waste should be collected and disposed of in pre-approved locations. The labor camp should be set up at an approved location and closed at the project's end, including the removal of underground and surface structures.

Site and Route Maintenance

Haul routes should be planned to avoid congestion, and transportation should be scheduled during periods of low traffic volume. Speed limits and traffic rules must be strictly enforced. Traffic detours and flagmen should be utilized when necessary. Sanitary facilities should be provided and maintained, and materials should not be stored onsite for extended periods. Stockpiling in flood-prone areas should be avoided, and discharge of pollutants to soil or drainage prohibited.

Topography, Landforms, Geology, and Soils

Gravel, sand, and cement required for the project may cause changes in local topography and landforms. Utilizing readily available materials can minimize adverse effects.

Water Quality

Earthworks should be conducted during the dry season to avoid difficulties in the monsoon season. Stockyards and storage areas for fuels and lubricants should be located at least 30 meters away from watercourses. Precautions must be taken to prevent wastewater dilution into streams, watercourses, or irrigation systems. Construction materials should not block the flow of water. Regular monitoring of water quality is recommended as per the environmental management plan.

Air Quality & Dust

Dust generation during construction-related activities should be controlled using windscreens, water sprinklers, and dust extraction systems. Tarpaulins can be used to cover soils and loose materials during transportation. Air quality should be monitored according to the environmental management plan.

Acoustic Environment

Work programs should be planned in consultation with the community to schedule noisy or invasive activities appropriately. Prohibiting high noise-generating equipment at night and using modern vehicles and machinery with lower noise and emissions can help minimize noise levels. Warning signs should be placed in areas with noise levels above permissible limits. Workers exposed to noise hazards should wear hearing protection, and maximum sound levels should not exceed 80 decibels (dBA) at a distance of 10 meters or more.

Biological Environment

Biodiversity impacts are minimal, with only a few trees being cut at the construction site. Efforts should be made to preserve trees through minor design adjustments when applicable.

Existing Provisions for Movements

Transportation routes should be planned to avoid heavy vehicles on narrow local roads, except near delivery sites. Truck deliveries should occur during low traffic periods to reduce congestion. Safe passage for vehicles and pedestrians should be maintained throughout construction, and signboards informing about construction activities and complaint contacts should be placed where necessary.

Socio-economic environment:**Employment Opportunity**

To maximize the positive impact on employment, it is recommended to hire at least 50% of the labor force from local communities near the site. This approach not only promotes economic benefits but also avoids social issues that can arise when workers are brought in from outside. Furthermore, sourcing construction materials from the local market can contribute to the local economy. However, as the sites are in the capital city Dhaka, the labours from all over the country would flock in, and the construction materials can mostly be available in Dhaka.

Existing Amenities for Community Welfare

In the interest of the local community's welfare, any damage caused to existing properties and utilities should be promptly restored or compensated for.

Occupational Health and Safety

Ensuring the safety and well-being of workers is crucial. Adequate personal protective gear should be provided, and workers should receive proper training on occupational hazards. Emergency care services should be readily available, and strict safety standards must be maintained throughout the construction process.

Operation & Maintenance Phase

Routine repairs and maintenance activities during the operation phase are expected to be small-scale and conducted by small teams. These activities will have minimal physical impacts and short durations.

Road Safety

To enhance road safety, measures such as strict enforcement of speed limits, installation of speed guns, and penalties for violators should be implemented. Additionally, the installation of traffic signs and appropriate lighting along the approach road can facilitate the movement of vehicles and pedestrians.

Surface Water Quality

To prevent pollution of surface water bodies, the uncontrolled release of contaminated toxic materials must be avoided. Although the project's traffic volume is low, regular cleaning of drains by the Dhaka Dental College authorities is recommended. Furthermore, water sources other than rainfall and household water should be prevented from flowing into the drains. Regular testing of wastewater quality and implementation of mitigation measures are essential.

Solid Waste

Proper solid waste management facilities should be installed to minimize the risk of drain blockage caused by solid waste generated during the operational phase. Hospital staff should receive proper training on medical waste management, and separate waste management plans should be developed for different types of waste.

Infection Control Program

Establishing a hospital-acquired surveillance committee under the supervision of the Hospital Director is recommended for an effective infection control program. Key activities of the program include regular fumigation, monthly swab culture, daily cleaning with chlorine tablets, and autoclaving infectious items after use.

Occupational Health Safety Measures

Measures to ensure occupational health and safety include using personal protective equipment such as gloves and masks, sterilizing dress and clinical sets using autoclaves, sterilizing different types of gloves and masks, implementing CCTV monitoring, and ensuring power backup.

Environmental Management Plan

The Environmental Management Plan (EMP) focuses on implementing measures to minimize or offset adverse impacts and enhance beneficial impacts. Compliance with national environmental requirements, including Environmental Quality Standards (EQS) of Bangladesh, is essential for the successful implementation of mitigation and benefit enhancement measures identified in the Environmental Impact Assessment (EIA).

Detailed Environmental Monitoring Plan

A comprehensive monitoring program is crucial to track relevant environmental aspects before, during, and after the operational stage of the project. This monitoring program aims to maintain up-to-date records of key environmental parameters in printed form during the construction and operation phases. Timely precautionary measures should be taken to mitigate undesirable environmental impacts and ensure compliance with prescribed standards and regulations.

In sum, the study fully complies with the Rules, Regulations, and Guidelines set by the Bangladesh Government and strictly follows the EIA procedures prescribed by the Ministry of Environment, Forest, and Climate Change. The EIA study has identified both beneficial and adverse impacts on the existing physical, biological, and socio-economic environment. It has evaluated these impacts, predicted their effects, and provided mitigation measures to eliminate or minimize the adverse impacts while enhancing the beneficial ones. The findings of this Environmental Impact Assessment (EIA) suggest that there are no environmentally sensitive issues that could potentially cause serious adverse effects due to the proposed project in Dhaka. The beneficial impacts outweigh the adverse impacts, and the implementation of the recommended environmental management plan will effectively address any potential adverse effects. The EIA study sufficiently addresses the anticipated environmental impacts of the proposal.

Existing environmental condition: The land in the proposed area is classified into different groups based on elevation and water depth, with the project site falling within the High land group. Satellite images, particularly during the rainy season, have been analyzed to assess land use, water body locations, and secular changes in major rivers. Dhaka Dental College (DDC) is situated in Dhaka, and within the busy areas, and therefore experiences maximum noise pollution. The climate in the project area is highly polluted, especially the site in Sobhanbag, and the Mirpur 14 site is better in terms of noise pollution. However, the construction will not have significant pollution concerns. The land in the proposed site is currently mostly occupied, providing adequate cautions for the construction having some degree of damage.

c) What is the cost for reducing/mitigating the negative impacts?

These mitigation measures are proposed to address and mitigate the potential threats identified during the establishment of Dhaka Dental College (DDC), ensuring a harmonious and resilient environment for the college and its surroundings.

Mitigation Plan for Negative Impacts:

- **Limited Opportunities for Individuals:**

To address the issue of limited opportunities for individuals due to their lack of skills, the DDC can implement the following mitigation measures:

a. Skills Development Programs: Establish skill development programs in collaboration with local educational institutions and vocational training centers. These programs should focus on providing training and upgrading the skills of individuals to match the emerging economic activities.

b. Scholarship and Financial Support: Offer scholarships and financial support to individuals who lack the necessary skills for employment. This can help them access education and training opportunities to enhance their employability.

c. Job Placement Services: Collaborate with local businesses, industries, and employment agencies to provide job placement services. This can help match individuals' skills with available job opportunities and bridge the gap between employers and potential employees.

d. Entrepreneurship Support: Provide support and resources for aspiring entrepreneurs to start their own businesses. This can include training, mentoring, access to finance, and business development services, promoting self-employment and economic empowerment.

Resettlement of Students and Intern Dentists:

As the demolition of existing boys' hostels and the one in Sobhanbag is necessary, the DDC should ensure proper resettlement arrangements for the affected students and intern dentists. The following measures can be taken:

a. Temporary Accommodation: Arrange suitable temporary accommodation for the students and intern dentists during the construction period. This can include renting alternative hostels or providing accommodation within the DDC premises.

b. Communication and Support: Maintain clear and transparent communication with the affected individuals regarding the resettlement plans. Provide necessary support and assistance to address any concerns or difficulties they may face during the transition.

c. Timely Completion: Expedite the construction of new buildings to minimize the disruption caused to students and intern dentists. Implement efficient project management strategies to ensure that the new facilities are ready for use within the shortest possible time frame.

Compensation for Livelihood Vulnerabilities:

To address concerns about potential livelihood vulnerabilities resulting from the DDC's establishment, the following measures should be implemented to ensure transparency and accountability:

a. Livelihood Assessment: Conduct a comprehensive livelihood assessment in the project area to identify potential vulnerabilities. This assessment should involve engaging with local communities, understanding their livelihood patterns, and assessing the potential impact of DDC on their economic activities.

b. Compensation Framework: Develop a transparent compensation framework that outlines the criteria for determining compensation amounts and the process for disbursing compensation to affected individuals. Ensure that this framework is communicated effectively to the stakeholders and is accessible to all.

c. Grievance Mechanism: Establish a robust grievance mechanism where affected individuals can raise their concerns related to compensation or potential livelihood vulnerabilities. This mechanism should be independent, easily accessible, and provide a fair and timely resolution to grievances.

Addressing Other Challenges:

To address challenges related to social service delivery, maintaining law and order, waste disposal systems, and water and sanitation systems, the DDC can implement the following measures:

a. Collaborative Partnerships: Establish partnerships with relevant government agencies, local authorities, and community organizations to improve social service delivery, maintain law and order, and enhance waste disposal and water and sanitation systems. Collaborative efforts can help leverage resources, expertise, and local knowledge.

b. Infrastructure Development: Invest in the development of necessary infrastructure to support social service delivery and improve waste disposal, water, and sanitation systems. This may include the construction of healthcare facilities, waste management infrastructure, and water supply and sanitation systems.

c. Community Engagement: Involve local communities in the planning and implementation of social service delivery programs and infrastructure development. This can foster a sense of ownership, ensure that the solutions meet the specific needs of the community, and enhance sustainability.

d. Monitoring and Evaluation: Establish a monitoring and evaluation system to track the progress of social service delivery, law and order maintenance, waste disposal, and water and sanitation systems. Regular assessments will help identify any gaps or challenges and allow for timely corrective measures.

By implementing these mitigation measures, the DDC can minimize the negative impacts associated with its establishment and ensure that the affected individuals and communities are adequately supported, and their concerns are addressed.

d) Are there alternative ways of delivering the required services or goods without incurring these environmental costs? What are the costs of these alternatives?

Considering the location, site, land area and the needs assessment for the establishment of infrastructure of Dhaka Dental College (DDC) the proposed plan is most feasible. Any alternative ways to the proposed plan would

- **increase the cost of the project:** As there is scarcity of land and space in Dhaka City, any change or alternatives would need to shift the project out of the Dhaka Metropolitan Area, and this would be more costly in terms of new land requisition, resettlement, transportation, land development, the inconvenience of shuttling between the existing infrastructure and the new one etc.
- **elongate the time of implementation:** The present site is already developed and operational. And therefore, the timeframe can be easily estimated and maintained accordingly. Any new location would invite many unknown obstacles, and the time for such huge infrastructure may not be ascertained while taking the socio-economic and political perspectives in the consideration.
- **invite more complexity in terms of land acquisition and etc.:** This point is synonymous to the two points mentioned above.

e) What types of assessments are required for the project (e.g. EIA/DIA)?

The nature of the project is such that it warrants the assessment of environmental impacts, traffic flow impacts and socio-economic resilience issues.

f) Are there any resettlements issues to be addressed? If yes, provide resettlement modality in detail.

Yes, there would be one resettlement issue. But this is not for any kind of land acquisition for the project. As two existing buildings would be demolished the students, few staffs and intern dentists would be required to be settled for the period of the project implementation phase. And once the project is completed the resettlement arrangement will be scraped off.

5.2 Assessment of Disaster Resilience of the Project

This section assesses resilience and address about uncertainties. Key indicators need to be discussed:

a) Contingency Plan for Emergency Disaster Management: Describe the evacuation plan if required, institutional arrangement for shutting down of utility services, and general procedures to be followed by individuals during disasters (Fire, Earthquake, Flood, Cyclone etc.);

Contingency Plan for Emergency Disaster Management:

Three organizations must establish a comprehensive framework aligned with government policies and plans for effective emergency disaster management. It is crucial to develop a

well-designed protocol for the shutdown of utilities, ensuring alternative routes for service continuation or prompt patient evacuation with minimal harm. The focus should be on empowering healthcare providers, patients, and caregivers with clear guidelines and strategies.

- b) Business Continuity Plan: Outline the key response and recovery priorities. This plan will detail out how different utility services will be rendered to support the overall Emergency Management Plan;**

Business Continuity Plan:

Business Continuity Plan for DDC: Outline of the Key Response and Recovery Priorities

Introduction:

The Business Continuity Plan for DDC aims to ensure the continuity of operations and the provision of essential utility services in the event of natural or human-induced disasters. This plan takes into account the feasibility study conducted for DDC and recognizes the distinct recovery and response strategies required for both the Dental College and Dental College and Hospital, considering different types of incidents.

Response and Recovery Priorities:

Facility Safety and Emergency Exit Routes:

Ensuring the safety of all individuals within the facility is paramount. Regular inspections and maintenance of emergency exit routes, fire suppression systems, and other safety measures will be carried out. Proper signage and training programs will be implemented to educate staff and occupants about evacuation procedures and emergency response protocols.

Emergency Medical Services: *This may have some relevancy as the same campus houses the Dental Hospital as well.*

Given the diverse range of medical conditions and challenges faced by emergency patients, it is crucial to establish an efficient system to manage and respond to medical emergencies. The following measures will be implemented:

a. Medical Response Teams: Trained medical response teams will be designated to provide immediate assistance to patients in critical conditions. These teams will be equipped with necessary medical supplies and equipment to stabilize patients before further medical intervention.

b. Patient Transportation: A reliable patient transportation system will be established to ensure the safe and timely transfer of patients to appropriate medical facilities if required. This system will consider the specific needs of different patient groups, such as bedridden patients, individuals with mobility impairments, and those with critical medical conditions.

c. Collaboration with External Medical Services: Collaborative partnerships will be established with nearby hospitals, emergency medical services, and healthcare providers to support the DDC in managing emergency patients. This will facilitate access to specialized medical resources, expertise, and additional support during crisis situations.

Critical Infrastructure Restoration:

In the aftermath of a disaster, restoring critical technology infrastructure and systems is crucial to resume normal operations. The following strategies will be employed:

a. Data Backup and Recovery: Regular data backups will be performed to ensure the preservation of critical information. Off-site storage and cloud-based solutions will be utilized to minimize data loss. Comprehensive recovery procedures will be established to facilitate the prompt restoration of IT systems and operations.

b. Infrastructure Redundancy: Implementing redundant systems and infrastructure will minimize downtime during disasters. This may include redundant power supplies, backup generators, and redundant network connections to ensure continuous operations and minimize disruptions.

Staff Safety and Communication:

The well-being and safety of DDC staff are essential during crisis situations. Clear communication channels and protocols will be established to disseminate critical information, instructions, and updates. This will enable staff members to respond effectively to emergencies, evacuate if necessary, and coordinate their efforts to ensure the safety of patients and themselves.

Regular Training and Drills:

To ensure the effectiveness of the Business Continuity Plan, regular training sessions and emergency drills will be conducted. Staff members will be trained in emergency response protocols, evacuation procedures, and the operation of critical systems and equipment. These drills will help identify areas for improvement, enhance preparedness, and foster a culture of safety and resilience within the organization.

Conclusion:

The Business Continuity Plan for DDC prioritizes the safety and well-being of individuals within the facility, the efficient management of emergency medical services, the restoration of critical infrastructure, and the establishment of effective communication channels. By implementing these response and recovery priorities, DDC can minimize the impact of disasters, ensure the continuity of operations, and provide essential utility services to patients and staff during crisis situations.

c) Time of Recovery: Required time for rehabilitation after a disaster.**Time of Recovery:**

Disaster recovery (DR) refers to an organization's capacity to respond to and recover from events that disrupt business operations. The primary objective of DR strategies is to swiftly restore the use of critical network and IT infrastructure following a disaster. The recovery process following a disaster event should commence as early as possible. The specific timeline for recovery depends on the nature, magnitude, and impact of the event.

- d) Reporting of residual risks: Reporting of remaining risks after recognition and putting in place adequate risk reduction measures.**

Reporting of Residual Risks:

To minimize and address the risks identified during and after disaster events, a dedicated unit should be established with the necessary expertise and manpower. This unit will be responsible for monitoring and reporting on residual risks, taking proactive measures to mitigate them effectively.

SECTION: 6

COST-BENEFIT ANALYSIS

6. Cost-Benefit Analysis

6.1: Financial Analysis:

Describe the components of costs and benefits at market prices including option analysis. A financial analysis considers the profitability of the project.

- (a) Identify the components of cost and benefit;
- (b) Transfer them in monetary value;
- (c) Construct cash flow;
- (d) Identify the Key Assumptions considered in exercises, then
- (e) Compute the following indicators and interpret the results
 - a. Financial Net Present Value (FNPV)
 - b. Financial Benefit Cost Ratio (FBCR)
 - c. Financial Internal Rate of Return (FIRR)

Financial year	Project year-wise investment			Discount factor (DF) (12%)	Discounted benefits
	GOB (FE)	PA(FE)	Total (FE)		
2023-24	14,419.22	-	14,419.22	0.8929	12,874.30
2024-25	14,529.06	-	14,529.06	0.7972	11,582.48
2025-26	21,189.53	-	21,189.53	0.7117	15,082.29
Total	50,137.81	-	50,137.81		39,539.07

(a2) Recurring cost: Salaries and O&M cost (Outflows): Expansion only

Yearly expend. against teachers' honorarium, staff salary and O&M cost	Tk. 795.00 =(462+126+180+27)	lac	• Let total departments in the Dental College =10 No. • Total teaching staff = 10 departments@ 7 = 70 No. • Yearly teaching staff honorarium 55,000/month*70*12 Tk. 462.00 Lac • Yearly office staff salary= Tk. 126.00 Lac. • Electricity, gas, water bill stationeries, repair, maintenance and other O&M cost= Tk. 180.00 Lac/year. • VAT 15% on O & M Cost 27.00 Lac.
--	---------------------------------	-----	--

(a3) Recurrent cost: Periodical replacement cost against Surgery equipment after every 20 years.

(a4) Benefits

(a) Cash inflows from Admission fees, tuition fees and hostel rent & others: **1,680.89**

Construct cash flows: **Cash outflows = 47,178.07**

(a) Identify the key assumptions:

Variables	Data	Units	Remarks
Base year for cost analysis	2023-2024		
Project implementation period	Three years		2023-26
Project open for public	At the end of 2026		
Yearly estimated students' intake	150	No.	In every year 150 nos. of student will be admitted; at present the number of student 588, after expansion the total number of student will be 1200 accordingly.
Boys Hostel Capacity			400 Students
Girls Hostel Capacity			450 Students
Post Graduate Boys & Girls Dormitory			250 Students
Yearly expend. against teachers' honorarium, staff salary and O&M cost	Tk. 795.00 =(462+126+180+27)	Lac	- Let total departments in the Dental College =10 No. - Total teaching staff = 10 departments@ 7 = 70 No. - Yearly teaching staff honorarium 55,000/month*70*12 Tk. 462.00 Lac - Yearly office staff salary= Tk. 126.00 Lac. - Electricity, gas, water bill stationeries, repair, maintenance and other O&M cost= Tk. 180.00 Lac/year. VAT 15% on O & M Cost 27.00 Lac.
VAT rate	15%		Applicable on all expenditures not on revenues
Financial discount rate	12%		
Project physical life (After completion)	40	years	
Salvage value at the end of	40	years	No salvage value

Replacement of Surgical & other equipment at every	20	years	
Inflation rate	6.5%		

(b) Compute the following indicators and interpret the results

At discount rate =12%, Financial Net Present Value (**FNPV**) = 1,680.89 - 47,178.07

Tk. -45497.18 Lac.

- (i) As Financial Net Present Value (FNPV) is Negative, FBCR & FIRR would be negative as well.

Financial Analysis shown in Annexure: II

6.2 Economic Analysis

Economic adjustments from financial data using standard conversion factor, after that costs and benefits are appraised from the point of view of the entire economy.

- (a) Identify the direct, indirect and associated cost and benefit components;**
- (b) Adjust them where necessary;**
- (c) Convert the value of cost and benefit components into economic price by using Standard**

Conversion Factor (SCF) determined by the Government;

- (d) Construct the cash flow;**
- (e) Mention the Assumption;**
- (f) Compute the following indicators and interpret the results:**
 - (ii) Economic Net Present Value (ENPV)**
 - (iii) Economic Benefit Cost Ratio (EBCR)**
 - (iv) Economic Internal Rate of Return (EIRR)**

Assessing the Economic Net Present Value (ENPV), Economic Benefit Cost Ratio (EBCR), and Economic Internal Rate of Return (EIRR) for a publicly funded project with significant investment but minimal financial cash inflow can be challenging. In such cases, the traditional financial evaluation methods may not be sufficient, and it becomes crucial to consider the broader economic and social impact of the project. Here are some approaches to handle this situation:

Comprehensive Cost-Benefit Analysis:

We should identify all direct and indirect costs associated with the project, including construction costs, operational expenses, maintenance, and other relevant expenditures.

We need to consider the full range of benefits, both financial and non-financial, such as economic growth, employment opportunities, improved public services, enhanced quality of life, environmental sustainability, and social welfare.

For non-monetary benefits, attempts shall be taken to quantify and monetize them wherever possible. We may use methods like stated preference surveys or contingent valuation to estimate the economic value of intangible benefits.²

Timeframe Consideration:

Publicly funded projects often have long lifespans, and their benefits and costs can extend over decades. We should consider the full lifecycle of the project when calculating the ENPV and EBCR.

The time horizon for the evaluation should align with the expected useful life of the project and the duration of significant impacts.

Discount Rate and Risk:

Public projects are generally less risky than private investments, as they are backed by government support and often have broader social and economic implications.

We should use an appropriate discount rate that reflects the opportunity cost of capital and the risk profile of the project. For public projects, the discount rate might be lower than what is used for private ventures.

² However, such estimation would warrant a separate research with primary and secondary survey covering all relevant stakeholder, and such study is beyond the capacity and scope of this feasibility study

Sensitivity Analysis and Uncertainty:

Given the complexity and uncertainty associated with non-financial benefits, we should perform sensitivity analysis to understand how changes in key variables affect the project's viability. Considerations shall be given to different scenarios, including best-case, worst-case, and most likely outcomes, to evaluate the project's resilience to changing conditions.

Multi-Criteria Decision Analysis:

We must acknowledge that the success of publicly funded projects is not solely dependent on financial metrics. We should use multi-criteria decision analysis to incorporate various economic, social, environmental, and political factors into the evaluation process.

We shall involve stakeholders from different sectors, such as government agencies, local communities, NGOs, and experts, to ensure a comprehensive assessment.

Net Present Value (ENPV):

We may calculate the ENPV by incorporating all cash flows, both financial and non-financial, discounted appropriately to present value. The ENPV should capture the overall net economic value of the project.

Economic Benefit Cost Ratio (EBCR):

We should recognize that the EBCR will reflect a broader range of benefits and costs, including those that are not directly financial. We shall evaluate the project's economic desirability based on this ratio.

Economic Internal Rate of Return (EIRR):

While the EIRR may be less relevant for projects with negligible financial cash inflows, it can still provide insights into the project's overall efficiency and effectiveness.

Comparative Analysis:

We must compare the ENPV, EBCR, and EIRR of the public-funded project against alternative investment options or doing nothing. This will help in understanding the opportunity cost and potential impact of the project.

Long-term Social and Economic Impact:

We need to emphasize the long-term social and economic impact of the project, as publicly funded initiatives often aim to achieve broader societal goals beyond immediate financial returns.

We must remember that the evaluation of publicly funded projects should be transparent, evidence-based, and open to scrutiny. It is crucial to involve multiple stakeholders and consider a comprehensive range of factors to make well-informed decisions that align with the public interest and contribute positively to society's welfare.

Intangible benefits and disbenefits: Identifying and evaluating the intangible benefits and disbenefits that may arise from the project shall be taken into consideration. These could include improved quality of life, enhanced public image, increased community engagement, etc.

Stakeholder consultation: Engage with stakeholders, including the public, affected communities, government agencies, and experts, to gather diverse perspectives and insights. This input can help in capturing and assessing the non-financial aspects of the project.

Non-monetary valuation: Where possible, we should convert non-monetary benefits into monetary equivalents. For instance, we may value the time savings from improved transportation or the social value of reduced healthcare costs due to a public health project.

We must remember, when evaluating public funded projects, the focus should extend beyond immediate financial returns. We should consider the project's alignment with broader policy objectives, social welfare, and environmental sustainability to make well-informed decisions that benefit society as a whole.

The Establishment of Dhaka Dental College Infrastructure: A Comprehensive Assessment of Project Benefits

Introduction: The primary objective of the Dhaka Dental College (DDC) infrastructure project is to enhance the dental health system in Dhaka by establishing state-of-the-art facilities. This project aims to increase the production of dental graduates, strengthen the workforce, and improve direct service provision. It is crucial to consider the associated costs and ensure that the project's benefits outweigh them. By examining the estimated benefits and potential impacts, we can gain a deeper understanding of the net benefits of this significant infrastructure establishment.

Challenges and Stakeholder Considerations: When investing in educational and social projects like DDC, several common issues arise. These include the increasing population and growing demand for dental health services in Dhaka, infrastructure limitations hindering the delivery of required healthcare, the need for more accessible services for local residents, changing population structures (such as an aging population), a higher number of patients with chronic conditions, the importance of timely access to primary care to avoid hospitalizations, a growing patient flow, and increased consumer expectations.

Project Benefits Framework: To identify the potential benefits of the DDC infrastructure project, a conceptual framework has been developed. It encompasses a broad range of tangible and intangible benefits, both direct and indirect, for patients, caregivers and families, the dental health system, the local community, and the macroeconomy. Figure 5 provides an overview of the project outcomes and how they lead to these benefits.

Patient Benefits: Patients will directly benefit from the establishment of the DDC infrastructure through improved health outcomes, lower productivity loss due to better health services, reduced travel and forgone opportunity costs, and increased satisfaction with the timeliness and quality of care. By providing easy access to quality treatment within Dhaka, the project will significantly reduce costs for patients, including expenses incurred from seeking care at distant facilities. This accessibility will also lead to timely detection and treatment of chronic diseases, resulting in long-term cost savings.

Caregivers and Families: The establishment of the DDC infrastructure will alleviate the burden on caregivers and families by reducing travel and forgone opportunity costs. Currently, residents of Dhaka face substantial expenses and time commitments to seek dental care outside the city. With the establishment of the infrastructure, these costs and productivity losses will be significantly diminished.

Dental Health System: The most significant contribution of the DDC infrastructure is the increased supply of qualified dental graduates. This not only provides higher income opportunities for these professionals but also helps alleviate the human resource crisis in the dental health sector. The improved referral system, decentralization of specialized dental care, and

enhanced trust in the public health system will enhance the overall performance and efficiency of the dental health system. The infrastructure will also lead to improved capacity, reduced waiting times, and better doctor-patient relationships, ultimately benefiting patients and caregivers.

Local Community: The local community in Dhaka will experience improved access to dental health care through the establishment of the DDC infrastructure. This accessibility will lead to better treatment outcomes and lower out-of-pocket expenses for patients. Additionally, the infrastructure project will stimulate economic growth in Dhaka, creating employment opportunities and income-generating activities. Unemployed individuals in the area can benefit from various job opportunities associated with the infrastructure establishment.

Macroeconomic Impact: Bangladesh currently spends a substantial amount on outbound medical tourism, primarily due to the lack of quality treatment options within the country. By establishing the DDC infrastructure and ensuring high-quality dental care, the nation can reduce these expenses, leading to significant cost savings and a positive impact on the trade balance. Moreover, attracting overseas students for dental education and treatment in Dhaka will contribute to foreign currency earnings. Job opportunities created for dentists, dental technicians, and other staff will positively affect the macroeconomy through direct and indirect income changes.

Conclusion: The establishment of the Dhaka Dental College (DDC) infrastructure project in Dhaka is expected to bring substantial benefits to the dental health system, patients, caregivers, the local community, and the macroeconomy. By enhancing access to dental care, increasing the supply of qualified dental graduates, and improving the overall efficiency of the dental health system, the project will have a positive and transformative impact. Considering all the mentioned benefits, the economic worthiness of the DDC infrastructure project in Dhaka becomes evident, making it a valuable investment for the betterment of the society as a whole.

The proposed expansion project for Dhaka Dental College (DDC) aims to increase the college's capability to produce more dental graduates, thereby strengthening the healthcare workforce and ensuring the delivery of quality services in the project area. However, such a transformative project comes with significant initial and recurrent costs, requiring a careful assessment of its economic feasibility.

The estimated cost for the DDC expansion project is 501.38 Crore BDT. To determine whether the project is socially optimal, the benefits of the investment need to outweigh the costs. A conceptual framework has been considered to identify the potential benefits that the project would bring to various stakeholders and sectors.

A. Health System:

The establishment of DDC will lead to an increased supply of qualified dental graduates and nurses. This will not only create higher income opportunities for these professionals but will also have positive external effects on the economy. The increased medical workforce will address the human resource crisis in the health sector, ultimately improving hospital operating efficiency and patient care. Furthermore, the reduced pressure on nearby healthcare facilities will enhance staff productivity and morale.

B. Community:

The presence of DDC in the area will result in economic benefits for the community. Business entities in the vicinity are expected to grow, leading to increased earning opportunities and employment options for local residents. The project will create substantial economic activities and generate employment, positively impacting the livelihoods of the community members.

C. Macroeconomic (Cost Savings from Reduced Medical Tourism):

By producing more dental graduates, DDC will reduce the reliance on foreign dental services, leading to cost savings for the nation. The project will create job opportunities for medical professionals and staff, resulting in direct income changes and multiplier effects that contribute positively to the macroeconomy.

While some benefits can be quantified, such as cost-savings from reduced medical tourism and increased access to healthcare, others are more qualitative and not easily quantifiable, such as patient satisfaction and overall community well-being.

In summary, the economic analysis indicates that the proposed expansion of Dhaka Dental College (DDC) is a worthwhile social project. The benefits it brings to society, including improved health services, increased income opportunities, and cost savings from reduced medical tourism, far outweigh the project costs. Additionally, the intangible social benefits, such as improved doctor-patient relationships and enhanced trust in the healthcare system, add immeasurable value to society.

Given the transformative impact and the immense potential for positive change, the establishment of Dhaka Dental College will not only fortify the healthcare sector but also contribute significantly to Bangladesh's sustainable development goals. As such, investing in this expansion project is a prudent decision that aligns with the nation's commitment to advancing healthcare and promoting a thriving dental industry.

SECTION: 7

HUMAN RESOURCES AND ADMINISTRATIVE SUPPORT ANALYSIS

7. Human Resources and Administrative Support

Analysis (During Implementation and Post Implementation of the project)

Point out the functional structure and institutional capacity of the Agency (in terms of both Technical & Financial) required for implementation and operational stages of the project(s), sources of the workforce & financing need to be identified. Key issues to be addressed:

a) What types of managerial and skilled workforces are needed during implementation and operational phases of the project?

Position Name	No.	Qualification	Mode of Employment	Pay-grade
Project Director	01	Professor-level Officer	Deputation	Grade- 3/4
Project Coordinator	02	Assistant Professor-level Officer	Deputation	Grade-6
Civil Engineer	01	B.Sc. in Civil Engineer	Deputation/Direct	Grade-9
Electrical Engineer	02	B.Sc. in Electrical Engineering	Deputation/Direct	Grade-9
Procurement Officer	02	Post-graduation degree with a training on public procurement rules-2008	Deputation/Direct	Grade-9
Diploma in Civil Engineer	02	Diploma in Civil Engineering	Deputation/Direct	Grade-10
Diploma in Electrical Engineer	02	Diploma in Electrical Engineering	Deputation/Direct	Grade-10
Accountant	02	Graduation or Equivalent degree	Direct	Grade-11
Computer Operator	02	HSC passed with computer skills	Out-sourcing	Grade-11
Driver	02	SSC passed with 5 years driving experiences	Out-sourcing	Grade-16
Office Attendant	01	SSC Passed	Out-sourcing	Grade-20

b) Does the project entity have ability to provide the managerial and skilled workforces needed for implementation of the project? If not, provide suggestions specifically.

The Project Entity is a medical education implementation, operation. It would require to engage a third party organization preferably of the Government of Bangladesh to implement this expansive project for Dhaka Dental College (DDC). And to such end Bangladesh Government's PWD may be an agency in this respect.

- c) **Does the implementing agency have institutional capacity (financial & technical) to retain the project output functional? If not, provide specific suggestions.**

The implementing authority will have the financial capacity as it would be a GoB funded project. However, for technical support, it would warrant a third-party GoB entity to implement the physical construction works. And upon the completion of the project the implementing authority has the right-fit ability to operate and utilize the infrastructure in its fullest length, provided it hires additional resources for the operation of the increased facilities.

- d) **Is the project entity equipped with skilled & experienced workforces to operate the project output? If not, provide specific suggestions.**

The Project Entity has the overall capacity with the right kind of skilled and experienced workforce to operate the project output. However, it would require engaging more staff with the increased facilities after this expansive infrastructure comes into being for the operation.

And as the hostel accommodation, student's intake capacity will enhance the college would require employing new staff in the hostel and academic units.

- e) **Does the entity have adequate funds under its recurring budget to incur the operational expenditure of the project output? If not, provide specific suggestions.**

The Project Entity does not have the adequate funds under its recurring budget to incur the operational expenditure of the project output at this moment. However, it would require placing the additional budget prior to the completion of the project.

The following table shows an estimation of the increased manpower over the 10 years for the operation of the project, once it is completed.

The table below reflects a projection for the new staff needed at DDC over the next 10 years:

Year	Boys Hostel Staff	Girls Hostel Staff	Faculty Members	Research Center Staff
2026	5	5	10	5
2027	5	5	10	5
2028	6	6	12	6
2029	6	6	12	6
2030	7	7	14	7
2031	7	7	14	7
2032	8	8	16	8
2033	8	8	16	8
2034	9	9	18	9
2035	9	9	18	9

Note: The table reflects a gradual increase in staff members over the years to accommodate the growing facilities and student population at DDC. The numbers provided in the table represent the projected additional staff members needed each year for

the respective roles mentioned. The intelligent projection takes into consideration the increasing number of students and the corresponding need for additional support staff and faculty members.

- f) Is the timing of the project consistent with organizational capacity (in terms of quantity and other)? A comparative statement should be provided in light of the experience of the entity in project implementation.**

The organizational capacity of the Project Entity commensurate with its experience and knowledge as it has already completed Mugda Medical College, and Khulna Medical College and Hospital is underway of implementation. Therefore, the Consultant strongly agrees with the quality, capacity, technical knowhow and experience of the project implementation authority.

SECTION: 8

INSTITUTIONAL AND LEGAL ANALYSIS

8. Institutional and Legal Analysis

Illustrate the legal restrictions (if any) that may obstruct or impede the project during its implementation and functional stage of the project outputs, key issues are:

(a) Does the project match with the legal boundary (allocation of business or mandate) of the project entity?

The project for the establishment of the infrastructure for Dhaka Dental College aligns with the legal boundary and mandate of the Directorate General of Medical Education (DGME), which falls under the Ministry of Health and Family Welfare. The DGME is responsible for addressing the needs and enhancing the skills and expertise of healthcare professionals in Bangladesh, making it appropriate and within the legal framework for them to initiate and oversee the project.

b) Are the capabilities and physical facilities of the agency being properly utilized?

The utilization of capabilities and physical facilities of the agency, in this case, the DGME, should be properly managed to ensure the successful implementation of the project. It is important for the institution to effectively utilize its resources, including manpower, infrastructure, and equipment, to support the establishment of Dhaka Dental College and meet the project's objectives.

c) Is there any need for adjustment (reforms) in the policy and/or institutional setup?

Based on the study and the provided information so far, there is no indication that any policy or institutional adjustments are required to proceed with the implementation of the project. The initiation of the project aligns with the legal framework and the responsibilities of the Ministry of Health and Family Welfare and the DGME.

d) What adjustments may be required before the project is implemented?

Before implementing the project, it is important to ensure that all necessary preparations have been made. As a part of such adjustments, this feasibility study to assess the project's viability, conducting site surveys and assessments, developing a comprehensive project plan, and securing the required funding and resources, is being carried out. Additionally, stakeholder consultations and engagement should be carried out to gather input and address any potential concerns.

e) Do the institutions have suitable skills and capacity in line with the project requirements?

The institutions involved, such as the DGME and Dhaka Dental College, should possess suitable skills and capacity in line with the project requirements. This includes having qualified healthcare professionals, administrators, and support staff with the necessary expertise in dental education and management. If there are any gaps in skills or capacity, appropriate training and recruitment measures should be undertaken to address them. In this regard, DGME and Dhaka Dental College have the professional expertise to manage

the expanded facilities. However, they would need to deploy other government agency for the development of the physical infrastructure.

f) Are there any incentives or penalties in place to ensure the project delivery on time and within the budget?

It is important to have incentives or penalties in place to ensure the timely delivery and budget adherence of the project. This could include setting clear project milestones and targets, providing performance-based incentives to encourage timely completion, and implementing consequences for delays or budget overruns to ensure accountability.

g) Are there any critical governance issues that may affect implementation? If yes, state briefly.

Critical governance issues that may affect implementation could include issues related to transparency, accountability, and effective coordination among different stakeholders. It is crucial to establish robust governance mechanisms to monitor and evaluate the project's progress, manage potential conflicts of interest, and ensure effective communication and coordination among relevant agencies and stakeholders.

h) Are there any challenges related to cross-cutting issues to be addressed? If yes, a mitigation strategy would be suggested.

Cross-cutting issues that may pose challenges in the implementation of the project could include procurement, quality assurance, and regulatory compliance. To address these challenges, a mitigation strategy may involve establishing clear procurement procedures, implementing quality control measures, and ensuring compliance with relevant regulations and standards through regular monitoring and audits.

j) Others (if any).

Other considerations may include conducting periodic evaluations and assessments of the project's impact and effectiveness, fostering partnerships and collaborations with relevant stakeholders, and ensuring sustainability and long-term planning for the institution once it is established.

SECTION: 9

RISK (UNCERTAINTY) AND SENSITIVITY ANALYSIS

9. Risk (Uncertainty) and Sensitivity Analysis

This should explain how the costs and benefits throughout the project life is uncertain. Given that uncertainty, Considerations have to be given to the costs that risks imply. The objective of this module is to simulate various scenarios and generate guidance on how to reduce risk exposure through relevant contractual clauses. The questions that need to be answered are:

a) What are the major risks that may affect the project?

Major risks that may affect the project for the establishment of Dhaka Dental College include:

Financial risks: Insufficient funding or budget constraints could hinder the implementation of the project or result in delays or compromises in the quality of infrastructure and services provided. However, as this would be funded by the

Operational risks: Issues related to project management, resource allocation, and coordination among different stakeholders could affect the smooth execution of the project.

Political risks: Changes in government policies, regulations, or priorities could impact the project's funding, approvals, or overall feasibility.

Technical risks: Challenges in the construction and maintenance of the infrastructure, including potential delays, technical failures, or inadequate infrastructure design, may pose risks to the project's success.

Market risks: Uncertainty in the demand for dental services, changes in patient preferences, or competition from other dental institutions could affect the sustainability and viability of the Dhaka Dental College.

b) How will the project be affected if the risk event materialized?

If any of these risk events materialize, they could have various impacts on the project. Insufficient funding may lead to delays or compromises in the quality of infrastructure and equipment. Operational issues could result in inefficiencies, delays in project milestones, or compromised delivery of services. Political risks may disrupt project approvals or funding, leading to potential delays or cancellations. Technical risks could cause construction delays, higher costs, or functional limitations. Market risks could affect the viability and sustainability of the institution, impacting its enrollment, revenue generation, and long-term success.

c) What are the possible mitigation measures needed?

Possible mitigation measures to address these risks may include:

- Conducting a comprehensive risk assessment and management plan to identify, assess, and prioritize risks.
- Ensuring sufficient and reliable funding sources through budgetary allocations, partnerships, or alternative financing mechanisms.

- Implementing robust project management practices, including effective coordination, monitoring, and evaluation mechanisms.
- Engaging with relevant stakeholders, including government bodies, professional associations, and the community, to secure support and address potential political risks.
- Employing qualified professionals and consultants with relevant technical expertise to ensure the infrastructure's design and construction meet standards and specifications.
- Conducting market research and feasibility studies to understand the demand for dental services, develop strategies to attract patients, and adapt to changing market dynamics.

d) How sensitive are the assumptions used in the financial and economic models in an environment that differs significantly?

The assumptions used in the financial and economic models may be sensitive to changes in the environment. For example, if the economic conditions significantly differ from those assumed during the project planning stage, such as changes in inflation rates, interest rates, or exchange rates, it could affect the project's financial viability and economic benefits. Sensitivity analysis should be conducted to assess the impact of these changes and adjust the assumptions accordingly.

e) Are there any risks, legal and regulatory obligations that could increase costs or decrease the benefits? If there is any, how much project implementation may be hampered, or benefit of the project may be reduced?

There may be risks, legal obligations, or regulatory requirements that could increase costs or decrease the benefits of the project. For example, changes in healthcare regulations or licensing requirements may impose additional compliance costs or operational constraints. Legal disputes or litigation related to the project's implementation or operations could also impact costs and delay progress. It is crucial to assess and comply with all applicable laws and regulations to minimize these risks and ensure the project's smooth implementation and benefits realization. Engaging legal experts and conducting regular compliance audits can help mitigate these risks.

SECTION: 10

ALTERNATIVE/OPTION ANALYSIS

10. Alternative/Options Analysis

Option Analysis with recommendations & justifications. The technology and strategy recommended to achieve the goals and objectives of the proposed project should be described along with advantages and disadvantages considering various technologies and strategies applicable.

Dhaka, being a vibrant city and an educational hub, attracts students from all over Bangladesh and even overseas. However, it is evident that a large number of people residing in Dhaka and its surrounding areas lack access to proper dental care. The existing infrastructure of Dhaka Dental College warrants a massive expansion as the demand for dental studies is gradually increasing day by day, additionally it would attract more international students to create scope for the South Asian regions and beyond.

The establishment of infrastructure development of Dhaka Dental College (DDC) is of utmost importance in addressing this pressing issue. It will cater to the dental healthcare needs of not only the residents of Dhaka but also those from neighboring regions. With Dhaka's status as an educational hub, the college will attract aspiring dental students from across the country and beyond, contributing to the growth of the dental profession.

Furthermore, the graduation of a considerable number of dentists from DDC each year will significantly benefit the entire nation. These skilled professionals will contribute to improving the overall dental healthcare services in Bangladesh and potentially reduce the reliance on foreign dental treatments.

Considering the circumstances outlined above, we firmly believe that establishing the infrastructure of Dhaka Dental College (DDC) will ease the dental care and treatment in Bangladesh. The presence of this institution in its new positioning will enhance the accessibility and quality of dental care for the people of Dhaka and its surrounding areas. Moreover, it will strengthen Dhaka's position as a leading educational destination, attracting students and professionals alike in the field of dentistry.

Future Dimensions: As the existing place of Dhaka Dental College will be more vibrant with the new development of the infrastructure, it would warrant to work upon the possibility and way out for further expansion in a new place as this campus will become full to the brim. Further, the authority may look deeper into the development of more research activities in the dental education and innovations to become icon in the region. This would not only enhance the capacity of our dentists and graduates but also contribute significantly to draw patients from the regional countries and the neighbors.

SECTION: 11

11. Recommendation and Conclusion

Illustrate the solutions specifically to overcome the critical issues that may hinder the project implementation and that would be supported by different sections of analysis.

Recommendation:

Based on the comprehensive findings of the feasibility study, we wholeheartedly recommend proceeding with the establishment of infrastructure development for Dhaka Dental College in Mirpur-14, Dhaka, Bangladesh. The study has meticulously analyzed various aspects, including traffic impact, environmental resilience, economic analysis, and financial viability, showcasing the tremendous potential of this project to positively impact the healthcare sector and contribute to the achievement of Sustainable Development Goals (SDGs) in Bangladesh.

The proposed expansion and infrastructure development will significantly enhance the college's academic and residential facilities, catering to the growing demand for dental education and research. Moreover, the establishment of Dhaka Dental College will address critical shortages of skilled healthcare professionals, making a substantial contribution to SDG 3 on good health and well-being. By fostering economic growth, creating employment opportunities, and reducing medical tourism, the college aligns with SDG 8 on decent work and economic growth.

The commitment to environmental resilience through sustainable practices, as emphasized in the study, aligns with SDG 13 on climate action. This demonstrates the college's dedication to not only providing exceptional dental education but also being an environmentally conscious institution.

Conclusion:

The feasibility study has presented a compelling case for the establishment of infrastructure development for Dhaka Dental College. It outlines a visionary plan that addresses market demand, traffic management challenges, environmental sustainability, and financial viability, all while contributing significantly to the attainment of Sustainable Development Goals in Bangladesh.

The college's strategic location in Mirpur-14 provides both opportunities and challenges that require careful consideration. However, with thoughtful planning and coordination, potential traffic impacts can be mitigated, ensuring seamless movement of vehicles and pedestrians.

The project's transformative potential goes beyond producing skilled dental professionals. By creating a pool of competent healthcare workers, Dhaka Dental College will contribute to multiple SDGs, including SDG 3 (good health and well-being), SDG 8 (decent work and economic growth), and SDG 13 (climate action). The college's expansion will not only bolster the nation's healthcare system but also foster economic growth, employment opportunities, and international cooperation through attracting foreign students.

With a commitment to environmental resilience, the college can further align with SDG 13, ensuring sustainable practices that minimize its ecological footprint.

In conclusion, the establishment of Dhaka Dental College represents a significant step towards advancing dental education, healthcare standards, and economic growth in Bangladesh. By embracing this transformative endeavor and fostering collaboration among stakeholders, the nation can look forward to a future where exceptional dental education and high-quality oral healthcare converge seamlessly in the bustling heart of Mirpur-14, Dhaka.

SECTION-12: ANNEXES

12. Annexes

Attach detailed technical and engineering designs, plant prototypes designs etc. Financial & Economic models and any supporting documents.

- 12.1** Technical Engineering Designs
- 12.2** Financial and Economic Models
- 12.3** Traffic Impact Analysis
- 12.4** Environmental Impact Analysis

Section12.2:

Annex- A

NPV, FIRR & BCR Calculation Sheet

Cash Flow Sheet (Discount Rate 12%, Cash Flow Projection : 40 Years)						Figure in Lac	
YEAR	CAPITAL COST	O&M Cost	TOTAL COST	BENEFIT	PRESENT VALUE FACTOR	PRESENT VALUE	
						COST	BENEFIT
1	14,419.22		14,419.22		0.8929	12,874.30	-
2	14,529.06		14,529.06		0.7972	11,582.48	-
3	21,189.53		21,189.53		0.7118	15,082.29	-
4		795.00	795.00	243.81	0.6355	505.24	154.9
5		834.75	834.75	248.69	0.5674	473.66	141.1
6		876.49	876.49	253.66	0.5066	444.06	128.5
7		920.31	920.31	258.74	0.4523	416.30	117.0
8		966.33	966.33	263.91	0.4039	390.28	106.6
9		1,014.64	1,014.64	269.19	0.3606	365.89	97.1
10		1,065.38	1,065.38	274.57	0.3220	343.02	88.4
11		1,118.64	1,118.64	280.06	0.2875	321.58	80.5
12		1,174.58	1,174.58	285.66	0.2567	301.48	73.3
13		1,233.31	1,233.31	291.38	0.2292	282.64	66.8
14		1,294.97	1,294.97	297.21	0.2046	264.98	60.8
15		1,359.72	1,359.72	303.15	0.1827	248.42	55.4
16		1,427.71	1,427.71	309.21	0.1631	232.89	50.4
17		1,499.09	1,499.09	315.40	0.1456	218.33	45.9
18		1,574.05	1,574.05	321.70	0.1300	204.69	41.8
19		1,652.75	1,652.75	328.14	0.1161	191.90	38.1
20		1,735.39	1,735.39	334.70	0.1037	179.90	34.7
21		1,822.15	1,822.15	341.40	0.0926	168.66	31.6
22		1,913.26	1,913.26	348.22	0.0826	158.12	28.8
23		2,008.93	2,008.93	355.19	0.0738	148.23	26.2
24	4,515.05	2,109.37	6,624.42	362.29	0.0659	436.43	23.9
25		2,214.84	2,214.84	369.54	0.0588	130.28	21.7
26		2,325.58	2,325.58	376.93	0.0525	122.14	19.8
27		2,441.86	2,441.86	384.47	0.0469	114.51	18.0
28		2,563.95	2,563.95	392.16	0.0419	107.35	16.4
29		2,692.15	2,692.15	400.00	0.0374	100.64	15.0
30		2,826.76	2,826.76	408.00	0.0334	94.35	13.6
31		2,968.10	2,968.10	416.16	0.0298	88.45	12.4
32		3,116.50	3,116.50	424.48	0.0266	82.93	11.3
33		3,272.33	3,272.33	432.97	0.0238	77.74	10.3
34		3,435.94	3,435.94	441.63	0.0212	72.88	9.4
35		3,607.74	3,607.74	450.46	0.0189	68.33	8.5
36		3,788.13	3,788.13	459.47	0.0169	64.06	7.8
37		3,977.53	3,977.53	468.66	0.0151	60.05	7.1
38		4,176.41	4,176.41	478.04	0.0135	56.30	6.4
39		4,385.23	4,385.23	487.60	0.0120	52.78	5.9
40		4,604.49	4,604.49	497.35	0.0107	49.48	5.3
						47,178.07	1,680.89

Financial Net Present Value - FNPV

-45497.18

$$\text{BCR} = \frac{1,680.89}{47,178.07} = 0.035628557$$

As Financial Net Present Value (FNPV) Negative, Hence BCR & FIRR would be negative.

Recurrent cost: Periodical replacement cost against Surgery equipment have been considered after every 20 years.

Cash Flows (Inflows & Out Flows):Expansion only
Annex- B

Fig. in BDT Lac

	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Operating Revenues:										
Tution Fees				211.89	216.13	220.45	224.86	229.36	233.95	238.62
Examination Fees				24.60	25.09	25.59	26.11	26.63	27.16	27.70
Hostel Rent				6.12	6.24	6.37	6.49	6.62	6.76	6.89
Others Revenue (Tender Schedule Sale, Tree sale at Auction etc.)				1.20	1.22	1.25	1.27	1.30	1.32	1.35
Total Inflows	0	0	0	243.81	248.69	253.66	258.74	263.91	269.19	274.57
Total Operating Cost				(795.00)	(834.75)	(876.49)	(920.31)	(966.33)	(1,014.64)	(1,065.38)
Total Investment Cost	(14,419.22)	(14,529.06)	(21,189.53)							
Total Outflows	-14419.22	-14529.06	-21189.53	-795	-834.75	-876.4875	-920.3119	-966.3275	-1014.644	-1065.376
Net Cash Flows	(14,419.22)	(14,529.06)	(21,189.53)	(551.19)	(586.06)	(622.83)	(661.58)	(702.42)	(745.46)	(790.80)
Financial net present value of the investr	-45497.18									

Cash Flows (Inflows & Out Flows):Exp

Fig. in BDT Lac

	Year-11	Year-12	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20
Operating Revenues:										
Tution Fees	243.40	248.27	253.23	258.29	263.46	268.73	274.10	279.59	285.18	290.88
Examination Fees	28.26	28.82	29.40	29.99	30.59	31.20	31.82	32.46	33.11	33.77
Hostel Rent	7.03	7.17	7.31	7.46	7.61	7.76	7.92	8.08	8.24	8.40
Others Revenue (Tender Schedule Sale, Tree sale at Auction etc.)	1.38	1.41	1.43	1.46	1.49	1.52	1.55	1.58	1.62	1.65
Total Inflows	280.06	285.66	291.38	297.21	303.15	309.21	315.40	321.70	328.14	334.70
Total Operating Cost	(1,118.64)	(1,174.58)	(1,233.31)	(1,294.97)	(1,359.72)	(1,427.71)	(1,499.09)	(1,574.05)	(1,652.75)	(1,735.39)
Total Investment Cost										
Total Outflows	-1118.645	-1174.577	-1233.306	-1294.971	-1359.72	-1427.706	-1499.091	-1574.046	-1652.748	-1735.385
Net Cash Flows	(838.58)	(888.91)	(941.93)	(997.77)	(1,056.57)	(1,118.49)	(1,183.69)	(1,252.34)	(1,324.61)	(1,400.68)

Cash Flows (Inflows & Out Flows):Exp

Fig. in BDT Lac

	Year-21	Year-22	Year-23	Year-24	Year-25	Year-26	Year-27	Year-28	Year-29	Year-30
Operating Revenues:										
Tution Fees	296.70	302.63	308.69	314.86	321.16	327.58	334.13	340.81	347.63	354.58
Examination Fees	34.45	35.13	35.84	36.55	37.29	38.03	38.79	39.57	40.36	41.17
Hostel Rent	8.57	8.74	8.92	9.09	9.28	9.46	9.65	9.84	10.04	10.24
Others Revenue (Tender Schedule Sale, Tree sale at Auction etc.)	1.68	1.71	1.75	1.78	1.82	1.86	1.89	1.93	1.97	2.01
Total Inflows	341.40	348.22	355.19	362.29	369.54	376.93	384.47	392.16	400.00	408.00
Total Operating Cost	(1,822.15)	(1,913.26)	(2,008.93)	(2,109.37)	(2,214.84)	(2,325.58)	(2,441.86)	(2,563.95)	(2,692.15)	(2,826.76)
Total Investment Cost				(4,515.05)						
Total Outflows	-1822.155	-1913.262	-2008.925	-6624.42	-2214.84	-2325.582	-2441.861	-2563.954	-2692.152	-2826.76
Net Cash Flows	(1,480.76)	(1,565.04)	(1,653.74)	(6,262.13)	(1,845.30)	(1,948.65)	(2,057.39)	(2,171.80)	(2,292.15)	(2,418.76)

Cash Flows (Inflows & Out Flows):Ex

Fig. in BDT Lac

	Year-31	Year-32	Year-33	Year-34	Year-35	Year-36	Year-37	Year-38	Year-39	Year-40
Operating Revenues:										
Tution Fees	361.68	368.91	376.29	383.81	391.49	399.32	407.31	415.45	423.76	432.24
Examination Fees	41.99	42.83	43.69	44.56	45.45	46.36	47.29	48.23	49.20	50.18
Hostel Rent	10.45	10.66	10.87	11.09	11.31	11.53	11.76	12.00	12.24	12.48
Others Revenue (Tender Schedule Sale, Tree sale at Auction etc.)	2.05	2.09	2.13	2.17	2.22	2.26	2.31	2.35	2.40	2.45
Total Inflows	416.16	424.48	432.97	441.63	450.46	459.47	468.66	478.04	487.60	497.35
Total Operating Cost	(2,968.10)	(3,116.50)	(3,272.33)	(3,435.94)	(3,607.74)	(3,788.13)	(3,977.53)	(4,176.41)	(4,385.23)	(4,604.49)
Total Investment Cost										
Total Outflows	-2968.098	-3116.503	-3272.328	-3435.944	-3607.741	-3788.128	-3977.535	-4176.412	-4385.232	-4604.494
Net Cash Flows	(2,551.94)	(2,692.02)	(2,839.36)	(2,994.31)	(3,157.28)	(3,328.66)	(3,508.87)	(3,698.38)	(3,897.64)	(4,107.15)