Initial Environmental Examination

PUBLIC

August 2025

India : Assam State Tertiary Healthcare Augmentation Project

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Prepared by the Assam Health Infrastructure Development and Management Society, Government of Assam for the Asian Development Bank (ADB).

Asian Development Bank

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CURRENCY EQUIVALENTS

(as of 30 July 2025)

Currency unit – Indian Rupee (INR)
INR1.00 = $0.0114
$1.00 = INR87.4560

ABBREVIATIONS

ADB	-	Asian Development Bank
AHIDMS	-	Assam Health Infrastructure Development and Management Society
AMCH	-	Assam Medical College & Hospital
ASEAN	-	Association of South East Asian Nation
BOD5	-	5-day biochemical oxygen demand
BMWM	-	Bio-medical waste management
CBWTDF	-	Common biomedical waste treatment and disposal facility
C&D	-	construction and demolition
COD	-	chemical oxygen demand
COVID-19	-	coronavirus disease
CSF	-	construction supervision firm
CTE	-	Consent to establish
CTO	-	Consent to operate
DMER	-	Department of Medical Education & Research
DPR	-	detail project report
EC	-	Environmental clearance
EHS	-	Environment, health, and safety
EIA	-	Environmental impact assessment
EMP	-	Environmental management plan
EMR	-	environmental monitoring report
FSR	-	feasibility study report
GHG	-	greenhouse gas
GRSI	-	gender-responsive and socially inclusive
GMCH	-	Guwahati Medical College and Hospital
GRM	-	grievance redress mechanism
IEE	-	initial environmental examination
IFC	-	International Finance Corporation
LAeq	-	equivalent continuous A-weighted sound pressure level
MCH	-	Mother and Child Care
MMCH	-	Mahendra Mohan Choudhury Hospital
MoHFW	-	Ministry of Health and Family Welfare
MoEF&CC	-	Ministry of Environment, Forest and Climate Change
O&M	-	operation and maintenance
PCC	-	public complaint center
PM	-	particulate matter
PMC	-	project management consultant
PMU	-	project management unit
SEIAA	-	State Environmental Impact Assessment Authority
SMCH	-	Silchar Medical College & Hospital
SPCB	-	State Pollution Control Board
SPS	-	Safeguard Policy Statement
SS	-	suspended solids
SSUHS	-	Srimanta Sankaradeva University of Health Sciences
STP	-	Sewage treatment plant
TSP	-	Total suspended particulate
VOC	-	volatile organic compound
WBG	-	World Bank Group

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WHO	-	World Health Organization

WEIGHTS AND MEASURES

°C	-	degree centigrade
dB	-	decibel
kg/d	-	kilogram per day
km	-	kilometer
km^2	-	square kilometer
kW	-	kilowatt
m	-	meter
mu	-	1/15 hectare
m^2	-	square meter
m^3	-	cubic meter
m^3/a	-	cubic meter per annum
m^3/d	-	cubic meter per day
mg/l	-	milligram per liter
mg/m^3	-	milligram per cubic meter
t	-	metric ton
t/a	-	ton per annum
t/d	-	ton per day
time/h	-	time per hour

NOTES

(i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2025 ends on 31 March 2025.

(ii) In this report, "$" refers to United States dollars.

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EXECUTIVE SUMMARY

A. Background

1. This initial environmental examination (IEE) report including an environmental management plan (EMP), has been prepared for the proposed Assam State Tertiary Healthcare Augmentation Project (hereafter referred to as the project) in Assam State of India by the Assam Health Infrastructure Development and Management Society, Government of Assam, for the Asian Development Bank (ADB). This IEE is prepared in accordance with the requirements of the ADB's Safeguard Policy Statement (SPS 2009) based on the feasibility study reports (FSRs) and available detailed project reports (DPRs), as well as results of site investigations and discussions with various stakeholders during environmental due diligence.

B. Project Design

2. The proposed project aims to strengthen Assam's tertiary care and medical education. The project will be aligned with the following impact: quality health care services provided to all citizens of Assam. The outcome will be access to resilient, quality, and affordable tertiary health care and medical education in Assam improved. The project will achieve the outcome through three outputs including (i) quality of tertiary care services enhanced with focus on affordability, resilience, inclusion, and gender responsiveness; (ii) quality of medical, paramedical and pharmacy education improved; and (iii) state systems for quality tertiary care and medical education strengthened. All three outputs will strategically deploy digital technologies to drive transformation.

3. The project will be implemented over a period of 6 years from Q1 2026 to Q4 2032. An oversight body will be organized chaired by the Honorable Minister of MERD, Government of Assam, and (b) Executive Committee, headed by the Chief Secretary to Government of Assam. The executing agency of the project will be the Medical Education & Research Department (MERD), Government of Assam and the project implementing agency will be the Assam Health Infrastructure Development and Management Society (AHIDMS), Government of Assam. The Government has requested financial assistance from ADB to help finance the project.

4. The project will support the construction of new hospital buildings and renovations of medical, paramedical and pharmacy colleges, in addition to supply and installation of medical equipment in selected facilities. The major civil works will be carried out for the Guwahati Medical College and Hospital (GMCH) and Srimanta Sankaradeva University of Health Sciences (SSUHS) and the renovation of the Assam Medical College & Hospital (AMCH) in Dibrugarh and Silchar Medical College & Hospital (SMCH). The GMCH building will incorporate green building design, state of the are digital systems, and new medical equipment. Medical and digital equipment and goods will be supplied to Mother and Child Care (MCH) Wings of GMCH, Mahendra Mohan Choudhury Hospital (MMCH) Annexed to GMCH, Nalbari Medical College, Nagaon Medical College, AMCH Dibrugarh, SMCH, and Pragjyotishpur Medical College & Hospital. All these facilities are in Assam state of India.

5. The project civil works sites (GMCH and SSUHS in Guwahati, AMCH in Dibrugarh, and SMCH in Silchar) are not located in or near any protected area or ecologically sensitive areas. These are existing sites currently owned and occupied by the same hospitals and university, and colleges.

6. The project underwent appraisal during project preparation and was classified as environment category B based on the project description, comprehensive site audits, stakeholder consultations, and guided by the ADB's Rapid Environmental Assessment Checklist. Domestically, the redevelopment of Guwahati Medical College and Hospital will require an environmental impact assessment and environmental clearance from the Ministry of Environment, Forest and Climate Change (MoEF&CC) based on the requirement of the

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Environmental Impact Assessment (EIA) Notification of 2006 as the total built-up area for GMCH is 309,083.78 m^2 . The implementing agency will obtain environmental clearance before the start of the construction work.

C. Anticipated Environmental Impacts and Mitigation Measures

7. No significant adverse environmental impacts are anticipated. The project civil works sites are not located in any protected area or ecologically sensitive areas. The demolition and construction of buildings under the expansion and modernization of GMCH will pose some adverse impacts that are site-specific, and co-terminus with the construction phase. These impacts include air and water quality deterioration[1]; generation of noise, vibration, and dust[2]; erosion[3]; potential generation of hazardous materials; increase in vehicular traffic congestion; and labor and community health and safety. There is a minimal number of trees of no biodiversity importance to be removed from the project site. Receivers of these impacts include the health workers, construction workers, haul roads, borrow areas, and the nearby communities. Most of the anticipated impacts are site-specific, predictable, temporary, and co-terminus with the construction phase; few are permanent (building footprint), and residual potential adverse risk and impacts to human population and environment are unlikely to be significant.

8. During operation, the major negative environmental impacts and risks are related to storage, transportation and disposal of biomedical waste and treatment of medical wastewater. Biomedical waste of GMCH will be disposed of by the existing Common biomedical waste treatment facility(CBWTF) Fresh Air Common Bio Medical Waste Treatment Facility located in Guwahati and operating under Assam Pollution Control Board authorization. Common Biomedical Waste Treatment facilities proposed by Pollution Control Board in Upper Assam area and Barrak Valley will facilitate disposal of biomedical wastes of AMCH and SMCH. Due diligence confirmed that CBWTF at Guwahati is established and operated in accordance with the Government of India and Assam environmental and pollution control regulations. Other environmental impacts are anticipated to be minor and will be addressed through available conventional operation and maintenance practices, health and safety codes and measures included in the operations aspects of the EMP.

9. Environmental risks and the assurances required to address these risks have been identified in this IEE. Majority of environmental risks are related to design features and operational plans which will avoid or mitigate impacts, but which rely on the implementers' commitment and capacity to implement and consistently follow-up.

D. Environmental Management Plan

10. An EMP has been developed for the design and pre-construction, construction, and operation phases of the project. The EMP sets out: (i) actions to implement mitigation measures; (ii) a monitoring and reporting program; (iii) institutional/organizational arrangements; (iv) capacity development and training; (v) an implementation schedule; and (vi) cost estimates. The total estimated cost of the EMP implementation is about $4.29 million. Under the supervision of project management unit (PMU), the implementing agency will ensure funds are available in a timely manner. The final EMP forms part of the project administration manual (PAM) and will be included as a separate annex in all the bidding documents. The contractors will be made aware of their obligations to implement the EMP, to budget EMP implementation costs in their bids, and to develop site specific-CEMP fully responsive to the project EMP.

E. Information Discloser, Consultations, and Grievance Redress Mechanism

11. In the framework of the environmental due diligence, information disclosure and consultations (public and stakeholder) meetings were held in the months of May-July 2025. Site- specific consultations were conducted near the project sites for GMCH and SSUHS in

[1] Mostly from surface run-off
[2] Particularly during the demolition of the existing buildings in GMCH and construction of the new buildings
[3] Including off-site borrow-areas

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Guwahati. This included local communities (residents), vendors and shop owners[4] , and state level stakeholders (Assam State Pollution Control Board, State Environmental Impact Assessment Authority, Biomedical Waste Management Agencies, management of hospitals). The consultations indicated that most of the affected people had a positive attitude toward the project and believed it would benefit them in the long-term through better health care facilities. Each project site will establish and maintain a project-specific grievance redress mechanism (GRM) to address public complaints related to project activities during project implementation and operation. Consultation and participation will continue throughout project implementation and any environmental complaints or disputes will be handled in accordance with the GRM.

12. The Project's GRM will adopt the existing mechanism established by the World Bank funded "Assam State Secondary Initiatives for Service Delivery Transformation (ASSIST)" Project in the state of Assam with updates to allow the early segregation of the ADB-related grievances and resolution. The GRM will give an opportunity to a person who is directly or indirectly impacted by the activities under the project to express his/her concern or complaints/grievances. There may be complaints which are directly related to the project activities or out of project activities. The complaints thus received will provide an opportunity to identify the gaps and risks that are posing as hindrances in the progress of the project, and effectively addressing these complaints form a core component of managing the risk and gaps. The GRM shall be equipped to receive, register, and facilitate resolution of complaints. A GRM Portal is proposed to be developed for addressing the grievances.

F. Conclusion

13. The project IEE concludes that if the measures prescribed in the EMP are fully implemented, it is unlikely that the project will have significant adverse environment, health and safety impacts. Environmental management and monitoring plan have been prepared, with budgets and responsibilities for implementation assigned. The EMP will be updated based on final design and will be submitted to ADB for review and approval prior to the commencement of the civil works. Contractors during construction, and facility operators as well as implementing agencies during operation will implement these measures. The effectiveness of these measures will be regularly evaluated in the framework of the environmental monitoring program, and corrective actions defined as required.

[4] Majority of the business surrounding the GMCH are related to health services including pharmacies and small restaurants.

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I. INTRODUCTION

14. This initial environmental examination (IEE) has been carried out to identify and assess the potential environmental risks and impacts of the physical infrastructure components proposed under the Assam State Tertiary Healthcare Augmentation Project (hereafter referred to as the project) in Assam State of India. This IEE has been conducted to meet the Asian Development Bank's (ADB) Safeguard Policy Statement (SPS 2009) requirements for financing the project.

A. Background and Rationale

15. **Socio-economic context**. Assam serves as a connectivity and commercial hub for India's northeastern region. According to the 2023 census population projections, Assam has a population of 35.7 million (2.6% of Indian population).[5] The state's gross domestic product is estimated to have increased by 13.3% (at constant prices) in fiscal year 2023 over the previous year (compared to India's 9.2%)[6] Its economy, however, faces several challenges such as heavy reliance on agriculture (70% of population in agriculture), vulnerability to disasters, infrastructure gaps in rural connectivity, logistics, and industrial infrastructure, and increasing climate and environmental risks.[7]

16. **Health issues**. Assam has been steadily improving its healthcare infrastructure in recent years, laying a strong foundation for better health outcomes in the future. While life expectancy currently stands at 66.9 years—slightly lower than the national average of 69.4 years[8] —these figures highlight the immense potential for progress. The state is actively addressing maternal and child health challenges, with focused efforts to reduce mortality rates which stands at 125 per 100,000 live births against the national average of 88.[9]. Ongoing programs are also targeting anemia, which affects 68% of children between 6 months and 5 years and 66% of women, ensuring that interventions can bring about meaningful change. With these initiatives in place, Assam aims to achieve significant improvements in overall health and well-being in the coming years. Noncommunicable diseases account for 51.2% of the total disease burden in the state.[10] From January 2020 to May 2023, Assam registered 746,122 coronavirus disease (COVID-19) cases that resulted to 8,035 deaths.[11] The COVID-19 pandemic highlighted critical areas for strengthening Assam's health system, including the need for more doctors, nurses, and allied health staff; improved availability of medical equipment; stronger disease surveillance systems; and expanded public health capacity, particularly in secondary and tertiary care. These lessons have provided valuable insights and opportunities for the state to build a more resilient and responsive healthcare system in the future.

17. **Inadequate access to quality tertiary care**. Assam has only 0.48 public hospital beds at all levels of care and 0.16 dedicated tertiary care beds per 1,000 population in the public sector[12]. While these figures are lower than states like Karnataka (3.9) and Kerala (2.8) [13], they highlight the significant scope and opportunity for Assam to expand its healthcare infrastructure. With ongoing investments in medical colleges, district hospitals, and secondary

[5] Projected data on population growth rate, dependency ratio, population density, and urban population is sourced from "Population Projections for Indian States 2011–2036" by the Technical Group on Population Projections, National Commission on Population, Ministry of Health and Family Welfare, Government of India.
[6] PRS Legislative Research. Assam Budget Analysis 2025–2026 (accessed on 31 May 2025).
[7] *Periodic Labour Force Survey 2023-24.* Ministry of Statistics and Programme Implementation. Annual Report. https://dge.gov.in/dge/sites/default/files/2024-10/Annual_Report_Periodic_Labour_Force_Survey_23_24.pdf
[8] Health Dossier 2021, Reflections on Key Health Indicators, Assam, NHSRC, NHM https://nhsrcindia.org/sites/default/files/practice_image/HealthDossier2021/Assam.pdf
[9] Sample registration system (SRS). Special bulletin on maternal mortality in India (2020-22), Office of Registrar General, GoI, June 2025.
[10] Institute of Health Metrics and Evaluation. 2017. Assam: Disease Burden Profile, 1990–2016.
[11] Government of India. MOHFW. COVID-19 State-wise Status (accessed on 31 May 2025).
[12] World Health Organization. 2022. Harmonization of Purchasing Functions for Health Insurance Schemes of Government of Assam – Supplementary Report. Data based on National Health Profile 2019 and Census of India population projected for 2020.
[13] S. Chandrasekhar, K. Naraparaju, and A. Sharma. 2021. Spatial Disparities in Household Earnings in India: Role of Urbanization, Sectoral Inequalities and Rural-Urban Differences. Indira Gandhi Institute of Development Research, Mumbai.

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and tertiary care facilities, the state aims to bridge these gaps and strengthen its health system. The are 279 Poly Clinic/Nursing Homes in the state of Assam as in 2023-24[14] , which is approximately 0.0078 hospitals for every 1000 population accentuating the reliance on public hospitals to meet the healthcare needs of the population and these are concentrated in urban areas of the state. In addition, many of the public medical colleges and tertiary care hospitals were designed decades ago and now face critical infrastructure obsolescence. Outdated layouts hinder patient-centric workflows, while aging equipment limits the ability to deliver high-quality, specialized care. These facilities often fail to meet modern building codes, clinical standards, as well as safe and all-weather access to the facilities, thus undermining efficiency and safety. There is an urgent need for modernization and capacity enhancement of tertiary care facilities to meet current and future demands and cater to changing disease patterns in addition to climate change- related stressors.

18. **Inadequate human resources for health including doctors, specialists, nurses and pharmacists .** Assam's healthcare system is at a critical juncture, with the current shortage of doctors, nurses, and allied health professionals underscoring the urgent need for expansion. With several new medical colleges being opened, the state is actively expanding its pool of trained personnel, laying the foundation for stronger healthcare delivery and improved quality of care in the years ahead. Assam currently has 0.66 doctors per 1,000 population, lower than the WHO's recommended ratio of 1 per 1,000, and 0.43 pharmacists per 1,000, compared to the all-India average of 0.81.[15] While this reflects existing workforce gaps, it also underscores the tremendous potential for strengthening human resources in health. Strengthening the healthcare workforce will not only improve service delivery but also enhance Assam's ability to adapt to climate-induced health impacts, ensuring better protection for vulnerable populations. The state also serves as a medical hub for the other northeastern states and bordering countries of Bhutan, Nepal, and Bangladesh, accentuating need for quality human resources for health to deliver quality healthcare.

19. **Limited access to medical education**. Assam currently has 13 government medical colleges which offer 1,600 undergraduate medical seats and 722 post graduate seats[16]. At All India Institute of Medical Sciences, Guwahati, the current annual intake for undergraduate medical seat is 100[17] Further, 44 super specialist seats are offered competitively through 2 government medical colleges in the state[18] Further, private medical colleges cost almost six times as much as government medical colleges. [18] The establishment of new medical colleges across the state will help harness this potential, gradually reducing the supply–demand gap and strengthening Assam's healthcare workforce for the future.

20. **Government initiatives.** India's National Health Policy (NHP), 2017[19] envisages the attainment of the highest possible level of health and well-being for all at all ages, through preventive and promotive health care and universal access to good-quality health care services without financial hardship. The NHP recommends strengthening existing medical colleges and converting district hospitals into new medical colleges to increase the number of doctors and specialists to address human resources for health deficit. The policy emphasizes the importance of addressing environmental factors that affect health and recognizes the need for disaster preparedness in healthcare delivery. In line with the NHP, the Assam government adopted the Vision 2030 in 2016 and became the first state in India to adopt sustainable development goals for its development path. The state outlined 'augmenting healthcare

[14] Statistical Handbook , Assam-2024, Directorate of Economics and Statistics Assam (Page no 249), https://des.assam.gov.in/sites/default/files/swf_utility_folder/departments/ecostat_medhassu_in_oid_3/this_comm/statistical_handbook_assam_2024_new.pdf

[15] Harmonization of Purchasing Functions for Health Insurance Schemes of Government of Assam – Supplementary Report.,2022, World Healtrh Organization, India and National Health Mission, Assam (https://iris.who.int/bitstream/handle/10665/363945/9789290229148-eng.pdf?sequence=1)

[16] Directorate of Medical Education, Assam, Allotment of Seats, https://dme.assam.gov.in/information-services/allotment-of-seats

[17] All India Institute of Medical Sciences, Academics, https://aiimsguwahati.ac.in/page/courses

[18] Directorate of Medical Education, Assam, Admission to Various Courses, https://dme.assam.gov.in/information-services/courses

[19] Government of India, MOHFW. 2017. National Health Policy 2017.

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facilities and physical and human infrastructure to ensure universal access.[20]' To realize Vision 2030, the state committed to building 24 medical colleges (including teaching hospitals) of which 13 new colleges have already been constructed. The Assam government introduced several measures to incentivize, attract and retain medical college faculty, including car loans, international seminar funding, supporting new-age research works, and career promotion schemes.[21] Notably, the GMCH is set to transform into a 5,000-bed unit, and the state aspires to make Guwahati an important healthcare hub for the northeast and the Association of South East Asian Nation (ASEAN) region.[22] The state is also collaborating with development partners like the World Bank and Japan International Cooperation Agency (JICA) to upgrade secondary and tertiary care facilities.[23]

21. Despite Vision 2030 and various central and state government initiatives, Assam faces challenges in achieving its objectives. ADB's sector assessment and consultations in the state show that: (i) the quality of tertiary care delivery in the state is currently constrained by gaps in infrastructure, equipment, and processes; (ii) there is a need to strengthen the availability of quality doctors, specialists, nurses and pharmacists at the state level coupled with supply and improved resource allocation; (iii) quality of medical education needs strengthening adopting digital tools and new approach of learning; and (iv) state systems for continued capacity building, ongoing healthcare needs assessment, research on emerging issues, establishing partnerships and new approaches of learning need institutionalization. Assam has requested ADB support to fill these investment gaps and strengthen medical education and tertiary care delivery.

B. Project Impacts and Outputs

22. The proposed project aims to strengthen Assam's medical education and tertiary care ecosystem using a project loan modality. The project will have positive impact on the quality health care services provided to all citizens of Assam. These will be achieved through the following outputs:

(i) **Output 1: Quality of tertiary care services enhanced with focus on affordability, resilience, inclusion, and gender responsiveness.** The project will help the state transform the quality of tertiary healthcare delivery in selected tertiary care hospitals. Output 1 will include (i) establishing a state-of-the-art medical and teaching hub in GMCH incorporating green, climate- and disaster-resilient, and gender-responsive and socially inclusive (GRSI) designs (ii) strengthening digital systems in hospital operations, patient management, streamlining access to and utilization of hospital services at GMCH; (iii) improving processes and practices to attain quality accreditation for various departments at GMCH and other medical college hospitals; (iv) providing medical equipment at GMCH and other medical college hospitals to enhance tertiary care delivery, especially for women and children; (v) strengthening performance-based incentives to targeted hospital staff at GMCH and other medical college hospitals from health insurance payments to encourage them to prioritize poor patients covered by insurance schemes; (vi) enhancing private sector engagement by outsourcing key services within GMCH for efficiency gains and user-friendly access; and (vii) establishing a state-of-the-art, one-stop crisis center for GBV (including management of sexual assault cases) at GMCH.

(ii) **Output 2: Quality of medical, paramedical, and pharmacy education improved.** This output will (i) upgrade teaching and learning infrastructure to 'digitally smart' ones at Assam Medical College and Hospital (AMCH) and

[20] Government of Assam. 2016. *Vision Assam: 2030. Everything for Everyone – Achieving Inclusive Sustainable Development*.
[21] *The Sentinel. Assam News.* 2025. Assam Government Introduces AIIMS -Equivalent Facilities for Medical College Faculty: CM Sarma. 24 February.
[22] *Healthworld.com*. 2025. Guwahati important healthcare hub for NE, ASEAN bloc: Himanta. 6 June.
[23] Government of India, Ministry of Health and Family Welfare. 2023. Update on Medical Colleges in Aspirational Districts. 21 July.

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Dibrugarh and Silchar Medical College and Hospital (SMCH) to improve the quality of education for doctors, specialists, paramedical staff and pharmacists in the state; (ii) strengthen digital systems by establishing a medical, paramedical and pharmacy data management system portals to help streamline data processes and to ensure data security. Key aim would be to strengthen regulatory oversight and support in the continuous improvement of education quality and standards of services; and (iii) improve state medical, paramedical and pharmacy education curriculum (by including the latest developments in digital, gender mainstreaming, and climate change) and pedagogic practices, under the guidance of the national and state commissions.

(iii) **Output 3: State systems for quality tertiary care and medical education strengthened.** The project aims to strengthen and institutionalize state systems for continuous improvement of tertiary care and medical education. For this, this output will strengthen the Srimanta Sankaradeva University of Health Sciences (SSUHS), an apex health university in the northeast which affiliates and governs 97 health institutes across medical, nursing, pharmacy, and paramedical disciplines in the state, as a hub COE. The project will also develop AMCH and SMCH as spokes COEs to the hub under SSUHS. SSUHS infrastructure and capacity will be enhanced to conduct research related to medical education and healthcare based on state priorities, including gender, and help establish partnerships with national and global institutions. The COE will conduct training for medical college staff on GRSI and GBV response (as recommended by the World Health Organization or the Government of India) which will be incorporated in the training program and implementation of such response will be monitored. The output will also support (i) deployment of digital tools for machine learning modules and simulation-based training in addition to capacity building of faculty to integrate state-of-the-art technologies and innovative teaching methods; (ii) establishment of a private sector engagement cell to identify and support private investment and expertise for enhancing the availability and quality of healthcare and medical education services in the state; (iii) establishment of gender equality cells for promoting gender responsiveness in AHIDMS and at GMCH. The cell will work closely with COE to promote gender mainstreaming within tertiary health care and medical education and develop a gender friendly workplace strategy for medical colleges; and (iv) develop improved capacities for financial management in large public hospitals with a focus on augmenting and optimizing revenue generation and improving reporting and monitoring systems.

23. The project will support the construction of buildings such as new hospital buildings and medical college infrastructure, and supply and installation of medical equipment and associated facilities. The civil works will be carried out for the GMCH, Assam Medical College & Hospital (AMCH) Dibrugarh, Silchar Medical College & Hospital (SMCH), and Srimanta Sankaradeva University of Health Sciences (SSUHS). The equipment and goods will be supplied to Mother and Child Care (MCH) Wings of GMCH, Mahendra Mohan Choudhury Hospital (MMCH) Annexed to GMCH, Nalbari Medical College, Nagaon Medical College, AMCH Dibrugarh, SMCH, and Pragjyotishpur Medical College & Hospital. All these facilities are in Assam state of India.

24. The project will be implemented over a period of 6 years from Q1 2026 to Q4 2032. The executing agency of the project will be the Medical Education & Research Department (MERD) of Government of Assam and the project implementing agency will be the Assam Health Infrastructure Development and Management Society (AHIDMS), Government of Assam.

C. Objective, Scope, and Methodology of the IEE

25. **Objectives and scope**. This IEE report documents the environmental assessment of the

physical infrastructure to be developed under the proposed project and identifies the environmental risks and issues to be considered in the project planning and design stages. No environmental impacts are anticipated in the supply of equipment and goods under the project. The IEE addresses, as far as required, the environmental, health and safety management requirements of the ADB's SPS 2009 as well as those of the country safeguard system of India.

26. The objectives of the IEE are to:

(i) assess the existing environmental conditions in the project areas including the identification of environmentally sensitive areas;
(ii) provide guidance as to the assessment of suitability for construction locations;
(iii) review any legislative and approval requirements under which construction activities can occur; and
(iv) prepare an environmental management plan (EMP) incorporating mitigation and monitoring measures that will guide environmental management during project construction and operation.

27. Environmental studies have been confined to the project sites and their direct influence area including immediate surrounding neighborhood,[24] haul roads and borrow areas. The IEE was based on proposed key construction activities. The corridor of impact is taken as a 100 m radius around the proposed facilities. However, the study area impact zone is considered up to 500 m radius to allow for coverage of indirect and induced impacts and a larger analysis of land use and other environmental features including the haulage of materials and equipment. Assessment is carried out on the environmental elements comprising of ecology, soil, water, air, noise, and socioeconomic aspects.

28. **Methodology**. The IEE has been conducted following the process established in the SPS 2009 and complies with the country's safeguard system. The study was carried out based on a reconnaissance survey to project sites, field visits, consultation with stakeholders, review of secondary data, identification of adverse impacts, and preparation of environmental management and monitoring plans. The stepwise activities carried out include:

(i) review of legal requirements;
(ii) review of the available technical feasibility study reports and detailed project reports;
(iii) reconnaissance survey for identification of key issues data requirement and preliminary consultations;
(iv) primary and secondary data collection;
(v) consultation with stakeholders; and
(vi) identification of impacts and mitigation measures.

D. Structure of the IEE

29. In compliance with ADB SPS 2009 requirements, this IEE consists of eleven structured sections: (i) Executive Summary; (ii) Introduction; (iii) Policy, Legal and Administrative Framework; (iv) Description of the Project; (v) Description of the Environment; (vi) Audit of Existing Facilities (vii) Anticipated Environmental Impacts and Mitigation Measures; (viii) Consultations, Participation, and Information Disclosure; (ix) Grievance Redress Mechanism; (x) Environmental Management Plan; and (xi) Conclusion and Recommendations.

[24] Assumed at 100 meters from hospital, university, and colleges boundaries (typical noise, dust, and vibration screening distances)

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II. POLICY, LEGAL, ADMINISTRATIVE FRAMEWORK AND STANDARDS

30. India has a well-defined institutional and legislative framework that covers all components of the environment viz. air, water, soil, terrestrial, aquatic flora and fauna, natural resources, and sensitive habitats. India is also signatory to various international treaties, conventions, and protocols. The ADB has also defined its Environmental and Social Safeguard policy requirements viz. ADB's SPS 2009. This assessment is about the applicability of National laws and regulations, conventions, protocols, to the proposed project. The project will also be guided by ADB's SPS 2009 and IFC EHS Guidelines. This chapter summaries:

(i) National (India) Environmental Legislation and Administrative Framework,
(ii) ADB safeguard policies and Categorization of the project,
(iii) IFC EHS Guidelines (General), and
(iv) International Treaties, Conventions, Protocols and applicability to the project.

A. National (India) Environmental Legislation and Administrative Framework

A.1 Administrative Framework and Main Regulatory Bodies

31. The main regulatory bodies responsible for administration of the environmental policy and legislation pertinent to the solar power plant component are:

32. **Ministry of Environment and Forests, Forest, and Climate Change (MOEF&CC).** Responsible for the administration and implementation of Government of India's policy with respect to environmental conservation, management, and pollution control. It formulates and regulates all country level legislations and enforces the regulations in conjunction with various autonomous organizations under MoEF&CC and the states. The environmental management and pollution control framework at Government of India level defines the roles and responsibility of various ministries and government departments at central level and state level with the MoEF&CC at central level as the apex body and state boards/departments working under their guidance and overall coordination. Both central and state governments can enact environmental legislation. The ministry also reviews and issues prior environmental clearances through an Expert Appraisal Committee for category A projects as per Government of India's legislation besides according to wildlife and forest diversion clearances.

33. **National Green Tribunal (NGT).** The NGT based out of New Delhi was established in 2010 under the National Green Tribunal Act, 2010. This tribunal is headed by a chairman and has both judicial and expert members (having multidisciplinary expertise). It is responsible for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources. It is also responsible for enforcing any legal right relating to the environment and giving relief and compensation for damages.

34. **Central Pollution Control Board (CPCB).** Statutory authority under the MoEF&CC with headquarters in New Delhi and several regional offices. Responsibilities include planning and implementing air and water pollution control programs, setting air and water standards; and coordination with the state level pollution control boards (SPCB). The project components shall be required to adhere to the various standards set by CPCB.

35. **Central Ground Water Board (CGWB) and Central Ground Water Authority (CGWA).** Separate to the MoEF&CC, CGWB is a multi-disciplinary scientific organization under the Ministry of Jal Sakti, providing scientific inputs for the management, exploration, monitoring, assessment, augmentation, and regulation of ground water resources. Besides advising states on planning and management of ground water resources, it provides technical know-how for scientific ground water exploration, development, and management. CGWA is a sister concern of CGWB engaged in various activities related to regulation of ground water development to ensure its long-term sustainability. A no objection certificate (NOC) is required to be obtained

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from the CGWA for withdrawal of ground water through bore wells before they are drilled, or if existing borewells are used for construction that were installed for some other purposes as it would augment the use of groundwater.

36. **Archaeological Survey of India (ASI).** Sitting under the Ministry of Culture, ASI is responsible for maintenance of ancient monuments and archaeological sites and remains of national importance. It is also responsible for regulating all archaeological activities in the country as per the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Antiquities and Art Treasure Act, 1972. The Guwahati Circle of the ASI is responsible for maintenance of monuments in Assam.

37. **National Disaster Management Authority**. Is the apex body in India responsible for orchestrating disaster management efforts across the country. Established under the Disaster Management Act of 2005, NDMA is chaired by the Prime Minister of India and plays a central role in both disaster response and health care preparedness during emergencies. Its core roles in disaster management are the formulation national policies, plans, and guidelines for disaster management and approves disaster management plans from various ministries and ensures alignment with the National Plan. In terms of health care, the NDAM plays a pivotal in integrating health care into disaster management, with a strong focus on medical preparedness, mental health, and hospital safety. During disasters, NDMA contributes to: i) Mental Health and Psychosocial Support, ii) Medical Preparedness and Mass Casualty Management; iii) Hospital Safety and Disaster Resilience, and iv) Strategic Framework and Implementation.

38. **Assam State Disaster Management Authority (ASDMA).** Plays a crucial role in integrating health care into disaster preparedness and response. Its responsibilities span across mental health support, medical preparedness, and hospital safety, particularly in a state prone to floods, earthquakes, and other natural calamities. The ASDMA are implementing the following health care programs during disasters: i) Mental Health and Psychosocial Support (MHPSS) where the state pioneered mental health initiatives in disaster settings through programs like MANOJNA (Methodological Application of Neuroscientific Options for Judicious Natural Adjustment); ii) Psychosocial Helpline that was launched in August 2021, this was Assam's first dedicated helpline for mental health during disasters; iii) Counselling Services iv) Training and Supervision, and iv) Integration with National Health Mission. ASDMA has developed: i) Disaster Mental Health Manual, ii) Hospital Safety and Medical Preparedness; iii) Hospital Disaster Management Plans; iv) Mass Casualty Management; and v) Early Warning Systems.

A.2 National Regulatory Framework

39. Government of India have established regulations to manage the environmental condition, biomedical waste and other waste, which will be directly relevant to the project. In addition, there are relevant legal provisions to ensure the pollution prevention, protection of workers and labor and provisions to ensure adequate management of environmental risks and impacts during the project planning and implementation stage. Table 1 below outlines the laws, regulations and policies potentially relevant to the Project.

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Table 1: National Laws, Regulations, and Policies Potentially Relevant to the Project

S.No.	Key Regulations	Relevance to the Project	Requirements
Environmental Management			
1	Environment (Protection) Act, 1986 and Environmental Protection Rules 1986 and subsequent amendments thereon.	This is an umbrella act under which several applicable statutes/regulations have been framed. This Act provides general guidelines for prevention of pollution. Under this Act, rules have been specified for discharge/ emission of effluents and different standards for environmental quality. These include ambient noise standard, general effluent standards, emission standards etc.	The act should be followed to ensure environmental protection, compliance towards emissions, waste discharge, water quality, air quality, noise level standards etc.
2.	EIA Notification, 2006 and subsequent amendments	The EIA notification lists out type of projects that requires EIA and/or environmental clearance (EC) from the Expert Appraisal Committee of Ministry of Environment, Forest and climate change, State/District Environment Impact Assessment Authority body prior to commencement of any developmental work or project expansion. As specified in the notification, the projects are classified into Category A and B based on the type of development/sector and potential impacts. The Category B projects can be further classified into either Category B1 or Category B2.	Since the proposed GMCH facility exceeds Built-Up Area (BUA) of 20,000m^2, Environment Clearance (EC) from MoEF&CC will be obtained by implementing agency prior to commencement of construction works and the conditions stipulated in EC letter will be complied with during design (pre-construction), construction, and operation stage of project. EC will also be applicable for the sources of construction materials such as stone quarries, sand mines etc. both in case of new quarry/ mines opened by contractor or sourced from existing third party owned quarries/ mines.).In case of any development of the Phase II area (future expansion area) in future, the Environmental Clearance which will be secured for current stage (i.e., Phase I) should be amended as per the provisions of EIA notification 2006 and its subsequent amendments.
3.	Water (Prevention and Control of Pollution) Act, 1974 and subsequent amendments	The Act prohibits discharge of pollutants into water bodies beyond a given standard and lays down penalties for non-compliance with its provisions. This act will be applicable for segregation of liquid chemical waste at source and ensuring pre- treatment or neutralization prior to mixing with other effluents generated from healthcare facilities and standard disposal. The Central and State Pollution Control Boards are the statutory authorities.	The proposed facility will require to obtain the Consent to establish (CTE) and Consent to Operate (CTO) from State Pollution Control Board (SPCB) prior to commencement of construction and operation respectively. CTE, and CTO would also be required during construction phase for construction equipment/ machineries as per the industrial categorization of the SPCB such as prior to establishing and
4.	The Air (Prevention and Control of Pollution) Act, 1981 and subsequent amendments	The purpose of this Act is to prevent, and control air pollution and preserve air quality. This Act empowers Central and State Pollution Control Boards for managing air quality and emission standards, as well as monitoring air quality, prosecuting offenders and issuing licenses for construction and operation of any facility. This Act has notified National Ambient Air Quality	

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S.No.	Key Regulations	Relevance to the Project	Requirements
		Standard for different land uses.	operating batching plant, crusher etc.
5.	Noise (Regulation and Control) Rules 2000 amended in 2010	The Rules require activity/ processes generating noise to ensure that the ambient noise standards are within the prescribed Standards. The proposed project will result in generation of noise during construction phase and will require to follow the noise standards as prescribed under the rules.	The noise levels during construction period will be attenuated to meet the levels stipulated for the land uses adjacent (within 100 m) to the project. During operations stage the noise levels for silence zone needs to be achieved as per the standards, i.e., 50 dB(A) during the day and 40 dB(A) during the night.
6.	National Environment Policy (NEP), 2006	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by central, state and local government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.	The EA should adhere to NEP principle of “enhancing and conservation of environmental resources and abatement of pollution”.
7.	Guidelines/ Criteria for evaluation of proposals/ requests for ground water abstraction (With effect from 16.11.2015) and subsequent amendments	These guidelines specify the provisions to be followed for obtaining permission towards abstraction of ground water in Notified/ Non- notified areas. The requisite permission needs to be obtained from the Central Ground Water Authority (CGWA)/ if groundwater is abstracted for project.	Permission from competent authority needs to be obtained prior to extraction of ground water, if borewell etc. are proposed. Requisite permission for surface water extraction will be obtained prior to extraction.
8.	Ancient Monuments and Archaeological Sites and Remains Act 1958 and subsequent amendments	According to this Act, areas within the radii of 100m and 300m from the “protected property” are designated as “prohibited areas” and “regulated areas” respectively. No development activity is permitted in the “prohibited areas”. Development activities are not permitted in the “regulated areas” without prior permission from the Archaeological Survey of India (ASI) if the site/remains/ monuments are protected by ASI or the State Directorate of Archaeology.	Not applicable as the project is located more than 300m away of any such protected features.
9	The National Green Tribunal (NGT) Act, 2010	NGT provides an effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith. NGT has jurisdiction over matters related to Water Act, 1974; Water Cess Act, 1977; Forest (Conservation) Act, 1980; Air Act, 1981; Environment (Protection) Act, 1986; Public Liability Insurance Act, 1991; and Biodiversity Act, 2002. Consequently, no other court will have jurisdiction over the matters related to environment falling under the above referred Acts. Being a dedicated tribunal for environmental matters with the necessary expertise to handle	Stakeholders / affected persons may approach NGT to resolve project/s induced environmental issues

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S.No.	Key Regulations	Relevance to the Project	Requirements
		environmental disputes, NGT provides speedy justice (within 6 months) If not satisfied with the NGT decision, aggrieved party can approach the Supreme Court within the specified period of time. Matters relating to the Wildlife (Protection) Act, 1972 do not fall under the jurisdiction of NGT.	
10.	The Motor Vehicle Act, 1988 and Motor Vehicles Rules, 1989 and subsequent amendments	The Act regulates all aspects of road transport vehicles. It details legislative provisions regarding licensing of drivers/conductors, registration of motor vehicles, control of motor vehicles through permits, traffic regulation, insurance, liability, offences and penalties, etc. This Act will be applicable for all machinery including vehicles/machineries deployed/used by contractor and/or hospital authority.	The law mandates requirement of valid pollution under control certificate (PUC) of vehicles or machinery used for construction works.
11.	Petroleum and Explosives Safety Organization (PESO) License under provisions of Petroleum Act 1934	The Act is pertinent to regulate the manufacture, possession, use, sale, transport, import and export of Explosives.	License from Chief Controller of Explosives/ PESO will be applicable if the storage quantity of Diesel exceeds the allowable limit.
12.	Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989; The Gas Cylinder rules, 2016	Defines hazardous chemicals and stipulates rules, procedures to manufacture, storage and import of hazardous chemicals requires permission, authorization from the State Pollution Control Boards for certain chemicals which have hazardous property or if the total storage exceeds specified quantity; requires emergency management plan. The Gas cylinder rules were issued under the Explosives Act 1884	For storage of any Hazardous Chemicals like chlorine (schedule II of the rules) permission, authorization is required from the State Pollution Control Board Controller of Explosives based on the storage quantity. Permission will be required if storage of chlorine gas/ liquid is made in more than 5 cylinders
13.	Bio-Medical Waste Management (BMWM) Rules, 2016 and subsequent amendments	Facility should have authorization under BMWM Rule, 2016. BMWM Rules, 2016 is the key legislation governing the management of biomedical waste in India. These guidelines provide the necessary compliance requirements for BMW generation, storage, transportation, disinfection, treatment and disposal. In addition, these guidelines also outline the provisions for obtaining authorization for management of biomedical waste as well as monitoring and reporting requirements for healthcare facilities involved in biomedical waste generation and management.	The Healthcare establishment needs to secure Authorization from SPCB under these rules. The Rule mandates Management, monitoring, and record keeping of BMW management processes alongside submission of annual reports to concerned authority. The rule also mandates the healthcare facility to have a formal tie-up with SPCB approved Common Biomedical Waste Treatment and Disposal Facility (CBWTDF)

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S.No.	Key Regulations	Relevance to the Project	Requirements
14.	Solid Waste Management (SWM) Rules, 2016	These guidelines will be applicable for disposal of solid waste generated from construction camp and Health Care Facility (HCF) which may include packaging material of hospital supplies, food waste, and other general waste. All bio- degradable, non-biodegradable and domestic hazardous wastes generated in the hospital premise needs to be managed by the hospital authorities in accordance with the relevant provision of this Rule.	The hospital authority is required to engage a licensed waste disposal company to collect and handle the non-hazardous solid waste and/or arrangement with municipal authority/Local Authority for collection and disposal of nonhazardous solid waste.
15.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	These rules ensure the protection to the public against improper handling and disposal of hazardous wastes. These rules will be applicable for hazardous material and waste storage and handling. The waste generated from HCFs may be hazardous in nature depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Such as broken thermometers, blood pressure gauges, or waste containing mercury and cadmium content etc. In addition to that, Effluent Treatment Plant Sludge and used oil generated from Generator Sets are also considered as Hazardous waste.	For handling and disposal of hazardous waste, authorization under this rule to be ensured for the project. As per the rule the healthcare facility will have a formal tie-up with SPCB approved authorized vendor for collection and disposal of Hazardous Waste.
16.	Construction and Demolition Waste Management Rules, 2016	The rules apply to every waste resulting from construction, re-modelling, repair and demolition of any civil structure of individual or organization or authority who generates construction and demolition waste such as building materials, debris, rubble. To promote the management of construction and demolition waste in an environmentally friendly manner and reduce the environmental impacts throughout the duration of the project; CPCB has developed guidelines on Environmental Management of C&D Waste Management in India (2017) in accordance with the Rule 10 subrule 1(a) of C&D Waste Management Rules, 2016.	The proposed project will generate some construction and demolition (C&D) waste during the construction stage and would require authorization under C&D Waste Management Rules, 2016.
17.	E-Waste (Management and Handling) Rules, 2022 (Electrical and electronic waste)	Provides for the collection, dismantling, recycling, transport, disposal, and overall handling of e- waste. E-waste means waste electrical and electronic equipment, whole or in part, or rejects from manufacturing and repair process which are intended to be discarded.	Applicable as electrical and electronics as listed in the Schedule I of the aforesaid rules will be used and will require replacement within the lifecycle of the project as well during decommissioning. As per the provision of these rules, the disposal of E-wastes to be done at the specified collection centers and needs to be reported annually.
		The Act regulates the responsibilities of producers and generators, for effective segregation, management and recycling of plastic waste. The health care facilities/ hospitals are specified as institutional waste generator in the said rules. All institutional generators of plastic waste are required to segregate and store the plastic waste in accordance with the Municipal	The hospital authority is required to engage a licensed recycler to collect and handle the recyclable plastic waste generated from facility.

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S.No.	Key Regulations	Relevance to the Project	Requirements
18.	Plastic Waste Management Rules, 2016 and amendments	Solid Waste (Management and Handling) Rules and handover the segregated wastes to authorized waste processing or disposal facilities or deposition centers either on its own or through the authorized waste collection agency.	
19.	National Building Code (NBC), 2016	The primary requirement of the Code is the Safety of the Occupants, the safe exit of Occupants, restricting fire to a part of the building and the suppression of fire through automatic or manual means.	The proposed project will have to comply with fire and life safety considerations (as applicable to) under the NBC.
20.	National Disaster Management Act 2005	Provides for the timely and effective response to disaster. It lays down guidelines to be followed by the State Authorities in drawing up the State Plans. This Act is applicable if the project encounters natural disaster during the construction of operation stage.	Applicable in case any disaster situation arises. The project should have both onsite and offsite emergency response plan prepared for the construction and operations period.
21.	Regulation of Polychlorinated Biphenyls Order, 2016	Use of Polychlorinated Biphenyls (PCBs) by project will be prohibited as per the provisions of the order, old transformers, if any, will be handled as per the provisions of the Act, and all existing transformers to be PCB free by 2025. Disposal of PCB containing equipment must be done as per Hazardous and Other Wastes (Management, & Trans-boundary Movement) Rules	Applicable since transformers and sub stations to be installed for power supply. It will be ensured that PCB free oil is used.
22.	Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005	Use of ozone depleting substances by project will be prohibited as per the provisions of the Act. Any equipment, using such substances will be hermetically sealed	Applicable as refrigerators, air conditioners, fire extinguishers will be used. It will be ensured that no ozone depleting substances are used such appliances
23.	Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987 notified under the Atomic Energy Act 1962.	It exercises regulatory control over nuclear installations and the use of radioactive substances and radiation generating plants outside such installations. As per provisions of Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987, no person shall dispose of radioactive waste (a) unless he has obtained an authorization from the competent authority under these rules; (b) in any manner other than in accordance with the terms and conditions specified in the authorization issued under these rules; (c) in any location different from those specified in the authorization; and (d) in quantities exceeding those specified in the authorization. Health Care Facilities generating radionuclides waste from treatment of Cancer patients and end-of-life equipment containing radio radionuclides shall obtain authorization from AERB for its disposal.	Applicable in case of generation of radioactive waste. Requisite authorization shall be obtained from AERB
Other Guidelines for Handling of Biomedical Waste			

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S.No.	Key Regulations	Relevance to the Project	Requirements
24.	Guidelines on management of bio-medical waste under Universal Immunization Program (initially released in 2004, revised in 2016, 2017, 2018, 2021)	These guidelines provide directions for stepwise management of bio-medical waste generated from the Universal Immunization Program, including provisions for training of health care workers, segregation, labelling, record-keeping, transportation, packaging, treatment and disposal of biomedical and solid waste generated from vaccination programs.	These guidelines will be applicable for waste generated from the various vaccination program in conjugation with BMW Rules 2016.
25.	Guidelines for Bar Code System for effective management of bio-medical waste, CPCB	The bar code system was designed to ensure effective monitoring of biomedical waste from the source of generation to its ultimate disposal as per BMW Rules, 2016. These guidelines provide the technical specifications of a bar code system and guidance to implement the system.	The hospital authority will ensure the implementation of Bar Code system for BMW management.
26.	Guidelines for Handling of Biomedical Waste for Utilization, CPCB	These guidelines provide guidance to healthcare facilities as well as to industry/vendors for the purpose of management i.e., collection, transportation and disposal of biomedical waste to ensure handling of biomedical waste with adequate safeguards to protect community health and the environment.	The hospital authority will ensure the compliance towards the stipulated provisions under these guidelines.
27.	The Epidemic Diseases Act 1897 and The Epidemic Diseases (Amendment) Ordinance, 2020	The Act provides for the prevention of the spread of dangerous epidemic diseases. The Ordinance amends the Act to include protections for healthcare personnel combating epidemic diseases and expands the powers of the central government to prevent the spread of such diseases.	The Ordinance has a direct applicability to ensure safety of communities, workers and project/s staff working in the hospital facility and residing in the area surrounding to the hospital facility in time of epidemic/pandemic.
28.	CPCB “guidelines for Handling, Treatment and Disposal of waste generated during Treatment/ Diagnosis /Quarantine of COVID-19 patients”, 2020	These guidelines provide guidance on management of waste generated during diagnosis and treatment of COVID-19 suspected / confirmed patients.	These guidelines are required to be followed by all facilities engaged in COVID-19 waste management.
Workers and Labour Welfare			
29.	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) BOCW Act, 1996	This is a social welfare legislation that aims to benefit workers engaged in building and construction activities across the country and regulates the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures and for other matters connected therewith or incidental thereto.	This act will have a direct applicability to the project as it will involve construction activity for the proposed hospital facility.
30.	Workmen’s Compensation Act, 1923 and Rules 1924 and subsequent amendments	The Act requires if personal injury is caused to a workman by accident arising out of and in the course of his employment, his employer should be liable to pay compensation in accordance with the provisions of this Act. The provision of this act will be applicable during the construction and	The provisions of the act are to be adhered to by the contractor, developer and hospital administration at all times of project’s construction and operation.

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S.No.	Key Regulations	Relevance to the Project	Requirements
		operation phase	Labour insurance will be obtained for skilled, semi- skilled and unskilled workers prior to commencement of construction
31.	The Child Labour (Prohibition and Regulation) Act, 1986	This Act prohibits employment of children in certain occupation and processes (including construction and demolition activities) as listed in the Act. The act also specifies conditions of work for children, if permitted to work. The Act also requires maintenance of a register for employed children (Section 11).	The contractor and project authorities need to ensure that no child labor is engaged at site for construction or operation works either directly or by the contractors/ subcontractors.
32.	The Bonded Labour (Abolition) Act 1976	The bonded labor means any labor or service rendered under the bonded labor system. The act states that all forms of bonded labor stand abolished, and every bonded laborer stands freed and discharged from any obligations to render any bonded labor.	The contractor and project authorities need to ensure that no bonded labor is practiced at site for construction or operation works either directly or by the contractors/ subcontractors.
33.	Minimum Wages Act, 1948	The Act empowers the Government to fix minimum wages for employees working in specified employments. The Act requires the Government to fix minimum rates of wages and review the rates every 5 years. These are the minimum wages that are to be paid to employees (for construction workers).	The project authority needs to ensure the display of wage notice and issue wage slip to workers as prescribed by the regulatory body.
34.	Equal Remuneration Act 1976	As per the Equal Remuneration Act 1976, it is the duty of an employer to pay equal remuneration to men and women workers for same work or work of a similar nature. This act will be applicable to the proposed project during construction and operation stage.	The contractor and project authority need to ensure.
35.	Inter-state Migrant Workers (ISMW) Act, 1979 and subsequent amendments	The objective of the act is to regulate the employment of inter-State migrant workmen and to provide for their conditions of service and for matters connected therewith. Every establishment that is recruiting interstate migrant workmen will be required to be registered with registering officers and every contractor who employ interstate migrant workmen need to obtain a license from the specified authority both of the State i.e., home state (from where belongs) and the host state (where to be employed).	Applicable if more than five inter-state workers are engaged. The requisite license needs to be obtained from governing authority as per the provisions stipulated in the act. The contractor and project authorities need to ensure this.
36.	The Contract Labour (Regulation and Abolition) Rules, 1971, 1973 and subsequent amendments. Contract Labour (Regulation and Abolition) Assam Rules 1971 and subsequent amendments	The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The central Act is applicable to the establishments or Contractor of principal employer if they engage 20 or more contract labor. The Assam Rules are applicable if more than 50 labors are engaged on contract basis.	Labour license will be obtained for skilled, semi-skilled and unskilled workers prior to commencement of construction works and if engaged during operation stage.

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S.No.	Key Regulations	Relevance to the Project	Requirements
37.	The E.P.F. and Miscellaneous Provision Act, 1952	This act aims to provide a kind of social security to the employees and workers. The Act provides retirement or old age benefits, such as Provident Fund, Superannuation Pension, Invalidation Pension, Family Pension and Deposit-Linked Insurance.	This norm secures wellbeing of the employees and will be followed as per applicability.
38.	Public liability insurance act, 1991	An Act to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith or incidental thereto.	The contractor/ subcontractor needs to obtain insurance policies to cover liabilities from accidents that cause harm or injury to the affected person.

Note: All relevant environmental and labor laws as amended from time to time will be applicable to the project

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A.3 Government of Assam Environmental Framework

40. The environment safeguards framework in Assam consists of several acts, notifications, rules, and regulations to protect the environment detailed in Table 2. The key policies and environmental authorities are discussed below.

41. **State Environmental Impact Assessment Authority (SEIAA).** An authority constituted by central government under sub-section (3) of section 3 of the Environment (Protection) Act, 1986 for every state and union territory. The composition of the SEIAA is published through separate gazette notifications and normally has a term of three years. It issues Prior environmental clearances to Category B projects. If the SPP installation required an EC due to its building sizes (in excess of 20,000 square meter), it would be prior applied with Assam SEIAA. However, based on the currently anticipated building sizes, this is not required.

42. **Pollution Control Board, Assam.** State Pollution Control Board, Assam is an autonomous statutory organization constituted on 2nd June 1975 under the provision of section 4 of the Water (Prevention & Control of Pollution) Act 1974 with a view to protecting the environment and preventing and controlling the pollution of water and air in the State of Assam. Responsible for pollution control activities at the state level for Assam, including planning and executing state level air and water quality initiatives, establishing standards for air and water quality based on national minimum standards, and enforcing and monitoring all the activities within the state under air and water related legislation. SSPCB shall be issuing Consent to Establish (CTE) and Consent to Operate (CTO) for establishing and operating any construction plant required such as batching plant, hot mix etc.

43. **Directorate of Archaeology**. The Directorate of Archaeology, under the Department of Cultural Affairs, Guwahati is responsible for the maintenance of state protected monuments in Assam. Set up in 1961 as the Directorate of Archaeology and Museums, the Directorate of Archaeology has been functioning under the Education (CTM) Department as an independent Directorate since 1983. The department is entrusted for the protection and preservation of ancient archaeological sites, monuments, remains of historical and archaeological importance, which are not less than one hundred years old and developing these into centers of tourists attraction in Assam; archaeological exploration of hitherto unknown sites, remains and their preliminary survey; archaeological excavation of the explored sites; documentation of antiquities found at archaeological sites as well as at excavated archaeological sites in Assam; conservation and restoration of protected Archaeological sites and monuments in the State; publication of archaeological reports of exploration, excavation, conservation of archaeological sites; and publication of annual reports, journals, brochures, leaflets, pamphlets, on archaeology and antiquities and protection, preservation and development of various Sattras (consisting of a large prayer hall facing a simple shrine, surrounded by dormitories and bathing tanks for monk) of Assam.

44. **Autonomous Councils of Assam**. The Government of Assam have been taking various steps to accelerate development process for the welfare of Scheduled Tribe (ST) communities in the State through democratic decentralization of power and empowering the Scheduled Tribe (ST) communities to participate in the planning, monitoring and implementation of Tribal Sub Plan (TSP) schemes in grass root level by constituting Territorial Councils, Autonomous Councils and Development Councils for different Scheduled Tribe (ST) communities in the State.

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Table 2: Applicable State Environmental Requirements

S. No.	Name of Policy / Law / Regulation	Applicability	Remarks
1	Assam (Control of Felling & Removal of trees from Non Forest Land) Rules, 2002	The rule regulates felling permission and transit of timber derived from non-forest areas. The Rule mandates permission for the falling of various species of trees from the Department of Environment and Forest.	Responsible Authorities: Environment and Forest Department of Assam and District Autonomous Councils.
2	State Water Policy of Assam, 2007	Applicable as water is required during construction. The State Water Policy of Assam adopts integrated water resource management as a core strategy, based on the principles of water as a finite resource, need to use a participatory approach, the crucial role of men and women, ensuring clean water for human health and looking at water both as an economic and social good.	Responsible Authorities: Water Resource Department, Government of Assam
3	Assam And Meghalaya Autonomous districts (Constitution Of District Councils) Rules, 1951	The Statutory Autonomous Councils are constituted for Social, Economic, Educational, Ethnic and Cultural advancement of the Scheduled Tribe (ST) communities living in Core Areas as well as in Satellite Areas covering many districts of Assam.	Responsible Authorities: Chief Executive Member of KAAC District Autonomous Council
4	Assam Land and Revenue Regulation (Amendment) Act, 1947 as amended Assam Land (Requisition and Acquisition) Act. 1964	This Act of 1947 was to amend Assam Land and Revenue Regulation 1886, and insert Chapter X, which is aimed at protecting land- ownership rights of indigenous tribal people of Assam. An Act to amend and consolidate the law for requisition and speedy acquisition of premises and land for certain public purposes such as accommodation, transport, communication, irrigation, flood control and anti-erosion measures.	Responsible Authorities: KAAC Chief Executive Member of District Autonomous Council
5	The Assam Ancient Monument and Records Act, 1959" and "The Assam Ancient Monument and Records Rules 1964"	No components are situated within 500m of a state notified monument. The acts will only become applicable if there are any chance finds of physical cultural resources during excavation for construction.	Act for future preservation and maintenance of the sites/ monuments by the Directorate. In event of any chance finds being made they must be notified / surrendered to the competent authority. Responsible Authorities: Deputy Commissioner, Directorate of Archaeology.

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B. ADB Environment Safeguards Requirements

45. ADB requires consideration of environmental issues in all aspects of its operations and the requirements for mainstreaming environmental safeguard are embodied in SPS 2009. SPS 2009 applies to all projects that require financing from ADB.

46. The Asian Development Bank has defined its Safeguard requirements under its Safeguard Policy Statement 2009 (SPS 2009). The prime objectives of safeguard policy are to: (i) avoid adverse impacts of projects on the environment and affected people, where possible; and (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible. This policy requires assessment, mitigation and commitment towards environmental protection. The policies apply to all ADB-financed projects, including private sector operations, and to all project components.

47. A key concern of ADB is that the Project does not result in degradation of sensitive ecosystems including critical and natural habitat. The SPS 2009, Appendix 1, paragraph 27, states that "the project mitigation measures should be designed to achieve at least no net loss of biodiversity," which could be achieved by post-project restoration of habitats or "through the creation or effective conservation of ecologically comparable areas," i.e. an ecological "offset." SPS 2009 provides the working definition of critical habitat as: habitat required for the survival of (i) globally endangered and/or critically endangered species, (ii) nationally endangered or critically endangered species, (iii) endemic/restricted range species, and (iv) migratory/congregatory species. Any Important Bird Areas (IBA) should be considered as critical habitat until further notified.

48. The extent of assessment depends on the category of the project. ADB's SPS 2009 classify a project depending on the following three categories:

- **Category A:** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B:** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, none or very few of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

49. **ADB prohibited investment activities list:** All components involving activities included in the ADB Prohibited Investment Activities List, as provided below, must be excluded from the project.

50. **International Finance Corporation Environment, Health, and Safety Guidelines:** ADB's SPS 2009 refers borrowers to the IFC's General Environment, Health, and Safety (EHS) Guidelines, 2007 and EHS guidelines for health care facilities which sets out international good practice related to environment, health, and safety provisions which the project should follow regarding assessment of potential impacts and applicable standards and management measures, performance indicators, and monitoring guidelines.

C. Categorization of the Project

51. **ADB screening and categorization**: The proposed project has been evaluated considering the outcome of the ADB Rapid Environmental Assessment (REA) checklist. All

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environmentally sensitive areas within the PIA have been critically analyzed to assess the magnitude and extent of likely impacts. The project falls under Environment Category A. Given this, safeguard documents shall meet all the requirements of ADB's SPS 2009, hence, an IEE including EMP has been carried out.

52. **Government of India categorization**: As per EIA Notification, dated 14th September 2006 (and amendments thereafter), all building construction work which exceeds Built-Up Area (BUA) of 20,000 m^2 require environment clearance (EC) from concerned authority. Since redevelopment of Guwahati Medical College and Hospital will be carried out with the total built-up area of 309083.78 m^2, will require an environmental impact assessment and environmental clearance from the Ministry of Environment, Forest and Climate Change as per EIA Notification of 2006. Accordingly, the implementing agency should prepare an EIA and obtain EC from MoEF&CC prior to start of the construction work for GMCH redevelopment work.

D. International Environmental Agreements

53. The Government of India has signed many international treaties and have framed guidelines and laws to meet the country's obligations under these treaties. The project may contribute to meeting a country's obligation to international treaties either directly or indirectly. A screening process was carried out regarding the applicability of the international treaties to the project. Table 3 provides a summary of pertinent international treaties.

Table 3: Pertinent International Treaties and Agreement Signed and Ratified by India

S. No.	International Agreements and Commitments	Applicability	Date of Signing / Ratifying
	Hazardous Material		
1	Cartagena Protocol on Bio safety	No	Signed the Protocol in 2000 and it came into force in 2003
2	Strategic Approach to International Chemicals Management (SAICM)	No	-
3	Stockholm Convention on Persistent Organic Pollutants (POPs)	No	-
4	Basel Convention on the Control of Trans- boundary Movement of Hazardous Waste and Their Disposal	Yes	Adopted on 22 March 1989
5	Rotterdam Convention on Prior Informed Consent (PIC) for certain Hazardous Chemicals and Pesticides in International Trade	No	Adopted in 1998
	Atmospheric Emissions		
6	United Nations Framework Convention on Climate Change (UNFCCC)	Yes	
7	Kyoto Protocol	Yes	Signed by India in August 2002 and ratified in February 2005.
8	Paris Agreement	Yes	Ratified by India on 2 October 2016. The agreement entered into force on 4 November 2016.
9	United Nations Convention to Combat Desertification (UNCCD)	No	-
10	Montreal Protocol (on Ozone Depleting Substances)	Yes	India signed on 17-9-1992 and also ratified on 3rd March, 2003

Source: MOEF&CC, India

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54. India has also ratified many of the International Labor Organization conventions that are relevant to the project including:

(i) C1 Hours of Work (Industry) Convention, 1919 (14:07:1921, ratified);
(ii) C5 Minimum Age (Industry) Convention, 1919 (09:09:1955, ratified):
(iii) C11 Right of Association (Agriculture) Convention, 1921 (11:05:1923, ratified):
(iv) C14 Weekly Rest (Industry) Convention, 1921 (11:05:1923, ratified);
(v) C29 Forced Labor Convention, 1930 (30:11:1954, ratified) & C105 Abolition of
(vi) Forced Labor Convention, 1957 (18:05:2000, ratified);
(vii) C100 Equal Remuneration Convention, 1951 (25:09:1958, ratified);
(viii) C107 Indigenous and Tribal Populations Convention, 1957, and
(ix) C111 discrimination (Employment and Occupation) Convention, 1958 (03:06:1960, ratified).

E. Evaluation Standards and Guidelines

55. India has a large set of specific standards that refer to emissions to air, effluent discharge, and noise standards, as well as standard to handle and dispose specific wastes ranging from sewage to hazardous wastes. Details of applicable standards along with other good international industry practice (GIIP) guidelines are provided in Appendixes.

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III. DESCRIPTION OF THE PROJECT

A. General

56. The proposed project will support the state of Assam to strengthen tertiary health care and medical education system. The investment loan modality will help in upgrading of the a few key hospitals including the Guwahati Medical College and Hospital (GMCH), which is the largest hospital in northeastern India. Strengthening of the tertiary healthcare sector with an emphasis on GMCH will negate migration owing to medical needs to other large metro cities, while enhancing the development potential of Assam as an affordable medical tourism destination for super specialty medical care for northeast region and several neighboring South Asian countries. The project will also support medical, paramedical and pharmacy colleges of Assam Medical College and Hospital (AMCH); Dibrugarh and Silchar Medical Colleges and Hospital (SMCH), and other Nagaon, and Nalbari Medical Colleges.

57. These interventions, in addition to supporting the Srimanta Sankaradeva University of Health Science (SSUHS) in Guwahati, are expected to bolster the tertiary care and medical education infrastructure and consequently quality service delivery in the state significantly. The project would include adoption of best practices in state-of-the-art infrastructure development, digital solutions, climate change adaptation and mitigation, and collaborations with international super-specialty hospitals.

58. The proposed project's plan and works will be implemented through a design-build scheme guided by the Fédération Internationale Des Ingénieurs – Conseils (FIDIC's) Yellow Book. The general conditions will conform with the Conditions of Contract for Plant and Design– Build for Electrical and Mechanical Plant, and for Building and Engineering Works, Designed by the Contractor(Yellow Book) Second Edition 2017, reprinted in 2022 with amendments published by the (FIDIC).

B. Nature, Size, and Location of the Project Facilities

59. The project will cover the construction of physical infrastructure, supply of equipment and goods, and capacity building to strengthen medical education and tertiary care ecosystem in Assam state. This included civil works at four (04) sites and supply of equipment and goods at seven (07) sites.

60. Table 4 provides details of the project components, locations and scope of work under ADB financing. The location map of the project facilities is provided in Figure 1.

Table 4: Project Components and Scope of Work

Sl. No.	Project Components	Location	Scope of Work under ADB Financing
1	MCH Wings, GMCH	Guwahati, Kamrup Metropolitan District (26° 9'34.55"N, 91°46'5.35"E)	Supply of equipment and medical facilities/hardware
2	GMCH Redevelopment (Demolition and Construction)	Guwahati, Kamrup Metropolitan District (26° 9'29.27"N, 91°46'4.19"E)	Redevelopment of GMCH including demolition of existing buildings and construction of new buildings. Supply and installation of equipment and medical facilities/hardwires
3	Pragjyotishpur Medical College & Hospital	Guwahati, Kamrup Metropolitan District (26° 9'43.49"N, 91°45'4.24"E)	Supply of equipment and medical facilities/hardware

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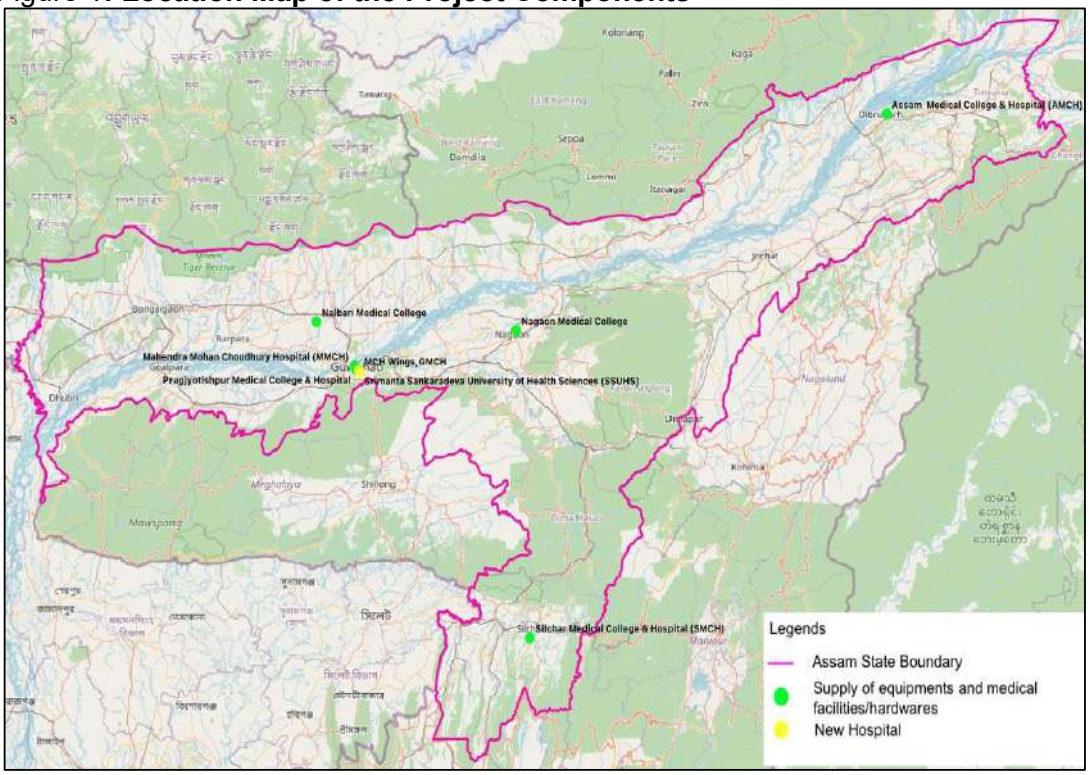
Sl. No.	Project Components	Location	Scope of Work under ADB Financing
4	Mahendra Mohan Choudhury Hospital (MMCH) Annexed to GMCH	Guwahati, Kamrup Metropolitan District (26°11'7.87"N, 91°44'26.50"E)	Supply of equipment and medical facilities/hardwares
5	Nalbari Medical College	Nalbari, Nalbari District (26°24'47.27"N, 91°30'50.90"E)	Supply of equipment and medical facilities/hardwares
6	Nagaon Medical College	Nagaon, Nagaon District (26°21'57.17"N, 92°42'52.21"E)	Supply of equipment and medical facilities/hardwares
7	Assam Medical College & Hospital (AMCH)	Dibrugarh, Dibrugarh District (27°29'19.32"N, 94°56'25.94"E)	Rehabilitation and renovation work at existing buildings. Supply of equipment and medical facilities/hardwares
8	Silchar Medical College & Hospital (SMCH)	Silchar, Silchar District (24°46'32.89"N, 92°47'42.03"E)	Rehabilitation and renovation work at existing buildings. Supply of equipment and medical facilities/hardwares
9	Srimanta Sankaradeva University of Health Sciences (SSUHS)	Guwahati, Kamrup Metropolitan District (26° 9'16.27"N, 91°46'11.98"E)	University building construction (green field facility) Supply and installation of lab equipment/ furniture and hardwares

Source: AHIDMS

Figure 1**: Location Map of the Project Components**



Source: Consultant work based on project coordinates received from AHIDMS

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C. Overview of Physical Infrastructure Development

61. The physical infrastructure development works have been proposed at four locations. This included redevelopment works at existing Guwahati Medical College and Hospital (GMCH) where demolition and construction works are proposed; green field development of new Srimanta Sankaradeva University of Health Sciences (SSUHS) where new university building will be constructed; and AMCH Dibrugarh and SMCH Silchar where rehabilitation and renovation work at existing buildings will be carried out. Medical equipment and supplies will be provided for seven existing medical facilities in the state (refer Table 4). Four project facilities/sites fall under the jurisdiction of Guwahati Metropolitan Development Authority whereas other facilities are located in different part of the State. Details are presented in following sections.

1. Redevelopment of Guwahati Medical College and Hospital

62. GMCH is located in the city of Guwahati which is the largest city of the Indian state of Assam, and also the largest metropolis in northeastern India. Dispur, the capital of Assam, is in the circuit city region located within Guwahati and is the seat of the Government of Assam. The Lokpriya Gopinath Bordoloi International Airport is the 12th busiest in India, and the busiest in the North- East of the country. A major riverine port city along with hills, and one of the fastest growing cities in India, Guwahati is situated on the south bank of the Brahmaputra. The city is known as the "gateway to Northeast India".

63. The GMCH hospital campus is spread on a land parcel of 27 Acres (approx.) providing best healthcare services in the Northeast Region. Figure 2 shows the location map and Figure 3 shows the existing site conditions of the GMCH and proposed development site.

Figure 2: Location map of GMCH

Source: AHIDMS

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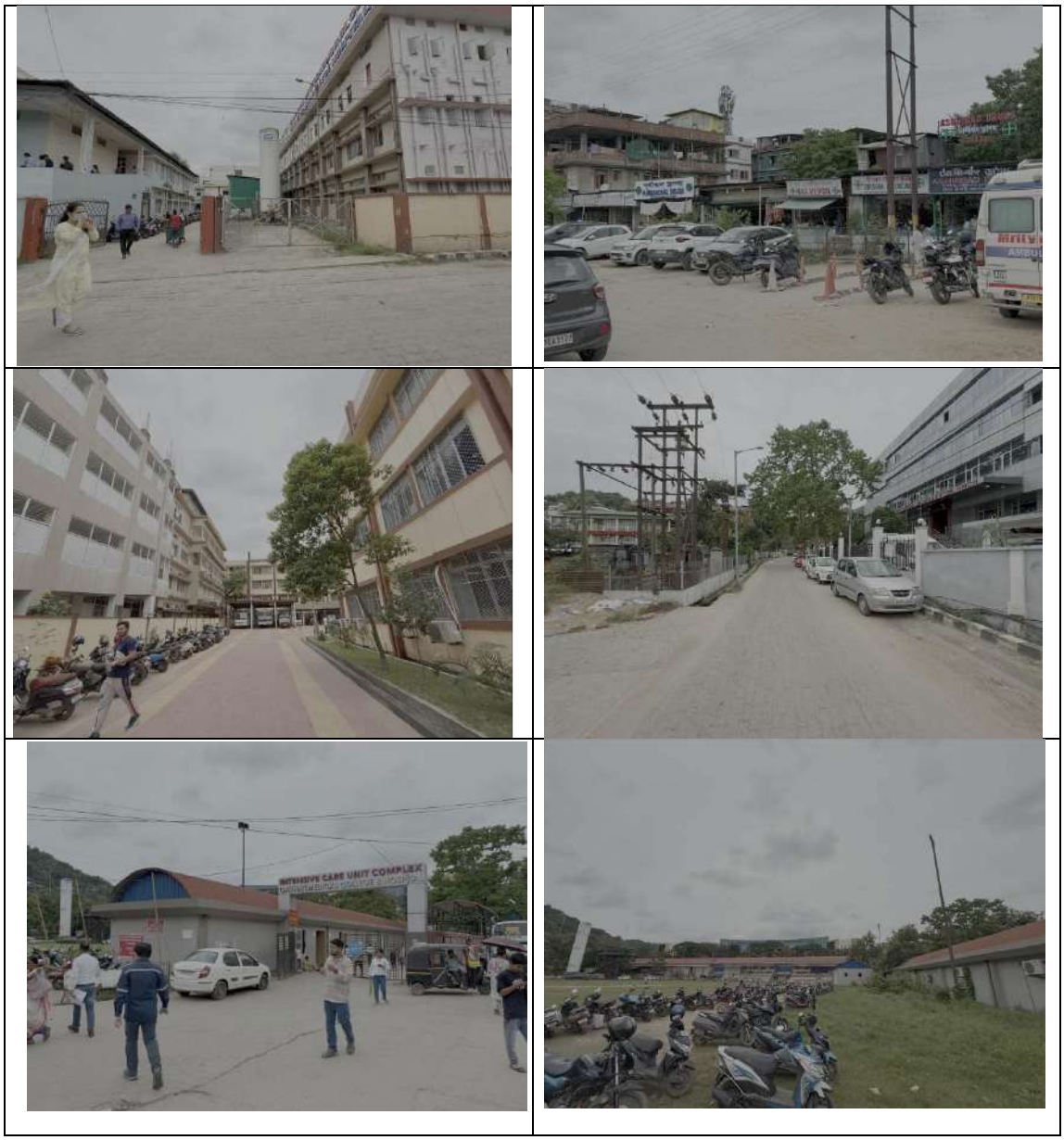
Figure 3:Existing Condition of the Proposed Site for GMCH Redevelopment



64. The proposed planning has a total of nine towers where 6 nos. of Hospital towers of B+G+8 floors accommodating 2600 beds with a single basement having car parking of 840 cars, Mortuary and PWLCS. Other 2 nos. of towers of B+G+6 floors are designated for private wards accommodating (400 beds) with a single basement having car parking of 200 cars. 1 no. of MLCP tower of G+4 accommodating Electric Substation and HVAC plant room at ground floor level and from 2nd to 4th floor level car parking of 300 cars.

65. All the nine towers are interconnected at every floor level except MLCP which is only connected at 2nd floor level or Podium level for ease in patient/ public movement across the campus with all weatherproof corridors. Campus has also kept a future expansion space for Night Shelter, or any other facilities desired by the client in the mere future. The new proposed development has been planned with the following facilities:

(i) Total number of beds in the newly constructed buildings = 3000
(ii) Total number of Operation Theatres are 22 no. of Major OT and 6 no. of Minor OT

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(iii) Radiology (MRI-2 nos., CT-3 nos., Ultrasound-6 nos., DSA-1 no., Mammography etc.
(iv) Car Parking of 970 cars in basement and MLCP - 700 cars.
(v) Podium for visitors, patients seating area with green landscape at 2nd floor level.
(vi) Ancillary services (Kitchen, Laundry, Workshop, Mortuary, Central Stores)
(vii) Engineering services (STP/ETP @ 1800 KLD, UGT @ 2200 KLD, Electrical Load @17500 KVA)

66. Figure 4 shows the bird eye view of the proposed redevelopment and Figure 5 shows the redevelopment layout plan of GMCH. The floor wise details including built up area is presented in Table 5.

Figure 4: Bird Eye View of the Proposed Redevelopment of GMCH

Source: AHIDMS

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Figure 5: Redevelopment Layout Plan of GMCH

Source: AHIDMS

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Table 5: Floor wise Built up Area of GMCH

AREA SHEET																
S.No.	BUILDING BLOCK	TOWER	NO.OF FLOORS	PLINTH HEIGHT (IN METRES)	BASEMENT	PORCH	BUILT UP AREA									
							GROUND	FIRST FLOOR	SECOND FLOOR	THIRD FLOOR	FOURTH FLOOR	FIFTH FLOOR	SIXTH FLOOR	SEVENTH FLOOR	EIGHTH FLOOR	TOTAL (INCLUDING BASEMENT)
					(IN SQM.)		(IN SQM.)	(IN SQM.).)	(IN SQM.)	(IN SQM.)	(IN SQM.)	(IN SQM.)	(IN SQM.)	(IN SQM.)	(IN SQM.)	(IN SQM.)
1	HOSPITAL BLOCK	T-1	B+G+8	0.60	8801.15	1192.80	3492.56	3492.56	3492.56	3492.56	3492.56	3492.56	3492.56	3492.56	3492.56	41427.01
2		T-2	B+G+8	0.60			4357.44	4357.44	4200.19	4200.19	3894.43	3894.43	3894.43	3894.43	3894.43	36587.41
3		STRECHER RAMP	B+G+8	0.60			232.18	232.18	232.18	232.18	232.18	232.18	232.18	232.18	232.18	2089.62
4																
1	HOSPITAL BLOCK	T-3	B+G+8	0.60	20370.35	4855.00	5249.76	4357.44	4200.19	4200.19	3894.43	3894.43	3894.43	3894.43	3894.43	62705.07
2		T-4	B+G+8	0.60			5249.76	4357.44	4200.19	6093.55	5787.79	5787.79	5787.79	5787.79	5787.79	48839.88
3		T-5	B+G+8	0.60			4357.44	4357.44	4200.19	4200.19	3894.43	3894.43	3894.43	3894.43	3894.43	36587.40
		T-6	B+G+8	0.60			2752.14	2752.14	2446.40	2446.40	2289.15	2289.15	2289.15	2289.15	2289.15	21842.81
		STRECHER RAMP	B+G+8	0.60			232.18	232.18	232.18	232.18	232.18	232.18	232.18	232.18	232.18	2089.58
1	PRIVATE WARD		B+G+6	0.60	4900.00		5145.00	5145.00	5145.00	5145.00	5145.00	5145.00	5145.00			40915.00
1	MLCP		G+4	0.60			4000.00		4000.00	4000.00	4000.00					16000.00
		Grand Total														309083.78
5	FLOOR HEIGHT HOSPITAL				6.00		4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
6	FLOOR HEIGHT MLCP						7.2		3.6	3.6	3.6					

Source: AHIDMS

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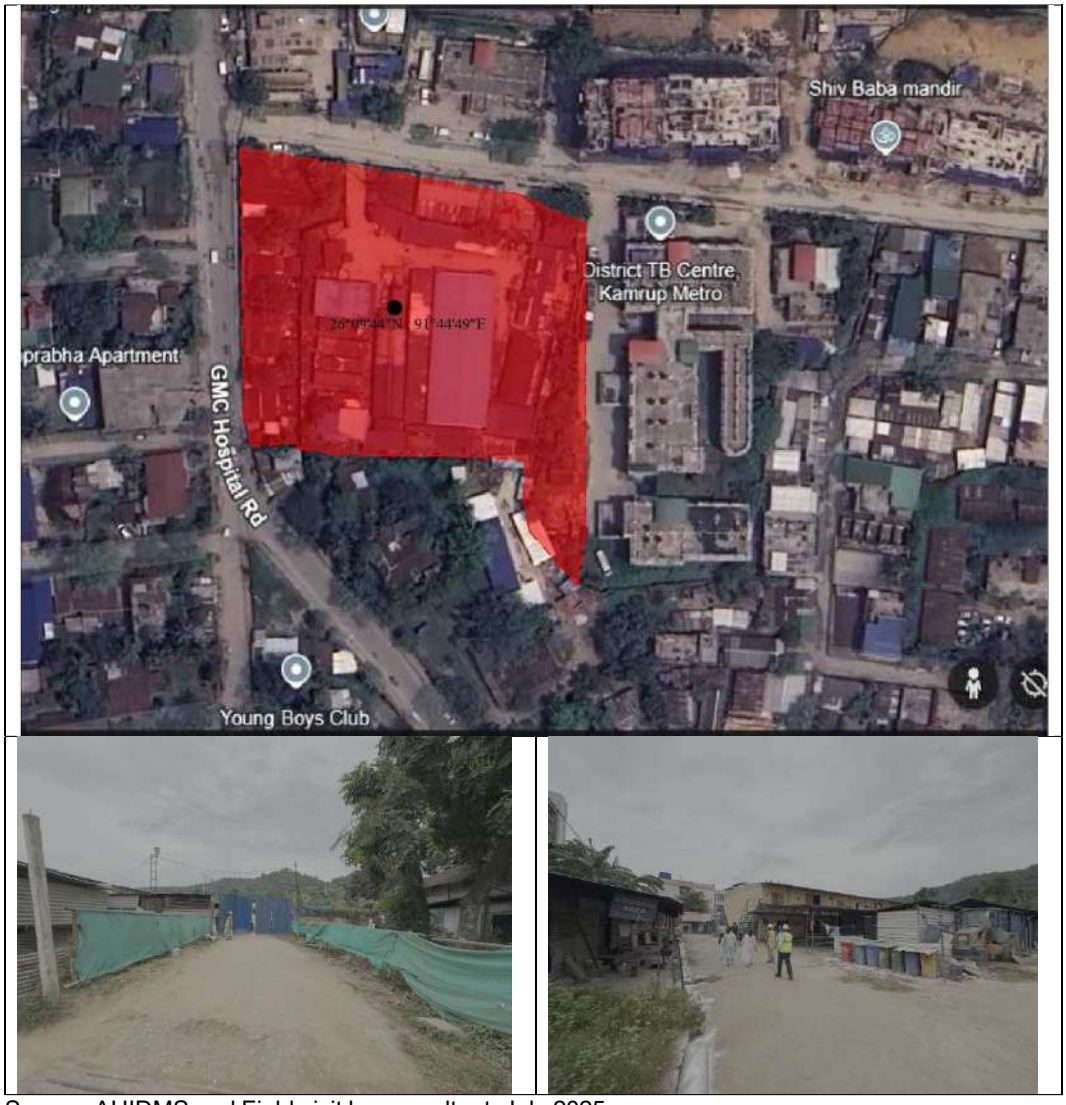
2. Srimanta Sankaradeva University of Health Sciences

67. The Srimanta Sankaradeva University of Health Sciences (SSUHS) is developing its permanent campus building within the campus of the Pragjyotishpur Medical College & Hospital in Guwahati, Assam. The proposed site is an open area measuring 6,375 m^2. The proposed site has temporary workers accommodation (Figure 6) of M/s. L&T Contractors for ongoing construction work for the Pragjyotishpur Medical College & Hospital. The site will be cleared up by the contractor once the ongoing work is completed.

Figure 6: Location and Existing Conditions of the Proposed Site for SSUHS Building



Source: AHIDMS and Field visit by consultant, July 2025

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68. The proposed building has a total built-up area of 15,096.2 m^2, with a ground coverage of 2,270 m^2, constituting 35.6% of the site area. The structure comprises a basement, ground floor, and six additional floors (G+6 configuration). The floor wise details including built up area is presented in Table 6.

Table 6: Floor wise Built up Area Statement of Proposed SSUHS Building

	MAIN BUILDING (B+G+6)
FLOOR HEIGHT	**3.9**
Ground Floor	2270.00 Sqm
First Floor	1899.25 Sqm
Second Floor	1848.10 Sqm
Third Floor	1663.44 Sqm
Fourth Floor	1663.44 Sqm
Fifth Floor	1663.44 Sqm
Sixth Floor	1663.44 Sqm
Basement Floor	2425.10 Sqm
Grand Total Area	**15096.21 Sqm**
Note: Canopy, Boxings and Mumty Areas not Counted in Area Calculation	

Source: AHIDMS

69. The design integrates a range of academic, administrative, and support functions. These include registration and certificate branches, classrooms of varying capacities, examination halls, seminar and conference halls, a digital library, modern research laboratories, and office spaces for faculty and administration. Dedicated rooms for the Vice Chancellor, Registrar, Deans, and Controllers of Examinations are provided, along with PA rooms, waiting lobbies, pantry spaces, strong rooms, and storage areas. The Srimanta Sankaradeva University of Health Sciences (SSUHS) will be transformed as the state center of excellence (COE) hub with affiliation with 97 health institutes across medical, nursing, pharmacy, and paramedical disciplines. As the state COE, SSUH will conduct training for medical college staff in promoting and gender mainstreaming. The AMCH and SMCH will serve as spokes COEs to the hub under SSUHS with a focus on augmenting and optimizing revenue generation and improving reporting and monitoring systems.

70. The SSUHS building also features an auditorium with backstage and green rooms, canteen and kitchen areas, lift lobbies with multiple passenger lifts, accessible toilets, fire control rooms, and mechanical and electrical service areas. Accessibility is ensured through multiple ramps with appropriate slopes, and provision has been made for four-wheeler and two-wheeler parking slots. The layout emphasizes efficient space utilization, accessibility, and integration of essential academic infrastructure to serve the university's long-term operational needs.

71. Figure 7 shows the 3D view of the proposed SSUHS building and Figure 8 shows the site layout plan of SSUHS.

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Figure 7: 3D View of the Proposed SSUHS Building

Source: AHIDMS

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Figure 8: Proposed Site Plan of the SSUSH

Source: AHIDMS

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3. Rehabilitation and Renovation Work at AMCH Dibrugarh and SMCH Silchar

72. The project will support rehabilitation and renovation work at existing buildings of AMCH Dibrugarh and SMCH Silchar. These are the existing buildings and rehabilitation, and renovation work will be limited to minor refurbishment and installation works. No new buildings will be constructed in these facilities.

4. Supply of Equipment and Facilities

73. The project will procure various medical equipment and supplies for seven existing medical facilities in the state.

D. Climate Change Adaptation Considerations

74. An analysis of temperature records in Assam for the period 1990-2019 indicates a rising trend in annual average maximum temperature at a rate of 0.049°C and minimum temperature at a rate of 0.013°C per year. For the same period, the annual rainfall has shown a decreasing trend of approximately 10.77 mm (annually). According to the Assam State Action Plan on Climate Change, the annual average mean temperature will continue to increase by 0.01 degrees Celsius (°C) per year, and is further projected to increase by 1.7-2.0 degrees Celsius (°C) by 2050. The annual average rainfall is also projected to increase in all parts of the state, except for the westernmost regions. A study conducted on the 'Future projection of climate extremes across contiguous northeast India and Bangladesh' indicates that heavy to extremely-heavy rainfall (daily rainfall >=6.5 millimeters) is projected to increase by up to 14 days. Notably, the analysis of the daily rainfall intensity index for the region demonstrates a rise of 2.4 mm/day compared to the current baseline of 14.4 mm/day. These projected changes have significant implications for the state's health infrastructure and additional disease burden arising from outbreaks of vector-borne and water-borne diseases from annual floods across the state.

75. The adaptation measures included in the project design are:

i) Raising the ground-level of the new construction sites (at GMCH and SSUHS) by 0.3 meters (m) over and above the current road finish level (which is at current HFL), and further raising plinth height by 0.6 m of GMCH buildings and 1.6 m of SSUHS building, with retention walls and waterproofing the foundation structures.
ii) Additional stormwater drains with rainwater harvesting structures to capture the water from paved surfaces, rooftop and runoff during rainy season.
iii) Augmentation of Dispur Water Supply Scheme by 2.7 million liters per day (MLD) to supply water to the entire hospital campus through hydropneumatics-supply system and site water-treatment plant
iv) Augmenting the current sewage treatment facility from 400 kilo-liter per day (KLD) to 1800 KLD and establishing new effluent treatment plant of 200 KLD and reusing 90 percent of treated water for flushing and horticulture purposes.
v) Use of heat-reflective cool-roof tiles on terraces, applying passive and adapting architecture and strategic landscaping to prevent absorption of solar energy and heat.
vi) Modernizing teaching facilities in selected para-medical colleges, provisioning modern medical equipment for diagnosis and treatment, digitizing systems and processes for greater and remote reach, early detection and treatment and helipad for disaster support.

76. While the mitigation measures are:

i) SSUHS building will be designed and constructed to get certified under GRIHA/ IGBC/ LEED programs.
ii) Buildings of GMCH will be conforming to GRIHA 4-star and ECBC standards for meeting specific U-Values, Solar Heat Gain Coefficients (SHGC), and

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Visible Light Transmittance (VLT) of glass façade, roof, and wall insulation and installing multi- stage air filtration systems conforming to ASHRAE Standard 170-2017.

iii) Optimizing electrical load by installing – a) variable frequency drives (VFD) and variable air volume (VAV) boxes in air handling and cooling system, pumps, fans, etc.,
b) CO sensor-based AHU at parking lots, Automation with occupancy sensor and Integrated Building Management System and other digitization measures

iv) Renewable energy-based systems including - a) 4500 kWp Solar Rooftop System, b) Solar water heaters of capacity 100 liters per day, c) Solar-powered Street lights at GMCH campus

E. Analysis of Alternatives

77. An alternative analysis was conducted to justify the project based on a with and without-project‖ alternative analysis. Since the projects will be constructed within the existing premises or close to existing hospitals, no alternative sites were considered. Also, as the existing waste treatment and medical waste treatment and disposal facilities are available, therefore option of constructing new treatment facilities is not considered.

78. The “no-project” alternative is not an option as the patients’ and health workers’ safety is currently compromised by lack of adequate health care facilities in project area. The no-project option would impede further social and economic development of the citizens of state. The “with- project” alternative will improve patients’ and health workers’ safety in hospitals in the project cities.

F. Cost and Implementation Schedule

79. The overall project is estimated to cost $498.50 million. The government has requested a loan equivalent to $398.80 million from ADB's ordinary capital resources to help finance the project and remaining amount will be funded by government as counterpart funding. The project will be implemented over 6 year period from Q1 2026 to Q1 2032. The construction of each facility will last from 36 to 60 months in total. The overall EMP will be adjusted at the time of loan effectiveness, then be reviewed, and updated on an annual basis during the project implementation period.

IV. DESCRIPTION OF THE ENVIRONMENT

80. This chapter emphasizes on the description of physical, biological, and socioeconomic conditions of Project Area (Guwahati) as the physical infrastructure interventions/upgrades under this project are located mostly in Guwahati City.

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A. Physical Environment

81. **Location.** Geologically, the state can be divided into three structural regions: the alluvial plains of Brahmaputra and Barak, the plateau region of Karbi Anglong, and the Tertiary Era Mountains of North Cachar Hills.

82. Guwahati is situated on the southern bank of river Brahmaputra with its cardinal points as $26^0 10'$ north latitude and $92^0 49'$ east longitude. The city is located towards the north-western side of Kamrup Metropolitan district, surrounded by Darrang district in the north, Marigaon district in the east and north east, Meghalaya State in the south and Kamrup district in the West. The city is situated on an undulating plain with varying altitudes of 49.5 m to 55.5 m above mean sea level (MSL). The southern and the eastern sides of the city are surrounded by hillocks. The central part of the city has small hillocks namely Sarania hill (193 m), Nabagraha hill (217 m), Nilachal hill (193 m) and Chunsali Hill (293 m). The city is also covered by swamps, marshes and water bodies like Dipar Bil, Dighali Pukhri, Silsakoo bil.[25]

83. **Topography and landform**. The average slope varies from zero degree to 18 degrees. The natural topography of the city guides flow of the rain water towards Bharalu and Basistha Rivers. The physical configuration of Guwahati exhibits a peculiar structure being located within a crescent shaped basin, surrounded by a number of hillocks. As a result, swamps and low- lying areas in between the hillocks have emerged in the landscape. These low lying areas are often inundated during heavy rainfall.

84. Guwahati is characterized by mostly Precambrian granite gneisses, quartzite forming residual hills and occupying a major part of the landscape. Small-elongated inter montane valleys with varying thicknesses of sediment fill and alluvium form the rest of the areas. There is presence of a number of paleo-channels that are perceived to be old channels linked to the Brahmaputra River towards north. The Brahmaputra valley and its adjoining highlands constitute a highly active seismic zone. Guwahati falls in the Seismic Zone V, where earthquakes of magnitude 8 or more can occur i.e., the zone with highest intensity. Guwahati and its surrounding area are situated on the fringe of hard rock formation. Its vulnerability to the seismic activity is exacerbated due to congestion brought on by topography, with poorly built housing and narrow streets.

85. Climate. From the climatic point of view, the year in Assam can broadly be divided into the cold and rainy seasons. However, there are two other short seasons, namely spring and autumn, representing the transition between cold and rainy seasons and rainy and cold seasons, respectively. With an average of 24.1°C (75.4°F), February is the warmest month. July is the coldest month, with temperatures averaging 21.9°C (71.4°F).

86. Three seasons are witnessed in Guwahati. From February to May, the weather is dry. In the month of March, the northeast wind carries the dry sand from the Brahmaputra River and makes the whole atmosphere dusty. In April and May, local rain along with thunderstorms is a common feature. As shown in table 7, the maximum and minimum temperature varies from 12° to 31°C during this period. From June to October is the southwest monsoon season with heavy rainfall. The temperature varies from 22° to 32°C in this period. November to January is the cold weather season. The average annual rainfall in Guwahati is 1637.3 mm with 87 average rainy days. About 90% of this rain occurs between April and September and July and August being the maximum rainy months. The precipitation varies from 297 mm to 340 mm between the driest and wettest months. Throughout the year, temperatures vary by 2.2°C.

Table 7: Monthly Average Weather in Assam

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	October	Nov	Dec

[25] Master Plan Guwahati 2025. https://gmda.assam.gov.in/portlets/master-plan-guwahati-2025-0.

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Avg. Temperature (ºC)	23.8	24,1	23.9	24	23.8	23.1	21.9	22	22.7	23	22.8	23.5
Min. Temperature (ºC)	19.5	19.4	19.1	19.2	19.3	19.1	18.1	18	18.8	18.7	18.6	19.4
Max. Temperature (ºC)	28.1	28.8	28.8	28.8	28.3	27.1	25.7	26	26.6	27.3	27.1	27.7
Precipitation / Rainfall (mm)	48	102	189	227	236	153	43	63	254	340	205	67

Source: https://waterresources.assam.gov.in/sites/default/files/swf_utility_folder/departments/wr_webcomindia_org_oid_3/menu/document/airbmp_esmf_.pdf

87. **Water resources.** The whole GMA area is divided into six drainage basins, which are ultimately drained into the Brahmaputra River either directly or through various drainage channels and reservoirs. These six basins are Bharalu Basin, Dipar Basin, Silsako Basin, Foreshore Basin, North Guwahati Basin, and Kalmoni Basin.

88. Brahmaputra River within Assam is almost 700 km long with more than 100 tributaries. It has a total length of 28.67 km, total area of 49 sq km and a major natural feature in Guwahati.

89. The Bharalu River originates as a small stream from the southern range of Khashi Hills and flows through the city gaining momentum in width and depth and ultimately joining Brahmaputra River. Most of the drains directly or indirectly fall into Bharalu River which is an important channel for the drainage of the city. But due to siltation, the bed level of the river has considerably risen. Results of monitoring conducted by APCB show dissolved oxygen, biological oxygen demand, and coliforms exceed the prescribed GoI limits. All other parameters are within the prescribed limit.

90. Guwahati depends on groundwater from ring/dug wells and tube wells for drinking purposes. To ensure affordable and safe water supply for the Guwahati Metropolitan Area, the Government of Assam has undertaken four major water supply projects. These transformative initiatives are being supported through funding from the Government of India (JNNURM) for the South West region, the Japan International Cooperation Agency (JICA) for the North and South Central regions, and the Asian Development Bank (ADB) for the South East region. On completion, these will be operated and maintained by the Guwahati Jal Board.[26]

91. **Soil resources.** The soils of Assam (Table 8) are very rich in content of nitrogen and organic matter. The alluvial soils of the Brahmaputra and the Barak valley are highly fertile and are very much suitable for raising varieties of crops around the year, such as cereals, pulses, oilseeds, plantation crops, etc. The well-drained, deep, acidic alluvial soils of upper Assam with a good proportion of phosphoric content are most suitable for the plantations. New alluvial soils occurring in the char lands of the Brahmaputra are most suitable for growing oilseeds, pulses and Rabi crops. The alluvium of the plains offers an excellent opportunity for cultivating rice and vegetables. The soils occurring in the upper reaches of the hill slopes are very suitable for horticulture.

Table 8: Distribution of Soils in Assam under different orders

Soil Order	Area (in 000 hectares)	Percentage of Soils	Local name
Inceptisols	3245.3	41.40%	Brahmaputra alluvial soils, Old alluvial soils
Entisols	2640.1	33.60%	Recent alluvial soils, Sandy soils
Alfisols	886.9	11.30%	Red soils

[26] Guwahati Metropolitan Development Authority, Govt of Assam (https://gmda.assam.gov.in/portlets/water-supply-projects-0#:~:text=In%20order%20to%20provide%20affordable,as%20shown%20in%20the%20map)

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Ultisols	436.5	5.60%	Red soils
Miscellaneous	635.3	8.10%	
Total	7844	100%	

Source: Agriculture Department Assam, 2011

B. Environmental Baseline

92. Baseline data for environmental quality parameters (air, noise, water, soil) were collected from various secondary sources including those monitored by the government agencies. The data relevant to the project sites/areas have been presented and discussed in following sections. Site specific baseline monitoring will be conducted by contractors prior to commencement of the construction work.

1. Air Quality

93. Table 9 presents ambient air quality data from multiple monitoring stations across Assam, recorded on 10th October 2023 and 6th November 2023, along with annual average values from key cities. The table captures concentrations of major air pollutants including Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter PM_{10}, and $PM_{2.5}$, measured in micrograms per cubic meter (µg/m³). Locations monitored include urban centers such as Guwahati, Silchar, Dibrugarh, Nagaon, and Nalbari, using both Manually Operated (MAAQMS) and Continuous Ambient Air Quality Monitoring Stations (CAAQMS). The data is benchmarked against the National Ambient Air Quality Standards (NAAQS) for both 24-hour and annual averages in residential and commercial areas. The data has been taken from Assam Pollution Control Board Annual Report 2023-2024.

Table 9: Ambient Air Quality monitoring

Stations	SO2 (µg/m3)	NO2 (µg/m3)	PM10 (µg/m3)	PM2.5 (µg/m3)
Date: 10/10/23				
Santipur, Guwahati	6.5	15.5	37	20
Khanapara, Guwahati	6.5	15.5	97	45
Nalbari College, Nalbari	5.8	16.5	66	30
Nowgaon Girls College, Nagoan	6.2	13	91	43
Dibrugarh	4.3	9.3	14	8
Kathal Road, Silchar	7.3	9	41	19
Tarapur, Silchar	5.7	6.8	32	12

+

Stations	SO2 (µg/m3)	NO2 (µg/m3)	PM10 (µg/m3)	PM2.5 (µg/m3)
Stations	SO2 (µg/m3)	NO2 (µg/m3)	PM10 (µg/m3)	PM2.5 (µg/m3)
Date: 06/11/23				
Bamunimaidam, Guwahati	6.8	14.8	150	62
Khanapara, Guwahati	6.5	16.3	148	63
ITI Building, Guwahati	6.7	16.8	109	47
Santipur, Guwahati	6.5	-	83	45
Gauhati University Campus	6.7	15	55	30
Tarapur, Silchar	7	9	48	25
Kathal Road, Silchar	9	10	42	21
Chowkidinghee, Dibrugarh	5.7	11.3	45	22

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Nowgaon Girls College, Nagoan	5.3	11.1	124	66
Nalbari College, Nalbari	5.5	13.7	109	58
NAAQ Standard for Residential/ Commercial Area for 24 hrs. Average for Annual Average	80	80	100	60
Stations	**SO2 (µg/m3)**	**NO2 (µg/m3)**	**PM10 (µg/m3)**	**PM2.5 (µg/m3)**
Annual Average				
Guwahati (10 MAAQMS+4 CAAQMS)	12.9	12.3	109	53
Dibrugarh (1 MAAQMS)	5.7	11.5	46	22
Nalbari (3 MAAQMS+1 CAAQMS)	5.8	10.6	111	51
Nalbari (3 MAAQMS+1 CAAQMS)	8.5	15.6	101	46
Silchar (3 MAAQMS+1 CAAQMS)	8.5	9.8	46	26
National AAQ Standard for Residential/Commercial Area for Annual Average	50	40	60	40
MAAQMS: Manually Operated Ambient Air Quality Monitoring Stations CAAQMS: Continuous Ambient Air Quality Monitoring Stations				

Source: Assam Pollution Control Board. Annual Report 2023-2024.

94. ***Sulphur Dioxide:*** Across all monitoring locations and dates, SO_2 concentrations remained well below the national ambient air quality standards—both for 24-hour and annual averages. The observed values generally ranged between 4.3 to 9.0 µg/m³, while the annual permissible limit is 50 µg/m³. Even in urban centers such as Guwahati and Silchar, the levels stayed low and consistent over both dates. This suggests that SO_2 pollution is not a significant concern in these regions, likely due to limited heavy industrial activity and moderate vehicular sulfur emissions. Overall, the air quality with respect to SO_2 can be considered good and non-threatening to public health.

95. ***Nitrogen Dioxide*:** The NO_2 levels were also found to be well within the permissible limits set by the National Ambient Air Quality Standards (40 µg/m³ annual and 80 µg/m³ for 24-hour average). Most locations showed values in the range of 6.8 to 16.8 µg/m³, with only a minor increase observed from October to November, particularly in urban pockets such as Khanapara and Bamunimaidam in Guwahati. This consistent trend across cities points to relatively low NO_2 pollution, indicating that vehicular and combustion-related emissions are not critically high in the region.

96. ***Particulate Matter PM$_{10}$:*** PM_{10} levels are a major concern, especially in urbanized and congested areas like Guwahati, Nalbari, and Nagaon. On 06/11/23, several locations including Khanapara (148 µg/m³), Bamunimaidam (150 µg/m³), and Nowgaon Girls College (124 µg/m³) recorded values well above the 24-hour permissible limit of 100 µg/m³. Even the annual average PM_{10} concentrations in cities such as Guwahati (109 µg/m³) and Nalbari (101–111 µg/m³) were significantly above the annual limit of 60 µg/m³. This persistent exceedance suggests chronic exposure to coarse particulate pollution, likely driven by road dust, construction activities, biomass burning, and vehicular emissions.

97. ***Particulate Matter PM$_{2.5}$:*** Similar to PM_{10}, $PM_{2.5}$ concentrations pose a serious air quality challenge, especially during the cooler months. On 06/11/23, critical levels were recorded at Khanapara (63 µg/m³), Nowgaon (66 µg/m³), and Nalbari (58 µg/m³)—approaching or exceeding the 24-hour standard of 60 µg/m³. The annual averages in Guwahati (53 µg/m³) and Nalbari (46–51 µg/m³) also breached the national annual limit of 40 µg/m³, indicating sustained fine particulate

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pollution. $PM_{2.5}$ is especially harmful due to its ability to penetrate deep into the lungs and bloodstream, and its dominance suggests pollution from combustion sources such as vehicular exhaust, domestic biomass burning, and industrial emissions.

2. Acoustic Environment

98. Table 10 presents recorded ambient noise levels from various monitoring locations across Assam, captured on two dates: 10th October 2023 and 6th November 2023. The data, sourced from the Assam Pollution Control Board's Annual Report (2023–2024), includes measurements from commercial, residential, and silent zones in key urban centers such as Guwahati, Silchar, Dibrugarh, and Nagaon. The noise levels, expressed in decibels (dB), reflect environmental sound conditions in different functional zones, highlighting potential deviations from permissible limits set for respective land-use categories.

Table 10: Recorded Noise Levels in the Project Cities

City	Monitoring Station	Measured Noise Level (dB)		Land Use
		10/10/23	06/11/23	
Guwahati	Ganeshguri	69.2	66.8	Commercial
	Bharalumukh	58.9	-	Commercial
	Pandu	55.8	-	Commercial
	Ulubari	-	65.9	Residential
	MMC Hospital	-	57.9	Silent
Silchar	DC Office, Silchar	48.5	-	Silent
	Premlata, Silchar	63.3	-	Commercial
	Ambicapatty	56.3	-	Residential
	Link Road	57.2	-	Commercial
	District Court	50.7	-	Silent
	Rangirkhari	63.7	-	Residential
Dibrugarh	HS Road	65.8		Commercial
	Dibrugarh University	66.5		Silent
	PCBA RO Office	-	59.68	Residential
	Milanpur	60.8		Residential
Nagoan	BP Civil Hospital	60.5	63.9	Silent
	Milanpur Area	62.7	62.2	Residential
	Haibargaon Bazar Area	81.9	81.9	Commercial
	Near Hojai Civil Hospital	-	62.2	Silent
	Kalibari Road	-	62.7	Residential
	Market Area	-	62.06	Commercial

Source: Assam Pollution Control Board. Annual Report 2023-2024

99. **Commercial areas:** Noise levels in commercial zones were found to be consistently high, often exceeding the CPCB prescribed limit of 65 dB during the day. For example, Ganeshguri (Guwahati) recorded 69.2 dB and 66.8 dB on the two dates, clearly breaching the standard. Other areas like Haibargaon Bazar (81.9 dB) and Premlata, Silchar (63.3 dB) also showed elevated levels. Notably, Haibargaon Bazar's 81.9 dB is significantly high, suggesting serious commercial congestion and inadequate noise control. These readings highlight a common pattern of excessive noise pollution in commercial hubs, often due to vehicular traffic, market activity, and public movement.

100. **Residential areas:** In residential areas, where the CPCB limit is 55 dB during the day,

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the noise levels were generally above the permissible threshold. For instance, Milanpur in Dibrugarh recorded 60.8 dB, and Kalibari Road in Nagaon had 62.7 dB—both noticeably above the standard. Even Ulubari in Guwahati reported 65.9 dB, comparable to a busy commercial zone. Such levels indicate growing noise intrusions in what are supposed to be quieter, livable spaces. The data suggests that in the face of rapid urbanization, residential areas are experiencing greater exposure to traffic, construction, and urban expansion. While these pose challenges to quality of life and health, they also highlight the pressing need and opportunity for sustainable urban planning, greener infrastructure, and healthier living environments for

101. **Silent zones:** Silent zones (typically within 100 m of hospitals, courts, and educational institutions) have the strictest day-time noise limit at 50 dB, but the data shows they are consistently violated. For example, BP Civil Hospital in Nagaon recorded 60.5 and 63.9 dB, while Dibrugarh University and MMC Hospital in Guwahati also exceeded 57 dB. These exceedances highlight the importance of strengthening noise management, as maintaining low levels in sensitive zones is vital for patient recovery, effective learning, and overall well-being. The findings present an opportunity to enhance enforcement and awareness, ensuring that silence and tranquility are prioritized where they matter most.

3. Water Environment

102. **Surface water quality**. Table 11 presents comprehensive surface water quality data for various rivers, ponds, and beels across Assam, based on monitoring conducted by the Assam Pollution Control Board for the year 2023–2024. The table reports key physicochemical and biological parameters such as dissolved oxygen (DO), pH, electrical conductivity, biochemical oxygen demand (BOD), nitrate concentrations, fecal and total coliform levels, and chemical oxygen demand (COD). Sampling locations include major stretches of the River Brahmaputra, River Barak, urban water bodies like Bharalu River, and several urban ponds and beels in Guwahati and Nagaon. The data is presented with minimum, maximum, and mean values, allowing assessment of seasonal and locational variations. For reference, the CPCB Class B standards for water quality are included, enabling comparison to national benchmarks for designated best-use criteria such as bathing and recreational purposes.

Table 11: Surface Water Quality in Project Cities

Monitoring Station	Range	DO (mg/L)	pH	Conductivity (µS/cm)	BOD (mg/L)	Nitrate N (mg/L)	Fecal Coliform (MPN/100ml)	Total Coliform (MPN/100ml)	COD (mg/L)
River Brahmaputra, Dibrugarh	Min	5	6.8	102	2	0.7	360	730	10.2
	Max	8.7	7.6	140	2.7	1.2	1100	2100	16
	Mean	7	7	119	2	1	658	1388	12
River Brahmaputra, Kacharigaht, Guwahati	Min	5.4	7.2	132	2.1	0.6	360	910	11.5
	Max	9.9	7.8	210	2.5	1	1100	2700	13
	Mean	8	7	166	2	1	903	1851	12
River Brahmaputra, Chandrapur, Guwahati	Min	6.9	6.8	128	2	0.6	610	1500	11.8
	Max	10	8	152	2.6	1.1	2800	3600	13.6
	Mean	8	7	136	2	1	1062	1983	13
River Brahmaputra, Near Bogibeel Bridge, Dibrugarh	Min	5	7	120	2	0.6	300	730	11.4
	Max	8.7	7.4	146	2.4	1	1100	2100	13.6
	Mean	7	7	131	2	1	682	1469	13
River Bharalu at Guwahati	Min	0.3	6.9	520	30.6	1.6	2300	4200	64
	Max	1	7.6	610	34	3.8	2900	5300	80.6
	Mean	0.5	7	552	32	3	2775	4417	71

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Monitoring Station	Range	DO (mg/L)	pH	Conductivity (µS/cm)	BOD (mg/L)	Nitrate N (mg/L)	Fecal Coliform (MPN/100ml)	Total Coliform (MPN/100ml)	COD (mg/L)
River Barak at D/S of Silchar	Min	5.1	7	90	2	0.6	300	730	9.6
	Max	5.6	7.3	116	2.6	1.2	1100	2800	12.2
	Mean	5	7	106	2	1	895	1911	11
Silsakao Beel, Guwahati	Min	0.6	7	344	10.6	0.7	1500	2700	18.6
	Max	4.6	7.5	442	18.2	1.9	2800	3600	32.4
	Mean	2	7.2	389	14.5	1.2	1742	3183	25.7
Soru Sola Beel, Guwahati	Min	0.3	7	362	12.6	0.7	2800	4200	47.6
	Max	1.1	7.5	432	23.6	4.4	3600	5300	60
	Mean	0.6	7.2	396	16.9	1.6	3033	4742	51.9
Borsola Beel, Guwahati	Min	0.3	6.8	360	12.8	0.6	2700	4200	47.2
	Max	1.1	7.6	460	25.2	4	2900	4400	534
	Mean	0.4	7.1	403	18.3	1.7	2817	4317	92
Batodrawa Satra Pond, Nagaon	Min	5	6.7	81	1.8	0.8	300	730	11.4
	Max	7.6	7.8	112	2.7	1.2	360	1200	13.6
	Mean	5.8	7.3	95	2.2	0.9	350	1048	12.6
Dighali Pukhuri, Guwahati	Min	5.1	7.9	176	2.3	0.6	360	1400	10.4
	Max	10	8.2	200	2.8	1.3	730	1600	13.4
	Mean	8.7	8.1	188	2.6	0.9	678	1492	11.7
CPCB Class B National Standards		>5.0 mg/l	6.5-8.5		<3.0 mg/l		<2500 MPN/100ml	<5000 MPN/100ml	

Source: Assam Pollution Control Board. Annual Report 2023-2024.

103. **Dissolved oxygen:** Most river and pond sites, including the Brahmaputra at Dibrugarh, Guwahati, and Bogibeel, maintain DO levels well above 5 mg/L, indicating good oxygenation and aerobic conditions. Exceptions are observed in urban water bodies like River Bharalu (mean: 0.5 mg/L) and Beels (wetlands) such as Silsakao (2 mg/L), Soru Sola (0.6 mg/L), and Borsola (0.4 mg/L). These values fall significantly below the threshold, suggesting organic pollution, stagnation, and possible eutrophication, impairing aquatic life. In contrast, cleaner ponds like Dighali Pukhuri and Batodrawa Satra Pond show healthy DO levels (~5.8–8.7 mg/L).

104. **pH:** All monitored locations fall within the acceptable range of 6.5 to 8.5, indicating no serious acidity or alkalinity issues. Most sites show a slightly neutral to mildly alkaline pH (~7.0–7.5), which is ideal for aquatic ecosystems. Only a few localized deviations are noted at the lower end of the range (6.7–6.8), particularly in Dibrugarh and Borsola Beel, but these are still within permissible limits.

105. **Conductivity:** Electrical conductivity values vary widely, reflecting differences in ionic content and pollution loads. Rivers like Brahmaputra and Barak show relatively low conductivity (90–210 µS/cm), indicating cleaner, fast-moving waters. However, urban drains and stagnant wetlands such as River Bharalu (mean: 552 µS/cm), Silsakao (389 µS/cm), and Soru Sola (396 µS/cm) display much higher conductivity, suggesting high levels of dissolved salts and organic matter, possibly from sewage inflows and urban runoff.

106. **Biochemical oxygen demand:** BOD levels are a key pollution indicator. In natural rivers like Brahmaputra and Barak, BOD remains well below 3 mg/L, signifying minimal organic pollution. In contrast, River Bharalu exhibits extremely high BOD (mean: 32 mg/L), far exceeding the limit, indicating severe organic contamination from untreated domestic or

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industrial sewage. Similar pollution is evident in urban wetlands like Silsakao (14.5 mg/L), Soru Sola (16.9 mg/L), and Borsola (18.3 mg/L), suggesting their use as sinks for urban effluents with poor flushing.

107. **Nitrate:** Nitrate levels in all sites are below the threshold of concern (generally <10 mg/L for drinking water and 5–10 mg/L for aquatic health). The range across all locations is 0.6 to 4.4 mg/L, suggesting moderate nutrient presence but no acute nitrogen loading. However, the higher ends at Soru Sola (4.4 mg/L) and Borsola (4.0 mg/L) indicate potential fertilizer runoff or sewage leakage, which could lead to nutrient enrichment over time.

108. **Fecal coliform:** This is one of the most concerning parameters. While river sites like Brahmaputra at Dibrugarh, Bogibeel, and Barak mostly stay within limits (mean: 658–903 MPN/100 ml), urban rivers and beels far exceed the standard. River Bharalu (mean: 2775 MPN/100 ml) and wetlands like Soru Sola (3033 MPN/100 ml) and Borsola (2817 MPN/100 ml) are heavily contaminated, likely due to direct discharge of untreated sewage.

109. **Total coliform:** Similar to fecal coliforms, total coliform levels exceed the Class B standard (5000 MPN/100 ml) at sites such as Borsola (mean: 4317 MPN/100 ml) and Soru Sola (4742 MPN/100 ml). While not always pathogenic, their presence in such high concentrations signals the influence of sewage contamination. Even major rivers like Brahmaputra (mean: 1388–1983 MPN/100 ml) show moderate levels, suggesting diffuse or upstream contamination.

110. **Chemical oxygen demand:** COD levels serve as a cumulative measure of organic and inorganic pollutants. The cleaner rivers (Brahmaputra, Barak) show COD in the 10–13 mg/L range, considered moderate. In contrast, River Bharalu (mean: 71 mg/L) and urban ponds/wetlands like Borsola (92 mg/L) are highly polluted, indicating both biodegradable and non- biodegradable organic matter, possibly from industrial discharges or urban drainage. Soru Sola and Silsakao also show elevated COD (51.9 and 25.7 mg/L respectively), reinforcing their polluted status.

111. **Ground water quality**. Table 12 provides a summary of groundwater quality parameters monitored across various locations in Assam during different months in 2023–2024. The table includes data from Noonmati, Garchuk, Khanapara (all three in Guwahati), as well as Silchar, Nalbari, and Nagaon. Key parameters such as temperature, pH, electrical conductivity, biochemical oxygen demand (BOD), and nitrate concentration were analyzed to assess the suitability of groundwater for drinking and other uses. Seasonal variations are evident in several locations, reflecting fluctuations in water chemistry due to climatic and anthropogenic influences. The data is sourced from the Assam Pollution Control Board's Annual Report (2023–2024).

Table 12: Ground Water Quality in the Project Cities

Location	Month	Temperature (oC)	pH	Conductivity	BOD (mg/L)	Nitrate (mg/L)
Noonmati, Guwahati	April	25	6.7	342	2.5	0.8
	October	25	6.8	346	2.3	0.9

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Location	Month	Temperature (oC)	pH	Conductivity	BOD (mg/L)	Nitrate (mg/L)
Garchuk, Guwahati	April	22	7.6	398	2.8	1
	October	27	7.1	392	2.7	1.1
Khanapara, Guwahati	May	24	6.8	346	2.2	0.7
	November	24	7	198	2.5	1
Silchar	May	24	6.8	126	2	1
Nalbari	April	20	7.2	340	2.6	0.9
	October	19	7	344	2.5	2.5
Nagaon	April	24	7.1	320	2.5	0.9
	October	24	6.9	324	2.6	1

Source: Assam Pollution Control Board. Annual Report 2023-2024.

112. **Temperature:** While temperature is not regulated in IS 10500, it can influence chemical and biological activity in groundwater. Recorded temperatures range from 19°C to 27°C, which are typical for shallow aquifers in Assam and do not raise any concern. The consistent 24–25°C range in most sites also suggests thermal stability of aquifers.

113. **pH:** The pH values across all groundwater samples range from 6.7 to 7.6, which fall comfortably within the IS 10500 acceptable range of 6.5 to 8.5. This suggests that the groundwater is neither too acidic nor too alkaline and is chemically stable for drinking purposes. The highest value observed was at Garchuk in April (7.6), which is still well within permissible limits. The consistency in pH across seasons also indicates stable subsurface conditions.

114. **Electrical conductivity:** While IS 10500 does not prescribe limits for electrical conductivity, it serves as an important indicator of dissolved ions (salts, minerals). Most locations report EC in the moderate range (198–398 µS/cm), with the lowest in Khanapara in November (198 µS/cm) and highest at Garchuk in April (398 µS/cm). These values suggest low to moderate mineralization, which is generally acceptable for drinking. However, if the trend increases seasonally, it could indicate salt intrusion or contamination from leaching.cc

115. **Biochemical oxygen demand:** Although BOD is typically used for surface water or sewage evaluation, its presence in groundwater can indicate leaching of organic matter or contamination from septic systems. All BOD values range between 2.0 and 2.8 mg/L, below the CPCB Class B limit of 3.0 mg/L, but still somewhat elevated for pristine groundwater, which should ideally have BOD near zero. Garchuk (2.8 mg/L) and Nalbari (2.6 mg/L) show the highest BOD levels, suggesting some localized organic contamination or interaction with organic-rich soils or anthropogenic sources.

116. **Nitrate:** All observed nitrate concentrations are well below the IS 10500 drinking water limit of 45 mg/L, ranging from 0.7 to 2.5 mg/L. This indicates that there is no nitrate contamination due to fertilizers, septic tanks, or sewage. However, Nalbari in October (2.5 mg/L) shows a noticeable increase compared to its April level (0.9 mg/L).

4. Soil Environment

117. Table 13 presents the results of soil quality analysis conducted at MMCH Hospital in 2022, detailing the physical and chemical properties of the sampled soil. The soil texture was identified as sandy loam, with a composition of 60% sand, 25% silt, and 15% clay, and a brownish-yellow color. Key parameters such as pH, organic matter, moisture content, and nutrient concentrations (e.g. nitrogen, phosphorus, and exchangeable cations) were assessed to understand the soil's fertility, structure, and suitability for vegetation or construction.

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Table 13: Soil Quality Analysis carried at MMCH Hospital (2022)

Sl. No.	Parameters	Units	Value
1	Texture	-	Sandy Loam
2	Sand	:	60
3	Silt	%	25
4	Clay	%	15
5	Color	-	Brownish yellow
6	pH (1:2 Suspension)	-	6.43
7	Specific Conductivity	umhos/cm	519
8	Moisture	%	12.2
9	Exchangeable Potassium	mg/kg	8.5
10	Exchangeable Sodium	mg/kg	22.7
11	Exchangeable Calcium	mg/kg	312
12	Exchangeable Magnesium	mg/kg	84.2
13	Porosity	%	36.5
14	Organic Matter	%	0.57
15	Phosphorous	mg/kg	12.2
16	Nitrogen	mg/kg	90
17	Chloride	mg/kg	65
18	Bulk Density	gm/cc	1.7

Source: PWD Assam

118. The analyzed soil sample from the proposed site at MMCH and Kalapahar Campus, Guwahati in 2022, shows a sandy loam texture, comprising approximately 60% sand, 25% silt, and 15% clay. The soil color is described as brownish yellow, indicating moderate organic content and good aeration. The pH of the 1:2 suspension is 6.43, suggesting a slightly acidic nature, which is generally favorable for most plant growth and infrastructure stability.

119. The specific conductivity is recorded at 519 µmhos/cm, indicating low salinity and thus, no immediate risk of salt-related degradation. The moisture content is 12.2%, which is typical for well-drained soils of this texture. In terms of fertility, the soil has low levels of exchangeable potassium (8.5 mg/kg) and nitrogen (90 mg/kg), indicating the need for nutrient supplementation for agricultural or landscaping purposes. Phosphorus is moderately present at 12.2 mg/kg, while exchangeable calcium (312 mg/kg) and magnesium (84.2 mg/kg) are adequate to support plant growth and soil structure.

120.

121. The porosity of the soil is 36.5%, within the acceptable range for sandy loam, ensuring good drainage and air movement. However, the bulk density is relatively high at 1.7 g/cc, which may imply some compaction, potentially limit root penetration or water infiltration if not addressed. The organic matter content is notably low at 0.57%, suggesting poor nutrient retention and biological activity, and calling for organic amendments. Lastly, chloride levels are 65 mg/kg, which are within a safe range and pose no salinity concerns for construction or vegetation.

C. Ecological Environment

122. The project areas are not located in any environmentally sensitive or protected area. These areas are existing built-up areas with the land use and zoning retained under the project. Assam, in general, is very rich in biodiversity that includes the Kaziranga National Park, a UNESCO World Heritage site in the State is home to two-thirds of the world's population of the

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one-horned Rhinoceros. The one horned Rhino which was almost extinct in India, with only a dozen left at the turn of last century, now stands restored to scientifically sustainable level. As per the Champion & Seth Classification of Forest Types (1968), the forests of Assam belong to seven Forest Type Groups further divided into 25 different Forest Types. Assam can boast of possessing a host of endangered and rare mammals, avian and amphibian species. These include pigmy hog, hispid hare, white winged wood duck and great Indian hornbill among many others.

D. Socio-economic Environment

123. **Demography.** The demographic profile of the Guwahati Metropolitan Area (GMA) as outlined in the Master Plan for 2025 reflects significant growth and urban expansion. The population of Guwahati has seen a steep increase from 100,707 in 1961 to 809,895 in 2001 within the Guwahati Municipal Corporation (GMC) area. Including the surrounding GMA, the population in 2001 stood at approximately 890,773. For the planning horizon of 2025, the population is projected to reach around 2.17 million. Of this, about 1.77 million will reside in the existing GMA, while the remaining 400,000 will be accommodated in three newly developed New Towns. In addition, a 10% floating population is anticipated, bringing the effective daytime population to approximately 2.29 million by 2025. The age and sex composition indicates an increasing share of the working-age and elderly populations, highlighting the need for expanded employment opportunities, healthcare services, and recreational infrastructure. District-wise projections suggest a fairly balanced distribution, with the highest concentration in District C (682,717) and the lowest in District D (396,124).

124. **Economy**. The economic base of Guwahati is robust and continues to expand as the city evolves into a major commercial and industrial hub of Northeast India. Historically, industrial growth began with the establishment of the Guwahati Refinery in 1962 and gained further momentum with the construction of the Saraighat Bridge and the shifting of the Assam state capital from Shillong to Guwahati in 1972. As of 2025, the workforce participation rate (WFPR) is estimated at 36%, translating to about 782,605 individuals engaged in economic activities, and increasing to 860,866 when including the floating workforce. The employment structure is dominated by the services sector (33%), followed by trade and commerce (30%), and manufacturing (20%, including both household and non-household industries). Wholesale and retail trade are key drivers of the economy, with major commercial activities concentrated in Fancy Bazaar, Machkhowa, Panbazar, and other central locations. To decongest the core areas and enhance logistics efficiency, a large Integrated Freight Complex is proposed in the northern zone of GMA, with dedicated areas for warehousing, coal yards, and truck terminals. The commercial planning follows a five-tier structure, ranging from city-level commercial centers to neighborhood-level shopping areas, ensuring equitable access across population clusters. The informal sector is also integrated into the economic landscape, with space earmarked for approximately 52,000 units. Furthermore, around 400 hectares are proposed for new industrial development, building upon the 520 hectares already developed under the earlier master plan. This integrated approach aims to foster inclusive economic growth and strengthen Guwahati's role as the gateway to Northeast India.

125. **Healthcare facilities. The healthcare infrastructure planned for the** Guwahati Metropolitan Area (GMA) under the Comprehensive Master Plan (CMP) 2025 for Guwahati[27] is guided by the goal of achieving equitable and adequate health service coverage in line with national policies. The existing health system includes 51 hospitals and nursing homes, comprising 4 government hospitals with 2,427 beds, 23 private hospitals with 1,724 beds, and 24 nursing homes with 696 beds. This results in a total of 4,847 beds, providing approximately 4.9 beds per 1,000 population.

126. To meet the projected population of 2.17 million by 2025 and align with the planning norm

[27] Comprehensive Master Plan (CMP) 2025 for Guwahati, Assam, Assam State Disaster Management Authority (ASDMA), Government of Assam's Revenue & Disaster Management Department

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of 5 beds per 1,000 people, an additional 7,384 beds are required, bringing the total to 12,231 beds. The plan proposes a hierarchical health facility system, ranging from city-level specialty hospitals and medical colleges to neighborhood dispensaries. The standards include General Referral Hospitals (500 beds) at the district level (1 per 2.5 lakh population), Intermediate Hospitals A (200 beds) and B (80 beds) at the community level, and Dispensaries for every 15,000 people. Nursing homes, maternity centers, and polyclinics are also proposed across neighborhoods.

127. As per the Master Plan for GMA-2025, one Superspeciality Hospital with 500 beds is proposed to be provided in City Facility Centre and a Superspecialistily Hospital of 500 beds will be provided with Medical College. A total of 73843 beds is proposed to be distributed over health facilities like Intermediate, 6 general hospitals, 12 Intermediate A hospitals, 15 Intermediate B hospitals, and 20 nursing homes are planned across various facility centers.

128. These facilities are integrated into a five-tier social infrastructure hierarchy, ensuring accessibility across housing clusters, neighborhoods, communities, districts, and city level. Additionally, healthcare services will be embedded within mixed-use Facility Centers, which also house educational, cultural, and public utilities. Overall, the CMP 2025 envisions a significantly upgraded and spatially equitable health infrastructure for Guwahati that supports both its growing population and floating urban population.

129. **Physical and cultural resources:** Assam has rich historical and cultural resources including Kamakhya temple in Guwahati. Since the project facilities will be constructed within the premises of the existing facilities, no physical and cultural resources are present within the project area of influence.

130. **Land use:** The land use plan proposed (Figure 9) under the Comprehensive Master Plan (CMP) for Guwahati Metropolitan Area (GMA) 2025 presents a detailed spatial framework that aims to accommodate projected population growth, economic development, and ecological sustainability.

131. Guwahati's urban expansion includes three major New Towns—each designed with a specific economic role and distinctive land use composition. New Town I, located in the northeast of the GMA and planned for a population of 80,000, is envisioned as a hub for wholesale trade and logistics. Its land use distribution includes 21.1% for residential purposes, 23.6% for business and commerce, 18.6% for recreation and open space, and a significant 20.2% as eco-sensitive zones. Transportation infrastructure accounts for 10.6%, while public and semi-public uses take up 5.8% of the area. New Town II, situated in the northwest, is designed for a larger population of 1.6 lakh and is primarily industrial. Its land use plan allocates 30.2% for residential use, 17.1% for industrial activity (400 hectares), and 20.3% for recreation and open spaces. About 16.3% is reserved as eco-sensitive zones. The remainder is distributed among public and semi-public services (5.5%), transportation (8.9%), and commerce (1.7%). New Town III, in the southwest near the airport, is positioned as a high-tech hub including IT and Special Economic Zones (SEZs). It has the highest residential share at 36.3%, while 28.1% of the area is marked as composite use (mixed institutional-commercial, including the SEZ). Recreational and open space accounts for 17.2%, transportation 10%, and public/semi-public utilities 6.3%. Business and commerce are limited to just 2.1%.

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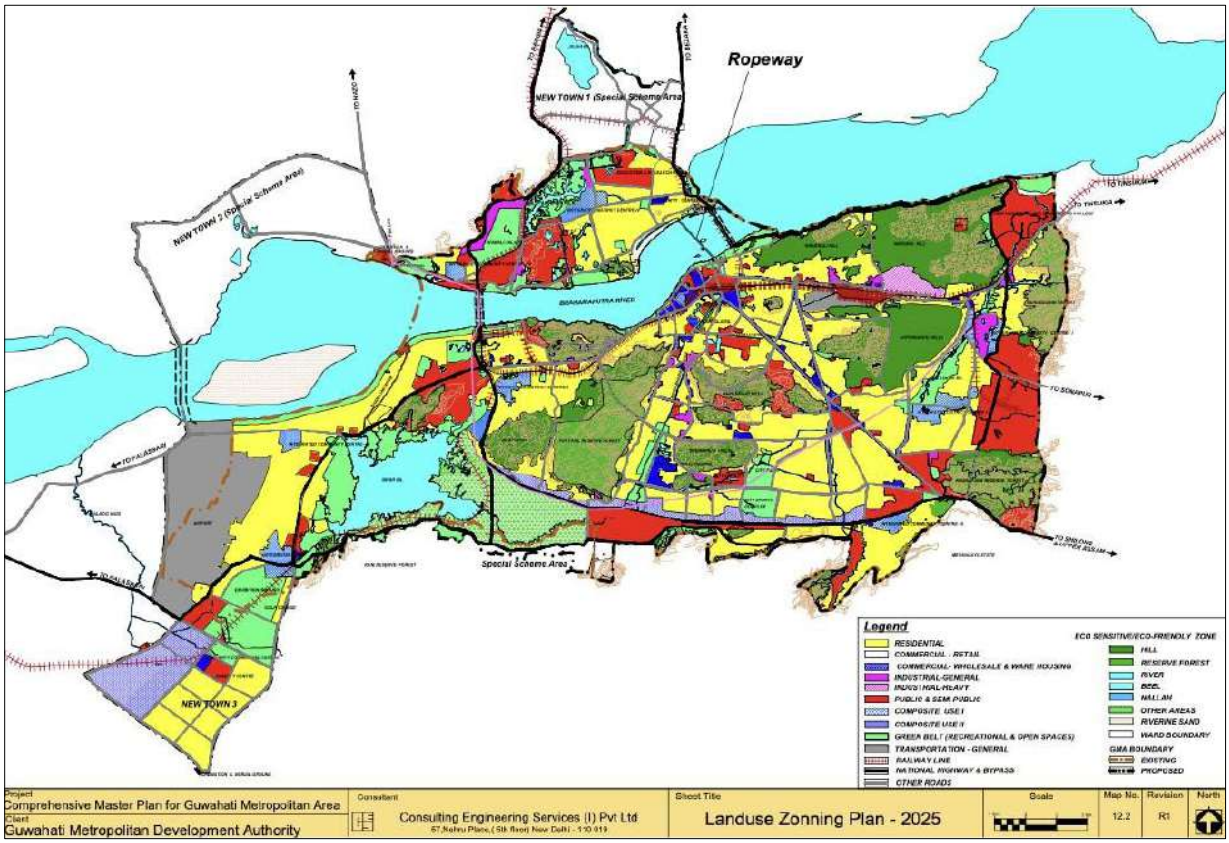
Figure 9: Land Use Zoning Master Plan 2025



Source: Comprehensive Master Plan Guwahati 2025. https://gmda.assam.gov.in/portlets/master-plan-guwahati-2025-0

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V. EXISTING FACILITIES AUDIT

132. Based on SPS (2009) definition of associated facilities, the project does not have facilities that are not funded by the project but (i) whose viability and existence depend exclusively on the project, and (ii) whose goods and services are essential for successful operation of the project. The project facilities will be connected or covered by the existing public utilities which are identified as existing facilities. Also the equipment will be supplied to the existing facilities (hospitals) which are also identified as existing facilities.

133. Due diligence of project existing facilities was carried out to assess the occupational health and safety (OHS) practices, good practices, recommendations and lessons learned to be incorporated in the IE based on ADB SPS, any applicable E&S standards, GIPs and applicable Indian H&S regulations. This will cover but not limited to risk assessment and control, safe work procedure (SWP), safe system of work, control of work (CoW), permit to work system, assurance and inspection program (activities and equipment), resource (people and equipment) sufficiency, workforce training and competency program, H&S contractor / subcontractor management, exposure monitoring, emergency preparedness and response, incident/near miss system, potential community health and safety issue from the on-going construction, traffic management and vehicles, pedestrian safety, construction site safety lay-out.

134. Several good practices were noted during the OHS audit to include:

(i) Presence of H&S safety dashboard at the MMCH site;
(ii) H&S PPE display of PPEs and posters at the MCH site;
(iii) Visible copies of the management system certificate of the Larsen and Tourbo Limited for ISO 45001:2015 valid until 2027;
(iv) Clear system procedure for hazard identification and risk assessment for routine and non-routine activities, actives of all personnel access to the workplace, facilities at workplace, and equipment/substances;
(v) Clear and detailed assurance of legal compliance to national laws and regulations;
(vi) Automation and digitization of assurances to establish safety to start work; and
(vii) System of recognition and reward for good performance that includes safe manhours milestones, wall of fame, and L&T champions.

135. However, as identified during site inspection, the following are the areas for attention and need of rectification as summarized in Table 14.

Table 14: Key Audit Findings and Recommendations

Areas for attention/ Issue	Recommendation
Safe Work Practices Management (SWP) System	1. Implement SWP defining requirements (controls, competency, monitoring, tools etc.) 2. Implement risk-based permit to work system based on work consequence (low, medium and high)
Risk Assessment and Management Plan, for project in MCH Wing of GMCH needs to be in place. Baseline Hazard identification and Risk Assessment (HIRA) and site and task-specific hazard identification and assessment of risks is essential .	1. Formulate a Risk Assessment and Management Planning standard / process. Refer to Goof Industry Practice (GIP) (e.g. ISO 31000 / 31010 and consult safety risk management practitioner or assessor. 2. Project (planning phase hazard analysis), site specific and activity-based risk assessment should be in place. The detailed task / area specific Hazard Identification and Risk Assessment (HIRA), which would involve breaking the actual task into steps and assessing the hazards and risks of each step . Task / area HIRA's should then be used by the supervisors to train workers and discuss with them the hazards and risks associated by the tasks to be performed and the mitigation steps to prevent accidents and incidents.

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Areas for attention/ Issue	Recommendation
Internal audit system presented.	Each project site/structure should define the internal audit structure: 1. Is risk based, with more frequent engagement with respect to high potential consequence activities and exposures (e.g. working at height, lifting and hoisting, confined space entry, energy isolation) 2. Defines the frequency of H&S verifications and audits, subject activity or exposure, verification tools, and required skillsets are defined in the verification plan 3. Includes subcontractor activities and exposure
Training and competency management program/matrix	Each project site/structure should define the competency and training management structure which includes the following element: 1. Identify HSE sensitive positions which is not limited to HSE officers but to include functions which requires certification such as crane operator, rigger, scaffolder etc. Formulate a training and competency standard which indicates the required qualification, experience and certification. Establish a monitoring system and include as one of the KPIs / Leading indicator. 2. For each of the HSE sensitive position, formulate a corresponding job description which includes requirement on qualification, experience and certification. 3. integrate these requirements into the election and hiring of staff.
Simultaneous Operations (SIMOPs)	1). Effective SIMOPS management should be in place identifying potential hazards, assessing risks, implementing control measures, and ensuring clear communication to minimize negative impacts on the hospital and its patients. 2) There is a need to include additional provision in managing the interface between pedestrian traffic and construction traffic, consider including the following elements in the Traffic Management Plan (refer to GIP) to include the following: • the layout of the site, the activities carried out, the types of vehicles/ mobile equipment used, the competency of operators, and the control measures for subcontractors and delivery drivers • the steps to be taken to prevent vehicle incidents, including detail of site traffic routes for the safe movement of vehicles/equipment and pedestrians, fatigue management, and drivers to check that the vehicle being driven is free from hazards before moving the vehicle • risk awareness training for all personnel on hazards associated with construction traffic interface with emphasis on blind spots and the appropriate use of spotters • that only authorized/approved persons operate a vehicle/truck/motorized equipment
PPE	1. Sufficient resourcing on PPE (to be included in future EMP), replacement and usage monitoring should be in place. 2. Enforce the usage of PPE through toolbox/ pre job safety briefing and through regular monitoring. 3. Review the PPE matrix and issue the right PPE. 4. PPE inspection and replacement policy and implementation.
Safety critical equipment e.g. scaffolding, gas tester etc., sufficient resourcing and asset integrity plan	1. Sufficient resourcing on equipment (to be built in future EMP). 2. Ensure that an asset integrity plan (or equivalent) following GIP is in place indicating: a. Required design b. Calibration frequency c. Maintenance frequency d. Inspection requirements e. Monitoring and replacement system

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Areas for attention/ Issue	Recommendation
Capacity of internal H&S	Review the H&S complement to ensure that high consequence activities are mitigated.
Safe Work Procedures (SWP) for Safety and Health	
Anchor Point	• During hazard assessment, identify need for anchor point and identify proper anchor point. • Provide adequate and proper anchorage point based on Good International Industry Practice(GIIP) e.g. Occupational Safety and Health Administration (OSHA) or American National Standards Institute (ANSI) guidance.
Excavation	• Follow GIIP on Excavation • Define Permit to Work(PTW) or control of work system criteria for excavation. • Assurance of Controls - Adopt Start Work Check on Excavation or equivalent.
Hot Work / Electrical Safety	1. Follow GIIP on Hot Work Practices. Flash back arrestor for acetylene tanks. 2. Issue right PPE for hot work. 3. Conduct daily bump testing and monthly calibration. 4. Follow National Fire Protection Association (NFPA) or India standard on electrical panel maintenance.
Lockout/tagout (LOTO) / Isolation of Hazardous Energy	Follow GIIP on LOTO.
Rescue Plan	Activity based Rescue Plan.

136. Table 15 below present the key findings of the environmental due diligence of the existing facilities and compliance status. Figure 10 shows the photographic records of the existing facilities.

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Table 15: Key Findings of the Environmental Due Diligence Audit of the Existing Facilities

Name of Existing Facility	Location	Criteria for Existing Facility Qualification	Year of Establishment and Commencement of Operations	EIA prepared and EC obtained?	CTE/CTO from APCB?	Authorization under BMWM Rules?	Biomedical Waste Disposal Facility?
MCH Wings, GMCH	Guwahati, Kamrup Metropolitan District (26° 9'34.55"N, 91°46'5.35"E)	Supply of equipment and medical facilities/hardware from ADB loan	Under Construction	Not Available	Will apply for CTO before initiating the operation	Will apply for CTO before initiating the operation	Will apply for CTO before initiating the operation
Pragjyotishpur Medical College & Hospital	Guwahati, Kamrup Metropolitan District (26° 9'43.49"N, 91°45'4.24"E)	Supply of equipment and medical facilities/hardware from ADB loan	Under Construction	Yes. EC attached	Yes. CTE Attached	Yet to start operation	NA
Mahendra Mohan Choudhury Hospital (MMCH) Annexed to GMCH	Guwahati, Kamrup Metropolitan District (26°11'7.87"N, 91°44'26.50"E)	Supply of equipment and medical facilities/hardware from ADB loan	Under Construction	Yes. EC attached	Yes. CTE Attached	Yet to start operation	NA
Nalbari Medical College	Nalbari, Nalbari District (26°24'47.27"N, 91°30'50.90"E)	Supply of equipment and medical facilities/hardware from ADB loan	2023		CCA Attached	CCA Attached	Agreement Attached
Nagaon Medical College	Nagaon, Nagaon District (26°21'57.17"N, 92°42'52.21"E)	Supply of equipment and medical facilities/hardware from ADB loan	2023		Applied for CCA; in process at PCBA	Applied for CCA; in process at PCBA	Agreement Attached
Assam Medical College & Hospital (AMCH)	Dibrugarh, Dibrugarh District (27°29'19.32"N, 94°56'25.94"E)	Supply of equipment and medical facilities/hardware from ADB loan	3rd Nov., 1947	Not Applicable			Captive Facility as CBWTF is under construction phase
Silchar Medical College & Hospital (SMCH)	Silchar, Silchar District (24°46'32.89"N, 92°47'42.03"E)	Supply of equipment and medical facilities/hardware from ADB loan	1976	Not Applicable	CCA Attached	CCA Attached	Captive Facility as there is no CBWTF in this area
Fresh Air Common Bio Medical Waste Treatment Facility	Hajobori, Guwahati, Kamrup District (N 26.2216711N, 91.8990466 E) (24°46'32.89"N, 92°47'42.03"E)	Receiving Biomedical Waste from ADB funded hospitals	2004	NA	Attached	Attached	NA

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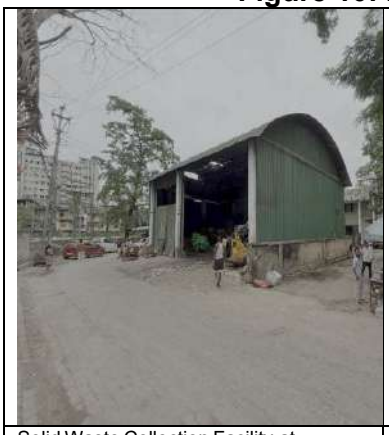
Figure 10: Photographs of the Existing Facilities



Solid Waste Collection Facility at GMCH

Biomedical Waste Collection Facility at GMCH

Temple within the Premises of GMCH

Safety Park with daily EHS Statistics at MMCH site

Poor PPEs

Safety Park with complaint box at MCH site

Batching plant installed at MCH site

Pragjyotishpur Medical College

Ongoing work at Pragjyotishpur Medical College site

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Inadequate controls to manage the risks associated with excavation	No rescue plan in place Questionable integrity of anchor point	Scaffolding tagged as Green, but with missing parts
OPD Block of the Medical College	Nagaon Medical College Hospital	Silchar Medical College and Hospital
Fresh Air Common Bio-Medical Waste Treatment Facility	Fresh Air Common Bio-Medical Waste Treatment Facility	OPD Block of the Medical College

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VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

137. The proposed project facilities will be developed on a greenfield as well as brownfield sites. In consideration of prevailing environmental conditions, this chapter assesses the nature, type and magnitude of the potential impacts on the various environmental components i.e., physical, biological and social environment likely associated with proposed development. In commensurate with nature and type of impact on various environmental component the chapter suggests mitigation measures to avoid, reduce or alleviate potential negative impacts and enhance positive ones throughout various project phases.

138. The impacts on the environment can be potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Direct impacts are those that are directly attributable to the project, whereas indirect impacts are those that are indirectly generated as well as altered patterns of social and economic development.

139. The proposed mitigation measures should be implemented alongside sound management practices and well-conceived engineering designs, construction techniques, and operational procedures. It is imperative that personnel are adequately trained and equipped to manage environmental issues at the site and effectively execute and monitor these protective measures.

A. Project Area of Influence and Sensitive Receptors

140. The project area of influence is defined as the total area which might be subjected to adverse impacts of the project. This is based on the locations of sensitive receptors, defined as settlements and/or environmental values that might be affected by the project construction and/or operation.

141.

142. The project's area of influence for direct impact has been considered as 50m around the project location, while a 10 km radius around the site location is considered for indirect impact assessment towards framing up of corresponding mitigation measure. For ecological resources and health and safety, the influence area is the footprint of the project site. In addition, there will also be an impact due to transportation of construction materials through trucks during construction phase, and increased traffic during hospital operation and transportation of BMW during operation phase. These distances, combined with the direct construction sites, were assumed to encompass the total project area of influence.

143. Both the sites, GMCH and SSUHS are in the urban areas of Guwahati city. The identified sensitive receptors are residential and commercial buildings and population (local and venders) around these facilities.

B. Anticipated Project Benefits and Positive Impacts

144. The project intends to improve healthcare facilities, procure new medical equipment, and increase the number of beds available, which will directly benefit people living in the project areas. The implementation of knowledge management in the participating hospitals and training of staff will increase the capacity in these participating hospitals and across Assam State. This will benefit a larger population not only in Assam but also in entire northeastern region of India. Additionally, training will be provided to the general public by health workers, which will particularly target the elderly, women, and vulnerable populations, and will increase the health of the local population through better understanding of disease symptoms, prevention, and treatments.

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C. Impacts and Mitigation Measures during Design and Pre-Construction Phase

145. A few environmental measures will be implemented in the design and pre-construction phase. These include:

(i) Design buildings in compliance with relevant design standards and codes for energy-efficient, safe and green public buildings. The Hospital Building along with its allied facilities would be Indian Green Building Council (IGBC) Healthcare Platinum certified.

(ii) To mitigate the adverse effects of climate change, it is imperative to select construction materials with lower carbon footprint. An effective approach involves favoring alternative materials over conventional ones, with a particular emphasis on those that possess a significantly lower carbon footprint. For instance, the exploration of options such as fly ash AAC (Autoclaved Aerated Concrete) blocks or the incorporation of industrial waste or by-products as viable building materials stands as a noteworthy strategy. This approach substantially reduces greenhouse gas emissions associated with construction activities. The amount of energy to be saved with climate resilient and passive structures against the conventional requirement to be calculated during the detailed designing stage. It is imperative to consider building design considerations tailored specifically for floodplain areas.

(iii) Opting for materials sourced near the construction site serves a dual purpose. It not only minimizes fuel consumption linked to transportation but also mitigates the associated greenhouse gas emissions. By favoring local sourcing, a project can significantly curtail its carbon footprint while concurrently fostering regional economic sustainability.

(iv) The Hospital Building, as well as its allied facilities, would be IGBC-Healthcare Platinum certified. In addition, all additional campus buildings would be accredited according to the relevant IGBC Platinum certification. Pre-certification for green building would be obtained when needed. ECBC 2017 (as revised as of date) norms would also be followed, and ECBC certification would be obtained as a result.

(v) The layout of the facilities will be such that the in-patient departments, classrooms and hostel premises are away from the noise generating sources such as road traffic, pumps, DG sets.

(vi) The siting of STP/ETP and temporary storage areas of BMW as far as possible will be away from the hostel and inpatient departments and from the residential areas around the site. Siting of STP/ ETP and waste storage areas will be avoided in the upwind direction of the hostel, in patient department and surrounding residential areas.

(vii) Building layout will be superimposed on the site features to avoid clearing trees from the zones that are not going to be constructed. Minimization of tree cutting by identifying the areas to be retained as green or open areas.

(viii) STP/ETP, waste storage areas etc. will be installed at height above the high flood level as a precautionary measure.

(ix) Acoustic building materials for walls, windows, doors will be proposed based on the assessment of noise levels, if they are anticipated to be beyond the standards.

(x) Acoustic enclosures will be provided to noise generating sources like DG sets, pumps etc.

(xi) Roof top and in other suitable locations rainwater harvesting structures will be proposed.

(xii) Drainage layout will be well planned and ensured that it leads the runoff to a treatment chamber and reused as much as possible.

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(xiii) Proper traffic circulation plan along with adequate parking will be ensured.

(xiv) In case of open parking areas, possible usage of grasscrete may be explored

(xv) Adequate provisions will be in place to deal with situation in case of emergency like proper exit path, assembly area, area for water storage for fire emergency etc.

(xvi) Ensure no-use of VOC-emitting materials (including paints, coatings, adhesives, carpet and furniture's) to ensure high indoor air quality.

(xvii) No asbestos or asbestos containing material in the project facilities.

(xviii) The design and functional layout of health care buildings shall comply with the local building codes of Assam and India.

(xix) Institutional strengthening, including (a) appointment of PMU-EO; (b) hiring of project management and supervision consultant by PMU; and (c) contracting of environmental monitoring laboratory by the implementing agency to conduct environment impact monitoring.

(xx) **Updating EMP.** Mitigation measures defined in this EMP will be updated based on final technical design. This will be the responsibility of PMU, with support of the design consultant.

(xxi) **Contract documents.** Include EMP obligations in tender documents and specifications, referencing the EMP and monitoring plan. This will be the responsibility of the design firm, with support of PMU and Project Management Consultants (PMC).

(xxii) **Public consultation.** PMU will hold public meetings with the support of the PMC prior to construction to discuss the EMP, project activities, and issues associated with the safety of nearby communities in the vicinity of the construction sites.

(xxiii) **Environmental protection training**. The PMC to provide training on implementation and supervision of environmental mitigation measures to contractors.

(xxiv) **Grievance redress mechanism.** The GRM will be adjusted and/or confirmed, and made operational, prior to construction. This will be the responsibility of PMU, with support of the PMC.

(xxv) **Contractor site specific-CEMP.** Following the award of contracts of construction, the contractor will prepare a construction site specific environmental management plan (Site specific- CEMP), including an emergency preparedness and response plan for construction emergencies and a site environmental health and safety plan, for clearance by the implementing agency.

(xxvi) **Demolition plan.** Contractor will prepare a detailed demolition plan for GMCH site which will have comprehensive procedures for demolition work including demolition waste management. The demolition plan should be approved by PMU and relevant authorities.

(xxvii) **Permits and clearances.** The permits or certificates from concerned authorities (i.e. environmental clearance, tree felling permissions, water abstraction etc.) as applicable to be obtained prior to the start of the construction activity.

1. Worker's Accommodation Siting

146. **Impacts:** Poor siting and layout of workers accommodation (if located outside of proposed area premise) may result in loss of agricultural produce if sited on cultivable land, health hazards to workers and nearby community due to poor hygiene conditions, contamination of surface and ground water bodies if sited near water bodies, local drainage problems, fire, electrical, and other safety risks, and so on.

147. **Mitigation measure:** Prior to the establishment of a worker's accommodation, the site,

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layout, and basic facility provision should be carefully prepared by the contractor and approved by the project authority (PMC/Implementing Agency). The location of workers accommodation should be determined by considering the proximity of residential and sensitive facilities like schools, existing healthcare centers, religious institutions, forests and waterbodies to the construction site. To the extent possible, workers accommodation is to be located within properties already owned by the Govt. of Assam. The minimum distance requirement should be determined based on site- specific factors to include but not limited to air, noise, vibration limits. If the workers' accommodation is located on the premises of a project, they should be suitably barricaded. Contractors should produce solid waste (including hazardous waste) and wastewater management plan (SW&WMP) that includes collection, storage, and disposal, subject to the project Authority's (PMC/Implementing Agency's) evaluation and approval. Air polluting construction sources such as batching plant, crusher etc. shall be in the downwind direction of residential or environmentally sensitive areas. Prior to site preparation or construction, necessary consent/permission such as labor licenses from Labour Department and labor insurance, etc. as applicable to the project must be secured. No temporary or permanent constructions are to be done on the locations of water bodies (including seasonal) identified within site[25] even if there is no water and these water bodies shall be barricaded.

148. Specific considerations for women accommodation to include**:**

(i) Separate and secure living quarters for male and female workers to ensure privacy and safety. Female accommodations should be located in well-lit, secure areas with controlled access and proximity to site security or management offices
(ii) Gender-Specific Sanitation Facilities. Toilets and bathing areas must be separate, lockable, and equipped with hygiene products. Facilities should be within short walking distance from living quarters and work zones, with clear signage and lighting
(iii) Inclusive Rest and Recreation Areas: Common areas should be designed to be welcoming to all genders, with seating, shade, and privacy options. Centrally located but away from high-traffic or noisy zones to reduce harassment risks
(iv) Accessible Health and Wellness Facilities: On-site clinics or first-aid stations with female health services and mental health support. Easily reachable from both work and living areas, with private consultation spaces
(v) Gender-Sensitive Lighting and Surveillance: Adequate lighting in pathways, entrances, and shared spaces; CCTV or security patrols. Focus on routes between accommodations, sanitation blocks, and work zones
(vi) Safe Transportation Access: Gender-sensitive transport schedules and designated pick-up/drop-off points. Near accommodations and work entry points, with waiting areas that are visible and monitored.
(vii) Inclusive Communication and Signage: Provision of Multilingual, gender-neutral signage and grievance redressal information posted in common areas, entrances, and near sanitation facilities.
(viii) Training and Awareness Space: Spaces for gender sensitivity training, GBVH (gender-based violence and harassment) awareness, and worker orientation near administrative offices or recreation zones to encourage participation

2. Climate change

149. **Impacts:** An analysis of temperature records in Assam for the period 1990-2019 indicates a rising trend in annual average maximum temperature at a rate of 0.049°C and minimum temperature at a rate of 0.013°C per year. For the same period, the annual rainfall has shown a decreasing trend of approximately 10.77 mm (annually). According to the Assam state action plan on climate change, the annual average mean temperature will continue to increase by 0.01 degrees Celsius (°C) per year, and is further projected to increase by 1.7-2.0 degrees Celsius (°C) by 2050. The annual average rainfall is also projected to increase in all parts of the state, except for the westernmost regions. A study conducted on the 'Future projection of climate extremes across contiguous northeast India and Bangladesh' indicates that heavy to extremely- heavy rainfall (daily rainfall >=6.5 millimeters) is projected to increase by up to 14 days. Notably, the analysis of the daily rainfall intensity index for the region demonstrates a

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rise of 2.4 mm/day compared to the current baseline of 14.4 mm/day. These projected changes have significant implications for the state's health infrastructure and additional disease burden arising from outbreaks of vector-borne and water-borne diseases from annual floods across the state.

150. **Adaptation and Mitigation Measure**: The project will demonstrate a model for developing a green and resilient healthcare facility with a low carbon footprint, equipped with a state-of-the- art water conservation and wastewater management system, the use of natural light, and adaptive design to reduce energy and cooling demands. It will promote the adoption of green energy sources and deploy energy-efficient mechanisms, including the Green Rating for Integrated Habitat Assessment norms for the project buildings. The project will strengthen the institutional capacity of the state's health sector to predict, detect, and reduce the spread of vector-borne diseases anticipated due to changing climate. The project also aligns with the National Program on Climate Change and Human Health, the Guidelines on Green and Climate Resilient Healthcare Facilities, the National Action Plan on Climate Change, and Assam's Vision 2030.

151. The adaptation measures included in the project design are:

i) Raising the ground-level of the new construction sites (at GMCH and SSUHS) by 0.3 meters (m) over and above the current road finish level (which is at current HFL), and further raising plinth height by 0.6 m of GMCH buildings and 1.6 m of SSUHS building, with retention walls and waterproofing the foundation structures.
ii) Additional stormwater drains with rainwater harvesting structures to capture the water from paved surfaces, rooftop and runoff during rainy season.
iii) Augmentation of Dispur Water Supply Scheme by 2.7 million liters per day (MLD) to supply water to the entire hospital campus through hydropneumatics-supply system and site water-treatment plant
iv) Augmenting the current sewage treatment facility from 400 kiloliter per day (KLD) to 1800 KLD and establishing new effluent treatment plant of 200 KLD and reusing 90 percent of treated water for flushing and horticulture purposes.
v) Use of heat-reflective cool-roof tiles on terraces, applying passive and adapting architecture and strategic landscaping to prevent absorption of solar energy and heat.
vi) Modernizing teaching facilities in select para-medical colleges, provisioning modern medical equipment for diagnosis and treatment, digitizing systems and processes for greater and remote reach, early detection and treatment and helipad for disaster support.

152. While the mitigation measures are:

i) SSUHS building will be designed and constructed to get certified under GRIHA/ IGBC/ LEED programs.
ii) Buildings of GMCH will be conforming to GRIHA 4-star and ECBC standards for meeting specific U-Values, Solar Heat Gain Coefficients (SHGC), and Visible Light Transmittance (VLT) of glass façade, roof, and wall insulation and installing multi-stage air filtration systems conforming to ASHRAE Standard 170-2017.
iii) Optimizing electrical load by installing – a) variable frequency drives (VFD) and variable air volume (VAV) boxes in air handling and cooling system, pumps, fans, etc., b) CO sensor-based AHU at parking lots Automation with occupancy sensor and Integrated Building Management System and other digitization measures
iv) Renewable energy-based systems including - a) 4500 kWp Solar Rooftop System, b) Solar water heaters of capacity 100 liters per day, c) Solar-powered Street lights at GMCH campus

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3. Utility Shifting

153. **Impacts:** Several types of utilities serving local and regional needs may be placed on the proposed project's premises and may need to be relocated/shifted from their current location due to the proposed project's activities. These features may primarily consist of electric wires, water supply/sewerage pipelines, and telephone cables. These may create service disruptions and inconvenience to residents. Exposure to asbestos containing materials during utility shifting can pose serious health risks to workers and anyone in the vicinity.

154. **Mitigation measures:** Following measures will be implemented.

(i) Prior to the start of construction, all utilities should be relocated. The necessary measures should be to instruct the relevant owners of these utilities to relocate them before construction begins to avoid disruption of local services.
(ii) If there are temporary service delays, the community shall be notified as soon as possible, and alternate supply facilities, such as water tanks or equivalent, must be provided if unavoidable.
(iii) Before beginning construction, the contractor would inspect existing underground utilities such as water supplies, gas pipelines, sewerage lines, and cables to ensure that underground utilities (if any) are not disrupted during construction/ excavation operations. If any subsurface utilities are anticipated to be impacted because of the construction activity, the contractor shall request authorization from the relevant authority before initiating construction works.
(iv) Underground and/or aboveground utilities such as power lines, water lines, gas lines, oil pipelines (if any) and any communal property resources such as temples, mosques, and so on shall be protected. The concerned authorities shall be notified right away if any utilities are damaged.
(v) If it is found that asbestos-containing (AC) structures are present during the survey, then the Contractor will prepare a detailed standard operating procedures (SOP) for asbestos handling and management prior to disposal/ handling of the AC structures.
(vi) All AC pipes/ structures will be left in situ and untouched, if possible
(vii) In the event, that the asbestos fibers from AC structures were accidentally disturbed/exposed, the contractor should follow Safe disposal provisions as per the USEPA.[28]
(viii) Use of AC materials will be strictly prohibited at site

4. Biodiversity

155. **Impacts:** The planned site lacks dense vegetation cover, with only sporadic bushes, shrubs, and a small number of trees. Tree felling will be very few number of trees. The total number of trees to be felled will be finalized based on the contractor's final design, the necessary permission will be obtained from Forest Department, and compensatory plantation activity will be undertaken. According to the information shared by Forest Department, there are no endangered or rare species in the project area vicinity.

156. Mitigation measures:

(i) All efforts must be made to conserve trees and avoid felling to the greatest extent practicable.
(ii) Disturbance and removal of vegetation must be confined solely to the designated project area where construction of buildings is sited in the layout (this shall be identified in the design stage itself by superimposing the approved layout on the existing features map of site). Before proceeding with any vegetation clearance or construction work, it is essential to conduct a survey to identify mature, older trees,

[28] https://www.epa.gov/asbestos/safe-work-practices.

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and to actively consider alternative measures including transplantation to avoid their removal.

(iii) In the case of any tree felling, prior approval from the competent department should be acquired.

(iv) Compensatory plantation may be carried out at a ratio of 1:10 or as specified by the competent authority along the area available within project premises or any other designated places.

5. Universal access

157. **Impacts:** If not properly designed, the new hospitals and colleges under the project may not be easily accessible to: i) patients with disabilities that could face physical barriers like inaccessible entrances, restrooms, and equipment resulting to delayed or denied care, loss of dignity; ii) elderly patients who may struggle with poor lighting, long distances, and unsafe flooring resulting to increased risk of falls, confusion, and missed appointments; iii) patients with sensory or cognitive Impairments that are communication and navigation challenged resulting to disorientation, stress, and reduced autonomy; iv) caregivers and family members who are dealing with added stress in supporting loved ones in inaccessible environment resulting to emotional fatigue and reduced effectiveness; v) healthcare staff who could work in inefficient layouts with limited accessibility resulting to increased physical strain, burnout, and errors; and vi) marginalized communities who experience cultural and linguistic exclusion resulting to lower engagement and trust in the healthcare system.

158. **Mitigation measures:** The design requires the adoption of universal access considerations for health care facilities that includes but not limited to the following core universal design measures:

(i) **Accessible entrances and pathways**: Ramps with slopes ≤ 5% (max 8–10% if space is limited); Minimum width of 1.2 meters for pathways; Non-slip surfaces and clear visual markers.

(ii) **Doors and corridors:** Door width ≥ 90 cm; ideally sliding doors; Corridors wide enough for wheelchair turning (≥ 1.5 m diameter clearance); Lever or D-type handles at accessible heights (90–100 cm).

(iii) **Toilets and showers:** At least one accessible latrine per facility; Space for wheelchair maneuvering (1.8 × 1.5 m); Grab bars (40–45 mm diameter) at appropriate heights: Elevated seats (45–50 cm) and privacy locks

(iv) **Water points:** Elevated platforms to reduce effort; Multiple height options (65–75 cm and 85–100 cm); Smooth, dry, non-slip surfaces with handrails

(v) **Lighting and flooring:** Low-glare lighting and matte flooring to reduce visual strain; Contrasting colors for wayfinding and hazard identification

(vi) **Wayfinding and signage:** High-contrast, multilingual, and tactile signage: Braille indicators and audio prompts; Predictable layouts with visual cues (e.g., color-coded zones)

(vii) **Waiting and registration areas:** High/low counters for seated and standing patients: Chairs with arms for support: Quiet zones and sensory-friendly spaces for neurodiverse individuals

(viii) **Inclusive latrines for children:** Smaller toilet dimensions (e.g., 20×15 cm); Fun, friendly design with night lights and handwashing stations; Consideration of cultural and gender needs

(ix) **Medical equipment:** At least one accessible exam table and weight scale per facility; Adjustable-height equipment for diverse body types and mobility levels

(x) **Sensory and neurodiversity considerations:** Soft color schemes and natural light; Sound-absorbing materials; Private consultation rooms away from busy zone

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D. Impacts and Mitigation Measures during Construction Phase

159. The project will construct multistorey hospital and medical College buildings (GMCH and SSUHS) with associated facilities. GMCH redevelopment will also involve demolition of existing building structures. Building construction includes four stages: clearing and land leveling, foundation, main structural engineering, and interior decoration and exterior wall construction. Main impacts during construction, as well as mitigation measures, are discussed below.

160. Potential impacts during the construction phase are related to soil erosion, increased noise and dust levels, the generation of liquid and solid waste from the construction site and workers accommodation, and safety risks to both workers and the local community. There will be no major adverse effects on flora and fauna, as the project site mostly consists of open barren land with very few mature trees or vegetation. There are also no known reports of physical cultural resources in the vicinity of the proposed site; however, a procedure for the chance find will be established as a precautionary measure.

161. The environmental impacts associated with the construction phase are expected to be localized and of short term. These impacts can be effectively mitigated through the implementation of sound construction site management practices. The primary impacts during construction are elaborated below.

1. Land Use, Drainage and Topography

162. **Impacts:** As the proposed project area is barren and there are no water bodies present inside the project area except for a seasonal stream passing through the site and one waterbody. It is expected that there will be no substantial alteration in land use however, the seasonal stream will be diverted to some extent by not hampering the flow pattern. Nevertheless, due to site preparation activities like land levelling, cutting, and filling, the topography and drainage patterns in the project area may be influenced. However, these impacts are predicted to be confined to specific areas. Therefore, it is advisable to incorporate measures for maintaining proper drainage conditions in the project design to prevent potential issues like localized waterlogging that could create unhygienic conditions or flooding that might affect the surrounding environment.

163. **Mitigation measures:** Site levelling should be done with minimum alteration in contour level as possible while not disturbing the natural drainage system.

2. Air Quality

164. **Impacts:** During the construction phase of the project, moderate, temporary impacts on air quality are foreseen, primarily stemming from fugitive dust generation in the vicinity of the project site. Significant fugitive emissions during the construction phase primarily originated from activities such as vehicular movements, excavation, and levelling operations. Minor elevations in the levels of PM10, PM2.5, nitrogen oxides (Nox), Hydrocarbons (HC), Carbon Monoxide (CO) and Sulfur Dioxide (SO2) are expected due to construction activities and the operation of construction equipment and machinery. It's important to note that these impacts during the construction phase will be confined to specific areas and of a short-term nature. Nevertheless, they have the potential to affect the nearby residential community. Major anticipated impacts are emitted from the following sources:

(i) **Construction activities:** Construction equipment, especially batching plants, Wet Mix Macadam (WMM) plants, and Hot Mix Plant (HMP), can generate dust emissions during material handling, mixing, and transportation processes. These emissions can contain particulate matter (PM10 and PM2.5),Sox, Nox etc. that can degrade air quality.

(ii) Excavation, earthmoving, grading, and demolition activities disturb the soil and

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create airborne dust particles. Wind can carry these particles over considerable distances, impacting air quality in the surrounding area.

(iii) **Transport of construction materials:** The transportation of construction materials to and from the construction site can also generate dust, especially if the materials are not adequately covered or contained.

(iv) **Storage and handling:** Storing and handling construction materials, particularly fine materials like sand, cement, and aggregates, can lead to dust emissions. Wind and human activities in these storage areas can further exacerbate the problem.

(v) **New quarry/crusher plants:** The establishment of new quarry/crusher plants can lead to land clearance, dust emissions, and habitat disruption, which can affect air quality.

(vi) **Existing quarry/crusher sites**: Sourcing materials from existing licensed quarry/crusher sites with established environmental safeguards can reduce the environmental impact associated with new operations.

(vii) The nearby settlements especially the school located in adjacent to the boundary towards Southern side may get exposed to the higher air pollution level during construction period.

165. **Mitigation measures:** Following mitigation measures will be implemented to control the air pollution.

(i) **CTE/CTO for construction equipment:** The installation and operation of construction equipment like batching plants, crushers, WMM plants, and HMM plants often require obtaining Consent to Establish (CTE) and Consent to Operate (CTO) from the local pollution control authorities. These permits ensure compliance with emission standards and best practices to mitigate air quality impacts.

(ii) quarry and mines also require Consent to Establish (CTE) and Consent to Operate (CTO) to ensure that their operations meet air quality standards and environmental regulations. These permissions shall be obtained prior to their establishment and operations and the conditions stipulated in the permission shall be complied to manage the air quality.

(iii) **Dust control:** Use water sprays, dust suppressants, dust screens and wind barriers to control dust emissions from construction activities, material transport, storage, and handling.

(iv) A temporary dust screen cum noise barrier of adequate height shall be provided on the boundary of the project sites, especially towards southern side where there is a school located (as well as residential area) to prevent the generated dust from the construction activity.

(v) **Emission controls:** Equip construction vehicles and machinery with emission control technologies like catalytic converters and diesel particulate filters to reduce the release of harmful pollutants.

(vi) **Fuel efficiency:** Promote the use of energy-efficient equipment and machinery and their regular maintenance to minimize fuel consumption and emissions.

(vii) **Regular maintenance:** Ensure that construction vehicles and equipment are well-maintained to optimize combustion efficiency and reduce emissions. Ensure all the vehicles should have PUC (Pollution Under Control) certificate.

(viii) **Compliance:** Adhere to air quality regulations and standards and monitor and report emissions as required. All the Construction vehicles and machineries should be regularly maintained to conform to the emission standards stipulated under Environment (Protection) Rules, 1986. All the DG sets will conform to the emission standards as stipulated under Environment (Protection) Rules, 1986.

166. Batching plants should be located at downwind (as far as possible) direction from the nearest settlement.

(i) Batching plants will have dust screens at the silos, aggregate batcher, feeder areas of adequate height.

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(ii) Only crushers licensed by the PCB should be used along with dust screens around the outlet of crushed aggregates.
(iii) DG sets should be provided with adequate stack height and use of low Sulphur diesel as fuel.
(iv) LPG should be used as fuel source in construction camps instead of wood.
(v) Ambient air quality monitoring should be taken up at adequate location environment monitoring plan.
(vi) Contractor to prepare maintain log book for water sprinkling.
(vii) PPE kits shall be provided to workers like goggles and masks.
(viii) The workers shall be made aware of adverse impact of silica and silicosis and motivated to use proper PPE kits.

3. Noise and Vibration

167. **Impacts:** The primary contributors to noise pollution stem from the movement of construction vehicles, the transportation of construction materials to the site, and the noise-generating activities taking place at the construction site. The noise level at the construction site may range from 58 dB(A) to 102 dB(A)77 depending on the activity. Attenuation of noise level to permissible limits of residential or sensitive zones without acoustic barrier might take more than a kilometer. Specifically, concrete mixing and material handling activities are the principal sources of noise, and these activities are expected to occur consistently throughout the entire construction period. The vibration standards stipulated by the Directorate General of Mining Safety[29] have been adopted for this project as follows: the permissible vibration limits for buildings and structures range between dominant excitation frequencies (Hz) of <8, 8-25 and > 25 between 2- 10 mm/sec for objects of historical importance and sensitive structures and from 2-5 mm/sec for domestic houses/ structures (Kuchha brick and cement). These limits will be followed during the entire construction phase. Major anticipated impacts are emitted from the following sources:

(i) **Construction activities:** Construction sites are inherently noisy due to various activities like excavation, demolition, concrete pouring, and the operation of heavy machinery and equipment. These activities can generate high noise levels that extend beyond the construction site boundaries.
(ii) A temporary acoustic barrier of adequate height shall be provided on the boundary of the project sites, especially towards southern side where there is a school (as well as residential area) located to attenuate the noise generated due to the construction activity.
(iii) **Operation of equipment and machinery:** Construction vehicles, cranes, loaders, and other equipment often have engines and systems that produce noise during their operation. This noise can be particularly disruptive when equipment is in use for extended periods.
(iv) **Vibration from heavy machinery and equipment:** The operation of large construction machinery, pile drivers, and other equipment can generate ground vibrations. These vibrations may be felt by residents living near the construction site.
(v) **Vibration from pile driving:** Pile driving activities, often used in foundation work, can create significant ground vibrations that can be transmitted through the soil, potentially causing structural damage to nearby buildings and discomfort to residents.
(vi) The nearby settlements especially the school located in adjacent to the boundary towards Southern side may get exposed to the higher noise level during construction period.

168. **Mitigation measures:** Mitigation measures for noise and vibration are:

[29] The same standard has been adopted by Chennai Metro Rail Limited (CMRL), which is funded by the Asian Development Bank (ADB). These standards are integrated into metro rail projects to mitigate potential structural impacts from underground train operations.

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(i) **Noise barriers:** Erecting noise barriers or sound walls around the construction site to block or reduce noise propagation to be installed.
(ii) **Construction scheduling:** Carefully plan construction schedules to minimize noisy activities during sensitive hours, such as early mornings and late evenings. Restrict major noise generating activities during night-time 10:00 pm to 6:00 am.
(iii) **Equipment selection:** Choose construction equipment and machinery that produce lower noise levels and vibrations when possible.
(iv) **Community engagement:** Maintain open lines of communication with local residents and sensitive receptor facilities to address concerns and provide information about construction activities.
(v) **Providing PPE's:** Provide personal protective equipment (e.g., Earmuffs) to all workers wherever noise is generated due to machinery operation.
(vi) **Regulatory compliance:** Adhere to local noise and vibration regulations and standards to ensure compliance.
(vii) Noise monitoring should be taken up at adequate location as per the environment monitoring plan.
(viii) If activities generating high level of vibration are proposed to be undertaken like blasting (if any) or use of heavy vibrating machines then it will be required to establish initial data on the structural quality of nearby buildings and implement a vibration monitoring system. This monitoring should begin during the preconstruction phase and continue during activities like blasting or those generating high levels of vibration, if any. Additionally, strategies to mitigate vibration effects, including controlled vibration, reduced blasting charges, and the restoration of buildings if vibration-induced cracks occur, should be integrated into the project plan.

4. Soil

169. **Impacts:** During excavation for construction, the removal of topsoil can result in the loss of fertile and nutrient-rich soil, which is vital for plant growth. This loss can impact future landscaping, greenery, and soil quality, requiring remediation efforts to restore it for vegetation.

170. Construction activities, especially earthmoving, cut and fill operations, and the presence of stockpiles, can disrupt natural soil stability and increase the risk of soil erosion. Erosion can lead to the displacement of soil particles, negatively affecting the surrounding environment and potentially causing sedimentation in nearby water bodies.

171. The construction phase can introduce contaminants to the soil through various means, including accidental oil or chemical spills, improper disposal of debris, and poor management of wastewater and waste from workers accommodation. Contaminated soil poses environmental and health risks and may require remediation. The frequent movement of heavy construction vehicles and equipment can lead to soil compaction, reducing soil porosity and impairing its ability to absorb water. This compaction can negatively affect soil fertility and drainage. Additionally, it can impact access and haul roads, causing wear and rutting.

172. Mitigation measures:
(i) Provision for appropriate storage of topsoil (top 15 cm of soil) in an appropriate way (to ensure that the organic / inorganic properties of soil are retained) should be made and reused for growing vegetation.
(ii) Excavated soil should be reused as much as possible for backfilling, landscaping and for other project areas.
(iii) To prevent seepage into project site soil, store hazardous materials such as diesel and used oil in an isolated room/ covered area with an impervious surface with a chamber to collect spilled oil that can be reused or recycled Spill kits/ spill tray will be used at DG set locations as well.
(iv) Fuel storage and replenishment locations should be kept away from drainage

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infrastructure and water bodies.

173. Filling and transferring oil to and from containers must take place on an impermeable surface:

(i) To avoid soil contamination Oil-Interceptors will be provided at wash down and refueling areas. Precautions should be made to avoid changes in soil quality caused by human activities such as dumping of solid and liquid waste from the workers accommodation on open/ unlined ground surface.

(ii) It is crucial to implement proper soil management practices, erosion control measures, and waste handling protocols to mitigate these adverse effects on soil quality, the environment, and surrounding infrastructure.

(iii) Soil Monitoring shall be undertaken to ensure adequacy of safeguard performance

5. Surface and Groundwater

174. **Impacts:** During the construction phase, there can be considerable stress placed on local water resources. This stress is primarily a result of increased demand for water to support various construction activities. Construction requires water for tasks such as mixing concrete, dust suppression, and general site maintenance. The increased extraction of water from local sources can lead to a strain on the availability of water in the area, potentially affecting local communities and ecosystems. The modification of natural drainage patterns on the site resulting from excavation and construction activities can lead to altered stormwater runoff. Construction activities can pose a risk of contaminating both surface and groundwater sources in several ways:

(i) **Fuel and Chemical Spills:** Accidental spills of fuels, oils, or chemicals used in construction machinery and equipment can occur. These spills, if not properly managed, can infiltrate the soil and potentially reach groundwater sources, leading to Contamination.

(ii) **Discharge of Wastewater:** Construction sites and construction camps are likely to generate wastewater and solid waste. If not appropriately treated and disposed of, wastewater can contaminate surface water bodies, such as rivers or streams, and infiltrate into groundwater.

(iii) Construction may alter natural drainage patterns by changing the flow of water through grading, excavation, or dumping of construction materials/ waste etc. This alteration can affect the seasonal drain's capacity to carry water and the hydrology of nearby ponds and potentially leading to water scarcity in the area

(iv) **Solid Waste:** The improper disposal of solid waste from construction activities can contribute to contamination. Materials such as construction debris or hazardous waste can leach pollutants into the soil and water if not handled and disposed of correctly.

175. As of time of writing, the number of workers needed by the project has not been estimated. Considering water requirement as 135 LPCD according to the CPHEEO Manual on Water Supply and Treatment -MoUD,1999. The total water required per day during construction phase for workers accommodation will be estimated based on this unit consumption rate. The volume of sewage generated and to be treated during construction phase will be estimated at 80% of the water requirement.

176. **Mitigation measures:** Mitigation measures for water pollution are:

(i) Obtain approval/permission from competent authority if ground water abstraction through bore well is carried out or water is sourced from any other means.

(ii) Temporary storm drains should be designed according to site conditions to avoid contaminating water sources from storm water and spills. Use of oil spill kit shall be mandatory at locations of fuel storage and fuel locations.

(iii) Spills should be collected and disposed of as soon as they occur as per the Hazardous waste management rules. Oily waste/grease should be collected and

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skimmed using oil traps before being sold or delivered to authorized agencies. Sewage from construction camps, on the other hand, shall be collected in soak pits and septic tanks. A record of water use will be kept.

(iv) Use of environmentally friendly sanitation solutions, such as bio toilets and bio digestor septic tanks, or any other advanced small-scale sewage treatment systems shall be made by the contractors at workers accommodation.

(v) Silt barriers shall be installed around the banks of water bodies to avoid siltation, contamination, dumping of materials/ waste into it. If dumped, it must be immediately cleared.

(vi) Use treated water for water sprinkling to optimize usage of water for dust suppression in access/haul roads, washing of vehicles, concrete mixing, etc. Littering and unauthorized discharge will be prohibited.

(vii) Solid garbage and earth materials shall not be dumped into open drains, water bodies be it seasonal or perennial.

(viii) Construction materials and debris shall be stored away from bodies of water or waterways, and only at approved construction zones.

(i) All fuel and chemical storage (if required on-site) shall be located on an impermeable base within an embankment and will be surrounded by fencing. The storage facility shall be at least 100 m away from the from the water bodies with adequate bunds.

(ii) Provision for water conservation, e.g., rainwater harvesting at the project site.

(iii) Monitoring of surface, ground water quality (also drinking water of workers) should be taken up at adequate location as per the environment monitoring plan.

6. Waste Generation

177. **Impacts:** The following activities are expected to have impact on generation of solid and liquid waste during construction works and from the construction camp:

a. Solid Waste Generation:

(i) **Construction and demolition waste:** The demolition of existing hospital buildings and construction of new infrastructure will generate significant volumes of construction and demolition (C&D) waste, including concrete debris, bricks, metal scraps, and excavated earth. If not managed properly, this waste can lead to environmental degradation such as air pollution due to dust emissions, clogging of drains from debris dumping, and contamination of nearby water bodies through runoff. Additionally, improper disposal may reduce soil quality, pose physical hazards to workers and nearby residents, and contribute to visual blight in the surrounding area. The presence of hazardous materials like asbestos (if any) further increases the risk to human health and the environment.

(ii) **Packaging waste:** Construction materials often come packaged in various materials like cardboard, plastic, and metal. The removal and disposal of packaging materials contribute to solid waste generation.

(iii) **Non-Hazardous waste:** General non-hazardous waste generated at the construction camp, including food waste, packaging, and discarded items, also adds to the solid waste stream.

(iv) Considering solid waste generation of 0.6 kg/cap/day according to the Manual on Solid Waste Management, CPHEEO- 200080. The approximate amount of solid waste generated from the workers accommodation during construction phase will be 333 kg per day (0.6 kg x 555 no. of workers).

b. Liquid Waste Generation:

(i) **Wastewater:** Liquid waste is generated from various construction activities, particularly those involving the use of water, such as concrete mixing, dust suppression, and equipment cleaning. This wastewater can contain suspended

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solids, chemicals, and other contaminants.

(ii) **Sanitary waste:** Liquid waste from the construction camp includes domestic wastewater from toilets, showers, and kitchen facilities.

178. Mitigation measures:

(i) Full compliance with the Environment (Construction and Demolition) Waste Management Rules, 2025 to include recycling, planning, waste registration, reusing of processed wastes.

(ii) **Construction and demolition waste handling:** All C&D waste will be segregated at source into recyclables, reusables, and inert materials. Recyclable and reusable materials such as steel, timber, and bricks will be recovered for on-site use or sent to authorized recyclers. Inert waste will be safely transported in covered vehicles to designated disposal sites approved by the local urban body. Dust suppression measures like water sprinkling and vehicle wheel washing will be adopted to control fugitive dust emissions. A dedicated storage yard will be set up on-site to temporarily hold segregated waste, and all handling will follow the Construction and Demolition Waste Management Rules, 2016. Regular monitoring, record keeping, and worker training will ensure compliance and safe implementation.

(iii) **Hazardous waste handling:** Safely manage and dispose of hazardous materials such as paints, solvents, spent oil, spilled oil, and chemicals according to Hazardous And Other Wastes (Management and Transboundary Movement) Rules, 2016 and their subsequent amendments. .

(iv) It is to be ensured that hazardous waste is not stored for more than 90 days.

(v) **Wastewater treatment:** Sewage from construction camps shall be collected in soak pits and septic tanks.

(vi) A sedimentation tank of adequate capacity shall be constructed for the batching plant.

(vii) The treated water should undergo testing for alkalinity before being discharged into low-lying areas, water bodies, or open grounds. It would be better to reuse the treated water for non-potable uses.

(viii) **Monitoring:** Regularly monitor waste generation rates and the effectiveness of waste management practices to make adjustments as needed. Monitoring and regulating alkalinity levels are crucial as excessive alkalinity can inhibit vegetation growth and pose harm to aquatic life.

7. Ecosystem and Biodiversity

179. **Impacts:** Based on consultation with forest department, there are no threatened or endangered flora and fauna species recorded in the vicinity of project area which may get affected. The current land uses consist of open barren spaces with grown shrubs and bushes. As a result, it is unlikely that there will be any adverse impacts on such species during the construction phase. No mitigation is required.

180. Furthermore, after the construction is completed, the project site will undergo landscaping efforts, including the planting of vegetation. Additionally, a green belt will be developed in accordance with the approved layout. These measures are intended to enhance the ecological quality of the site, provide habitat for local flora and fauna, and contribute positively to the overall environment following construction.

8. Potential Loss of Physical Cultural Resources

181. **Impacts:** Based on a Rapid Environment Assessment, there is no documented presence of heritage or archaeological sites/ monuments on the proposed project site. No mitigation is required.

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9. Worker's Accommodation and Living Condition

182. **Impacts:** Inadequate site selection and ineffective workers accommodation management can result in a range of adverse environmental consequences. These include the depletion of vegetation caused by the use of wood for cooking, the degradation of nearby surface water bodies and soil quality due to improper handling of wastewater and solid waste, and an increased risk of communicable diseases spreading among both the workers and the local communities.

183. Mitigation measures:

(i) Necessary permits from the concerned labor department should be obtained, pertaining records should be maintained at site with proper documentation
(ii) The Contractor and project authority will ensure decent labor conditions for workers and compliance with applicable law and regulations in India.
(iii) Contractors will ensure that wages are paid as per the requirement of minimum wages act and records are maintained
(iv) Daily attendance register with name and signature of labor will be maintained
(v) Notice boards to display terms of employment giving details of wage rates, working hours, criterion for overtime etc. Payment of wages of workers (including subcontracted/casual labors) should be aligned with the payment of wages act.
(vi) The contractor to put in place a Code of Conduct (customized to local sensitivities and regulations) for worker-community interaction and on-site behavior. Oblige workers to adhere to the code of conduct. The Code of Conduct should take into consideration relevant legislation, safety rules, substance abuse, environmental sensitivity, communicable diseases, gender issues (sexual harassment), respect for local beliefs and customs, community interactions etc.
(vii) Local people should be preferred for employment wherever possible, especially as construction workers/unskilled workforce.
(viii) Contractor to ensure non-engagement of forced and child labor, gender equity, non-discrimination on employment and opportunity and freedom to express their view
(ix) GRM will be disclosed to the workers and made accessible for reporting
(x) Contractors should ensure access of necessary basic amenities and facilities such as drinking water, beds, mosquito net/ repellent, snake repellent, common kitchen, gender segregated toilet and crèches for female worker's children, if any.
(xi) Contractor to monitor to avoid any conflict with local community due to influx of migrated labor.
(xii) A record of water use will be kept.
(xiii) Littering and unauthorized discharge will be prohibited.
(xiv) Solid garbage and earth materials shall not be dumped into open drains, water bodies.

10. Occupational Health and Safety

184. **Impacts**: The key occupational health and safety impact are:

(i) **Heavy lifting and fall hazards**: Construction often involves the manual handling of heavy materials such as concrete blocks, steel beams, and construction equipment components. Improper lifting techniques can lead to musculoskeletal injuries like strains and sprains. Workers are often at risk of falls from heights usually from scaffoldings or platforms constructed temporarily for construction activities.
(ii) **Storage hazards**: Inadequate storage of materials can result in cluttered work areas, increasing the risk of tripping, falling objects, and injuries caused by improperly stored materials.
(iii) **Equipment usage**: The operation of machinery for material handling, like cranes

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and forklifts, poses risks if not operated by trained personnel or if safety protocols are not followed.

185. **Mitigation measures:** Proposed mitigation measures are:

(i) An occupational health & safety Plan will be prepared and implemented by the contractor including Health & Safety reporting and incident/accident reporting procedure. Accidents will be reported immediately to ADB (within 48 hours). Root cause analysis and corrective actions take to avoid further accidents will also be submitted to ADB (preferably within 72 hours). Accident register will be maintained at site and closed monthly by the site supervisor.
(ii) **Training:** Provide workers with proper training on equipment operation, safety procedures, and the handling of hazardous materials. Workers with adequate training and no acrophobia shall only be assigned height works and similar for works requiring specific skills or training.
(iii) **Personal protective equipment (PPE):** Mandate the use of appropriate PPE, such as helmets, gloves, safety goggles, and harnesses, as needed.
(iv) **Safe work practices:** Implement and enforce safety protocols and work practices to minimize risks, including fall prevention measures and material handling guidelines.
(v) Usage of fluorescent and retro refectory signage, in local language should be provided at construction sites.
(vi) The construction of scaffolding and temporary work platforms must be carefully designated and regularly inspected to ensure stability and safety for workers.
(vii) **Regular inspections:** Conduct routine safety inspections and audits to identify and rectify potential hazards promptly.
(viii) **Health monitoring:** Implement health monitoring programs to assess and address potential health impacts related to chemical exposures or noise levels, acrophobia, silicosis, impacted vision etc.
(ix) **Emergency response:** Establish emergency response plans and first-aid stations to address accidents and injuries promptly.
(x) By diligently implementing these measures and fostering a safety-conscious work environment, we can minimize occupational health and safety risks, ensuring the well- being of all workers on the site.

11. Labour Rights and/or Influx of Workforce in the Area

186. **Impacts:** The influx of a diverse workforce into an area may lead to cultural conflicts, as workers from different backgrounds may have varying customs, languages, and practices. Misunderstandings and clashes can arise if not properly managed.
187. A large influx of workers may disrupt local social dynamics and create tensions with the community. An increased workforce population may strain local housing and physical infrastructure, potentially causing overcrowding and overuse of resources.

188. **Mitigation measures:** By respecting labor rights, managing the influx of the workforce, promoting cultural understanding, and establishing effective conflict resolution mechanisms, we can create a harmonious work environment and minimize conflicts between contractors, labor, and the local community.

(i) Local people should be preferred for employment wherever possible, especially as construction workers/unskilled workforce.
(ii) Contractor shall provide all basic amenities to the workers in the workers accommodation so that reliance of workers on community infrastructure is less thus having lesser chances of conflicts
(iii) Contractor to monitor to avoid any conflict with local community due to influx of migrated labor.
(iv) Promote cultural awareness and sensitivity among project personnel to respect local

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customs, traditions, and values.

(v) Consider ways to contribute positively to the local community, such as supporting local schools, healthcare facilities, or other community projects. These contributions can help build goodwill.

(vi) Implement adequate security measures to safeguard both workers and local residents. This includes controlling access to the construction site and addressing safety concerns.

(vii) Keep residents informed about construction schedules, potential disruptions, and any necessary safety precautions. Timely communication can prevent misunderstandings.

(viii) Continuously monitor the social and community aspects of the project's impact. Regularly report on progress and address any issues that arise promptly.

(ix) Regular meetings, forums, and feedback channels should be in place to address concerns and grievances promptly.

(x) A community liaison officer shall be appointed if social unrest or resentments are observed amongst the community.

189. **Securing necessary permits:** It is essential for the Project Authority to obtain the necessary permits applicable to the project. These permits may include, but are not limited to, Consent to Operate (CTO), Biomedical Waste Authorization, Water Abstraction Permission, Pollution Under Control (PUC) certificates for vehicles, and Fire No Objection Certificates (NOC), among others. These permits should be obtained before the project begins its operations and should be renewed periodically in accordance with the relevant regulatory requirements. The Project Authority shall adhere to the conditions specified in the permit and clearance documents.

12. Social and Socio-economic Impacts

190. **Impacts:** Increased construction related traffic can lead to congestion and inconvenience for residents. There will be also issues associated with lack of community involvement which can lead to social unrest.

191. **Mitigation measures:** Implement traffic management plans if necessary, schedule deliverables during off-peak hours, and encourage alternative transportation methods for workers. Engage with the local community through public consultations, address concerns, and establish open communication channels.

E. Impacts and Mitigation Measures during Operation Phase

192. The project encompasses various activities, each with a diverse range of environmental impacts, necessitating comprehensive assessment. Each of these elements plays a critical role in evaluating and managing the environmental impact of the project during operation stage.

1. Air Quality

193. **Impacts:** The primary sources of air pollution stem from dust emissions originating from vehicles and the exhaust outlets of DG sets. In this project, DG sets are installed solely as backup power sources, and it is anticipated that their contribution to pollution will be minimal.

194. Sulfur Dioxide (SO2) and Nitrogen Oxides (Nox) emissions arise from the functioning of DG sets when the power grid experiences a failure. To reduce these emissions while DG sets are in operation, it is necessary to install appropriate control devices and ensure that the stack height adheres to CPCB (Central Pollution Control Board) regulations. The minimum height of stack to be provided with each generator set can be worked out by using the following formula:

$$H=h+0.2\ KVA$$

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- H=Total height of stack in meter
- h=height of the building in meters where the generator set is installed.
- KVA=Total generator capacity of the set in KVA

195. **Mitigation measures:** Mitigation measures to control air emission are:

(i) Encourage the use of low-emission vehicles and promote alternative fuels like compressed natural gas (CNG) or electric vehicles. Implement emission standards and vehicle maintenance programs to reduce SO2 and Nox emissions.
(ii) Adopt energy-efficient technologies, renewable energy sources, and eco-friendly building designs to reduce emissions associated with heating, cooling, and power generation. Further details to be worked out during detailed design stage.
(iii) Vehicle maintenance should be done on a regular basis.
(iv) All DG sets shall adhere to the emission standards outlined in the Environment (Protection) Rules, 1986.
(v) Compliance with all stipulated conditions given by concerned regulators.
(vi) CTO to be renewed in timely manner from concerned pollution control board and conditions as stipulated in CTO should be strictly adhered to
(vii) Air quality monitoring should be taken up as per the environment monitoring plan.
(viii) The air quality shall adhere to the standards. If not, then corrective action to be taken should the reason of degraded quality be related to the Project activities.
(ix) Provisions should be kept to regularly check and repair leakages of Medical Gas Pipeline System (MGPS) immediately in order to prevent release of the GHG (especially like Nox and CO2) like into the air.

2. Water Quality

196. **Impacts:** The water requirement for the project is estimated and based on water demand calculation (as provided by the PWD), the total water demand for redevelopment of GMCH is 2200 kiloliter per day. Considering this water requirements the total quantity of wastewater generated at GMCH will be 2000 KLPD (based on 90% rate). The sewage generated shall be treated through Sewage Treatment Plant (STP). The Sewage Treatment Plant cum Effluent Treatment Plant has been provided (2400 KLPD capacity). The proposed Sewage Treatment Plant shall be with MBBR Technology or improved version and shall include the Effluent Treatment Plant.

197. Mitigation measures:

(i) Effluent and sewage discharge shall comply with CPCB/SPCB/NGT standards whichever is stringent.
(ii) Compliance with all stipulated conditions given by concerned regulators shall be ensured.
(iii) Mechanism for proper segregation and collection of Effluent and Sewage should be ensured.
(iv) Quality of treated wastewater from the facility should conform the discharge standards (whichever is stringent) as stipulated in the Biomedical Management Rules during facility operation i.e., (i) For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 (29 of 1986) and the standards of MoEF&CC notification dated 1st January 2016[30] will be applicable; and (ii) For discharge into public sewers without terminal facilities (or facilities not connected to public sewers), the standards stipulated in Biomedical Management Rules.
(v) The treated sewage should conform standard as stipulated in NGT Order 1069/2018 dated 30 April 2019 or by any regulatory authority time to time.
(vi) Regular monitoring of inlet and outlet water quality (with respect to wastewater treatment plants) should be taken up.

[30] https://parivesh.nic.in/writereaddata/ENV/envstandard/envstandard2.pdf

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(vii) Sludge from Effluent Treatment Plant shall be given to common bio-medical waste treatment facility for incineration or to hazardous waste treatment, storage and disposal facility for disposal.
(viii) A contingency plan will be in place to handle the liquid waste in case of power/ technical failures.
(ix) Monitoring of Drinking/Groundwater and surface water quality should be taken up as per Environmental Monitoring Plan.

3. Maintenance of Rainwater Harvesting Pits

198. **Impacts:** The following impacts are anticipated if the proper maintenance of rainwater harvesting pits is neglected.

(i) **Reduced water quality:** Without proper maintenance, rainwater harvesting pits can accumulate debris, sediment, and pollutants, leading to a decrease in water quality.
(ii) **Clogging:** Accumulated debris and sediment can clog the pit, reducing its capacity to capture and store rainwater effectively.
(iii) **Structural damage:** Over time, the structural integrity of the pit may degrade due to erosion or settling of the surrounding soil.

199. Mitigation Measures:

(i) **Regular cleaning:** Establish a schedule for regular cleaning and desilting of the rainwater harvesting pits. Remove debris and sediment to maintain water quality and prevent clogging.
(ii) **Erosion control:** Implement erosion control measures in the surrounding area to prevent soil erosion, which can undermine the pit's structure.
(iii) **Regular inspection:** Conduct routine inspections to identify any signs of damage or deterioration in the pit or its components. Address issues promptly to prevent further damage.
(iv) **Seasonal preparations:** Prior to the rainy season, ensure that the pit is in good condition and ready to capture rainfall. This may involve cleaning and performing any necessary repairs.

4. Bio-Medical Waste Generation and Management

200. **Impacts:** Generation of biomedical waste which is hazardous in nature that might cause spread of infections/ contamination of surrounding environment etc.

201. According to Bio Medical Waste (Management and Handling) Rules, 2016[31] "bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. As per categorization of BMW Rules, generation of following types (refer table 16) of Biomedical Waste is envisaged due to the proposed project.

Table 16: Types of Biomedical Waste Envisaged due to the Proposed Project as per BMW Rules 2016

Yellow	Red	White (Translucent)	Blue	Liquid Biomedical Waste

[31] https://dhr.gov.in/sites/default/files/Bio-medical_Waste_Management_Rules_2016.pdf

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Human, Anatomical Waste] Soiled Waste Expired or Discarded Medicines Chemical Waste Discarded linen, mattresses, beddings contaminated with blood or body fluid Microbiology, biotechnology and other clinical laboratory waste	Contaminated Waste (Recyclable) Waste generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and vacutainers with their needles cut) and gloves.	Waste sharps including Metals: Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes. Metallic Body Implants	Chemical Liquid Waste requiring separate collection system leading to effluent treatment system

202. Comparison between BMW rules 2016 and WHO-recommended segregation scheme is furnished in Table 17.

Table 17. Comparison between BMW rules 2016 and WHO-recommended segregation scheme

Waste Categories as per BMW Rules	Waste Categories as per WHO	Color Coding and Storage
Human Anatomical Waste	Infectious waste	**BMW Rules:** Yellow colored non-chlorinated plastic bags **WHO:** Yellow, marked “HIGHLY INFECTIOUS”, with biohazard symbol
Soiled Waste	Infectious waste	**BMW Rules:** Yellow colored non-chlorinated plastic bags **WHO:** Yellow, marked “HIGHLY INFECTIOUS”, with biohazard symbol
Expired or Discarded Medicine	Pharmaceutical waste	**BMW Rules:** Yellow colored non-chlorinated plastic bags or containers **WHO:** Brown, labelled with appropriate hazard symbol
Chemical Waste	Chemical Waste	**BMW Rules:** Yellow colored containers or non-chlorinated plastic bags **WHO:** Brown, labelled with appropriate hazard symbol
discarded linen, mattresses, beddings contaminated with blood or body fluid	Infectious waste	**BMW Rules:** Non-chlorinated yellow plastic bags or suitable packing material **WHO:** Yellow, marked “HIGHLY INFECTIOUS”, with biohazard symbol
Microbiology, biotechnology and other clinical laboratory waste	Chemical Waste	**BMW Rules:** Autoclave safe plastic bags or containers **WHO:** Brown, labelled with appropriate hazard symbol
Contaminated Waste (Recyclable)	Pharmaceutical waste	**BMW Rules:** Red colored non-chlorinated plastic bags or containers **WHO:** Brown, labelled with appropriate hazard symbol

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Waste Categories as per BMW Rules	Waste Categories as per WHO	Color Coding and Storage
Waste sharps including Metals	Sharps waste	**BMW Rules:** Puncture proof, Leak proof, tamper proof containers **WHO:** Yellow, marked "SHARPS", with biohazard symbol
Glassware	Sharps waste	**BMW Rules:** Cardboard boxes with blue colored marking **WHO:** Yellow, marked "SHARPS", with biohazard symbol
Metallic Body Implants	Chemical Waste	BMW Rules: Cardboard boxes with blue colored marking **WHO:** Brown, labelled with appropriate hazard symbol
Chemical Liquid Waste	Chemical Waste	**BMW Rules:** Separate Collection system leading to effluent treatment system **WHO:** separate collection system and wastewater treatment

203. **Impact:** Consequences of accidents involving vehicles carrying infectious biomedical waste to the Fresh Air Common Bio Medical Waste Treatment Facility, Hajobori in Kamrup District, located approximately at distance of 50 km from the GMCH project site may cause severe threat of spread of infections in the accident area.

204. Around 75-80% of healthcare waste is general, similar to municipal or plastic waste; the remaining 20-25% is hazardous bio-medical waste with potential environmental and health risks. High-income countries generate on average up to 0.5 kg of hazardous waste per hospital bed per day; while low-income countries generate on average 0.2 kg.[30]

205. It is estimated that the proposed project activities (mainly GMCH) will generate approximately 900 kg per day of bio-medical waste (calculated as 0.3 kg multiplied by 3000 beds).

206. Separate dedicated space has been planned for collection of Bio Medical waste generated from various buildings in the proposed project sites.

207. **Mitigation measures**: Due to the hazardous nature of Biomedical Waste, it is essential to adhere to regulatory requirements for its proper management. This involves activities such as sorting at the source, storing temporarily in designated containers marked with specific colors in assigned locations, and transporting it for timely disposal at a State Pollution Control Board (PCB) approved Common Biomedical Waste Treatment and Disposal Facility (CBWTDF). These actions must align with the provisions outlined in the BMW Rules of 2016, IFCs EHS guidelines for Health care centers, 2007, WHO's guidelines for Safe management of wastes from health-care activities, 2017 and subsequent amendments whichever is stringent to ensure compliance. Table 18 provides comparison of national and IFC standards for Emission from Incinerator.

Table 18. Comparative Analysis of Emission from Incinerator

Pollutant	Units	IFC EHS Guidelines	BMW Rules, 2016
Total Particulate matter (PM)	mg/Nm3	10	50
Total organic carbon (TOC)	mg/Nm3	10	-
Hydrogen Chloride (HCl)	mg/Nm3	10	50
Hydrogen Fluoride (HF)	mg/Nm3	1	-
Sulfur dioxide (SO2)	mg/Nm3	50	-

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Pollutant	Units	IFC EHS Guidelines	BMW Rules, 2016
Carbon Monoxide (CO)	mg/Nm3	50	-
NOX	mg/Nm3	200-400**	400
Mercury (Hg)	mg/Nm3	0.05	0.05
Cadmium + Thallium (Cd +Tl)	mg/Nm3	0.05	-
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V	mg/Nm3	0.5	-
Polychlorinated dibenzodioxin and dibenzofuran (PCDD/F)	mg/Nm3 TEQ	0.1	0.1 (at 11% O2)
***200 mg/m3 for new plants or for existing incinerators with a nominal capacity exceeding 6 tons per hour; 400 mg/m3 for existing incinerators with a nominal capacity of 6 tons per hour or less*			

(i) It is proposed that a formal association will be made with common biomedical waste facility (CBWTDF) by the proposed facility to ensure regular collection and subsequent treatment and/or disposal of biomedical waste. The Fresh Air Common Bio Medical Waste Treatment Facility, Hajobori in Kamrup Metropolitan District is engaged in biomedical waste (BMW) Management in Assam. Many Hospitals , including GMCH have contracted them for BMW management. The CBWTDF facility is equipped with Incinerator, Autoclave and Shredder and has valid (up to 1-05-2025) Combined Consent and Authorization of APCB. As per the provisions of BMW rules, the facility should be equipped with proper facility for collection- disinfection-segregation-temporary storage in line with the requirements of BMW Rules-2016 and subsequent amendments.

(ii) Ensure that storage is done in leak proof containers that should not generate leachate or attract flies/ vectors etc.

(iii) Under the purview of BMW Rules-2016, the hospital facility should secure Authorization (or Combined Consent and Authorization) from concerned PCB for ensuring effective handling and management of biomedical waste.

(iv) The hospital facility should have a formal tie up with PCB approved CBWTDF to ensure regular and effective collection and disposal of Biomedical waste.

(v) If no CBWTDF is available, then in-situ treatment as recommended by BMW and related rules (and regulatory authority) will be done.

(vi) The hospital should comply with the conditions precedents of Authorization or Combined Consent and Authorization (CCA) issued by PCB and ensure timely renewal of the same

(vii) Identification and segregation of Biomedical Waste at point of generation should be ensured.

(viii) Segregated waste should be placed in color coded (as recommended by BMW rules) containers to avoid mixing biomedical waste with non-biomedical waste and proper waste handling, storage and disposal must be ensured.

(ix) Should comply with the Waste Segregation Strategies, On-site Handling, Collection, Transport and Storage guidelines and Transport to External Facilities guidelines of IFC's Environmental, Health, and Safety Guidelines for Health Care Facilities.[31]

(x) The Biomedical waste should be stored in designated imperviously covered area temporarily before handing over to CBWTF.

(xi) Ensure workers involved in biomedical waste handling are having PPEs such as puncture resistant gloves, masks etc.

(xii) Record for quantum of different types of generated biomedical waste and handed over to CBWTF should be well documented.

(xiii) Educate staffs engaged in BMW management about different category of infectious waste and pathogens

(xiv) Immunization of staff members as necessary

(xv) Adequate facilities to be made for hand washing and to ensure all staffs should wash their hands before and after direct patient contacts and contact with patient blood/fluid

(xvi) Monitoring and observation of surrounding areas to ensure that no contamination

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is taking place due to BMW mis management.

(xvii) Conduct regular consultations with the surrounding community/ staff etc. to ensure there no spread of any infections/ disease that can be attributed to the mismanagement of bio medical wastes.

(xviii) Where possible, hazardous waste generated in medical areas should be stored in utility rooms, which are designated for cleaning equipment, dirty linen and waste. From here, the waste can be kept away from patients before removal, then collected conveniently and transported to a central storage facility. This is known as interim or short-term storage.

(xix) A contingency plan involving the highway authorities as immediate measures to mitigate risk associated with accidental spills during BMW transportation and subsequent contamination of soil/ water bodies/ human health etc. from the vehicles carrying bio-medical waste needs to be provided.

(xx) On-site Handling, Collection, Transport and Storage guidelines according to IFC's Environmental, Health, and Safety Guidelines for Health Care Facilities to be followed.[32]

(xxi) Seal and replace waste bags and containers when they are approximately three quarters full. Full bags and containers should be replaced immediately.

(xxii) Identify and label waste bags and containers properly prior to removal.

(xxiii) Transport waste to storage areas on designated trolleys / carts, which should be cleaned and disinfected regularly.

(xxiv) Waste storage areas should be located within the facility and sized to the quantities of waste generated, with the following design considerations:

- Hard, impermeable floor with drainage, and designed for cleaning / disinfection with available water supply
- Secured by locks with restricted access
- Designed for access and regular cleaning by authorized cleaning staff and vehicles
- Protected from sun, and inaccessible to animals / rodents
- Equipped with appropriate lighting and ventilation
- Segregated from food supplies and preparation areas
- Equipped with supplies of protective clothing, and spare bags / containers

(xxv) Unless refrigerated storage is possible, storage times between generation and treatment of waste should not exceed the following:

- Temperate climate: 72 hours in winter, 48 hours in summer
- Warm climate: 48 hours during cool season, 24 hours during hot season

(xxvi) Store mercury separately in sealed and impermeable containers in a secure location.

(xxvii) Store cytotoxic waste separately from other waste in a secure location.

(xxviii) Store radioactive waste in containers to limit dispersion, and secure behind lead shields.

(xxix) Segregation, storage and transport of health-care waste guidelines according to WHO's Safe Management of Wastes from Health-care Activities to be followed:

208. The following general principles of waste segregation, storage and transportation relate to the control of waste flow from generation to disposal:

(i) Health-care waste is generated in a medical area and should be segregated into different fractions, based on their potential hazard and disposal route, by the person who produces each waste item.

(ii) Separate containers should be available in each medical area for each segregated waste fraction.

(iii) Waste containers when filled should be labelled to help managers control waste production.

(iv) Closed local storage inside or near to a medical area may be needed if wastes are

[32] https://www.ifc.org/content/dam/ifc/doc/2000/2007-health-care-facilities-ehs-guidelines-en.pdf.

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not collected frequently.

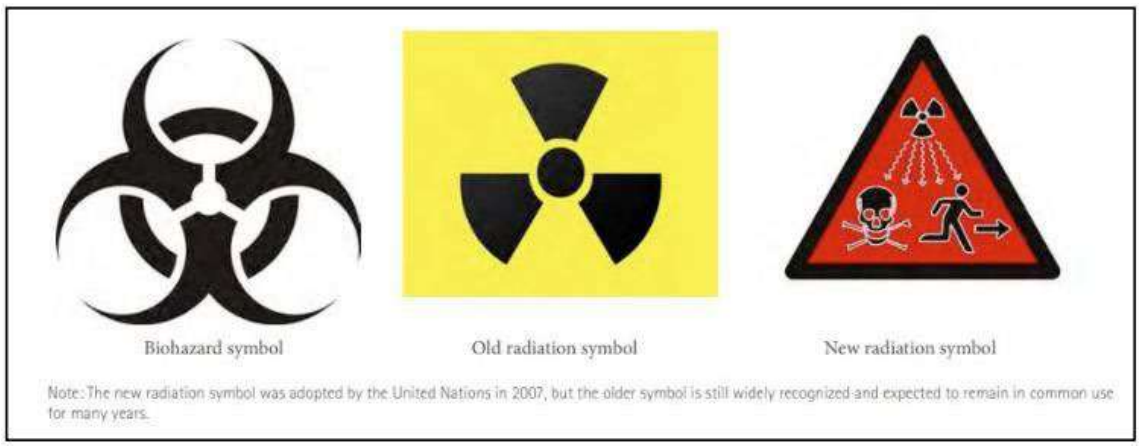
(v) Hazardous and non-hazardous wastes should not be mixed during collection, transport or storage.

(vi) Collected waste is often taken to central storage sites before onsite or offsite treatment and disposal.

(vii) Staff should understand the risks and safety procedures for the wastes they are handling.

209. Labelling of waste containers is used to identify the source, record the type and quantities of waste produced in each area, and allow problems with waste segregation to be traced back to a medical area. A simple approach is to attach a label to each filled container with the details of the medical area, date and time of closure of the container, and the name of the person filling out the label. Using an international hazard symbol on each waste container is also recommended (Refer Figure 11).[33]

Figure 11: Biohazard, radiation and chemical hazard symbols



Source: WHO's report on Safe management of wastes from health-care activities

5. Radioactive Waste

210. **Impacts:** The radiology department, as part of proposed medical facility, may involve the use of radioactive materials for diagnostic and therapeutic purposes. Improper management of radioactive waste can lead to potential health risks like radiation, cancer and damage of tissue etc. and can lead to environmental contamination posing risks to ecosystems and wildlife.

211. **Mitigation measures:** The executing agency will need to adopt appropriate and strict measures to store, handle and transport (for disposal by authorized agencies) the radioactive wastes as per the provisions of Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987, IFC EHS guidelines for healthcare centers and WHO guidelines. Radioactivity traces can be present in clothing, utensils, syringes, needles, cotton swabs, vials, gloves and absorbent materials of patients administered high doses of radioisotopes like I-131 constitute the solid radioactive waste material, x-ray tubes, x-ray plates, unused liquids from radiotherapy or laboratory research; contaminated glassware, packages or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources etc. The Atomic Energy Regulatory Board (AERB) has been mandated by the Central Government, as the Competent Authority as per Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987 notified under the Atomic Energy Act 1962. It exercises regulatory control over nuclear installations and the use of radioactive substances and radiation generating plants outside such installations. As per provisions of Atomic Energy (safe Disposal of Radioactive Wastes)

[33] https://www.who.int/publications/i/item/9789241548564.

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Rules, 1987, no person shall dispose of radioactive waste:

(i) unless they have obtained an authorization from the competent authority under these rules;
(ii) in any manner other than in accordance with the terms and conditions specified in the authorization issued under these rules;
(iii) in any location different from those specified in the authorization; and
(iv) in quantities exceeding those specified in the authorization.

212. Healthcare facilities generating radionuclides waste from treatment of Cancer patients and end-of-life equipment containing radio radionuclides shall obtain authorization from AERB for its disposal. As per the policy of AERB, radionuclides wastes are required to be re-exported back to the manufacturer. Radioactive waste should be stored in compliance with national regulations and in consultation with the radiation officer. It should be placed in containers that prevent dispersion of radiation and stored behind lead shielding. Waste that is to be stored during radioactive decay should be labelled with the type of radionuclide, date, period of time before full decay and details of required storage conditions.

6. Other Solid Waste Generation (Hazardous and Non-hazardous)

213. **Impacts:** During the operational phase of the project, substantial volume of solid waste are expected to be generated, including food waste, used disposable tableware, plastic sheets, fabrics, e-wastes and paper waste. Inefficient disposal of these wastes can lead to environmental deterioration. To prevent such issues, waste shall be systematically collected, distinguishing between biodegradable and non-biodegradable waste using color-coded bins, and stored in a designated garbage collection area.

214. According to a paper on Bio-medical waste generation in India[34], the average quantity of hospital waste produced in India ranges from 1.5 to 2.2 kg per bed per day. Considering 80% of this to be non-biomedical waste according to the WHO, the range will be from 1.2 kg to 1.76 kg.

215. According to Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines the Institutional waste generation per capita per day range from 0.05 to 0.2 kg per capita per day and the Residential waste generation per capita per day range from 0.3 to 0.6 kg/cap/day.[35]

216. Based on the estimate provided by PWD, the total bio-medical waste generated from the project (GMCH) is 900 kg per day and the total solid waste generated from the GMCH project is estimated at 4510 kg per day. This includes 1804 kg per day organic waste and 2706 kg per day inorganic waste.

217. Adequate space will be planned for collection of solid waste from various buildings in the proposed project sites.

218. Mitigation measures:

(i) **Segregation and Collection:** Proper segregation of different waste should be taken up which may include municipal waste (biodegradable and non-biodegradable), plastic, electronic waste, hazardous waste etc.
(ii) Set up an on-site or off-site composting facility where kitchen waste can be processed into compost. Regularly test the quality of compost to ensure it meets quality standards for safe use in landscaping or agriculture.
(iii) Hazardous waste should be stored in clearly marked, leak-proof containers that are resistant to corrosion and damage. Storage areas should be secure, well-ventilated, and equipped with spill containment measures. Each hazardous waste

[34] https://www.ctdt.co.in/doi/CTDT/pdf/10.5005/jp-journals-10055-0064.
[35] https://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20Vol%20I(2).pdf.

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container must be clearly labelled with its contents, potential hazards, and handling instructions in compliance with the Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016. Hazardous waste should be handed over to authorized and licensed hazardous waste recyclers or disposal facilities, complying with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016.

(iv) Ensure that inert waste is handed over to authorized municipal dumping yards or landfill sites in compliance with local waste disposal regulations.

(v) Establish a collection system for recyclable materials, including e-waste and plastic waste. Segregate these materials at the source for efficient recycling. Partner with authorized recyclers or recycling facilities for the proper disposal and recycling of electronic waste, plastics, and other recyclable materials.

(vi) **Training and Awareness:** Train hospital staff on the proper handling and disposal of waste. Create awareness among all stakeholders about the importance of safe disposal.

(vii) No untreated or infected waste will be disposed into water bodies or open pits or grounds.

(viii) **Storage:** Store biomedical waste in secure, leak-proof containers with labels indicating the type of waste and its potential hazards.

(ix) **Transport:** Use dedicated vehicles for transporting biomedical waste to authorized treatment facilities. Ensure proper labelling and handling during transportation.

(x) **Monitoring and Record-Keeping:** Implement a system for monitoring and documenting the generation, handling, and disposal of waste to ensure compliance with regulations.

(xi) **Emergency Response:** Develop and communicate emergency response procedures in case of spills or accidents involving biomedical waste.

(xii) **Compliance with Regulations:** Requirement of separate Authorization for Hazardous waste (Hazardous Waste Management Rules) may be checked from pollution control board time to time.

(xiii) **Regular Audits and Inspections:** Conduct regular audits and inspections to assess the effectiveness of waste management practices and make necessary improvements.

7. Noise Environment

219. **Impacts:** Noise pollution arises from several sources, including vehicular traffic and D.G. sets, among others. It is imperative to implement effective measures to mitigate this noise pollution. High-noise-generating areas should be enclosed with appropriate and soundproof barriers. Furthermore, D.G. sets should be housed within acoustically treated rooms to ensure that the ambient noise level is less than 30 - Laeq (dB) during daytime hours.[36]

220. Mitigation measures:

(i) DG sets and pumps should be provided with acoustic enclosures.

(ii) If traffic noise is anticipated to be higher than the permissible limits, the facility sites will be encompassed with acoustic boundaries in combination with green belt with high and dense enough canopy/ building materials (door/window sheets) used will have acoustic properties and be properly maintained to retain such properties (such as repairing gaps, or broken sheets, replantation of green belt)

(iii) Soundproof sensitive areas like patient rooms, classrooms, and lecture halls to attenuate noise levels.

(iv) **Landscaping:** Use dense vegetation and natural features like trees and bushes as a natural sound barrier as far as possible. Develop Green belt.

[36] WHO Guidelines for Noise. https://cpcb.nic.in/who-guidelines-for-noise-quality/.

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(v) Compliance with all stipulated conditions given by concerned regulators.
(vi) Noise level monitoring should be taken up as per the environment monitoring plan.
(vii) All DG Sets shall be outdoor type with Hospital Type Silencer and acoustic enclosure as per CPCB and other relevant norms.

8. Occupational and Community Health and Safety Risks

221. **Impacts:** Inadequate handling of waste and wastewater, which may contain infectious agents, pathogens, chemicals, and hazardous materials, has the potential to pollute the surrounding environment in the project area. Improper waste and effluent management may contaminate surrounding land environment or waterbody present within the site and nearby and subsequently contamination of groundwater. Hence, it is crucial to ensure effective waste and wastewater management, including proper treatment and disposal. This could increase the occupational health and safety risks, hospital acquired infection for medical staff, non-medical staff and patients and also pose a safety risk to the local community since they may be exposed to healthcare waste and other hazardous substances. Civil maintenance works during operation stage can also have impact on health and safety of works, staff and community.

222. The increased traffic resulting from hospital operations might also expose the local community to potential accidents and lead to traffic congestion at the local level.

223. Mitigation measures:

(i) OHS management procedures covering safe working conditions for employees, including staff training, job safety instructions and measures to ensure workplace safety and mitigate OHS risks emanating from exposure to infections and diseases, hazardous materials / waste should be in place and implemented as per infection management guidelines of MoHFW. Additionally, these procedures should extend to encompass maintenance activities to ensure that workers are adequately protected during repair and upkeep tasks, thereby reducing the risk of accidents and health hazards.
(ii) Depending on the nature of the maintenance work, provide and guarantee the use of personal protection equipment such as gloves, helmets, ear plugs, safety belts, and so on.
(iii) The facilities should have Emergency, preparedness and response plan and should be designed in commensurate with the requirement of concerned department (like Fire Department). Fire NoC should be secured from Fire Department and renewed in timely manner. Emergency preparedness plan should have the provision to manage potential risk likely associated with the industries located (planned to be located) in the vicinity like GAIL (Gas Authority of India Limited), HPCL (Hindustan Petroleum Corporation Limited)
(iv) It is advisable to develop a traffic management plan. Additionally, it's essential to take all reasonable precautions and create an Emergency Preparedness Plan to mitigate potential risks, taking into account emergency scenarios such as fires, flooding, and accidental release or spillage of hazardous materials. Maintain an effective work permit system for vital tasks including electrical work and working at heights for maintenance works.
(v) Provide adequate sanitation facilities.
(vi) The emergency contact number shall be displayed.
(vii) Provisions for a designated route for vehicle movement.
(viii) Accidents if any will be reported to the management / SPCB/ ADB (within 48 hours to ADB) etc. in the form prescribed as per BMW rules.
(ix) Develop and implement robust health and safety protocols to protect workers and the community.
(x) Conduct regular safety training sessions and drills to ensure all personnel are

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prepared for emergencies.

(xi) Awareness campaign on HIV/AIDS is to be conducted to effectively mitigate the impacts on occupational health and safety.

(xii) Develop community engagement programs that involve local residents in project-related activities, such as job fairs, skill development workshops, or community events. Encourage social interaction and collaboration between workers and locals to foster understanding and mutual respect.

(xiii) Establish open channels of communication between project management, workers, and local residents.

(xiv) Hold regular meetings, forums, or community advisory groups to discuss project progress, address concerns, and provide updates on project activities.

(xv) In case chlorine gas or liquid storage is proposed, safety provisions shall be as per guidelines. To avoid risks and hazards to staff and workers at WTP and general public around in case of chlorine gas leakage by accident, the contractor/concerned authority should prepare OHS plan during O&M, including emergency response procedures for chlorine gas leakage, chemical spill, fire, earthquake, etc. Handling and storage chemicals should be in accordance with the Material Safety Data Sheet. Also, prepare and implement the safety procedures of handling chlorine based on national and international standards such as the World Bank's Group General EHS Guidelines and EHS Guidelines for Water and Sanitation, pollution control board guidelines, precautions mentioned in Chapter 8 of the CPHEEO Manual on Water Supply and Treatment etc.

9. Risk of Transformers, Substation & Power Lines

224. **Impacts:** The anticipated impacts from electrical works are:

(i) **Risk of electrocutions:** This risk pertains to the potential for accidents or fatalities caused by electric shock. In a construction or operational setting, there may be exposed electrical equipment, wiring, or power lines that can pose a threat to workers, visitors, or even wildlife.

(ii) **Avifauna collision risk:** Avifauna collision risk refers to the potential harm or mortality to bird species due to collisions with power lines and electrocution.

(iii) **Risk of use of Polychlorinated Biphenyls (PCBs) and Sulfur Hexafluoride (SF6)**: PCB is a hazardous chemical banned for use in India and SF6 is a greenhouse gas that can have adverse environmental and health effects. SF6 leakage can trigger GHG emission if not managed properly. The risk arises when these substances are used in equipment or processes associated with the project, such as electrical transformers or insulation.

225. Mitigation measures:

(i) Visual monitoring will be conducted to detect any avian collisions. If such incidents are reported, appropriate mitigation measures, such as bird deterrence and adjusting spacing between energized components, will be implemented in consultation with the forest and wildlife department.

(ii) If Sulphur Hexafluoride (SF6) is employed, thorough monitoring will be in place to prevent any potential leaks.

(iii) The transformers utilized will contain oil that is free of Polychlorinated Biphenyls (PCBs) since their use is prohibited in India.

10. Landscaping and Aesthetics

226. **Impacts:** During the operational phase of the project, there are no alterations to the topography of the project site. This is because all changes in land use, land levelling, and construction activities were carried out during the project's construction phase. Nevertheless, ongoing efforts to develop a green belt and plant avenues are expected to enhance the site's

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aesthetics further.

227. **Mitigation measures:** Maintenance of Green belt including vegetation care, Litter Control, Irrigation, Erosion Control, maintenance of Rain Water Harvesting Pits including inspection, cleaning, repairs & upkeep etc.

11. Socio economic Impact

228. **Impact on** local **community:** The proposed project is likely to have beneficial impact on the local community as the project will increase the opportunity for jobs during construction as well as operation as local labor and/or staff will be preferred based on their qualifications and skill sets. The employment potential will shift the focus from primary sector. There will be quality health care services available to the community and might also encourage development of informal and formal commercial activities around the health facility thus helping in improving the living standards of local community. There could however be loss of land and livelihood for few project affected persons however, they will be compensated if applicable under the relevant laws and policies.

229. **Mitigation measures:** Skilled (Engineers and other officials), semiskilled and unskilled labor. Skilled (Engineers and other officials), semiskilled and unskilled labor. The local employment should be preferred to the extent possible. And it is suggested to take the educated and uneducated locals for employment in the proposed project. The unskilled labors can be given skill development training in order to fill the unemployment around the study and project area.

F. Cumulative and Induced Impacts

230. **Cumulative impact** consists of an impact that is created because of the combination of the project evaluated together with other projects causing related impact in the area. Since the project is implemented in urban setup within the existing facilities no major development (except local construction work) in the proximity to proposed sites were reported. There is no development features found in the surrounding area of the project sites which can lead to cumulative impact on air, water, noise, soil and biodiversity during construction and operation phase.

231. **Induced impact** usually has no direct relationship with the action under assessment and represent the growth- inducing potential of an action. The induced impacts due to proposed project activity includes increase in traffic on the adjacent road and increase in commercial development along the road which can lead to socio-economic development. Commercialization is likely to happen in the surrounding areas of the project immediately after commencement of its operation and this along with increased healthcare facility may lead to gradual urbanization.

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VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Legislative Framework for Public Consultation and Information Disclosure

232. Meaningful public participation and consultation in the evaluation of project planning, feasibility study, design, and implementation are an important environmental safeguards' requirement; it can directly reflect the public's perceptions on environmental quality in the project's area of influence.

233. **ADB requirements**. ADB's SPS (2009) has specific requirements for information disclosure and public consultation. Relevant information, including those documented in environmental assessment reports, should be provided in a place, language, and form that is accessible and understandable to affected people and other stakeholders. This process shall commence early in the project cycle and continues throughout the life of the project. To make key documents widely available to the public, ADB requires that the borrower/client submit the following documents for disclosure on ADB's website:

1. **Category A projects:**
   - (i) Draft EIA - at least 120 days prior to ADB Board consideration, and/or environmental assessment and review framework before project appraisal, where applicable.
   - (ii) Final EIA upon receipt.
   - (iii) Supplementary reports, if required during project implementation.
   - (iv) Corrective action plan/s (for major noncompliance, if any) prepared during project implementation.
   - (v) Environmental monitoring reports.

2. **Category B projects:**
   - (i) Final IEE (upon receipt or Board approval, whichever is earlier).
   - (ii) A new or updated IEE, if required during project implementation.
   - (iii) Corrective action plan/s (for major noncompliance, if any) prepared during project implementation.
   - (iv) Environmental monitoring reports.

234. The proposed project is classified as environmental Category B. The relevant disclosure requirements for Category B are applied.

235. The SPS (2009) requires the borrower/client carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that (i) begins early in the project preparation stage, and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision-making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues. Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report.

236. **National requirements**. As per the GOI EIA requirements, a formal public hearing is required for Category A projects. Public hearing should be conducted by the State (Assam) State Pollution Control Board (ASPCB) at the project site. The ASPCB should submit the official report on the public hearing proceedings, and this should be forwarded to the Expert Appraisal Committee (EAC) of MoEF&CC. The EAC will consider recommendations of the public hearing

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while issuing the environmental clearance (EC) to the project.

B. Methodology used for Public Consultations

237. Both formal and informal modes of consultation were used in the public consultation process for the project. Consultation with the stakeholders, beneficiaries, and local communities were carried out using standard structured questionnaires as well as unstructured questionnaires. In addition, focused ground discussions (FGDs) and personal discussions with officials, on-site discussion with project affected stakeholders, and reconnaissance visits have also been made to the project area. The attempts were made to encourage participation in the consultation process of the government officials from different departments that have relevance to the project. Similarly, local people from different socio-economic backgrounds in the project area, women groups, residents along the alignments, local venders around the hospitals, and other concerned stakeholders were also consulted.

C. Public and Project Stakeholders

238. All types of stakeholders were identified to ensure as wide coverage as possible.

(i) Residents, shopkeepers and business people who live and work around the project hospitals specially the project affected persons
(ii) All type of patients in hospitals
(iii) Management of hospitals including medical College principals and hospital chief superintendents,
(iv) Other government institutions including pollution control board, state EIA authority, operators of the biomedical waste management facility,
(v) The beneficiary community in general.

239. The community consultation with locals were organized together with PWD and IA representatives. Local residents, shop owners, and venders around GMCH and SHUSS sites were consulted during the site visits in the month of July 2025. Stakeholders consultations were also carried out during 1st week of July 2025. Table 19 shows the details of the stakeholders and public consultations carried in the project areas and Figure 12 shows the photographic record of the consultation meetings.

Table 19. List of Stakeholders Consulted & Issues Discussed

Sl. No.	Agency / Department	Official Consulted	Date	Issue discussed
1.	State Environmental Impact Assessment Authority, Assam	Sri Jatinder Sarma, Chairman, SEAC	02 July 2025	Project introduction and scope. National regulatory and legal frameworks, project categorization, reporting and monitoring requirements, permitting requirements and timeframe, institutional setup and capacity, baseline data requirements. Timeline for EIA approval and issuance of environmental clearance for hospital projects. Approval process, opinion or recommendation on where ADB should focus, coordination with local SEIAA, recommendations from the department.

Sl. No.	Agency / Department	Official Consulted	Date	Issue discussed
2.	Assam State Pollution Control Board, Assam	Ms. M. Bardalai, Add. Chief Environmental Engineer	02 July 2025	National regulatory and legal frameworks, project categorization, reporting and monitoring requirements, permitting requirements and timeframe, institutional setup and capacity, baseline data requirements. Biomedical waste management authorization for hospital. EIA and EC requirements. Pollution control and authorization for hospital projects. Timeline for processing the consents and approvals under air, water, noise, and hazardous waste management acts and rules of Assam and India.
3.	Fresh Air Waste Management Services Private Limited, Common Bio Medical Waste Treatment Facility, Kamrup	Mr. Joao Anselmo Pereira, Director	03 July 2025	Scope of project. Facility operation and capacity. Management and authorization under biomedical waste management. Status of biomedical and hazardous waste management in Assam. Treatment process, pollution monitoring, authorization, collection and transport of hospital waste. Community health and safety.
4.	Gauhati Medical College Hospital	Prof. (Dr.) Achyut Ch. Baishya, Principal cum Chief Superintendent	01 July 2025	Scope of project and ADB support required for the hospitals, proposed redevelopment and improvement plan, capacity of the hospitals, operational issues, management of waste including hazardous and biomedical waste, ADB requirements for project processing. Permits and clearances obtained and required for the facilities.
5.	Nalbari Medical College and Hospital	Prof. (Dr.) Babul Kumar Bezbaruah, Principal cum Chief Superintendent	04 July 2025	
6.	Pragjyotishpur Medical College & Hospital	Prof. (Dr.) B.K. Baishya, Principal	02 July 2025	

240. The informal consultation generally started with explaining the projects, followed by an explanation to potential impacts. Participants' views were gathered with regard to all aspects of the environment which may have direct or indirect impact on local people. Key issues discussed were:

(i) Awareness and extent of the project and development components;
(ii) Benefits of the project for the economic and social upliftment of community;
(iii) Labour availability in the project area or requirement of outside labor involvement;
(iv) Local disturbances due to project construction work;
(v) Waste management at project sites;
(vi) Impact on water bodies, water logging and drainage problem if any;
(vii) Environment and health aspects;
(viii) Flora and fauna of the project areas, and
(ix) Socio-economic standing of the local people.

241. The project has immense acceptability among the local people. They perceive that in addition to providing improved healthcare facilities, the project will also bring positive socioeconomic changes in the areas. Local people mainly discussed on the issues related to increase in air and noise pollution during construction and demolition, waste management, traffic and safety issues. In addition, information on the GRM procedures and formats was

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shared with the local people.

Figure 12: Photographs of Stakeholders and Public Consultation Proceedings

Meeting with Project Director, Assam Health Infrastructure Development & Management Society

Discussion with Principal cum Chief Superintendent, Nalbari Medical College at Nalbari

Discussion with the Managers of the Common Bio-Medical Waste Management Facility of M/s Freshair Waste Management Services Ptd. Ltd at their treatment plan at Hazo Bori, Panikhaiti, Guwahati

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Meeting with Chairman, State EIAA in Guwahati

Meeting with Principal of Pragjyotishpur Medical College and Hospital site at Birubari, Guwahati

Meeting with Principal cum Chief Superintendent, Gauhati Medical College Hospital

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Consultations with local venders around GMCH Site

Consultations with local residents near GMCH redevelopment site

Meeting with Add. Chief Environmental Engineer, State Pollution Control Board

D. Interaction with Local and/or National and International NGOs

242. To get independent views on the likely impacts of the project, non-government organizations at local as well as regional level were consulted during the IEE process. Aspects such as biomedical waste management, conservation activities, likely project impacts and possible mitigation measures were discussed and views and suggestions from these NGO's were incorporated in the EMP. Consultation will continue with these NGO's during project implementation and operation.

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E. Future Information Disclosure and Public Consultation

243. Information disclosure and public consultation relating to environment safeguards will continue throughout project implementation. The project executing agency will be responsible for the disclosure of this IEE in compliance to ADB's Communication Policy 2011 and ADB SPS 2009. The project's environmental information will be disclosed by the Assam SPCB/SEIAA and ADB as follows:

(i) The project IEE will be disclosed on the project website at https://www.adb.org/.
(ii) The domestic EIA will be disclosed on the websites of SPCB/SEIAA.
(iii) All environmental monitoring reports during project implementation will be available at https://www.adb.org/.
(iv) The project information and GRM entry points will be disclosed on the information board of each construction site.

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VIII. GRIEVANCE REDRESS MECHANISM

244. A project-specific GRM was prepared and complies with ADB's SPS (2009) and Government of India and Assam requirements. The GRM will be accessible to diverse members of the villages and community, including more vulnerable groups such as women, minority and poor. Multiple points of entry, including face-to-face meetings, written complaints, telephone conversations, or e-mail, will be available. The project will adopt the grievance redressal mechanism currently in place for the ongoing Assam State Secondary Healthcare Initiatives for Service Delivery Transformation (ASSIST) Project funded by the World Bank and being implemented by AHIDMS. This will enable AHIDMS to implement an effective GRM system instead of running two different GRMs parallelly.

245. The existing GRM provides an opportunity for a person who is directly or indirectly impacted by the activities under the project to express his/her concern or complaints/grievances. There may be complaints which are directly related to the project activities or out-of-project activities. The complaints thus received provide an opportunity to identify the gaps and risks that are posing as hindrances in the progress of the project. Addressing effectively these complaints form a core component of managing the risk and gaps. The existing GRM is equipped to receive, register, and facilitate resolution of complaints.

246. A GRM Portal is being developed for addressing grievances. The components of the portal are:

(i) Mechanisms for lodging of grievance (calling toll free phone number, physically registering, sending email, or online submission at portal).

(ii) Categories of the grievances (Project Grievances and Non-Project Grievances). This includes a list of the probable grievances further categorized into subcategories, broad categories and grievance heads.

(iii) Institutional mechanism for GRM includes details of the GRM Cell at PMU, GRM Cell at districts, and GRM Cell at Facility/ Entity level.

247. **Escalation levels**. There are two levels of escalation viz. 1st Level and 2nd Level for Project Grievances. At 1st Level the grievances registered at GRM Portal are forwarded to Nodal Officers at the Facility/Intervention Sites/ Entities concerned, notified for the purpose. The grievances are addressed in three timeframes of 24hr, 10-30 days, 30 days respectively. If not resolved at 1st level in given timeframe, the grievances are escalated to 2nd level which comprises the PMU/ Comm & Secy, MERD. The grievances are addressed in a timeframe of 10- 30 days depending on the nature of complaints. The non-project registered grievances in the GRM portal are redirected to respective HCF/Entity concerned.

248. Addressing grievances in GRM portal consists of various steps right from registration of the complaints to resolution of the grievances. This included (i) all complaints registered and integrated in GRM Portal of the Project and Unique ID created for each of the complaints, (ii) acknowledgement SMS with the Unique ID sent to the complainant, (iii) total number of grievances received and redressed reflected in dashboard of the Project GRM Portal, (iv) credentials to log in to the GRM Portal of the project have to be created for the Nodal Officers and PMU to whom the grievances are forwarded, (v) SMS communicating escalation/forwarding of grievance are sent to all the Nodal Officers. If the grievance is redressed then (i) the complainant are communicated about redressal through SMS, (ii) action taken report to PMU, and (iii) closing of grievance & final report kept in file at respective level of redressal. If the grievance not redressed then (i) action taken report to PMU, (ii) respective stakeholders to escalate the grievance to PMU/ Comm & Secy, MERD, and (iii) PMU to take up grievance with agency/department concerned.

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A. Grievance Redress Mechanism for the Project

249. The project's grievance will be addressed and redressed through various mechanisms at different layers which are; i) proposed GRM Portal, ii) complaints box with complaints form, iii) complaints registrar at sites, and iv) proposed Toll-free number.

250. **GRM Portal**: AHIDMS suggested and has agreed that the same portal will be used for the proposed ADB financed ASTHA project with several new features, mainly to segregate grievances and concomitant redressal for the ADB financed sections. This will be accomplished by screening the complaints segregating at the source and the system will forward the complaints to the relevant PMUs and PIUs and officials.

251. Complaints may lodge the complaint in the following ways:

(i) **Online submission of complaints in the GRM Portal of ASSIST by login:** The portal will have homepage where login option will be there. There will be flow of information to be put into the portal.

(ii) **Physically registering complaints at health care facilities, project intervention sites and entities**; Office of AHIDMS in person and by posts by using the complaints form: The complainants can file the complaints through physical mode by using the complaints forms and complain box placed in project site locations. The contractor's EHS expert and PMC expert will assist the complainant in filling in the forms. Once the forms are received, the project team will forward it to the concerned officials and at the same time it will be reverted to the online portal for registering it in the portal.

(iii) **Sending GRM email of ASTHA to the PMU:** An email will be created for the ASTHA project where people can raise their complaints through writing email to the email address which will be handled by the project's PMU team. The PMU team will then register it in the portal.

(iv) **Registering the complaints in the complaints registrar to be placed at project sites:** A complaints register will be placed at each construction site where the contractor's EHS expert and the PMC expert will assist the complainants to register the complaints in the register/complaint book.

(v) **Calling in the GRM toll free number/phone number (to be established):** A toll-free number will be established for the World Bank funded project, ASSIST. The same will be used for the ADB funded ASTHA project. The setting up toll free number, administrative approval which is under process and the timeline for operationalizing the toll-free number will be communicated to ADB once the approval is obtained.

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Figure 13: Flow of information in submitting the grievances in the proposed GRM Portal

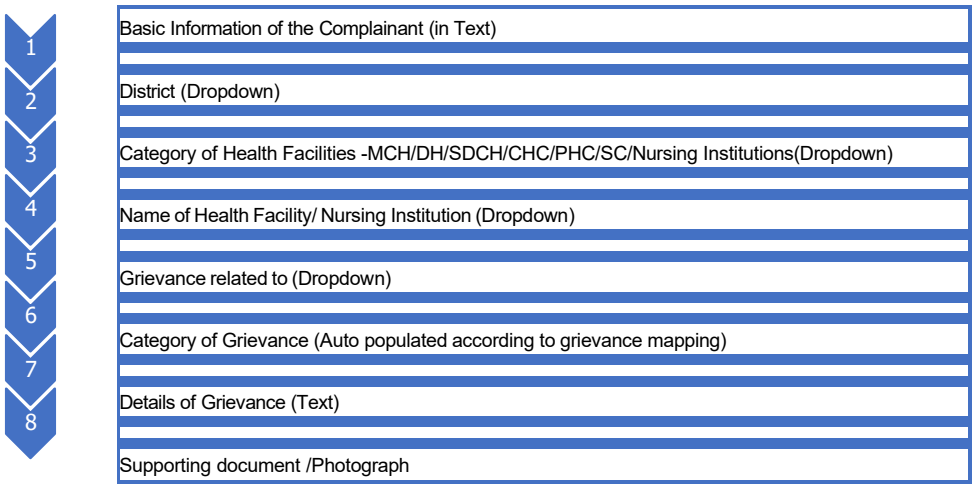
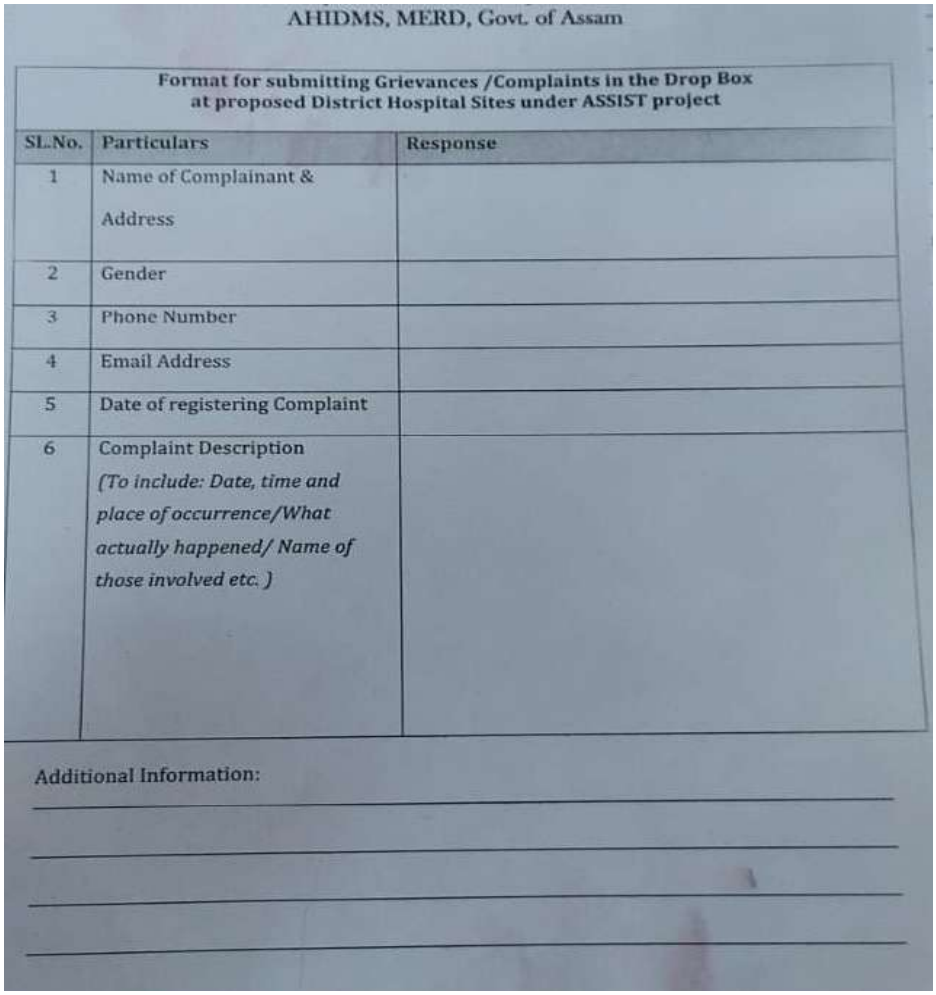


Figure 14: Flow of information in submitting the grievances in the proposed GRM Portal



AHIDMS, MERD, Govt. of Assam

Format for submitting Grievances /Complaints in the Drop Box at proposed District Hospital Sites under ASSIST project

SL.No.	Particulars	Response
1	Name of Complainant & Address	
2	Gender	
3	Phone Number	
4	Email Address	
5	Date of registering Complaint	
6	Complaint Description *(To include: Date, time and place of occurrence/What actually happened/ Name of those involved etc.)*	

Additional Information:

Table 20: Sample format of Complaint Register

#	Name of complainant	Address of complainant (Village, Taluk, Dist)	Type of component and work	Details of Complains	Name of contractor	Date of complaint received	Action taken (Yes/No)	Status of the Complaint (resolved/ pending
1								
2								
3								
4								
5								
6								
7								
8								
9								

252. **Categories of Grievance**. The categories of grievances that are expected to be received by the proposed GRM Portal are categorized as either Project-related grievance and non-project related. Anticipating the type of grievances to be received in the GRM Portal from the citizen's end, a list of possible grievances is pre-identified in a drop-down menu available on-line.

253. **Grievance Redressal**. Grievance redressal will follow the following procedure:
All Complaints to be registered and integrated in GRM Portal of ASSIST and Unique ID to be created for each of the complaints. Acknowledgement SMS with the Unique ID to be sent to the Complainant.

SMS format

1. Grievance received. The Unique ID of your complaint is .....
2. Please track status of your grievance @ .....

254. **SMS sender header:** ASTHA (5 characters only)
Total nos. of Grievances received and redressed to be reflected in Dashboard of GRM Portal of ASSIST
Credentials to log in to the GRM Portal of ASSIST have to be created for the Nodal Officers and PMU to whom the grievances will be forwarded.
SMS communicating escalation/forwarding of grievance to be sent to all the Nodal Officers.

Format of SMS to be sent to the Nodal Persons

3. Grievance with Unique ID.....is forwarded to .....
4. 1st action is to be taken in 24 hours at HCF/Intervention level
5. Please Log in to..... for necessary action.

255. If the grievance is redressed: Complainant to be communicated about redressal through SMS.

6. Grievance with Unique ID ..... has been redressed.
7. Please Log in to .....for knowing the status.

- Closing of Grievance & Final Report to be kept in file at respective level of redressal

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256. If the grievance not redressed,
- Action taken Report to PMU
- Respective stakeholders to escalate the grievance to PMU/ Comm & Secy, MERD
- PMU to take up grievance with agency/department concerned

B. Other Platforms for Addressing Grievance

257. There are three other supplementary avenues that are opened for the APs to resolve their problems, complaints, and grievances with regard to the project and its implementation.

258. **ADB India Resident Mission and Human and Social Development Sector Office.** An aggrieved party can directly contact ADB's resident mission in New Delhi regarding a grievance or problem that GRM has failed to resolve. The party in writing informs the resident mission and initiates a good faith negotiation to solve the problem by working with the concerned resident mission's specialists and, if necessary, with ADB's Human and Social Development Sector Office at the head quarter. The aggrieved party can use English or any local language to send the complaint to the resident mission or to the sector group, energy, and the arbitration can be done in the preferred language of the aggrieved party.

259. **ADB Accountability Mechanism.** The affected party can use the ADB's Accountability Mechanism by writing to the Complaint Receiving Officer at the ADB Headquarters in Manila. The Accountability Mechanism has two arms: the first is the Office of the Special Project Facilitator. The facilitator deals with the complaints with the help of the project personnel and the aggrieved party through a consultative process; the second arm of the Accountability Mechanism deals with the complaints against ADB regarding its failure to abide by its own safeguard policy requirements. Information on the ADB Accountability Mechanism will be included in the project information kit to be distributed among the affected communities as a part of the project GRM.

260. **India's judicial system.** If the GRM of the project cannot resolve a grievance or the aggrieved party feels that it has not received a fair hearing or award, the party can access the country's court system for relief at any stage of the deliberations in GRCs. In such an event, the GRC immediately terminates its hearing.

C. GRC Record Keeping and Cost

261. Submission of grievance will be through local language and English translation of the local language as well. Illiterate people can submit their grievance orally that will be translated into written local language. Records of all grievances received, including contact details of the complainants, dates the complaints received, nature of grievances, agreed corrective actions and when they were implemented, and the outcome are recorded and kept in the project office. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed at the project office especially in the PIU and PMU of AHIDMS. A summary of this information will be included in the periodic monitoring report. If ADB involves grievance resolution, it will maintain records of its proceedings and disclose them to all parties engaged in the hearings. All costs incurred related to GRM will be borne by AHIDMS. ADB will bear the cost of its own involvement in grievance resolution. The complainants are not charged any fee for the service.

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IX. ENVIRONMENTAL MANAGEMENT PLAN

262. The project is classified as Category B for the environment based on the ADB Safeguard Policy Statement 2009. This IEE was conducted and documented based on design and build implementation arrangements. Although detailed engineering designs are not available, this IEE identified potential impacts and mitigation measures based on available project description, baseline environmental conditions, and public consultation plans. The intention of the environmental management plan is to guide the contractor(s) in adapting the evolving design by:

(i) Including environmental requirements in the bidding documents,
(ii) Specifying environmental obligations in the Employer's Requirements**,** including the results of the site audit for existing facilities,
(iii) Require contractors to prepare respective construction EMPs (CEMP[37]) that are aligned with the approved EMP contained in this report,
(iv) Assign roles and responsibilities for implementation, and
(v) Provide budget and schedule for EMP activities.
(vi) This EMP also includes supervision and compliance monitoring that specifies:

- Conduct of regular monitoring during construction and operation,
- Use of performance indicators, particularly related to OHS, and
- Preparation and public disclosure of semi-annual environmental monitoring reports.

263. Public consultation and information disclosure was undertaken during IEE preparation. Several potentially affected people and key stakeholders were consulted through meetings and focus group discussions. Meaningful consultation will continue during project implementation in accordance with the EMP. The Grievance Redress Mechanism (GRM) established under the World Bank assisted Assam State healthcare Initiative for Service Delivery Transformation (ASSIST) will be adopted in this project to avoid duplication.

A. Environmental Management Plan

264. The Environmental Management Plan (EMP) is the synthesis of all mitigation and monitoring actions to avoid, minimize and mitigate adverse environmental impacts and enhance positive impacts of the project. The EMP also defines institutional responsibilities for mitigation, implementation and monitoring, reporting requirements, and a system to manage and provide speedy resolution of construction-related complaints through the grievance redress mechanism (GRM). The EMP is included in the bid documents to enable contractors to allocate human and financial resources for effective implementation and monitoring of the project.

265. The EMP will be shared with potential contractors so that the mitigation and monitoring requirements can be evaluated and included in the specifications and cost proposals submitted for the proposed project. It enables the project to comply with Government of India and ADB requirements on environmental management.

266. This EMP is subject to regular updates after the ADB review and approval to ensure that unanticipated impacts or significant changes in the project scope are effectively managed on time. These regular updates, to be made no more than annually, will be in the form of contractor's environmental management plans (CEMP).

[37] See Attachment 1 for outline

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B. Objectives of the EMP

267. The objectives of this EMP are for the contractors and the implementing agencies to:

(i) present a comprehensive and systematic list of measures for mitigating and enhancing anticipated environmental impacts, as discussed and prescribed in IEE;
(ii) define and specify institutional arrangements to support implementation of the prescribed measures;
(iii) clearly assign responsibility for implementation of each prescribed measure;
(iv) clearly assign responsibility for systematic monitoring of implementation of the prescribed measures and overseeing corrective action as needed;
(v) establish a system for regular reporting on EMP implementation;
(vi) identify training and capacity-building needed to enable effective implementation of the EMP; and
(vii) provide estimates of the costs that will have to be budgeted by various entities to enable full and effective implementation of all prescribed measures to address likely impacts.

268. **Contractors Environmental Management Plan (CEMP[37]).** The CEMP (template provided in Attachment 1 to EMP) shall include the contractor's management plans to mitigate construction impacts, such as air and water pollution, soil erosion, construction noise, solids, liquids and hazardous wastes, construction spoils, traffic, and community and workers' health and safety. The contractor's environment, health and safety (EHS) officers are primarily responsible for CEMP preparation. Hence, it is important for the contractor to mobilize the EHS Officer upon receipt of the notice to proceed. The Construction Supervision Consultant (CSC) will ensure that the CEMPs are in accordance with the EMP requirements before they are submitted for approval to ASTHA-PMU.

269. The associated project facilities such as borrow pits, quarry sites, construction camps, and batching plants will be identified by the contractors, the CEMPs will provide specific information on these facilities to identify potential impacts and the required mitigation measures to address these impacts. The CEMPs will be updated periodically but not more than annually to complement the actual construction activities and provide customized environmental guidance to the contractors. The CEMP contains details of activities and the location of facilities specific to the contract package. It confirms and updates the list of sensitive receptors in the IEE to identify locations where mitigation would be most required. Examination should be conducted to determine the necessity for environmental baseline survey results prior and during construction, to supplement secondary data available. If undertaken, the survey results shall be included in the CEMP and mitigation measures shall be adjusted accordingly based on the results.

270. The contractor shall take all necessary measures and precautions to ensure that the execution of works and all associated operations are carried out in conformity with statutory and regulatory environmental and social requirements of the Government of India. The contractor shall be required to develop site specific CEMP and environmental mitigation measures during construction and shall comply with the Contract Specifications.

271. Each contractor is required to prepare and submit a Contractor's Environmental Management Plan (CEMP) consistent with the overall project EMP, prior to start of construction. It should be approved by the Project Management Consultants (PMC) and cleared up by ADB before any physical activity is started on the site.

272. In the event of serious or repeated violations by the Contractor of the conditions stipulated

[37] See Attachment 1 for outline

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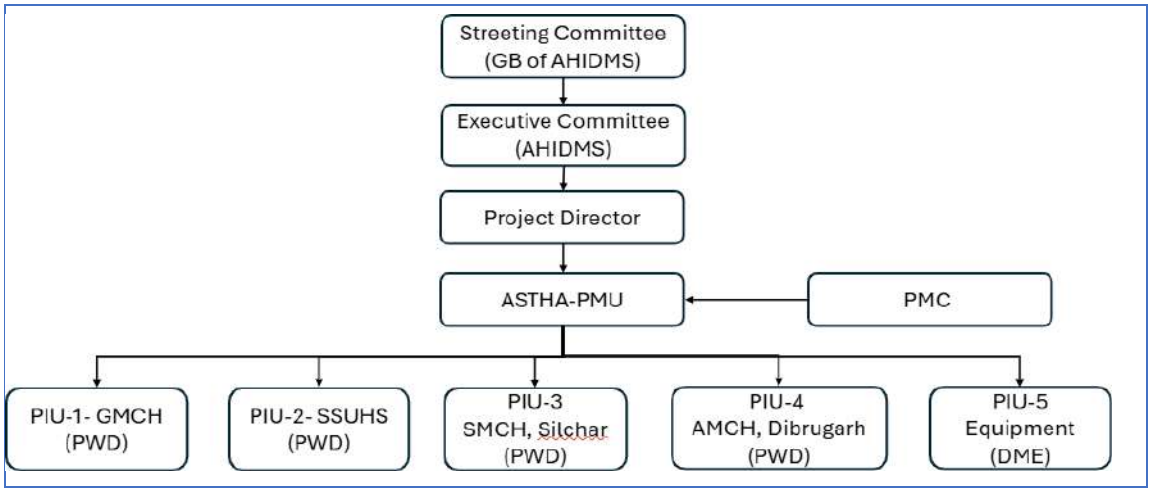
in the in the EMP, CEMP, and the Contract Specifications, the ASTHA reserves the right to withhold payments and/or stop construction.

C. EMP Implementation Arrangement

273. Effective implementation of the project's EMP will rely on inputs from multiple entities, spanning the pre-construction, construction and operation phases of the project. Specific tasks are identified and assigned in the Environmental Management Plan and Environmental Monitoring Plan, which appear in the subsequent sections of this EMP. The general roles and responsibilities of each entity in implementation of the EMP are explained below, beginning with an outline of the entities that will be involved.

274. The Institutional arrangement (Figure 15) provides details of establishing an office that will implement the EMP whose main thrust is to ensure that environmental, socio-economic, political, and public health issues are properly addressed in a timely manner. It provides the necessary mechanism that will strengthen the organizational relationship of the proponent with the host community, concerned government agencies and other stakeholders.

Figure 15: EMP Implementation Arrangement



Source: ADB

D. Entities With Roles in EMP Implementation

275. The ley entities involved in the EMP implementation and their roles and responsibilities are presented in Table 21.

Table 21: Institutional arrangement to implement the Environmental Management Plan

Entity	Roles
MERD	i. Ultimate responsibility for ensuring that the project is implemented in accordance with applicable national laws, in compliance with the project's GoI requirements, and in line with environmental covenants under the ADB loan. ii. Responsible for allocating adequate resources for implementing the project EMP, and for securing any coordination agreements with other agencies and entities necessary to ensure timely and effective implementation of the EMP, including monitoring.
AHIDMS through ASHTA-PMU	i. Responsible for guidance of safeguards implementation in relation to all PIU ii. Review function and is involved in all stages of the IEE from early scoping and formulation through to oversight of monitoring in the construction phase iii. During the pre-construction and construction phases, main roles will be the review and approval of the IEE and other safeguards documents; verification of the procurement of all necessary permits, clearances and agreements; confirmation of the integrity of monitoring activities carried out by contractors and other designated parties; providing operation guidance for the project's monitoring teams iv. Review and approval of the consolidated monitoring reports prepared for submission to ADB. v. Supporting PIUs is needed to address emerging safeguards compliance concerns, including major grievances. vi. Help and advice PIUs to manage and coordinate with regulatory agencies in relation to compliance vii. Responsible for providing direction and overseeing the implementation of the CEMP in accordance with the ADB SPS 2009 and GoI requirements viii. During the project implementation, will be supported by a team of experts including environmental
Project Management Consultants (PMC)	i. Manage the Design Build Contract of Up gradation and Reconstruction of Guwahati Medical College & Hospital and Infrastructure development in Srimanta Sankardev University of Health Science (SSUHS) including Proof Checking, Review of Designs and Drawings and undertake Construction Supervision so as to ensure the Reconstruction of Guwahati Medical College and Infrastructure development in Srimanta Sankardev University of Health Science (SSUHS) as per the Specifications and standards in the stipulated time ii. Establish & ensure safety protocols at site and ensure adherence to the iii. protocols by everyone who is at site including but not limited to personal safety, equipment safety and works safety.

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	iv. Establish & ensure work protocols including barricading protocols at the proposed construction sites to ensure there is minimal disturbance to the users of the nearby existing facility. v. Review the safety protocol and compliances at site during all activities being undertaken at site, maintain records of compliance/ non-compliance/ near miss/ minor accident/ major accident etc. vi. Ensure compliance to all Statutory regulations during construction of the hospital by the Contractor including but not limited to labor laws, environment laws, pollution control laws and any other law not specifically mentioned here but is applicable as per the Law of Land. vii. Periodically conduct safety awareness talks and meetings with contractors and its labor force working at the site. Ensure all visitors coming in to the site including officials of the government are sensitized on safety aspects before they enter the site for inspection. Review, approve Contractor's Environment Social Impact Assessment (ESIA) and Environment Social Management Plan (ESMP); labor management plan, waste management plan (as required) and monitor Contractor's performance against the approved plans. The ESMP plan is dynamic in nature, hence the Consultant has to ensure the Contractor updates the plan periodically as per Asia Development Bank (ADB) norms. viii. Identify and report any changes to project design or construction methods which would trigger an update to the contractors ESMP. Changes to works or methods should be assessed against the existing Project Area of Influence (PAI) and whether there is a likely public interest aspect to the changes. If either the PAI (geographically, socially or environmentally) the safeguard instruments shall be updated by the Consultant and the Contractor as required and re- disclosed. ix. Issue instructions to the Contractor to address any ESMP non-compliance issues, or if site restoration is not being done in a timely manner. Review the remedial action/s proposed by the Contractor or Propose suo-moto remedial actions and their timeframe for implementation in the event of a noncompliance of the ESMP. x. Submit ESMP monitoring report along with MPR & Quarterly Progress Reports to ASTHA/ PWD (Building). xi. Establish and maintain a grievance redress mechanism pertaining any of the grievance of stakeholders of the project. Submit the status of grievances and their resolution status in the MPR to ASTHA/ PWD (Building). xii. Develop Comprehensive Training Module covering E&S safeguards, OHS, POSH and Health & Hygiene with frequency and timelines to conduct the training for Contractor personnels at sites
PIUs	i. Responsible for the day-to-day implementation of the EMP. ii. Responsible to lead in providing direction and to oversee the implementation of the CEMP is in accordance with the ADB SPS 2009
Primary Contractor	i. Prepare a CEMP covering all of the works and related sites under its control, including all works and sites conducted and set up by its sub-contractors. The CEMO shall cover all aspects of the PC's responsibilities under the EMP, including the permits it must obtain; the specialized management plans it must prepare and implement; ii. and responsibilities for self-monitoring and reporting requirements.

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	iii. The CEMPs must be prepared and approved by the ADB and PMU before the PC can begin any works. iv. Each Contractor will have the following key staff and general responsibilities: v. The General Manager: Over-all in charge of the implementation and vi. monitoring of Contractor's EMP and OHS. vii. Environmental, Health and Safety: Implement the Contractor's EMP; Ensure compliance with recommended conditions in the contract, and CEMP; Review the effectiveness of the mitigation measures for proper management of construction risks and uncertainties and make recommendations for improvement as needed; Recommend modifying or halting construction activities, or developing mitigation measures in case of unpredicted harmful effects on the environment or if environmental monitoring determine construction works pose environmental concerns; Identify resources and equipment needed for environmental management and monitoring purposes; Prepare training modules for various groups of project officers and employees and conduct trainings on a regular basis ensuring that all employees undergo regular training to improve awareness/knowledge of environmental and social management issues in consultation and supervision of PMC; Ensure project operations are performed in accordance with statutory environmental and social requirements; Secure and renewing permits and clearances for all pollution control facilities; Conduct water, air, and noise monitoring sampling as required in the ECC; Submit to PMC the Self Environmental Management Report (SEMR) for submission to ADB on a regular basis as required; and submit to PMC Self- Monitoring Report (SMR) for submission to the PMU on a regular basis as required.

276. The EMP, presented in Appendix 1-EMP, defines: (i) responsibilities and authorities for the EMP implementation, (ii) summary of impacts and mitigation measures, (iii) environmental monitoring and inspection plan, (iv) institutional strengthening and training plan, (v) reporting requirements, (vi) public consultation plan, (vii) cost estimates, and (viii) mechanism for feedback and adjustment. The EMP will be included as separate annex in all bidding and contract documents. Contractors will be required to develop site specific-CEMPs that are fully responsive to the EMP. The PMU-EO will be assigned with the responsibility to ensure contractors' compliance with the site-EMPs and the project EMP.

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X. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

277. The Project has been officially classified as an Environment Category B project in accordance with the Asian Development Bank's Safeguard Policy Statement (SPS) of 2009. In line with this classification, an initial environmental examination has been conducted and documented in this report in compliance to the ADB's SPS 2009.

278. The IEE concludes that if the environmental mitigation and management measures, as defined in the EMP, are properly implemented, all adverse environmental impacts associated with the project will be prevented, eliminated, or minimized to an acceptable level. The project is feasible from an environment safeguards point of view. This IEE is sufficient to meet the ADB SPS requirements for the project, therefore no further assessment is required.

279. Specific measures to address identified adverse impacts are included in the EMP. Sound construction site safety management systems and careful planning and implementation of rerouting schemes including early installation of traffic signages in consultation with local authorities and communities will be essential to minimize safety risks and avoid excessive temporary traffic disturbance.

280. Emissions of Noise, dust, and vibration impacts particularly during demolition will be fully mitigated along the project areas perimeters. A screening analysis of noise impacts shows that during the construction stage, active construction areas will experience increased noise levels. Overall, the impacts of noise are expected to result in a moderate increase in ambient noise levels, confined to local construction sites away from noise-sensitive receptors and limited to daytime periods, and short in duration. The Project will result in moderate residual noise impacts during the operation phase.

281. The proposed project has demonstrated a commitment to meaningful public consultation and information disclosure throughout the environmental examination. Key stakeholders, including potentially affected individuals and communities, were engaged through various channels, such as meetings, public hearings, and focus group discussions. The engagement will be sustained throughout the project pre-construction and construction stages. The outcomes of these consultations have been generally positive, with support from the potentially affected people and key stakeholders. The AHIDMS is committed to meaningful consultation and engagement will not end continue. The Project has established a GRM that outlines a continued commitment to involving stakeholders and the public throughout the project's implementation phase.

B. Recommendations

282. This report acknowledges its commitment to ongoing updates and revisions. It shall be promptly updated in the event that new information becomes available or unanticipated impacts arise. This commitment underscores the project's dedication to transparency, accountability, and the responsible management of environmental and social considerations throughout its implementation.

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APPENDIX 1: Environmental Management Plan

A. Objectives

1. This project environmental management plan (EMP) is developed for the Assam State Tertiary Healthcare Augmentation Project (the project) in Assam State of India. The EMP is prepared in accordance with the requirements of the Asian Development Bank's (ADB's) Safeguard Policy Statement ([SPS] 2009) on the basis of the feasibility study report (FSRs) and detailed project reports (DPRs) prepared by the implementing agency; and the initial environment examination (IEE) conducted for the project.

2. The EMP defines appropriate mitigation measures for the anticipated environmental impacts, and defines the institutional responsibilities and mechanisms to monitor and ensure the compliance with India's environmental laws, standards and regulations, and ADB's SPS. The EMP specifies (i) objectives; (ii) mitigation measures; (iii) implementing organization and responsibilities; (iv) inspection, monitoring, and reporting arrangements; (v) training and institutional strengthening; (v) a feedback and adjustment mechanism; and (vi) the grievance redress mechanism (GRM).

3. The EMP will be reviewed and updated at the end of the detailed designs, as needed, in order to be consistent with the final design. The EMP (or its updated version) will be included as a separate annex in all bidding and contract documents. The contractors will be made aware of their obligations to implement the EMP, and to budget the EMP implementation costs in their proposals.

4. The EMP supervision and monitoring results will be used to evaluate (i) the extent and severity of actual environmental impacts against the predicted impacts, (ii) the performance of the environmental protection measures or compliance with related rules and regulations, (iii) trends of impacts; and (iv) overall effectiveness of the mitigation measures.

B. Environmental Management Plan Implementation Arrangement

5. The project consists of several sites spread all over Assam State with focus of the civil works will be on the upgradation and reconstruction of Guwahati Medical College & Hospital (GMCH) and infrastructure development in Srimanta Sankaradeva University of Health Sciences (SSUHS). Both sites are located in Guwahati City. The overall EMP implementation arrangements and responsibilities of governmental organizations are summarized in **Table EMP-1**.

6. **Executing and implementing agencies**. The Department of Medical Education & Research, Government of Assam will be the executing agency of the project and the project implementing agency will be the Assam Health Infrastructure Development and Management Society (AHIDMS), Government of Assam. Within AHIDMS, a Project Management Unit (PMU) will be established for project management and coordination with ADB which reports to the Government of Assam. AHIDMS will oversee the implementation of the project through PMU and PIUs. PMU will be supported by a project management consultant (PMC).

7. PMU, established under AHIDMS, will be the in charge of project coordination. PMU will have the overall responsibility for supervising the implementation of the EMP, coordinating the project-level GRM and reporting to ADB. PMU will internally assign one environmental officer (PMU-EO) to supervise the effective implementation of the EMP. The PMU-EO will take charge of (i) coordinating the implementation of the EMP and developing implementation details; (ii) supervising the implementation of mitigation measures during project construction and operation;(iii) ensuring that environmental management, monitoring, and mitigation measures are incorporated into bidding documents, construction contracts, and operation

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management plans; (iv) submitting environmental monitoring reports to ADB; (v) coordinating the local GRM; and (vi) responding to any unforeseen adverse impact beyond those mentioned in the project IEE and the EMP.

8. The PMU-EO is responsible for day-to-day administration of the project activities including (i) review and approve contractors' site-EMPs; (ii) conduct site inspections monthly during construction; (iii) act as local entry point for the project GRM; (iv) assess the contractors' compliance with the EMP and the India's environmental quality standards for ambient air, water, and noise quality; (v) submit quarterly inspection results to the contractors for information, and PMU for verification and confirmation.

9. **Construction contractors.** Contractors will be responsible for implementing the mitigation measures during construction under the supervision of the project management and construction supervision consultant firm (PMC), and PMU. In their bids, contractors will be required to respond to the environmental management requirements defined in the EMP. Each contractor will be required to develop site specific-CEMP and will assign a person responsible for environment, health, and safety. After acceptance of the constructed works, environmental management responsibilities will be handed over to the implementing agency.

10. PMC will be selected through the bidding procedure by PMU. PMC will be responsible for supervising construction progress and quality, and implementation of the EMP on construction sites. The PMC shall have at least one environmental, health and safety office on each construction site (GMCH and SSUHS) to (i) conduct regular site inspection, (ii) supervise the contractor's EMP implementation performance, and (iii) prepare the contractor's environmental management performance section in monthly project progress reports submitted to PMU.

11. **Environmental, Health and Safety Officer as a member of PMC Team**. Under the PMC firm, national Environmental, Health and Safety Officers (EHSO) will be recruited to support the effective implementation of the EMP. The EHSO will:

(i) assist PMU in conducting consultation meetings with relevant stakeholders as required, informing them of imminent construction works, updating them on the latest project development activities, GRM, contact information of PMU, and contractors;
(ii) assess the project components' environmental readiness prior to implementation
based on the readiness indicators defined in the EMP;
(iii) update the EMP including mitigation measures, monitoring program, institutional arrangements, and training plan, as necessary, to reflect the final project scope and detailed design, and submit to ADB for review and disclosure;
(iv) support PMU to ensure that the bidding documents and works contracts contain provisions requiring contractors to comply with the mitigation measures in the EMP and that relevant sections of the project EMP are incorporated in the bidding and contract documents;
(v) support PMU-EO in reviewing and approving contractors' site-EMPs and conducting periodic environmental site inspection;
(vi) assist PMU to establish a GRM, and provide training for PMU, and GRM entry points;
(vii) conduct regular EMP compliance monitoring, undertake site visits as required, identify any environment-related implementation issues, propose necessary corrective actions, and reflect these in a corrective action plan;
(viii) assist PMU in preparing environmental sections of quarterly project progress reports to ADB;
(ix) assist PMU in preparing semiannual internal environmental monitoring reports to ADB;
(x) provide training to PMU, and contractors on environmental laws,

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regulations, and policies (ADB's SPS), the EMP implementation, and GRM in accordance with the training plan defined in the EMP;

(xi) participate in ADB review missions, when required, and assist PMU in discussing environmental issues with the ADB mission members; and

(xii) conduct rapid assessments of project facilities after project completion and approximately 1 year of operation to confirm compliance with the EMP, as well as sound management practices (environment audit).

Table EMP-1: Environmental Responsibilities by Project Phase

Phase	Responsible Agencies	Environmental Responsibilities
Detailed design	Design Consultant	Incorporation of environmental mitigation measures and green building design in detailed designs.
	PMU and PMC	Review the design and confirm that mitigation measures have been included in the engineering detailed design. Update the EMP before the start of construction according to the detailed design, if necessary.
	ADB	Review and approve the updated EMP, including disclosure.
Tendering and contracting	PMU, procurement agency, and contractors	Incorporate the EMP clauses in tender documents and contracts.
	PMU	Engage PMC and ensure the PMC have dedicated and qualified staff.
	EHSO and ADB	Review bidding documents; and confirm project's readiness.
Construction	Contractor	Develop site specific-EMP and assign EMP implementation responsibilities; ensure health and safety; and implement mitigation measures.
	PMU	Coordinate GRM; supervise EMP implementation; and prepare environmental sections of project progress report and semiannual internal environmental monitoring report (with support of the EHSO).
	PMC	Advise on the mitigation measures; provide comprehensive technical support to PMU for environmental management; conduct training; conduct annual EMP compliance review; support PMU in preparing environmental sections of project progress reports/ internal environmental monitoring reports.
	ADB	Conduct review missions; and review and approve environmental progress sections of the project progress reports, and internal and external environmental monitoring reports, including disclosure.
	SPCB/SEIAA	Conduct periodic inspections of all construction projects relating to compliance with the India and Assam regulations and standards.
Operation	PMU	Conduct EMP compliance review, instruct implementing agency on environmental management requirements; and prepare an annual
		internal environmental monitoring report for the first year of operation. Implementation of mitigation measures as defined in the EMP.
	SPCB/SEIAA	Conduct periodic inspections to confirm compliance with the India and Assam standards and regulations.
	ADB	Review and approve environmental progress/monitoring reports and disclose on ADB project website.

ADB = Asian Development Bank, PMC = project management consultant, SPCB = State Pollution Control Board, SEIAA = State Environmental Impact Assessment Authority, EMP = environmental management plan, GRM = grievance redress mechanism, PMU = project management unit, EHSO = environmental, health and safety officer of PMC.

C. Summary of Potential Impacts and Mitigation Measures

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12. **Table EMP-2** summarizes the potential impacts and environment safeguard issues of the projects during pre-construction, construction, and operation as identified by the environmental impact assessments and set out in the project IEE, as well as corresponding mitigation measures designated to minimize those impacts and address these issues.

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Table EMP-2: Potential Environmental Impacts and Mitigation Measures

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
General (during entire project lifecycle)						
Legal register	Compliance to regulatory requirements, tracking of compliance to regulatory requirements	Set-up an integral compliance management system for ensuring regulatory compliance e.g., legal register should be developed for better monitoring of the compliance status of permits and approvals during preconstruction, construction and operational phase.	Verification of Consent /Permit documents	Throughout the project lifecycle (preconstruction, construction and operational phase)	Contractor, PMC, PMU	AHIDMS
Grievance Redressal Mechanism (GRM)	Establish a grievance redressal process for receiving and dealing with the concerns and complaints of affected public and community, if any	A GRM will be developed and implemented to allow the community and workers to express their concerns with respect to EHS concerns, if any.	Verification of records of registered grievances and resolution outcomes; minutes of meetings	Before initiation of construction works and throughout project lifecycle	Contractor, PMC, PMU	AHIDMS
Stakeholder Engagement	Dissemination of information, engaging stakeholders in process of decision making	- A stakeholder engagement plan may be developed by contractor to ensure that a consistent, comprehensive, informed and coordinated approach is taken up with the concerned stakeholders and disclosure of information is ensured throughout the project cycle as and when required. - Hold a public meeting prior to construction to discuss the EMP, project activities, and issues associated with the safety of nearby communities in the vicinity of the construction sites. The measures to address the public concerns will be incorporated into the updated EMP and final design if necessary.	stakeholder engagement meetings/workshop.	Before initiation construction works and throughout the project lifecycle	Contractor, PMC, PMU	AHIDMS
Design and Pre-construction Phase						

Lay out plan and Building Design	Lack of proper planning may lead to energy inefficiency, cutting of trees unnecessarily, improper drainage system (possibility of runoff being contaminated due to mis management of wastes), lack of water harvesting, contamination of water bodies, emission of odor from treatment plants and waste storage areas, disturbance to patients, students due to noise, improper landscaping and traffic management etc.	- The layout of the facilities will be such that the in-patient departments, classrooms and hostel premises are away from the noise generating sources such as road traffic, pumps, DG sets. - The siting of STP/ETP and temporary storage areas of BMW as far as possible will be away from the hostel and inpatient departments and from the residential areas around the site. - STP/ETP, waste storage areas etc. will be installed at height above the high flood level as a precautionary measure. - Acoustic building materials for walls, windows, doors will be proposed based on the assessment of noise levels, if they are anticipated to be beyond the standards. - Acoustic enclosures will be provided to noise generating sources like DG sets, pumps etc. - Roof top and in other suitable locations rainwater harvesting structures will be proposed. - The Hospital Building, as well as its allied facilities, would be IGBC Healthcare Platinum certified. In addition, all additional campus buildings would be accredited according to the relevant IGBC Platinum certification - Energy efficiency measures will be proposed to comply with ECBC. - Environmental Sustainability Provisions required for obtaining GHRIHA rating will be detailed in the project specific IEE and EMP. - Drainage layout will be well planned and ensured that it leads the runoff to a treatment chamber and reused as much as possible	Compliance with GRIHA, ECBC, NBC criteria and those stipulated by EC, Consents, authorization letters etc.	Before initiation construction works and to be maintained during operation phase	Contractor, PMC, PMU	AHIDMS

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		- Proper traffic circulation plan along with adequate parking will be ensured. - In case of open parking areas, possible usage of grasscrete may be explored. - Adequate provisions will be in place to deal with situation in case of emergency like proper exit path, assembly area, area for water storage for fire emergency etc. - Review the mitigation measures defined in the EMP and updated to reflect the final design if necessary. - Include an environmental section in the technical specifications for bidders. - Ensure that construction contracts are responsive to EMP provisions, and mitigation and monitoring measures are adequately budgeted.				
Securing clearances required prior to commencement of construction	If not followed strictly, it will lead to violation of EIA Notification 2006 and Air and Water Acts	- The permits or certificates from concerned authorities (i.e., Environmental Clearance from State Environment Impact Assessment Authority, Tree Felling Permissions from Forest Department, water abstraction for GMCH and SSUHS, consent to establish for the GMC and SSUHS etc. [38]) as applicable prior to construction.	Clearance letters/ permits/ Monitoring of stipulated conditions	Before site preparation	PMC, PMU	AHIDMS
Contractor's Environment, Health, Social and Safety Experts	Inadequate Safeguard Performance during project implementation	- Contractor to appoint One Environment Expert and one H&S Expert[39], having relevant qualification and adequate experience in implementation of Environmental safeguards in the	Availability of the expert/s during construction phase; construction EMP CEMP, EMP Monitoring Report	before initiation of site preparation	Contractor	PMC,PMU

[38] Responsibility of securing Environmental Clearance, tree felling permission, water abstraction permission (if that is to be continued during operation stage) would lie with EA

[39] Instead of One Environment Expert and one H&S Expert, an expert with Environment, Health, and Safety expertise may be considered if the person is qualified enough in terms of qualification and professional experience.

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		project till the engagement period of contractor. - The expert/s to prepare construction EMP (CEMP, template provided in Attachment 1 of the EMP) including health and safety (H&S) plan based on ADB cleared EMP if required to include the site-specific conditions pertaining to construction and associated activities. - The occupational health and safety plan for construction site and nearby community will also be prepared in detail by the Contractor.				
Securing applicable Permits/ consents from concerned authorities	To ensure compliance to regulatory requirements	- Consent to Establish and Consent to Operate (for facilities such as crusher, batching plant etc.) should be obtained as appropriate and terms/conditions mentioned in the consent must be complied with. - Prior Permission for ground water extraction shall be obtained from the central ground water board (CGWB) or other concerned authority for proposed borewells/abstraction of groundwater - Registration and license to be obtained as per Contract Labour (regulation and abolition) Act 1970 or state act and rules - Registration and license under Inter State Migrant Worker Act (in case migrant workers are engaged).	Permit document and integration of related measures into the specific EMPs	before initiation of site preparation and construction	Contractor	PMC,PMU
Alteration of land contour and drainage pattern	Changed storm water runoff from alterations of the site's natural drainage patterns due to excavation works in the sites, construction	- Design of proposed facility components should enable efficient drainage of the sites and maintain natural drainage patterns to the extent possible. - Plan should be in place so that the drainage pattern of surrounding area is unaffected. The waterbody located within the site should be retained and conserved.	Adoption of drainage plan in project	before initiation of site preparation and construction, during construction	Contractor	PMC,PMU

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		The seasonal stream passing through the site is proposed to be realigned. It will be ensured that the diversion doesn't affect the flow and capacity of the stream.				
Shifting of Utility	Disruption of utility services to local community (if any)	- All utilities (including underground utilities) which are likely to be affected by the project should be shifted before start of construction. - Necessary permission and payments[40] should be made to relevant utility service agencies to allow quick shifting and restoration of utility services - Local people must be informed in prior through appropriate means about the time of shifting of utility structures and potential disruption of services if any. - If it is found that AC structures are present during the survey, then the Contractor will prepare a detailed SOP for asbestos handling and management prior to disposal/ handling of the AC structures. - All AC pipes/ structures will be left in situ and untouched, if possible - In the event, that the asbestos fibers from AC structures were accidentally disturbed/exposed, the contractor should follow Safe disposal provisions as per the USEPA. - Use of AC materials will be strictly prohibited at site.	Utility shifting plan, Intimation to local community	before initiation of site preparation and construction	Contractor	PMC,PMU
Selection of materials and construction technologies/ design	To ensure structural stability, visual aesthetics, ventilation, adequate health and safety condition	- Applicable building regulations as per Assam and Government of India or other relevant regulation (as per the applicability) should be followed	Adoption of Design Report developed for the project	Before initiation of site preparation and construction and during construction	PMU along with design consultant and PMC; Contractor	PMU

[40] Responsibility of making payment to concerned entity would lie with PMU/ AHIDMS

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
Climate change	Climate adaptation and mitigation	The adaptation measures included in the project design are: - Raising the ground-level of the new construction sites (at GMCH and SSUHS) by 0.3 meters (m) over and above the current road finish level (which is at current HFL), and further raising plinth height by 0.6 m of GMCH buildings and 1.6 m of SSUHS building, with retention walls and waterproofing the foundation structures. - Additional stormwater drains with rainwater harvesting structures to capture the water from paved surfaces, rooftop and runoff during rainy season. - Increased depth of pile foundation by 5 meters and use of higher-grade M-30 reinforced cement concrete (RCC) to reach stable substrata for necessary support and mitigate subsidence risks. - Augmentation of Dispur Water Supply Scheme by 2.7 million liters per day (MLD) to supply water to the entire hospital campus through hydropneumatics-supply system and site water-treatment plant with reverse osmosis (RO) system. - Augmenting the current sewage treatment facility from 400 kilo-liter per day (KLD) to 1800 KLD and establishing new effluent treatment plant of 200 KLD and reusing 90 percent of treated water for flushing and horticulture purposes. - Use of heat-reflective cool-roof tiles on terraces, applying passive and adapting architecture and strategic landscaping to prevent absorption of solar energy and heat. - Modernizing teaching facilities in	Adoption of Design Report developed for the project	Before initiation of site preparation and construction and during construction	PMU along with design consultant and PMC; Contractor	PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		select para- medical colleges, provisioning modern medical equipment for diagnosis and treatment, digitizing systems and processes for greater and remote reach, early detection and treatment and helipad for disaster support. While the mitigation measures are: - SSUHS building will be designed and constructed to meet Net Zero (Energy, Water, and Waste) standards and get certified under GRIHA/ IGBC/ LEED programs. - Buildings of GMCH will be conforming to GRIHA 4-star and ECBC standards for meeting specific U-Values, Solar Heat Gain Coefficients (SHGC), and Visible Light Transmittance (VLT) of glass façade, roof, and wall insulation and installing multi-stage air filtration systems conforming to ASHRAE Standard 170-2017. - Optimizing electrical load by installing – a) variable frequency drives (VFD) and variable air volume (VAV) boxes in air handling and cooling system, pumps, fans, etc., b) CO sensor-based AHU at parking lots, c) heat - pumps to extract heat from the electrical system. - Automation with occupancy sensor and Integrated Building Management System and other digitization measures - Renewable energy-based systems including - a) 4500 kWp Solar Rooftop System, b) Solar water heaters of capacity 100 liters per day, - c) Solar-powered Street lights at				

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		GMCH campus				
Trees	Felling of trees (if any)	- In case of felling/cutting of any trees, Permission from competent authority (Forest Department) should be obtained. All efforts must be taken to conserve trees and avoid felling to the greatest extent practicable. - Disturbance and removal of vegetation must be confined solely to the designated project area where construction of buildings is sited in the layout (this shall be identified in the design stage itself by superimposing the approved layout on the existing features map of site). Before proceeding with any vegetation clearance or construction work, it is essential to conduct a survey to identify mature, older trees, and to actively consider alternative measures including transplantation to avoid their removal. - In consultation with concerned department compensatory plantation (1:10 or as specified by the competent authority), green area development activities should be undertaken accordingly.	Tree Felling Permission, payment disbursed for felling and taking up of Compensatory plantation, Green area development plan, Site inspection	Cutting prior to start of construction and monitoring monthly to avoid cutting of trees unnecessarily	Contractor/PMC / PMU	PMC, PMU, Forest Department
Chance find procedure	Accidental discovery of historical and archeological resource/artefacts	- A rapid response procedure to protect chance finds while minimizing disruption to project activities should be in place. It will include the provisions to: i) consultation with the State Archaeology Department, ii) demarcation of the discovery site, iii) chance finds report, iv) arrival and actions of cultural authority, and suspension/ non-suspension/ further suspension of work If archaeological artifacts are unexpectedly found during construction,	Chance finds procedure, findings (if any) record	Before initiation construction works and implementation to be ensured throughout construction phase	Contractor	PMC, PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		- work will be immediately halted, and the Implementing Agency (IA) and the local cultural relics/heritage department will be informed of the discovery. [41]				
Site Induction Training	Lack of understanding of potential safeguard concerns and correspondir mitigation measures	- No works will be initiated by the contractor until the site induction training is carried out - Site induction training includes but not limited to i) discussion and review of EMP detailing specific environmental risks associated with their Scope of work; how to manage, requirement of legal compliances ii) Health and Safety Awareness	Record of Induction Trainings	Prior to start of work at site	Contractor	PMC,PMU
Worker's Accommodation Siting	Poor siting and layout of workers accommodation (if located outside of proposed area premise) may result in loss of agricultural produce if sited on cultivable land, health hazards to workers and nearby community due to poor hygiene conditions, contamination of surface and ground water bodies if sited near water bodies, local drainage problems, fire, electrical, and other safety risks, and so on. Gender-based workers accommodation. Conflicts between locals	- Prior to the establishment of a worker's accommodation, the site, layout, and basic facility provision should be carefully prepared by the contractor and approved by the project authority (PMC/Implementing Agency). - Labour accommodation should be established with prior permission from PCB as applicable. Labour accommodation will not be established on forest land, low lying/ flood prone areas and will be located as far as possible from the habitations, water bodies, harvesting structures, environmentally sensitive areas (at least 500 m away) etc. - Labour accommodation should comply with ILO guideline (preferably those ratified by India) [42] - The location, layout and basic facility of workers accommodation will be submitted to and approved by	Visual observation/ Site inspection/ consultation with labors	Monthly basis	Contractor	PMC, PMU

[41] If any such archaeological relics are found in the project sites and, it is destroyed or removed from the area without the knowledge of the competent authority that will be considered as violation of national regulations as well as SPS 2009.

[42] https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---multi/documents/publication/wcms_116344.pdf

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
	and labors Health & Safety and environmental risks related to labor accommodation leading disruption and delay of construction works and quality of life of the labors	PMU/PMC before establishment. - Use of fuelwood should be strictly prohibited at workers accommodation; Contractor should ensure supply of alternative clean fuel such as LPG and common cooking area with fire safety provisions in place. - The building materials used for camps will be sturdy and safe to ensure structural safety. - No temporary or permanent constructions to be done on the locations of water bodies (including seasonal) identified within site even if there is no water and these water bodies shall be barricaded. - Provisions of workers accommodation provided with individual dwelling units supported with piped water supply, - Provision of common toilets/latrines and bathing facilities duly segregated for male and female labor - Provision of First aid facilities, beds, mosquito repellent/ net, snake repellent will be made Contractor to ensure the followings measures in consideration of the local conditions- - Collection of domestic waste and sewage and proper disposal to be ensured as per rules - Workers accommodation should be developed to avoid possibility of flooding, any other natural hazards. - Organizing awareness workers accommodation on general health awareness with medical facility - Access to complaint register. - Lighting and fencing will be provided. - Wildlife awareness training should be provided so that no wildlife, in case of chance encounter in the region is disturbed.				

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		Precautions to be taken to protect the workers from insect/pest to reduce the risk to health. Use of insecticides complying with local regulations. - No liquor or prohibited drugs will be imported, sold, given to the workers of host community. - Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases such as HIV, AIDs and others. - Besides the above, the contractor to ensure the followings - Workers will have access to an adequate and convenient supply of free potable water that meets national/local or WHO drinking - water standards, - All tanks used for the storage of drinking water should be covered to prevent water stored therein from becoming polluted or contaminated, - Ensure that drinking water quality is regularly monitored. - Use of environmentally friendly sanitation solutions, such as bio toilets and bio digestor septic tanks, or any other advanced small- scale sewage treatment systems shall be made by the that contractor. Specific considerations for women accommodation to include: - Separate and secure living quarters for male and female workers to ensure privacy and safety. Female accommodations should be located in well-lit, secure areas with controlled access and proximity to site security or				

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		management offices - Gender-Specific Sanitation Facilities. Toilets and bathing areas must be separate, lockable, and equipped with hygiene products. Facilities should be within short walking distance from living quarters and work zones, with clear signage and lighting - Inclusive Rest and Recreation Areas: Common areas should be designed to be welcoming to all genders, with seating, shade, and privacy options. Centrally located but away from high-traffic or noisy zones to reduce harassment risks - Accessible Health and Wellness Facilities: On- site clinics or first-aid stations with female health services and mental health support. Easily reachable from both work and living areas, with private consultation spaces - Gender-Sensitive Lighting and Surveillance: Adequate lighting in pathways, entrances, and shared spaces; CCTV or security patrols. Focus on routes between accommodations, sanitation blocks, and work zones - Safe Transportation Access: Gender-sensitive transport schedules and designated pick- up/drop-off points. Near accommodations and work entry points, with waiting areas that are visible and monitored. - Inclusive Communication and Signage: Provision of Multilingual, gender-neutral signage and grievance redressal information posted in common areas, entrances, and near sanitation facilities. - Training and Awareness Space:				

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		Spaces for gender sensitivity training, GBVH (gender- based violence and harassment) awareness, and worker orientation near administrative offices or recreation zones to encourage Participation.				
Demolition Waste Management	- Air and dust pollution during demolition and material handling - Runoff contamination and clogging of drains - Risk of injury to workers - Visual nuisance from unmanaged debris - Potential presence of hazardous materials (e.g., asbestos)	- Contractor will prepare a detailed demolition plan for GMCH site which will have comprehensive procedures for demolition work including demolition waste management as per Construction and Demolition Waste Management Rules, 2016. The demolition plan should be approved by PMU and relevant authorities. - Segregation of waste at source into recyclables, reusables, and inert fractions - Covered temporary storage area on-site - Reuse/recycling of bricks, wood, and metal through authorized vendors - Safe transport in covered trucks to GMC/SPCB approved sites - Water sprinkling to suppress dust - PPE and safety training for workers - Compliance with C&D Waste Rules, 2016	Daily inspection logs, Waste inventory and disposal records, Copies of receipts from recycling/disposal sites, Photographic records, Contractor compliance checklist, Monthly site audit reports	Daily during demolition. Weekly documentation. Monthly compliance audit.	Contractor / C&D waste vender	PMC/PMU/ GMC/SPCB
Universal Access	If not properly designed, the new hospitals and colleges under the project may not be easily accessible to: i) patients with disabilities that could face physical barriers like inaccessible entrances, restrooms, and equipment resulting to delayed or denied care, loss of dignity; ii) elderly patients who may struggle with poor	**Mitigation Measures:** The design requires the adoption of universal access considerations for health care facilities that includes but not limited to the following core universal design measures: - Accessible Entrances and Pathways: Ramps with slopes ≤ 5% (max 8–10% if space is limited); Minimum width of 1.2 meters for pathways; Non-slip surfaces and clear visual markers. - Doors and Corridors: Door width ≥ 90	Review of detailed design	During project design/pre-construction	PMC	PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
	lighting, long distances, and unsafe flooring resulting to increased risk of falls, confusion, and missed appointments; iii) patients with sensory or cognitive Impairments that are communication and navigation challenged resulting to disorientation, stress, and reduced autonomy; iv) caregivers and family members who are dealing with added stress in supporting loved ones in inaccessible environment resulting to emotional fatigue and reduced effectiveness; v) healthcare staff who could work in inefficient layouts with limited accessibility resulting to increased physical strain, burnout, and errors; and vi) marginalized communities who experience cultural and linguistic exclusion resulting to lower engagement and trust in the healthcare system. -	cm; ideally sliding doors; Corridors wide enough for wheelchair turning (≥ 1.5 m diameter clearance); Lever or D-type handles at accessible heights (90–100 cm). - Toilets and Showers: At least one accessible latrine per facility; Space for wheelchair maneuvering (1.8 × 1.5 m); Grab bars (40–45 mm diameter) at appropriate heights: Elevated seats (45–50 cm) and privacy locks - Water Points: Elevated platforms to reduce effort; Multiple height options (65–75 cm and 85–100 cm); Smooth, dry, non-slip surfaces with handrails Lighting and Flooring: Low-glare lighting and matte flooring to reduce visual strain; Contrasting colors for wayfinding and hazard identification - Wayfinding and Signage: High-contrast, multilingual, and tactile signage: Braille indicators and audio prompts; Predictable layouts with visual cues (e.g., color-coded zones) - Waiting and Registration Areas: High/low counters for seated and standing patients: Chairs with arms for support: Quiet zones and sensory-friendly spaces for neurodiverse individuals - Inclusive Latrines for Children: Smaller toilet dimensions (e.g., 20×15 cm); Fun, friendly design with night lights and handwashing stations; Consideration of cultural and gender needs - Medical Equipment: At least one accessible exam table and weight scale per facility; Adjustable-height equipment for diverse body types and mobility levels - Sensory and Neurodiversity Considerations: Soft color schemes				

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		and natural light; Sound-absorbing materials; Private consultation rooms away from busy zone				
Construction Phase						
Sources of construction materials	Potential Impact on natural land Use/ contours, vegetation clearance, disturbance to natural drainage patterns, water logging, and water pollution.)	- Strip the topsoil and store properly (so that it maintains the organic/ inorganic properties of the soil) for reuse later. - Maximize the re-use of earth-cut materials, spoils, and construction debris/wastes. - Obtain construction materials only from government-approved quarries/vendors that are compliance to the environmental regulations. - Creation of new borrow areas, quarries, etc., for the project should be avoided; if unavoidable, contractor to obtain all necessary clearances and permissions in Prior.	Documentation with respect to source of material; permit/ clearance documents	Monthly basis	Contractor	PMC,PMU
Generation of Construction and Demolition Waste and disposal of the same (as applicable)	Contamination of surrounding environment, risk to community health and safety, poor aesthetics	- Construction and Demolition Waste Management Rules, 2016.[43] - The contractor to ensure regular collection and disposal of construction waste generated debris, concrete, metal cuttings waste, waste/used oil etc. through authorized vendor or by any other means in compliance with regulatory requirement and in compliance with Construction and Demolition Waste Management Rules, 2016 - Collection, storage, handling and disposal of Asbestos (if any) containing waste/material from the site should be managed in accordance with rules and guidelines on environmental management of construction & demolition (C&D) wastes by Central Pollution Control	Demolition and Waste management plan, evidence of contracting and disposal of C&D waste, record of generation of waste, visual observation	Monthly basis	Contractor /C&D waste vender	PMC, PMU, SPCB

[43] https://cpcb.nic.in/displaypdf.php?id=d2FzdGUvQyZEX3J1bGVzXzIwMTYucGRm

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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		board (CPCB) and MoEF&CC. Contractor should submit a demolition plan for the existing structures/ sheds (if any) within the premises that are likely to demolished for the proposed development works.				
Asbestos Materials	Health risk due to exposure to asbestos materials	- Obtain details from PHED/WD/Local body on location of underground AC pipes/ structures. - Contractor should conduct a survey with the assistance of PHED/PWD and / or NP on the presence of existing AC pipes/ structures at site (if any). - If it is found that AC structures are present during the survey, then the Contractor will prepare a detailed SOP for asbestos handling and management. ADB's Good Practice Guidance for the Management and Control of Asbestos: Protecting Workplaces and Communities from Asbestos Exposure Risks Asian Development Bank (adb.org) will be followed along with other international guidelines in preparing the SOPs. - All AC pipes/ structures will be left in situ and untouched, if possible - In the event, that the asbestos fibers from AC structures were accidentally disturbed/exposed, the contractor should follow Safe disposal provisions as per the USEPA https://www.epa.gov/asbestos/safe-work-practices - Use of AC materials will be strictly prohibited at site	- Onsite observations & records - Asbestos management plan - Reporting of Incidence by Contractor - Supervision report of Asbestos management in Semi-annual Environmental Monitoring Report (SEMR)	As and when required	Contractor	PMC, PMU, PH ED, PWD
Air Quality	- Dust Generation due to construction activities and transport, storage and handling of construction	- Comply with the Construction & Demolition Waste Management Rules, 2025 Effective from April 1, 2026. - The construction site will be barricaded with temporary dust	- Site Inspection/ Document review, monitoring results	Monthly basis	Contractor	PMC, PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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	materials - Emission of air pollutants (HC, SO2, NOX, CO etc.) from Construction vehicles and use of construction equipment and machinery	capturing and noise attenuating barriers of adequate height as must be prescribed in the CTE. - Contractor to submit location and layout plan for storage areas of construction materials approved by PMU/PMC. - Transport, loading and unloading of loose and fine materials through covered vehicles. - Provisions for Paved approach roads. - Storage areas to be located downwind of the habitation area. - Water spraying on earthworks, unpaved haulage roads and other dust prone areas. - Provision of (Personal Protective Equipment) PPEs to workers. - Regular maintenance of machinery and equipment as per SPCB requirements. - Batching plants should be located at downwind (as far as possible) direction from the nearest settlement. - Batching plants will have dust screens at the silos, aggregate batcher, feeder areas of adequate height. - Only crushers licensed by the PCB should be used - All DG Sets shall have acoustic enclosure as per CPCB and other relevant norms - DG sets should be provided with adequate stack height and use of low Sulphur diesel as fuel. - LPG should be used as fuel source in construction camps instead of wood - Ambient air quality monitoring should be taken up at adequate location on quarterly basis or as per the recommendation of APCB or any				

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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		other regulatory body. To ensure adequacy of safeguard performance, the standards should be considered as benchmark. - Contractor to prepare and maintain log book for water sprinkling. - A temporary dust screen cum noise barrier of adequate height shall be provided on the boundary of the project site, especially towards southern side where there is a school located (as well as residential area) for dust control. - Use of fuelwood should be strictly prohibited at workers accommodation, Contractor should ensure supply of alternative clean fuel - such as LPG and common cooking area with fire safety provisions in place.				
Noise and Vibration	Disturbance to local residents and sensitive receptors due to increased noise and vibration from construction activities and operation of equipment, machinery and construction vehicles	- The vibration standards stipulated by the Directorate General of Mining Safety[44] have been adopted for this project as follows: the permissible vibration limits for buildings and structures range between dominant excitation frequencies (Hz) of <8, 8-25 and > 25 between 2-10 mm/sec for objects of historical importance and sensitive structures and from 2-5 mm/sec for domestic houses/ structures (Kuchha brick and cement). These limits will be followed during the entire construction phase. - Ensure noise level during construction in nearby operating hospital will be attenuated to meet silence zone as per the standards, i.e., 50 dB(A) during the day and 40 dB(A) during the night.	Site Inspection, Document review, Visual observation, monitoring results	Monthly basis	Contractor	PMC,PMU

[44] The same standard has been adopted by Chennai Metro Rail Limited (CMRL), which is funded by the Asian Development Bank (ADB). These standards are integrated into metro rail projects to mitigate potential structural impacts from underground train operations.

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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		- During construction, noise levels along the project boundary does not exceed 65dBA or in case where the baseline without the project exceeds 65dBA, the project activities contribution should not exceed +3dBA - The construction site will be barricaded with temporary dust capturing and noise attenuating barriers of adequate height as must be prescribed in the CTE. - All construction equipment/ machineries to be timely serviced and maintained. - Construction equipment and machinery to be fitted with silencers and maintained properly. - Timing of noise generating activities should be restricted during daytime near residential areas and any noise generating works near to the primary school (located in the site adjacent area) must be avoided during school hours. - Noise generating operations may be taken up intermittently to avoid exposure to higher noise level for longer period - Honking should be restricted near built-up areas - Provision of PPEs should be kept for workers - Noise monitoring should be taken up at adequate location on quarterly basis or as per the recommendation of MPCB or any other regulatory body. To ensure adequacy of safeguard performance, the standards should be considered as benchmark. - If blasting is done, prior permission will be obtained from the competent authority. - Structural assessment of surrounding				

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		building will be done. Baseline and during blasting vibration monitoring will be done so as to ensure no adverse impacts are there on the surrounding structures/ ground - A temporary dust screen cum noise barrier of adequate height shall be provided on the boundary of the project site, especially towards southern side where there is a school located (as well as residential area) to mitigate the concerns associated with noise generation - All DG Sets shall be outdoor type with Hospital Type Silencer and acoustic enclosure as per CPCB and other relevant norms				
Surface and Groundwater	- Stress on water resources. - Contamination of surface and ground water with fuel and chemical spills; and discharge of wastewater/ solid waste from the construction area/ construction camps	- Obtain approval/permission from competent authority if ground water abstraction through bore well is carried out or water is sourced from any other means. - Permit conditions (if any) should be made in practice. These should be included in construction EMP by the contractor. - To avoid contaminating water, discharge of hazardous substances, chemicals, construction material and wastes into water courses, drainage systems should strictly be prohibited. - Silt fencing will be used along the seasonal stream and pond within site area whenever works are conducted adjacent to them. o Dumping of waste, construction materials will be strictly prohibited into the water bodies even if they are dry. - Temporary Storm drains should be designed according to site conditions to avoid contamination of water sources from storm water runoff and spills.	Site Inspection, Document review, monitoring results	Monthly	Contractor	PMC,PMU

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		- All fuel and chemical storage (if required on- site) shall be located on an impermeable base within an embankment and will be surrounded by fencing. The storage facility shall be at least 100 m away from the water stream./bodies. - Use treated water for water sprinkling to optimize usage of water for dust suppression in access/haul roads, washing of vehicles, concrete mixing, etc. - The batching plant will have adequate capacity sedimentation tank. No untreated alkaline water from will be discharged on open and unlined ground or water bodies. The treated water should undergo testing for alkalinity before being discharged into low- lying areas, water bodies, or open grounds. Reuse the treated water for non-potable uses should be ensured to the extent possible. - Labour engaged in the construction phase, should be sensitized about water conservation and encouraged for optimal use of water - Maintain water consumption ,record. - Collection and disposal of spills immediately after occurrence of the event. The oily waste/grease will be collected and skimmed by oil traps and handed over to the authorized agents. - Contamination of nearby waterbodies due to surface runoff should be strictly avoided with the provisions of necessary measures like silt fencing. Silt/sediment should be collected and stockpiled for possible reuse - Use of environmentally friendly sanitation solutions, such as bio toilets and bio digestor septic tanks,				

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		or any other advanced small- scale sewage treatment systems shall be made by the that contractors. - No temporary or permanent constructions to be done on the locations of water bodies (including seasonal ones) identified within site even if there is no water and these water bodies shall be barricaded. - Wastes/wastewater generated from workers accommodation must be collected at regular interval and transported to approved disposal location. Such wastes/wastewater must not be dumped/released in open environment under any circumstances. - Provision for water conservation e.g., rainwater harvesting at the project site. - Monitoring of surface, ground water quality (also drinking water of workers) should be taken up at adequate location on quarterly basis or as per the recommendation of APCB or any other regulatory body. To ensure adequacy of safeguard performance, the standards should be considered as benchmark.				
Soil	- Loss of productive Topsoil due to excavation - Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc. - Contamination of soil due to leakage/ spillage of oil, debris generated from construction activities, poor	- Provision for appropriate storage of separately stripped topsoil (15 cm) in an appropriate way (to ensure that the organic / inorganic properties of soil are retained) should be made and reused for growing vegetation. - Excavated soil should be reused as much as possible for backfilling, landscaping and for other project areas. - Oil spill kits will be placed at fuel storage, refueling areas, DG sets, pump locations etc. - In case of any accidental spill, the soil	Site Inspection, Document review, monitoring results	Monthly	Contractor	PMC,PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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	management of effluent and waste generated from the workers accommodation - Compaction of soil and impact on access/ haul roads due to movement of vehicles and equipment	should be cut and stored securely for disposal with hazardous waste. - Re-vegetation should be done in the area after the completion of construction, in order to reduce the risk of soil erosion. - As a best practice, site clearance, excavation and access road strengthening will not be carried out during the monsoon season to minimize erosion and run-off. - Workers accommodation site to be restored at the end. Storage of hazardous material (like used oil, oil-soaked cotton/clothes etc.) in isolated room with impervious surface must be ensured to avoid potential soil contamination. The hazardous waste should be disposed of through PCB approved Hazardous Waste Management vendor. - Construction vehicles, machinery, and equipment to be stationed in the designated areas to avoid compaction - Approach roads/haulage roads should be designed along the barren and hard soil area to reduce the possibility compaction of fertile soil. - To avoid soil contamination Oil-Interceptors will be provided at wash down and refueling areas. - Monitoring of soil quality should be taken up at adequate location on quarterly basis or as per the recommendation of APCB or any other regulatory body.				
Solid/Liquid Waste /Hazardous Waste	Solid/liquid Waste will be generated during construction works as well as from construction camp.	- The contractor to ensure daily collection and regular disposal of construction waste/ generated debris etc. - Segregation of waste should be ensured by using color coded bin	Site Inspection, document verification	Monthly	Contractor	PMC, PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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		system for biodegradable and nonbiodegradable waste segregation. - Employees working at the site should be provided with training and awareness on the segregation of waste at source. - Biodegradable waste will be preferably composted in -situ that can be utilized to establish a nursery on-site, contributing to the development of the planned green area - Collaborate with local authorities to transport and dispose waste in accordance with the regulatory requirements. - Biodegradable waste will be preferably composted in -situ that can be used as compost for landscaping - The municipal solid waste should be routed through proper collection and handover to local body for further disposal. - All the construction and demolition waste should be managed as per Construction and Demolition Waste Management Rules, 2016[48]. - Good housekeeping should be ensured. - Recyclable waste should be appropriately directed to authorized recycling facilities, based on waste type. - Waste oils/Greases/ Oil contaminated cotton waste from equipment's should be properly collected and disposed through PCB authorized vendors. - Secured storage of civil construction materials including paint, thinner, etc. to be ensured. - Construction vehicles and equipment should undergo regular maintenance to avoid any oil leakages. - Offloading and loading protocols				

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		should be prepared for diesel, oil and used oil respectively and workers to be trained to prevent/contain spills and leaks. - Burning of any type of waste and dumping of waste at any unpermitted area (especially near watercourses) should be strictly prohibited. - Hazardous waste should be properly labelled, stored onsite at a location provided with impervious surface, shed and secondary containment system in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016 and their subsequent amendments. - The municipal solid waste should be routed through proper collection and handover to local body for further disposal. - All the construction and demolition waste should be managed as per Construction and Demolition Waste Management Rules, 2016. - Good housekeeping should be ensured. - Recyclable waste should be appropriately directed to authorized recycling facilities, based on waste type. - Waste oils/Greases/ Oil contaminated cotton waste from equipment's should be properly collected and disposed through PCB authorized vendors. - Secured storage of civil construction materials including paint, thinner, etc. to be ensured. - Construction vehicles and equipment should undergo regular maintenance to avoid any oil leakages. - Offloading and loading protocols should be prepared for diesel, oil and				

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		used oil respectively and workers to be trained to prevent/contain spills and leaks. - Burning of any type of waste and dumping of waste at any unpermitted area (especially near watercourses) should be strictly prohibited. - Hazardous waste should be properly labelled, stored onsite at a location provided with impervious surface, shed and secondary containment system in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016[45] and their subsequent amendments. - Hazardous waste will be disposed routinely through approved vendors and proper records will be maintained of the same. - It is to be ensured that hazardous waste is not stored for more than 90 days. - Regular collection and disposal (in compliance to regulatory requirement) of domestic waste and sewage generated from workers accommodation to be ensured.				
Ecosystem and Biodiversity	Loss of vegetation and associated biodiversity due to site preparation and construction activities; accidental contamination of habitat condition	- Possibility of avoidance and minimization of tree felling should be thoroughly examined prior to project development. - Vegetation disturbance and clearance should be restricted to the Project activity area only. Prior to vegetation clearance and construction activities, old mature trees should be identified through a survey and options of avoidance should be explored - Strict prohibition on use of fuel wood and shrubs from nearby areas as fuel	Tree felling, plantation, record of plantation, survival rate of planted trees, Site Inspection	Monthly	Contractor	PMC,PMU

[45] https://cpcb.nic.in/displaypdf.php?id=aHdtZC9lV01fUnVsZXNfMjAxNi5wZGY=

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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		should be imposed and workers should strictly be directed not to harm any wildlife in the area - Laborers should be provided training about dos and don'ts when encountering wildlife - Proper disposal of solid and liquid wastes should be ensured to avoid any kind of contamination of soil/waterbody which may affect the dwelling species.				
Occupational Health and Safety	Material handling and storage Possible injuries associated with working conditions and other occupational hazards	The contractor will require to comply with the followings. - An occupational health & safety Plan will be prepared and implemented by the contractor including Health & Safety reporting and incident/accident reporting procedure. Accidents will be reported immediately to ADB (within 48 hours). Root cause analysis and corrective actions taken to avoid further accidents will also be submitted to ADB (preferably within 72 hours). - Accident register will be maintained at site and closed monthly by the site supervisor. - Provisions of PPEs viz., gloves, helmets, dust mask, ear plug, safety belt, etc. for the workers/staff depending on the type of works assigned to them (e.g., construction, excavation, welding, painting etc.) - A PPE matrix and its onsite inventory and deployment should be maintained. - Contractors to adopt and maintain safe working practices. - Usage of fluorescent and retro reflectory signage, in local language should be provided at construction sites - Training to workers on safety procedures, precautions and	Site inspection, document verification, training records; consultation with workers	Monthly basis	Contractor	PMC,PMU

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		hazardous material handling should be delivered. Workers with adequate training and no acrophobia shall only be assigned height works and similar for works requiring specific skills or training. - Organizing awareness camp on general health awareness with medical facility - Access to complaint register. - Provision of First aid facilities, beds, mosquito repellent/ net, snake repellent will be made - Collection of domestic waste and sewage and proper disposal to be ensured as per rules - Appointment of safety officer should be ensured. - All regulations regarding safe scaffolding, ladders, working platforms, gangway, stair wells, excavations, trenches etc. should be complied with. The construction of scaffolding and temporary work platforms must be carefully designated and regularly inspected to ensure stability and safety for workers - Use of hazardous material should be minimized/restricted to the extent possible. - Emergency plan should be prepared to respond to any accidents or emergencies. On-site display of emergency contact numbers of the city/local fire services, etc. to be ensured. - On-site first aid kits and trained First Aid attendants should be provided. - Mock drill/Toolbox talks will be conducted at regular intervals and training record should be maintained at site. - Loading and unloading operation of				

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		equipment should be done under the supervision of a trained professional. - All work at height to be undertaken during daytime with sufficient sunlight. - On-site fire extinguishing equipment should be provided to handle any possible fire outbreaks. Fire extinguishers should be regularly checked and working condition of the same to be ensured. - A Grievance Redressal Mechanism (GRM) will be implemented to allow the workers/labors to express their concerns, if any. - A Grievance register will be maintained at site and details such as name of complainant, date and mode of complaint receipt, details of complaints, resolution details, resolution dates, mode of communication to the complainant etc. The register will be closed on monthly basis by the site supervisor and countersigned by the PMC environment, health social and expert. - Contractor to maintain good housekeeping to prevent trips, slips and falls.				
Labour Rights/ Influx of workforce in the area	Cultural and Behavioral Conflict. Conflict between contractor and labor.	- Necessary permits from the concerned labor department should be obtained, pertaining records should be maintained at site with proper documentation - The Contractor and project authority will ensure decent labor conditions for workers and compliance with applicable law and regulations in India. - Contractors will ensure that wages are being paid as per the requirement of minimum wages act and records are maintained - Daily attendance register with	Site inspection/ /document verification/Training record/ consultation with labors	Monthly basis	Contractor	PMC,PMU

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
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		name and signature of labor will be maintained - Notice board to display terms of employment giving details of wage rates, working hours, criterion for overtime etc. Payment of wages of workers (including subcontracted/ casual labors) should be aligned with the payment of wages act. - The contractor to put in place a Code of Conduct (customized to local sensitivities and regulations) for worker-community interaction and on-site behavior. Oblige workers to adhere to code of conduct. The Code of Conduct should take into consideration relevant legislation, safety rules, substance abuse, environmental sensitivity, communicable diseases, gender issues (sexual harassment), respect for local beliefs and customs, community interactions etc. Consider ways to contribute positively to the local community, such as supporting local schools, healthcare facilities, or other community projects. These contributions can help build goodwill. - Local people should be preferred for employment wherever possible, especially as construction workers/unskilled workforce. - Contractor to ensure non-engagement of forced and child labor, gender equity, nondiscrimination on employment and opportunity and freedom to express their views - GRM will be disclosed to the workers and made accessible for reporting - Contractors should ensure access				

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		of necessary basic amenities and facilities such as drinking water, kitchen, separate toilet (for male & female) and crèches for female worker's children, if any. - Contractor to monitor to avoid any conflict with local community due to influx of migrated labor. - Health Monitoring: Implement health monitoring programs to assess and address potential health impacts related to chemical exposures or noise levels, acrophobia, silicosis, impacted vision etc.				
Community Health, Safety, and Security.	- Traffic congestion - Potential exposure to pollutants/hazardous material - Threat of emergency situation - Potential threat from the security personals to the local community (like abuse, unnecessary use of force etc.)	- Contractor should keep local residents informed about construction schedules, potential disruptions, and any necessary safety precautions. - Contractor to continuously monitor the social and community aspects of the project's impact. Regularly report on progress and address any issues that arise promptly. - A community liaison officer shall be appointed if social unrest or resentments are observed amongst the community. - The third-party vendors/suppliers especially associated with transport of construction materials and site cleaning should not be allowed to enter into the premises without valid ID cards or gate pass. - The entry and exit inside the site will be strictly monitored. Unauthorized entry will be prohibited. - Excavation for foundations will be closed as soon as practicable to prevent people or animals falling into the excavation sites. - The transport of heavy loads will be undertaken out of normal	Traffic management plan, Consultation with contractor and local community, Grievance Register, visual observation, environmental monitoring reports, Management Plan for Hazardous material and Emergency Preparedness plan	Weekly site inspection	Contractor	|PMC,PMU

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		working hours to the extent possible. - The contractor/project authority will make reasonable inquiries to ensure that those providing security are not implicated in past abuses; will train security staffs adequately in the use of force (and where applicable, firearms), and appropriate conduct toward workers and local Communities. - Security personnel engaged should not use force except when used for preventive and defensive purposes in consideration to the nature and extent of threat. For any issue with the community, take support of local administration as needed. - Establish a Code of Conduct for worker/security persons community interaction and on-site behavior. Oblige workers/ security persons to adhere to code of conduct. - A GRM will be implemented to allow the community to express their concerns, if any. - All construction sites should be barricaded to restrict entry of general public to avoid chance of any accidents - At least one traffic marshal/ flagmen will be deployed in junction/diversion point (at approach road to the project area and main road). - The traffic movement in the project area should be regulated to ensure safety measures for pedestrians. - Traffic management plan may be developed as necessary speed limits for all Project vehicles will be implemented				

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		- Training will be provided to all the drivers on safety measures - Management Plan for Hazardous material and Emergency Preparedness plan should be in place. - Necessary mitigation measures as suggested for management of different environmental components (Air, Soil, surface water, ground water, noise, waste/effluent management etc.) should be adequately implemented				
Demobilization: Site restoration and rehabilitation	Potential Community health and safety threat post construction	- Contractor will prepare site restoration plan which will be approved by the PMC/PMU. - The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. - All construction zones, workers accommodation, plant sites, crushers etc. or any other area used/affected by the project will be left clean and tidy, to the satisfaction of the PMC/PMU. The restored level of the ground will be as per the original level and condition or better.	Visual observation	Completion of construction work	Contractor	PMC, PMU
Construction Phase						
Energy efficiency and energy conservation	Integration of energy efficiency and energy conservation component in design	- The Hospital Building along with its allied facilities would be Indian Green Building Council (IGBC) Healthcare Platinum certified. - Also, ECBC 2017 (amended as on date) norms would be complied with and ECBC certification would be obtained accordingly	Review of relevant certifications	Prior to start of operation	PMC , PMU	AHIDMS
Regulatory Compliance	To ensure compliance to regulatory requirements	- Obtaining permission and ensuring that they remain valid throughout the implementation period. - Ensuring compliance with the terms/ conditions of various permits such as, CTO, Biomedical waste authorization, water abstraction permits, Fire	Verification of documents	Semi Annually	PMC, PMU	AHIDMS

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		License, PESO License etc.				
Air Quality	Generation of Particulate Matter, Sulphur dioxide and Oxides of Nitrogen due to traffic movement and operation of DG sets (in case of used due to power shortage).	- CTO to be renewed in timely manner from concerned pollution control board and conditions as stipulated in CTO should be strictly adhered to. - Inspection and maintenance of vehicles will be done at regular intervals/as per manufacturer's specification and pollution under control certificate should be secured - Regular maintenance of DG to be carried out - Adequate height of stack should be provided for the DG sets. - Liquid waste treatment plants will be maintained well so that odor emitting gases can be prevented/ controlled - Air quality monitoring should be taken up. To ensure adequacy of safeguard performance, the standards should be considered as benchmark.	Site Inspection, Document review, stakeholder consultation	Monthly	PMC, PMU	AHIDMS
GHG Emission	Accidental release of Greenhouse gases.	- Provisions should be kept to regularly check and repair leakages of Medical Gas Pipeline System immediately in order to prevent release of the GHG (especially like NOx and CO2) like into the air. - Auto leakage detection system should be installed	Site Inspection, Document review,	Continuously	PMC, PMU	AHIDMS
Noise	Noise may be generated due to traffic movement and operation of DG sets (in case of use due to power shortage)/ pumps at STP/ ETPs etc.	- DG sets and pumps should be provided with acoustic enclosures All DG Sets shall be outdoor type with Hospital Type Silencer and acoustic enclosure as per CPCB and other relevant norms. CPCB recommends that the maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity up to 1000 KVA shall be 75 dB(A) at 1 meter from the enclosure surface. diesel generator sets should	Site Inspection/ Document review	Monthly	PMC, PMU	AHIDMS

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					Implementation	Supervision
		be provided with integral acoustic enclosure at the manufacturing stage. - If traffic noise is anticipated to be higher than the permissible limits, the facility sites will be encompassed with acoustic boundaries in combination with green belt with high and dense enough canopy/ building materials (door/window sheets) used will have acoustic properties and be properly maintained to retain such properties (such as repairing gaps, or broken sheets, replantation of green belt) - Noise levels would be reduced using noise absorbing material on roof walls and floors. - Noise level monitoring should be taken up. - To ensure adequacy of safeguard performance, the standards should be considered as benchmark.				
Biomedical Waste	Generation of biomedical waste which is hazardous in nature that might cause spread of infections/ contamination of surrounding environment etc.	- As per the provisions of BMW rules, the facility should be equipped with proper facility for collection-disinfection-segregation- temporary storage in line with the requirements of BMW Rules-2016 and subsequent amendments. - It will be ensured that storage (anticipated BMW generation from the GMCH facility would be ~ 900 KG per day) is done in leak proof containers that should not generate leachate or attract flies/ vectors etc. - Under the purview of BMW Rules 2016, the hospital facility should secure Authorization (or Combined Consent and Authorization) from concerned PCB for ensuring effective handling and management of biomedical waste - The hospital facility should have a formal tie up with APCB approved	Site Inspection, Document review, stakeholder consultation	Monthly	CBWTF, PMC, PMU	AHIDMS

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		Common Biomedical Waste Treatment and Disposal Facility (CBWTDF) [46] to ensure regular and effective collection and disposal of Biomedical waste - If no CBWTDF is available, then in-situ treatment as recommended by BMW and related rules (and concerned regulatory authority) will be done. - The hospitals should comply with the conditions precedents of Authorization or Combined Consent and Authorization (CCA) issued by PCB and ensure timely renewal of the same - Identification and segregation of Biomedical Waste at point of generation should be ensured. - Segregated waste should be placed in color coded (as recommended by BMW rules) containers to avoid mixing of biomedical waste with nonbiomedical waste and proper waste handling, storage and disposal must be ensured. - The Biomedical waste should be stored in designated impervious covered area temporarily before handing over to CBWTF. - Ensure workers involved in biomedical waste handling are having PPEs such as puncture resistant gloves, masks etc. - Record for quantum of different types of generated biomedical waste and handed over to CBWTF should be well documented. - Educate staffs engaged in BMW management about different category of infectious waste and pathogens - Immunization of staff members as				

[46] At present Fresh Air Common Bio Medical Waste Treatment Facility located at Hajobori in Kamrup District is authorised by Assam PCB to handle biomedical waste in the state.

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		necessary - Adequate facilities to be made for hand washing and to ensure all staffs should wash their hands before and after direct patient contacts and contact with patient blood/fluid - Monitoring and observation of surrounding areas to ensure that no contamination is taking place due to BMW mismanagement. - Conduct regular consultations with the surrounding community/ staff etc. to ensure there no spread of any infections/ disease that can be attributed to the mis management of bio medical wastes.				
Other Waste	Generation of other kind of hazardous and nonhazardous waste due to hospital operation	- Proper segregation of different waste should be taken up which may include municipal waste (bio degradable and non-biodegradable), plastic, electronic waste, hazardous waste etc. Anticipated waste generation from the project facilities would be ~ 4510 KG per day). - The Hospital also needs to have formal mechanism for collection of municipal waste, plastic waste, Hazardous Waste and E-waste for sound management of waste generated from the facility. Requirement of separate Authorization for Hazardous waste (Hazardous Waste Management Rules) may be checked from pollution control board time to time. - No untreated or infected waste will be disposed into water bodies or open pits or grounds. - Set up an on-site or off-site composting facility where kitchen waste can be processed into compost. Regularly test the quality of the compost to ensure it meets	Site Inspection, Document review, stakeholder consultation	Monthly	PMC, PMU	AHIDMS

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		quality standards for safe use in landscaping or agriculture. - Hazardous waste should be stored in clearly marked, leakproof containers that are resistant to corrosion and damage. Storage areas should be secure, well-ventilated, and equipped with spill containment measures. Each hazardous waste container must be clearly labeled with its contents, potential hazards, and handling instructions in compliance with the Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016. Hazardous waste should be handed over to authorized and licensed vendor only - Ensure that inert waste is handed over to authorized municipal dumping yards or landfill sites in compliance with local waste disposal regulations. - Monitoring and observation of surrounding areas to ensure that no contamination is taking place due to waste mis management. - Conduct regular consultations with the surrounding community/ staff etc. to ensure there no spread of any infections/ disease that can be attributed to the mis management of wastes from the facilities.				
Wastewater and Effluent Management	Generation of sewage, effluent (containing Chemical Liquid Biomedical Waste) due to hospital operation	- Mechanism for proper segregation and collection of Effluent and Sewage should be ensured. - The anticipated volume of sewage and effluent are 384 KLD and 49 KLD respectively. - The hospital will be equipped with Wastewater Treatment Plant/s (Sewage Treatment Plants cum Effluent Treatment Plants).	Site Inspection/ Document review, stakeholder consultation	Monthly	PMC, PMU	AHIDMS

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		- The performance and functioning of wastewater treatment plants should be monitored closely and in case of any underperformance, should be repaired immediately. Quality of treated wastewater from the facility should conform the discharge standards as stipulated in the Biomedical Management Rules during facility operation i.e., - For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 (29 of 1986) will be applicable - For discharge into public sewers without terminal facilities (or facilities not connected to public sewers), the standards stipulated in Biomedical Management Rules and NGT Order (as per the applicability) - Regular monitoring of inlet and outlet water quality (with respect to wastewater treatment plants) should be taken up. To ensure adequacy of safeguard performance, the standards should be considered as benchmark. - Backwash water recirculation system will be there to ensure recycling of backwash water - Sludge will be dried and treated to conform to the standards given in Solid waste management rules, 2016 or amendments. - Sludge from Effluent Treatment Plant shall be given to common bio-medical waste - treatment facility for incineration or to hazardous waste treatment, No untreated or infected waste will be disposed into water bodies or open pits or grounds. - Monitoring and observation of				

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		surrounding areas to ensure that no contamination is taking place due to liquid waste mismanagement. - Conduct regular consultations with the surrounding community/ staff etc. to ensure there no spread of any infections/ disease that can be attributed to the mis management of liquid wastes from the facilities. - A contingency plan will be in place to handle the liquid waste in case of power/ technical failures. - Disposal locations for treated water will be monitored for their water quality and ensure that the quality meets the requirement of end use of the disposed water be it for irrigation or washing or aquaculture etc. - The disposal locations will also be monitored to ensure that there is no overflow or flooding due to addition of the treated waste water from the facilities.				
Soil and Water Resource	Potential contamination to surrounding soil and water environment due to improper waste (including Biomedical waste) and effluent/sewage management	- CTO and Authorization to be secured and renewed timely from concerned pollution control board and conditions as stipulated in CTO and Authorization should be strictly adhered to - To avoid contamination to surrounding environment (soil and water resource) discharge of untreated wastewater and indiscriminate dumping of Biomedical waste and other kind of solid waste should be strictly prohibited - Treated water generated from wastewater treatment plants should be reused in the facility to the extent possible (e.g., HVAC, - cleaning and Greenbelt development etc.) with a target to achieve zero discharge. Provisions for rainwater harvesting should be made.	Site Inspection, Document review, stakeholder consultation	Monthly	PMC, PMU	AHIDMS

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		Periodic cleaning of rainwater harvesting system to be carried out. The run- off from the previous surfaces and built-up areas of the project site should be routed through a carefully designed storm water drainage network discharging into rainwater harvesting structures. - Efficient Water saving devices/ fixtures should be installed in kitchens and toilets to reduce avoidable water consumption. - Water meters may be installed at the inlet point of water uptake and the discharge point to monitor the daily water consumption and identify any leakage (if any) - Regular monitoring of Soil and Water Quality (Ground and Surface Water) from the project area and/or vicinity should be carried out. To ensure adequacy of safeguard performance, the standards should be considered as benchmark.				
Health and Safety Risk	Occupational Health and Safety (OHS) risk Community Health and Safety risk	- OHS management procedures covering safe working conditions for employees, including staff training, job safety instructions and measures to ensure workplace safety and mitigate OHS risks emanating from exposure to infections and diseases, hazardous materials / waste should be in place and implemented as per infection management guidelines of MoHFW. Additionally, these procedures should extend to encompass maintenance activities to ensure that workers are adequately protected during repair and upkeep tasks, thereby reducing the risk of accidents and health hazards - A set of procedures defining the overall waste (bio-medical and others)	Site Inspection, Document review, stakeholder consultation	Monthly	PMC, PMU	AHIDMS

Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		management system should be in place in consideration of scale and type of activities and identified hazards. This will include minimization, an adequate segregation at point of generation, safe handling, collection, temporary storage, marking, decontamination, transport, treatment and disposal procedures; this will be, accompanied by systematic record keeping of waste quantity, type and final disposal/treatment - Standard operating procedures on the use, storage and disposal of hazardous materials should be in place Depending on the nature of the maintenance work, provide and guarantee the use of personal protection equipment such as gloves, helmets, ear plugs, safety belts, and so on. - The facilities should have emergency, preparedness and response plan and should be designed in commensurate with the requirement of concerned department (like Fire Department). Fire NoC should be secured from Fire Department and renewed in timely manner. - It is advisable to develop a traffic management plan. Additionally, it's essential to take all reasonable precautions and create an Emergency Preparedness Plan to mitigate potential risks, taking into account emergency scenarios such as fires, flooding, and accidental release or spillage of hazardous materials. Maintain an effective work permit system for vital tasks including electrical work and working at heights				

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		for maintenance works. - Provide adequate sanitation facilities. - The emergency contact number shall be displayed. - Provisions for a designated route for vehicle movement should be maintained. - Accidents if any will be reported to the management / SPCB/ ADB (within 48 hours to ADB) etc. in the form prescribed as per BMW rules. - Develop and implement robust health and safety protocols to protect workers and the community. - Conduct regular safety training sessions and drills to ensure all personnel are prepared for emergencies. - Awareness campaign on HIV/AIDS is to be conducted to effectively mitigate the impacts on occupational health and safety. - Develop community engagement programs that involve local residents in project-related activities, such as job fairs, skill development workshops, or community events. Encourage social interaction and collaboration between workers and locals to foster understanding and mutual respect. - Establish open channels of communication between project management, workers, and local residents. - Hold regular meetings, forums, or community advisory groups to discuss project progress, address concerns, and provide updates on project activities. - Traffic and Parking management plan should be developed.				

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		- Develop and implement a code of conduct for security personnel to ensure that security personnel are screened for implication in past abuses including Gender Based Violence (GBV) and adequately trained in the use of force and appropriate conduct toward the public and workers. The code of conduct will also include procedures to report incidents, for affected people to raise related grievances, for incident investigations. The code of conduct will also indicate that the contractor does not sanction use of force in relation to the project except preventive and - defensive purposes in proportion to the nature and extent of the threat. A contingency plan involving the highway authorities as immediate measures to mitigate risk associated with accidental spills during BMW transportation and subsequent contamination of soil/ water bodies/ human health etc. from the vehicles carrying biomedical waste needs to be provided. - In case chlorine gas or liquid storage is proposed safety provisions shall be as per guidelines. To avoid risks and hazards to staff and workers at WTP and general public around in case of chlorine gas leakage by accident, the contractor/concerned authority should prepare OHS plan during O&M, including emergency response procedures for chlorine gas leakage, chemical spill, fire, earthquake, etc. Handling and storage chemicals should be in accordance with the Material Safety Data Sheet. Also, prepare and				

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Item/Components	Potential Concerns / Impacts	Mitigation, Management and Enhancement Measures	Means of Verification/ Monitoring Procedure	Timelines/ Frequency of Monitoring	Responsibility	
					Implementation	Supervision
		implement the safety procedures of handling chlorine based on national and international standards such as the World Bank's Group General EHS Guidelines and EHS Guidelines for Water and Sanitation, pollution control board guidelines, precautions mentioned in Chapter 8 of the CPHEEO Manual on Water Supply and Treatment etc.				
Note: Additional measures (including permits/clearances) as mandated by any regulatory bodies (if any) time to time and/or conditions precedents of permits/clearances should also be implemented by Contractor/PMC during their engagement period and AHIDMS in addition to mitigation measures as suggested in the EMP.						

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D. Environmental Inspection and Monitoring

13. Environment safeguards monitoring will include (i) project readiness monitoring, to be conducted by the EHSO who is included in the team of the project management consultant firm, engaged under the project; and (ii) environmental monitoring conducted by PMU with assistance of the EHSO. Monitoring and reporting arrangements defined for this project are described below.

14. **Assessment of project readiness.** Before construction, the EHSO will assess the project's readiness in terms of environmental management based on a set of indicators (**Table EMP-3**) and report it to ADB and PMU. This assessment will demonstrate that environmental commitments are being carried out and environmental management system (**Table EMP-3**) are in place before construction starts, or suggest corrective actions if the project readiness indicators cannot satisfy.

Table EMP-3: Project Readiness Assessment Indicators

Indicator	Criteria	Assessment
EMP update	The EMP updated after detailed design, and approved by ADB	Yes No
Environmental supervision in place	EHSO is in place and has trained environment consultants	Yes No
	Environment officer assigned by PMU (PMU-EO)	Yes No
Compliance with loan covenants and assurances	The borrower complies with loan covenants related to project design and environmental management planning	Yes No
Public involvement effectiveness	Meaningful consultation completed; construction activities publicized at construction sites	Yes No
	GRM established with entry points publicized	Yes No
Chinese version EMP distributed to all parties	EMP translated and distributed by PMU	Yes No
Contracts with environmental safeguards	Bidding documents and contracts incorporating the environmental activities and safeguards listed as loan assurances	Yes No
Site construction planning (environmental)	Site-EMP prepared for each work site by the contractors and cleared by the implementing agency	Yes No
EMP financial support	EMP budget established, and required funds set aside for EMP implementation by each implementing agency	Yes No

ADB = Asian Development Bank, EMP = environmental management plan, PMU = project management unit, GRM = grievance redress mechanism, EHSO = environmental, health and safety officer of PMC.

15. **Environmental quality monitoring by laboratory**. The implementing agency will contract a local authorized environmental monitoring laboratory to conduct environmental quality monitoring in accordance with the monitoring plan (**Table EMP-4**). Monitoring will be conducted during construction and operation period, until a project completion report is issued. Quarterly monitoring results will be prepared by the environmental monitoring laboratory and submitted to PMU.

16. **Environmental monitoring and reporting.** The EHSO will review project progress and compliance with the EMP based on field visits, and the review of the environmental impact monitoring conducted by the environmental monitoring laboratories. The findings of the EHSO will be reported to ADB through the semiannual environmental monitoring report and quarterly project progress reports. The reports will include (i) progress made in the EMP implementation; (ii) overall effectiveness of the EMP implementation (including public and occupational health and safety);(iii) environmental impact monitoring and compliance with allowable emission limits; (iv) institutional strengthening and training; (v) public consultation (including GRM); and (vi) any problem encountered during construction and operation, and the relevant corrective actions undertaken. The EHSO will help PMU prepare the reports and submit the English report to ADB for appraisal and disclosure.

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Table EMP-4: Environmental Monitoring Plan

Sl. No.	Key Indicators	Monitoring Parameter	Period & Frequency	Location	Sampling Size	Implementation Responsibility	Supervision Responsibility
Pre Construction Phase (baseline monitoring)							
1.	Ambient air quality	Measurement of PM10, PM2.5, SO2, NOx, CO	Once at 4 locations (except monsoon)	Upwind, downwind and cross wind locations	4 nos	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
2.	Ambient noise quality	Measurement of Noise Pressure Level in dB(A)	Once at 4 locations (except monsoon)	Upwind, downwind and cross wind locations	4 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
3.	Ground water quality and drinking water	Key Physicochemical and biological parameters as per IS 10500 (2012)	Once at 2 locations (except monsoon)	Upslope and downslope locations	2 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
4.	Surface water quality	Key Physicochemical and biological parameters as per IS: 2296 Specifications/ CPCB criteria	Once at 2 locations (except monsoon)	upstream and downstream of flowing waterbody and 1 location in case of stagnant water body	3 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
5.	Soil quality	Soil parameters viz. pH, SAR, Water holding capacity, Organic matter, Conductivity, Organic Carbon, Nitrogen, Phosphorous, Potassium Alkalinity, Acidity, heavy metals, trace metals, Alkalinity, Acidity.	Once at least at 2 locations	prefer ably near the treated effluent discharge points	2 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
Construction Phase (assuming 48 months including 6 months demolition)							
6.	Ambient air quality	Measurement of PM10, PM2.5, SO2, NOx, CO	Once in each season at 4 locations (except monsoon)	upwind, down wind and cross wind locations	48 nos	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
7.	Ambient noise quality	Measurement of Noise Pressure Level in dB(A)	Once in each season at 4 locations (except monsoon)	upwind, down wind and cross wind locations	48 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
8.	Ground water quality and drinking water	Key Physicochemical and biological parameters as per IS 10500 (2012)	Once in each season at 2 locations (except monsoon)	Upslope and downslope locations	24 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU

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Sl. No.	Key Indicators	Monitoring Parameter	Period & Frequency	Location	Sampling Size	Implementation Responsibility	Supervision Responsibility
9.	Surface Water quality	Key Physicochemical and biological parameters as per IS: 2296 Specifications/ CPCB criteria	Once in each season at 2 locations (except in monsoon)	Upstream and downstream if flowing water body and 1 location in case of stagnant water body	36 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
10.	Soil quality	Soil parameters viz. pH, SAR, Water holding capacity, Organic matter, Conductivity, Organic Carbon, Nitrogen, Phosphorous, Potassium Alkalinity, Acidity, heavy metals, trace metals, Alkalinity, Acidity.	Once in each season at least at 2 locations (except in monsoon season)	Preferably near the treated effluent discharge points	24 nos.	Contractor through NABL accredited/ MoEF&CC registered monitoring laboratory	PMC, PMU
11.	EHS audit	Regulatory compliances, performance against EMP	6 Monthly per site	Project Site and associated areas	48	Contractor through external authorized auditor	PMC, PMU
12.	Tree cutting/ green area development	Record of tree felling (if applicable) and plantation; plantation within premise or any other suitable areas in discussion with concerned authority. Species survival rate	Quarterly	Project Site and associated areas	8 times	Contractor	PMC, PMU
13.	Traffic safety arrangements	Traffic management plan, visual observation; consultation with contractor	Regularly during construction phase	Project Site and associated areas	Continuous	Contractor	PMC, PMU
14.	Accidents	records of all types of accidents, near miss records during construction period.	Regularly during construction phase	Project Site and associated areas	Continuous	Contractor	PMC, PMU
15.	Records of Grievance	All pertinent to EHS underperformance/ concerns	Regularly during construction phase	-	Continuous	Contractor	PMC, PMU
Operation Phase (assuming 3 years)							
16.	Ambient air quality	Measurement of PM_{10}, $PM_{2.5}$, SOx, NOx, CO	Yearly basis at 2 locations except in monsoon season	Upwind and downwind near facility premises	6 Nos	PMU	AHIDMS
17.	Ambient noise quality	Measurement of Noise Pressure Level in dB(A)	Six monthly basis 2 locations except in monsoon season	Near facility premises	12 nos.	PMU	AHIDMS

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Sl. No.	Key Indicators	Monitoring Parameter	Period & Frequency	Location	Sampling Size	Implementation Responsibility	Supervision Responsibility
18.	Ground water quality and drinking water	Key Physicochemical and biological parameters as per IS 10500 (2012)	Once in each season at least at 2 locations except in monsoon season	Near facility premises and nearby village	18 nos.	PMU	AHIDMS
19.	Surface water quality (depending on availability)	Key Physicochemical and biological parameters as per IS: 2296 Specifications	Once in each season at least at 2 locations except in monsoon season	Prefer ably near the treated effluent discharge points	18 Nos	PMU	AHIDMS
20.	Soil quality	Soil parameters viz. pH, SAR, Water holding capacity, Organic matter, Conductivity, Organic Carbon, Nitrogen, Phosphorous, Potassium Alkalinity, Acidity, heavy metals, trace metals, Alkalinity, Acidity.	Once in each season at least at 2 locations except in monsoon season	Prefer ably near the treated effluent discharge points	18 Nos	PMU	AHIDMS
21.	Waste water from Inlet and treated water from outlet of ETPs cum STPs	The parameters as suggested under BMW rules 2016. EPA 1986, NGT order and its subsequent amendments	Daily if not defined otherwise by regulations	ETP & STPs	Continuous	STP/ETP operating agency	
22.	Treated STP / ETP water at end use location	The parameters as suggested under BMW rules 2016. EPA 1986, NGT order and its subsequent amendments	Once in each season at 2 discharge locations except in monsoon season	Discharge points s (number to be increased in case there are more discharge points)	18 Nos.	PMU	AHIDMS
23.	EHS audit	Regulatory compliances, performance against EMP	Half Yearly		6 times	PMU through external authorized auditor	HIDMS
24.	Green area maintenance	Survival of planted trees	Quarterly		12 times	PMU	AHIDMS
25.	Air emissions & odor monitoring at STP/ETP	H2S shall not exceed in ambient air; - 7 µg/m3 (30-minute averaging period) - 150 µg/m3 (24- hour average)	03 points Quarterly once throughout the operation phase As and when	Downwind direction wet well/ raw sewage inlet or near STP/ ETP STP, near hospital and near hostel/ community residents etc.	36	PMU	AHIDMS

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Sl. No.	Key Indicators	Monitoring Parameter	Period & Frequency	Location	Sampling Size	Implementation Responsibility	Supervision Responsibility
		Methane exposure limit shall not be beyond – 1000 ppm for 8 hours Chlorine exposure limit shall not be beyond – 0.4 µg/m3 Ammonia exposure limit shall not be beyond – 400 µg/m3 for 24 hours **(**As per World Bank General EHS Guidelines; thresholds specified by the National Institute for Occupational Safety & Health (NIOSH); and NAAQS, 2009).	required based on public complaint s (throughout the operation phase)				

ADB = Asian Development Bank, PMC = project management consultant, SPCB = State Pollution Control Board, EMP = environmental management plan, GRM = grievance redress mechanism, PMU = project management unit, EHSO = environmental, health and safety officer of PMC, SS = suspended solids.

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E. Environmental Reporting

17. The executing agency will provide ADB with project quarterly progress reports in a format consistent with ADB's project performance reporting system, including (i) progress achieved by output as measured through the indicators' performance targets, (ii) key implementation issues and solutions, (iii) updated procurement plan, and (iv) updated implementation plan for the next 6 months; and (v) a project completion report within 6 months of physical completion of the project.

18. The environmental section of quarterly project progress reports and semiannual environmental monitoring reports will present the EMP implementation status, results of inspections conducted by PMU-EO, problems encountered during construction and operation, if any, and the relevant corrective actions undertaken. The semiannual environment monitoring report will be compiled by the EHSO, on behalf of PMU, and be disclosed on ADB website. The effectiveness of the EMP implementation and public satisfaction to the solutions of environmental concerns and complaints will also be assessed in the project completion report.

19. **Table EMP-5** summarizes the reporting requirements.

Table EMP-5: Reporting Requirements

Reports	Purpose	From	To	Frequency	Disclosure requirements
Site inspection and monitoring results	Confirmation of contractors' compliance with EMP, presentation of monitoring results	Contractor, PMC	PMU	Monthly	N/A
Project progress reports (including environmental section)	General project progress, including a summary of EMP implementation	PMU	ADB	Quarterly	N/A
Environment monitoring reports	Adherence of environmental covenants and EMP, presentation of internal monitoring results	PMU, EHSO	ADB	Semi-annually (30 days of the end of reporting period) during construction and annually until project completion report	ADB website

ADB = Asian Development Bank, PMC = project management consultant, EMP = environmental management plan, PMU = project management unit, EHSO = environmental, health and safety officer of PMC.

F. Institutional Strengthening and Training

20. The capacity of the staff of PMU responsible for the EMP implementation and supervision will be strengthened. The project will address any lack of capacities and expertise in environmental management through (i) institutional strengthening, and (ii) training.

21. **Institutional strengthening.** The capacities of PMU to coordinate environmental management will be strengthened through the following measures:

(i) The appointment of a staff member within PMU (PMU-EO) in charge of the EMP coordination, including GRM.
(ii) The appointment of national environmental, health and safety officers under the PMC (the EHSO) to guide PMU in implementing the EMP and ensuring compliance with ADB SPS.
(iii) PMU to conduct regular site inspections and coordinate local environment monitoring agencies periodic reports.

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22. **Training**. The implementing agency, PMU, and contractors will receive training in the EMP implementation, supervision, and reporting, and on the GRM. (**Table EMP-6**). Training will be facilitated by the PMC EHSO, with the support of other experts under the loan implementation consultant services. A budgetary provision of $10,000 has been made for the same.

Table EMP-6: Training Program - Summary of Training Needs

Training Topic	Summary of Training Purpose and Content	Recipients/ Participants	Frequency or Target Date
Induction to EMP	Overview of EMP, including site information, pollution risks and controls, and programs; and preparation of site-EMPs and training on implementation to staff of contractor(s)	IA, PMU, contractor, and PMC	At beginning of construction for each site
Review of EMP, and refreshers' training on EMP	EMP monitoring, supervision, reporting, procedures, and review of EMP, including new changes and updates	IA, PMU, contractor, and PMC	1 year after project start or more frequently if required
GRM	GRM roles and responsibilities, and procedures	IA, PMU, contractor, and PMC, and other stakeholders	Once prior, and once the first year of project operation
Environmental aspects of facilities operation	Sludge treatment and disposal process; occupational and community health and safety; and storage, transportation, and disposal of medical waste. (A series of training modules on good practices in health care waste management of WHO can be referred).[a]	IA, and facility operators	Once at first year of operation, and yearly after
Emergency preparedness and response drill	Organize drill on emergency conditions such as fire, natural disaster, epidemic, explosion, etc.	IA, and facility operators	Once at first year of operation, and yearly after

CSF = construction supervision firm, EMP = environmental management plan, PMO = project management office, GRM = grievance redress mechanism, WHO = World Health Organization, PIA = project implementing agency.

[a] https://www.who.int/water_sanitation_health/facilities/waste/training_modules_waste_management/en/

G. Consultation, Participation, and Information Disclosure

23. Information disclosure and public consultation relating to environment safeguards will continue throughout project implementation. The project's environmental information will be disclosed by the SPCB/SEIAA and ADB as follows:

(i) The project IEE will be disclosed on the project website at https://www.adb.org/.
(ii) The domestic EIA will be disclosed on the website of SPCB/SEIAA.
(iii) All environmental monitoring reports during project implementation will be available at https://www.adb.org/.
(iv) The project information and GRM entry points will be disclosed on the information board of each construction site (in Assamese).

24. An indicative consultation plan has been developed (Table EMP-7) to instruct PMU to organize meaningful consultation throughout project implementation. The cost for these consultations will be borne by PMU under project monitoring cost.

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Table EMP-7: Public Consultation Plan

Organizer	Format	No. of Times	Subject	Attendees
Pre-construction phase				
PMU	Public consultation workshop and site visit	Once before construction commences	Introduce the project activities, proposed mitigation measures, entry points of the GRM	Residents adjacent to project sites
Construction phase				
PMU	Public consultation workshop and site visit	Once each year during construction	Adjusting of mitigation measures if necessary; construction impact; and comment and suggestion	Residents adjacent to project sites
Operation stage				
PMU and facility operator	Public consultation workshop and site visit	Once in the first year	Effectiveness of mitigation measures, impacts of operation, comments and suggestions	Residents adjacent to project sites

GRM = grievance redress mechanism, PMU = project management unit.

25. PMU shall announce the time, place, theme, and registration method of the meeting to the public through the website and post announcements in places where the public can easily be informed 2 weeks prior to the meeting. PMU shall disclose the minutes and measures to address the public concerns truthfully to the public through the website, , community posters, etc., within 5 working days after the consultation forum.

H. Environmental Management Plan Cost Estimates

26. The budget for implementing EMP measures in this project is $4.290 million. The details of estimated EMP costs are specified in **Table EMP-8**.

27. The costs of building and maintaining infrastructure systems included in the infrastructure construction and operating costs, and therefore, are not to be double counted as part of the EMP costs. Those that are temporary measures particularly during the construction stage, such as dust suppression, use of quiet/low-noise powered mechanical equipment, etc., will need to be included in the tender documents, otherwise they are not budgeted by the contractor, and they will not be done. The cost for implementing these measures is included in the EMP.

Table EMP-8: Cost Estimates for EMP Implementation and EMS Capacity Building

Item	Unit cost ($)	Total ($ million)	Source of Funds
Environmental protection during construction works (calculated based on the floor area and cost of civil works): - Erosion control - Dust and noise control - Waste management - Site safety, traffic management	GMCH	2.00	Works contractors
	SSUHS	1.50	
EMP and GRM training	Lump sum	0.015	PMU through PMC firm package
EHSO: national 5 experts for 42 person-months, including consultant fees, travel costs)	2,500/month	0.525	PMU through PMC firm package
Environmental quality monitoring	LS	0.250	Implementing Agency counterpart fund
Total ($ million)		**4.290**	

EMP = environmental management plan, GRM = grievance redress mechanism, PMU = project management unit, PMC = project management consultant.

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Appendix 2: Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Safeguards Division (SDSS) for endorsement by Director, SDSS and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's: (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: IND (59241-001): Assam State Tertiary Healthcare Augmentation Project

Sector Division: SD3-HSD

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING AREAS:			The redevelopment and renovations of existing hospital buildings and new building construction will be located on various sites located within existing urban areas. These are all located near the cities/townships centers and not within, or adjacent to, any natural protected areas.
▪ Underground Utilities	X		Underground utilities are likely to be present.
▪ Cultural Heritage Site		X	No cultural heritage sites were identified at this moment. The draft project proposal confirmed that the facilities are not within, or adjacent to, cultural heritage sites. However, chance find procedure will be included into construction contracts.
▪ Protected Area		X	Subprojects are all located near cities /townships centers and not within, or adjacent to, any natural protected areas.
▪ Wetland		X	
▪ Mangrove		X	
▪ Estuarine		X	
▪ Buffer Zone of Protected Area		X	Subprojects are all located near cities /townships centers and not within, or adjacent to, any natural protected areas.
▪ Special Area for Protecting Biodiversity		X	
▪ Bay		X	

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B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
▪ Encroachment on historical/cultural areas?		X	All works will be done within the premises of existing buildings.
▪ Encroachment on precious ecology (e.g. sensitive or protected areas)?		X	All works will be done within the premises of existing buildings.
▪ Impacts on the sustainability of associated sanitation and solid waste disposal systems?	X		Minimal. All subprojects are located adjacent to the cities/townships centers covered by municipal waste collection and disposal systems as well as municipal wastewater collection and treatment systems, and the project's impact on the sustainability of these systems will be minimal. Biomedical waste generated during operation will be transported and disposed in existing common biomedical waste management facility operating under Assam Pollution Control Board authorization.
▪ Dislocation or involuntary resettlement of people?		X	Renovations and construction of facilities will be restricted to existing hospital and medical College facilities acquired.
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples, or other vulnerable groups?		X	Not anticipated.
▪ Accident risks associated with increased vehicular traffic, leading to loss of life?	X		An increase of traffic during redevelopment and new building construction activities is anticipated. Contractors will be required to ensure traffic safety around project sites.
▪ Increased noise and air pollution resulting from increased traffic volume?	X		The project will increase traffic volumes during redevelopment and new building construction activities and operation.
▪ Occupational and community health and safety risks?	X		Occupational H&S: This is anticipated. Subproject facilities will produce additional biomedical waste and wastewater than original existing facilities. However there are enough facilities and capacity in the state for safe and proper disposal of medical waste. Community H&S: The project will promote barrier-free, universal design of project facilities. Emergency preparedness and response planning (to respond to earthquakes, fires and other disasters) will be incorporated during project design.
▪ Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		Occupational health and safety concerns mainly related to physical hazards during redevelopment and new building construction works on existing medical college and hospital facility sites. Sound site management and site safety supervision will reduce the risk to minimum level.

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▪ Generation of dust in sensitive areas during construction?	X		The impact can be mitigated through sound practices during redevelopment and new building construction works inside of existing medical college and hospital facility sites. Contractors will be required to implement dust control measures to avoid excessive dust generation during the redevelopment and construction.
▪ Requirements for disposal of fill, excavation, and/or spoil materials?		X	Disposal of fill, excavation and spoil material will be carried out in accordance with national guidelines and with prior approval of the government.
▪ Noise and vibration due to blasting and other civil works?		X	Blasting is not anticipated. Ambient noise is likely to increase due to construction activities but their occurrence will be intermittent and co-terminus with the project construction. All stationary noise making equipment will be installed with acoustic enclosures.
▪ Long-term impacts on groundwater flows as result of needing to drain the project site prior to construction?		X	Not anticipated
▪ Long-term impacts on local hydrology because of building hard surfaces in or near the building?		X	Not anticipated
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Each project facility is localized and within cities township and township centers with adequate access to social services. Water supply, wastewater collection and treatment, and solid waste collection and disposal will not be significantly affected.
▪ Social conflicts if workers from other regions or countries are hired?		X	Work contracts will stipulate priorities to (i) employ local people for works, (ii) ensure equal opportunities for women and men, (iii) pay equal wages for work of equal value.
▪ Risks to community safety caused by fire, electric shock, or failure of the building's safety features during operation?		X	Minimal risk. Facilities are designed for vulnerable people with limited mobility, orientation challenges and in weak health. Special levels of safety and cleanliness is emphasized in design and operation. As well, all buildings will comply with the India's standards and codes pertaining to building energy-efficiency and safety as well universal design principles.
▪ Risks to community health and safety caused by management and disposal of waste?	X		All facilities are located adjacent to the cities/townships centers covered by municipal waste collection and disposal systems. Additional amounts of biomedical waste compared to the current original existing buildings during operation will be anticipated and those will be transported and disposed in existing biomedical waste management facility (Fresh Air Common Bio Medical Waste Treatment Facility) operating under Assam Pollution Control Board authorization.

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▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	Not anticipated

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: INDIA: Assam State Tertiary Healthcare Augmentation Project

Sector : Human and Social Development Sector

Subsector: Health Infrastructure

Division/Department: SARD

Screening Questions		Score	Remarks[51]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather- related events such as floods, droughts, storms, landslides?	1	
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	1	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g., prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g., construction material)?	1	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	1	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g., annual power production) of project output(s) (e.g., hydro-power generation facilities) throughout their design lifetime?	1	

[51] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

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Appendix 2

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high-risk project.

Result of Initial Screening (Low, Medium, High) : Medium

Other Comments: The proposed project is exposed to extreme rainfall and flood risks at the same levels as the entire Guwahati City. The proposed interventions will address localized flooding through the formation of higher ground elevation (the project area, being one of the oldest was overtaken by surrounding land developments and lower elevation) and larger cross drains. The building construction, conforming to green design will be able to handle extreme hot ambient temperatures. The entire project improves the climate resilience of the entire region by providing better health care.

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Appendix 2

Attachment 1: Contractor's Site-Specific Environmental Management Plan

India: Assam State Tertiary Healthcare Augmentation Project

1. Site-Specific Construction Environmental Management Plan (CEMP) shall be prepared by the contractor and reviewed by the PMC and approved by the PMU before the construction works are allowed to start. This requirement will be included in the construction contracts. The CEMP shall be prepared in full alignment with the final IEE and EMP, and the CEMP shall be updated consistent with any later updated version of the IEE/EMP.

2. The CEMP details the implementation of measures in accordance with the environmental requirements stipulated in the construction contract, the EMP and IEE, ADB Safeguard Policy Statement (SPS) and in applicable national environmental laws, regulations and guidelines.

3. The purposes of the CEMP are to:

- Ensure that the Contractor implements appropriate and sufficient site- specific environmental, and health and safety mitigation, labor welfare and monitoring measures as required to adequately protect the environment and human health from risks and impacts associated with the project.
- Ensure that the Contractor fully complies with all applicable environmental, health and safety safeguard requirements including in OHS, labor welfare, community health and safety, gender equality those required by the Laws and regulations of India and those required by ADB.
- Ensure that the Contractor's management and site organization include personnel with the required competence and authority to effectively implement the CEMP.
- Provide site-specific and practical environmental and health and safety control and mitigation measures, and related construction method statements designed to prevent or minimize environmental and health and safety impacts.

4. It is recommended that the CEMP (including health and safety management plan) are combined in one document. This will help to avoid unnecessary repetitions, help to prevent inconsistencies and in general make the document much easier to use.

5. The recommended structure of the CEMP is summarized below:

Part 1: General Matters:

- Introduction, presentation of the Contractor, objectives of the CEMP.
- Overview of the construction works, workforce, construction equipment and time schedule with milestones.
- Applicable environmental legislation and planning conditions,
- Contractor's organization, roles and responsibilities.
- Consents, commitments, and permissions.
- Environmental, health and safety compliance assurance procedures and programs (construction supervision, reporting and documentation, corrective actions).
- Overview of environmental quality monitoring and reporting procedures and programs.
- Occupational and community health and safety hazard assessment procedures.
- Environmental, social and health and safety training and awareness including training plans with topics and training content, trainees, trainers, frequency,

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duration, and training methods, and emergency drills.

Part 2: EMP Subplans:

Subplan 1: Demolition waste management measures.

- Description of demotion waste composition (cement concrete, bricks, mortar, wood, bamboo, GI sheet etc.).
- Collection, segregation, storage, and transportation of construction and demolition waste.
- Pollution prevention and control measures.
- Final disposal plan.

Subplan 2: Erosion and sediment control measures.

- Description of potential areas prone to erosion, mitigating measures.
- Site drainage maps (to be updated as the work progresses).
- Maps and drawings of temporary drainage structures and sediment retention facilities together with engineering calculations of hydraulic and sediment loads.
- Inspection and maintenance procedures and plans.

Subplan 3: Borrow pit and spoil management

- Documentation of approval from the relevant authorities and agreement with landowners for the proposed borrow pits and spoil disposal sites.
- Maps, layout drawings and cross sections (before and after use) with brief description of the sites and their surroundings.
- Estimated amounts (to be excavated or disposed) and type of materials.
- Documentation of testing for contamination before backfilling.
- Documenting application of the borrow pit and spoil disposal site selection criteria.
- Method statement for extraction, transport and backfilling. Description of measures to mitigate associated impacts (noise, dust, loss of habitats, erosion, sedimentation).
- Inspection, maintenance and rehabilitation plans.

Subplan 4: Solid and liquid waste management

- Description of solid and liquid waste generation, expected amounts, composition and sources.
- Procedures and schedules for documentation of waste collection, segregation, storage, recycling and disposal.
- Collection, segregation, temporary storage, treatment and disposal (incl. recipients of effluents) measures and control systems and devises.
- Maps and drawings of waste and wastewater management facilities.
- Housekeeping, inspection and maintenance.

Subplan 5: Hazardous materials and hazardous waste management

- Description of solid and liquid hazardous materials and waste use/generation, expected amounts composition and sources.
- Description of hazards and risks for each material/waste.
- Description of collection, segregation, temporary storage and labelling of hazardous waste.
- Maps and drawings of waste management facilities.
- Documentation of the use of a duly licensed hazardous waste management

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enterprise for collection, recycling/treatment and/or destruction/disposal of the hazardous waste.

- Description of hazardous materials, their use, amounts, temporary storage facilities and procedures ensuring adherence to the relevant Safety Date Sheets (to be attached in an appendix).
- Housekeeping, inspection and maintenance.
- Emergency response and clean-up procedures.

Subplan 6: Air emissions and dust control and monitoring

- Air emissions and dust generation sources, locations and mitigation plans.
- Environmental (air) quality monitoring (include sampling point description/ coordinates, maps, parameters to analyze, methods, frequency, standards.

Subplan 7: Noise and vibration control and monitoring

- Noise and vibration emission sources, locations and mitigation plans.
- Noise and vibration monitoring (include sampling point description/ coordinates, maps, parameters to analyze, methods, frequency, standards).

Subplan 8: Water quality monitoring program

- Method statement for construction of groundwater monitoring wells.
- Method statement for river crossings and intake construction work.
- Environmental quality monitoring programs for surface water and groundwater (including sampling point description/ coordinates, maps, parameters to measure/analyze, methods, frequency, standards).
- Groundwater table measurement program (well location map, method, frequency).

Subplan 9: Chance finds procedures

Part 3 Health and Safety Management Subplans

Subplan 10: Traffic management

- Construction sites access control measures.
- Description of the road construction plan/ scheme and identify timing and road sections to be partly closed
- community coordination and information measures regarding road construction activities,
- Installation of traffic signs, barriers, posting of traffic (flag) persons, and re- routing plans.

Subplan 11: Occupational health and safety.

- Occupational health and safety hazards and risks assessment.
- Measures to address the risks which document the proper application of the hierarchy of controls.
- Plans and procedures for regular follow-up hazard identification and risks assessments including the use of site and work specific checklists.
- Compliance assurance through inspection, reporting and corrective actions including procedures and tool for documentation such as the use of checklists.
- For COVID-19 measures see https://www.adb.org/publications/safety-well- being-workers-communities-covid-19.

Subplan 12: Construction workers accommodation management

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- Location map and a site layout drawing.
- Description and drawings of the labor sanitation and welfare facilities documenting compliance with ILO labor housing standards
- Expected number of workers to stay at the worker accommodation, gender segregated and room allocations.
- Security, housekeeping, cleaning and maintenance.

Subplan 13: Recruitment and labor management

- Labor data, expected number of workers (male and female) over the course of the construction period, segregated by type of work.
- Procedures and plans that document implementation of the core labor standards.

Subplan 14: Community health and safety

-
- Community health and safety concerns (including identification of the directly affected community, community consultations, and mitigation measures that will influence community health and safety) will be identified and incorporated into relevant subplans.

Subplan 15: Emergency preparedness and response

- Emergency preparedness and response responsibilities
- Identification of hazards that may lead to an emergency situation
- Identification of people at risk
- Detection, evaluation and emergency level determination
- Notification and communication
- Emergency actions
- Termination and follow-up
- Prevention and preparedness
- Training and exercises
- Emergency contacts

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