Government of Assam,
Health and Family Welfare Department
India

Preparatory Survey for the Assam Health System Strengthening Project in India

Final Report (Advanced Version)

March 2022

Japan International Cooperation Agency (JICA)

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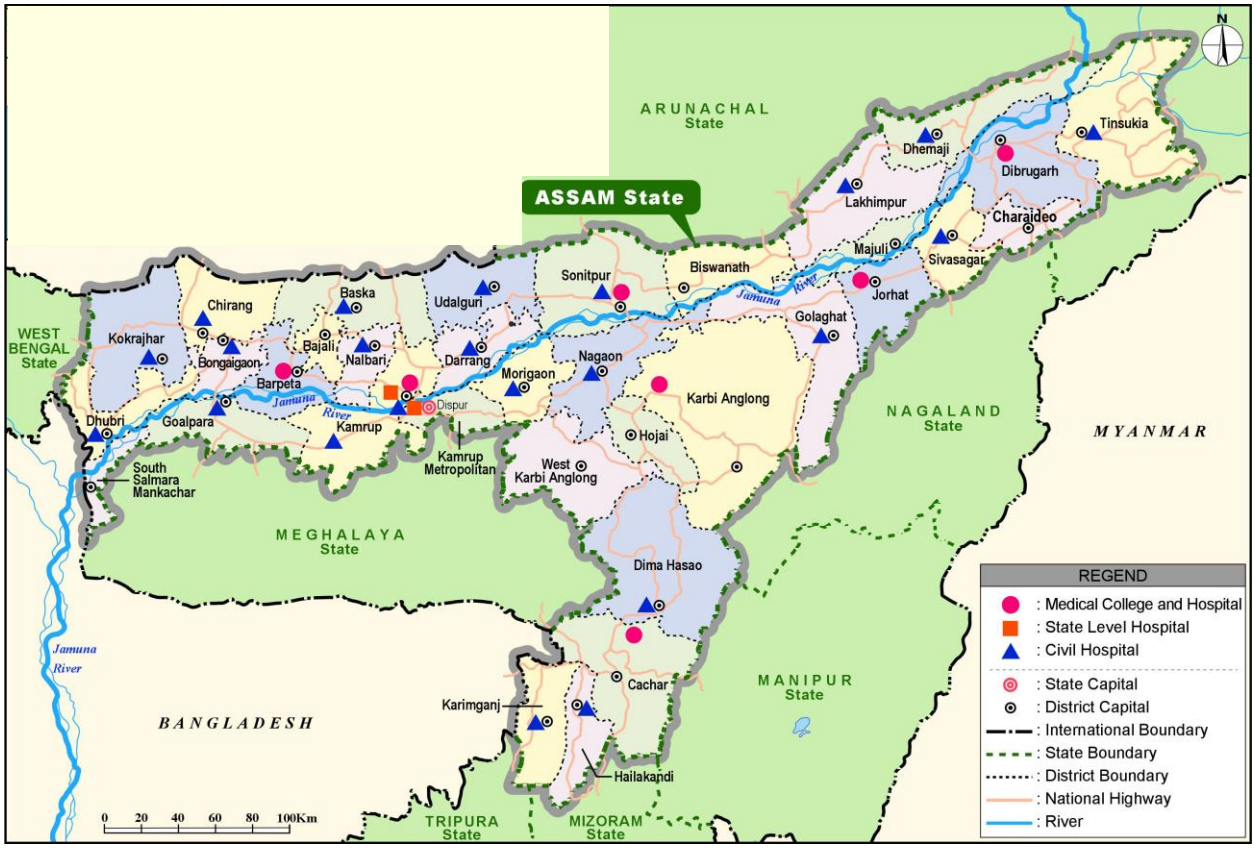

Location Map

Abbreviations and Acronyms

3D	Three Dimensions
5S	Sort, Set, Shine, Standardize, Sustain (Workplace Organization Method)
ACCF	Assam Cancer Care Foundation
ACH	Air Changes per Hour
AHMC&RI	Assam Hills Medical College and Research Institute
AIIMS	All India Institute of Medical Science
AMC	Annual Maintenance Contract
AMCH	Assam Medical College and Hospital
ANM	Auxiliary Nursing and Midwife(ry)
APWD	Assam Public Works Department
A-RAP	Abbreviated Resettlement Action Plan
ASHA	Accredited Social Health Activist
AYUSH	Ayurveda, Yoga, Naturopathy, Unani, Siddha, Sowa-Rigpa and Homoeopathy
B	Basement Floor
BPL	Below Poverty Line
BSNL	Bharat Sanchar Nigam Limited (telephone landline company)
CBR	Cost Benefit Ratio
CDH	Civil and District Hospital
CH	Civil Hospital
CHC	Community Health Centres
CHE	Current Health Expenditure
CMC	Comprehensive Maintenance Contract
CME	Continuing Medical Education
CNE	Continuing Nursing Education
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus Disease 2019
CPAP	Continuous Positive Airway Pressure
CPWD	Central Government PWD
CSR	Corporate Social Responsibility
CSSD	Central Sterile Supply Department
CT	Computer Tomography
DAC	Development Assistance Committee of the Organisation for Economic Co-operation and Development
DALYs	Disability-adjusted Life Year
DDO	Drawing and Disbursing Officer
DFW	Directorate of Family Welfare
DGCT	Digital Content Technologies
DH	District Hospital
DHS	Directorate of Health Services
DMCH	Diphu Medical College and Hospital
DME	Directorate of Medical Education
DMU	Dimapur Airport
EC	Environmental Certificate/ Executive Committee
ECG	Electrocardiogram
ECMO	Extracorporeal Membrane Oxygenation
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ENPV	Economic Net Present Value
ENT	Ear, Nose and Throat
ER	Emergency Room
ESC	Environmental and Social Considerations
ETP	Effluent Treatment Plant
FAAMCH	Fakhruddin Ali Ahmed Medical College and Hospital
FIRR	Financial Internal Rate of Return
FRU	First Referral Unit

FY	Fiscal Year
G	Ground Floor
GEM	Government e-Marketplace
GGE	General Government Expenditure
GHE	Government Health Expenditure
GMCH	Guwahati Medical College and Hospital
GNM	General Nurse Midwife(ry)
GOA	Government of Assam
GOI	Government of India
GP	General Physician
GSDP	Gross State Domestic Product
HEAJ	Healthcare Engineering Association of Japan
HEPA	High Efficiency Particulate Air
HFO	High frequency oscillation
HFWD	Health and Family Welfare Department
HIV	Human Immunodeficiency Virus
HMIS	Hospital Management Information System
ICB	International Competitive Bidding
ICT	Information and Communication Technology
ICU	Intensive Care Unit
IDS	Individual Dialysis System
IMR	Infant Mortality Rate
INR	Indian
IPD	Inpatient Department
IPHS	Indian Public Health Standards
IPL	Intense Pulsed Light
IT	Information Technology
IVR	Interventional Radiology
JICA Guidelines	JICA Guidelines for Environmental and Social Considerations
JMCH	Jorhat Medical College and Hospital
JPY	Japanese Yen
KPI	Key Performance Indicator
LCB	Local Competitive Bidding
LMICs	Lower Middle-income Countries
MBBS	Bachelor of Medicine and Bachelor of Surgery
MC	Medical College
MCH	Medical College Hospital
MCI	Medical Council of India
MEP	Mechanical, Electrical and Plumbing
MH	Model Hospital
MHFW	Ministry of Health and Family Welfare
MHRB	Medical & Health Recruitment Board
MIS	Management Information System
MM	Man-Months
MMR	Maternal Mortality Ratio
MRD	Medical Records Department
MRI	Magnetic Resonance Imaging
NABH	National Accreditation Board for Hospitals and Health Care Providers
NBC	National Building Code
NCB	National Competitive Bidding
NCDs	Non-communicable Diseases
NER	North Eastern Region
NGO	Non-governmental Organization
NHM	National Health Mission
NHP	National Health Policy
NIC	National Informatics Centre
NICU	Neonatal Intensive Care Unit
NMC	National Medical Commission
NSO	National Statistics Office

O&M	Operation and Maintenance
ODA	Official Development Assistance
OJT	On-the-Job Training
OOPE	Out-of-pocket Expenditure
OPD	Outpatient Department
OT	Operation Theatre
P/Q	Pre-Qualification
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
PCI	Percutaneous Coronary Intervention
PG	Postgraduate
PHC	Primary Health Care/ Primary Health Centre
PICU	Paediatric Intensive Care Unit
PIU	Project Implementation Unit
PMC	Project Management Consultant
PM-JAY	Health Insurance
PMU	Project Management Unit
PPP	Public and Private Partnership
PWD	Public Works Department
QC	Quality Control
QCBS	Quality- and Cost-based Selection
QMS	Quality Management System
RFP	Request for Proposal
RO	Reverse Osmosis
SBD	Standard Bidding Documents
SC	Sub Centre
SD	State Dispensary
SDCH	Sub-district/ Civil Hospital
SDGs	Sustainable Development Goals
SEIAA	State Level Environment Impact Assessment Authority
SMCH	Silchar Medical College and Hospital
SNCU	Special New-born Care Unit
SOR	Schedule of Rates
SPBC	State Pollution Control Board
SPD	Sterile Processing Department
sqm	Square meter
STP	Septic Tank / Sewage Treatment Plant
TABS	Thermo Active Building System
TB	Tuberculosis
TBC	To be considered
THE	Total Health Expenditure
TMCH	Tezpur Medical College and Hospital
TOR/ ToR	Terms of Reference
TQM	Total Quality Management
U5MR	Under-five Mortality Rate
UHC	Universal Health Coverage
UPS	Uninterruptible Power Supply
USD	United States Dollar
USG	Ultrasound / Sonography
UV	Ultraviolet
VSATS	Very Small Aperture Terminal
VSM	Value Stream Mapping
WHO	World Health Organization

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Chapter 1 Background of the Survey

1.1 Background of the Project and Purpose of the Survey

1.1.1 Background of the Project

The target area of the survey is Assam State, which is the largest state in the North Eastern Region (NER) in India accounting nearly 70% of the population of all eight states of NER. It is the third lowest in all Indian states in achieving the "Sustainable Development Goal (SDG) 3" (Ensure healthy lives and promote wellbeing for all at all ages) [NITI Aayog, 2019]. As of 12th November 2021, a total of 580,657 infected persons have been confirmed for coronavirus disease 2019 (COVID-19), and the death toll has reached 1,119 [Government of Assam, 2021].

The Government of Assam (GOA) has made efforts to strengthen the primary healthcare system with the aim of achieving Universal Health Coverage (UHC) through the implementation of the National Health Mission (NHM). However, strengthening the entire medical system in terms of fostering medical personnel by medical college hospitals, preventing the outflow of human resources, strengthening the systems and operations of secondary and tertiary medical institutions, renewing aging facilities and equipment, and strengthening cooperation between medical institutions are remaining to be major issues. In addition, the spread of COVID-19 has caused further burden on the medical institutions in the state. The project aims to improve access and quality of service for rural residents in Assam State by improving and strengthening the medical and educational institutions, focusing on core medical centres of secondary and tertiary medical institutions.

Also, GOA formulates a policy on reducing the out-of-pocket expenditure (OOPE) for the use of healthcare services. These include free medicines, free cardiac surgery for children, compensation for the poor, and a reduction in the number of visits to private institutions by improving the quality of public medical facilities. The utilisation rate of public medical institutions is 50.6%, which is higher than the national average of 32.5%, especially in the rural areas [NSO, 2020]. There is a large disparity in service provision and health situations in Assam, and in the tea plantation area, where 20% of the population lives, as doctors are not stationed in half of the healthcare facilities [The Enterprise of Healthcare, 2019]. In addition, the three districts along the Brahmaputra River, where 10% of the population lives, are in the bottom 20 health rankings of the Aspiration District Program [NITI Aayog, 2018].

The population has increased by 14% from 2011 to 2019, but expansion of the system of healthcare service provision has not caught up, and the number of doctors per 100,000 population is 40.3, which is far below the national average (79.7) [WHO, 2016]. To keep the high-quality human resources in the public medical institutions, it is important to improve the working conditions and environment that enables a continuous study of knowledge and skills, but existing facilities and equipment of public hospitals are aging and not attractive environments for healthcare professionals.

In addition, the spread of COVID-19 infection has caused further burden on medical institutions, and there is a strong demand for system strengthening from the perspective of infectious disease control. For these

reasons, this project is important in the health sector of India and Assam and will greatly contribute to the realisation of UHC.

In this circumstance, "the Assam Health System Strengthening Project" has been formulated, which aims to improve the abovementioned situations, strengthen the functions of medical institutions focused on tertiary hospitals which are core medical centres, remedy the medical burdens, and create an environment where residents in Assam State can access equally to necessary medical services.

The background and significance of this project are shown in Figure 1-1.

Background

- Inadequate and/or aging facilities / equipment / management system, paper-based medical information system, inadequate patient flow, and hygiene management system.
- Issues on excessive patient concentration in the tertiary medical institutions, limited capacity in secondary and tertiary medical institutions, need for use of the public medical institutions by low-income group, long patient waiting times, and inadequate advanced medical service provision and hospital management.
- Issues on strengthening the cooperation among hospitals in the area and improvement of the referral system.
- There is a program by GOA to strengthen the primary care system. However, strengthening the entire medical system and rending the medical burden by strengthening the operation and management capacity of secondary and tertiary medical institutions, and strengthening cooperation among medical institutions, are remaining issues.
- With the spread of COVID-19, it is necessary to strengthen the system from the viewpoint of infectious disease control.

Significance

It is an important project in the health sector of India and Assam as the project aims to improve access to public medical services and quality medical services for rural residents, through the improvement of secondary and tertiary medical institutions, which are core medical centres.

Source: JICA Survey Team

Figure 1-1 Background and Significance of the Project

The healthcare issues facing Assam State are essential but improving only the hardware cannot solve those issues in a short period. It is also difficult to start interventions in all areas of the state at once to solve those issues. Therefore, this project focuses on the "establishment of model project that enables the Indian side to develop horizontally through self-efforts (see following box).

- Developing an environment that can ensure qualified medical personnel (Regarding the quantitative expansion, the construction of medical colleges is in progress; therefore, the project will develop an environment where high-quality clinical education can be provided in medical college hospitals).
- Strengthening cooperation between secondary and tertiary level medical institutions (establishment of referral systems, system of dispatch the doctors, provision of technical guidance and training, etc.)

1.1.2 Purpose of the Survey

The purpose of the survey is to collect and analyse necessary information for evaluation in the implementation of the project under the Japanese yen loan scheme. Such information includes but not limited to the background, objectives, outline, cost, implementation agency, management and maintenance structure of the project, and the consideration of social and environmental aspect.

1.2 Outline of the Project

1.2.1 Objectives of the Project

This project aims to strengthen the healthcare system in Assam State by strengthening the functions of medical institutions and educational/ human resource development institutions, which are core medical centres of secondary and tertiary medical institutions (medical college hospitals).

1.2.2 Outline of the Project

(1) Strengthening medical institutions (facilities, equipment)

1) Improvement of existing tertiary medical institutions (medical college hospitals) and provision of related equipment.
2) Improvement of existing secondary medical institutions and provision of related equipment.

(2) Strengthening the capabilities of medical professionals.

(3) Strengthening the organisational and management capabilities for provision of the medical services.

(4) Consulting service including design development, tender assistance, supervision for construction and equipment work, and capacity development.

1.2.3 Survey Area

The target survey area is Assam State, India.

1.2.4 Responsible Ministry / Implementing Agency

Government of Assam, Health and Family Welfare Department (HFWD)

Chapter 2 Appropriateness of the Project

The survey has been conducted by desktop research, direct observations to health facilities, direct and virtual interviews with Assam stakeholders, as well as a sub-contracted survey on seven medical college hospitals, selected civil/district hospitals, and primary health facilities. The sub-contracted survey included outline of medical facility and equipment, management status, as well as satisfaction of health personnel and patients. The survey targeted seven medical college hospitals (MCHs), which were included in the terms of reference (TOR) of the survey, and six civil/district hospitals (CDHs) identified based on the discussion between the Government of Assam (GOA) and the Japan International Cooperation Agency (JICA) Survey Team. The detailed methodology of the subcontracted survey is described in Annex A.

2.1 Healthcare Sector

2.1.1 Major Policies on Healthcare Sector in India and Assam

Soon after its independence, India started formulating a health policy based on the recommendations of the Bhore Committee Report in 1946: public healthcare system, healthcare workers on the government payroll, and emphasis on limiting the need for private practitioners. The first National Health Policy (NHP) was developed in 1983 to provide primary health care (PHC) access to all citizens by 2000. Under NHP 1983, PHC networks were established by using health volunteers. However, since the mid-1990s, the private sector has rapidly expanded, and the public sector took the private model such as user charge and outsourcing of services. In 2002, the second NHP was formulated with the goals of delivering health services to the general population through decentralisation, utilisation of private sector, and increase in public healthcare spending. Also, utilization of alternative medicines such as Ayurveda was emphasised. In this era, disease structure had been changed; while maternal and child health was improved, non-communicable diseases (NCDs) increased health and financial burden [Gauttam, P, et al., 2021].

NHP 2017 is based on the principles of universality, affordability, equity, patient-centred, and quality care, inclusive partnership, pluralism, decentralisation, as well as dynamism based on the World Health Organization (WHO) “Heath in All Policies”. The priorities of NHP 2017 are summarised in Table 2-1.

Table 2-1 Priorities of the National Health Policy 2017

- Universal health coverage
  - Availability: health insurance (PM-JAY) and comprehensive primary healthcare (Ayushman Bharat)
  - Affordability: secondary and tertiary care through partnership between public and other sectors
  - Reduction of out-of-pocket expenses
- Reinforcing trust in public healthcare system
  - Primary – comprehensive and continuum through the life
  - Secondary – strengthening of district and sub-district hospitals
- Information management
- Growth of private sector
- Prevention and health promotion

Source: [MHFW, GOI, 2017]

Table 2-2 presents the targets of NHP 2017 and key performance indicators (KPIs) of Assam for 2019-20.

Table 2-2 Targets of the National Health Plan 2017 and Key Performance Indicators of Assam 2019-20

Indicators	NHP2017	Year	Assam KPIs (2019-20)
Under 5 mortality rate (per 1,000 livebirths)	23	2025	43
Maternal mortality ratio (per 100,000 livebirths)	100	2020	192
Infant mortality rate (per 1,000 livebirths)	28	2019	34
Premature mortality from NCDs*	Reduce by 25%	2025	Reduce by 28.1%
Utilisation of public health facilities	Increase by 50%	2025	Increase by 3.9% for OPD
Antenatal care coverage	>90%	2025	97.6%
OOP in CHE			53.7%
Life expectancy	70 years	2025	(66.2 years in 2017-18)
Public health expenditure	2.5% of GDP	2025	(3.5% in 2018)

*Cardiovascular diseases, cancer, diabetes, and chronic respiratory disease

Source: [Gauttam, P, et al., 2021] [MHFW, GOI, 2017] [National Health Mission, Assam, 13 March 2019]

Progress of the flagship and priority actions from 2017 to 2021 are summarised in Table 2-3. The Government of Assam has been making great effort to increase production of medical doctors by establishing medical colleges and hospitals.

Table 2-3 Progress in Health Sector Priority Actions in Assam

	Major Progress 2017-21
Medical Education	・ Aiming at annual production of 1,200 ・ GMCH, AMCH, SMCH, JMCH, TMCH, FAAMCHG civil construction and renovation almost completed ・ New – Dhubri, Nagaon, North Lakhimpur, and Diphu (Assam Hills Medical College and Research Institute Diphu, Nagaon MC, Dhubri MC, and North Lakhimpur MC) ・ New – Nalbari, Tinsukia, Kokrajhar ・ New general nurse and midwife (GNM) and paramedical training institute at Gohpur
AIIMS Guwahati	・ Foundation works, DPR prepared and under evaluation
Nursing Education	・ Aiming at annual production of 5,000, upgrading training colleges and schools both government and private ・ ANM and GNM in rural areas incentives INR 1,500
Tea Gardens	・ Wage compensation for pregnancy period ・ 80 mobile medical units in PPP to cover 440 tea gardens ・ Health camps ・ Hospitals in PPP in 150 tea gardens
Upgrading Primary Level Facilities	・ Expansion of village health outreach programme ・ Upgrading of 5 SDH to DH, 1 new DH, and 116 model hospitals approved. ・ NHM upgrading model hospital: 94 functioning ・ Upgraded 3 SDCH to DH, 1 DH to 100 bedded DH, 1 DH to 200 bedded DH ・ Improvement some SDCH/FRU, PHCs
Volunteers	・ Financial benefits for staff working in societies INR 5 x 93 families ・ Wages for ASHA additional INR 1,000 x 31,955
Cancer Hospitals	・ GMCH-PET-CT functional, PET-MRI proposed for state cancer institute ・ Assam Cancer Care Foundation ・ State Caner Centre Guwhati (200 beds) ・ 19 cancer hospitals construction works were started
Drugs	・ Increase essential drug list from 200 to 407, make medicines available and affordable costs ・ AMRIT pharmacies (private sector) in MCHs and DHs are functioning.
Atal Amrit Abhiyan	・ Cashless scheme launched on 18 April 2018, AAA cards, hospital help desk with Arogyamitras at all DHs and MCHs, 24x7 service facilities in government and private hospitals ARM, 24x7 call centre, health camps ・ Expanded target illness ・ 52 hospitals empanelled
Samarth Assam	・ Aiming to decrease mortality of Children 0 to 6, provide infant care, birth defect registry to proper treatment and follow up children's hospital will be set up in Guwahati.

Source: [Gov of Assam, 2021]

Table 2-4 Priorities of Health and Family Welfare Department of Assam under 2021/22 Budget

- Sonali Xaishab Bikkashit Axom
  - Develop 1,000 model Anganwadi Centre with proper water supply and electricity
- 1,000 health sub-centres will be converted to hospitals (Buniyadi Swasthya Kendra: BSK)
  - Free medical consultation, diagnostics test/ medical treatment of primary diseases including diabetes, hypertension, asthma, and communicable diseases
- Priority capital projects
  - Super-specialty hospital at GMCH
  - Ongoing construction of medical colleges: Kokrajhar, Charaideo, Tinsukia, Lakhimpur, Nalbari, Nagaon, Dhubri, and Biswanath
- Proposed projects: new MCHs in Golaghat, Dhemaji, Morigaon, Bongaigaon, and Tamulpur
- Other projects
  - Blood banks: upgrade at Guwahati MCH, new with component separation units (CSU) at Lakhimpur and Nagaon MCHs
  - Increase of medical colleges to 20 to increase production of doctors and postgraduate students
  - Upgrade SDHs at Biswanath, Charaideo, Majuli, West Karbi Anglong, and South Salmara to District Hospitals
  - 100 bedded MCH wing at S.K. Roy Civil Hospital, Hailakandi District

Source: [Gov of Assam, 2021]

Table 2-5 Roles of Federal, State, and District Health Authorities

Level	Roles
Federal: Ministry of Health and Family Welfare	・ Regulatory power: health policy decisions but is not directly involved in healthcare delivery. The ministry comprises two departments: ・ The Department of Health and Family Welfare: organising and delivering all national health programs ・ The Department of Health Research: responsible for promotion of health and clinical research, development of health research and ethics guidelines, outbreak investigations, and trainings
State: Directorates of Health Services, Health and Family Welfare Department	・ Conduct healthcare activities ・ Management and monitoring of the healthcare workforce ・ Implementation of federally-funded national health programs ・ Collection of health information and statistics ・ Control of food and drug quality ・ Supervision of local healthcare entities and organisations ・ Promotion of alternative medicine practices.
District: Panchayati Raj/ Zilla Parishad (District Council)	・ Grassroots governance and administration in rural villages ・ Establishment of primary health centres

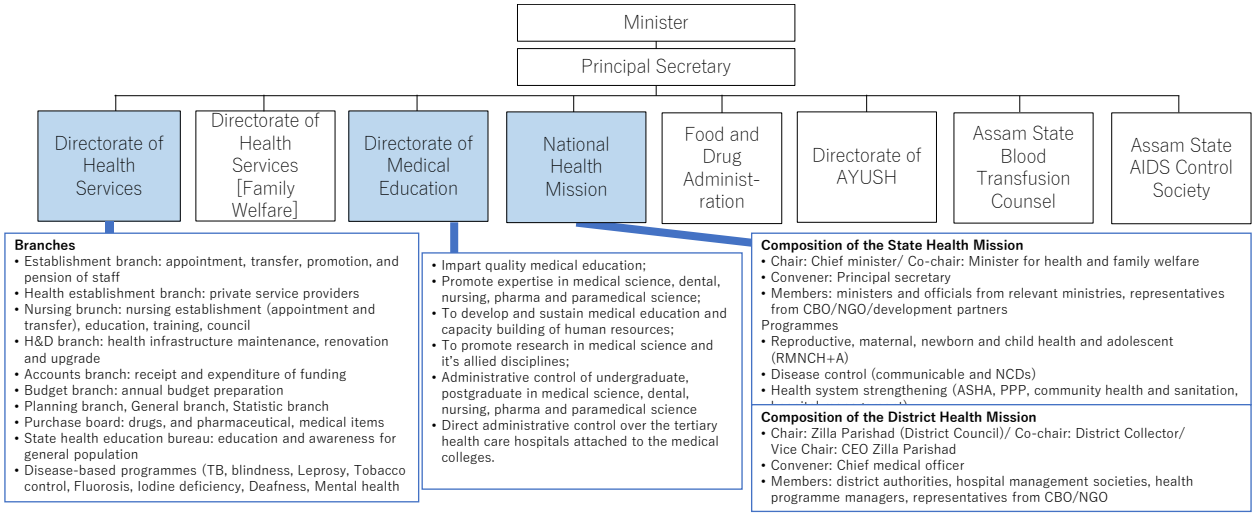
Source: [The Commonwealth Fund, 2020]

The implementation structure, the position within GOA (delegation of authority to the project), the relationship with each department, the personnel composition, and understanding the demarcation / responsibility, budget scale / execution status, etc., of the implementation agency of the GOA, Health and Family Welfare Department (HFWD) (Figure 2-1) will be clarified. Also, the consensus with the HFWD regarding the implementation system of this project will be built.

It is assumed that the Directorate of Health Services (in charge of medical institutions), the Directorate of Medical Education (in charge of medical colleges), and the National Health Mission (maternal and child health, infectious diseases, NCDs countermeasures) will be involved in the implementation of the project.

On the other hand, rationalisation of the decision-making process is important when implementing the project. Therefore, in this survey, the process of decision-making, authority, demarcation, and responsibility within the HFWD and GOA related to design, design change, procurement, construction, etc., will be scrutinised. In addition, information from other projects underway will be collected and the actual situation and issues will be confirmed.

A Project Management Unit (PMU) will be set up within the HFWD as an executing agency in implementing the project. In addition, a governing body & executive committee should be established from the perspective of state-wide management. Based on these, consensus building will be achieved for improving the efficiency of decision-making process during project implementation.



Source: [Health and Welfare Department, Assam, 2021] [Gov of India, 2021]

Figure 2-1 Organisation of Health and Family Welfare Department

2.1.2 Relevant Development Plans and Donors' Activities

In 2017, the Assam Cancer Care Foundation was established as a partnership between GOA and Tata Trusts. The foundation is planning to establish a three-level cancer grid in the state by establishing facilities that specialise in cancer treatment, strengthening chemotherapy, radiation therapy, and surgical treatment at the Department of Oncology of the medical university; as well as starting day care services at the district hospital. It will also implement programs for human resource development and raising awareness among residents.

2.1.3 Health Conditions and Disease Burden in Assam

In terms of population, Assam State is the biggest in the North Eastern Region[1], whose population accounts for nearly 70% of the region [UIDAI, 2020]. Most of the population, i.e., 86%, lives in the rural area. Table 2-6 presents the major health and relevant indicators of Assam State and India. According to the Census Organization of India, the population in 2021 is projected at 36.5 million. Population growth has shown significant gap among the states in India. Generally, it is lower in the southern part, at less than 10%, and higher in the northern part, especially the North Eastern Region. According to the recent interview [MINT,

[1] Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura

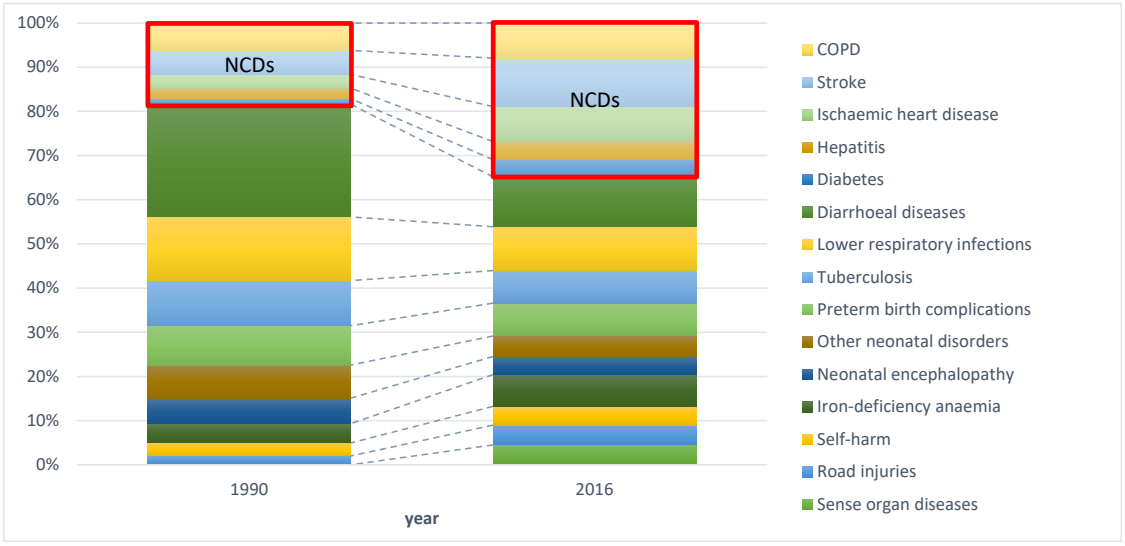
2020], institutional delivery in 2019-2020 was 91% and it could contribute to improve maternal and neonatal mortality.

Table 2-6 Major Demographic and Health Indicators of Assam and India

Indicators	Assam	India	Year
Population	31,205,576	1,210,193,422	2011
Under 14	32.8%	28.6%	2011
65 and over	4.2%	5.3%	2011
Population growth from 2001	17.07%	1.64%	2011
Sex ratio (female to 1,000 male)	958	940	2011
Life expectancy (years at birth)	66.2	69.0	2017-18
Literacy Male	77.85%	82.14%	2011
Female	66.27%	65.46%	2011
Per capita GSDP at constant prices (INR)	65,138	100,268	2011-12
Population living below national poverty line	32.0%	21.9%	2019
Maternal mortality ratio (per 100,000 livebirths)	215	113	2017-18
Neonatal mortality (per 1,000 livebirths)	32.8	29.5	2015-16
Infant mortality (per 1,000 livebirths)	47.6	40.7	2015-16
Under-five mortality (per 1,000 livebirths)	56.5	49.7	2015-16
Institutional delivery	70.6%	78.9%	2015-16
ANC by a skilled provider*	82.5%	79.3%	2015-16
Four or more ANC visits	46.4%	51.2%	2015-16

Note: *doctor, auxiliary nurse midwife, nurse, midwife, and lady health visitor
Source: [Census Organization of India, 2011], [NSO, 2019], [IIPS, 2017], [NITI Aayog, 2019]

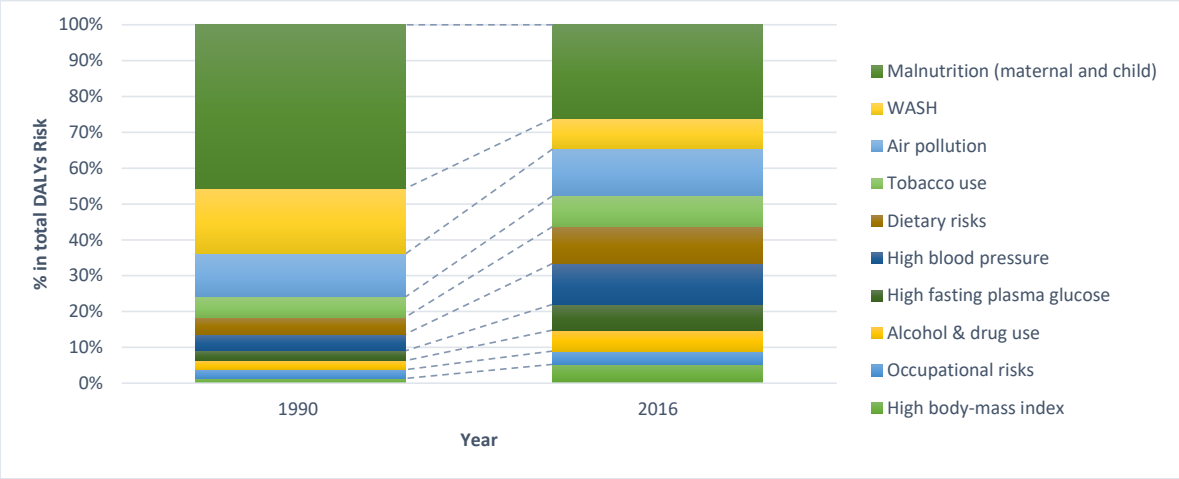
As shown in Figure 2-2, the burden of non-communicable diseases has increased from 1990 to 2016. However, diarrhoea and infectious diseases, as well as nutrition condition such as anaemia, still account for certain proportions among major causes of Disability-adjusted Life Year (DALYs). Regarding coronavirus disease 2019 (COVID-19), accumulated cases were at 219,272 and deaths were at 1,112, as of April 13, 2021. All seven medical college hospitals, a military hospital, and 15 government hospitals are designated as “COVID-19 hospitals” [Gov of Assam, 2021].



Source: [Health Data, 2017]

Figure 2-2 Change in Top 15 Causes of DALYs in Assam State, 1990-2016

As presented in Figure 2-3, nutrition condition and environmental health were major risk factors of DALYs both in 1990 and 2016; however, unhealthy lifestyles increased in 2016.



Source: [Health Data, 2017]

Figure 2-3 Contribution of Top 10 Risks to DALYs in Assam State, 1990-2016

Table 2-7 presents the comparison of estimated infant and maternal death per 100,000 population among the districts. There are six aspirational districts in the health sector selected based on maternal and child health status. Also, the health status of tea garden areas has been a concern and therefore, GOA has been making interventions to enhance health services in tea gardens [GOA and NHM Assam, 2016].

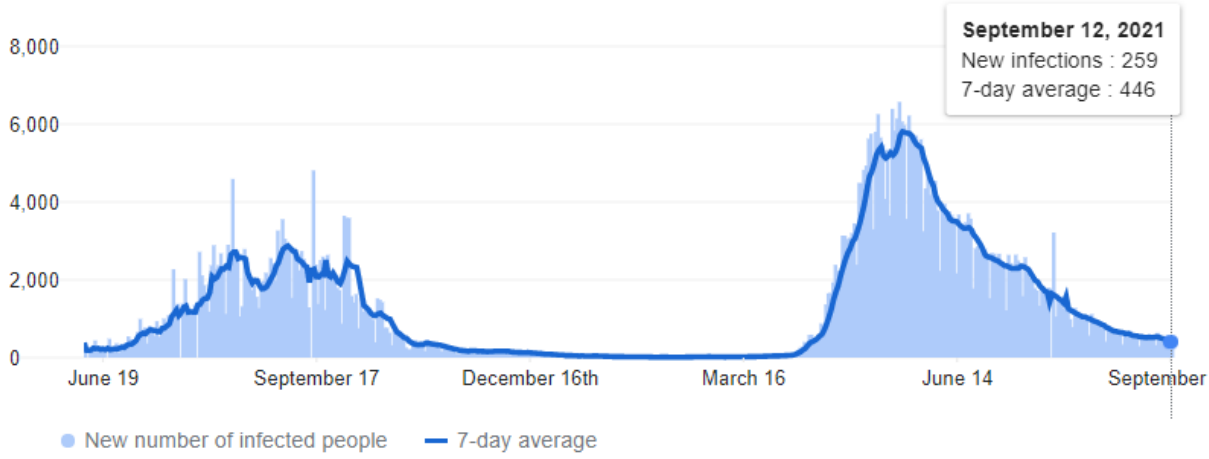
In comparison of the numbers of death per 100,000 population, the state centre, Kamrup Metro, showed the highest both in infant and maternal death. Also, in some districts in Lower Assam including Goalpara, and Kokrajhar, as well as Barak Valley including Cachar, Hailakandi, and Karimganjm, the number of infant deaths per population was higher within the state. Regarding maternal death, Chacar and Dibrugarh were also higher.

Table 2-7 Infant and Maternal Deaths in Districts in Assam (2016)

		Note		Population	Infant Death/ 100,000 Population	Maternal Death/ 100,000 Population
North	Dhemaji			686,133	31.2	1.5
	Lakhimpur		Aps	1,042,137	16.6	0.5
	Darrang			928,500	25.3	2.3
	Udalguri	Tea		831,668	12.9	1.1
	Sonitpur	Tea		1,924,110	21.4	4.1
Lower	Biswanath					
	Barpeta			1,693,622	25.0	3.5
	Bajali	Tea				
	Baksa	Tea		950,075	12.1	0.3
	Bongaigaon			738,804	29.4	2.8
	Chirang	Tea		482,162	29.0	2.7
	Dhubri			1,949,258	32.9	3.2
	South Salmara	Tea				
	Goalpara	Tea		1,008,183	49.5	3.3
	Kokrajhar	Tea		887,142	44.4	4.1
	Kamrup Metro			1,253,938	132.1	8.0
	Kamrup Rural	Tea		1,517,542	12.1	0.9
	Nalbari	Tea		771,639	10.8	0.7
Central	Dima Hasao			214,102	36.9	3.7
	Morigaon	Tea		957,423	16.7	1.0
	Karbi Anglong	Tea	Aps	956,313	21.2	2.7
	West Karbianglong	Tea				
	Nagaon			2,823,768	18.2	2.3
	Hojai		Aps			
Upper	Dibrugarh			1,326,335	22.5	6.7
	Tinsukia	Tea		1,327,929	11.9	1.2
	Jorhat	Tea		1,092,256	47.8	2.4
	Majuli					
	Golaghat			1,066,888	23.1	1.5
	Sivasagar	Tea		1,151,050	5.8	0.6
	Charaideo	Tea				
Barak Valley	Cachar			1,736,617	43.0	8.0
	Hailakandi	Tea		659,296	44.6	1.2
	Karimganj			1,228,686	64.4	2.8

Note: Districts with blank are newly separated ones.
Tea = tea garden areas, Asp = Aspirational districts
Source: [Census Organization of India, 2011]
Infant death/100,000 and maternal death/100,000 were estimated by JICA Survey Team with referring to [NHM Assam, 2021] and [Gov of Assam, 2017]

Figure 2-4 presents the number of COVID-19 infected people from 19 June to 12 September 2021. As of 13 September 2021, the cumulative number of confirmed cases were 580,657 and deaths were 5,502. From March to May 2021, the confirmed cases had increased, but getting better until September 2021.



Source: [Google, 2021]

Figure 2-4 COVID-19 Infected Cases in Assam State from 19 June to 12 September 2021

Major measures undertaken by GOA were as follows [Gov of Assam, 2021]:

- 80% of hospital beds (16,461) for isolation;
- 2,964 beds with oxygen;
- 1,151 beds for ICU (400 in Guwahati, 100 in temporary COVID hospital);
- Free treatment with food for BPL families; and
- 78 million of above age 18 have been vaccinated.

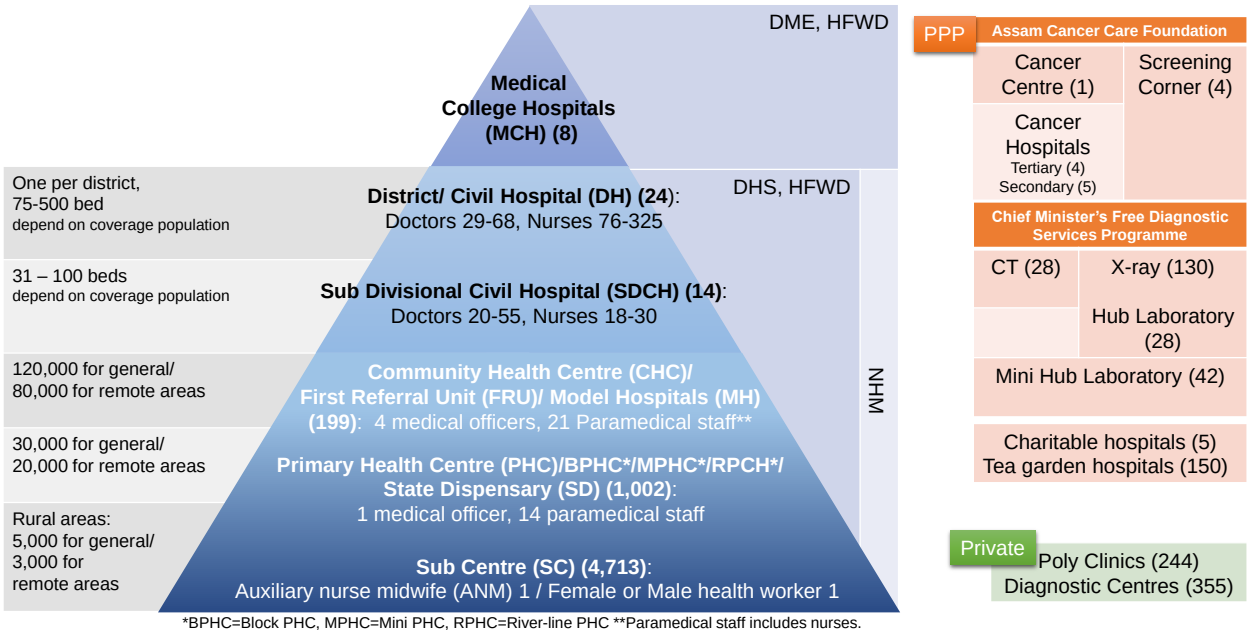
2.1.4 Medical Services and Referral System in Assam

(1) Overview

Figure 2-5 summarises the referral system in Assam State. Health service provision system could not cover the increasing population at 14% from 2011 to 2019 [The Enterprise of Healthcare, 2019]. Primary level health facilities cover more population than the national standards. The coverage population of a primary level health facility varies among districts. For example, Dima Hasao and Majuli districts seem to have enough number of primary health facilities, while community health centres in Cachar, Kamrup Metropolitan, Kokrajhar, South Salmara, and Sivasagar cover more than twice of the standard population (120,000)[2].

Patient referral should be carried out in accordance with the referral guidelines. The patients should access the nearest primary facilities, and they could be referred based on the decision of a health personnel. However, it is not strictly regulated. Then, patient could access the health facility at any level without any penalty or additional payment.

[2] Population per health facility was calculated by number of health facilities provided by JICA and population in Census 2011.



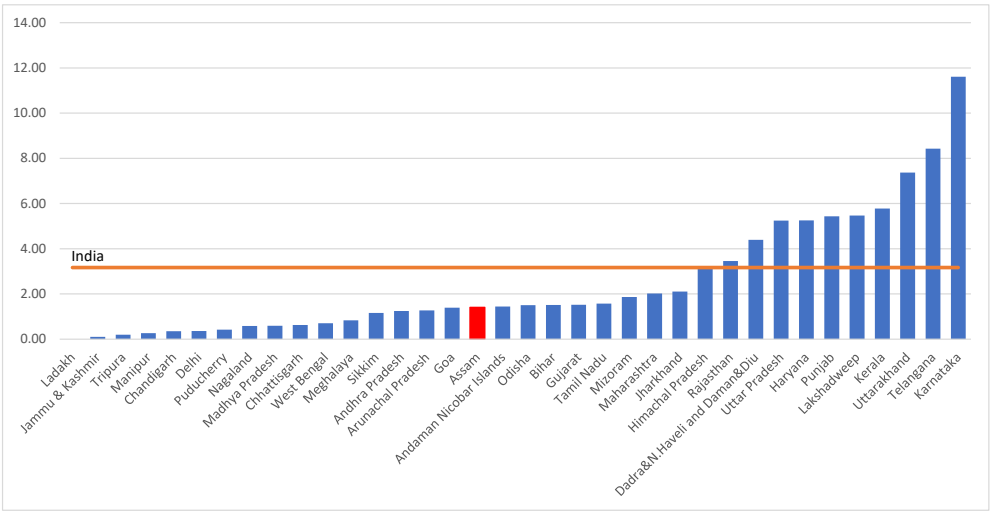
*BPHC=Block PHC, MPHC=Mini PHC, RPHC=River-line PHC **Paramedical staff includes nurses.

Source: [Census Organization of India, 2011] [MHFW, 2012] [Gwmsath Mushahary & Manjil Basumatary, June 2020] [Directorate of Economic and Statistics, 2017] [Assam Cancer Care Foundation, 2021]

Figure 2-5 Referral System in Assam State

As presented in Table 2-8, eight medical college hospitals are serving tertiary medical services and seven more hospitals are under development. In India, the number of medical colleges for 100,000 population is 0.03 on average and those are similar in the divisions in Assam. And Hojai, Karbi Along, and Dibrugarh have no secondary level hospitals (Table 2-8).

According to the HFWD of GOA [HFWD, Assam, 2018], because the number of private hospitals is also limited, many people seek tertiary care in another state. It causes high out-of-pocket expenditure (OOPE), especially for hospitalisation. As shown in Figure 2-6, the number of private hospitals per 100,000 population in Assam (1.4) is less than half of the national average (3.2).



Source: [CDDEP, 2020] [Unique Identification of India, 2020]

Figure 2-6 Number of Private Hospitals per 100,000 Population

Hospital beds per 1,000 population was 0.89 on average in Assam. Districts in Upper Assam tend to have higher beds to population ratio, while Duburi, Nagaon, and Karimganj have less than half of the state average.

Table 2-8 Health Facilities in Districts in Assam (2019)

Districts		Medical College Hospitals	Per 100,000 pop.	District Hospitals	Subdistrict Hospitals	Community Health Centres	Primary Health Centres	Sub Centres	Beds per 1,000 pop.
North	Dhemaji		0.018	1	0	4	24	98	0.67
	Lakhimpur			1	1	8	29	157	0.89
	Darrang			1	0	7	33	176	0.69
	Udalguri			1	0	7	24	150	0.68
	Sonitpur	1		1	0	7	29	148	0.71
Lower	Biswanath		0.018	0	2	3	26	141	
	Barpeta	1		1	1	11	48	264	0.72
	Bajali								
	Baksa			1	0	8	36	157	0.57
	Bongaigaon			1	0	4	29	108	0.72
	Chirang			1	0	4	24	87	1.02
	Dhubri			1	1	6	35	187	0.29
	South Salmara			0	1	2	8	51	
	Goalpara			1	0	7	37	155	0.57
	Kokrajhar			1	1	2	46	162	0.88
	Kamrup Metro	1		1	0	3	45	51	2.53
	Kamrup Rural			1	1	13	65	280	0.64
	Nalbari			1	0	11	44	122	0.74
Central	Dima Hasao		0.020	1	0	3	12	76	1.75
	Morigaon			1	0	6	34	122	0.48
	Karbi Anglong	1		0	0	6	24	104	0.64
	West Karbianglong			0	1	2	18	50	
	Nagaon			1	0	13	72	258	0.33
	Hojai			0	0	5	7	94	
Upper	Dibrugarh	1	0.034	0	0	10	31	234	1.96
	Tinsukia			1	0	8	22	166	0.65
	Jorhat	1		0	1	6	35	110	1.14
	Majuli			0	1	2	7	34	
	Golaghat			1	1	9	39	143	1.07
	Sivasagar			1	1	2	27	150	0.51
	Charaideo			0	1	2	19	70	
Barak Valley	Cachar	1	0.028	1	0	7	31	270	1.04
	Hailakandi			1	0	4	13	107	0.57
	Karimganj			1	0	7	29	231	0.43
Assam		**8**	**0.026**	**24**	**14**	**199**	**1,002**	**4,713**	**0.85**

Source: HFWD Assam, [Census Organization of India, 2011]

(2) PPP in Health Sector

In the Assam health sector, public and private partnership (PPP) is effectively applied in diagnostic services for the poor (Table 2-9) and primary health services, such as tea garden hospitals and charitable hospitals, are summarised in the box below.

Table 2-9 Chief Minister's Free Diagnostic Services Programme

Services	Start	Locations	Service Providers	Beneficiaries as of Sep. 2020
CT	May 2017	28 district/civil hospitals	Spandan Diagnostics Pvt. Ltd.	461,235
X-ray	May 2017	130 facilities including district/civil hospitals, CHC, and PHC	Krsnaa Diagnostics Pvt. Ltd.	1,372,424
Laboratory Services	Sep 2018	Hublabs in 28 district hospitals Mini hub labs in 13 subdistrict hospitals and 29 FRU/CHC	HLL Life Care Ltd.	3,239,793

Source: [HFWD Assam, 2021]

・ Charitable hospitals - Providing maternal and child health services, including immunisation, antenatal care, basic testing, delivery, outpatient services for below poverty line (BPL) families - Five hospitals in 2016/17; Assam State Government subsidies INR 1,500,000 per year
・ Tea garden hospitals (since 2007) - 2007: 50 → 2020: 150 hospitals - MoU between NHM and hospital operator: subsidisation - INR 750,000 per year - Subsidisation (INR 750,000/year) for MCH services, emergency care, referral to public facilities, communicable diseases and NCDs care, facility improvement, etc., as well as salary of doctors and paramedical staff - Essential drugs and an ambulance are provided.

Source: [HFWD Assam, 2021]

In partnership with Tata Trusts, GOA established Assam Cancer Foundation to provide cancer prevention and care services from primary to tertiary levels, as well as strengthen research capacity (Table 2-10).

Table 2-10 Assam Cancer Centre

<table>
<tr><td>Business Entities</td><td colspan="2">Assam Cancer Care Foundation (GOA and Tata Trusts)</td><td>Investment</td><td>INR 1400 Core (JPY 20.6 bil.)</td></tr>
<tr><td>Partners</td><td colspan="4">State Cancer Centre, National Caner Grid, Cachar Cancer Hospital and Research Centre (NPO), Alamelu Charitable Foundation, Dr. B. Borooah Cancer Institute, Atal Armit Abhiyan, Pfaizer, Tata group companies, Chinese medical equipment company, etc.</td></tr>
<tr><td rowspan="5">Service Network</td><td>Public</td><td colspan="3">Private</td></tr>
<tr><td>State Cancer Institute, Guwahati</td><td colspan="2">Guwahati Hospital</td><td rowspan="3">Screening and Awareness Kiosk at OPD</td></tr>
<tr><td>Assam Medical College Hospital (MCH)</td><td colspan="2">ACCF Cancer Centre (advanced medical services and research)</td></tr>
<tr><td>Other MCHs</td><td rowspan="2">Cancer hospitals</td><td>Diagnosis and treatment</td></tr>
<tr><td>Civil/District Hospitals</td><td>Diagnosis, onco-care/day care</td><td></td></tr>
<tr><td>Other Activities</td><td colspan="4">・ Fellowship, specialist training
・ Research – South Asia Cancer Research Centre (SACRC)
・ Cancer Hospitals at Dibrugarh, Barpeta, Tezpur, Lakhimpur, Mangaldoi, Kokrajhar, and Jorhat will become functional in 2021.</td></tr>
</table>

Note: Hospitals at Guwahati, Silchar and Diphu are targeted to be completed during 2022.
Source: [Assam Cancer Care Foundation, 2021] [Bikash Singh, 2017] [Gov of Assam, 2021]

(3) Patient Satisfaction and Care Seeking Behaviour

The general characteristics of the respondents are summarised in Table 2-11.

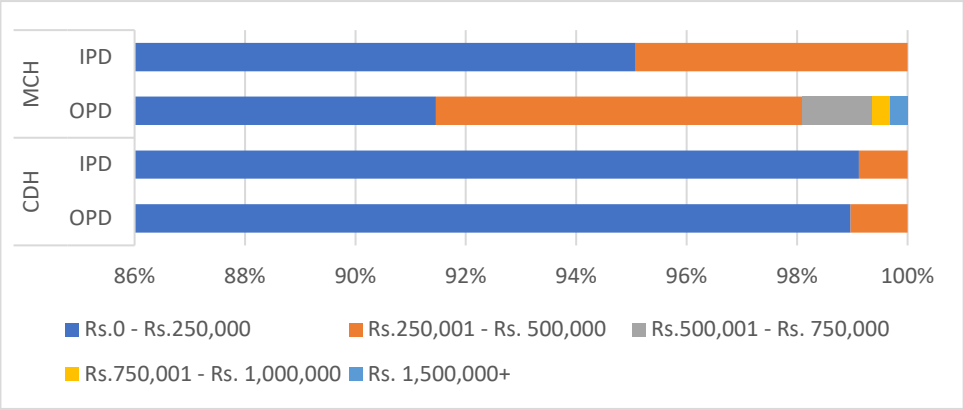
Table 2-11 General Characteristics of Respondent for the Patient Satisfactory Survey

		U5	6-9	10's	20's	30's	40's	50's	60's	70's	80's+	No answer	Total
Medical College Hospitals (MCH)													
IPD	Female	2	1	9	30	22	28	16	11	3	1		123
	Male	3	7	12	30	42	38	36	23	9	2		202
	No answer											12	12
OPD	Female	2	4	6	28	22	22	23	15	3			125
	Male	5	10	12	60	31	26	25	10	5	7		191
	No answer											10	10
Civil/District Hospitals (CDH)													
IPD	Female	3	5	9	36	10	5	1	3		1		73
	Male	3	1	3	10	7	5	6	4	1	1		41
	No answer											1	1
OPD	Female	1	2	3	12	8	8	3	1				38
	Male		1	7	19	16	9	4	1	1	1		59

Note: IPD= inpatient department, OPD= outpatient department

Source: JICA Survey Team

As shown in Figure 2-7, the household income of the respondents in civil/district hospitals (CDH) was lower than that in the medical college hospitals. In CDH, 75% were free of charge and 38% in MCH. Most of the payments were made for testing. Although 33% applied Atal Amrit Yojana (health insurance for the poor) and 40% used other financial support scheme, most of the respondents did not have a health card[3] to obtain financial assistance from the government with simpler process because they did not know.

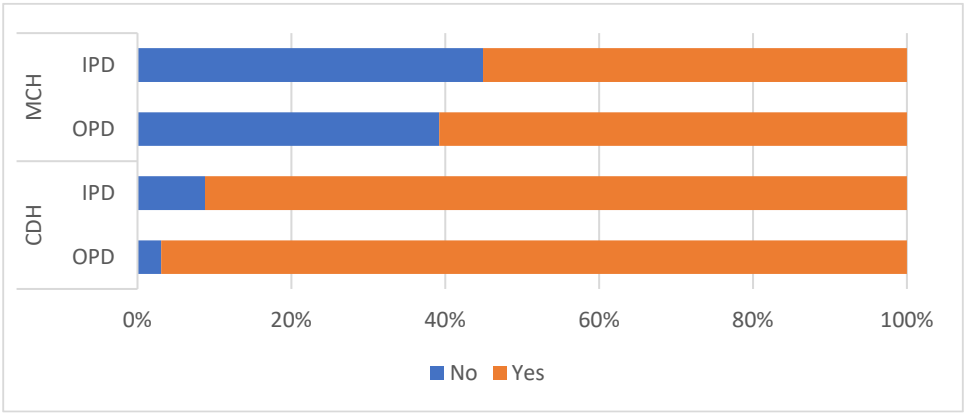


Source: JICA Survey Team

Figure 2-7 Level of Household Income of the Respondents

As shown in Figure 2-8, most of the respondents in CDH accessed the nearest hospitals and 93% came directly without referral from the primary level facilities. In MCH, 25% were referred from the secondary level hospitals. According to local experts, even if patients go to the nearest CDH, as necessary equipment or specialised doctors are not available, they are referred to MCH. Therefore, people prefer to go directly to MCH.

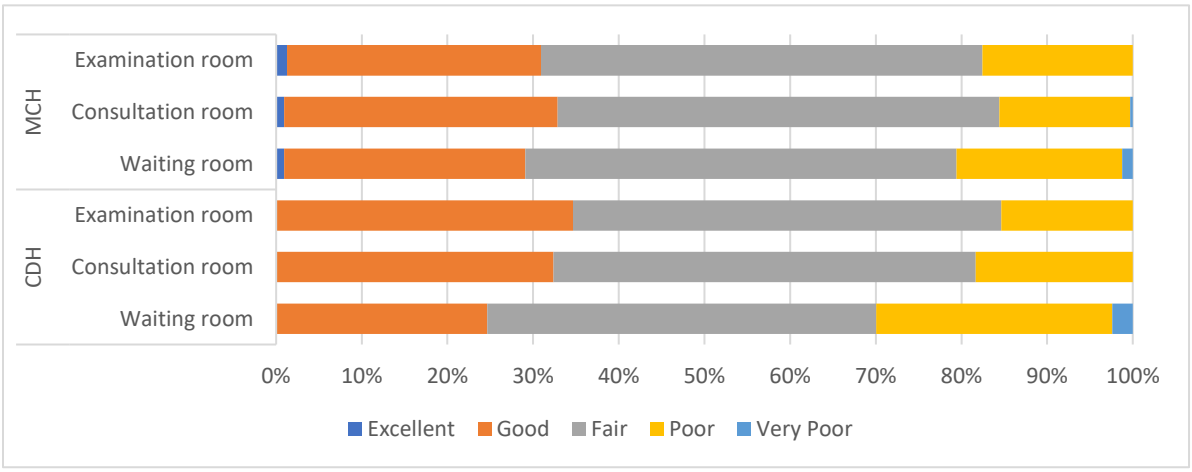
[3] Although they do not have a health card, they can obtain financial assistance by applying at the counter in every hospital visit.



Source: JICA Survey Team

Figure 2-8 Proportion of Respondents who Came to the Nearest Facility

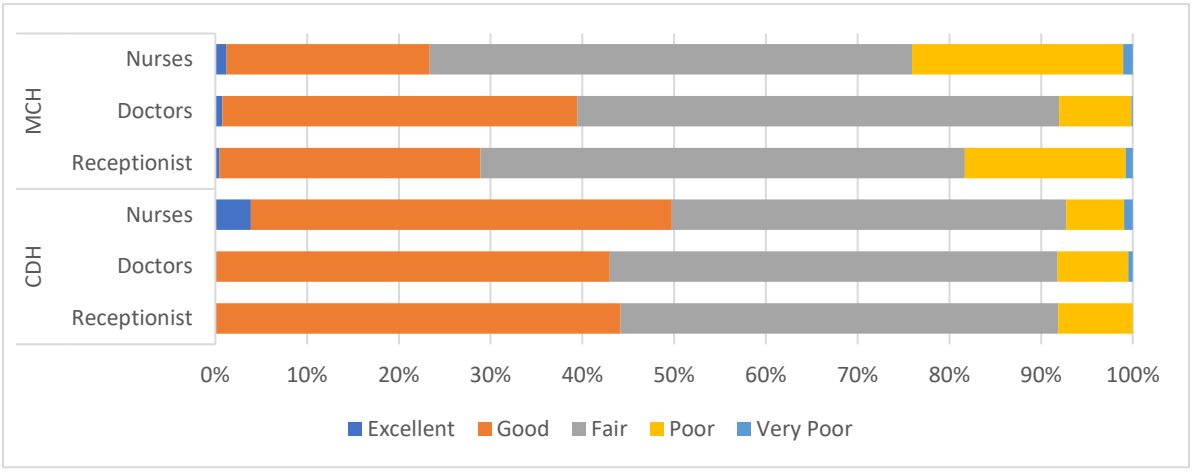
Satisfaction with hospital facilities was lower in CDH. Among the three rooms, satisfaction in a waiting room was lower than in the other rooms (Figure 2-9).



Source: JICA Survey Team

Figure 2-9 Satisfaction with Hospital Facility

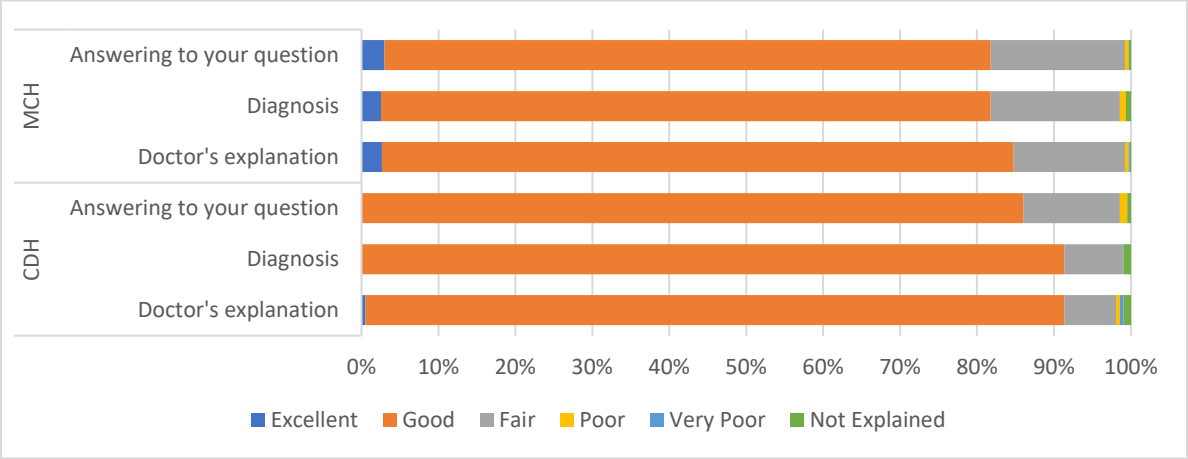
In MCH, the proportion of respondents who did not feel comfortable with the receptionist and nurses was higher, while in CDH, nearly half felt comfortable with the nurses (Figure 2-10).



Source: JICA Survey Team

Figure 2-10 Comfortableness with the Hospital Staff

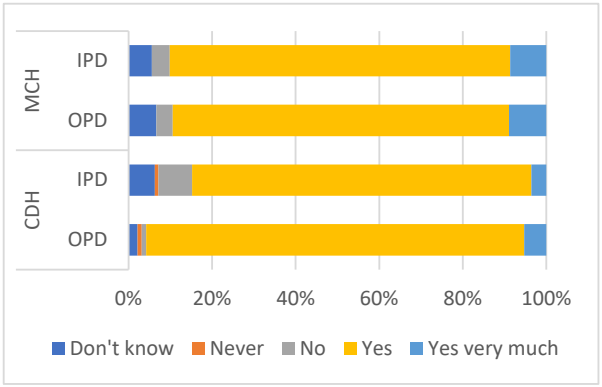
Regarding doctor's behaviour in MCH, although some rated excellent, the proportion of good was lower than in CDH (Figure 2-11). In CHD, a few did not receive any explanation or answer to the question.



Source: JICA Survey Team

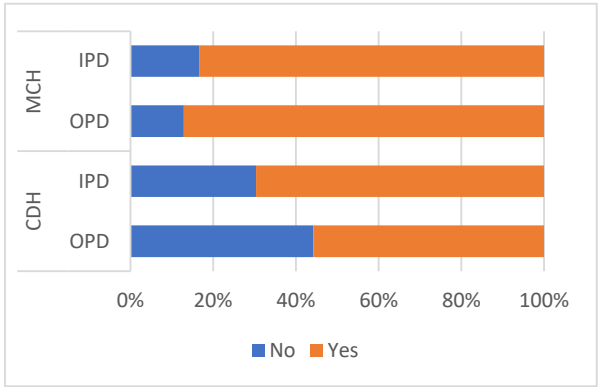
Figure 2-11 Satisfaction with Doctor's Behaviour

Although most of the respondents will recommend the hospital to friends or family members (Figure 2-12), more than half of them would go to private facilities if they were affordable (Figure 2-13). According to the interviews with some experts in community health in Assam, people tend to think that free and cheap services are not good in quality.



Source: JICA Survey Team

Figure 2-12 "Do you recommend this hospital to your friends/ family members?"



Source: JICA Survey Team

Figure 2-13 "Will you go to private facility if it is affordable?"

Many respondents complained about the cleanliness of the hospitals especially toilets. Those in the inpatient department required fan and drinking water facility. Also, insufficient stock of medicine in the pharmacy was pointed out. At the same time, they would like health personnel to improve the attitude to the patients both for doctors and paramedical staff. Some of them have observed that the number of doctors was not sufficient especially in CDH. Time for consulting was less than 15 minutes in almost all of the CHDs and 80% of MCH.

According to the local experts, rural people tend to hesitate to meet with health personnel because doctors and nurses are not kind enough to tell their concerns or symptoms. In addition, women and their family would like to see female doctors because of cultural context, but the number is limited. Therefore,

community health volunteers, ASHA, encourage such women and girls to have access to health services and convince male family members to let women seek healthcare in public health facilities.

2.1.5 Health Personnel

(1) Overview

In addition to insufficient number of public hospitals, human resource for health in the public sector is one of the critical challenges in the referral system in India. As for the urban-rural distribution, 66% of physicians worked in the urban areas, and 80% of physicians and surgeons were in the private sector although more than 50% of doctors are produced by government medical colleges [Karan A, Negandhi H, Nair R, et al., 2019].

Although India achieved the World Health Organization (WHO) recommended doctor-population ratio in 2018 [Raman Kumar and Ranabir Pal, 2018], it still varies among the states. According to WHO, the number of allopathic doctors per 100,000 population is one of the worst in the five states in India (Figure 2-15). According to an estimate using the National Sample Survey (NSS) 2016 and Registry Data [Karan A, Negandhi H, Nair R, et al., 2019], the number of qualified doctors (allopathic, AYUSH, and dental practitioners) per 10,000 population in Assam State (1.8) was the lowest in India[4].

WHO's report in 2016 points out several challenges in the human resources for health in India [WHO, 2016].

- Lack of doctors in rural areas
- Lack of medical qualification

The report recommended to step up the capacity to produce and deploy medically trained personnel rapidly.

There are 15 major professional categories including 53 professions in allied and healthcare streams as shown in Table 2-12.

[4] It ranged from 1.8 to 19.7 in Maharashtra and 11.3 in India.

Table 2-12 Major Professional Categories and 53 Professions by the Allied and Healthcare Professions Bill, 2018

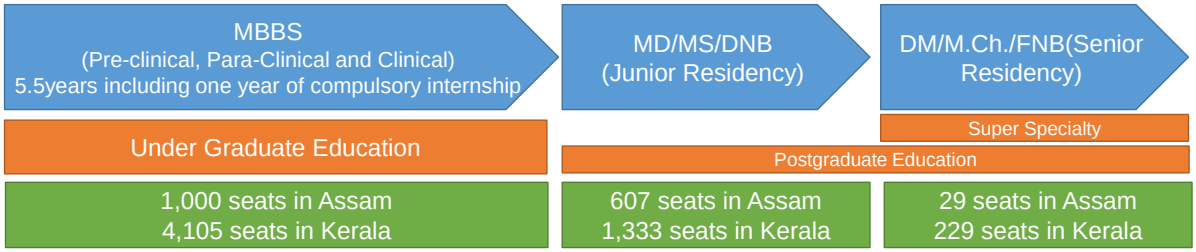
1	Life Science Professional	(i) Biotechnologist (ii) Biochemist (nonclinical) (iii) Cell Geneticist (iv) Microbiologist (non-clinical) (v) Molecular Biologist (non-clinical) (vi) Molecular Geneticist (vii) Environment Protection Officer (viii) Ecologist (ix) Biomedical Engineer (x) Medical Equipment Technologist (xi) Occupational Health and Safety Officer (Inspector)
2	Trauma and Burn Care Professional	(i) Burn Care Technologist (ii) Emergency Medical Technologist (Paramedic) (iii) Advance Care Paramedic
3	Physiotherapy Professional	Physiotherapist
4	Nutrition Science Professional	(i) Dietician (including Clinical Dietician, Food Service Dietician) (ii) Nutritionist (including Public Health Nutritionist, Sports Nutritionist)
5	Ophthalmic Sciences Professional	(i) Optometrist (ii) Ophthalmic Assistant
6	Occupational Therapy Professional	(i) Occupational Therapist (ii) Movement Therapist (including Art, Dance and Movement Therapist or Recreational Therapist) (iii) Podiatrist
7	Behavioural Health Sciences Professional	(i) Psychologist (Except Clinical Psychologist covered under RCI for PWD) (ii) Behavioural Analyst (iii) Integrated Behaviour Health Counsel (iv) Health Educator including Disease Counsellors, Diabetes Educators, Lactation Consultants (v) Human Immunodeficiency Virus (HIV) Counsellors or Family Planning Counsellors (vi) Mental Health Support Workers
8	Primary, Community and other Miscellaneous Care Professional	Community Health Promoters
9	Medical Radiology, Imaging and Therapeutic Technology Professional	(i) Medical Physicist (ii) Nuclear Medicine Technologist (iii) Radiology and Imaging Technologist (Diagnostic Medical Radiographer, Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Mammographer, Diagnostic Medical Sonographers) (iv) Radiotherapy Technologist (v) Dosimetrist (vi) Electrocardiogram (ECG) Technologist or Echocardiogram (ECHO) Technologist
10	Medical Laboratory Sciences Professional	(i) Cytotechnologist (ii) Forensic Science Technologist (iii) Histotechnologist (iv) Hematotechnologist (v) Medical Lab Technologist
11	Health and Information Management Professional	(i) Health Information Management Professional (including Medical Records Analyst) (ii) Health Information Management Technologist (iii) Clinical Coder (iv) Medical Secretary and Medical Transcriptionist
12	Physician Associate or Physician Assistant	Physician Associates and Assistants
13	Cardiovascular, Neuroscience and Pulmonary Technology Professional	(i) Cardiovascular Technologists (ii) Perfusionist (iii) Respiratory Technologist (iv)Electroencephalogram (EEG) or Electroneurodiagnostic (END) or Electromyography (EMG) Technologists or Neuro Lab Technologists or Sleep Lab Technologists
14	Renal Technology Professional	Dialysis Therapy Technologists or Urology Technologists
15	Surgical and Anaesthesia-related Technology Professional	(i) Anaesthesia Assistants and Technologists (ii) Operation Theatre (OT) Technologists (iii) Endoscopy and Laparoscopy Technologists

Source: The Allied and Healthcare Professions Bill, 2018

The National Health Policy 2017 by MoHFW recommends that medical and para-medical education be integrated with the service delivery system, so that the students learn in the real environment and not just in the confines of the medical school.

The National Medical Council (NMC) was established to maintain minimum standards of medical education in India. NMC has made it mandatory for doctors to complete 30 hours of Continuing Medical Education (CME) once in every five years to renew their license by attending workshops and seminars, which are organised by various healthcare institutions in India. For nurses, Continuing Nursing Education (CNE) is applied after the registration at each state nursing council.

Medical education in India comprises about 554 medical colleges [National Medical Commission, 2021] including both public and private across the country. These medical colleges have a capacity of producing 83,125 Bachelor of Medicine and Bachelor of Surgery (MBBS) graduates at present. Figure 2-14 shows the system of medical education in India. Undergraduate medical education (MBBS course) in India takes about five-and-a-half years, including one year of compulsory internship. The period of four-and-a-half years (nine semesters, six months each) is divided into three phases. Each semester consists of approximately 120 teaching days of eight hours each college working time, including one hour of lunch. The MBBS course is divided into three phases, viz., Pre-clinical, Para-clinical, and Clinical Phase.



Source: National Health Profile 2020, Central Bureau of Health Intelligence, Ministry of Health and Family Welfare

Figure 2-14 Medical Education System in India

There are two main routes into nurse training in India. One is a three-year diploma training in the School of Nursing to become a General Nurse Midwife (GNM). Another one is a four-year training in a College of Nursing to obtain a B.Sc. degree. Some nursing colleges also offer post-registration B.Sc. courses and M.Sc. courses. There are six levels of nursing education in India as summarised in Table 2-13.

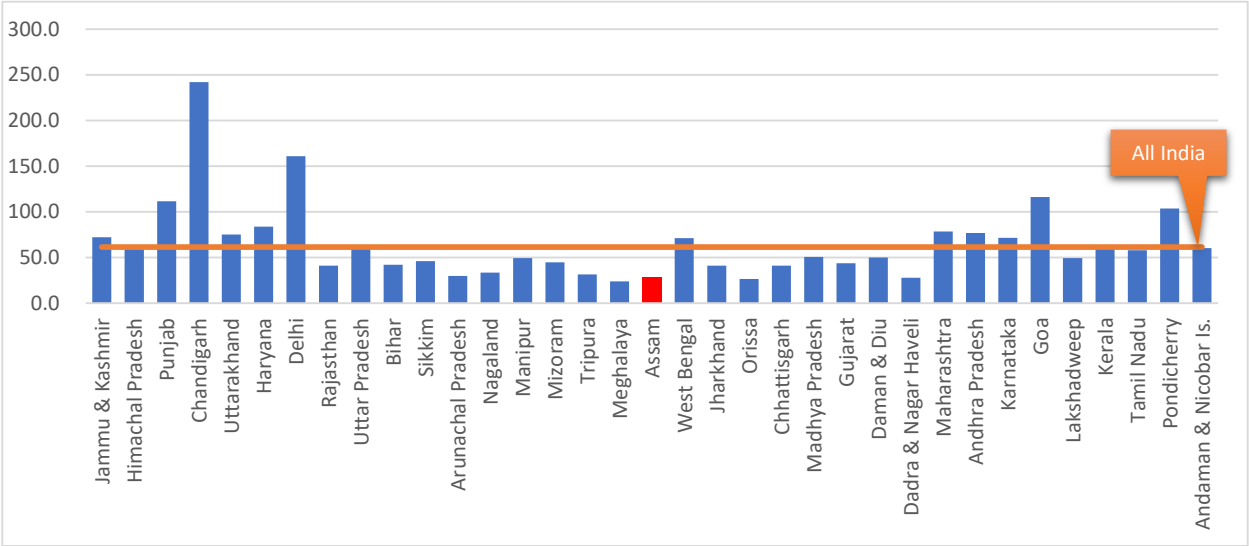
Table 2-13 Levels of Nursing Education in India

No.	Level	Description
1	Auxiliary Nursing and Midwifery (ANM)	Medical nursing course that focuses on the care of individual, families, and communities
2	General Nursing and Midwifery (GNM)	Medical nursing course that focuses on caring for the sick in hospitals
3	Graduate Nursing Programme (B.Sc. Nursing)	Four-year course prepared nurses to work at the bedside and take up leadership roles in public health nursing
	Post Basic B.Sc. Nursing	Two-year nursing programmes for those who have already finished GNM
4	Postgraduate Degree in Nursing	Trains nurses to be clinical and community health nursing specialists
5	MPhil in Nursing	One-year programme for research in undertaking doctoral work
6	Ph.D. Programme in Nursing	Ph.D. course for three years

Source: JICA Survey Team

(2) Assam

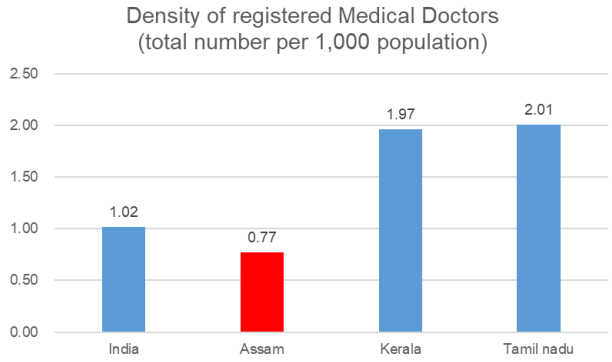
Assam HFWD pointed out that due to the limited intake capacity of medical colleges, many students seek medical education opportunity in other states. Also, around 30% of doctors in government hospitals move to the private sector or other states for better working condition annually [HFWD, Assam, 2018].



Source: [WHO, 2016]

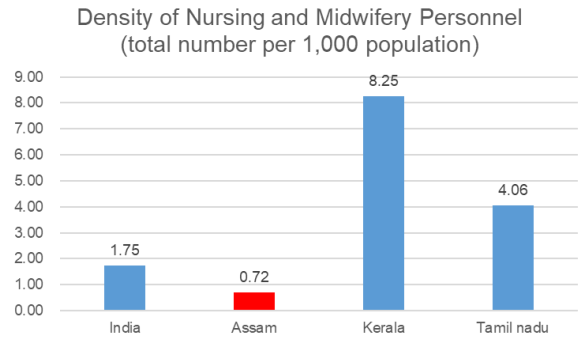
Figure 2-15 Number of Doctors per 100,000 Population by States

According to the National Health Profile 2020, Assam's density of medical doctors was 0.77 per 1,000 population, and that of nurses and midwives was 0.72 per 1,000 population, while WHO recommends one doctor for every 1,000 population. Compared with Kerala, which has a similar population size as Assam, and Tamil Nadu, which has better health indicators, the number of doctors and number of nurses and midwives are inadequate in Assam (Figure 2-16 and Figure 2-17).



*Total Population is based on 2011 Census and number of registered Medical Doctors is based on the data in 2019.
Source: National Health Profile 2020, Central Bureau of Health Intelligence, Ministry of Health and Family Welfare

Figure 2-16 Density of Registered Medical Doctors



*Total Population is based on 2011 Census and number of registered nurses and midwives are based on the data in 2018.
Source: National Health Profile 2020, Central Bureau of Health Intelligence, Ministry of Health and Family Welfare

Figure 2-17 Density of Nursing and Midwifery Personnel

There are seven medical colleges in Assam, and they have the capacity of producing 1,000 MBBS graduates while Kerala State has four times as large. The number of seats for postgraduate education is also less compared with the other states which have better heath profile.

Regarding nursing education, there are three government nursing college for B.Sc. Nursing and 22 GNM School of Nursing in Assam. Medical and Health Recruitment Board is responsible for recruitment of professionals of government health facilities except directors who are appointed by Chief Secretary of Health.

While the healthcare delivery system has remained focused on the strengthening of doctors, nurses, and frontline workers, numerous other healthcare workers have been identified. In order "to provide for regulation and maintenance of standards of education and services by the allied and healthcare professionals and the maintenance of a Central Register of Allied and Healthcare Professionals and for matters connected therewith or incidental thereto[5], the Allied and Healthcare Professions Bill, 2018, was introduced.

The estimated vacancy rate of doctors is much higher than nurses as estimated in Table 2-14. Fulfilment of the health workforce varied among the districts. Vacancy rates in Barak Valley were generally higher than in the other divisions.

Table 2-14 Estimated Vacancy Rate in Secondary and Primary Health Institute in Assam (2020)

		Doctors		Nurses	
		Secondary Hospitals	Primary Health Facilities	Secondary Hospitals	Primary Health Facilities
North	Dhemaji	25.0%	34.0%	19.0%	0.0%
	Lakhimpur	41.3%	33.3%	0.0%	0.0%
	Darrang	37.1%	34.2%	0.0%	0.0%
	Udalguri				
	Sonitpur				
Lower	Biswanath				
	Barpeta		33.5%	0.0%	29.4%
	Bajali				
	Baksa	16.7%	2.6%	0.0%	2.4%
	Bongaigaon	50.0%	31.1%	0.0%	0.0%
	Chirang	22.7%	54.8%	4.3%	4.0%
	Dhubri	39.0%	39.5%	1.0%	1.0%
	South Salmara		38.9%	2.1%	14.1%
	Goalpara	28.1%	11.9%	4.2%	5.8%
	Kokrajhar	50.0%	54.6%	0.0%	4.1%
	Kamrup Metro	35.7%	28.8%	14.8%	0.0%
	Kamrup Rural				
	Nalbari	28.6%	25.7%	0.0%	0.0%
Central	Dima Hasao	40.0%	67.4%	0.0%	0.0%
	Morigaon		26.3%	0.0%	15.0%
	Karbi Anglong	34.5%	32.2%	3.8%	6.7%
	West Karbianglong	42.9%	36.4%	0.0%	7.7%
	Nagaon		18.8%	0.0%	1.0%
	Hojai		33.3%	0.0%	21.6%
Upper	Dibrugarh		18.8%		1.6%
	Tinsukia	61.1%	50.0%	44.4%	30.5%
	Jorhat		20.8%	0.0%	1.3%
	Majuli		33.3%	0.0%	2.4%
	Golaghat	43.2%	50.4%	1.6%	2.7%
	Sivasagar	30.0%	52.3%	1.5%	0.8%
	Charaideo	0.0%	4.8%	0.0%	0.0%
Barak Valley	Cachar	27.8%	49.0%	40.8%	38.6%
	Hailakandi	37.8%	57.4%	62.7%	44.0%
	Karimganj	34.3%	51.9%	54.5%	52.5%
Assam		**34.6%**	**35.4%**	**9.1%**	**9.9%**

Note: Blanks are no data.

Source: Estimated by the JICA Survey Team based on the staff list provided by GOA.

[5] Ministry of Health and Family Welfare, India. (2018) *The Allied and Healthcare Professions Bill.*

In the medical college hospitals, the vacancy rate of medical doctors was the highest in Jorhat MCH. Fakhrudding Ali Ahmed MCH and Sichar MCH had more than 50% vacancy of co-medical staff (Table 2-15).

Table 2-15 Vacancy Rate of Health Personnel in Medical College Hospitals in Assam (2021)

	Medical Doctors	Co-medical staff
Assam MCH	19.2%	25.6%
Fakhruddin Ali Ahmed MCH	17.2%	58.0%
Dipih MCH	13.5%	
Jorhat MCH	36.0%	9.5%
Silchar MCH	27.5%	54.6%

Note: Guwahati and Tezpur MCHs did not submit the data.

Source: JICA Survey Team

(3) Level of Satisfaction

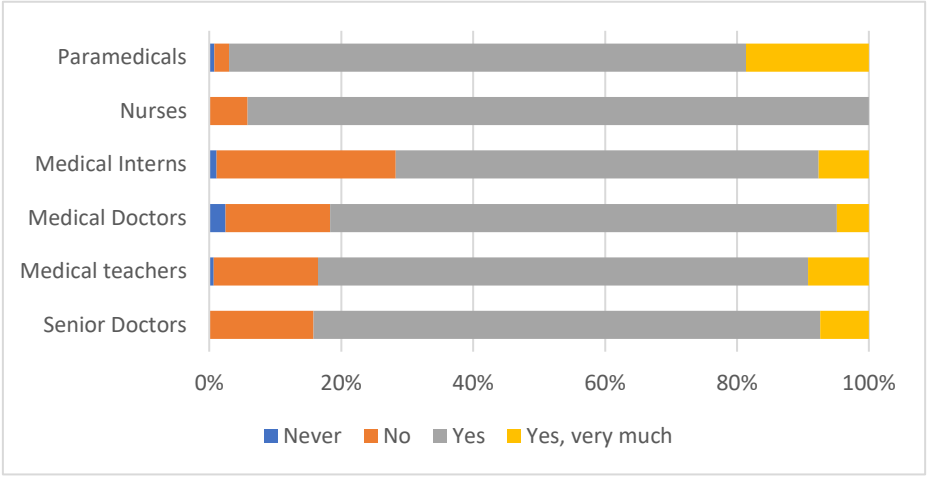
The general characteristics of the respondents are summarised in Table 2-16. The average age of medical interns was 24.1 years and that of nursing students was 23.2 years.

Table 2-16 General Characteristics of Respondent for the Staff Satisfactory Survey

			20's	30's	40's	50's	60's+	No Answer	Total
MCH	Senior Medical Doctors	Female		12	7	8	8		104
		Male		12	16	28	13		
		No answer						63	
	Medical Teachers	Female	11	17	19	27	3		164
		Male	1	24	42	17	3		
		No answer						81	
	Medical Doctors (≦5 years working)	Female	15	7	5				80
		Male	12	31	9	1			
		No answer						56	
	Nurses	Female	26	47	32	33			140
		Male	1			1			
		No answer						43	
	Paramedical Staff	Female	16	5	8	1			135
		Male	27	25	28	25			
		No answer						6	
	Medical Interns	Female						47	165
		Male						50	
		No answer						68	
	Nursing Students	Female						90	90
CDH	Senior Medical Doctors	n.a.							50
	Nurses	n.a.							100

Source: JICA Survey Team

As shown in Figure 2-18, most of the respondents in MCH were satisfied with the working environment. However, around 30% of medical interns were not satisfied. They would like to improve the facilities and services during the night shift, such as a 24-hour canteen, doctors' room, and safety and security especially during night-time. Medical doctors and interns also wanted to reduce the workload, especially among the young doctors. In CDH, 90% of senior doctors were satisfied and 96% of nurses were happy to work there.

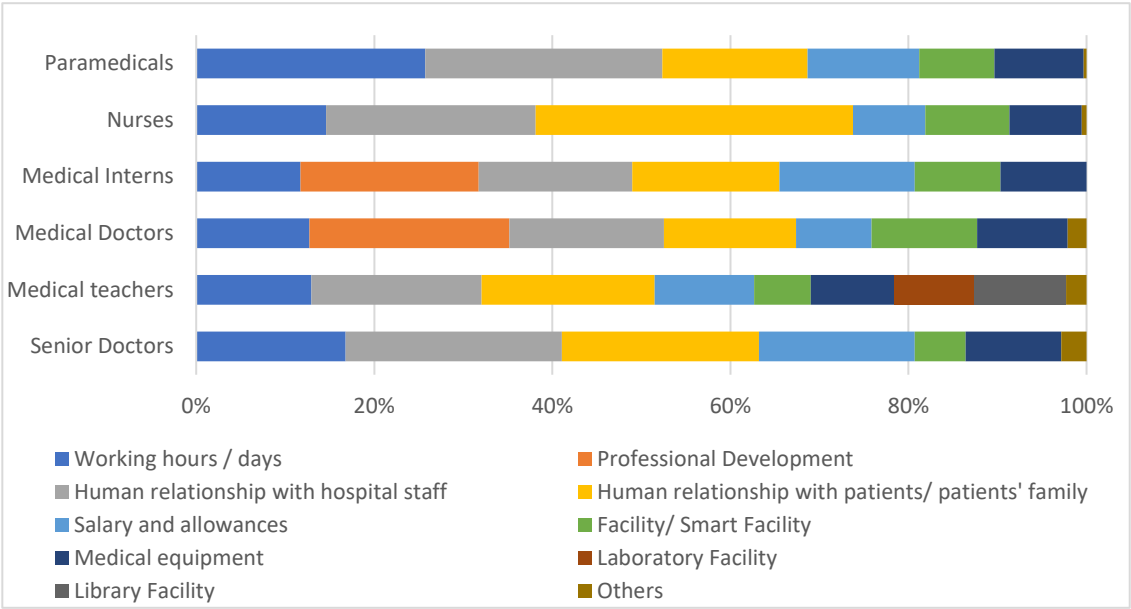


Source: JICA Survey Team

Figure 2-18 Satisfaction with Working Environment (MCH)

Both senior and young doctors wanted to strengthen the specialised services in terms of human resources, equipment, and facilities. They also would like to establish 24/7 laboratory services and increase efficiency of patient management and procedure by introducing information and communications technology (ICT). Senior doctors seemed to have wide range of concerns about the working environment such as involvement in decision-making process, gender consideration, relationship with patient and administrative staff, quality of patient services, multidisciplinary cooperation, improvement of management policy, etc.

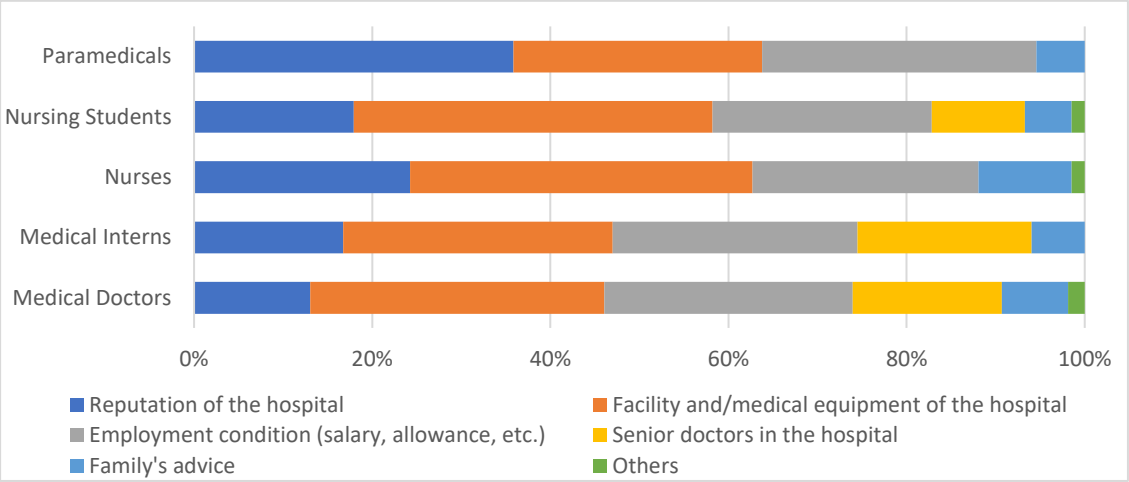
Figure 2-19 illustrates the major factors for satisfaction with workplace. Human relationship seems to be the biggest factor followed by working hours/days. Medical interns and young doctors also prioritise professional development such as opportunity of domestic and international training or workshops on advanced technology. Teachers also prioritise laboratory and library.



Source: JICA Survey Team

Figure 2-19 Determinants of Satisfaction of Working Environment (Multiple Answers) (MCH)

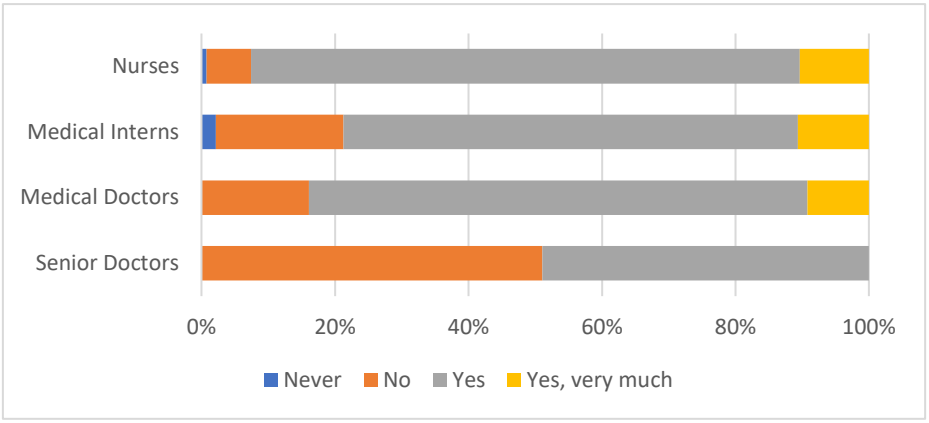
Figure 2-20 shows the factors considered when they choose the workplace. They value facility and equipment as much as employment condition. Also, medical doctors, interns, and nursing students may want to work with respectful senior doctors.



Source: JICA Survey Team

Figure 2-20 Factors to Choose the Workplace (Multiple Answers) (MCH)

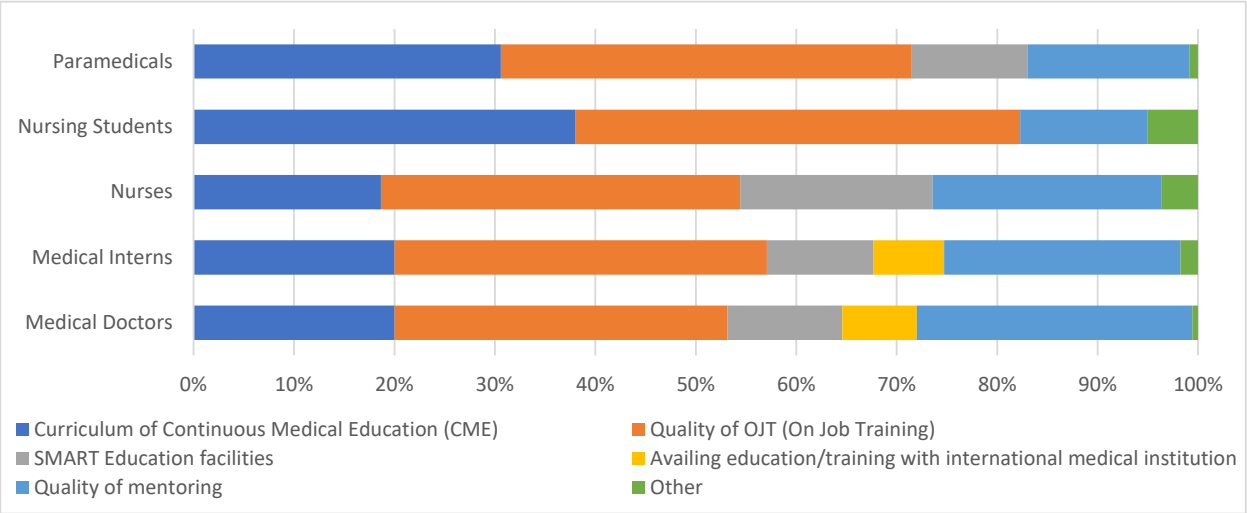
As for the learning environment, almost half of the senior doctors were not satisfied (Figure 2-21).



Source: JICA Survey Team

Figure 2-21 Satisfaction with Learning Environment (MCH)

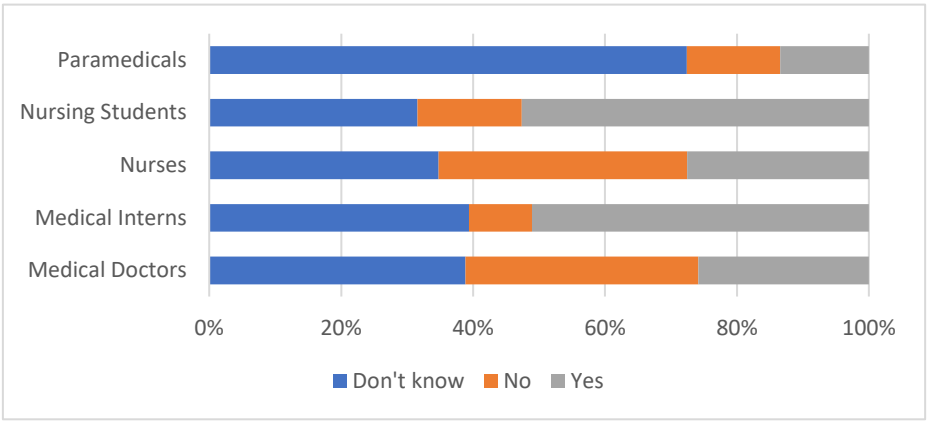
As shown in Figure 2-22, satisfaction with the learning environment depends on the curriculum and the quality of on-the-job training (OJT) and mentoring. However, medical teachers pointed out that the number of mentors/ teachers was not sufficient. Young doctors mentioned that post-graduate research, both domestic and international, as well as pre-service education curriculum should be improved.



Source: JICA Survey Team

Figure 2-22 Determinants of Satisfaction of Learning Environment (Multiple Answers) (MCH)

Relevant to human resource shortage, interns and nursing students were more willing to work in the rural areas than nurses and young doctors (Figure 2-23). Most of the positive reasons were that they were from rural areas, and they wanted to serve the poor who really needs medical services. In addition, medical interns expect to gain knowledges and experiences by working in the rural areas. On the other hand, the respondents are concerned with their security and that of their families in the rural areas. Also, basic infrastructure such as electricity and safe water, as well as education opportunity for their children hindered them to work in the rural areas. Doctors also pointed out that in rural areas, they could not utilise and improve their specialty.



Source: JICA Survey Team

Figure 2-23 Preference of Working in Rural Areas (MCH)

When they have to work in the rural areas, they wish to be provided with appropriate medical equipment, facility, and supporting staff, proper living environment, as well as sufficient allowance.

2.2 Health Finance

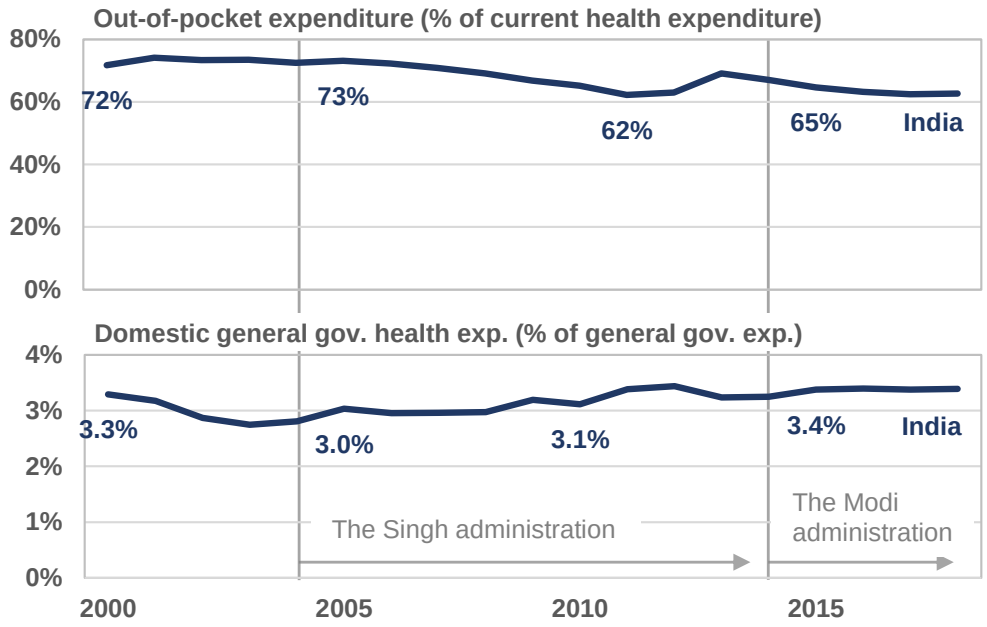
2.2.1 National Level

India's current health expenditure (CHE) is comparable to countries of similar income levels, both in per capita terms and as a share of gross domestic product (GDP). In per capita terms, India's CHE was USD 73 in 2018. As a share of GDP, India's CHE was 3.5% in 2018 (Table 2-1710). All the indicators related to government health expenditure (GHE) were also lower than the average of lower-middle income countries (LMICs). OOPE as a share of CHE was 62.7%, which was much higher than average of LMICs (Table 2-17). GHE as a share of general government expenditure (GGE) has been slightly increased over the past two decades, while OOPE as a share of CHE has been slightly decreased at the same period (Figure 2-24).

Table 2-17 Health Financing Indicators of India, 2018

Indicators	India
GDP per capita (current USD)	**2,006**
Current health expenditure per capita (current USD)	**73**
Current health expenditure (% of GDP)	**3.5**
Domestic general government health expenditure (% of current health expenditure)	**27.0**
Domestic general government health expenditure (% of GDP)	**1.0**
Domestic general government health expenditure (% of general government expenditure)	**3.4**
Out-of-pocket expenditure (% of current health expenditure)	**62.7**

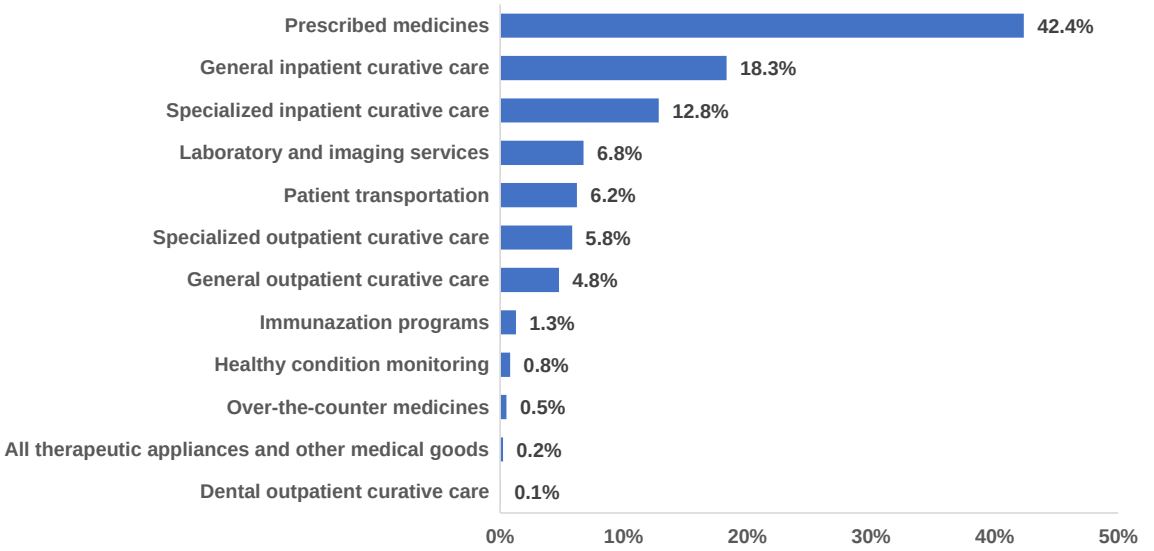
Source: [World Bank, 2021]



Source: [World Bank, 2021]

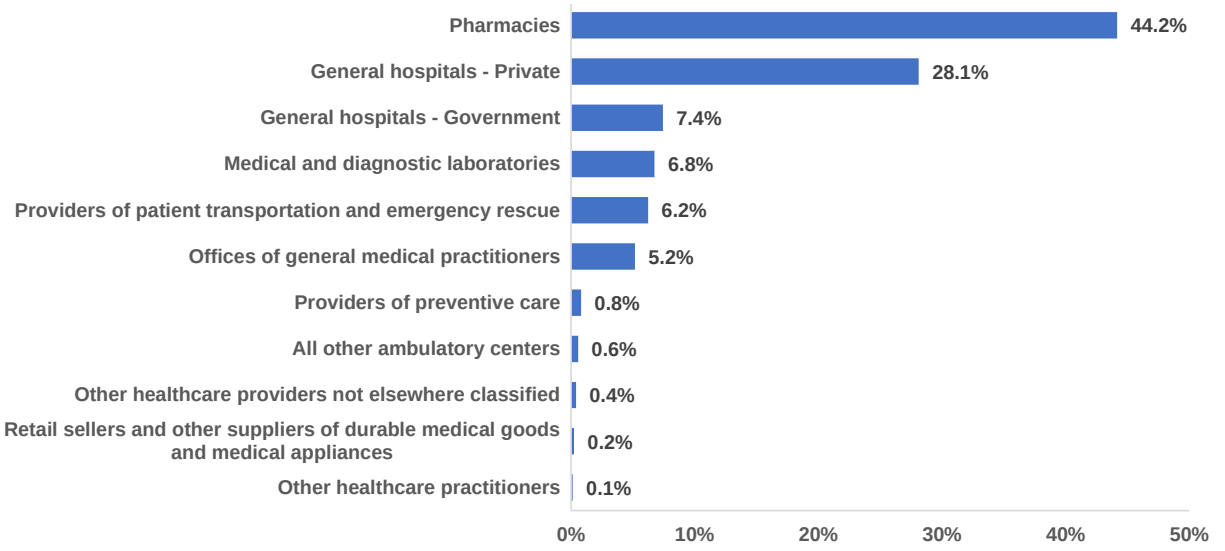
Figure 2-24 Trends of Out-of-pocket Expenditure and Domestic General Expenditure, India

Both breakdowns of OOPE by healthcare functions and by healthcare providers are shown in the following figures (Figure 2-25 and Figure 2-26). Prescribed medicines were the highest burden of OOPE (42.4%), followed by general and specialised inpatient curative care (18.3% and 12.8%). Other than pharmacies, OOPE in private general hospitals was the highest (28.1%), whose amount was about four times higher than in the government general hospitals (7.4%).



Source: [National Health Systems Resource Center, 2019]

Figure 2-25 Out-of-pocket Expenditure by Healthcare Functions, FY 2016-2017

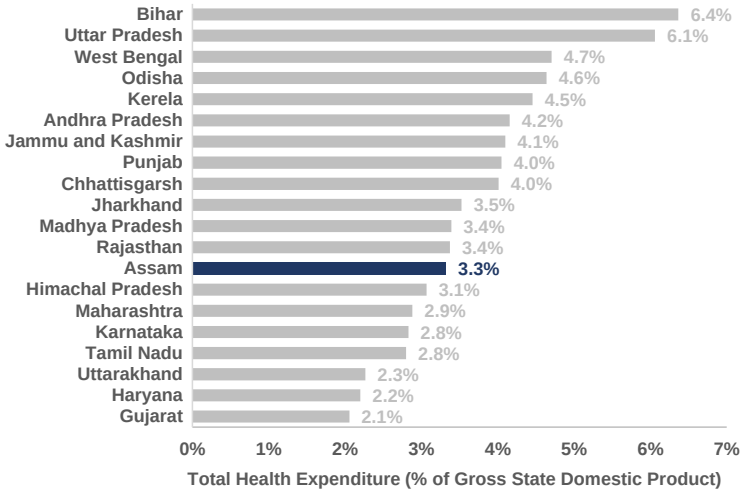


Source: [National Health Systems Resource Center, 2019]

Figure 2-26 Out-of-pocket Expenditure by Healthcare Providers, India, FY 2016-2017

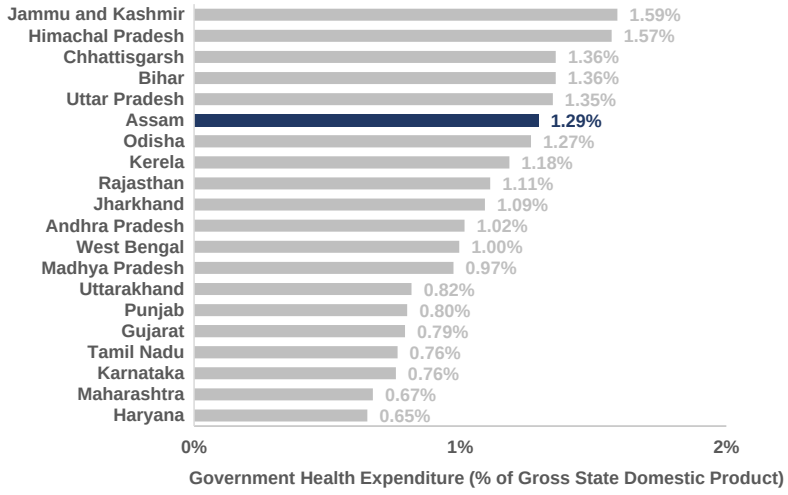
2.2.2 Overview of Health Finance in Assam

Assam's total health expenditure (THE) as a share of gross state domestic product (GSDP) was 3.3% for the fiscal year (FY) 2016-17, which stood at the middle among the states (Figure 2-27). The government health expenditure (GHE) as a share of GSDP was 1.29%, which was relatively higher compared with the other states (Figure 2-28). Similarly, GHE as a share of general government expenditure (GGE) was 6.0%, which was also relatively high (Figure 2-29). It suggests that the Government of Assam has placed higher priority to the health sector; nonetheless, these numbers are still far below the well-known targets: 5% for GHE/GDP [Rottingen, J.-A., Ottersen, T., Ablo, A., et al., 2014] and 15% for GHE/GGE [UNAIDS, 2013], respectively.



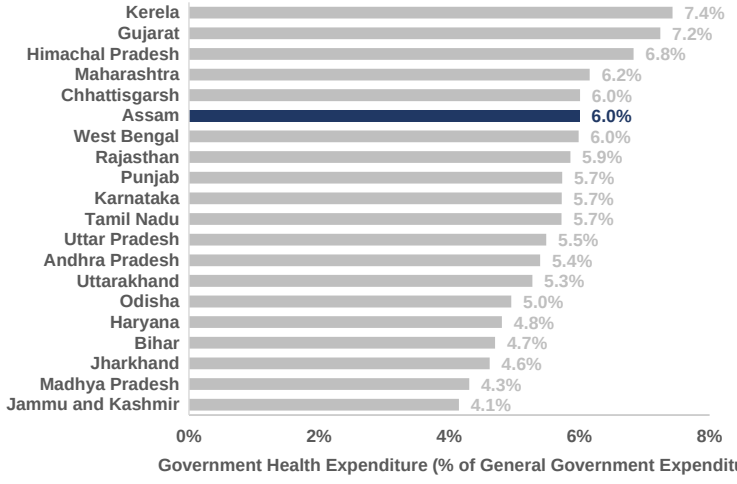
Source: [National Health Systems Resource Center, 2019]

Figure 2-27 Total Health Expenditure as a Share of GSDP for Selected States, FY 2016-17



Source: [National Health Systems Resource Center, 2019]

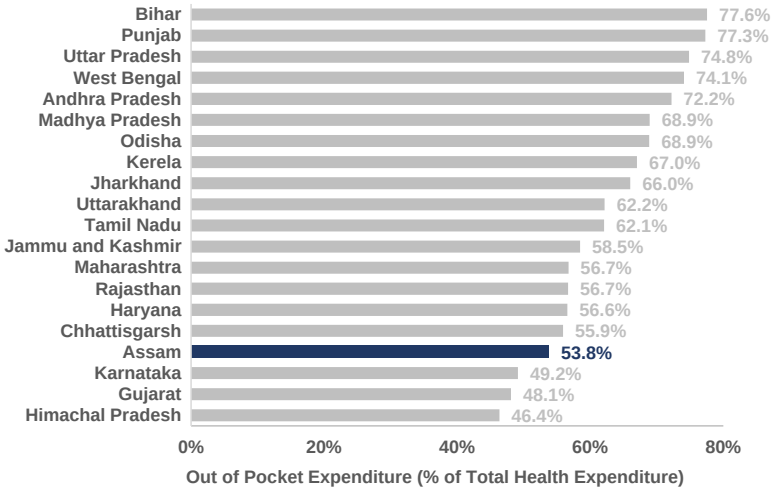
Figure 2-28 Government Health Expenditure as a Share of GSDP for Selected States, FY 2016-17



Source: [National Health Systems Resource Center, 2019]

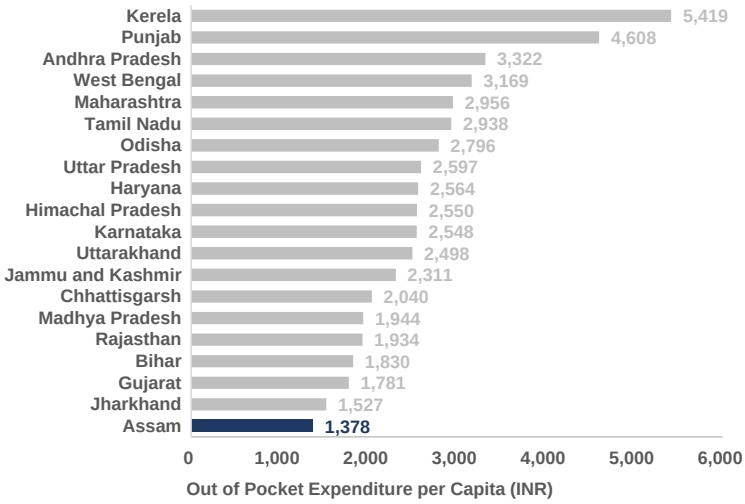
Figure 2-29 Government Health Expenditure as a Share of General Government Expenditure for Selected States, FY 2016-17

Out-of-pocket expenditure (OOPE) in Assam was relatively low, both as a share of THE and in per capita terms, compared with other states in FY 2016-17 (Figure 2-30 and Figure 2-31). However, 53.8% for OOPE/THE is far beyond the target of less than 15-20%, which is suggested by WHO [WHO, 2010].



Source: [National Health Systems Resource Center, 2019]

Figure 2-30 Out-of-pocket Expenditure as a Share of Total Health Expenditure for Selected States, FY 2016-17



Source: [National Health Systems Resource Center, 2019]

Figure 2-31 Out-of-pocket Expenditure per Capita for Selected States, FY 2016-17

(1) Fiscal Space for Health

As mentioned above, although the Government of Assam may have a stronger policy intention to maintain a sufficient level of GHE compared with other states, the health financing indicators have not reached the targets yet. To achieve the targets, the Government of Assam needs to secure the budgetary room to increase GHE without jeopardising its financial conditions. The rest of this subsection will give a broad overview of the fiscal space for health in Assam.

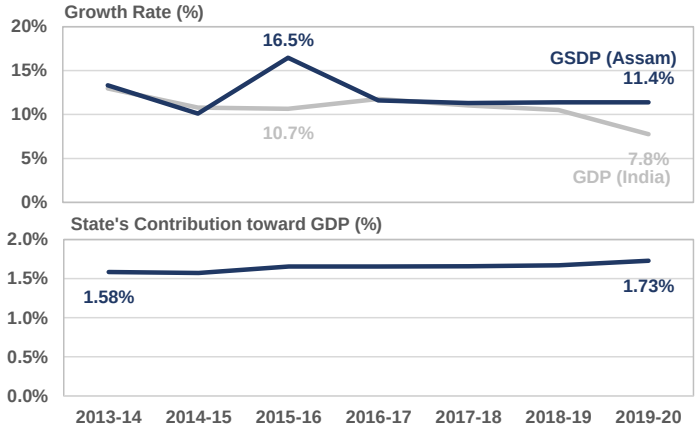
Mathematically, GHE can be described as follows [Teo, Hui Sin; Bales, Sarah; Bredenkamp, Caryn; Cain, Jewelwayne Salcedo, 2019]:

$$GHE = GDSP \times \frac{GGE}{GSDP} \times \frac{GHE}{GGE}$$

Each of these elements implies that GHE will increase when: 1) GSDP increases, which would be a result of growth in the state's economy, 2) GGE share of GSDP increases, which would come from increase in aggregate government fiscal resources such as revenues and debt financing, and 3) GHE share of GGE, which would be attributed to prioritisation of health within the government policy.

1) Economic Growth

A first key element of overall fiscal space as well as of fiscal space for health is economic growth. According to the statements laid before the Assam Legislative Assembly as required under the Assam Fiscal Responsibility and Budget Management Act, 2005 (2021-2022), GSDP over the last seven years for Assam has seen an upward trend moving from INR 1,777 billion in 2013-14 to INR 3,513 billion in 2019-20. It has grown at a compound annual growth rate (CAGR) of 12.0% between FY 2013-14 to FY 2019-20, while CAGR for India (i.e., GDP) has been 10.4% for the same period. Consequently, the states' contribution towards the GDP has slightly increased.



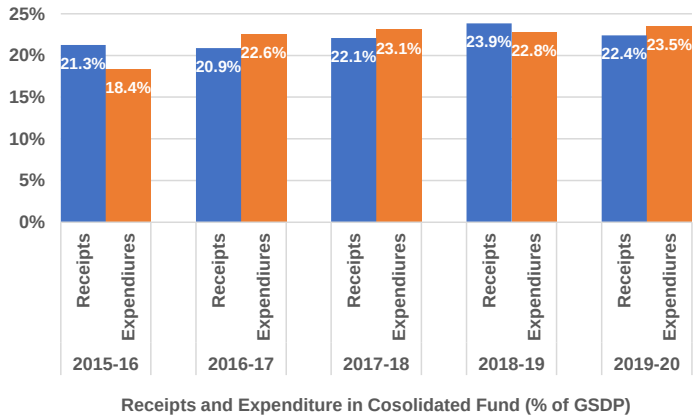
Source: [Finance Minister, Assam, 2021]

Figure 2-32 Growth Rate of GSDP and State's Contribution toward GDP

Although growth prospects in India have been downgraded following the unprecedented COVID-19 outbreak, IMF sees India's GDP growing by 8.5%, which is 160 basis points higher than its earlier projection, in FY 2022-23. If that happens, India will become the most rapidly expanding large economy in the world. The economic outlook of Assam, in a similar way, might be expected to be positive with steady recovery from the setback.

2) Financial Situation of the Government of Assam

A second source of fiscal space is from additional fiscal resources, which would allow the government to increase its aggregate expenditures. Those additional fiscal resources come from higher aggregate government revenues, debt financing, and so on. From FY 2015-16 to FY 2019-20, the government revenue and expenditure shares of GSDP have gradually climbed from 21.3% to 22.4% and from 18.4% to 23.5%, respectively (Figure 2-33).

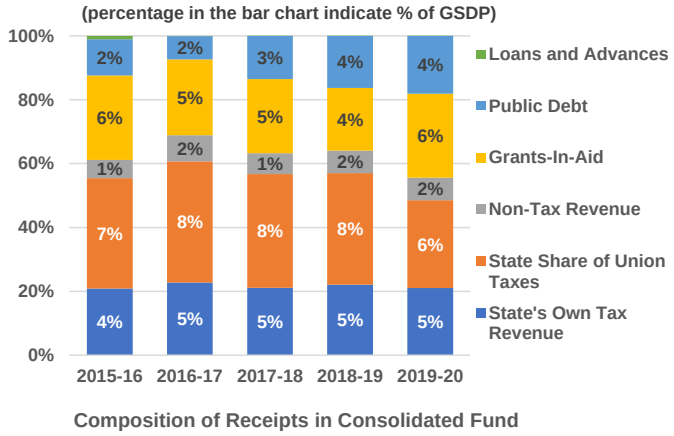


Source: [Government of Assam, 2021] and [Finance Department, Government of Assam, 2021]

Figure 2-33 Trend of Revenue and Expenditure of the Government of Assam

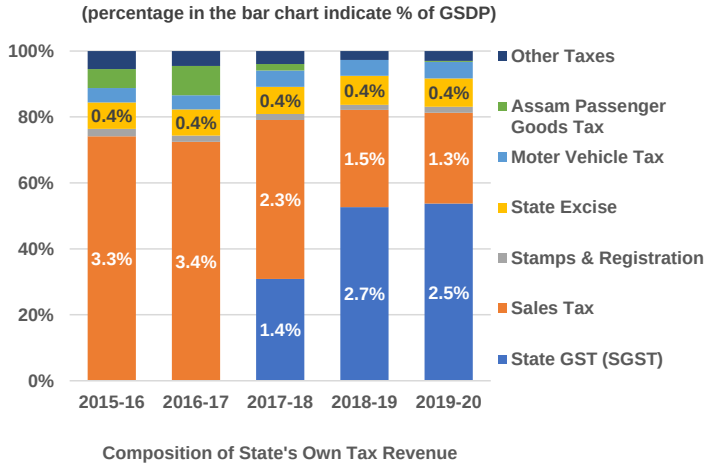
The overall composition of Receipts in Consolidated Fund has not been changed significantly in the recent past; on the other hand, there has been structural change to India's tax system (i.e., introduction of Goods and Services Taxes (GST)) and shifts in the composition of tax revenue (Figure 2-34 and Figure 2-35). Introduction of GST has brought about a paradigm shift in the taxing power of both the central and the state, and the state's tax revenue has now been pooled into GST leaving little scope with the state government to augment its revenue from GST by way of tweaking of GST rate since such power is vested in the GST Council. However, according to the Analytical Statement 2021-22, the implementation of GST is expected to have a positive impact on the state government's finances in the medium to long term. After introducing the GST in FY 2018-19, the state's own tax revenue increased at least at the same speed of the GSDP growth (11.4%). Moreover, the other factors behind the increase of the state's own tax are explained as follows, which implies that the tax collection capacity of the state government has improved.

- The introduction of the online system of revenue collection, vis-a-vis amendment in the rules, has made excise acts and rules more stringent and this has led to stepping up of innovative enforcement activities resulting to increase in the collection of excise duty in the state.
- Increase in the collection of stamp and registration fee is due to the enhancement of the registration fee and stamp duty in some documents via marriage, trust, will, release of adoption deed, revocation deed, security bond, etc.



Source: [Finance Minister, Assam, 2021] and [Finance Department, Government of Assam, 2021]

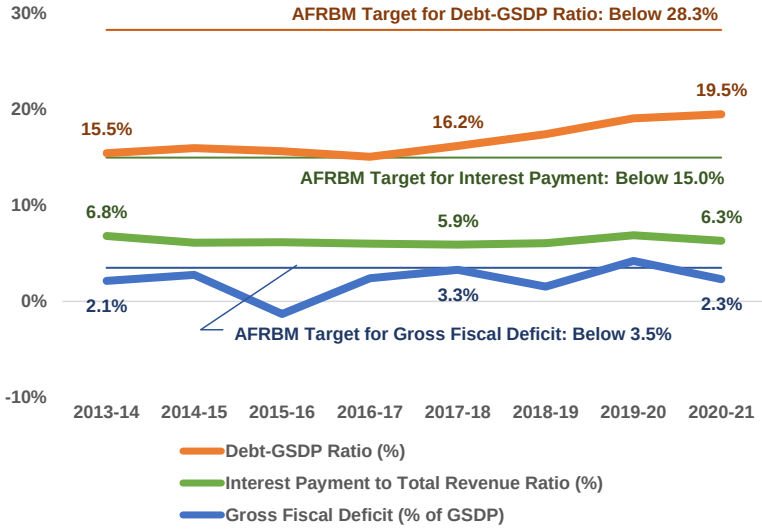
Figure 2-34 Composition of Government Revenue in Assam



Source: [Finance Minister, Assam, 2021] and [Finance Department, Government of Assam, 2021]

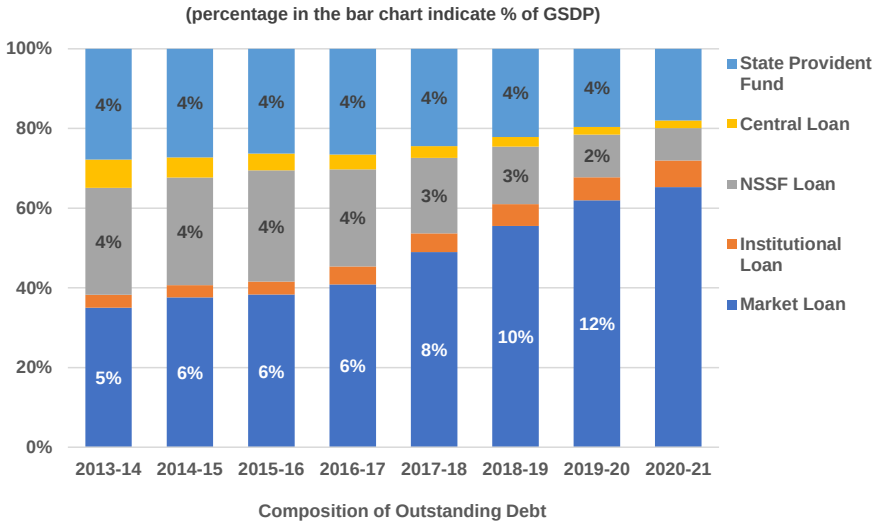
Figure 2-35 Composition of the State's Own Tax Revenue in Assam

In addition to aggregate government revenue, other fiscal indicators such as Gross Fiscal Deficit as a percentage of GSDP, Debt-to-GSDP ratio, and Interest Payment to Total Revenue ratio have also shown favourable financial conditions in Assam. Those fiscal indicators have mostly met the targets set by the Assam Fiscal Responsibility and Budget Management Act (AFRBM) during the past seven years. Although the Debt-to-GSDP ratio has been increasing recently, which is mainly due to the increase in Open Market Borrowings (OMBs) and institutional loan, the ratio itself is still below the targeted ceiling and the burden on interest payment has not shown a sharp growth (Figure 2-36 and Figure 2-37).



Source: [Finance Minister, Assam, 2021]

Figure 2-36 Major Fiscal Indicators of the Government of Assam

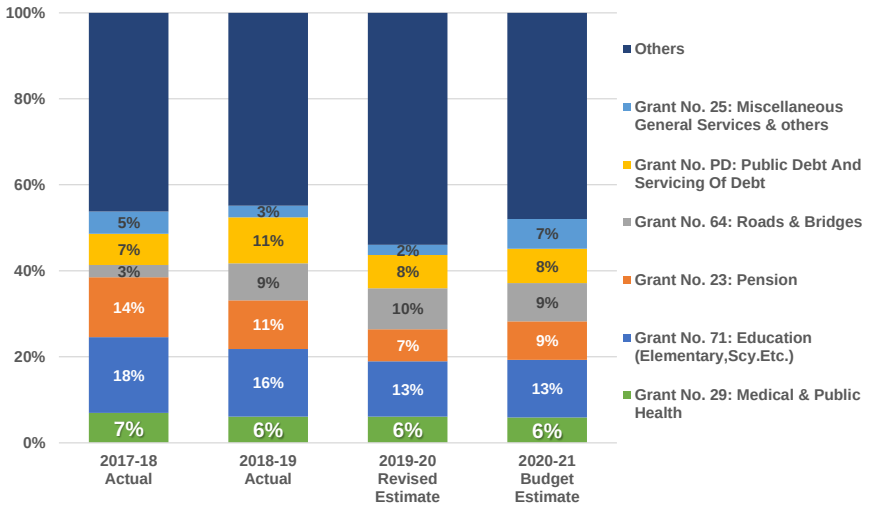


Source: [Finance Minister, Assam, 2021]

Figure 2-37 Composition of Outstanding Debt of the Government of Assam

3) Prioritisation of Health

The third key source of fiscal space for health is an increase in the share of government expenditure that goes to health. As a share of total government expenditure, government expenditure on health in Assam has been stably maintained at around 6% in recent years (Figure 2-38), which is relatively higher than in the other states in comparison as mentioned above. This desirable trend is expected to continue, since the Budget Speech 2021-22 clearly articulated that adequate provision of affordable and quality healthcare to the population has been a priority.



Source: [Government of Assam, 2021]

Figure 2-38 Composition of Government Expenditure in Assam

To summarise, given the moderate prospects of economic growth and the upward trend of the government revenue and expenditure with the context of relatively favourable fiscal conditions of GOA, as well as the sustainable prioritisation of health in government expenditure, fiscal space for health in Assam is expected to be secured in the short to medium term.

(2) Social Health Insurance Scheme

There are some social health insurance schemes in Assam.

1) Atal Amrit Abhiyan

Atal Amrit Abhiyan is a cashless health insurance scheme for families with an annual income below INR 500,000. This scheme provides free treatment for critical diseases as well as intensive care unit (ICU) packages, trauma care, critical care, paediatrics and paediatric surgery and bone marrow transplantation in super-specialty public and private sector hospitals within and outside the state. As of FY 2019-20, treatments for the following specialties are also covered by the newly launched scheme called Vistarita Atal Amrit Abhiyan:

- ICU Packages
- Trauma
- Critical Care Paediatrics
- Paediatric Surgery
- Japanese Encephalitis and Acute Encephalitis Syndrome
- Supplementary Packages

So far, a total of 145,220 people have received benefits under this scheme, of which 4,860 have been covered under the Vistarita Atal Amrit Abhiyan scheme.

2) Pradhan Mantri Jan Arogya Yojana (PM-JAY)

PM-JAY was launched in September 2018. This scheme provides comprehensive coverage of up to INR 500,000 per family per year for secondary and tertiary care treatment. Under this scheme, a total of 150,973 beneficiaries have received cashless treatment until now.

2.3 Health Information and Communication Technology (ICT)

In the survey, Hospital Information Management System (HMIS)/ Hospital Information System (HIS) was examined by studying the following:

1. The prevailing structure of HIS at Directorates and the National Health Mission;
2. The implementation of Hospital Information Systems in the medical college hospitals (work in progress now) and the suitability of NIC's e-Hospital software for large-scale state-wide implementation;
3. The GOI's National Digital Health Mission and how best to hasten digitisation of hospital operations and its integration into the Mission; and
4. General recommendations for strengthening of the information system in Assam.

The ICT plan will strengthen the hospital operations and medical records management of medical college/DHS and other sub-district hospitals by implementing the Government of India's e-Hospital system developed by NIC or other appropriate software vendors. The aim is to generate online data for appropriate decision-making at hospital level, directorate, and government level. Additionally, the ICT plan proposes to recommend database driven management systems in HR, equipment management, drug procurement and distribution. The ICT plan also aims to integrate the Assam medical system into the National Digital Health Mission of GOI over a period of five years, thereby improving the quality and ease of care. The ICT plan will bring in more transparency and reduce the cost of care.

Conservative timelines of three years for medical colleges and four years for district/CHC hospitals are proposed with a budget outlay of INR 45.54 crores; and five to seven years' timeline for PHC and other hospitals with a budget of INR 56.6 crore. Hardware, software, implementation, HR, and operational expenses are provided over five years.

2.3.1 Present Situation

(1) Medical College Hospitals

Medical college hospitals in Assam have been using two types of software systems for data capturing, GMCH and Dibrugarh, with an old legacy computer system and minimal data, as developed by AMTRON, the Assam government hardware and software corporation (Table 2-18).

Table 2-18 Summary of HIS Implementation Status of the Target Medical College Hospitals

Name of the hospital	System	Remarks
Assam Medical College & Hospital, Dibrugarh	Amtron, Guwahati developed system. Functional for OPD and billing and several other modules	Non – compatible for NDHM – local server based. It needed to be moved to cloud based e-Hospital software to include medical records
Guwahati Medical College & Hospital	Amtron, Guwahati developed system. Functional for OPD and billing and several other modules	Non – compatible for NDHM – local server based. It needed to be moved to cloud based e-Hospital software to include medical records
Silchar Medical College & Hospital	e-Hospital (GOI's NIC developed)	Basic modules of e-Hospital system are well implemented. Full modules to be implemented
FAA Medical College & Hospital Barpeta	Amtron Guwahati	Basic modules OPD and billing implemented
Tezpur Medical College & Hospital	Amtron Guwahati	Basic modules OPD and billing implemented
Jorhat Medical College & Hospital	Amtron Guwahati	Basic modules OPD and billing implemented
Diphu Medical College & Hospital	Amtron Guwahati	Basic modules OPD and billing implemented

Note: The following assessments are made through site visits, facilities survey data, interviews, observations by technical experts in NIC, luminous, CDAK, NIC, Pune, luminous info way along with present and past teams of NHM.

Source: JICA Survey Team

(2) Management information System of the National Health Mission

The National Health Mission (NHM) covers all other hospitals other than the tertiary medical colleges. NHM is having a strong management information system (MIS) cell in line with the national health information system guidelines, budget process, data elements, hardware (from sub-district and district hospital levels). It has in-house developed software modules like human resource management (HRM), EEE (Annex II). NHM created and maintain the standardised websites for all the stakeholder departments.

NHM since 2007 has been connecting the rural hospitals, getting the data entry, validation, and report preparation. It continued to upgrade its tools, processes, and hardware (deployed even Very Small Aperture Terminal (VSATS) and gained experience of connectivity even 13 years ago).

NHM is strong in terms of systems (established over the last 15 years) data collection and validation practices, hardware, training mechanisms, quality of teams in house, and even good budget support.

At present NHM operates mainly through the Swasthya Sewa Dapoon – Integrated MIS GIS System (Annex III).

(3) Information Management System in Health Administration

The Directorate of Health Services (DHS), Directorate of Medical Education (DME), and Directorate of Family Welfare (DFW) of the Health and Family Welfare Department of Assam (HFWD) have no in-house system or support for data for decision-making. However, they can always seek, access, and use the portals of NHM reporting modules or the Assam specific modules of HRM, PHARMA, etc.; but in practice, they seek/access the data on less occasions, do not regularly update the HR postings, etc., and almost not aware of modules like drugs vaccines, distribution logistics management system (DVDMS), biomedical equipment maintenance and management system.

(4) e-Hospital Software as Developed by National Informatics Center, Delhi

Several private vendors/HIS systems are available in the market (mostly cloud based). They are reasonably priced. But the chief orientation of these software is billing and revenue collection apart from referral linkages and payment mechanisms. Large hospital chains like Apollo have homegrown software and suit their business/revenue orientation (Annex IV).

The fairly proven and increasingly accepted HIS has been developed by the National Informatics Center, Delhi as a standardised HIS application in hospitals across India (www.ehospital.gov.in). It consists of all useful modules starting from outpatient department (OPD) to inpatient department (IPD) to e-prescriptions, medical records, and blood bank.

e-Hospital has been implemented in 678 hospitals (most of them are the basic modules) but is robust as it has handled the AIIMS, Delhi, and other top hospitals' patient's load and requirement with complete modules. e-Hospital is in the process of upgrading their modules to the next level by incorporating the GOI digital health mission standards. Detailed modules of e-Hospital and site visit to TRIPURA are presented in Annex V.

Brief comparative states of e-Hospital and other software are summarised in Table 2-19.

Table 2-19 Brief Comparative State of e-Hospital and other Software

Item	e-Hospital of NIC	Other Government Supported like eSushrut of CDAC	Private
Large user base	Around 700 hospitals	Up to 200 hospitals	Large number
GOI support	Yes (developed NIC, GOI)	Yes	Case specific – they will have to comply with NHDM
Continuous upgrading	Yes	Not sure	Yes
Cost	Low – but latest demand for INR 12 cloud charges a year for hospital is too high (implementation cost is additional)	Medium	Competitive
Flexibility	Medium – in consultation with the Tripura NIC, we can leverage sufficient customisation.	Medium	High (possible to customise and develop easier interfaces – but may take time)
Compatibility with digital health mission	High	Yes	Unspecified at present – but possible
Cloud based	Yes	Yes	Company and product specific
Speed of implementation	Medium (needed to hire large teams to speedup implementation)	Medium	High
In use in Assam	Yes, in SMCH, Silchar, LGBRIMH, Tezpur and all district hospitals in the Government of Assam. Thirty district hospitals will be covered within this financial year.	Not yet	Many public and private hospitals across India by multiple vendors
HER Compliance	Yes	Yes	Unspecified at present

Source: JICA Survey Team

Table 2-20 summarises outline of health information system in Assam.

Table 2-20 Summary of HMIS and HIS in Assam.

	NHM	DHS/DFW	DME	Medical Colleges
Section/Cell/Department	Fully established	Not present –	Not present	Not present
Teams	Dedicated up to 7 numbers	Not present -	Not present	Not present
HR	Manpower in position at state/dt/block level	Manpower in position at state/dt/block level	-	No dedicated IT person or IT coordinator from doctors' cadre
Modules/Software /Tools	All most for all purposes – rather too many	Not present	Not present	e-Hospital basic modules in implementation, AMTRON modules in AMC, GHM&C
Periodicity/ Regularity	Daily/weekly /monthly reports for GOI	eVIN and CoWIN system. Others Seek from NHM	Seek from Colleges and NHM	Generate on demand by DME or govt.
Data for Decision-making	Fairly established	Established for eVIN and CoWIN system. Need to grow for other subjects	Need to grow	Need to grow
Website	Strong and continuous updated	Good website	Good website – active in admission times	Good website – active in admission times
Hardware Support	Best and highest	Use for normal communication	Use for normal communication	Good but scattered for various purposes

Note: Atal Amrit Abhiyan society and other autonomous organisations have own software and formats for collecting – insurance related – beneficiary details at the OPD level in hospitals. (Needed to study)
Attempt has been made in 2017/2018 by NHM to develop most of the procurement/maintenance modules for drugs/equipment systems. Due to the host of logistical issues of engaging national vendors, NHM ended up developing its in-house system for drugs procurement and distribution, which is acceptable.

Source: JICA Survey Team

GOA may evaluate the implementation of e-Hospital in medical college and district hospitals as it is already underway whether to implement the full modules under this project or to seek a private top software vendor to integrate fully with the national digital health mission.

(5) GOI's Massive Plan and Digital Health Records of Indians through National Digital Health Mission

The National Digital Health Mission is a digital health ecosystem being implemented by GOI in the Union Territories (to be extended to all states soon) now under which every Indian citizen will have unique health IDs, digitised health records as well as a registry of doctors and health facilities (Annex V).

A unique health ID will be provided to every citizen, which will contain details of their diseases, diagnoses, report, medication, etc., in a common database through a single ID. This will essentially be a digitised version of all their health records. This digital database will be linked to the registry of doctors and health facilities across the country [Gov of India, 2021].

Digital data/records will help medical college professors' conduct/publish quality research articles, secure funding from national bodies, and improve their professional knowledge through submission of research papers in national and international conferences.

2.4 Medical Institutes

2.4.1 Outlines of the Medical College Hospitals

Table 2-21 and Table 2-22 summarise the outline of the seven medical hospitals. Generally, the facilities seemed to be deteriorated and layouts may not be appropriate to have efficient movement of patients and staff.

Table 2-21 Summary of the Candidate Medical College Hospitals (1)

Name	AMCH Assam Medical College Hospital	GMCH Gauhati Medical College Hospital	SMCH Silchar Medical College Hospital	JMCH Jorhat Medical College Hospital
Location	Dibrugarh	Guwahati	Cachar	Jorhat
Establishment Year	1947	1960	1968	2009
Number of Beds	1,365	2,185	1,151 Inpatients 54,978/year (2018.4～2019.3)	500 Inpatients 36,311/year (2019.9～2020.8)
Existing Clinical Department	Medicine General Surgery Orthopaedics Plastic Surgery Cardiology Neurology Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry Dentistry	Medicine General Surgery Orthopaedics Plastic Surgery Cardiology Cardiovascular Neurology Neurosurgery Gastroenterology Nephrology Endocrinology Urology Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry Oncology TB and Chest Community Medicine Emergency	General Medicine General Surgery Orthopaedics Pulmonary Medicine Neurology Neurosurgery Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry Dentistry Community Medicine Emergency and Trauma	Medicine Surgery Orthopaedics Cardiology Neurosurgery Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry Dentistry TB and Chest Community Medicine
No. of Doctors	341	(no data)	219	216
No. of Nurses	378	(no data)	313	346
OPD Patients	More than 1,000 patients/day	More than 4,000 patients/day	657,390/year (2018.4～2019.3) More than 2,000 patients/day	240,237/year (2019.9～2020.8) More than 800 patients/day
Operation Theatre	No Data	No Data	Major: 4,835/year Minor: 4,166/year (2018.4～2019.3)	Major: 7,473/year Minor: 9,468/year (2019.9～2020.8)
Diagnostic Imaging	No Data	No Data	MRI: 2,058/year CT: 16,461/year USG: 35,795/year X-ray: 69,796/year (2018.4～2019.3)	MRI: 1,614/year CT: 9,135/year USG: 16,923/year X-ray: 27,420/year (2019.9～2020.8)

Name	AMCH Assam Medical College Hospital	GMCH Gauhati Medical College Hospital	SMCH Silchar Medical College Hospital	JMCH Jorhat Medical College Hospital
Existing Facility Condition	All department buildings are deteriorated. Some inpatients are bedded in the floor due to the scarcity of beds. OPD waiting area is not sufficient to accommodate all patients. No lifts or most of lifts are not functioned.	No Data	All department buildings are deteriorated. There is no waiting space for outpatients.	Although the buildings are constructed only ten years ago, all department buildings are deteriorated. Some inpatients are bedded in the floor due to the scarcity of beds. No lifts. ICU is not functional because of the out of dated environment.
Under Construction	Cancer Hospital Super Specialty Hospital (What department ?)	Cancer Radiation Block (Tomo therapy)	Doctors' Quarters	Cancer Hospital OPD building refurbishment
Requirements from GoA on 24 September 2021	Smart Hospital, Dormitory for staffs and Night Shelter (200 beds)	Smart Hospital, Training, Monitoring, Administrative Centre (approx. 9,300 ㎡), Dormitory for staffs and Night Shelter (200 beds)	Super Specialty Wings (Cardiology, Nephrology, Neurology, Cardiovascular Surgery, Neurosurgery, Urology), Dormitory for staffs and Night Shelter (200 beds)	Super Specialty Wings (Cardiology, Nephrology, Neurology, Cardiovascular Surgery, Neurosurgery, Urology), Dormitory for staffs and Night Shelter (200 beds)

Source: JICA Survey Team

Table 2-22 Summary of the Candidate Medical College Hospitals (2)

Name	FAAMCH Fakhruddin Ali Ahmed Medical College Hospital	TMCH Tezpur Medical College Hospital	DMCH Diphu Medical College Hospital
Location	Barpeta	Tezpur	Diphu, Karbi Anglong
Establishment Year	2011	2013	2019
Number of Beds	500	500	300
Existing Clinical Department	Medicine Surgery Orthopaedics Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry T.B. and Chest Rehabilitation Community Medicine	General Medicine General Surgery Orthopaedics Pulmonary Medicine Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry Dentistry Community Medicine Emergency and Trauma	General Medicine General Surgery Orthopaedics Pulmonary Medicine Obstetrics Gynaecology Paediatrics ENT Ophthalmology Dermatology Psychiatry Dentistry Community Medicine Emergency and Trauma
No. of Doctors	159	167	135
No. of Nurses	345	361	452

Name	FAAMCH Fakhruddin Ali Ahmed Medical College Hospital	TMCH Tezpur Medical College Hospital	DMCH Diphu Medical College Hospital
OPD Patients	More than 1,000 patients/day	Nearly 800 ～1,000 patients/day	69631/year (2019.11～2020.10) More than 250 patients/day
Operation Theatre	No Data	No Data	Major: 857/year Minor: 146/year (2019.11～2020.10)
Diagnostic Imaging	No Data	No Data	No Data
Existing Facility Condition	Although the buildings are constructed only ten years ago, all department buildings are deteriorated. Some inpatients are bedded in the floor due to the scarcity of beds. ICU is not functional because of the out of dated environment.	Although the buildings are constructed only ten years ago, all department buildings are deteriorated. Some inpatients are bedded in the floor due to the scarcity of beds. ICU is not functional because of the out of dated environment. No lift or Most of lifts are not functioned.	Buildings are new. Some medical equipment are already procured but not yet installed. (ex. MRI etc.)
Under Construction	Cancer Hospital Mother and Child Hospital	Doctors Quarter Hostels for Doctors and Nurses	Staff Quarter Hostels for Doctors and Nurses
Requirements from GoA on 24 September 2021	Super Specialty Wings (Cardiology, Nephrology, Neurology, Cardiovascular Surgery, Neurosurgery, Urology), Dormitory for staffs and Night Shelter (200 beds)	Super Specialty Wings (Cardiology, Nephrology, Neurology, Cardiovascular Surgery, Neurosurgery, Urology), Dormitory for staffs and Night Shelter (200 beds)	Super Specialty Wings (Cardiology, Nephrology, Neurology, Cardiovascular Surgery, Neurosurgery, Urology), Dormitory for staffs and Night Shelter (200 beds)

Source: JICA Survey Team

2.4.2 Hospital Management

According to HFWD, every medical college hospital as a hospital management society. It is autonomous in functions and decision making to provide support to operation of the medical college hospital. A principal takes chair and superintendents are the members. Also, Director of Medical Education of HFWD, and representatives from other government agencies and public are involved. The governing board is headed by a public representative, such as local member of legislative assembly. Financial sources of the society are donations and government grants, which is usually Rs. 30 to 50 million per year per society. Also, user funds are generated from patient registration fee and other medical services to be deposited in the society's bank account. The user funds are utilized to hire contractual staff, operation and maintenance of hospital functions, purchase of consumables.

Also, in district/civil hospitals have hospital management society chaired by directors. Since introduction of the free diagnostic initiative, deposit from user fund has been decreased. The society also receives funds from the National Health Mission.

Under the subcontracted survey, the JICA Survey Team inquired about the management vision and commitment of the target hospitals, as well as concrete tools for management review. Six out of seven MCHs and four from six CDHs responded to the questionnaire. All the hospitals stated their management

vision and mission, but the commitment of the hospital to realise the management vision seemed not clear. According to the questionnaire survey to the hospital staff, there were some comments that decision-making procedure had not been opened to the staff but it was just limited to some personnel.

Mid-term and long-term development plans seemed to focus on infrastructure development such as installation of new facilities, and renovation and/or upgrade of the existing facilities.

The Plan-Do-Check-Action (PDCA) cycle seemed not to be familiar in most of the hospitals, except two in each of the MCHs and CDHs which stated that they use PDCA cycle in management. Regarding risk management, three MCHs and one CDH opened about incident report or risk management information, and one MCH out of those provided periodic training on risk management. Another MCH seemed to prepare an incident report, but it is closed to hospital staff.

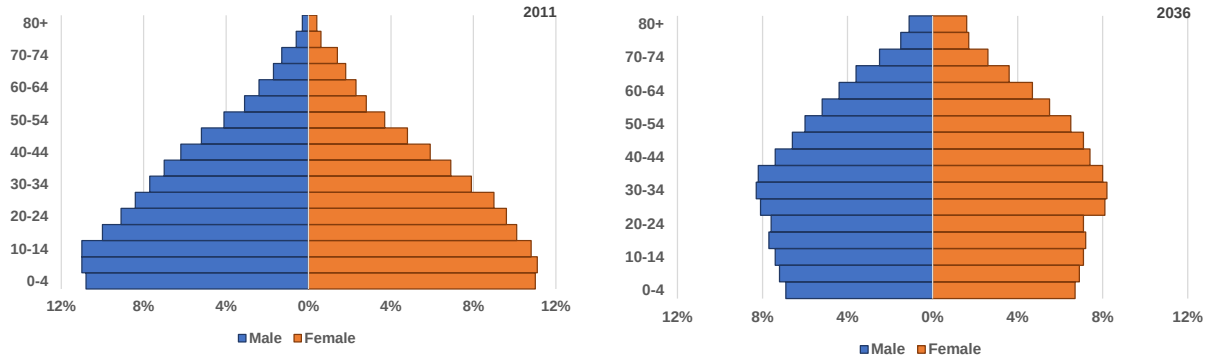
Chapter 3 Overview of the Project Site

3.1 Socio-Economic Overview

3.1.1 Geography and Demography

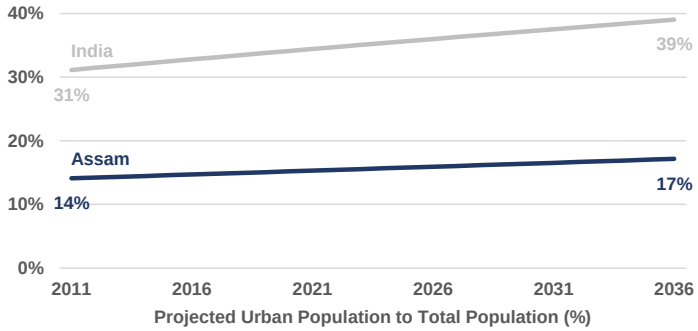
Assam is in the northeast of India and is the largest NER state in terms of population while second in terms of area. Assam covers an area of 78,438 km^2, which accounts for nearly 2.4% of India's total geographical area. The state is bordered by Bhutan and the State of Arunachal Pradesh to the north; Nagaland, Arunachal Pradesh and Manipur to the east; Meghalaya, Tripura, Mizoram, and Bangladesh to the south; and West Bengal to the west. A significant geographical aspect of Assam is that it contains three of the six physiographic divisions of India – The Northern Himalayas (Eastern Hills), The Northern Plains (Brahmaputra plain), and Deccan Plateau (Karbi Anglong). There is a distinct monsoon season in which a large part of the annual rainfall is concentrated. The landscape includes tea gardens, the river Brahmaputra, many historical monuments and temples. Another aspect that separates Assam from the rest of Indian states is the rich composite culture of the state. Assamese constitute most of the state's population, but the state has over two dozen other big and small tribal groups with many of them having their own language, writing system, and traditions.

According to the Population Projection Report, the total population of Assam in 2011 was 31.2 million and projected to be 39.4 million in 2036. Figure 3-1 shows Assam's population pyramid in 2011 and 2036. In 2011, the proportion of teenagers and twenties is high. However, in 2036, the shape of the pyramid is projected to be changed to a hanging bell shape, which indicates that the number of children will be declining while the overall population, including working age population and the people aged 65 or older, will be growing.



Source: [National Commission on Population, Ministry of Health & Family Welfare, Mirman Bhawan, 2020]

Figure 3-1 Population Pyramid in Assam

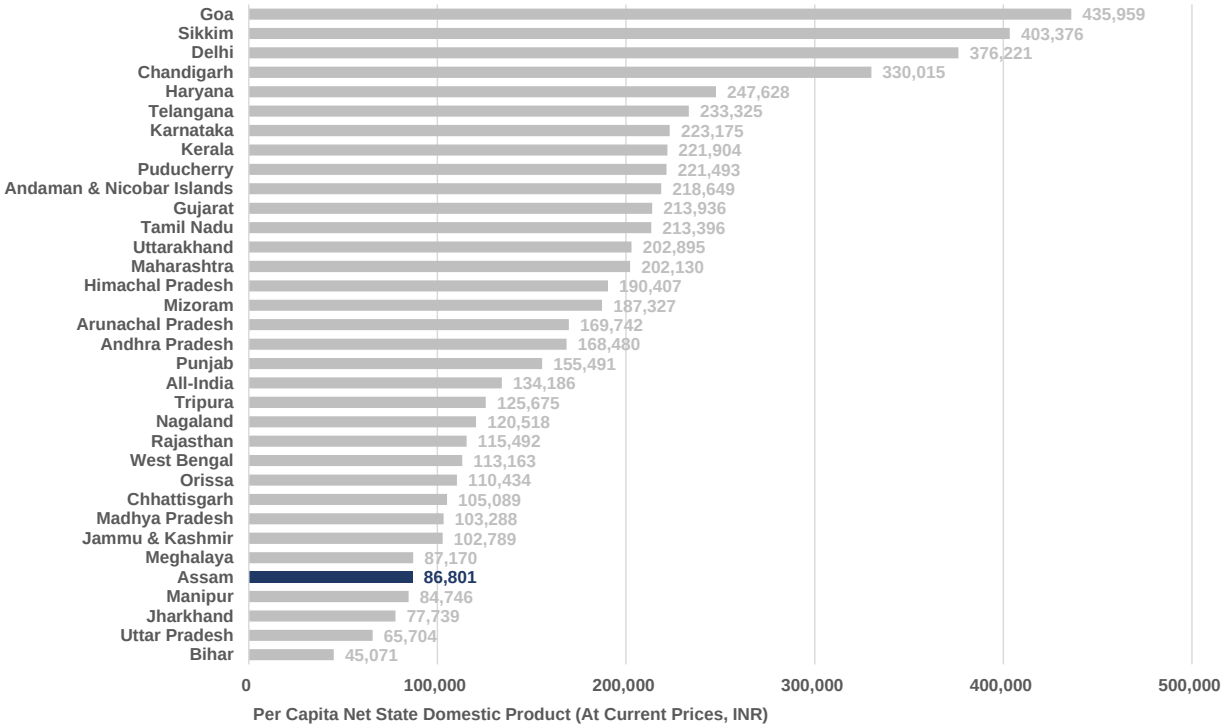


Source: [National Commission on Population, Ministry of Health & Family Welfare, Mirman Bhawan, 2020]

Figure 3-2 Projected Urban Population to Total Population

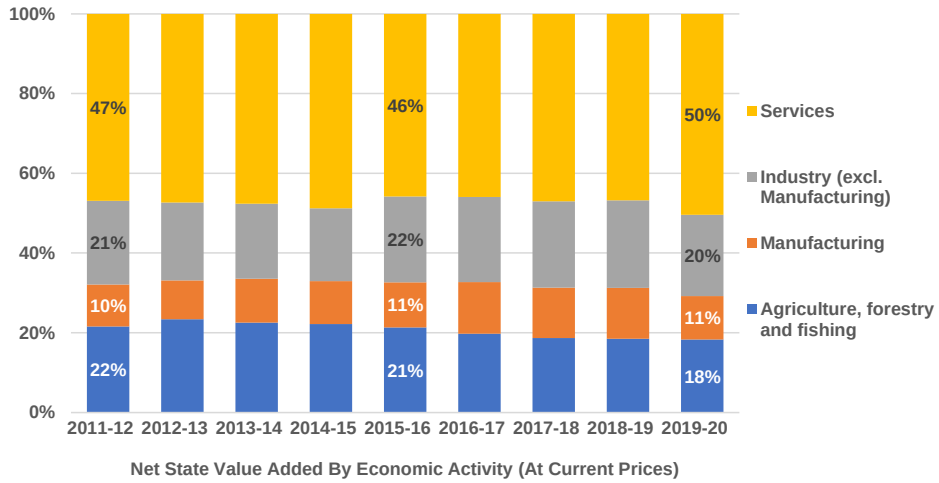
3.1.2 Economy

In FY 2019-20, Assam's Net State Domestic Product (NSDP) per capita was INR 86,801, or approximately USD 1,200 (Figure 3-3), which was the fifth lowest among the states. According to the statistics, other than the service sector, the percentage contribution of agriculture and industry sector is more or less static (Figure 3-4). The tea industry occupies an important place in Assam and plays a very special role in the state economy. Assam tea has maintained its international reputation and keeps significant share in the world tea market. The total area under tea cultivation in Assam is accounting for more than half of the country's total area under tea. In addition, the tea industry in Assam also provides average daily employment to more than 68,600 persons in the state, which is around 50 percent of the total average daily number of labourers employed in the country, according to the Economic Survey.



Source: [Reserve Bank of India, 2021]

Figure 3-3 Per Capita Net State Domestic Product



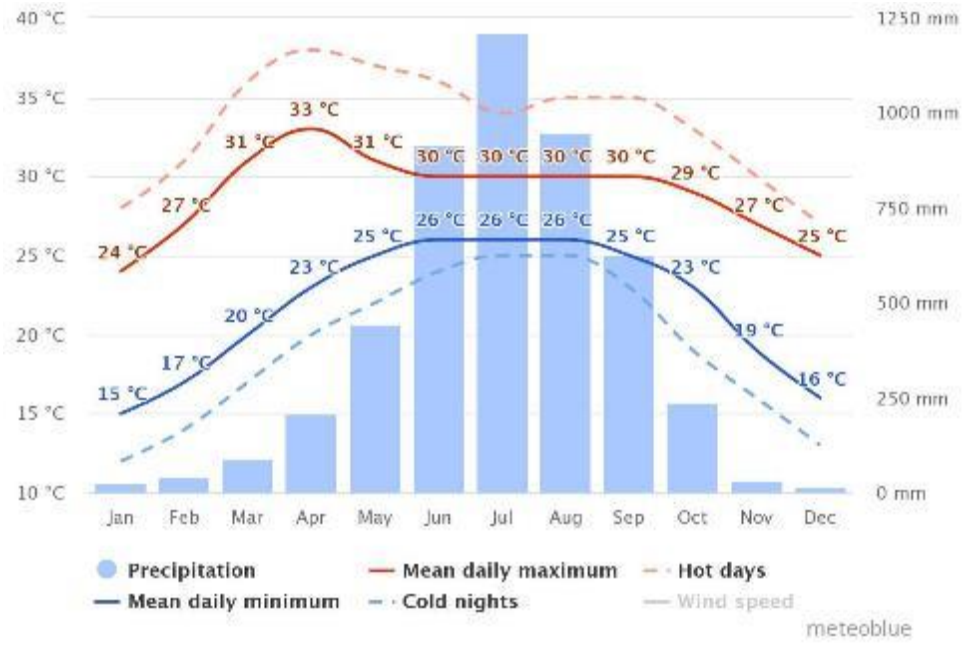
Source: [Reserve Bank of India, 2021]

Figure 3-4 Net State Value Added by Economic Activity

3.2 General Environmental Condition

3.2.1 Climate

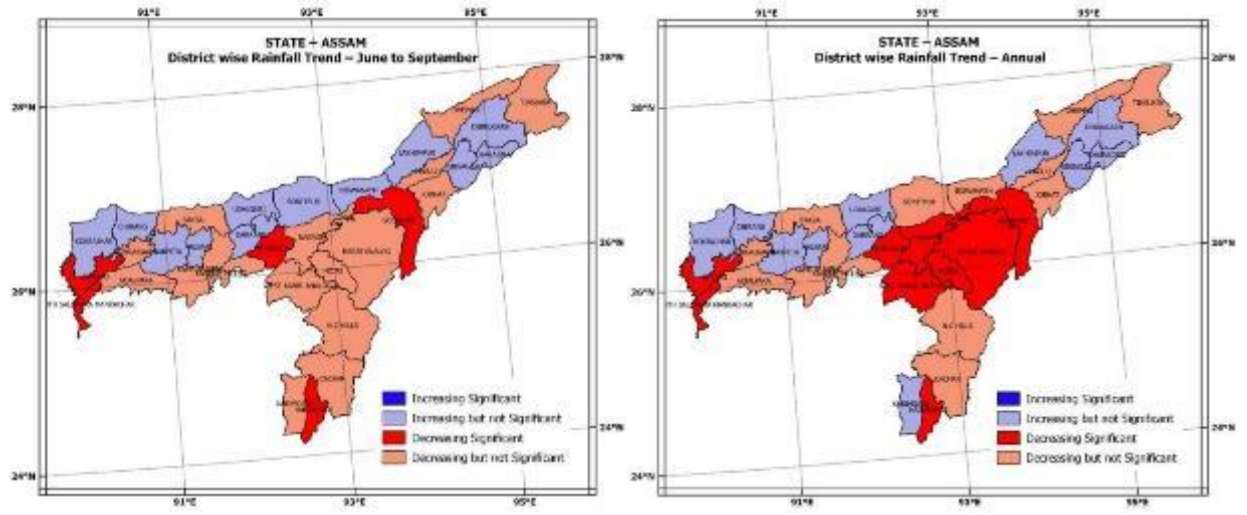
Assam State has a tropical monsoon climate, with an annual precipitation of around 2,100 mm and maximum temperature in summer (May-August) of around 35-38 °C and a minimum of 6–8 °C in winter (November-February). Figure 3-5 presents the annual distribution of precipitation, and the maximum and minimum temperatures at Dispur. The state gets the highest rainfall (28.7%) due to the southwest monsoon in July followed by June (28.6%). August and September receive 23.8% and 18.9% of southwest monsoon rainfall, respectively. Also, more than 66% of the annual rainfall is received during the southwest monsoon season only. The variability of monsoon or annual rainfall is also very low (12%).



Source: [meteoblue, 2021]

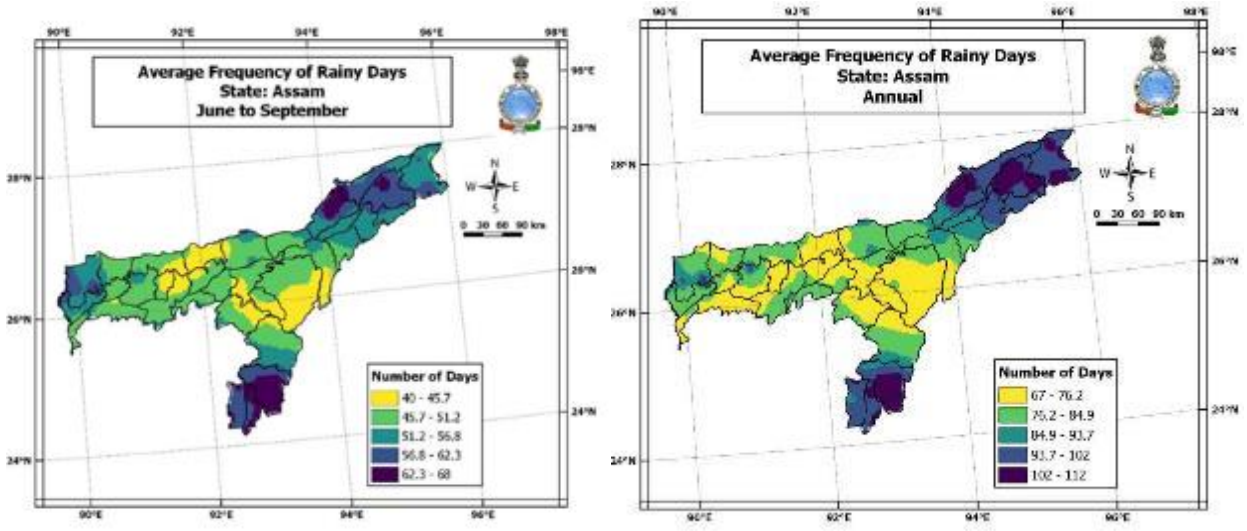
Figure 3-5 Monthly Precipitation, Mean Maximum and Minimum Daily Temperature

(Dispur)



Source: [Ministry of Earth Sciences, 2021]

Figure 3-6 Trend in District Level Rainfall (left) Rainy Season and June-September (right)



Source: [Ministry of Earth Sciences, 2021]

Figure 3-7 Average Frequency of Rainy Days (left) and June-September (right)

3.2.2 Agro-Climatic Division

Considering climate, topography, soil characteristics, and the cropping pattern, the state is divided into six agro-climatic zones, namely: Barak Valley Zone, Hill Zone, Upper Brahmaputra Valley Zone, Central Brahmaputra Valley Zone, Lower Brahmaputra Valley Zone, and North Bank Plain Zone. The characteristics of each zone are described as follows:

Upper Brahmaputra Valley Zone: The zone includes Tinsukia, Dibrugarh, Sibsagar, Jorhat, and Golaghat districts, where season-wise average rainfall ranges between 74.4 mm in winter and 1,060 mm in summer. Rice is the principal crop and sugarcane and mustard are the other important crops that are grown in the region.

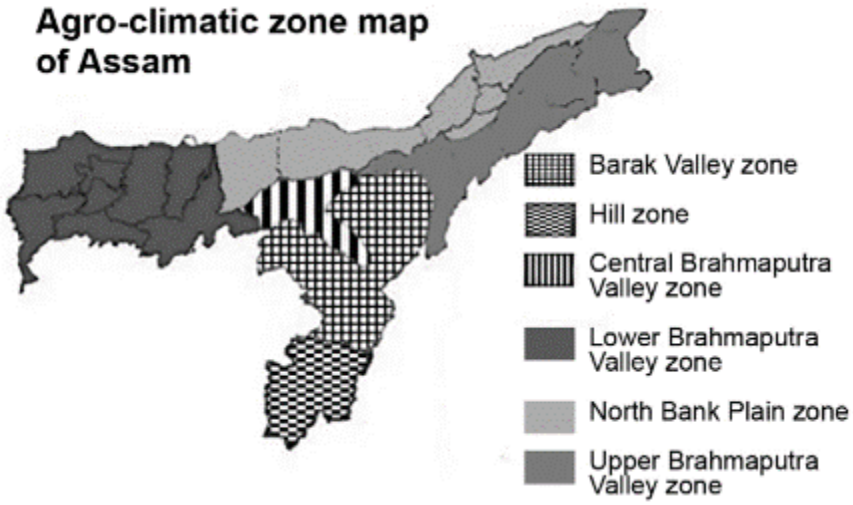
Central Brahmaputra Valley Zone: The zone encompasses Kamrup, Nagaon, and Morigaon districts. Season-wise average rainfall of the Central Brahmaputra Valley varies between 31 mm in winter and 1,271 mm in summer. Rice, mustard, jute, and pulse are the main crops of the zone.

Lower Brahmaputra Valley Zone: The zone stretches over Goalpara, Dhubri, Kokrajhar, and Bongaigaon districts. In this zone, rainfall mainly occurs due to the summer monsoon that originates from the Bay of Bengal and ranges from 89 mm during winter to 1,203 mm during monsoon in summer. The climate is suitable for rice, mustard, potato, wheat, and jute cultivation, because of fertile soils.

Hill Zone: It includes Karbi Anglong and N C Hills. The average seasonal rainfall during the monsoon season is about 719 mm, and shifting cultivation is practised in this region. Crops such as rice and sugarcane are cultivated in the zone mainly for sustenance.

Barak Valley Zone: Cachar, Hailakandi, and Karimganj districts are included in Barak Valley Agro-Climatic Zone. The average seasonal rainfall during the monsoon season is about 1,957 mm. This region is also known for the cultivation of rice and sugarcane.

North Bank Plain Zone: This agro-climatic zone stretches over the districts of Dhemaji, Lakhimpur, Sonitpur, Darrang, Nalbari, and Barpeta (newly formed districts like Udalguri, Baska, and Chirang are included here). While rice is the main crop of the region, mustard and sugarcane are also grown. The temperature varies from 22 ºC to 35 ºC, and annual rainfall varies from 1,500 mm in the western part to 3,400 mm in the northeastern part of the zone.



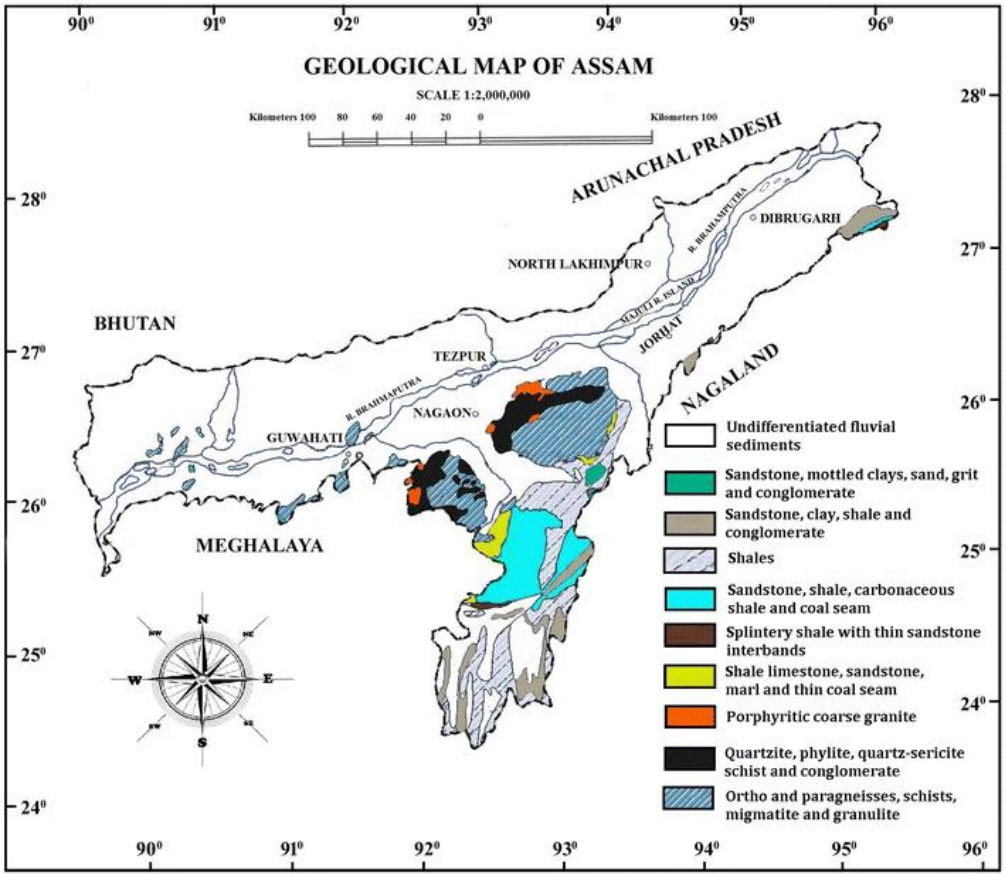
Source: [HK Nath, 2018]

Figure 3-8 Agro-Climate Division of Assam State

3.2.3 Geology

A major part of the state is covered by the recent alluvium of the east-west trending Brahmaputra floodplain (BFT), which is said to be tectonic in origin, in which the valley portion was formed by the compression between the European and the Indian plates and also led to the formation of the Himalayan Mountains [N Das, et al., 2017]. Sediment characteristics vary based on the origins and features of the northern and southern tributaries. The larger northern tributaries, of Himalayan origin, have greater sediment discharge,

consisting mainly of silt fractions. The beds and the banks of the southern tributaries were formed by non-alluvial sediments. The Karbi Anglong Hills and North Cachar Hills located at the central portion consist of gneisses, schists, and granite, while transported soils were formed through the weathering of rocks of the Himalayas and the Assam Plateau [Mahanta C, 1995]. Cachar Plain in the south comprises recent alluvium.



Source: JICA Survey Team based on Geological Survey of India

Figure 3-9 Geological Base Map of Assam with Different Geological Formations

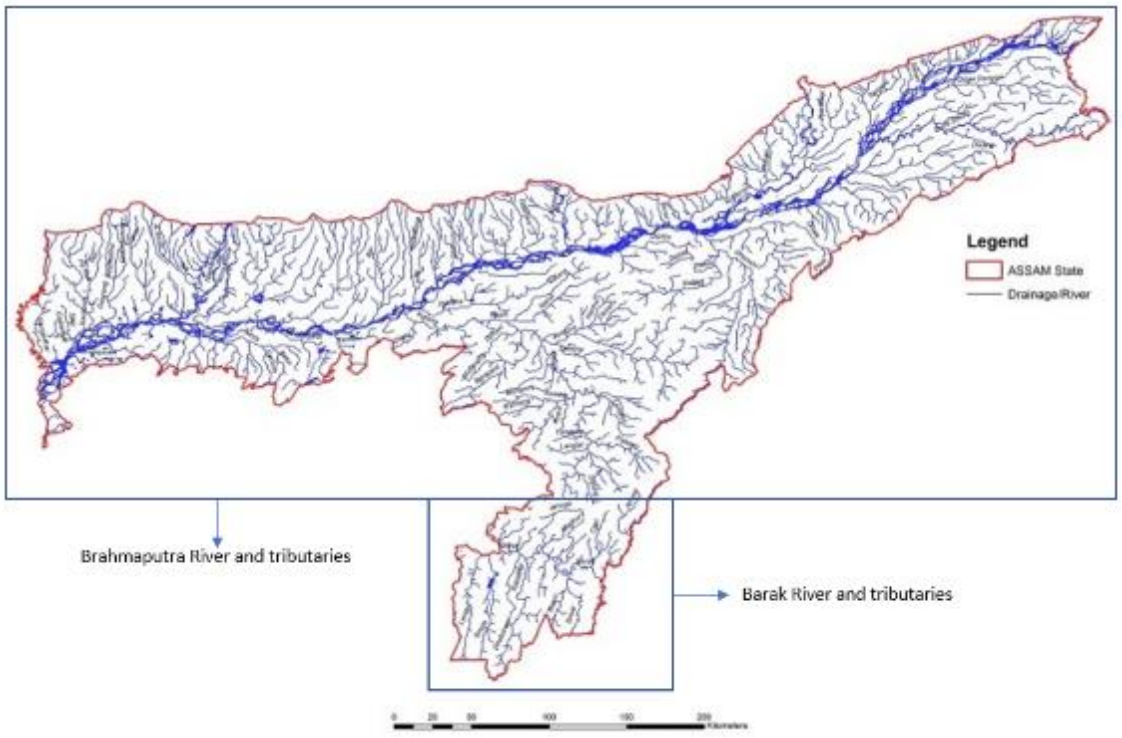
3.2.4 Hydrology

Assam is endowed with enormous water resources. The large perennial rivers and other water bodies with rich aquifer speak about the vastness of its water resources. Surface water is available in the form of river, stream, lake, swamp, pond, etc. Groundwater is available at low to moderate depths in almost the entire state. Although there is seasonal and regional variation in the availability of water resources, the annual availability of water resource remains almost the same.

(1) Surface Water

Apart from the annual rainwater received, thanks to the good monsoon and low pressure in the Bay of Bengal, the state is endowed with several perennial rivers and lakes. The state is drained by the river systems of Brahmaputra and the Barak rivers. There are about 73 important tributaries of the Brahmaputra River and 11 tributaries of Barak River. The vast potential surface water resource of the state is not yet properly utilised in the state. In the last few decades, the rate of consumption of water in the agricultural sector, industrial sector, and in the urban centres has increased significantly. The discharges of untreated domestic

wastewater, industrial wastewater, runoff from the agricultural fields, and urban sewage water are posing threat to the water bodies of the state.



Source: WWF

Figure 3-10 Major River System

(2) Groundwater

Assam is one of the rich states of the country in terms of the groundwater development potentiality. The entire Brahmaputra Valley, covering more than 70 percent of the total geographical area of the state, contains prolific aquifer system with water table lying within 5 m of land surface. The Barak Valley also has a good potentiality for the development of groundwater. In some parts of the state, there is a problem of groundwater contamination such as Fluoride, Iron, and Arsenic as shown in Table 3-1

Table 3-1 Groundwater Quality Problems

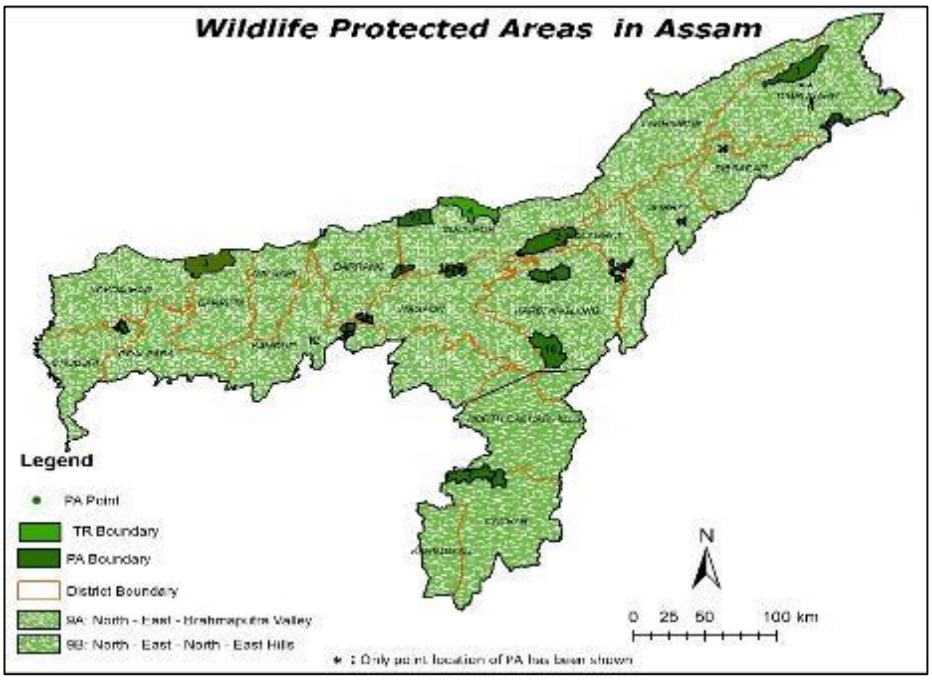
Contaminants	Levels	Districts Affected (in part)
Fluoride	>1.5 mg/L	Goalpapra, Kamrup, Karbi Anglong, Nagaon,
Iron	>1.0 mg/L	Cachar, Darrang, Dhemaji, Dhubri, Goalpapra, Golaghat, Hailakandi, Jorhat, Kamrup, Karbi Anglong, Karimganj, Kokrajhar, Lakhimpur, Morigaon, Nagaon, Nalbari, Sibsagar, Sonitpur
Arsenic	>0.05 mg/L	Dhemaji

Source: Central Ground Water Board (CGWB)

(3) Protected Areas

Out of the five national parks in Assam, two are designated as World Natural Heritage Sites by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Assam has rich biodiversity and is endowed with rich topography covering lush hills and valleys dissected by the majestic Brahmaputra and its many tributaries. It is home to over 180 species of mammals, including rare and endangered species like the great Indian one-horned rhinoceros, the royal Bengal tiger, the golden langur and hoolock gibbon, and

a spectacular range of avifauna. Assam's most famous parks are Kaziranga and Manas. Both were conferred World Heritage Status in 1985. There are 18 notified wildlife sanctuaries spread across the state. It is expected that none of the candidate project site is located within 10 km from protected area.



Source: Wildlife Institute of India

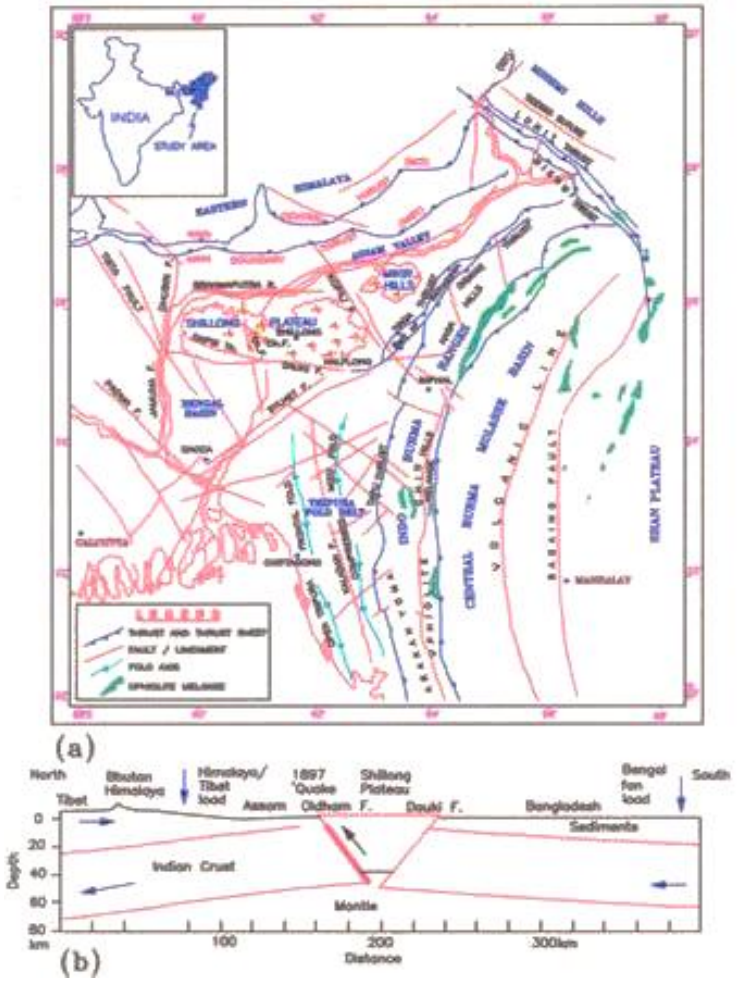
Figure 3-11 Wildlife Protected Areas in Assam

(4) Natural Disasters

1) Seismology

The NER of India including Assam State is an earthquake prone area. The region has experienced many earthquakes of tectonic origin. The risk probabilities of earthquake are less over the entire Brahmaputra Valley. Two major earthquakes in history, one with magnitude 8.7 that occurred in 1897 and another with magnitude 8.6 in 1950, both caused large-scale damage in lives and properties in the region. Sir Edward Gait (1933) has mentioned that the occurrence of destructive earthquakes in this region since 1500 happened once or twice every century. In the last century, destructive earthquakes occurred in 1918, ’23, ’30, ’32, ’38, ’43, ’47, ’50, and in ’88.

As indicated in the previous section, much of Assam lies in the Brahmaputra River Valley, except for a few southern districts. The northern and eastern parts of this valley are bounded by the Himalayan Frontal Thrust (HFF). In the eastern parts along with the HFF, there is the Lohit and Naga thrusts. Among the large earthquakes in this region were the events in 1869 and 1897. The 1897 earthquake is well known for the dramatic accounts of violent upthrow during the shock. The northeast Himalayan region of India is one of the most seismically hazardous zones in South Asia. GSI has determined the 3-D seismic velocity (Vp) structure of the crust of that region using selected arrival time data from two groups of shallows to intermediate-depth local earthquakes recorded by two different seismic networks by applying the 3-D tomography method of Zhao et al. (1992).



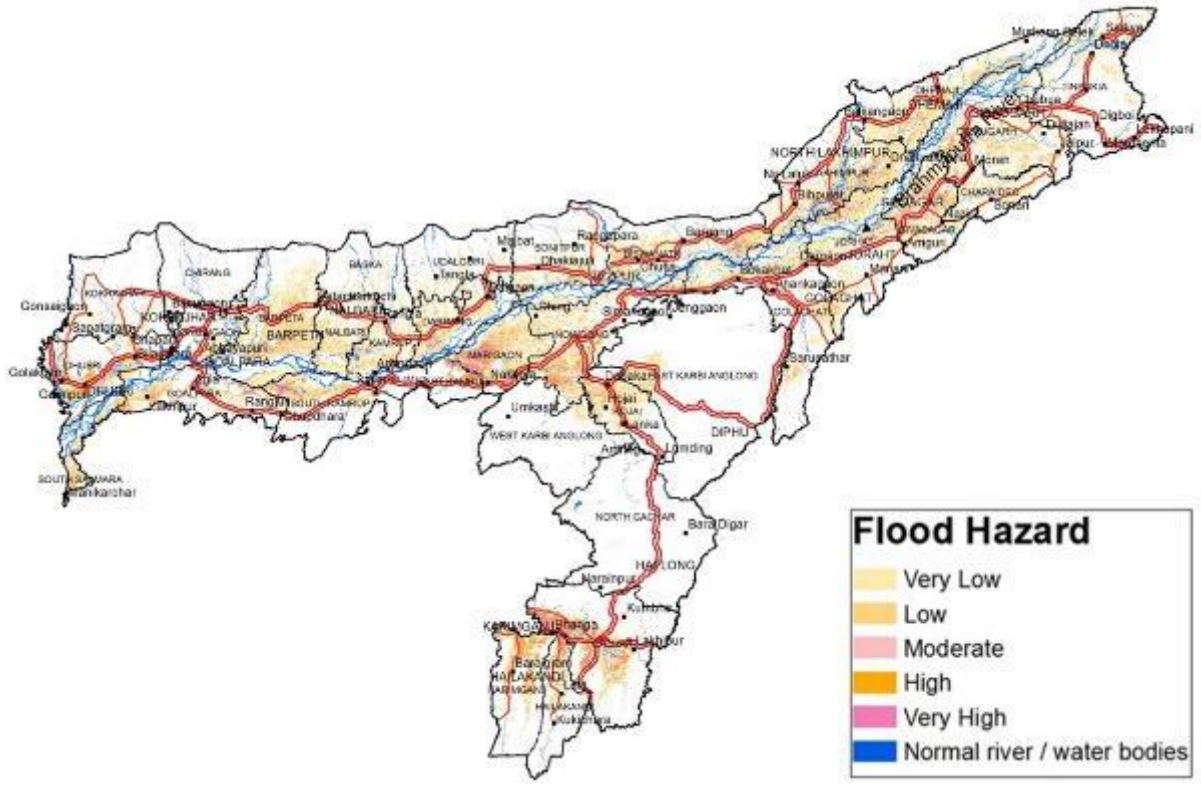
Source: Earthscrust.org.au (based on Gupta et. Al. 2005)

Figure 3-12 Tectonic Map of North Eastern Region

2) Annual Floods

The State of Assam has a total surface area of about 78,438 km^2, which forms part of the Brahmaputra basin. The basin lies within the monsoon rainfall regime receiving an annual rainfall of about 2,300 mm, 60-70% of which is observed during the monsoon season from June to September. The Brahmaputra River, along with its host tributaries, causes devastating floods almost every year with colossal loss and damage to infrastructure and environment in the state. The unique environmental setting, i.e., the eastern Himalayas, highly potential monsoon regime, and accelerated rates of erosion, rapid channel aggradation, deforestation, intense land use pressure, and high population growth especially in the floodplain belt, are some of the dominant factors that cause recurrent floods in the State of Assam with the extent of risk hazard as indicated in Figure 3-13 (Goswami, 1998, Kotoky et.al., 2003).

The flood prone area of the state as assessed by the Rastriya Barh Ayog (RBA) is 31.05 lakh hectares against the total area of the state of 7,852,300 ha, i.e., about. 40% of the total land area of Assam, and 9.4% of the total flood prone area of the country. Average annual loss due to flood in Assam is estimated to be around two billion Indian rupees.



Source: Department of Space, GoI

Figure 3-13 Flood Hazard Map of Assam

3.3 Project Site

3.3.1 Tertiary Medical Institute (Medical College Hospital)

There are seven medical college hospitals in Assam and the one in Lakhimpur is about to begin admission. The current specifications of the seven MCH are shown in Table 3-2 below.

Table 3-2 Current Specifications and Conditions of Seven MCH

	Name of the Institute	Location	Establishment (Year)	No. of MBBS Student	No. of Beds	Additional Departments to the Standard
1.	GMCH	Kamrup (M)	1960	156	2,284	Radiation Oncology/ Cardiology/ Neurology/ Neurosurgery
2.	AMCH	Dibrugarh	1960	170	1,954	Radiation Oncology/ Cardiology/ Neurology
3.	SMCH	Cachar	1968	100	1,256	Cardiology
4.	JMCH	Jorhat	2009	100	500	Cardiology/ Neurosurgery
5.	TMCH	Sonitpur	2013	100	500	-
6.	FAAMCH	Barpeta	2011	100	500	-
7.	DMCH	Karbi-Anglong	2011	100	300	Radiation Oncology (ACCF)
8.	LMCH	Lakhimpur	2021	-	-	-

Source: JICA Survey Team

(1) Gauhati Medical College and Hospital, Kamrup (M)

Gauhati Medical College and Hospital (GMCH) is one of the premier health care institutions established in Assam in 1960 in the NER of India, which provides tertiary level medical care with a bed strength of 2,500 beds. It provides medical education at undergraduate, postgraduate and super specialty levels. Basic information is shown in Table 3-3 below.

The hospital has all the basic specialties and super specialties like Cardiology, Cardiovascular, Neurology, Nephrology, and Neurosurgery. A new block of super specialty hospital across the road is under construction.

The distance from the nearest airport, Lokapriya Gopinath Bordoloi Airport, Guwahati to GMCH is 24.3 km (Driving time is approx. 49 min).

Table 3-3 Gauhati Medical College and Hospital (GMCH)

Address:	Bhangagarh, PO Indrapur 781032 Assam
Site Area:	No Data (No site plan shared)
Establishment:	Year 1960
MBBS Course:	156 students / year
Bed Strength:	2,284
OPD Patients:	More than 4,000 patients/day
Operation Cases:	No Data.
Diagnostic Imaging:	No Data.
Clinical Departments:	Medicine, General Surgery, Orthopaedics, Plastic Surgery, Cardiology, Cardiovascular, Neurology, Neurosurgery, Gastroenterology, Nephrology, Endocrinology, Urology, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, Oncology, T.B. and Chest, Community Medicine, Emergency
Facilities under Construction:	Cancer Radiation Block (Tomo-therapy)

Source: JICA Survey Team

(2) Assam Medical College and Hospital, Dibrugarh

Assam Medical College and Hospital (AMCH) was the first medical college set up in Assam and the whole NER in India. It is the tertiary medical referral centre for upper Assam and areas in neighbouring states. Basic information is shown in Table 3-4 below.

The distance from Guwahati to Assam MCH is 448.0 km (Driving time is 9 hours and 56 minutes). The distance from the nearest airport, Mohanbari Airport, to Assam MCH is 10.4 km (Driving time is approx. 25 min) via NH-15.

Table 3-4 Assam Medical College and Hospital (AMCH)

Address:	AMC Road, Barbari, Assam 786002 in Dibrugarh Town of Assam
Site Area:	Approx. 666,855 sqm
Establishment:	Year 1947
MBBS Course:	170 students / year
Bed Strength:	1,954
OPD Patients:	More than 1,000 patients/day
Operation Cases:	No Data
Diagnostic Imaging:	No Data
Clinical Departments:	Medicine, General Surgery, Orthopaedics, Plastic Surgery, Cardiology, Neurology, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, Dentistry
Facilities under Construction:	Cancer Hospital and Super Specialty Hospital
Observations on Existing Facilities:	All department buildings are deteriorated. Some inpatients are bedded on the floor due to the scarcity of beds. OPD waiting area is not sufficient to accommodate all patients. No lifts or most of lifts are not functioned.

Source: JICA Survey Team

(3) Silchar Medical College and Hospital, Silchar

Silchar Medical College and Hospital (SMCH) is a medical college based in Cachar District, Assam. This college is the third medical college of the state government for promoting medical education in the state. It is the only referral hospital in the southern part of Assam, also referred to as the Barak Valley, and serves neighbouring states including Mizoram, North Tripura, West Manipur, and Southeast Meghalaya. Basic information is shown in Table 3-5 below.

The nearest airport from the college is Silchar Airport, which is about 31.2 km away from the college and well connected to Guwahati, Kolkata, and New Delhi.

Table 3-5 Silchar Medical College and Hospital (SMCH)

Address:	Ghungoor Road, Masimpur, Silchar, Assam 788014
Site Area:	Approx. 844,116 sqm
Establishment:	Year 1968
MBBS Course:	100 students / year
Bed Strength:	1,256
OPD Patients:	657,390/year (2018.4～2019.3) More than 2,000 patients/day
Operation Cases:	Major: 4,835/year (2018.4～2019.3) Minor: 4,166/year (2018.4～2019.3)
Diagnostic Imaging:	MRI: 2,058/year (2018.4～2019.3) CT: 16,461/year (2018.4～2019.3) USG: 35,795/year (2018.4～2019.3) X-ray: 69,796/year (2018.4～2019.3)
Clinical Departments:	General Medicine, General Surgery, Orthopaedics, Pulmonary Medicine, Neurology, Neurosurgery, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, Dentistry, Community Medicine, Emergency and Trauma
Facilities under Construction:	Faculty/ Doctors Quarters
Observations on Existing Facilities:	All department buildings are deteriorated. There is no waiting space for outpatients.

Source: JICA Survey Team

(4) Jorhat Medical College, Jorhat

Jorhat Medical College and Hospital (JMCH) is a medical college based in Jorhat, Assam. This college is the fourth medical college of the state government for the improvement of medical education in the state and started functioning in 2009 in the premises of the former Jorhat District Hospital. Basic information is shown in Table 3-6 below.

The JMCH is located at Swahid Kushal Kownar Path, KB Road, Barbheta, Jorhat Assam, India. The distance from Guwahati to Jorhat MCH is 304.0 km (Driving time is 6 hours and 51 minutes). The distance from the nearest airport, Raraiyah Airport, to Jorhat MCH is 3.6 km (Driving time is approx. 10 min), the land is adjacent to the MCH compound. Again, the distance from Jorhat Town to Jorhat MCH is 3.0 km (Driving time is approx. 8-10 min).

Table 3-6 Jorhat Medical College and Hospital (JMCH)

Address:	Swahid Kushal Kownar Path, KB Road, Barbheta, Jorhat Assam
Site Area:	Approx. 194,984 sqm
Establishment:	Year 2009
MBBS Course:	100 students / year
Bed Strength:	500
OPD Patients:	240,237/year (2019.9～2020.8) More than 800 patients/day
Operation Cases:	Major: 7,473/year (2019.9～2020.8) Minor: 9,468/year (2019.9～2020.8)
Diagnostic Imaging:	MRI: 1,614/year (2019.9～2020.8) CT: 9,135/year (2019.9～2020.8) USG: 16,923/year (2019.9～2020.8) X-ray: 27,420/year (2019.9～2020.8)
Clinical Departments:	Medicine, Surgery, Orthopaedics, Cardiology, Neurosurgery, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, Dentistry, TB and Chest, Community Medicine
Facilities under Construction:	Renovation of OPD Building, Cancer Hospital
Observations on Existing Facilities:	Although the buildings were constructed only ten years ago, all the department buildings are deteriorated. Some inpatients are bedded on the floor due to the scarcity of beds. No lifts. ICU is not functional because of the outdated environment.

Source: JICA Survey Team

(5) Tezpur Medical College, Tezpur

Tezpur Medical College and Hospital (TMCH) is a medical college based in Tezpur. This college is the sixth medical college of the state government for promoting medical education in the state. Basic information is shown in Table 3-7 below.

The distance from Guwahati to Tezpur MCH is 159.6 km (Driving time is 3 hours and 37 minutes). The distance from the nearest airport, Salonibari Airport, to Tezpur MCH is 16.9 km (Driving time is approx. 29 min) via NH-15. Distance from Tezpur Town to Tezpur MCH is 15.3 km (Driving time is approx. 26-30 min).

Table 3-7 Tezpur Medical College and Hospital (TMCH)

Address:	Tumuki, Bihaguri, NH-52 (now NH-15) Tezpur Assam
Site Area:	Approx. 147,158 sqm
Establishment:	Year 2013
MBBS Course:	100 students / year
Bed Strength:	500
OPD Patients:	Nearly 800 ～1,000 patients/day
Operation Cases:	No Data
Diagnostic Imaging:	No Data
Clinical Departments:	General Medicine, General Surgery, Orthopaedics, Pulmonary Medicine, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, Dentistry, Community Medicine, Emergency and Trauma
Facilities under Construction:	Doctors Quarter, Hostels for Doctors and Nurses
Observations on Existing Facilities:	Although the buildings were constructed only ten years ago, all department buildings are deteriorated. Some inpatients are bedded on the floor due to the scarcity of beds. ICU is not functional because of the outdated environment. No lift or Most of lifts are not functioned.

Source: JICA Survey Team

(6) Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta

Fakhruddin Ali Ahmed Medical College and Hospital (FAAMCH) is a medical college based in Barpeta. This college is the fifth medical college of the state government for promoting medical education in the state. Basic information is shown in Table 3-8 below.

The shortest distance from Guwahati to FAA MCH is 98.8 km (Driving time 2 hours and 29 minutes) via Hao-Doulashal. The distance from the nearest airport, Lokapriya Gopinath Bordoloi Airport, Guwahati to FAA MCH is 110.0 km (Driving time is approx. 2 hour 45 min).

Table 3-8 Fakhruddin Ali Ahmed Medical College and Hospital (FAAMCH)

Address:	Jania Road, Joti Gaon, Barpeta Assam 781301
Site Area:	Approx. 167,225 sqm
Establishment:	Year 2011
MBBS Course:	100 students / year
Bed Strength:	500
OPD Patients:	More than 1,000 patients/day
Operation Cases:	No Data
Diagnostic Imaging:	No Data
Clinical Departments:	Medicine, Surgery, Orthopaedics, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, T.B. and Chest, Rehabilitation, Community Medicine
Facilities under Construction:	Cancer Hospital, Mother and Child Hospital
Observations on Existing Facilities:	Although the buildings are constructed only ten years ago, all department buildings are deteriorated. Some inpatients are bedded in the floor due to the scarcity of beds. ICU is not functional because of the outdated environment.

Source: JICA Survey Team

(7) Diphu Medical College and Hospital, Karbi-Anglong

Diphu Medical College and Hospital (DMCH) is a medical college based in Diphu, Karbi Anglong Assam, and was established in 2011 and started in 2019. The name of Diphu Medical College during that time was Assam Hills Medical College and Research Institute (AHMC&RI). This college is the seventh medical college of the state government for the promotion of medical education in the state. Basic information is shown in Table 3-9 below.

Diphu is a small well-known town in the hilly natural beautiful district of Assam. The natural ambience of the college campus attracts all people. The distance from Guwahati to Diphu MCH is 247.3 km (Driving time is approx. 4 hours and 54 minutes) via NH-27. It is the only referral hospital in Karbi Anglong District, Assam, and also for the other neighbouring districts of Lumding and Hojai. There is no airport in Karbi Anglong District. The nearest airport from the college is Dimapur Airport (DMU), Nagaland which is about 62.9 km away from the college.

Table 3-9 Diphu Medical College and Hospital (DMCH)

Address:	Baghmari, Diphu, Karbi Anglong Assam 782462
Site Area:	Approx. 308,698 sqm
Establishment:	Year 2011
MBBS Course:	100 students / year
Bed strength:	300
OPD Patients:	More than 250 patients/day
Operation Cases:	Major: 857/year (2019.11～2020.10) Minor: 146/year (2019.11～2020.10)
Diagnostic Imaging:	No Data
Clinical Departments:	Medicine, Surgery, Orthopaedics, Pulmonary Medicine, Obstetrics, Gynaecology, Paediatrics, ENT, Ophthalmology, Dermatology, Psychiatry, Dentistry, Community Medicine
Facilities under Construction:	Cancer Hospital, Mother and Child Hospital
Observations on Existing Facilities:	Although the buildings were constructed only ten years ago, all department buildings are deteriorated. Some inpatients are bedded on the floor due to the scarcity of beds. ICU is not functional because of the outdated environment.

Source: JICA Survey Team

3.3.2 Secondary Medical Institutes

There are 25 district hospitals in Assam and the selected hospitals as sample hospitals have been surveyed as shown in Table 3-10 below.

Table 3-10 Sampled District Hospitals

Name of District Hospital	Location	Name of MCH in the District	No. of Beds	Tea Garden	Aspirational Districts
Swahid Mukunda Kakati (SMK) Civil Hospital	Nalbari, Kamrup Metropolitan	GMCH (Guwahati Medical College & Hospital)	235		
Udalguri Civil Hospital	Udalguri, Kamrup Metropolitan	GMCH (Guwahati Medical College & Hospital) or TMCH (Tezpur Medical College & Hospital)	147	v	v
S.K Roy Civil Hospital	Hailakandi, Cachar	SMCH (Silchar Medical College and Hospital)	129	v	v
Sivasagar Civil Hospital	Sivasagar, Jorhat	JMCH (Jorhat Medical College and Hospital)	269	v	
Goalpara Civil Hospital	Goalpara, Barpeta	Fakuriddin Ali Ahmed Medical College & Hospital (FAAMCH)	216		v

Source: JICA Survey Team

(1) SMK Civil Hospital, Nalbari, Kamrup Metropolitan

SMK Civil Hospital is a district hospital based in Nalbari, Kamrup Metropolitan. The nearest MCH is GMCH and a new medical college is currently under construction at Nalbari. Basic information is shown in Table 3-11 below.

There are several buildings in the compound including administrative building and staff quarter. Sewage treatment plant, oxygen generation plant, RO purifier room, incinerator and power backup generator are functional, whilst electricity Sub-station needs to be maintained as water logging is a major issue.

Table 3-11 Swahid Mukunda Kakati (SMK) Civil Hospital, Nalbari

Address:	Nalbari Rd, Nalbari, Assam - 781335
Bed Strength:	235
Name of MCH in the District:	GMCH (Guwahati Medical College & Hospital). A new medical college is currently under construction at Nalbari.

Source: JICA Survey Team

(2) Udalguri Civil Hospital, Udalguri, Kamrup Metropolitan

Udalguri Civil Hospital is a district hospital based in Udalguri, Kamrup Metropolitan. The nearest MCH is GMCH and Tamulpur Medical College & Hospital which is under construction. Basic information is shown in Table 3-12 below.

The hospital building is old, and power backup generator is non-functional.

Table 3-12 Udalguri Civil Hospital, Udalguri

Address:	Sankar Nagar Road, Udalguri, Assam - 784509
Bed Strength:	147
Name of MCH in the District:	GMCH (Guwahati Medical College & Hospital)

Source: JICA Survey Team

(3) S.K Roy Civil Hospital, Hailakandi, Cachar

S.K Roy Civil Hospital is a district hospital based in Hailakandi, Cachar. The nearest MCH is SMCH. Basic information is shown in Table 3-13 below.

The hospital is equipped with oxygen generation plant. There are several power backup generators, some are functional.

Table 3-13 S.K Roy Civil Hospital, Hailakandi

Address:	NH 154, Bashdahar, Hailakandi, Assam 788151
Bed Strength:	129
Name of MCH in the District:	SMCH (Silchar Medical College & Hospital)

Source: JICA Survey Team

(4) Sivasagar Civil Hospital, Sivasagar, Jorhat

Sivasagar Civil Hospital is a district hospital based in Sivasagar, Jorhat. The nearest MCH is JMCH. Basic information is shown in Table 3-14 below.

The hospital is equipped with an oxygen generation plant. The access road is quite busy. The hospital building is old, and ruined roof and structure are partly observed. The access road is wide enough to accommodate two-way traffic.

Table 3-14 Sivasagar Civil Hospital, Sivasagar

Address:	NH 154, Bashdahar, Hailakandi, Assam 788151
Bed Strength:	269
Name of MCH in the District:	JMCH (Jorhat Medical College and Hospital)

Source: JICA Survey Team

(5) Goalpara Civil Hospital, Goalpara, Barpeta

Goalpara Civil Hospital is a district hospital based in Goalpara, Barpeta. Goalpara Civil Hospital has received multiple awards as the best civil hospital in Assam. The nearest MCH is FAAMCH. Basic information is shown in Table 3-15 below.

Water leakage is commonly observed in the roof of the hospital buildings. Maintenance of the oxygen generation plant and cleanliness of the surrounding area are needed. Electricity sub-station needs to be maintained as water logging is a major issue. Power backup generators are fully functional.

Table 3-15 Goalpara Civil Hospital, Goalpara

Address:	National Hwy 37, Bhalukdubi, Assam 783121
Bed Strength:	216
Name of MCH in the District:	Fakuriddin Ali Ahmed Medical College & Hospital (FAAMCH)

Source: JICA Survey Team

3.4 Construction Regulation and Restrictions

3.4.1 Facility Planning Guidelines / Building Regulations

In India, each state has its building codes and regulations. The Assam State Government's Building Code is strict, in the backdrop of flood and earthquake threats. When selecting a hospital site, the available site area and the necessary areas should be considered according to the plan of the building size and number of floors. In addition, the Indian Public Health Standards (IPHS), promulgated in 2012, provides design guidelines for 500-bed regional flagship hospitals.

The criteria for designing buildings will basically conform to the following. Other building codes and standards referred shall be from the National Building Code (NBC).

- Guidelines for District Hospitals / Community Health Centres (CHC), Indian Public Health Standards (IPHS)
- Design Guidelines, National Accreditation Board for Hospitals and Health Care Providers (NABH)
- Standard Requirements for Medical Colleges, National Medical Council (NMC)
- Design Guidelines of the Healthcare Engineering Association of Japan (HEAJ): To ensure the quality required as international standard, OT rooms and ICUs will conform to this.
- Assam Notified Urban Areas Other than Guwahati Building Rules 2014
- Guwahati Building Construction By-laws 2014 March (Amendment 05.05.2020)

3.4.2 Major Issues on Relative Building Rules

Table 3-16 and Table 3-17 show the Major Issues on Relative Building Rules excerpted from the “Assam Building Construction By-laws” and “the Guidelines for Indian Public Health Standards (IPHS)”.

Table 3-16 Excerpts from Building Construction By-laws

Issues	Contents
Criteria for Planned Hospital Sites	・ Front road: Road width 9 m or more, drainage channel 1 m or more on both sides *There must be considerable space for front road ・ Parking: One car per 60 sqm for staff, one car per 200 sqm for outpatients, one car per five beds in wards. (Also, one Car for every ten beds + one two-wheeler for every five beds + one car for every five cabins of Single Accommodation.) ・ Lot size: minimum area of 1,000 sqm, ground coverage of 45% (Horizontal projection area), floor-area ratio of 150%. ・ Building wall setback distance: 7.5 m (front road), 4.5 m (adjacent land boundary. Subject to height of building and Local Fire Approval, generally we keep at least 6 m as per National Building Code.) *This will be large restrictions on the number of floors and area of the building. ・ A pedestrian ramp of 2,000 mm width in 1:12 or less slope is required for all patient occupied floors of the hospital. ・ No restrictions regarding height but required to be approved by the Airport Authority of India / Indian Air Force in case the site is near an airport / air force station, respectively. ・ Green Area Cover: Minimum 20% of the total site area is to be kept under plantation or green cover; or 50% of open area (generally 50% of open area is more than or near about 20% of the total site area). Of these, at least 25% of the total open space should be in organised / consolidated green area (and not incidental areas like verges on parking or strips of green along footpaths).
Criteria for Hospital Facility Planning	・ For hospitals with more than 40 beds; installation of wastewater reuse facilities. ・ For hospitals with more than 5,000 sqm; installation of solar heat utilisation facilities; evacuation stairs should be located within 18 meters from each part of the hospital. Maximum travel distance to be within 22.5 m for buildings with fire sprinkler system.

Source: JICA Survey Team

Table 3-17 Excerpts from the Guidelines for Indian Public Health Standards (IPHS)

Issues	Contents
Standards related to Facility Size	・ Hospitals with more than 500 beds should have a site area of at least 65,000 sqm (45,000 sqm for hospitals, 20,000 sqm for residential areas). ・ Teaching hospitals should be sized at 100-110 sqm/bed. ・ A minimum of 2,500 sqm of facilities for short-term stays should be planned adjacent to the hospital.
Standards for the Entire Facility	・ The opening area (area of windows) for ventilation should be at least 20% of the floor area. ・ Corridors should be at least 3 m wide to allow stretchers with IVs to pass each other. ・ The slope of the ramp should be 1/15 to 1/18 to allow beds and stretchers to change direction. ・ The roof height should not be less than approximately 3.6 m measured at any point from floor to roof. ・ It should have a high boundary wall, at least two exit gates. ・ There shall be dedicated parking space separately for ambulances, hospital staff, and visitors. ・ For easy access to non-ambulant (wheelchair, stretcher), semi-ambulant, visually disabled, and elderly persons infrastructure. ・ Rainwater harvesting, solar energy use and use of energy-efficient bulbs/ equipment should be encouraged.
Standards for Outpatient Departments (OPD)	・ The area of the outpatient waiting area should be at a minimum of 38 sqm, calculated at 0.093 sqm/outpatient per day. (1 sq ft/per average daily patient with minimum 400 sq ft of area.) ・ A waiting area for 4-5 doctors (about 12 sqm) should be provided. ・ A consultation room for infectious diseases should be located away from the general outpatient department independently. ・ All examination rooms must be equipped with examination tables, Schaukasten (X Ray view box), curtains, and hand wash basins. ・ There should be one male toilet (urinal) for every 100 people and two female toilets for every 100 people; there should be one urinal for every 50 people.

Issues	Contents
	・ Potable drinking water, Functional and clean toilets with running water and flush, Fans/Coolers shall be installed.
Standards for Inpatient Departments (Ward)	・ The area of general wards shall be 15-18 sqm/bed, with a minimum of 7 sqm per bed. ・ It is recommended that 10% of the total number of beds should be private rooms and 20% should be day care beds. ・ One nursing unit should have 40-45 beds, half of which should be for acute care and half of which should be for chronic care. ・ One toilet and shower should be provided for every six beds. ・ One urinal should be provided for every 20 beds. ・ Two hand wash basins should be provided for every 24 beds. ・ There should be one additional hand-washing facility for every 24 beds. ・ All wards shall have positive pressure, except for infected beds. ・ Minimum area for apertures (windows/ Ventilators opening): 20% of the floor area (if on same wall), 15% of the floor area (if on opposite walls) ・ Minimum distance between centres of beds: 2.5 m (minimum) ・ Clearance at foot end of each bed: 1.2 m (minimum)
Standards for Operation Theatres (OT)	・ Number of operation theatres to be the ratio of one OT per 50 general hospital beds and one OT per 25 surgical beds shall be established. ・ ICU beds: 5 to 10 % of total beds ・ Floor space for each ICU bed: 25 to 30 sqm (this includes support services) ・ Floor space for Paediatric ICU beds: 10 to 12 sqm per bed
Intermediate Care Area	・ 10% of the total bed strength is recommended as private wards beds.
Imaging	・ The room shall have a sub-waiting area with toilet facility and a change room facility.
Clinical Laboratory	・ Room size: The laboratory shall have adequate space from the point of view of workload ・ Storage space: It shall be adequate (10% of total floor space) with separate storage space for inflammable items.
Pharmacy	・ Location: Conveniently accessible from all clinics. ・ Size: Adequate to contain 5 percent of the total clinical visits to the OPD in one session. For every 200 OPD patients daily/ one dispensing counter. ・ Components: Pharmacy should have component of medical store facility for indoor patients and separate pharmacy with accessibility for OPD patients.

Source: JICA Survey Team

3.4.3 Summary of Other Regulations and Rules

(1) Barrier Free Related Rules

The National Building Code of India, Assam Notified Urban Areas (Other than Guwahati) Building Rules 2014, Guwahati Building Construction (Regulation) By-laws 2014 and IPHS 2012 stipulate the barrier free related regulations below (Table 3-18).

Table 3-18 Major Issues on Relative Barrier Free Rules

Major Rules Relative to Barrier Free
・ Install handrails for the physically challenged at stairs and ramps.
・ Slopes for use of evacuation and barrier free shall be at least 2.4 m wide and have a maximum slope of 1:12.
・ At least one of the approaches to a facility shall be equipped with ramp.
・ Ensure that there are at least two parking spaces for the physically challenged within 30 m from the entrance and exit. The width of the cell should be at least 3.6 m.
・ At least one of the elevators should be large enough to accommodate a wheelchair (80 cm by 150 cm).
・ Install toilets for use by the physically challenged.
・ Door width to be at least 90 cm.

Source: JICA Survey Team

(2) Summary of NABH Design Guidelines

The National Accreditation Board for Hospitals and Healthcare Providers (NABH) is a constituent board of the Quality Council of India set up to establish and operate the accreditation programme for healthcare organisations. Table 3-19 shows the major topics mentioned in the guidelines.

Table 3-19 Topics of NABH Design Guidelines

General
・ Patient safety alarms.
・ Child friendly paediatric service.
・ Warnings outside Radiology service rooms.
・ Storage area for medicines and consumables and safe storage areas for high-risk medicines.
Universal Design
・ Fall prevention system for elders.
・ Grab bars, ramps with railing for disabled.
・ Bilingual signage display of patients' rights and responsibilities in strategic locations like entrance / lobby of the hospital, registration, billing, OPD, and IPD area.
Ambulance
・ It should have a demarcated space / parking area.
・ It should also have updated stock of medicines and piece of equipment like ECG.
Infection Prevention
・ Better to have positive and negative isolation rooms.
・ Hand washing facilities.
・ Elbow taps instead of screw taps.
MEP and Infrastructure
・ The engineering plant should have sufficient spaces for alternate sources like compressor or vacuum plants.
・ A central waste collection area for keeping biomedical waste.
Fire
・ Fire water tanks, fire exit routes etc. should be planned as per NBC norms.

Source: Architectural Planning February 2019, How to Design a Hospital which is NABH compliant

Chapter 4 Major Issues in the Health Sector in Assam State

Based on the situation analysis made in Chapters 2 and 3, the major facts and issues in the health sector in Assam are summarised as shown in Table 4-1.

To achieve universal health coverage (UHC), the nearest health facility should be reliable for the people. For that, interventions in both health service providers and users should be taken. Regarding health service providers, referral system should function appropriately, i.e., primary and secondary health facilities could provide proper diagnosis and treatment, then decide regarding referral with sufficient communication with patients and other health facilities. In addition, when the patients have careful and clear explanation on treatment or referral, they may seek care at the same health facility, the nearest from their community, from next time.

However, according to the results of the survey, medical doctors are too busy to give time for the patients. Because the number of doctors in the public sector is not enough to cover the increasing population, they are overloaded. Also, as there is limited number of specialised doctors, specialised or advanced services could be provided in limited hospitals. Therefore, patients who want quality and reliable services would access directly to the tertiary hospitals, MCH. As a result, MCH would always be congested by patients with minor illness and make the doctors busy. Then, the doctors get tired and leave for better opportunity. And patients must wait for long time. In addition, hospital staff could not consider the mental aspects of the patient.

The Government of Assam (GOA) has been increasing medical student seats aiming at 1,200 per year. Then, a strategy to attract them to public health facilities and improve retention rate could be required. According to the results of the questionnaire survey to the doctors, they value facility and equipment when they choose a workplace, and human relationship and professional development opportunity may affect their satisfaction. Therefore, upgrade of facility and equipment, as well as providing attractive training or workshop opportunities, could be effective to improve the retention rate of medical doctors. Then, the people might be attracted to such health facilities and doctors.

At the same time, effective intervention to improve health literacy of the people should be made. When the people have a certain level of health literacy, people could choose appropriate care-seeking behaviour. In addition, they could prevent diseases as they obtain healthy lifestyle and hygiene practice.

Table 4-1 Major Facts and Issues in the Health Sector in Assam

* = To be expected to take measures in the project

	Facts	Existing Efforts by GOA	Issues	*
Human Resource for Health	・ Sufficient number of health personnel are not hired/ retained in public health facilities, especially in specialised medicine, rural areas, and female doctors. ・ Student intake of medical education institutions are not enough to provide necessary number to cover the population. ・ Doctors may be overload of the work. ・ Behaviour of health personnel may not be appropriate to patients. ・ Satisfaction with workplace seems to depend on human relationship with co-workers, patients, and patient families. ・ Facility and equipment are valued when they choose the workplace. ・ Satisfaction with learning environment seems to depend on contents and quality of curriculum, quality of OJT, as well as opportunity to learn advanced knowledge and technology both domestic and international.	・ Increasing annual production of heath personnel by establishing new MCHs and a paramedical training institution ・ Strengthening training capacity by integration of training and education function of the government	・ Strategy to retain health personnel in public sector should be developed. ・ Behaviour of hospital staff to patients should be more kind. ・ Workload of doctors should be declined. ・ Mental health and communication skill of hospital staff should be considered. ・ Opportunities of learning and exchanging knowledge with domestic and international experts should be provided.	✓ ✓
Facility and Equipment	・ Generally, facilities seemed to be deteriorated and not properly maintained. ・ Medical equipment seemed not to be well maintained and appropriately operated. ・ Hygiene facilities such as drinking water supply and toilets seem not to be sufficiently served. ・ Necessary diagnostic and treatment could not be sufficiently provided in CDH. ・ Toilets are not clean. ・ Advanced equipment is not available to provide specialised services.	・ Installing super specialty functions to MCHs ・ Upgrading secondary and primary health facilities	・ Capacity of proper operation, daily and preventive maintenance of medical equipment should be developed. ・ 5S-KAIZEN-TQM could be introduced to improve clearness and condition of facilities and equipment.	✓ ✓
Management	・ Patient procedure seems not to be efficient due to insufficient digital solution. ・ Decision-making process may not be transparent for frontline staff. ・ Laboratory testing are not available for 24/7 to obtain prompt results. ・ Security of the hospital staff may not be well ensured. ・ Services during night shift such as canteen may not be sufficient.	・ Introducing ICT to hospital information management and patient services to MCHs and CDHs ・ Introducing PPP to laboratory services, teagarden hospitals, and cancer care	・ QMS concept could be introduced to enhance management capacity. ・ Security measurements should be enhanced in terms of facility, knowledge of staff, awareness of patients and families, legal support, etc.	✓

	Facts	Existing Efforts by GOA	Issues	*
Health Finance	・ Most of patients could receive the services free of charge or low cost. ・ Out-of-pocket expenditure is rather lower in India.	・ Various financial assistance schemes are provided to vulnerable groups	・ Sustainability of financial resources should be ensured.	
Drugs and Medical Supply	・ Necessary drugs may not be sufficiently stocked in pharmacies.	・ Expanding essential drug list ・ Introducing PPP to pharmacy operation		
Governance/ Administration	・ The people may be not aware of schemes for financial assistance from the government.	・ Information is uploaded on the official website.	・ Various public relation measurements should be considered for people who do not have ICT access.	
Cultural and Social Context	・ People do not trust cheap or free service. ・ People tend to seek care directly to tertiary hospitals. ・ People prefer to access private health facility if affordable. ・ Women and girls would like to be seen by female doctors. ・ Living condition in rural area such as education opportunity for children and infrastructure hinder health personnel to work there. ・ Frequent flood and mountainous areas hinder access to health services, as well as hospital operation.	・ Mobilising ASHA to facilitate community people to seek care to public health facilities.	・ Quality of diagnostic and treatment, and patient services should be improved to gain trust of the people to public health facilities. ・ Health literacy of the people should be increased to choose appropriate health care, and healthy lifestyle.	

Source: JICA Survey Team

Chapter 5 Development Plan for Strengthening of Health System in Assam

5.1 Vision / Mission

The mission of the development plan is to achieve universal health coverage (UHC) through the improvement of access to public medical services and quality medical services but improving only the hardware cannot achieve it and it is also difficult to cover all the areas of the state at once. Therefore, the project focuses on the "establishment of model health system that enables the Indian side to develop horizontally through self-efforts". Particularly, the development plan aims to achieve the following:

- Developing an environment that can ensure qualified medical personnel (Regarding the quantitative expansion, the project will develop an environment where high-quality clinical education can be provided in medical college hospitals);
- Strengthening cooperation among each level of medical institutions (establishment of referral systems, system of dispatch of doctors, provision of technical guidance and training, etc.).

As shown in Chapter 1 and Chapter 2, the population of Assam is 312,000, wherein 50.6% of the population uses public medical institutions, which is higher than the national average of 32.5%. In the rural areas, especially in the respirational area and around the Brahmaputra River, the percentage of the population is as high as 30%, and the percentage of the poor is 32.0%. Therefore, the provision of quality medical services by public medical institutions is indispensable.

5.2 Development Concept

In response to the above-mentioned challenges, the following development components should be in place to establish a UHC model (Table 5-1).

Table 5-1 List of the Components for Development Plan

Component	Contents
1. Strengthening Medical Institutions (Facilities, Equipment)	
1	Super Specialty Wing in Medical Colleges
2	Critical Equipment in All Medical Colleges
3	Smart Hospital at GMCH, AMCH with Modern Technology and Information Technology System
4	Infrastructure Improvement in District Hospital
5	Dedicated Training, Monitoring, Administrative Centre, Swasthya Bhawan.
2. Strengthening the Capabilities of Medical Professionals	
6	Capacity Building of Medical Staffs
3. Strengthening the Organisational and Management Capabilities for the Provision of Medical Services	
7	Hospital Management
8	Improve Hospital Management Information System
9	Establish Regional UHC System in Selected Area

Source: JICA Survey Team

The development of medical personnel is essential for the provision of quality medical services. However, in countries with global standards, medical education is usually provided through clinical training in hospitals, rather than in classrooms (theoretical lessons). Therefore, the basic concept of the project is to

establish clinical training in tertiary medical institutions, and at the same time, by developing district hospitals, to strengthen the medical services base in the catchment area, to receive patients from primary medical institutions and to establish a technical support system for primary medical institutions. For this reason, the project concept goes beyond the mere provision of hardware, such as facilities and equipment, to include technical interventions with soft components.

5.3 Stage-wise Development Plan

In the development plan, a stage-wise approach is considered in terms of establishing the UHC system in Assam. Because as stated in the concept, both hardware and software interventions are required to establish the system and there will be both time and physical constraints to proceed to the whole of Assam. These periods are defined as short term (three years), medium term (five years) and long term (ten years). The concept of each term is as follows:

(1) Short-term Development Plan

The short-term period is three years, from the commencement of the project until the construction of facilities and provision of equipment are completed. In addition, it is essential to strengthen the software component to establish the model. Therefore, technical support (soft component) for the construction of the model might be considered. The specific components of the project are as follows:

- Component 1 Candidate facilities: Silchar Medical College, Cachar Hospital (SMCH), Tezpur Medical College Hospital (TMCH), Jorhat Medical College Hospital (JMCH), Fakhruddin Ali Ahmed Medical College Hospital, Barpeta (FAAMCH), Diphu Medical College Hospital (DMCH) and Lakhimpur Medical College Hospital (LMCH)
- Component 2 Candidate facilities: Same as above
- Component 3 Candidate facilities: Gauhati Medical College Hospital (GMCH), Assam Medical College Hospital (AMCH)
- Component 4 Candidate facilities: See table below (Considerable collaboration between tertiary and secondary medical institutions) (Table 5-2)

Table 5-2 List of Candidate Facilities for Component 4

No.	Name of District Hospital	Name of Collaborating Medical College Hospital
1	Silchar Civil Hospital (CH)	SMCH
2	Mangaldoi CH	GMCH, TMCH
3	Udalguri CH	GMCH, Tamulpur MCH (Under Construction)
4	Hojai CH	GMCH, Nagaon MCH (Under Construction)
5	Haflong CH	SMCH, DMCH
6	Hailakandi CH	SMCH

Source: JICA Survey Team

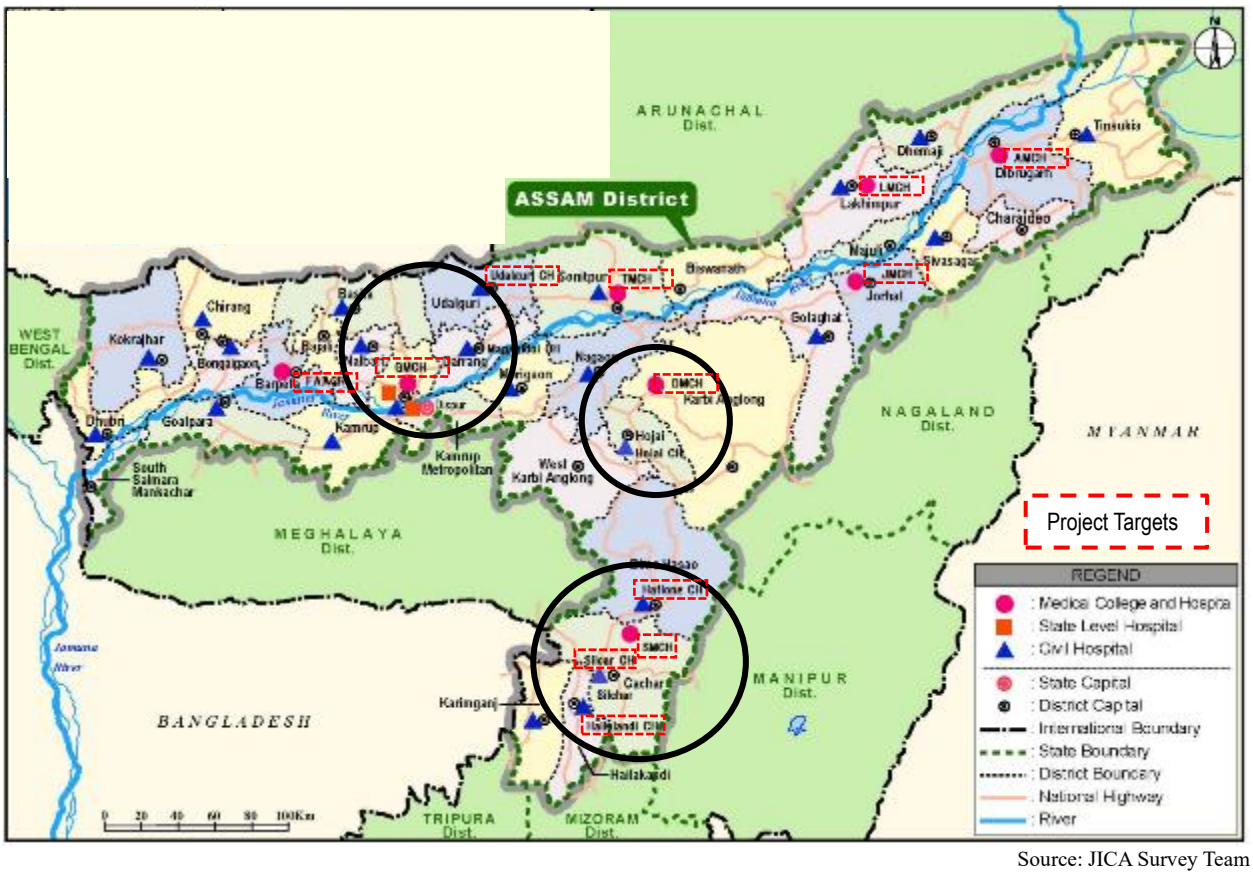
- Component 5 Candidate facilities: Integrated training and administrative centre, “Swasthya Bhawan”
- Component 6 Same as Component 1, 3, and 4
- Component 7 Same as component 1, 3, 4, and CHCs around 6 civil hospitals

- Component 8 Same as Component 1, 3, 4, and integrated training and administrative centre, "Swasthya Bhawan"
- Component 9 Same as Component 6

In the short-term period, it will focus on inter-institutional collaboration, the establishment of referral systems, the acquisition of knowledge, and the competence of patient referrals and health professionals in the Project Management Unit (PMU) organised by the state government and the Project Implementation Units (PIUs) organised by the candidate medical institutions (see Figure 5-1).

On the other hand, the existing facilities will be used to increase the knowledge of establishing a system for the improvement of medical skills, from tertiary to secondary and secondary to primary level medical institutions, as well as for awareness-raising and health promotion activities in the community.

The following is an image of the collaboration between tertiary medical institutions and secondary medical institutions in the short-term period (Figure 5-1), and the establishment of the UHC system through collaboration among primary, secondary, and tertiary institutions, aiming to establish a model around the area enclosed by the circle (the area covered by tertiary medical institution).



Source: JICA Survey Team

Figure 5-1 Collaboration between Target Hospitals

Based on the survey and the requests from the Government of Assam (GOA), soft components (component 6-9) are planned. The outline of each component is shown in Table 5-3.

Table 5-3 Outline of Soft Component (Plan)

No.	Component	Current Issues and Challenges	Contents
6	Capacity Building of Medical Staffs	➢ Lack of experienced doctors ➢ Lack of learning chances in/from other states and countries ➢ Low quality of patient service	6-1. Conduct training on patient care and attitude to patient (conduct trainings on warm reception, interacting comfortably, informed consent, care for terminal patients, etc.)
			6-2. Improve internship program (introduce online training programs in cooperation with Japanese hospitals and hospitals in other states such as AIIMS and Fortis.)
			6-3. Conduct refresher training for staffs (introduce the latest technology and research which can be useful for their daily operation.)
7	Hospital Management	➢ Staff involvement in decision making process ➢ Necessity for introducing management review tools ➢ Lack of multidisciplinary cooperation ➢ Necessity for improving management policy ➢ Necessity for improving patient procedure	7-1. Improve existing basic training courses （Basic trainings for hospital management such as Infection Control, Medical Waste Management, Fire safety, Disaster preparedness, etc.）
			7-2. Conduct trainings and activities of 5S-KAIZEN and Total Quality Management. Below training programs will be planed. The trainings will be divided based on the target group (management, administration officers, doctors, and nurses who oversee the department) ➢ Strategic planning ➢ Problem solving ➢ Quality Control (QC) ➢ Value Stream Mapping (VSM) ➢ Quality and Safety ➢ Concept of TQM approaches ➢ Implementation of TQM approaches ➢ Monitoring and Evaluation
8	Improve Hospital Management Information System	➢ Necessity for installing e-Hospital system by GOI to all the hospitals ➢ Lack of trainings to utilise the MIS system ➢ Necessity for promoting data-based decision making by the directorate systems	8-1. Conduct trainings on e-Hospital and MIS management at targeted facilities including Swasthya Bhawan ➢ Training on Administrative Modules of Hospital Information Management Systems ➢ Training/ Refresher Training on Basic Computer knowledge ➢ Training on Registration Module ➢ Training on Clinic Module ➢ Training on Indoor Module ➢ Training on Laboratory Management Module and Radiology Module ➢ Training on Stock Management and Dispensing Module ➢ Training of Doctors on Use of Data for Research Purpose
9	Establish Regional UHC System in Selected Area	➢ Patients directly go to secondary hospitals without referral from the primary level facilities ➢ Patients prefer to go to MCH as necessary doctors and equipment are not available at CDHs	9-1. Strengthen cooperation among primary, secondary, and tertiary. ➢ MCHs provides trainings for CDHs and CHCs including lectures and practical training ➢ MCHs dispatch lecturers and supervisors to CDHs and CHCs ➢ MCHs provide refresher training for CDHs and CHCs
			9-2. Conduct pilot activities to refer patients from primary to secondary, secondary to tertiary, and vice versa.
			9-3. Conduct awareness activities to improve health literacy of the people
			9-4. Conduct public health campaign to prevent diseases (immunisation, health lifestyle, hygiene practice, etc.)
			9-5. Introduce patient management system to support smooth referral and counter-referral system at primary and secondary levels

Source: JICA Survey Team

(2) Medium-term Development Plan

This will be for two years after the completion of the facility and delivery of the equipment. In the medium term, the aim is to establish a model in which the facilities and equipment are fully operated and properly managed by the parties concerned. It is a period to ensure the provision of quality medical services and clinical training for the fostering of medical personnel through the reliable operation and maintenance of facilities and equipment. On the other hand, the UHC model will be established regarding the knowledge of referrals and the system for improving the capacity of medical personnel through inter-facility collaboration among each tier of medical institution and activities for the community people, which were established during the short term. The Project Management Unit (PMU) and the Project Implementation Unit (PIU) organised in the PMU and at the candidate facilities as described in Chapter 10-1 will be responsible for the implementation of the project. The PMU and PIU will prepare the implementation plans and carry out the project in accordance with their plans. On the other hand, to improve UHC, it is important to strengthen the capabilities of medical professionals and strengthen the organisational and management capabilities. Therefore, under the Japanese yen loan scheme, the soft components will be carried out to strengthen these capabilities.

(3) Long-term Development Plan

This will be for five years after the end of the medium-term period. In the long-term period, the aim is to roll out the established model throughout the whole of Assam State. The PMU and PIU will assess the progress of the medium-term plan, and then develop plans for the implementation of the long-term plan and implement the project according to these plans. At the end of each year, the PMU and PIU will review the progress of the plans, and, if necessary, revise the plans to achieve the goals in the long term (establishment of the UHC model).

Chapter 6 Facility Plan

6.1 Minimum Standard Requirements for the Medical College

6.1.1 Background of Medical College Facility

The National Medical Commission (NMC), formerly known as the Medical Council of India (MCI) until May 2020, is an authority under the Ministry of Health and Family Welfare which made public notice to inform that the following regulations: (i) "Minimum Requirements for Annual MBBS Admissions Regulations, 2020" and (ii) "Amendment to Establishment of Medical College Regulations" were placed in public domain for comments in October 2020.

These are the new norms which stipulate the minimum requirements for medical colleges (MC) and medical college hospitals (MCH) of their facility, equipment, and staffing requirements in India. These guidelines have to be strictly followed for their establishment.

The Japan International Cooperation Agency (JICA) Survey Team analysed this aiming to propose a facility development policy.

6.1.2 Facility Requirements for MBBS Course

The requirements for a medical college and hospital are categorised by the number of MBBS students annually. The minimum requirements include accommodation in the college and its associated teaching hospitals, staff (teaching and technical both), and equipment in the college departments and hospitals.

Table 6-1 shows the major requirements set for an MCH catering to 100 MBBS, 150 MBBS, and 200 MBBS.

Table 6-1 Major Requirements Set in the Regulations

Location	100 MBBS	150 MBBS	200 MBBS
Referred Regulation / Name of Institute	*Public-notice-Reg-Regulations-for-Minimum-requirement-and-establishment-medical-colleges	Minimum-Standard-Requirements-for-150-Admissions	Standard-for-200
No. of MBBS	100	150	200
No. of Bed	430	700	900
Major OT	7	9	10
Minor OT	2	2	2
ICU (Incl. NICU)	25	25	25
Rural Health Training Centre	1	1	1
Urban Health Training Centre	1	1	1

Source: JICA Survey Team

The minimum required departments for MC and MCH are shown in Table 6-2.

Table 6-2 Minimum Required Departments

No.	Departments:	No.	Departments:
1	Anatomy	13	Respiratory Medicine (Pulmonary, TB, Chest)
2	Physiology	14	General Surgery
3	Biochemistry	15	Orthopaedics
4	Pathology	16	Radio-Diagnosis (Radiology)
5	Microbiology	17	Oto-Rhinolaryngology (ENT)
6	Pharmacology	18	Ophthalmology
7	Forensic Medicine & Toxicology	19	Obstetrics & Gynaecology
8	Community Medicine	20	Anaesthesiology
9	General Medicine	21	Dentistry
10	Paediatrics	22	Physical Medicine & Rehabilitation
11	Psychiatry	23	Emergency Medicine
12	Dermatology	24	Radiation Oncology (optional) (Radiotherapy)

Source: JICA Survey Team

6.1.3 Analysis of Existing Facilities

Comparing the current specification of the seven MCH and the above requirements, most of them fulfil the standards, but some have lower number of beds, which can be proposed for upgradation. Furthermore, the departments for non-communicable diseases (NCDs) such as Cardiology, Nephrology, Neurology, Cardiovascular Surgery, Neurosurgery, Urology are fully set in only a few of the MCH, and the rest of the hospitals either do not have or do not have enough capacity for these departments. Radiation Oncology Department is also one idea, but it is excluded from this project, since Assam Cancer Care Foundation (ACCF) is starting to develop related facilities.

6.2 Request from the Government of Assam

From the above considerations, a component request was submitted by the Government of Assam (GOA) from September to October 2021, which included the facility components requested by GOA as shown in Table 6-3.

Table 6-3 Requested Facility Components by GOA

Requested Facility Components	Justification
Super Specialty Wing in Medical Colleges	Super specialty wing in six medical colleges other than GMCH and AMCH. Required departments are: Cardiology, Nephrology, Neurology, Cardio-thoracic Surgery, Neurosurgery, and Urology.
Infrastructure Improvement in District Hospital	As suggested by the JICA Survey Team: (2 types of hospitals have been suggested. Type 1: General 150 bedded hospital and Type 2: Emergency department hospital without beds.)
Dedicated Training, Monitoring, Administrative Centre, Swasthya Bhawan	Facility which acts as a command, control and integrated training and administrative centre for all health-related activities will bring together all verticals for much better co-ordination. Consolidation of administrative and training functions, which are currently dispersed and inefficient in various locations, is appropriate from the perspective of human resource development.

Source: JICA Survey Team

6.2.1 Improvement of Super Specialty Wings in Medical Colleges

Since super specialty wing has already been initiated in GMCH and AMCH, it was requested in other six medical colleges, i.e., Silchar Medical College (Cachar), Tezpur Medical College, Jorhat Medical College, Fakhruddin Ali Ahmed Medical College (Barpeta), Diphu Medical College, and Lakhimpur Medical College.

For optimal utilisation, the following super medicine and surgical super specialty departments were requested:

1. Cardiology; 2. Nephrology; 3. Neurology; 4. Cardio-thoracic Surgery; 5. Neurosurgery; and 6. Urology.

In general, it is reasonable to set up such super specialty departments in tertiary level hospitals which require urgent and immediate treatment. In the case of Assam, considering the geographical and demographical situation, it is reasonable to set up such super specialty hospital in each medical college hospital.

6.2.2 Facility Upgrade in District Hospital

One of the project concepts is to build up a referral model from secondary level hospitals to tertiary level hospitals. In order to achieve this, it is ideal to select secondary level hospitals that are within close distance to tertiary level hospitals.

As for the hospital volume and type, the JICA Survey Team proposed two types of hospitals. One is a general 150-bedded hospital and the other is an emergency department hospital without beds, and these were accepted by GOA.

(1) Location

The following Table 6-4 shows the six district hospitals initially proposed by GOA for facility improvement under the JICA project. After internal discussion within GOA, Goalpara Civil Hospital and Sivsagar Civil Hospital were excluded from the request list due to their plan of new MCH establishment. Geographical location and vertical integration with existing and upcoming medical college hospitals have been taken into consideration.

Table 6-4 District Hospitals to be Upgraded

Name of the District Hospital	Name of the Medical College	Distance (km)
S.M Dev Civil Hospital, Silchar	Silchar Medical College & Hospital	4
Goalpara Civil Hospital	Fakhruddin Ali Ahmed Medical College & Hospital	71
	Dhubri Medical College & Hospital (Under Construction)	132
Mangaldoi Civil Hospital, Darrang	Gauhati Medical College & Hospital	75
	Tezpur Medical College & Hospital	87
Sivsagar Civil Hospital	Jorhat Medical College & Hospital	55
	Assam Medical College & Hospital, Dibrugarh	90
	Charaideo Medical College & Hospital (Under Construction)	40
Udalguri Civil Hospital, Udalguri	Gauhati Medical College & Hospital	113
	Tamulpur Medical College & Hospital (Under Construction)	68
Hojai Civil Hospital, Hojai	Gauhati Medical College & Hospital	170
	Nagaon Medical College & Hospital (Under Construction)	53
Haflong Civil Hospital, Dima Hasao	Silchar Medical College & Hospital	111
	Diphu Medical College & Hospital	162
S.K Roy Civil Hospital, Hailakandi	Silchar Medical College & Hospital	41

Source: JICA Survey Team

(2) Study of Hospital Type

Regarding the proposed building, two types of building were proposed by the JICA Survey Team, and this was accepted by GOA. The proposal was made in consideration of the following:

- Analyse the gap between the number of beds needed and the actual number of beds based on the hospital coverage area.
- For those bed numbers that are below the requirement, a hospital with inpatient ward is proposed. The proposed bed strength shall be limited to 150 beds, taking into consideration the available management resources (Type 1).
- For those already meeting the bed requirement, plan an emergency centre (Type 2).

Table 6-5 shows the considerations made for the proposal of the two types of district hospitals.

Table 6-5 Proposed Two Hospital Types

Type	Features of Type
Type 1	・ Apply to the area where the **number of beds is insufficient** to the population. ・ This type is focusing on the **provision of basic, general medical service.** ・ (As for NCD case, district hospitals will conduct only diagnosis. Patients will be referred to cancer centre or tertiary hospital for further detailed examination and treatment.)
Type 2	・ Focusing on the provision **of emergency service.** ・ After the first aid, if required, patients will be referred to tertiary hospital. ・ This type is applied to the area where **number of beds is sufficient to the population, but the clinical service is insufficient**.

Source: JICA Survey Team

6.2.3 Training Facility for Capacity Building

GOA wants to introduce an integrated administrative and training hub in Guwahati. The idea is to create a "Swasthya Bhawan". This facility will connect all the three Directorates of the Health and Family Welfare Department (HFDW) (as presently, all are scattered in different locations) in the same place having a centrally administrative unit for operation, central management information system (MIS), and monitoring unit for the whole health system. Moreover, this building shall be equipped with a modern integrated training hall for all kinds of staff training.

The facility is focused on training, capacity development, management personnel and digitalisation, and creating a central administrative hub. It will act as command, control, and integrated training and administrative centre for all health-related activities and bring together all verticals for much better co-ordination.

Consolidating administrative and training functions, which are currently dispersed and inefficient in various locations, is appropriate from the perspective of human resource development.

6.3 Facility Plan

Considering the above analysis and requirements, Table 6-6 shows the facility improvement plan which has been considered. Since the existing facilities are in operation, it is assumed that the basic infrastructure such as power inlet line and water supply are in place enough for the existing buildings, but further site survey is required to determine if they meet the demand for the newly developed facilities.

Basically, the access roads shall be no problem; as for electricity, power back-up is preferred to be arranged. For water supply, own source is suggested to be arranged by GOA since there is no proper water supply system in any of the locations. (General facility infrastructure equipment such as transformer, generator, STP and ETP which fulfil the capacity of the planned facilities shall be considered as facility development.)

Table 6-6 Facility Improvement Plan

Proposal for Various Institutions	Floor Area (sqm)	Stories	Remarks
1. Super Specialty Wing in Medical Colleges			
1 Silchar Medical College Hospital, Cachar	29,500	G+5	Total 170 beds (Include ICU 50 beds)
2 Tezpur Medical College Hospital, Tezpur	32,500	G+6	Total 200 beds (Include ICU 50 beds)
3 Jorhat Medical College Hospital, Jorhat	37,500	G+3 (+B2)	Total 260 beds (Include ICU 20 beds)
4 Fakhruddin Ali Ahmed Medical College Hospital, Barpeta	19,000	G+5 (+B1)	ICU 50 beds
5 Diphu Medical College Hospital, Diphu	19,000	G+5 (+B1)	ICU 50 beds
6 Lakhimpur Medical College Hospital, Lakhimpur	19,000	G+5 (+B1)	ICU 50 beds
2. Infrastructure Improvement in District Hospital			
Type 1 (At four locations)			
S.M Dev Civil Hospital, Silchar	18,000	G+2	Total 150 beds (Include ICU 10 beds)
Udalguri Civil Hospital, Udalguri	18,000	G+2	Total 150 beds (Include ICU 10 beds)
Hojai Civil Hospital, Hojai	18,000	G+2	Total 150 beds (Include ICU 10 beds)
S.K Roy Civil Hospital, Hailakandi	18,000	G+2	Total 150 beds (Include ICU 10 beds)
Type 2 (At two locations)			
Mangaldoi Civil Hospital, Darrang	6,000	G+1	Emergency Centre
Haflong Civil Hospital, Dima Hasao	6,000	G+1	Emergency Centre
3. Dedicated Training, Monitoring, Administrative Centre, Swasthya Bhawan			
	8,047	G+6	Training Health Centre

Source: JICA Survey Team

6.3.1 Improvement of Super Specialty Wings in Medical Colleges

Since super specialty wing has already been initiated in GMCH and AMCH, it was requested to establish in the other six medical colleges, i.e., Silchar Medical College (Cachar), Tezpur Medical College, Jorhat Medical College, Fakhruddin Ali Ahmed Medical College (Barpeta), Diphu Medical College, and Lakhimpur Medical College.

For optimal utilisation, the following super medicine and super specialty departments were requested:

1. Cardiology; 2. Nephrology; 3. Neurology; 4. Cardio-thoracic Surgery; 5. Neurosurgery; and 6. Urology.

It is rational for a tertiary level hospital to have such super specialty departments, and considering the geographical and demographical cases in Assam, it is a logical plan.

(1) Silchar Medical College Hospital (SMCH), Cachar

As the third medical college of the State Government, and the only referral hospital in the southern part of Assam, Silchar Medical College and Hospital (SMCH) is expected to be fully functional just as GMCH and AMCH. Proposed facilities are shown in Table 6-7, and the site map is shown in Figure 6-1.

The proposed site shall be altered as per GOA decision and it is required to make site available by demolishing existing old structures. Site acquisition shall be a prerequisite for this project.

Table 6-7 Proposed Facility for SMCH

Hospital Type:	Super Specialty Hospital
Floor Area and Story:	Approx. 29,500 sqm 1) Integrated Block: 28,000 sqm, G+5 story 2) Engineering Service Block: 1,500 sqm, G+2 story
Footprint Area:	Approx. 7,000 sqm 1) Integrated Block: 6,500 sqm 2) Engineering Service Block: 500 sqm
Height of the Facility:	Approx. 30 m (34 m including other structures, i.e., Lift Machine Room)
Targeted Clinical Department:	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology, and Urology
Bed Strength:	170 beds (ICU 50 beds, ward 30 beds × 4 units)
Facility:	Outpatient Department, Emergency Unit (Triage 2 beds, Recovery 6 beds), Diagnostic Imaging (CT × 1, MRI × 1, X-ray × 2, Fluoroscopy × 1, etc.), Angiography Unit (Single-plane × 1, By-plane × 1), Endoscopy Unit (Upper × 1, Colonoscopy × 1) , Physiological Laboratory (ECOE, ECG, Stress ECG, EMG, EEG, etc.), Operation Theatre including Hybrid Operation Theatre (OT × 3, Hybrid OT × 1), Laboratory (Chemistry, Microbiology, Pathology, Blood Bank), Dialysis (10 beds), Rehabilitation (Physiotherapy, Operation Therapy, Speech Therapy), Pharmacy, Medical Engineering, CSSD, Kitchen, Laundry, SPD, Morgue, Lecture Room, Administration, Medical Record, Engineering Service Block

Source: JICA Survey Team

Source: JICA Survey Team

Figure 6-1 Site Map (SMCH)

(2) Tezpur Medical College Hospital (TMCH), Tezpur

Tezpur Medical College and Hospital (TMCH) is the sixth medical college of the State Government for promoting medical education in the state. Proposed facilities are shown in Table 6-8, and the site map is shown in Figure 6-2.

The proposed site by GOA is lying in the northeast corner of the compound and is adjacent to the existing main hospital building. Site acquisition shall be a prerequisite for this project.

Table 6-8 Proposed Facility for TMCH

Hospital Type:	Super Specialty Hospital
Required Site Area:	Approx.10,000 sqm
Floor Area and Story:	Approx. 32,500 sqm 1) Integrated Block: 31,000 sqm, G+6 story 2) Engineering Service Block: 1,500 sqm, G+2 story
Footprint Area:	Approx. 7,000 sqm 1) Integrated Block: 6,500 sqm 2) Engineering Service Block: 500 sqm
Height of the Facility:	Approx. 34 m (38 m including other structures, i.e., Lift Machine Room)
Targeted Clinical Department:	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology, and Urology, Gastroenterology
Bed Strength:	200 beds (ICU 50 beds, ward 30 beds × 5 units)
Facility:	Outpatient Department, Emergency Unit (Triage 2 beds, Recovery 6 beds), Diagnostic Imaging (CT × 1, MRI × 1, X-ray × 2, Fluoroscopy × 1, etc.), Angiography Unit (Single-plane × 1, By-plane × 1), Endoscopy Unit (Upper × 1, Colonoscopy × 1) , Physiological Laboratory (ECOE, ECG, Stress ECG, EMG, EEG etc.), Operation Theatre including Hybrid Operation Theatre (OT × 3, Hybrid OT × 1), Laboratory (Chemistry, Microbiology, Pathology, Blood Bank), Dialysis (10 beds), Rehabilitation (Physiotherapy, Operation Therapy, Speech Therapy), Pharmacy, Medical Engineering, CSSD, Kitchen, Laundry, SPD, Morgue, Lecture Room, Administration, Medical Record, Engineering Service Block

Source: JICA Survey Team

Source: JICA Survey Team

Figure 6-2 Site Map (TMCH)

(3) Jorhat Medical College Hospital (JMCH), Jorhat

Jorhat Medical College and Hospital[6] (JMCH) is the fourth medical college of the State Government. Proposed facilities are shown in Table 6-9, and the site map is shown in Figure 6-3.

A lot of land on the east side of the compound is proposed by GOA. Currently, the proposed land is occupied by some facilities formerly used as Jorhat District Hospital, which is currently used as a facility for the medical college. Site acquisition shall be a prerequisite for this project.

The airport at Jorhat shares boundary wall with the medical college; the maximum permissible height may not be more than 21 m, depending on the location of the site with respect to the airport runway.

Therefore, the proposed building shall be planned lower than 21 m. This height limit includes lift machine room, lightning arrestor, DG chimney, and any other structure that may stick out over the building.

Table 6-9 Proposed Facility for JMCH

Hospital Type:	Super Specialty Hospital and Energy Centre
Required Site Area:	Approx.12,000 sqm
Floor Area and Story:	Approx. 37,500 sqm 1) Central Clinical Block: 36,000 sqm, G+3 story, with 2 basement floors. 2) Engineering Service Block: 1,500 sqm, G+2 story
Footprint Area:	Approx. 8,000 sqm 1) Central Clinical Block: 7,500 sqm 2) Engineering Service Block: 500 sqm
Height of the Facility:	Approx. 22.7 m (22.7 m including other structures, i.e., Lift Machine Room)
Targeted Clinical Department:	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology, and Urology
Bed Strength:	260 beds (ICU 20 beds)
Facility:	Outpatient Department Emergency Unit (Triage 2 beds, Recovery 6 beds), Diagnostic Imaging (CT × 1, MRI × 1, X-ray × 2, Fluoroscopy × 1, etc.), Angiography Unit (Single-plane × 1, By-plane × 1), Endoscopy Unit (Upper × 1, Colonoscopy × 1), Physiological Laboratory (ECOE, ECG, Stress ECG, EMG, EEG, etc.), Operation Theatre including Hybrid Operation Theatre (OT × 3, Hybrid OT × 1), Laboratory (Chemistry, Microbiology, Pathology, Blood Bank), Dialysis (10 beds), Rehabilitation (Physiotherapy, Operation Therapy, Speech Therapy), Pharmacy, Medical Engineering, CSSD, Morgue, Lecture Room, Administration, Medical Record, Engineering Service Block

Source: JICA Survey Team

[6] During the public consultation, there was an opinion that the name would like to be "Jananayak Deveshwar Sharma Civil Hospital".

Source: JICA Survey Team

Figure 6-3 Site Map (JMCH)

(4) Fakhruddin Ali Ahmed Medical College Hospital (FAAMCH), Barpeta

Fakhruddin Ali Ahmed Medical College and Hospital (FAAMCH) is the fifth medical college of the State Government. Proposed facilities are shown in Table 6-10, and the site map is shown in Figure 6-4.

The lot of land proposed by GOA in the compound is currently occupied by the Nursing School and Superintendent Quarter. Site acquisition shall be a prerequisite for this project.

Table 6-10 Proposed Facility for FAAMCH

Hospital Type:	Super Specialty Hospital and Energy Centre
Required Site Area:	Approx. 6,000 sqm
Floor Area and Story:	Approx. 19,000 sqm 1) Central Clinical Block: 17,500 sqm, G+5 story, with basement floor. 2) Engineering Service Block: 1,500 sqm, G+2 story
Footprint Area:	Approx. 3,000 sqm 1) Central Clinical Block: 2,500 sqm 2) Engineering Service Block: 500 sqm
Height of the Facility:	Approx. 29 m (33 m including other structures, i.e., Lift Machine Room)
Targeted Clinical Department:	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology, and Urology
Bed Strength:	50 beds (ICU 50 beds)
Facility:	Outpatient Department, Emergency Unit (Triage 2 beds, Recovery 6 beds), Diagnostic Imaging (CT × 1, MRI × 1, X-ray × 2, Fluoroscopy × 1, etc.), Angiography Unit (Single-plane × 1, By-plane × 1), Endoscopy Unit (Upper × 1, Colonoscopy × 1), Physiological Laboratory (ECOE, ECG, Stress ECG, EMG, EEG, etc.), Operation Theatre including Hybrid Operation Theatre (OT × 3, Hybrid OT × 1), Laboratory (Chemistry, Microbiology, Pathology, Blood Bank), Dialysis (10 beds), Rehabilitation (Physiotherapy, Operation Therapy, Speech Therapy), Pharmacy, Medical Engineering, CSSD, Morgue, Lecture Room, Medical Record, Engineering Service Block

Source: JICA Survey Team

Source: JICA Survey Team

Figure 6-4 Site Map (FAAMCH)

(5) Diphu Medical College Hospital (DMCH), Diphu

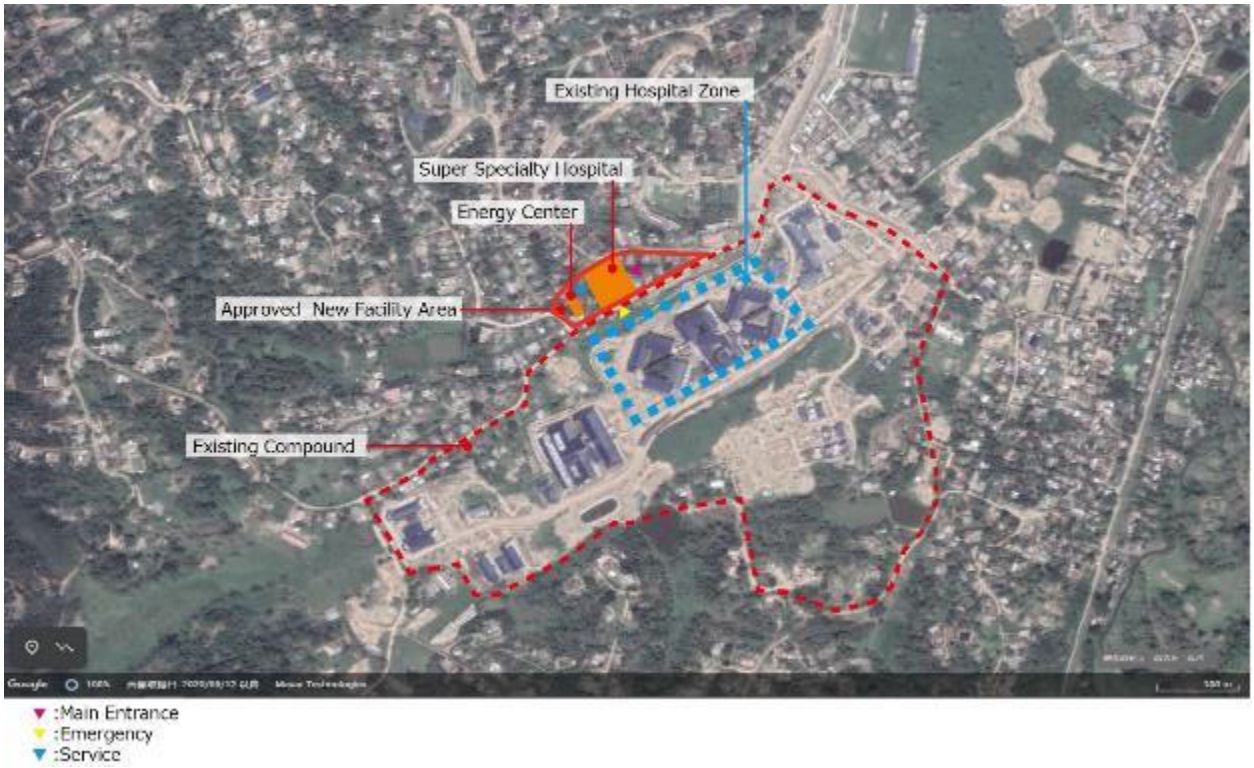
Diphu Medical College and Hospital (DMCH) is the seventh medical college of the State Government established in 2011 and started in 2019. Proposed facilities are shown in Table 6-11, and the site map is shown in Figure 6-5.

GOA proposed a lot of government site outside of the hospital compound, adjacent to the medical college. Site acquisition shall be a prerequisite for this project.

Table 6-11 Proposed Facility for DMCH

Hospital Type:	Super Specialty Hospital and Energy Centre
Required Site Area:	Approx. 6,000 sqm
Floor Area and Story:	Approx. 19,000 sqm 1) Central Clinical Block: 17,500 sqm, G+5 story, with basement floor. 2) Engineering Service Block: 1,500 sqm, G+2 story
Footprint Area:	Approx. 3,000 sqm 1) Central Clinical Block: 2,500 sqm 2) Engineering Service Block: 500 sqm
Height of the Facility:	Approx. 29 m (33 m including other structures, i.e., Lift Machine Room)
Targeted Clinical Department:	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology, and Urology
Bed Strength:	50 beds (ICU 50 beds)
Facility:	Outpatient Department, Emergency Unit (Triage 2 beds, Recovery 6 beds), Diagnostic Imaging (CT × 1, MRI × 1, X-ray × 2, Fluoroscopy × 1, etc.), Angiography Unit (Single-plane × 1, By-plane × 1), Endoscopy Unit (Upper × 1, Colonoscopy × 1), Physiological Laboratory (ECOE, ECG, Stress ECG, EMG, EEG, etc.), Operation Theatre including Hybrid Operation Theatre (OT × 3, Hybrid OT × 1), Laboratory (Chemistry, Microbiology, Pathology, Blood Bank), Dialysis (10 beds), Rehabilitation (Physiotherapy, Operation Therapy, Speech Therapy), Pharmacy, Medical Engineering, CSSD, Morgue, Lecture Room, Medical Record, Engineering Service Block

Source: JICA Survey Team



Source: JICA Survey Team

Figure 6-5 Site Map (DMCH)

(6) Lakhimpur Medical College Hospital (LMCH), Lakhimpur

Lakhimpur Medical College Hospital (LMCH) is the newest MCH in Assam, preparing its operation. Proposed facilities are shown in Table 6-12, and the site map is shown in Figure 6-6.

Currently, the proposed land by GOA is occupied by some facilities. Site acquisition shall be a prerequisite for this project.

Table 6-12 Proposed Facility for DMCH

Hospital Type:	Super Specialty Hospital and Energy Centre
Required Site Area:	Approx.6,500 sqm
Floor Area and Story:	Approx. 19,000 sqm 1) Central Clinical Block: 17,500 sqm, G+5 story, with basement floor. 2) Engineering Service Block: 1,500 sqm, G+2 story
Footprint Area:	Approx. 3,000 sqm 1) Central Clinical Block: 2,500 sqm 2) Engineering Service Block: 500 sqm
Height of the Facility:	Approx. 29 m (33 m including other structures, i.e., Lift Machine Room)
Targeted Clinical Department:	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology, and Urology
Bed Strength:	50 beds (ICU 50 beds)
Facility:	Outpatient Department, Emergency Unit (Triage 2 beds, Recovery 6 beds), Diagnostic Imaging (CT × 1, MRI × 1, X-ray × 2, Fluoroscopy × 1, etc.), Angiography Unit (Single-plane × 1, By-plane × 1), Endoscopy Unit (Upper × 1, Colonoscopy × 1), Physiological Laboratory (ECOE, ECG, Stress ECG, EMG, EEG, etc.), Operation Theatre including Hybrid Operation Theatre (OT × 3, Hybrid OT × 1), Laboratory (Chemistry, Microbiology, Pathology, Blood Bank) Dialysis (10 beds), Rehabilitation (Physiotherapy, Operation Therapy, Speech Therapy), Pharmacy, Medical Engineering, CSSD, Morgue, Lecture Room, Medical Record, Engineering Service Block

Source: JICA Survey Team

Source: JICA Survey Team

Figure 6-6 Site Map (LMCH)

6.3.2 Facility Upgrade in District Hospital

The details of the proposed 150-bed inpatient ward (Type 1) and emergency centre (Type 2) are as follows:

(1) Hospital Type 1: 150-bed Hospital

By analysing bed gap between the actual bed strength and the bed demand calculated from demarcation of the region, the number of lacking beds was figured out and it varies from below 100 to 500.

In general, the number of beds in hospital is an important factor in setting the scale of the hospital management; a rapid increase in the number of beds may burden the hospital. Therefore, the JICA Survey Team has set the recommended size of bed increase by 150 beds, and GOA has accepted this idea.

The basic specification of the Building Type 1: 150-bed hospital shall be shown in Table 6-13.

Table 6-13 Hospital Type 1: 150-bed Hospital

Floor Area:	Approx. 18,000 sqm
Story:	G+2
Required Site Area:	Approx. 25,000 sqm
Targeted Clinical Department:	General Medicine, General Surgery, Obstetrics & Gynaecology, Paediatrics, Ophthalmology, ENT, Orthopaedics, Psychiatry, Dental, Emergency
Bed Strength:	150 (ICU 10 beds, Emergency ward 20 beds, ward 30 beds × 4 units)
Facility:	Outpatient Department, Emergency Unit, Diagnostic Imaging (CT, MRI, X-ray, Fluoroscopy, etc.), Endoscopy Unit, Operation Theatre (4 rooms), Delivery Unit, Laboratory, Pharmacy, CSSD, Kitchen, Laundry, SPD, Morgue, Administration, Lecture Room

Source: JICA Survey Team

(2) Hospital Type 2: Emergency Centre

This building type is focusing on the provision of emergency service. After the first aid, if required, patients will be referred to the tertiary hospital. This type is applied to the area where the number of beds is sufficient to the population, but the clinical service is insufficient. Basic information of proposed hospital Type 2 shall be shown in Table 6-14.

Table 6-14 Hospital Type 2: Emergency Centre

Floor Area:	Approx. 6,000 sqm
Story:	G+1
Required Site Area:	Approx. 10,000 sqm
Targeted Clinical Department:	General Medicine, General Surgery, Obstetrics & Gynaecology, Paediatrics, Ophthalmology, ENT, Orthopaedics, Psychiatry, Dental, Emergency
Bed Strength:	No bed
Facility:	Outpatient Department, Emergency Unit, Diagnostic Imaging (CT, MRI, X-ray, Fluoroscopy, etc.), Endoscopy Unit, Delivery Unit, Operation Theatre (2 rooms), Laboratory, Pharmacy, CSSD, Morgue, Administration, Lecture Room

Source: JICA Survey Team

(3) Distribution of the Building Types

One of the project concepts was to build up a referral model from tertiary level to secondary level hospitals. To consolidate with this, district hospitals that are close to a tertiary level hospital was ideal to be selected.

The district hospitals shown in Table 6-15 are proposed by GOA for infrastructure improvement under the JICA project. The geographical location and vertical integration with existing and upcoming medical colleges have been taken into consideration. As for Goalpara CH and Sivasagar CH, medical college is upcoming and therefore these are excluded from the list by GOA.

For S.M Dev Civil Hospital, Silchar and S.K Roy Civil Hospital, Hailakandi, the process of demolition is to be initiated in phase-wise manner by GOA prior to the construction so that the functioning of the hospital services is not affected during the construction.

As for Haflong Civil Hospital, Dima Hasao, the existing building to be demolished is an abandoned training school. Hence, it is confirmed by GOA that it will not affect the functioning of the hospital services.

Table 6-15 District Hospitals Proposed by GOA

Sl. No.	Name of the District Hospital	Name of the Medical College	Number of Beds Currently Available (a)	Required Number of Beds (b)	Gap (a) - (b)	Proposed Building Type
1	S.M Dev Civil Hospital, Silchar	SMCH	134	500	-366	Type 1
2	Mangaldoi Civil Hospital, Darrang	GMCH, TMCH	313	300	13	Type 2
3	Udalguri Civil Hospital, Udalguri	GMCH, Tamulpur MCH (Under Construction)	147	300	-153	Type 1
4	Hojai Civil Hospital, Hojai	GMCH, Nagaon MCH (Under Construction)	50	-	-	Type 1
5	Haflong Civil Hospital, Dima Hasao	SMCH, DMCH	232	100	132	Type 2
6	S.K Roy Civil Hospital, Hailakandi	SMCH	129	200	-71	Type 1

Source: JICA Survey Team

From the analysis of the above requested locations, four blocks of Type 1 building and two blocks of Type 2 building shall be planned as shown in Table 6-16.

Table 6-16 Distribution of Building Type

Hospital Type	Location	Quantity
Type 1	S.M Dev CH, Udalguri CH, Hojai CH, S.K Roy CH	4
Type 2	Mangaldoi CH, Haflong CH	2

Source: JICA Survey Team

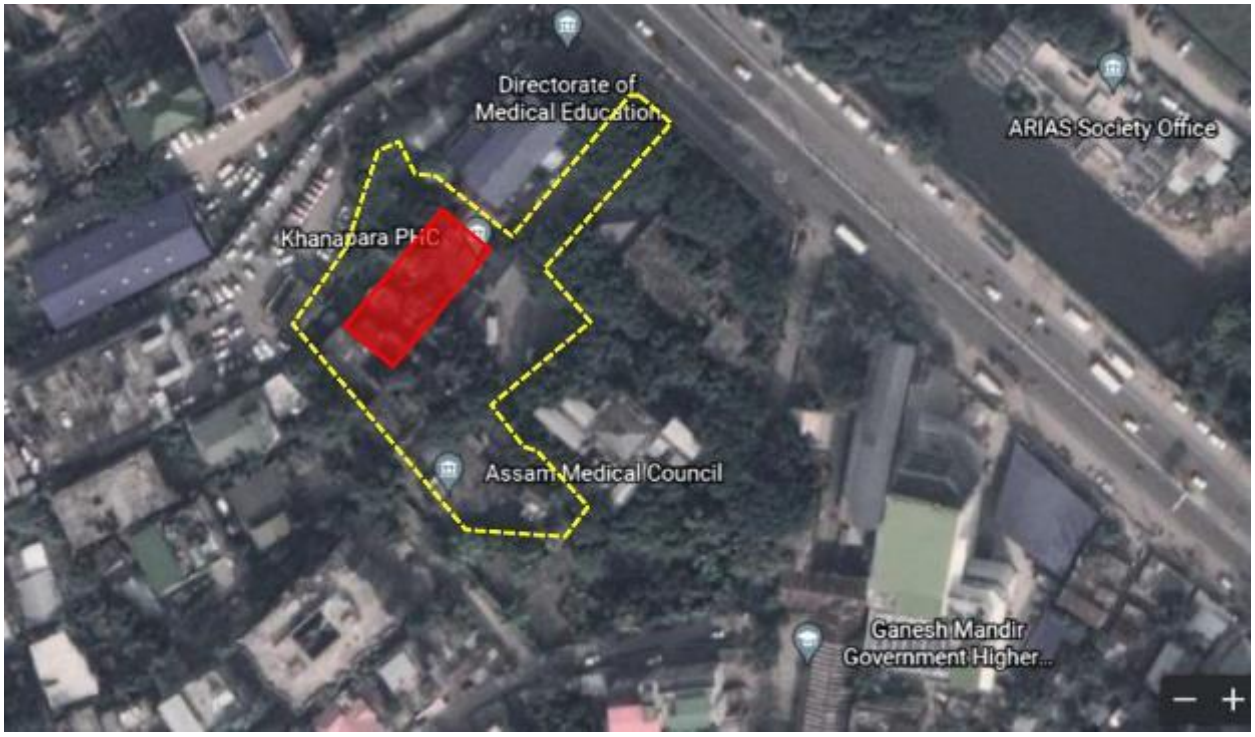
6.3.3 Training Facility for Capacity Building

It is a command, control, and integrated training and administrative centre, “Swasthya Bhawan”, which focuses on training, capacity development, management personnel and digitalisation, and creating a central administrative hub that will bring together all verticals for much better co-ordination and aims to build up human resource capacity. Basic information is shown in Table 6-17, followed by the location of the site as shown in Figure 6-7, area statement as shown in Table 6-18, site plan as shown in Figure 6-8, and floor plan and 3D image of the proposed building as shown in Table 6-19.

Table 6-17 Swasthya Bhawan

Plinth Floor Area:	8,047.6 sqm
Proposed Site Area:	6,870 sqm
Story:	G+6

Source: “PROPOSED NEW SWASTHYA BHAWAN AT SIXMILE, GUWAHATI” by GOA



Source: "PROPOSED NEW SWASTHYA BHAWAN AT SIXMILE, GUWAHATI" by GOA

Figure 6-7 Location of the Site

Table 6-18 Area Statement

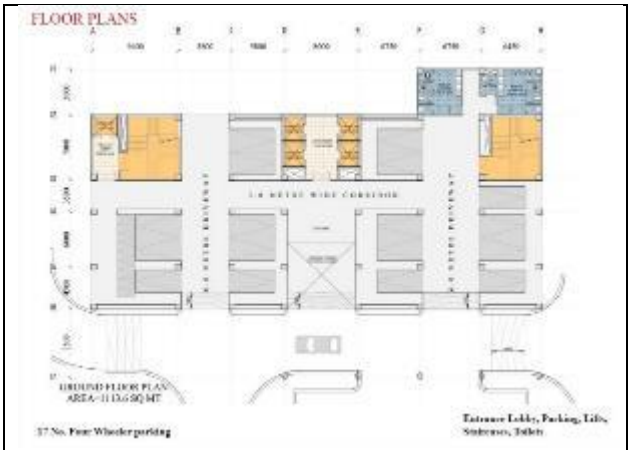
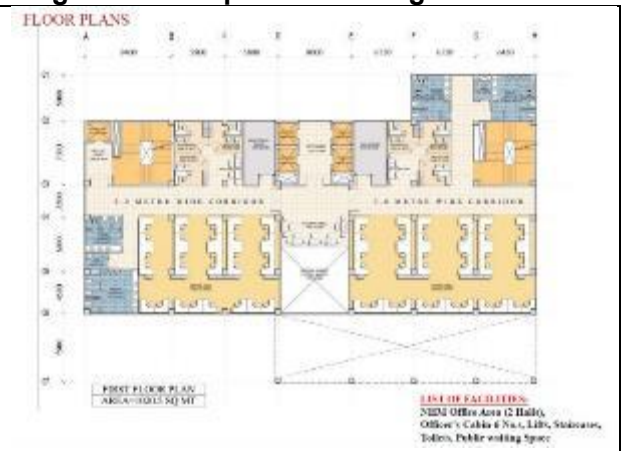
Floor	Area (sqm)	Facilities Provided
Ground Floor	1,113.6	Entrance Lobby, Parking, Lifts, Staircases, Toilets
First Floor	1,020.5	NHM Office Area (2 halls), Officer's Cabin-6 nos., Lifts, Staircases, Toilets, Public Waiting Space
Second Floor	1,283.2	NHM Office Area (2 halls), Officer's Cabin-4 nos., Senior Officer's Cabin-2 nos., 40-seater Office, Conference Hall, Lifts, Staircases, Toilets, Public Waiting Space
Third Floor	1,283.2	NHM Office Area with Officer's Cabin-2 nos., Senior Officer's Cabin-2 nos., Office Area with Managers of Different Departments, Lifts, Staircases, Toilets, Public Waiting Space
Fourth Floor	1,283.2	NHM Office- Managing Director's Cabin with PA and Waiting Space, Senior Officer's Cabin-2 nos., Conference Hall of 60 Seats, Board Room (14-seater), Lifts, Staircases, Toilets, Public Waiting Space, AMC & ANC Office Area with Officer's Cabin
Fifth Floor	1,283.2	AYUSH-Office Area with Senior Officer's Cabin, Lifts, Staircases, Toilets, Public Waiting Space, 250-seater Auditorium/Seminar Hall with Pre-function Area
Sixth Floor	780.7	Kitchen and Cafeteria
	8,047.6	

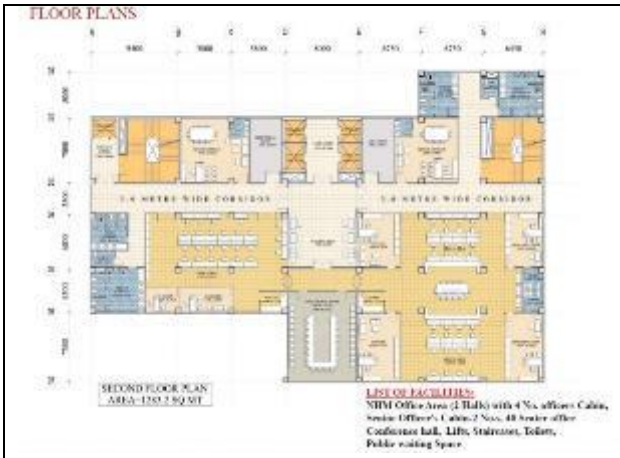
Source: "PROPOSED NEW SWASTHYA BHAWAN AT SIXMILE, GUWAHATI" by GOA

Source: "PROPOSED NEW SWASTHYA BHAWAN AT SIXMILE, GUWAHATI" by GOA

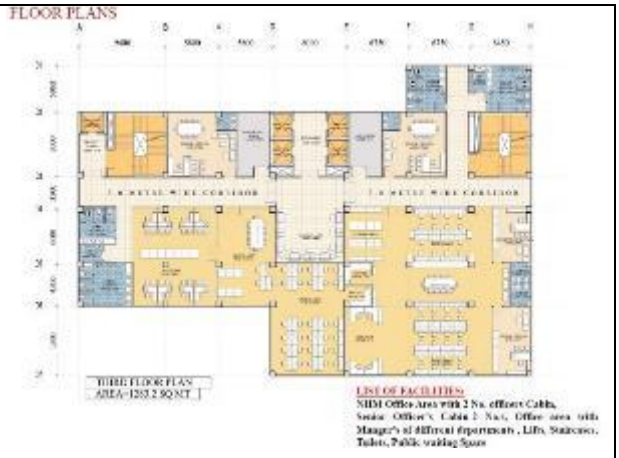
Figure 6-8 Site Plan

Table 6-19 Floor Plan and 3D Image of the Proposed Building

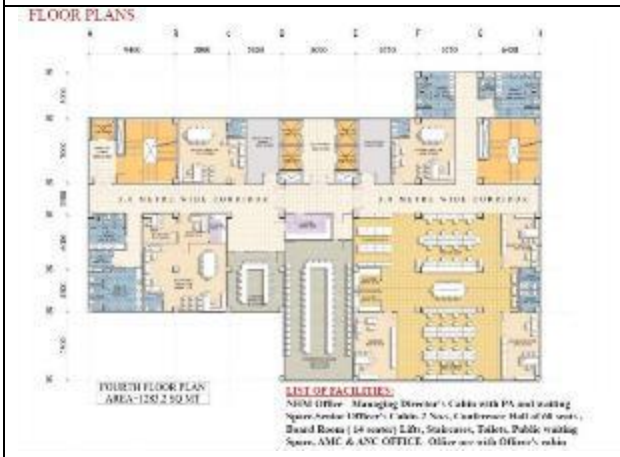
	
Ground Floor Plan	First Floor Plan



Second Floor Plan



Third Floor Plan



Fourth Floor Plan

Fifth Floor Plan

Sixth Floor Plan

3D Image View of the Proposed Building

Source: "PROPOSED NEW SWASTHYA BHAWAN AT SIXMILE, GUWAHATI" by GOA

6.4 Considerations for Design in the Implementation Stage

The issues shown in Table 6-20 will be considered and shall be reflected in the design during the implementation stage.

Table 6-20 Considerations for Design in the Implementation Stage

Issues	Considerations
Gender Considerations	Consider security around women's restrooms, changing rooms, and in the Obstetrics and Gynaecology Department. The entrance should not be easily visible from the crowds. Consider independent outpatient treatment rooms or separated with curtains. Waiting area usually gathered with crowds, regardless of gender. Considerations can include setting up a women-only waiting area. 
Barrier-free Considerations	Considering multilingual and multicultural situation, facilities should be designed with idea of barrier-free and universal design. Also, install ramps and lifts, handrails, and toilets for disabled in accordance with the regulations and rules. 
Skeleton Infill Facility Structure that Enables to Accommodate Future Changes	From a medium- to long-term perspective, hospitals are often required to update their facilities in response to updates in the medical technology. In order to realise this, installation of dry-structure partition walls and lowering the structural slab floor in advance to accommodate future changes in water supply and cable pit for diagnostic imaging and plan facilities that are easily adaptable to future changes. Planning the hospital facility under these principles from the design stage enables the facility to flexibly respond to future changes.
Long-span Structure that can Accommodate Future Changes	Cardiovascular operation theatres require a much larger column-free space than normal operation theatres due to the large number of medical devices used. It is same for the hybrid operation theatres where CT and angiography are used during surgery. In such rooms that require large flat plan, pre-stressed concrete can be adopted to reduce the number of columns. It is very significant to adopt such long-span structure to accommodate a plane large floor plan for providing advanced medical care.
Knowledge of Back Up Functions as Disaster Base Hospital	Assam has one of the world's highest rainfall and is known for its high agricultural productivity such as tea, but it is also prone to frequent natural disasters such as cyclones, major floods, and cliff collapses. The facility must be able to continuously provide medical care and treatment to the injured and sick in the event of such disaster. Considerations may be taken for receiving infrastructure from two supply sources is a minimum requirement, installing a private power generation system that can supply power for at least 72 hours (or a week when limiting the function area), planning a rainwater reservoir when the city water supply is cut off, and reusing of water.
Flood Water	Regarding flood, the major problem shall be the artificial flood during rainy seasons due to lack of proper stormwater drainage system. In general, it is advisable to have the finished ground level of the proposed locations to be kept at about 1.0 m above the Highest Flood Level. Generally, a good construction period in Assam is from end-September to mid-May. Major constructions like foundation and structural work should be completed during this period.
Seismically Isolated Structure	In India, large hospitals in high-risk areas for earthquakes have begun to use seismic isolation, and in Assam, there is a hospital currently being planned. Introducing seismic isolation structures in Assam enabled to ensure that medical activities continue even in the event of a major earthquake.
Green Hospital regarding Sustainable Development Goals (SDGs)	To reduce the energy consumption in the event of a disaster, as for the building facade, appropriate insulation materials shall be placed, air-tight window frames and pair glass shall be introduced, exterior louvers to reduce heat load, rooftop and wall greening, and solar panels shall be considered.

Source: JICA Survey Team

Chapter 7 Equipment Plan

7.1 Tertiary Medical Institute (Medical College Hospital)

The following eight medical college & hospital (Table 7-1) are targeted for the project:

Table 7-1 List of Medical College & Hospital

	Medical College & Hospital	Location	Establishment
1	Gauhati Medical College & Hospital	Guwahati	1968
2	Assam Medical College & Hospital	Dibrugarh	1947
3	Silchar Medical College & Hospital	Cachar	1968
4	Jorhat Medical College & Hospital	Jorhat	2009
5	Fakhruddin Ali Ahmed Medical College & Hospital	Barpeta	2005
6	Tezpur Medical College & Hospital	Tezpur	2005
7	Diphu Medical College & Hospital	Diphu	2011
8	Lakhimpur Medical College & Hospital	Lakhimpur	2021

Source: JICA Survey Team

For example, Gauhati Medical College & Hospital provides undergraduate and post-graduate education in: Medicine, Nursing, Midwifery, Pharmacy, Orthopaedics, Cardiology, Otorhinolaryngology, General Surgery, Anatomy, Pathology, Biochemistry, Ophthalmology, Paediatrics, Microbiology, Obstetrics and Gynaecology, Psychiatry, Dentistry, Neurology, Pharmacology, Forensics, Anaesthesiology, Dermatology, Plastic Surgery, Radiology, Physiology

As for patient care, it runs outpatient departments in General Medicine, General Surgery, Orthopaedics, Ophthalmology, Dermatology, Pulmonary Medicine, Geriatric Medicine, Obstetrics and Gynaecology, Dentistry, Paediatrics, Physiotherapy, and Psychiatry. Special outpatient departments for Rheumatology, Diabetes, Neurology, Nephrology, Cardiothoracic and Vascular Surgery, Plastic Surgery, Paediatric Surgery, Urology, Cardiology, and Neurosurgery run on specified days of the week. Emergency services run in Casualty, Paediatric Medicine, Obstetrics, and Psychiatry.

7.1.1 Keywords for the Equipment Plan for Each Facility

The plan of the medical equipment has been implemented taking into consideration the following:

- The availability of human resources who can operate the equipment, such as specialist doctors and medical radiologists, etc.
- For equipment that needs to be installed to the facilities, space for installation and ancillary facilities such as power supply, air conditioning, X-ray shielding, load-bearing capacity, etc., must be available.
- Maintenance services are available both in and outside of the target medical college & hospital.
- Procurement of consumables necessary for the operation of the equipment is secured (budget and procurement routes).
- The equipment must be suitable for clinical, educational, and research purposes.

7.1.2 Equipment Plan

【Expected cooperation components for medical equipment, request-wise】

The following table indicates the major planned equipment to be procured under the yen loan project.

(1) Component 1: Super Specialty Wing in Medical College & Hospital for Tezpur, Cilchar, Jorhat, Diphu, Fakhruddin Ali Ahmed, and Lakhimpur (Total six Medical College & Hospital) **No. of beds depends on the hospitals*

The medical equipment is considered and planned based on the facility architectural design (refer to Chapter 6 Facility Plan). Table 7-2 presents the major medical equipment by each service department / section.

Table 7-2 Contents of the Major Medical Equipment by Departments / Sections

Department	Major Medical Equipment
Target departments as the super specialty: Cardiology, CVD, Neurology, Neurosurgery, Nephrology, and Urology	CATH Lab including all accessories and EP, Multiparameter monitor, Dialysis machine, CRRT machine, 8-channel EMG/NCV/EP machine, Heart lung machine, etc.
ICU and general ward	**No. of beds depends on the hospitals*
Outpatient department	Consultation desk and chair, Examination bed, etc.
Emergency unit (Triage, recovery)	Stretcher, Patient monitor, Portable ultrasound scanner, etc.
Angiography unit	Single plane x 1 unit, Biplane x 1 unit
Endoscopy unit	Upper video endoscope, colonoscope, etc.
Physiological laboratory	ECOE, ECG, Stress ECG, CMG, EEG, etc.
Operation theatre	OT table, Diathermy unit, Suction unit, Surgical C-arm unit, etc.
Clinical laboratory	Biochemistry analyser, Haematology analyser, Coagulation analyser, etc.
Rehabilitation	Physiotherapy equipment, Occupational therapy equipment, etc.
CSSD	High pressure steam steriliser, Water distiller, etc.
Morgue	Mortuary refrigerator, Anatomy table, Instrument set, etc.
Lecture room	Projector, Screen, Desk and chair, etc.
Medical record	File cabinet, Desk and chair, etc.

Note: Personal computer to be used inside the hospital is prepared by the Indian side, and not covered by yen loan.
Source: Prepared by the Consultant (Based on questionnaire and interview survey)

(2) Component 2: To Improve Diagnostic / Curative Facilities for 8 Medical College & Hospitals

The medical equipment is necessary for the existing medical college & hospitals and was planned in view of the requests from the respective medical college & hospitals and the availabilities of the existing resources and infrastructure status. The items to be procured for the existing service departments / sections are designed in order to start standard essential diagnosis and treatment. Details are shown in Table 7-3.

Table 7-3 Contents of the Major Medical Equipment by Departments / Sections

Department	Major Medical Equipment
General Surgery	Hydraulic OT table, Laparoscope set, Open surgery instrument, Ultrasonic cutting & coagulation, etc.
Medicine	Multiparameter monitor, Syringe infusion pump, BIPAP/ CPAP, etc.
Paediatrics	Neonatal open care system, Ventilator (Neonatal) with HFO, Phototherapy machine (single surface), Transcutaneous bilirubin analyser, etc.
Orthopaedics	Orthopaedic table with attachments, Cautery machine with vessel sealing, General orthopaedic instruments, etc.
Ophthalmology	Slit lamp, Non-contact tonometer with pachymetry, ND YAG Laser - 1064 nm, Hand-held kerotometer, etc.
Psychiatry	Electro convulsive therapy (ECT) machine, EEG machine, etc.
Dermatology	IPL (Intense pulse light system), Motor (Electric) dermabrader, Hand foot UV phototherapy device, etc.
ENT	ENT operating microscope, OAE (screening), BERA with ASSR, etc.
Obstetrics & Gynaecology	Laparoscopic surgery set with hysterestoscope and resectoscope with high-definition camera & monitor, Delivery bed, etc.
Physical Medicine & Rehabilitation (PMR)	DVT prophylaxis pumps (calf and ankle) one set (pair), Tilt table (Manual), Motorised wheelchair, Shoulder CPM, Short wave diathermy, Interferential therapy, etc.
Respiratory & Pulmonary Medicine	Advanced PFT machine, Lung volume and diffusion apparatus, Cardiopulmonary exercise system, Polysomnography system, Rigid bronchoscope, etc.
Radiology	CT 256 Slice, MRI 3T, Digital X-ray 1000 mA, Colour doppler (2D & 3D), etc.
Anaesthesiology	Anaesthesia workstation with monitor and ventilator, Defibrillator with CPR capability, ICU ventilator, ICU monitor with CNS, etc.
Blood Bank	Haemoglobin meter, Blood collection monitor, -80 deep freezer, Cell counter (3-part diff.), etc.
Emergency and Traumatology	ICU ventilators, ICU beds, Operating table electro-hydraulic, Assorted surgical instrument, etc.

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

No new facilities are planned to be constructed at Assam Medical College & Hospital and Guwahati Medical College & Hospital due to the presence of existing super specialty wings. Therefore, it was necessary to investigate the equipment plan for all the existing departments / sections and the following diagnostic imaging equipment (Table 7-4) has been planned.

Table 7-4 Contents of the Equipment for Diagnostic Imaging Department of Assam Medical College & Hospital and Guwahati Medical College & Hospital

Department	Major Medical Equipment
Diagnostic Imaging	CT 256 slices, MRI 3T, Digital X-ray unit, Mobile X-ray unit, Ultrasound scanner colour doppler, Portable colour doppler unit, CR system, Mammography unit

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

7.2 Secondary Medical Institutes

7.2.1 Keywords for the Equipment Plan for Facilities

The plan of the medical equipment has been implemented taking into consideration the following:

- The availability of human resources who can operate the equipment, such as specialist doctors and medical radiologists, etc.
- For equipment that needs to be installed to the facilities, space for installation and ancillary facilities such as power supply, air conditioning, X-ray shielding, load-bearing capacity, etc. must be available.
- Maintenance services are available both in and outside of the target medical college & hospital.

- Procurement of consumables necessary for the operation of the equipment is secured (budget and procurement routes).
- The equipment is clinically relevant.
- The equipment that contributes to improve IMR, U5MR, and MMR (e.g., paediatrics, obstetrics and gynaecology) is prioritised.

7.2.2 Equipment Plan

The facilities to be covered by the project are listed in Table 7-5.

Table 7-5 Candidate Secondary Hospitals

	Hospital	Type	Remarks
1	Silchar Civil Hospital	1	150 beds
2	Mangaldoi Civil Hospital	2	Emergency centre, no bed
3	Udalguri Civil Hospital	1	150 beds
4	Hojai Civil Hospital	1	150 beds
5	Haflong Civil Hospital	2	Emergency centre, no bed
6	Hailakandi Civil Hospital	1	150 beds

Source: JICA Survey Team

Two types of secondary hospitals were designed: facilities with 150 beds (Type 1) and facilities with emergency and no beds (Type 2). Medical equipment was planned into the facility design.

(1) Equipment Plan of Type 1

Table 7-6 lists the equipment planned for Type 1 hospitals.

Table 7-6 Contents of Major Equipment of Type 1

Department	Major Medical Equipment
Emergency Unit	ECG machine-12 channel, Defibrillator, Mobile X-ray-100 mA, Portable ventilator, etc.
ICU	Multiparameter monitor, ICU ventilators, ICU bed, etc.
Surgical Unit	Operating table (electro-hydraulic), Plaster saw with suction, etc.
Outpatient Department	Examination couch, Consultation desk and chair, etc.
Laboratory	Random access medium throughput fully automated chemistry analyser, Cell counter and sizer, Blood gas analyser, etc.
Delivery Unit	LEEP system with smoke evacuator & integrated cart, Cryo-surgical system, Caesarean set, etc.
Diagnostic Imaging	CT 128 slices, MRI 1.5T, X-ray general, etc.
CSSD	High pressure steam steriliser 400 L and 80 L
Endoscopy Unit	Upper and lower video endoscope system, etc.
Pharmacy	Refrigerator (300-380L), Medicine cabinet, Iron rack, etc.
General Ward	Hospital bed with IV stand, Suction pump, etc.
Laundry	Washing machine, Drying machine, etc.
Morgue	Mortuary refrigerator, etc.

There is a possibility to provide 300 beds based on the huge medical demand of inhabitants.

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

(2) Equipment Plan of Type 2

Table 7-7 lists the equipment planned for Type 2 hospitals.

Table 7-7 Contents of Major Equipment of Type 2

Department	Major Medical Equipment
Outpatient Department	Examination couch, Consultation desk and chair, etc.
Labour Unit	Delivery bed, LEEP system with smoke evacuator & integrated cart, Hysterectomy set, etc.
Laboratory	Random access medium throughput fully automated chemistry analyser, Cell counter and sizer, Blood gas analyser, etc.
Diagnostic Imaging	CT 128 slices, MRI 1.5 T, X-ray general, etc.
CSSD	High pressure steam steriliser 400 L and 80 L
Endoscopy Unit	Upper and lower video endoscope system, etc.
ICU	Multiparameter monitor, ICU ventilators. ICU bed, etc.
Surgical Unit	Operating Table (electro-hydraulic), Plaster waw with suction, etc.

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

7.3 Primary Healthcare Facilities

7.3.1 Keywords for the Equipment Plan for Facilities

The plan of the medical equipment has been implemented taking into consideration the following:

- The availability of human resources who can operate the equipment, such as general physicians (GPs), midwifery staffs and nurses, etc.
- For equipment that needs to be installed, utilities such as electricity, water supply, etc. must be available.
- Maintenance services are available by equipment suppliers of the pilot primary health centres.
- Procurement of consumables necessary for the operation of the equipment is secured (budget and procurement routes).

7.3.2 Equipment Plan

The facilities to be covered by the project are listed in Table 7-8.

Table 7-8 Pilot Primary Health Centres

	Department	Major Medical Equipment
1	ANC	Height & weighing scale, Diagnostic set, Bilirubin analyser (percutaneous), etc.
2	Labour & Delivery	Labour bed, Delivery bed, Fetal doppler, Transport incubator, etc.
3	PNA / Vaccine	Vaccine refrigerator, Neonatal weighing scale, etc.
4	Inpatient (Observation)	Beds, Baby cots, etc.
5	Sterilisation	Tabletop autoclave

Source: JICA Survey Team

7.4 Others

Table 7-9 to Table 7-11shows other equipment to be planned for the project.

Table 7-9 Equipment for Dedicated Training, Monitoring, Administrative Centre, "Swasthya Bhawan" - Component 5

Department	Major Equipment
Lecture room	Projector, Screen, Desk, Chair, and Shelf

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

Table 7-10 Equipment Concerned to Improvement of Medical College Infrastructure Classroom, Libraries, Hostel, Smart Classrooms - Component 8

Department	Major Equipment
Classroom, smart classroom	Desk and chair for 2-student, Projector, Screen, Computer for teachers, Tablet, etc.
Libraries	Issue desk, Book trolley, DVD/Video display unit, etc.
Hostel	Desk, Chair, Shelf, etc.

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

Table 7-11 Equipment Concerned to ICT on Comprehensive Hospital Management System and Smart Hospital in AMCH & GMCH

Department	Major Equipment
Administration block, major clinical departments	Persona computers, database servers, etc.

Source: Prepared by the Consultant (Based on questionnaire and interview survey)

The above equipment is expected to be procured under the yen loan project as of Preparatory Survey time. In addition, due to budget ceiling, some component which is not high priority for the Assam side might not be covered by the yen loan.

7.5 Advantage of Japanese Medical Equipment

Medical equipment made in Japan has advantages mainly for image diagnostic equipment and endoscopic equipment. Details are shown in the following Table 7-12.

Table 7-12 Advantage of Japanese Medical Equipment

Image Diagnostic Equipment	・ CT scanner 320 slices developed in Japan can scan cardiac movement only within a second so that paediatrics and elder patients who have difficulty stopping their breathing can easily obtain high resolution image. In addition, this CT can minimise radiation exposure, suitable for infant/paediatrics. This high-quality image can be used without any data processing before PCI (Percutaneous Coronary Intervention) treatment at cardiology, and also suitable for oncology treatment. Considering NCD patients such as circulatory disease or oncology, this CT provides high quality image for accurate diagnosis. ・ Resolution of ultrasound scanner is very much advanced. Thus, it is suitable for cardiac follow up patients to check their heart movement after operation or intervention. (Included in the project) ・ Angiography system is pre-installed with stent enhancement software and 3D road mapping system so that the doctor can easily confirm where to insert stent, and it is suitable for intervention radiology treatment. (Included in the project)
Video Endoscopic Equipment	・ Diameter is very small compared with that of European made, and suitable for paediatric patients and relatively small body adult Indian whose body shape is similar to Japanese. (Included in the project)
Haemodialysis Healthcare Equipment	・ Haemodialysis including Dialyser is more economical and safer than the western method using Individual Dialysis System (IDS) because it enables the centralised preparation and supply of dialysis fluid to each patient. (Included in the project)

Source: JICA Survey Team

7.6 Operation and Maintenance of Medical Equipment

The maintenance of medical devices consists of common maintenance (routine and periodic inspections) and repairs.

Routine inspections include visual inspections that can be carried out without the use of tools or measuring instruments, checking of alarm operation, imaging accuracy checks using phantoms, etc., to ensure the safe and proper use of the medical equipment.

Periodic inspections include cleaning, calibration, replacement of consumable parts, etc. These inspections are carried out by the equipment supplier or distributor, who dismantles and inspects the equipment regardless of whether it is faulty or not, then, replaces deteriorated parts if necessary. In Assam, the authorised technicians of the distributors in Kolkata and Guwahati are ready to take immediate action.

In the Indian government tender, the Comprehensive Maintenance Contract (CMC) costs for three years will be included in the purchase price of the equipment. In addition, the bidder will be required to submit an estimate of the lifetime maintenance cost for ten years from the date of delivery, and the amount of maintenance is committed and paid in the fourth year and every year thereafter.

The roles of the DME, end-users (respective healthcare facilities) and equipment distributors in common maintenance (routine and periodic) and repair are generally divided as shown in Table 7-13.

Table 7-13 Roles of Stakeholders on Maintenance of Medical Equipment

Level	GOA (DME)	End-users (Healthcare Facilities)	Equipment Distributors
Tertiary	The DME guides / promote the renewal of maintenance contracts to public healthcare facilities.	The end users should carry out a routine inspection and, if any abnormality is found, request the distributor to carry out inspection and repair according to the following procedure: Head of each department ⇒ Hospital Procurement department ⇒ Distributors	Dispatch of certified technicians / engineers to ensure periodic / regular inspections and repairs to ensure proper operation of the equipment.
Secondary	Same as above	Same as above	Same as above
Primary	Same as above	Same as above	Same as above

Source: JICA Survey Team, based on questionnaire and interview survey

The following measures have been taken in terms of maintaining and developing the skills and knowledge of the equipment users.

Generally, Guwahati Medical College & Hospital and Assam Medical College & Hospital, where many advanced medical equipment (such as CT, MRI, PET scanners, radiotherapy machines, etc.) are introduced in the facilities, have established a multifaceted personnel exchange and network with other medical college & hospitals in the state.

As a part of this, training of doctors and para-medical staff such as radiologists and laboratory technicians, etc. are also conducted at Guwahati Medical College & Hospital and Assam Medical College & Hospital to acquire skills through hands-on and attachment training, for example, when new medical equipment is introduced in the facilities.

7.7 After Sales Service of Local Agents in New Delhi

Local agents of planned equipment under the yen loan project located in Gurugram, New Delhi are looking after medical equipment markets in the State of Assam including execution of after sales services. Some manufacturer has its workshop in Kolkata, and conducts corrective maintenances. The detailed survey result of each agent is

mentioned in Table 7-14.

Table 7-14 Reference Survey Results for Manufacturers in New Delhi

Agency Name	Olympus Medical Systems India	Fujifilm India
Product	・ Rigid and flexible endoscopes ・ Laparoscopic instruments ・ Ultra clinics	・ X-ray (Mobile, stationary, mammography) ・ PACS ・ Flexible endoscopes
Certified engineers*/ branch	3 technician/engineers in Assam and workshop in Kolkata are responsible for maintenance	New Delhi (Gurugram)

*Certified Service Engineer for the Installation, Diagnostics, Troubleshooting, Preventive Maintenance and Support

Source: JICA Survey Team

7.8 Procurement Plan

Procurement of medical equipment from foreign countries requires international competitive bidding (ICB) procedures. High-precision medical equipment needs periodic maintenance and regular supply of spare parts and consumable items. In order to maintain such equipment, it is desirable that the manufacturers have local agents in Guwahati, Kolkata or New Delhi (Gurugram), so that maintenance services can be performed in a timely manner.

It is also recommended to limit procurement range with Development Assistance Committee (DAC) member countries in order to guarantee the accuracy and quality of such precision equipment.

Procurement of general medical equipment, educational equipment or furniture, and ICT system from local manufacturers may apply local competitive bidding (LCB) procedures.

The image diagnostic equipment procurement cost consists of turnkey works, warranty, and Comprehensive Maintenance Contract (CMC), and also includes the cost of installation, initial operational fees, and UPS.

It is necessary to consider adequate packaging in terms of feasible maintenance and management system, as well as cost saving.

Chapter 8 Human Resource Development Plan of Medical Institutes

8.1 Human Resources to be Allocated in the New Facilities

8.1.1 Medical College Hospitals

The required number of faculty posts including entry level posts is created by the Health and Family Welfare Department, Government of Assam (HFWD) as per the minimum standard requirements set by the National Medical Commission (NMC) and service-related requirements of the medical college & hospitals. Once the posts are created, the Government of Assam advises the Medical & Health Recruitment Board (MHRB), Assam for selection of suitable candidates in the entry level posts (Demonstrator / Registrar). The list of selected candidates is then submitted by MHRB with a recommendation to the Government of Assam for appointment and the Health Department appoints the candidates in various medical colleges accordingly. The senior faculty posts (Assistant Professor, Associate Professor, and Professor) are promotional cadre posts. HFWD constitutes a high-level Departmental Promotion Committee (DPC) for promotion of faculty members of medical colleges from time to time on the basis of gradation list maintaining reservation roster.

The postgraduate (PG) students who have completed their PG courses have to serve under the State Government for a mandatory period of one year as Senior Resident / Post PG Resident with a provision of further extension of ten years, as and when required by the government. The number of doctors and students will be determined based on the “Postgraduate Medical Education Regulations, 2000, Medical Council of India” to establish the super specialty hospital. According to the regulations, one Professor, one Associate Professor, one Assistant Professor, one Senior Resident, and two Junior Residents will be required in the first unit. The required numbers of doctors for the proposed super specialty hospitals are presented in Table 8-1.

Table 8-1 Required Numbers of Doctors at Proposed Super Specialty Hospitals

Targeted Hospitals	Number of Beds (Planned)	Clinical Departments (Planned)	Required Numbers of Doctors
Silchar Medical College Hospital, Cachar	170 beds (ICU 50 beds, ward 30 beds × 4 units)	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology and Urology	・ In one department, at least three faculty members (one Professor, one Associate Professor/Reader & one Asst. Professor/Lecturer) per 20 beds ・ The ratio of postgraduate teacher to the number of students to be admitted for super specialty course shall be 1:2 for Professor/Assoc. Professor and 1:1 for remaining cadre in each unit per year subject to a maximum of 4 PG seats for the course per unit per academic year provided the complement of 10 teaching beds per seat is added to the prescribed bed strength of 20 for the unit.
Tezpur Medical College Hospital, Tezpur	200 beds (ICU 50 beds, ward 30 beds × 5 units)	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology and Urology, Gastroenterology	
Jorhat Medical College Hospital, Jorhat	260 beds (ICU 20 beds)	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology and Urology	
Fakhruddin Ali Ahmed Medical College Hospital, Barpeta	50 beds (ICU 50 beds)	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology and Urology	
Diphu Medical College Hospital, Diphu	50 beds (ICU 50 beds)	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology and Urology	
Lakhimpur Medical College Hospital, Lakhimpur	50 beds (ICU 50 beds)	Cardiology, Cardiac Surgery, Neurology, Neurosurgery, Nephrology and Urology	

Source: JICA Survey Team, based on Postgraduate Medical Education Regulations, 2000

The number of nurses and other medical workers will be calculated based on the "Minimum Standard Requirements for the Medical College for 100 Admissions Annually Regulations, 1999" by the Medical Council of India. Figure 8-1 presents the recommended norms for hospital nursing service.

RECOMMENDED NORMS FOR HOSPITAL NURSING SERVICE

	(STAFF)		(TEACHING HOSPITAL)
Staffing:	1. Nursing Superintendent		1 (for minimum of 150 beds)
	2. Deputy Nursing Superintendent		1
	3. Asstt. Nursing Superintendent		2
	(for every additional 50 beds one more Assistant Nursing Superintendent)		
	Staff Nurse	Sister	Department Senior/ANS
Medical Ward.	1:3	1:25	Each Shift 1 For 3-4 wards
Surgical Ward	1:3	1:25	" -do-
Orthopaedic ward	1:3	1:25	" -do-
Paediatric ward	1:3	1:25	" -do-
Gynaecology ward	1:3	1:25	" -do-
Maternity ward	1:3	1:25	" -do-
	(Including new borns)		
Intensive Care Unit	1:1 (24 Hrs.)	1 each shift	1 Departmental Sister/.
Coronary Care Unit	1.1 (24 Hrs.)	1 each shift	ANS for 3-4 units
Special wards Eye, ENT etc.	1:1 (24 hrs.)	1 each shift	
Operation Theatre	3 for 24 hrs. per table	1 each shift	1 Departmental sister/ANS for 4-5 Operation Theatre 1 Depttl. Sister/ANS for emergency casualty etc.
Casualty & Emergency Unit	2-3 Staff Nurse depending on the No. of beds	1 each shift	

Source: Minimum Standard Requirements for the Medical College for 100 Admissions Annually Regulations, 1999, NMC

Figure 8-1 Recommended Norms for Hospital Nursing Service

8.1.2 Civil Hospitals

Based on the proposed departments of civil hospitals (Type 1), the numbers of doctors, nurses, and paramedics as listed in Table 8-2 will be required as per the Indian Public Health Standards (IPHS), promulgated in 2012.

Table 8-2 Required Numbers of Doctors/Nurses/Paramedics

Position	100 beds	200 beds	300 beds
Medicine	2	2	3
Surgery	2	2	3
Obstetrics & Gynaecology	2	3	4
Paediatrics	2	3	4
Anaesthesia	2	2	3
Ophthalmology	1	1	2
Orthopaedics	1	1	2
Psychiatry	1	1	1
Dental	1	1	2
Staff Nurses*	45	90	135
Paramedics*	31	42	66

Note: *Numbers of staff nurses and paramedics might be changed as proposed Type 1 building does not include all the essential departments for civil hospital.

Source: JICA Survey Team, based on Indian Public Health Standards (IPHS), promulgated in 2012

The details of the staffing plan will be discussed as soon as the clinical departments and the number of beds of each proposed hospital are determined. According to Assam HFWD, 3,148 vacant posts are already advertised for filling up. Necessary steps are being taken to fill up another 5,707 vacant posts under different directorates. Further, about 1,100 doctors pass every year from the existing medical colleges and with the establishment of new medical colleges.

Chapter 9 Recommendations on Health ICT Improvement

9.1 Phasing of the Project:

The Assam government may like to implement all e-Hospital modules in all the medical college hospitals under the proposed project. Most of the hospitals began with the basic Outpatient Department (OPD), Billing modules and by April 2022 would have been sufficiently ready for the total system (all modules).

9.1.1 Strengthening the HMIS/HIS System in the State of Assam

(1) Strengthening the National Health Mission

At present, the Management Information System cell of the National Health Mission (NHM MIS cell) at the national and state level is organised in Table 9-1.

Table 9-1 Existing NHM MIS Cells

Level	Under Regular Services	Under NHM
State Level	・ Demographer – Vacant ・ Statistician ・ Statistical Investigator	・ State MIS Manager (1) ・ Data Analyst (4) ・ Programmer (3) ・ GIS Expert (1) ・ System Administrator (1) ・ Data Manager ・ System Assistant (1)
District Level	・ Statistical Investigator ・ Statistical Investigator (UIP)	・ District Data Manager (33) ・ Assistant District Manager (in 27 districts) ・ Computer Assistant (under UIP)
Health Block Level	・ Computer ・ LHV	・ Block Data Manager
Below Block Level	・ LHV	・ PHC Accountant cum Assistant Block Programme Manager (Also used for reporting)

Source: JICA Survey Team

(2) Suggestions for Improvement

1. Providing contemporary designations to the existing longstanding staff like Director of Information Technology (IT), or Head of Management Information System (MIS), Database Architect, Quality Assurance (QA) Lead, Team Leader, Development Specialist – need to be explored.
2. Incentive system may be suggested in the form of field visit allowance or some other form as overtime or holidays work is not counted to the staff.
3. Periodic good practices and achievements at the field/HO to be updated directly to the stakeholders.
4. In view of the national digital health mission, short-term training in digital medical records/visit to developers like the National Informatics Centre (NIC), Delhi/Tripura, World Health Organization (WHO) may be encouraged.
5. Hardware/servers upgrading to be considered.
6. It may be explored to strengthen the Assam Medical Services Corporation which is a separate company formed five years ago for various procurement roles if it gives flexibility from the government/government e-marketplace (GEM) portal-related complexities.

- **DME system** – Executive Assistant IT to Directorate of Medical Education (DME) (could be a qualified doctor with IT skill set) to be created and he will be responsible for data, updating, retrieving from various portals of NHM, support to the DME.
- **DHS system** – Executive Assistant IT to Directorate of Health Services (DHS) (could be a qualified doctor with IT skill set) to be created and he will be responsible for data, updating, retrieving from various portals of NHM, support to the DHS.
- **Medical college hospitals -** Coordinator IT (could be a qualified doctor with IT skill set suitably from community health department) to be created and she/he will be responsible for implementation, overseeing, data, updating, retrieving from the software system. She/he will be supported by full-time IT hardware professional and in case of large hospital, support team consisting of hardware and software skills is required. Sample provision of computers/terminals department-wise is shown in Table 9-2

Table 9-2 Example in One Medical College of 500 Beds Type

Sr. No	Department	No. of Computers
1	Help Desk	2
2	OPD	6
3	Clinics (Doctor Chamber)	30
4	Radiology and Pathology labs	15
5	Emergency	2
6	Nurse stations / IPD	20
7	Central Store	3
8	Pharmacy	5
9	OT	10
10	ICU	5
11	PICU	2
12	SNCU	2
13	Billing	5
14	Laundry	1
15	Diet	1
16	MRD Department	2
	Total	**111**

Source: JICA Survey Team

(3) Organisation Committee

Digital health records under the national digital health mission will give tremendous opportunity and also sufficient challenges in implementation. A suitable committee may be formed with medical/IT/legal to oversee, coordinate, and propagate the system. This committee may also decide the continuation of e-Hospital or seek other vendor services.

9.1.2 Concerns and Possible Solutions/Alternatives

(1) e-Hospital Implementation Issues

e-Hospital has been implemented in hundreds of hospitals across India. Some of the lessons learnt and suggestions are (if e-Hospital is chosen):

1. Doctors/clinicians need to be supported with forms filling (e-prescription data); the process has to start gradually and increase over one year. May need a medical assistant in the initial days.
2. Having a tablet type of interface which allows the doctors to scribble will be much more acceptable to the doctors.
3. Nurses at workstations need motivation and training in using/inputting the data.
4. Less paid/undertrained outsourcing staff can be a big bottleneck.
5. Latest hardware always helps the quicker inputting of the data.

(2) High Cost and Complexity of Local Area Network and Possible Solution

Medical colleges/hospitals are spread over several buildings and floors and in vast campuses. Guwahati Medical College & Hospital (GMCH), which is six times larger and more complex than the rest of the newly built colleges which have better building design and work flow, has been assessed and attempted to provide a local area network with cabling, nodes, routers, and switches. Average cost of this networking for a typical medical college is coming to INR 60 lakhs (by NIC estimates) to INR 3.8 crores to GMHC. This cost is prohibitive and even entails a continuous maintenance of the system with several stages of Uninterruptible Power Supply (UPS). Due to the proliferation of internet providers, the government may ask them to provide wireless routers in hospital buildings at their own cost so that wireless internet is available to each desktop/laptop thus reducing network investments and complexity of the system. This is now possible as the system proposed is totally cloud based and each desk/computer needs basic internet.

(3) GEM Portable and Procurement Problems

NHM continuously faces the issue of hardware procurement (on time) either for the thermo active building system (TABS), printers, UPS, desktops due to the Government of India (GOI) guidelines on the GEM portal (a national portal for procurement of government agencies).

Until 2016, the procurement was with the rate contract mechanisms as notified by Digital Content Technologies (DGCT) and fairly smooth. The present system of GEM portal and overload of vendors are delaying, if not blocking, the procurement of hardware.

(4) Command and Control System has been Created for COVID-19 Management

It should be with state of the art hardware, software, and processes including the HR efforts may be made to continue using the system by expanding data items in the normal times also. This way, the sophisticated, well refined system may continue to be in use for normal and emergency management.

(5) Encourage the Use of Existing Investments in Portals/Modules Development

Huge investments are made and being made into the health system but the track of the buildings, equipment, and human resources is not in an organised way by the concerned department/college/hospital.

The important modules (Table 9-3) are developed under GOI/NHM guidelines and in use. (There are several other modules for use in NHM-related activities.)

Table 9-3 Important Modules in NHM

	Important Modules in NHM	Access to DHS/DFW/DME
1	HR – MIS	Yes
2	Inventory management	Yes
3	Drug stock	Yes
4	RCH portal	Yes
5	Civil works	Yes
6	Health services monitoring	Yes
7	Bio medical equipment maintenance program	Yes
Note	Detailed modules are given in ANNEX I	

Source: JICA Survey Team

(6) Encouraging Data-based Decision Making by the Directorate Systems

It should be for the promotions, posting, training, and incentivising by the DME, DHS, DFW and is highly recommended to avoid delays and ensure transparency and efficiency in decision making.

(7) Management of Data Entry Without Additional Staff

Generally, during operations (checking the patient, reading his reports or recording the assessment), the nurse or doctor has to enter the data into the forms in the computer. There are apprehensions whether this will be treated as additional workload or non-acceptable due to computer aversion illiteracy in some parts of Assam.

(8) Limited Support of Vendors In e-Hospital Implementation

NIC's e-Hospital has limited empanelled vendors for the State of Assam (one vendor). Efforts may be made to empanel at least two more vendors to the system as the load of installing the software in large number of hospitals cannot be taken by one vendor. Additionally, local NHM team can also hire, train, and implement at least in few hospitals so as to internalise the knowledge.

(9) Project Monitoring Unit

Progress monitoring system to be formed to monitor each and every activity approved under the Japan International Cooperation Agency (JICA) project – line activity – linking to departments – persons – institution – master - photograph – (oxygen system monitoring by GOI – recent example) (this chapter to be expanded under the organisational structure/systems chapter)

(10) Incentivising the Software Implementers

NIC has provided modest budget for the implementation services by the empanelled vendor. This budget may need to be revised or if the revision is a national level decision by NIC, the project may provide some daily allowances to the implementation staff/agency to offset their HR cost in the challenging locations. Otherwise, there may be delays and project overruns and incomplete work in progress at hospitals resulting in frustration with the front level staff of the hospitals.

(11) Online/Mobile OPD Registration

In Assam, overall, the doctors' care/examination and subsequent treatment is at an acceptable level, but the wait time/queue in the OPD is stressful to sick patients or their attendant. Online OPD registration shall be encouraged through mobile phone with simple interface. They may be encouraged to do it even

in the hospital waiting area through a dedicated councillor (to begin with). Gradually, they may be able to do it even before they go to the hospital.

(12) Assam Health Dashboard

It is proposed to expand the (starting with the available data online/offline) Assam health dashboard that is already accessible to the decision makers. NIC – e-Hospital has provision to provide for a dashboard by clubbing selected hospitals. There may be a need to customise the display items, categorisation of hospitals, and add some offline data to make the data usable. e-Hospital can show live statistics of patient load, doctors/nurses, tests, admissions, discharges, billing information and many others as the data is in the cloud.

9.1.3 Other Suggestions that are Part of the HIS

(1) Tele-consulting for Follow-up Visits

For simple follow-up visits, the patients may be encouraged to tele-consult with the doctors – or tele-consult through the nearest primary health centre (PHC)/community health centre (CHC) thereby avoiding the long travel, waiting and other related hassles. e-Hospital module may be tweaked for this provision.

(2) Satellite Internet for Remote Hospitals

District hospitals/medical colleges sometimes are located near the main town in a village plus type demography where fibre connection is generally not available (Bharat Sanchar Nigam Limited (BSNL)[7] possible), the situation in subdivisional hospitals and in PHCs may be problematic in 20 to 30% of the places. Thanks to the newest satellite technologies like Starlink (by Tesla's Elon Musk-promoted) One Web by Airtel, by April/May next year, it may be possible to get satellite internet at any place in India (is already available in many countries) with most reliable bandwidths of up to 200 megabits per second (mbps) with very low latency and at a reasonable price. [India Today, 2021] [Times of India, 2021]

[7] Landine

Chapter 10 Environmental and Social Considerations

The Japan International Cooperation Agency (JICA) is accountable for the environmental and social considerations (ESC) of the project and it is necessary to confirm the implementation of ESC by the project proponents. In addition, JICA provides technical support for ESC-related studies including conducting the Environmental and Social Consideration Survey during the preparatory survey. The objective of the survey is to avoid significant impact from this project based on the JICA Guidelines for Environmental and Social Considerations April 2010 (hereinafter referred to as "JICA guidelines"). The result of the assessment together with mitigation measures and environmental monitoring plans need to be reflected in the project implementation planning.

10.1 Legal Framework for Environmental and Social Considerations

10.1.1 Institutional Setting

The ministry in charge of ESC in India is the Ministry of Environment, Forest and Climate Change (MoEF), which has institutions at both central and state levels. Under MoEF, the Central Pollution Control Board (CPCB) is established to formulate the policy, regulations, and guidelines for environmental conservation. It also operationalises international agreements such as the Montreal Protocol, Ramsar Convention, and Washington Convention.

At the state level, there are departments responsible for environmental protection and the State Pollution Control Board (SPCB), which plays the principal role in pollution control in practice.

10.1.2 Laws and Regulations Related to Environmental Considerations

(1) Environmental (Protection) Act (1986) and Its Amendment (1991)

The act provides foundation for environmental protection and improvement of environment in India and stipulates the role and power of the government, as well as penalties to non-compliance with the act and related rules.

(2) Environment (Protection) Rules (1986)

The rules provide standards for emissions or discharge of environmental pollutants, restrictions on the location of specific industries, and procedures of sample analysis of such pollutants.

(3) Environmental Clearance Notification (2006) and Its Amendment (2009)

The notification had been initially established in 1994 followed by the Environmental Protection Act and Rules in 1986. It provides the categorisation of projects based on the scale and type of activities that may cause environmental degradation and specifies the procedures to follow. It also specifies the type of project which should obtain environmental clearance and require the conduct of environmental impact assessment (EIA). Demarcation between national and state level environmental authorities is covered by the notification. The amendment in 2009 enhanced the obligation of project proponents to disclose information related to project implementation and the results of environmental monitoring.

The government issued the draft of EIA Notification in March 2020, which includes more exemptions and dilutes the environmental standards. As a result, the draft received around 1.7 million comments by the end of the public consultation period.

10.1.3 Gap Analysis

This section provides the gap between the JICA Guidelines for Environmental and Social Considerations (2010) and the relevant laws in India. Overall, there is no fundamental gap between them; nonetheless, some minor gaps arose, such as: 1) timing of conducting EIA study, 2) target of information disclosure, and 3) criteria for public consultation. The result of the gap analysis is presented in Table 10-1.

Table 10-1 Gap Analysis between Indian Laws and JICA Guidelines

JICA Guidelines on Environmental and Social Considerations 2010	Relevant Law in India	Gap between JICA Guidelines and Government Law / Actions to be Taken
Underlying Principles		
Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	**EIA Notification (2006)** The objectives are to impose certain restrictions and prohibitions on new projects or activities, or on the expansion or modernization of existing projects or activities based on their potential environmental impacts as indicated in the schedule to the notification.	There is no major gap between the underlying principles, but with minor gaps as follows: Timing of EIA study assumed in the JICA guidelines is during the basic design stage or before concluding agreement documents between project proponents and JICA in case EIA is required; whereas, EIA study for projects categorized under area development should be conducted after the detailed design phase in India. <Actions to be/have been taken> EIA survey should be conducted during the preparatory survey and the results should be reflected and incorporated into the following phases of project implementation especially EIA study to be undertaken after detailed design.
Information Disclosure		
EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to residents, written materials must be provided in a language and form understandable to them; EIA reports are required to be made available to the residents of the country in which the project is to be implemented. The EIA reports are always required to be available for perusal by project stakeholders such as local residents and copying must be permitted.	**EIA Notification (2006)** - The Applicant shall make a request through a simple letter to the Member Secretary of the SPCB or Union Territory Pollution Control Committee (UTPCC), in whose jurisdiction the project is located, to arrange the public hearing within the prescribed statutory period. - Whereas, the project that falls under Schedule 8(b) "Townships and Area Development Projects" of the Notifications is excluded from public hearing specified in the EIA Notification. - EIA report shall be publicized via State Government's website after approval.	Expected target of disclosed information is slightly different, where the JICA guidelines requires far reach of information, while under Indian law, the approved EIA report written in English shall be publicized via the State Government's website. <Actions to be taken> - To request State Government to publicize the project information through local media in a timely manner, and to make available the summary of the EIA report in the local language as well as in English language to the concerned project authorities and residents. It must also be available in selected offices or

JICA Guidelines on Environmental and Social Considerations 2010	Relevant Law in India	Gap between JICA Guidelines and Government Law / Actions to be Taken
		public libraries or panchayats.
Social Acceptability		
For projects with a potentially large environmental impact, enough consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of the project plans. - In preparing EIA reports, consultations with stakeholders, such as residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared; - Consultations with relevant stakeholders, such as residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared;	The Member-Secretary of the concerned SPCB or UTPCC shall finalize the date, time, and exact venue for the conduct of public hearing within seven (7) days of the date of receipt of the draft Environmental Impact Assessment report from the project proponent and advertise the same in one major national daily and one regional vernacular daily. A minimum notice period of thirty (30) days shall be provided to the public for furnishing their responses; ➢ The advertisement shall also inform the public about the places or offices where the public could access the draft Environmental Impact Assessment report and the Summary Environmental Impact Assessment report before the public hearing. ➢ No postponement of the date, time, venue of the public hearing shall be undertaken, unless some untoward emergency occurs and only on the recommendation of the concerned District Magistrate; the postponement shall be notified to the public through the same national and regional vernacular dailies and prominently displayed at all the identified offices by the concerned SPCB or UTPCC	The projects categorized into "Building/Construction projects" are exempted from public consultation process as per EIA Notification, 2006. Still in compliance with the JICA guidelines, it is recommended to conduct public consultation during preparatory survey and the comments should be incorporated into planning and implementation of the project. *Considering the situation related to COVID-19 at the time of the preparatory survey where mass gatherings are not allowed, interviews to community representatives were conducted instead of a meeting. Result of the interview is described in section 10.10, and record of interviews is attached to the report.
Scope of Impacts to be Assessed		
The impacts to be assessed about environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization	The environmental clearance process for new projects will comprise a maximum of four stages, all of which may not apply to cases as set forth below in this notification. These four stages in sequential order are: *(1) Screening (Only for Category 'B' projects and activities), (2) Scoping, (3) Public Consultation, and (4) Appraisal* For Social Consultation>	No major gap is observed.

JICA Guidelines on Environmental and Social Considerations 2010	Relevant Law in India	Gap between JICA Guidelines and Government Law / Actions to be Taken
of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	Land Acquisition Act 1894 (Amended in 1984) and The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. The Provision of the Panchayats (Extension to the Scheduled Areas) Act, 1996. The Madhya Pradesh Panchayat Raj Act, 1993. For Environment Survey> Environmental Impact Assessment Guidance Manual for Building, Construction, Townships and Area development projects provides the following items to be assessed: ➢ Land environment ➢ Water environment ➢ Air environment ➢ Noise environment ➢ Biological environment ➢ Socioeconomic Environment ➢ Solid waste	
Monitoring		
Project proponents should make efforts to make the results of the monitoring process available to local project stakeholders. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents, etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.	As per EIA Notification, 2006, (i) It shall be mandatory for the project management to submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory authority concerned, on 1st of June and 1st of December of each calendar year. (ii) All such compliance reports submitted by the project management shall be public documents. Copies of the same shall be given to any person on application to the concerned regulatory authority. The latest such compliance report shall also be displayed on the website of the concerned regulatory authority.	There are some gaps regarding availability of monitoring results to local project stakeholders. <Actions to be/have been taken> Project proponent should consider the method of unveiling the result of monitoring stipulated under the environmental clearance to the general public, such as uploading to the website and to show the solution for issues pointed out under the environmental management plan.

JICA Guidelines on Environmental and Social Considerations 2010	Relevant Law in India	Gap between JICA Guidelines and Government Law / Actions to be Taken
Ecosystem and Biota		
Projects must not involve significant conversion or degradation of critical natural habitats and critical forests.	Forests (Conservation) Act, 1980 and Rules 1981 as amended 2004. The Act restricts the powers of the State in respect of de-reservation of forests and the use of forestlands for non-forest purposes. An advisory committee has been created to oversee the implementation of the statute. Wildlife (Protection) Act 1972 ➢ The Act provides for the protection of wild animals, birds and plants; and for matters connected therewith or ancillary or incidental thereto. ➢ The application of the Order of the Supreme Court in WP 460 of 2004 dated 04.12.2006 has directed that all projects which require environmental clearance and are located within the distance of 10 km of National Park and Sanctuaries must be placed before the Standing Committee of the National Board for Wildlife constituted under the Wildlife (Protection) Act, 1972.	No major gap observed.

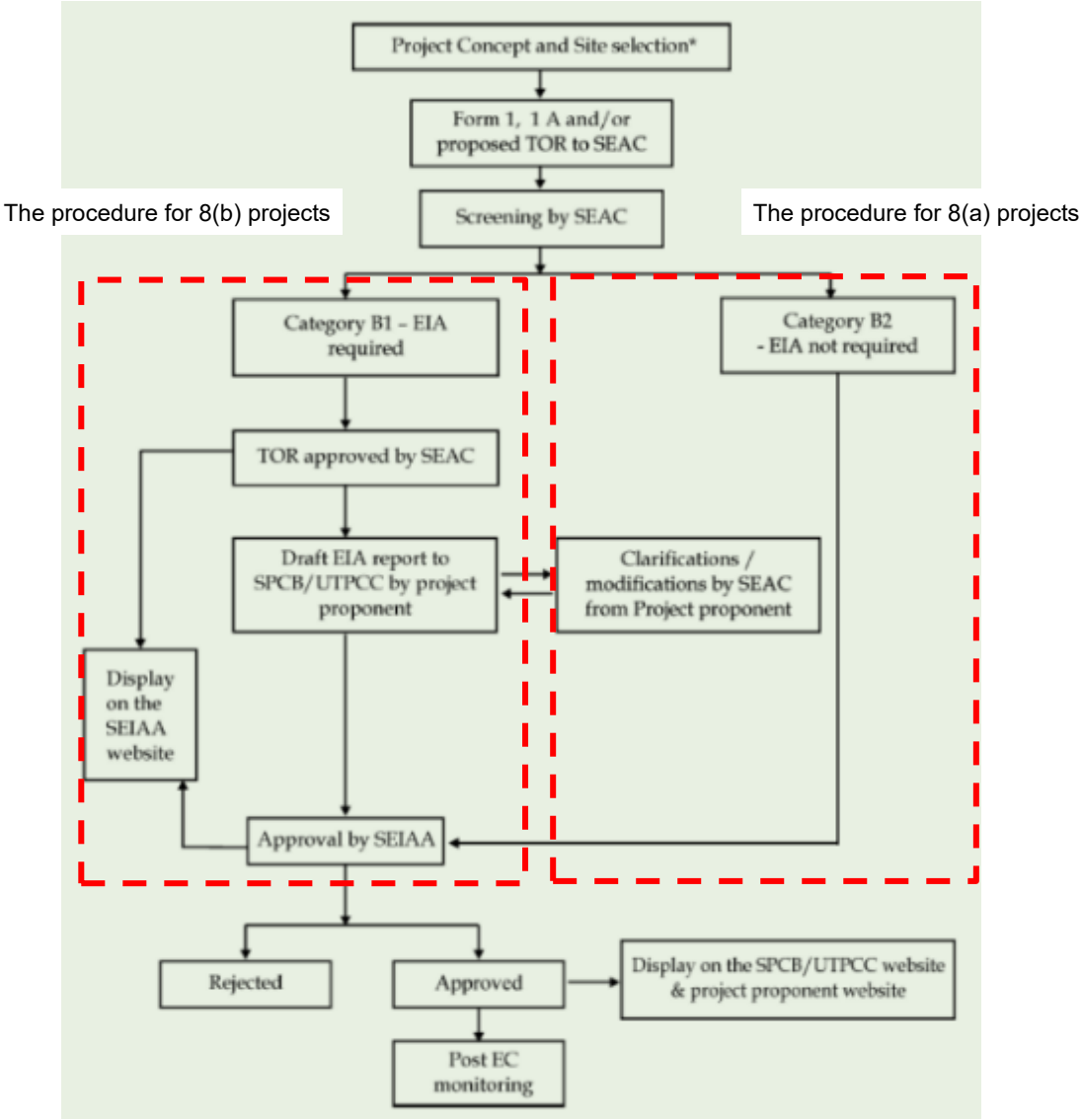
Source: JICA Survey Team, based on related regulations in India and the JICA Environmental and Social Consideration Guidelines (2010)

10.1.4 Environmental Clearance and EIA Procedures in India

The project target facilities and institutions can be categorised into three types in relation to the necessity of an Environmental Certificate (EC) and procedures to obtain the certificate based on the categorisation provided by the EIA Notification. They are, in the order of extent of impacts, described as follows:

1) The projects require to conduct EIA study to obtain EC by State Level Environment Impact Assessment Authority (SEIAA), which falls under category 8(b): Townships and Area development projects covering an area larger than 50 ha and/or build up area larger than 150,000 m^2;
2) The project falls under category 8(a): Building and Construction projects, build up area between 20,000 and 150,000 m^2, which requires Environmental Clearance by SEIAA;
3) The project of smaller scale compared with category 8(b) and 8(a), which do not require EC.

Figure 10-1 presents the flow of EC application related to 1) and 2) types of projects. The procedure needs to be initiated by the project proponent after the detailed design is approved by the project management unit (PMU), and hand-in-hand with the approval of the building design by the municipality and the guideline values of emission approved by the pollution control board. It is estimated that the entire process from application to acquisition of EC may take around six months. This needs to be incorporated into the implementation schedule of the project and the terms of reference (ToR) for the consultant.



Note) SEAC: State level Expert Appraisal Committee
SPCB: State Pollution Control Board
UTPCC: Union Territory Pollution Control Committee

Source: EIA Guidance Manual, Ministry of Environment and Forests (2010)

Figure 10-1 Flow of Environmental Clearance Procedures

10.2 Proposed Project Components Subject to Environmental and Social Impacts

The summary of the project components that may affect social and natural environment of surrounding area are shown in Table 10-2. (the table is provisional and will be updated based on decision made by Assam state government and JICA team)

Table 10-2 Summary of the Project Components that May Affect Environment by Institute

Proposal for Various institutions	Total area (sqm)	Floor area (sqm)	Applicable EIA category	Facilities that may cause environmental impacts, Remarks
Super Specialty wing in Medical colleges.				
1 Silchar Medical College Hospital, Cachar	844,116	29,500	8(b)*	Total 170 beds (including ICU 50 beds), *applicable EIA procedure should be checked with SEIAA after detailed design phase as facilities to be assisted under the project is completely within existing compound. Demolition is required for existing structure (510.78 m^2), which does NOT contain Asbestos NOR biosafety level 3 facility.
2 Tezpur Medical College Hospital, Tezpur	147,158	32,500	8(a)	Total 200 beds (including ICU 50 beds) Demolition is not required.
3 Jorhat Medical College Hospital, Jorhat	194,985	37,500	8(a)	Total 260 beds (including ICU 20 beds) Demolition is required for existing structure (app. 12,000 m^2), which does NOT contain Asbestos NOR biosafety level 3 facility.
4 Fakhruddin Ali Ahmed Medical College Hospital, Barpeta	167,225	19,000	-	ICU 50 beds Demolition is required for existing structure (3,924 m^2), which does NOT contain Asbestos NOR biosafety level 3 facility.
5 Diphu Medical College Hospital, Diphu	308,698	19,000	-	ICU 50 beds Demolition is not required.
6 Lakhimpur Medical College Hospital, Lakhimpur	7,700	19,000	-	ICU 50 beds Demolition is required for existing structure (3,000 m^2), which includes facilities built with Asbestos (2,600 m^2),
Infrastructure improvement in District Hospital				
Type 1 (At six locations)	25,000	18,000	-	Total 150 beds (Include ICU 10 beds)
Type 2 (At two locations)	10,000	6,000	-	Emergency Centre
Dedicated Training, monitoring, administrative centre, Swasthya Bhawan				
	6,870	8,047.6	-	Training Health Centre

Source: JICA Survey Team

10.3 Alternative Study

The alternative study was conducted by comparing 3 options namely 1) Not conducting project, 2) Alternative1: Expansion and improvement of medical facilities that includes land acquisition in addition to existing land area, and 3) Alternative 2: Improvement of medical facilities within existing land area (thus may require demolition of existing structures). As show in Table 10-3, the Alternative2 has been evaluated as the best option as the option can contribute improvement of medical services while minimizing negative environmental and social impacts by appropriate mitigation measures.

Table 10-3 Comparison of Alternatives

Option	No Project	Alternative 1: Expansion and improvement of selected Tertiary and Secondary medical institutes	Alternative 2: Improvement of selected Tertiary and Secondary medical institutes within premises
Outline	The option of not implementing any improvements of medical system and maintain current facilities.	Expansion of selected medical college hospitals and district hospitals into surrounding area of existing facilities.	Improvement of selected medical college hospitals and district hospitals within the land owned by medical facilities
Impact on Natural Environment	No impact on surrounding environment is expected as there will be no construction activities.	- The negative impact on air pollution, noise and vibration to surrounding area is expected during construction phase. - Operation of expanded facilities may cause air pollution by power generator and additional load to water resources of the area. - Expected land acquisition may cause cutting vegetation.	- Same impacts are expected as Alternative 1 during construction and operation. - Vegetation of surrounding areas will be maintained. - (for several facilities) demolition of existing facilities may be required, that may cause additional air pollution, noise & vibration, and solid wastes. The impact can be mitigated by following related regulations.
Impacts on Social Environment	It is expected that the medical facilities will not be able to accommodate patients at required level, which may result in poor public health status.	- Increased medical capacity and quality of medical services will contribute improvement of public health status of the area. - Land acquisition and clearance will be required that may cause involuntary resettlement of surrounding residents.	- Positive impact same as alternative 1 is expected. - Land acquisition may not be required.
Overall evaluation	Although no environmental impact is expected, quality and coverage of medical service would be deteriorated in the long term.	This option is second best, as it is expected to cause negative social impact due to expansion of facility area and may cause involuntary resettlements.	This option is evaluated as the limited the Best Option as the negative impact by demolishing existing facilities is expected to be minimized, and involuntary resettlements will be avoided.

Source: JICA Survey Team

10.4 Scoping and TOR for Environmental and Social Consideration Study

The purpose of scoping and drafting of ToR of the EIA study is to properly select the environmental and social impact items, on which the project potentially impacts through its implementation activities, and to decide the parameters and methodology of the survey. The result of the scoping is shown in Table 10-4 and the ToR is shown in Table 10-5.

Table 10-4 Result of Scoping

Impact Item	Rating		Reason
	Construction Phase (CP)/	Operation Phase (OP)	
Pollution			
Air Pollution	✓	✓	**CP:** Some negative impacts on air quality are anticipated due to increased transportation and operation of heavy equipment/ vehicles temporarily during construction activities. **OP:** Some negative impacts on air quality are anticipated due to the increase of traffic volume of patients and staff, and transportation of goods necessary for operating the hospital. Impact on air quality is also expected due to the

Impact Item	Rating		Reason
	Construction Phase (CP)/	Operation Phase (OP)	
			operation of power generator in case of emergency power supply.
Water Pollution	✓	✓	**CP:** There is a risk of temporary water pollution due to discharge of turbid water and leakage of oils from the construction activities. **OP:** Impact on water quality caused by the operation of the hospital and increased residents (staff and students) is expected.
Solid Waste	✓	✓	**CP:** Increase of solid waste amount due to construction waste and general waste from workers is expected. **OP:** Increase of various solid wastes is expected due to medical and research activities (biomedical and radioactive waste, hazardous waste), and increased number of residents such as staff and inpatients (general waste).
Soil Contamination	✓	✓	**CP:** There is potential risk of soil contamination due to oil leakage from the construction activities. **OP:** There is potential risk of soil contamination by improper management of fuel and leakage of waste liquid.
Noise and Vibration	✓	✓	**CP:** Temporary increase of noise and vibration levels due to the operation of construction machineries and traveling of construction vehicles is expected. **OP:** Increase of noise and vibration levels due to traveling of vehicles associated with the operation of the hospital, and operation of back-up power generator and air system is expected. Operation of medical equipment may not generate noise and vibration.
Ground Subsidence	✓	✓	**CP:** Ground subsidence is expected due to the usage of groundwater for construction activities. **OP:** There is risk of ground subsidence due to over abstraction of groundwater; however, it can be avoided if water will be provided from the public water system.
Offensive Odour	✓	✓	**CP:** No construction activities are expected that would cause offensive odour, but improper management of construction waste may generate it. **OP:** Improper management of waste (general/bio-medical) generated at the project site would cause offensive odour.
Bottom Sediment			**CP/OP:** No impact is predicted as there will be no direct discharge of wastewater to water body.
Natural Environment			
Protected Area			**CP/OP:** There are not any protected areas in and around the project sites.
Flora/ Fauna and Ecosystem			**CP/OP:** It is assumed that impact on flora/ fauna/ ecosystem by the development of the project is minimal, as most of the project areas are already developed.
Hydrology	✓	✓	**CP:** Earthwork by filling excavated soil would cause modification of hydrology in and around the site especially during flash flood. **OP:** Alternation of land surface may cause modification of hydrology in and around the site.
Topography and Geographical Features	✓		**CP**: Topography of the site needs to be adjusted for levelling.
Social Environment			
Involuntary Resettlement			**CP/OP**: Involuntary resettlement is not required for the project, as the land for the project development is already secured by the local government.
The Poor			**CP/OP:** Any activities that might impact on the poor are not planned in the project.
Indigenous, or Ethnic People			**CP/OP:** No impact on indigenous or ethnic people is expected, because there are no indigenous or ethnic people residing in and around the project site.
Local Economy (e.g., Employment and Livelihood)	✓	✓	**CP:** Job creation for construction workers is expected during the construction period because it includes construction work. **OP:** Positive impact on local economy is expected by the operation of the hospital.

Impact Item	Rating		Reason
	Construction Phase (CP)/	Operation Phase (OP)	
Land Use and Utilisation of Local Resources	✓	✓	**CP/OP**: Impact of the project is expected as the land use is modified for the project, although the intensity of impact is expected to be small considering the relatively small scale of the project component in comparison to the existing facilities.
Water Usage	✓	✓	**CP/OP**: Some impact is expected as the project plans to utilise groundwater and public water. Intensity of the impact needs to be assessed by studying the current condition of groundwater and water supply.
Existing Social Infrastructures and Services (including Traffic Condition)	✓	✓	**CP/OP**: Impact on traffic condition is expected due to increase of traffic for construction activities and operation of hospital. The extent of impact needs to be assessed comprehensively considering ongoing road expansion and housing area development around the site.
Misdistribution of Benefits and Damages			**CP/OP:** The project may not cause misdistribution of benefits and damages in the surrounding area considering the characteristics of the project.
Local Conflicts of Interest			**CP/OP:** In consideration of the project characteristics, the project will not cause conflicts of interest in the surrounding area.
Cultural Heritage			**CP/OP:** No impact on cultural heritage is expected since there is no cultural heritage in and around the project site.
Landscape	✓	✓	**CP/OP**: Some modification on landscape is expected as the building height will be up to 5 floors in some project sites.
Gender			**CP/OP:** No impact on gender is anticipated by the project.
Children's Rights			**CP/OP:** No impact on children's rights is anticipated by the project.
Health and Safety			
Occupational Health and Safety	✓	✓	**CP:** Some impacts are anticipated due to large-scale construction works. **OP**: Some impacts are anticipated due to handling of infectious diseases and hazardous materials for medical activities.
Community Health and Safety	✓	✓	**CP:** Some negative impacts on public health are anticipated due to the influx of construction workers and discharge of pollutants caused by the construction activities. **OP**: Positive impact is expected due to the improvement of medical service by the project.
Other			
Transboundary impacts including Climate Change	✓	✓	**CP:** Greenhouse gases (GHGs) would be emitted from the construction machines and vehicle. **OP:** Emission of GHGs is expected due to the operation of the air conditioning system and traveling of vehicles associated with the operation of the hospital.

✓: positive/negative impact is expected to some extent.

Source: JICA Survey Team

Table 10-5 Draft ToR for the Environmental and Social Consideration Study

Environmental Factors	Survey Items	Survey Methods
Air Pollution	• Current condition of air quality around the project site and nearby monitoring station as available • Environmental standards of air quality in India and other related international standards if necessary • Estimation of impact, proposed mitigation measures and monitoring plan	• To review existing reports/data • To confirm relevant regulations in India • To survey situations and measures taken by other similar institutions
Water Pollution	• Current condition of water quality in and around the project site • Environmental standards of water quality, effluent and licensing system in India and other related international standards if necessary • Current condition of wastewater collection • Estimation of impact, mitigation measures and monitoring plan	• To review existing reports/data • To confirm relevant regulations • To conduct the field survey, to review existing reports/materials • To survey situations and measures taken by other similar projects
Solid Waste	• Regulations related to medical/ hazardous waste management in Assam state • Current situation of waste management in Assam state • Estimation of impact, propose mitigation measures and monitoring plan	• To confirm relevant regulations in India • To review existing reports/materials • To survey situations and measures taken by other similar projects
Soil Contamination	• Environmental standards of soil quality in India and other related international standards if necessary • Potential risk of soil contamination caused by the project activities • Estimation of impact, proposed mitigation measures and monitoring plan	• To confirm relevant regulations in India • To review existing reports/materials and similar projects • To survey situations and measures taken by other similar projects
Noise and Vibration	• Environmental standards of noise and vibration in India and other related international standards if necessary • Current situation of the surroundings of the project site (Distance to the residential areas, school, etc.) • Estimation of impact, proposed mitigation measures and monitoring plan	• To confirm relevant regulations in India • To conduct the field survey around the project site • To survey situations and measures taken by other similar projects
Ground Subsidence	• Current ground condition around the project site • Current situation of groundwater usage around the project site • Estimation of impact, proposed mitigation measures and monitoring plan	• To review existing reports/materials • To survey situations and measures taken by other similar projects
Offensive Odour	• To identify possible source of the offensive odour during the project implementation • Estimation of impact, proposed mitigation measures and monitoring plan	• To review construction plan and operation plan • To survey situations and measures taken by other similar projects
Hydrology	• Current condition of hydrology in the surrounding area • Drainage plan during project implementation • Estimation of impact, proposed mitigation measures, and monitoring plan	• To conduct the field survey around the project site • To review construction plan and operation plan • To survey situations and measures taken by other similar projects

Environmental Factors	Survey Items	Survey Methods
Local Economy (e.g., Employment and Livelihood)	• Employment plan during the construction phase • Prediction of impact on local economy caused by the operation of the hospital	• To examine the construction plan • To review similar projects
Water Usage	• Current situation related to water usage • Water usage plan during the project implementation period	• To conduct the field survey, to examine the results of the field survey, to review similar projects • To examine the usage of water necessary for project implementation
Existing Social Infrastructures and Service	• Existing social infrastructures around the project site • Operation plan of the construction machinery and vehicles during the construction phase	• To conduct the field survey around the project site • To examine the construction plan, to review similar projects
Occupational Health and Safety	• Potential risks related to occupational health and safety • Guidelines related to occupational health and safety in India and other related international guidelines	• To review the project activities • To review existing documents, reports, and materials
Community Health and Safety	• Impact on the public health in consideration of types of activities during construction phase	• To review construction plan and activities
Global Warming	• Relevant policies for global warming in India and current situation of emission of greenhouse gases (GHGs) • Project activities that might emit GHGs	• To confirm relevant policies in India and to review existing reports/materials • To examine the construction plan and operation plan, to review similar projects

Source: JICA Survey Team

10.5 The result of Environmental and Social Impact Assessment

The results of environmental and social impact assessment are presented as in Table 10-6.

Table 10-6 Result of Environmental and Social Impact Assessment of the Project

Parameters	Result of Survey CP: Construction Phase, OP: Operation Phase
Pollution	
Air Pollution	• In current condition, the annual average values of SO_2 and NO_2 in all the stations were well below the permissible annual average standard values. The values of SO_2 ranges from 5-8 $\mu g/m^3$. The highest values of NO_2 ranges from 10-18 $\mu g/m^3$, based on the results of National Air Quality Monitoring Programme by CPCB(2019). • All medical facilities are connected to public line, therefore power generator will be necessary only when there is no power supply from the source. <Impacts and proposed mitigation measures> CP: Impact on air quality due to operation of construction machineries and traveling of the construction vehicles is expected. During construction phase, particulate matter will be main pollutant followed by SOx, NOx and CO from construction machineries and vehicles. These may be reduced by spraying water, periodical maintenance of machineries and vehicles, and reducing idling time for machinery operation. Considering the duration of construction activities and present air pollution status which is within standard values, air pollution quality during construction phase is estimated to be within national standards. OP: Impact on air quality due to diesel generator (DG) sets and increased project related transportation are expected. The overall air quality considering emission of air pollutants from DG while operated, and baseline air quality is confirmed to be within national standard values. - In addition, to prevent dispersion of contaminated air, HEPA(High Efficiency Particulate Air) filter will be installed to the air conditioning system and the system will be maintained by engineering department of each medical facility.
Water Pollution	• Based on the interview to managers in charge of maintenance and operation of each MCH, no significant water pollution issues are reported. • There is no law or regulation regarding management of medical effluent that would be generated from the project activities during operation phase. Instead, medical institutions and hospitals are obliged to install its own Effluent treatment facilities onsite under instruction of SPCB, and typical design of such facilities are provided. Effluent management plan will be developed and submitted to SPCB after detailed design stage for those facilities to go through EC procedure. The effluent management plan should include estimated amount of effluent and its characteristics, capacity of effluent treatment plant (ETP), and expected quality of treated effluent. In general, ETP should consist of primary, secondary and tertiary treatment. The tertiary treatment should include ultra-filtration system, ultraviolet disinfection system. The electromagnetic flow meter at the inlet and outlet of ETP as instructed by SPCB. During operation phase, the quality of treated effluent will be tested, and necessary measures will be taken if required to meet the standard specified by SPCB. <Impacts and proposed mitigation measures> CP: Impact on water quality due to leakage of oil from machineries and construction chemical is expected. The impact can be minimized by limiting oil handling area and applying impermeable material on the ground of the area. OP: Treated wastewater to be discharged through rainwater drainage will be main source of pollution from project operation. However, as the quantity of wastewater to be treated by water treatment unit and discharged into surrounding environment via rainwater drainage is estimated to be small. In addition, the quality of wastewater will strictly comply with SPCB standards, therefore the negative impacts are expected to be minimum. Another potential impact would be medical effluent, which may contain hazardous elements. The effluent should be treated by ETP designed to fit expected medical activities so as to avoid contamination of water environment of surrounding area.
Solid Waste	• Major regulations that stipulate waste management are Municipal Solid Wastes (Management and Handling) Rules (2000), Hazardous and other wastes (Management and Transboundary Movement) Rules (2015) under responsibility of the Ministry of Environment, Forest and Climate Change. • In addition, for demolishing existing facilities the waste shall be handled in compliance with Construction and Demolition Waste Management Rules, 2016. • General and medical wastes are segregated at source, collected by category, treated on site disposed or handed over to authorized third party depending on the type of waste. <Impacts and proposed mitigation measures> CP: The excavated solid waste as well as construction related waste will be main component of solid waste

Parameters	Result of Survey CP: Construction Phase, OP: Operation Phase
	during the construction phase of the project, including demolishing existing facilities. These should be maintained inside the proposed project site under responsibility of contractor and be disposed in accordance with the norms and rules mentioned above. - For demolishing existing structures especially those which made with Asbestos and other hazardous materials, waste management rules and regulations, related international regulations and good practices should be strictly followed by the contractor. - These responsibilities of contractor shall be clearly defined in the contract agreement to minimize the risk of making negative impacts to surrounding area. OP: Various medical, non-medical, hazardous, and non-hazardous wastes will be generated. These should be segregated at source, collected and stored to be either handed over to authorized third party or recycled inside project property in case of biodegradable compost in compliance with relevant rules and regulations.
Soil Contamination	• Although there is possibility that leakage of hazardous liquid waste, which may contain heavy metals and similar compounds results in contaminating soil, there is no written laws or regulations about handling of them. In practice, SPCB instructs installation of ETP on site and monitors performance of the plant regularly to prevent soil contamination as described in water pollution. <Impacts and proposed mitigation measures> CP: It is possible that oil leakage may cause soil contamination during construction phase. To avoid contamination by leakages, fuel to be used shall be stored impermeable storage space, machineries that have risk of oil leakage shall be well maintained, and the construction site shall be equipped with tools to treat accidental leakages and workers shall be trained to deal with such accident. OP: During operation phase, potential contaminates vary from oil and grease, inorganic and organic chemical compounds and so on. Installation and operation of ETP proposed as a measure to prevent water pollution is effective as means to prevent soil contamination. In addition safety operation manual as well as emergency reaction plan in case of accidental leakage shall be prepared and informed to all related workers to minimize the impact of leakage to surrounding environment.
Noise and Vibration	• Noise level should be controlled to comply with Noise Pollution (Regulation and Control) Rules (2000) and its amendments. • For the sites, which are located in operating hospital, extra considerations to be made to avoid affecting hospitalized patients. <Impacts and proposed mitigation measures> CP: During construction phase, various machineries such as concrete mixer, crane, and track generate noise nearly 90 (dB) as well as project related traffics may generate noise in and around project site. In addition, there would be a communication problem among work persons due to ambient noise of the equipment, this can be localized and temporary in nature. To mitigate level of noise generated from activities to disturb patients in the medical facilities and residents of surrounding area, temporal fence would be installed during construction period. Also, training to drivers and operator of machineries in less noise generation would be introduced if available and suitable. OP: During operation phase, generation of noise because of increased traffic volume with ambulance, cars of visitors and project personnel, operation of boiler system and emergency generator are expected. To minimize the impact, equipment that generate less noise were selected.
Ground Subsidence	• Based on the geological classifications and richness of groundwater in the region, the risk of ground subsidence is estimated at minimal. <Impacts and proposed mitigation measures> CP/OP: It is planned to utilize ground water for construction activities or as main water source for several facilities; therefore, the contractor/management units for each facility should monitor the groundwater level and ground subsidence (ground level). In case there is sign of rapid depletion of groundwater level or/and ground level, contractor should seek for other source to avoid worsening the situation.
Offensive Odour	• Basically, no activity is planned that may generate offensive odour; however, there are some activities that potentially may cause generation of odour. <Impacts and proposed mitigation measures> CP: No construction activities are planned that might cause offensive odour. However, inadequate management of waste and wastewater can be the source of odour. OP: No activities during the operation phase are planned that might cause offensive odour. However, inadequate management of waste and wastewater can be source of offensive odour. Therefore, monitoring plans of related activities should be developed. In addition, management plan should be developed in case the sign of adverse impact is observed.
Natural Environment	
Hydrology	• Installation of rainwater drainage may modify current hydrology of inside and surrounding area of the project sites. At Diphu MCH, cloggage of drainage and temporary floods during monsoon season are

Parameters	Result of Survey CP: Construction Phase, OP: Operation Phase
	observed in current condition. • Several MCH uses groundwater as primary water source. Increased amount of groundwater due to project activities could cause modification of hydrological status in and around project site area. <Impacts and proposed mitigation measures> CP: It is estimated that Construction and maintenance of drainage inside and around the site will modify the hydrology of site. In detailed design, layout, elevation, and size of channel should be confirmed to manage both rainwater and surplus of treated wastewater to be discharged into drainage. OP: In operation phase, drains should be maintained in good condition to avoid man-caused floods. In addition, for those facilities that use groundwater as primary water source, periodical monitoring of groundwater levels and proper extraction planning are recommended. All together, negative impact can be minimized and positive impact will be expected by modifying and improving seasonal flood flows.
Topography and Geographical Features	• No large scale excavation or construction activities are planned to modify topography or geographical features of project sites. CP: No activities would cause adverse impact to topography and geographical features of site.
Social Environment	
Local Economy (e.g., employment and livelihood)	• Increase of job opportunities related to project implementation is expected, since the project includes construction work in some sites and influx of construction workers are expected. <Impacts and proposed mitigation measures> CP: Temporal increased job opportunities for non-skilled worker and increased customers at restaurants and other recreational facilities may positively impact local economy. On the other hand, livelihood of residents may be adversely impacted because of inflow of workers, increased project related traffics and some pollutions generated from project activities. The contractor should conduct mitigation measures to minimize pollutions, sensitize workers not to disturb local community, plan timing and route for construction related traffic to minimize adverse impact, and inform the progress of project and foreseen activities as much as possible. OP: During operation phase, positive impact on local economy is expected because of increased job opportunity as office staff, inflow of people from the neighbouring communities to revitalize local business, and creation of new business targeting/supporting for the increased number of patients and its families. Also, improved access to health system may improve public health of community and individual health status.
Land use and utilization of local resources	• Proposed project sites have been a part of medical facilities or auxiliary area since foundation of each medical facility. • Land use may be converted into structure from vegetation/bare ground or vice versa due to project implementation in some facilities. <Impacts and proposed mitigation measures> CP/OP: Land use may be converted into structure from vegetation/bare ground or vice versa due to project implementation in some facilities. The impact of land use modification and usage of local resource are estimated to be negligible as the surface area to be modified is relatively small compare to entire land area for each medical facility.
Water usage	• Same as hydrology. <Impacts and proposed mitigation measures> CP: In case usage of ground water will be planned during construction phase, the contractor should monitor ground water level as stated in ground subsidence to avoid or minimize adverse impact to local water usage. OP: For the medical facilities that utilise groundwater as primary water source, increase of groundwater extraction will be expected due to increased medical activities during operation phase. Though it is assumed that it would not impact water usage of surrounding community of each project site considering water rich nature of the region, it is recommended that engineering section of the medical facility periodically monitor ground water level. - For the medical facilities that will utilize public water as primary source, no significant impact is expected during operation phase.
Existing social infrastructures and service	• All target facilities are connected to road network, which have enough capacity to accommodate project related traffic during construction and operation phases. • Historical and cultural heritages were not confirmed nearby project site so activities would not directly impact the access to these heritages. <Impacts and proposed mitigation measures> CP: Conceivable major impact on existing social infrastructures and services during the construction phase is traffic congestion because of construction related vehicles and visitor's transportation respectively. The impact is expected to be limited because the number of construction vehicles are small in

Parameters	Result of Survey CP: Construction Phase, OP: Operation Phase
	comparison with current traffic volume. In addition, the contractor shall plan timing and route for construction related traffic to minimize adverse impact, deploy traffic controller, and inform foreseen activities to the public as needed to avoid traffic congestion or traffic accident around the project site. OP: It is expected that existing traffic networks around project sites are capable of accommodate increase of traffic due to expansion and increased number visitors to the medical facilities.
Landscape	• Current landscape at project sites are composed of the buildings with similar heights with buildings to be constructed under the proposed project. <Impacts and proposed mitigation measures> CP: It is expected that the project implementation would impact landscape of the project site. Though the impact is expected to be minimal for construction phase as the duration is relatively short, and surrounding buildings at similar heights are already existing on each site. OP: During operation phase, vegetation would function as buffer zone, so the buildings to be constructed would not be distinct obstacle while seen from boundary of project sites. Greening and vegetation of project sites are also requested at public consultation.
Occupational Health and Safety	• Various occupational risks are foreseen as in general construction works during construction phase, as the construction work involves various machineries, and buildings with multi stories are designed. • Especially demolishing of existing structures which is made with Asbestos material requires further consideration and tangible personal protective gears (this applies to Lakhimpur MCH). • During operation phase, potential risks associated with medical treatment utilizing equipment, such as physical injuries with blades and needles, infectious accident, exposure to radiation and so on are expected. <Impacts and proposed mitigation measures> CP: During construction phase, the following occupational health and safety measures shall be adopted by contractor. The measures include to provide safety and health education and training, to provide appropriate personal protective equipment (helmet, protective shoes, glove, etc.), to establish internal system for safety and health management, to introduce danger warning signs and to undertake safety patrol periodically. - In addition to above mentioned measures, demolition site of buildings with Asbestos should be covered with polyethylene sheets to prevent dispersion of hazardous materials including Asbestos, marked in visible mark to avoid entry of workers who are not equipped with proper PPE. - Workers in charge of demolishing such buildings should wear goggles, HEPA filtered masks and completely cover body surface to avoid contamination by Asbestos. OP: As tangible measures, hospital blocks, medical institution and all equipment to be installed are designed to minimize the risk of occupational health and safety. In addition, several measures, such as training, providing health check, monitoring risk exposure and so on can be adopted by project proponent as intangible measures.
Community Health and Safety	• Insufficient public health care services are provided in Assam state due to lack of medical personnel and facilities. • Physical access to health services is hindered due to mountainous nature of the state and frequent occurrence of floods. <Impacts and proposed mitigation measures> CP: Some negative impacts on public health, such as spread of infectious diseases due to influx of construction workers are anticipated, since the project includes construction works. These can be mitigated by providing training and sensitization program for workers. OP: During operation phase, improvement of local medical service by the project implementation would improve access to medical services, increase medical personnel and medical facilities that contribute positive impacts on public health of Assam state.
Transboundary impacts including Climate Change	• Indian government adopted the National Action Plan on Climate Change (NAPCC) on June 30, 2008 and Intended Nationally Determined Commitments (INDC) submitted to the UN Framework Convention on Climate Change (UNFCCC) in October 2, 2015. • For applicable medical facilities, in the process of Environmental Clearance application, energy efficiency of project design and adoption of renewable energy will be examined. <Impacts and proposed mitigation measures> CP: During construction phase, GHGs would be emitted from the operation of the construction machines and traveling of the vehicles, but the impact is expected to be limited and temporary. OP: Conceivable major activities that emit GHGs during the operation phase are 1) Operation of wastewater treatment system, 2) increase of traffic caused by the project operation, and 3) usage of diesel generator.

Source: JICA Survey Team

10.6 Impact Assessment

The results of environmental and social impact assessment and comparison of rating during scoping and evaluation are presented in Table 10-7. Significance of impacts were evaluated based on following concepts.

✓: positive/negative impact is expected to some extent.

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

D: No impact is expected.

Table 10-7 Result of Impact Assessment

Item	Scoping		Evaluation		Reason
	CP	OP	CP	OP	
Pollution					
Air Pollution	✓	✓	B-	B-	**CP:** Negative impacts on air quality are anticipated due to increased transportation and operation of heavy equipment/ vehicles temporary during construction activities. Proper mitigation measures such as to be taken **OP:** Negative impacts on air quality is anticipated due to increase of traffic volume by patients, staff and transportation of goods necessary for operating hospital. Impact on air quality is also expected caused by operation of power generator in case of emergency power supply. Even after applying stack height design in view of prevent air pollution, some negative impacts may persist.
Water Pollution	✓	✓	B-	B-	**CP:** There is a risk of temporary water pollution due to leakage of oils and chemicals from the construction activities. These impacts can be mitigated with some measures, but the risk of polluting water may persist. **OP:** Impacts on water quality due to discharge of wastewater from hospital staff, patients, residents (staff and students), and mistreatment/leakage of liquid waste are expected. Although the wastewater treatment facilities will be installed and treated wastewater will be reused inside the institution, surplus of treated water will be discharged through rainwater drainage that may cause pollution. To minimize the risk, quality of effluent from wastewater treatment plant shall be checked regularly. For liquid waste management, effluent treatment system shall be installed under instruction of state pollution prevention board, and its performance should be checked so to avoid depletion of water quality in surrounding environment.
Solid Waste	✓	✓	B-*	B-	**CP:** B-) For majority of facilities, increase of solid waste amount due to construction activities and general waste from workers is expected. The impact will be limited inside the project site and several mitigation measures will be available. *) Additional negative impact is expected for the medical intuitions that require demolition of existing structures made by Asbestos and other hazardous materials. In demolition of such structures, waste management rules and regulations, related international regulations and good practices should be strictly followed by the contractor. **OP:** Increase of various solid wastes is expected due to medical and research activities (biomedical and radioactive waste, hazardous waste), and increased number of residents such as staff and in patients (general waste). The impact can be minimized by segregating wastes at source, collecting and storing them and handing over to authorized third party or recycling then inside project property in case of biodegradable compost.
Soil Contamination	✓	✓	B-	B-	**CP:** There is possibility of soil contamination due to leakage of oil and chemical substances used for construction activities. Impact can be avoided and mitigated by applying impermeable sheets around oil/chemical handling area and properly managing them. **OP:** Impact on soil contamination is expected due to leakage or mismanagement of oil and liquid waste containing heavy metals and non-volatile compounds. The impact can be avoided and mitigated by applying

Item	Scoping		Evaluation		Reason
	CP	OP	CP	OP	
					adequate measures, such as installation of confined oil handling area and effluent treatment facilities.
Noise and Vibration	✓	✓	B-	B-	**CP:** Temporary impact on noise and vibration levels due to operation of the construction machineries and traveling of the construction vehicle are expected, and these can be mitigated by applying temporally fence. Also, considering limited time period for construction, overall impact is estimated to be within acceptable level. **OP:** Impact on noise and vibration levels due to traveling of vehicles associated with the operation of the hospital, operation of back-up power generator and air system are expected. These can be mitigated by periodically maintaining project related machineries and equipment. Also, operation of medical equipment may not generate noise and vibration as the project apply high specification for these to minimize noise generation.
Ground Subsidence	✓	✓	B-	D/ B-	**CP:** Impact on ground subsidence is expected to be limited because amount of groundwater used for construction work will be limited, and the impact can be limited by monitoring ground level and ground water. **OP:** D) For the facilities which utilise public water supply as main source, impact on ground subsidence is estimated to be minimal or almost negligible as the project will not use ground water as water source and rainwater will be recharged to aquifer. B-) For the facilities that will utilize ground water as main source, the management units for each facility should monitor the groundwater level and ground subsidence (ground level). In case there is sign of rapid depletion of groundwater level or/and ground level, contractor should seek for other source to avoid worsening the situation.
Offensive Odour	✓	✓	B-	B-	**CP:** No construction activities are expected that would cause offensive odour, but improper management of construction waste may generate cause odour generation. **OP:** There is possibility to generate offensive odour if waste and sludge generated from wastewater treatment facility are improperly managed.
Natural Environment					
Hydrology	✓	✓	B-	B+/ -	**CP:** Earth works for construction and modification of land use of the sites would cause modification of hydrology in and around the project sites. **OP:** Modified hydrology may cause worsening of flood occurrence, while in some facilities that has clogging issues in current status, installation of additional drainage may improve the seasonal flood flows in and around project site.
Topography and Geographical Features	✓		D	N/A	**CP:** No adverse impact is expected as the required earth work would be minimal.
Social Environment					
Involuntary Resettlement			N/A	N/A	**CP/OP**: There is no impact in terms of involuntary resettlement as the project does not require land acquisition nor involuntary resettlement.
Indigenous, or Ethnic People			N/A	N/A	**CP/OP:** No impact on indigenous or ethnic people are expected, because there are no indigenous or ethnic people residing in and around the project site.
The Poor		✓	N/A	B+	**CP:** Any activity that might impact on the poor are not planned in the project. **OP:** Improvement of universal health coverage in the project area will contribute improvement of livelihood of the poor.
Local Economy (e.g., employment and livelihood)	✓	✓	B+	B+	**CP:** Job creation for non-skilled construction related workers is expected. This is expected to be temporal for construction period. **OP:** Increased job opportunity for office staff, surrounding retails and small businesses are expected, and they would revitalize local economy.
Land use and utilization of local resources	✓	✓	D	D	**CP/OP**: Land use may be converted into structure from vegetation/bare ground or vice versa due to project implementation in some facilities. The impact of land use modification and usage of local resource are estimated to

Item	Scoping		Evaluation		Reason
	CP	OP	CP	OP	
					be negligible as the surface area to be modified is relatively small compare to entire land area for each medical facility.
Water Usage	✓	✓	B-	D/ B-	**CP:** It is planned that water necessary for construction will be abstracted from groundwater. This may adversary impact water use of surrounding area; therefore, the contractor shall monitor ground water level to avoid over abstraction. **OP**: D) For the medical facilities that will utilize public water as primary source, no significant impact is expected during operation phase. B-) For the medical facilities that utilise groundwater as primary water source, increase of groundwater extraction will be expected due to increased medical activities during operation phase. It is assumed that it would not impact water usage of surrounding community of each project site considering water rich nature of the region.
Existing social infrastructures and services (including Traffic Condition)	✓	✓	B-	D	**CP**: It is estimated that the project activity during construction would impact traffic condition of surrounding area due to increased traffic volume for activities. The contractor shall employ traffic guide and plan the operation not to cause concentration of activities as possible. **OP**: No significant impact is expected.
Landscape	✓	✓	B-	D	**CP**: Some modification on landscape is expected during construction phase; however, no impact is expected as those are minimal considering duration of construction. **OP**: No impact on landscape during operation phase is expected.
Health and Safety					
Occupational Health and Safety	✓	✓	B-	B-	**CP:** Some impacts are anticipated due to construction works. These can be avoided or minimized by applying best practices for construction works such as safety and health training to workers, usage of protection gears and so on. These should be applied especially for demolition of existing building with Asbestos and other hazardous materials. **OP**: Some impacts to health workers are anticipated due to handling of infectious diseases, radioactive and hazardous materials for medical activities. These risks will be minimized by facility design that separates flow of patients and medical staff to minimize the chance of contact, formulating safety manual, and accident preparedness plan.
Community Health and Safety	✓	✓	B-	A+	**CP:** Some negative impacts on public health are anticipated due to influx of construction workers and possibility of discharging pollutants caused by construction activities. These would be mitigated by providing training and education to workers for safe operation and behaviour to the community. **OP**: Positive impact is expected due to improvement of medical service to surrounding communities by the project implementation.
Other					
Transboundary impacts including Climate Change	✓	✓	D	D	**CP:** Greenhouse gases (GHGs) would be emitted from operation of construction machines and vehicle. The impact is estimated to be limited considering the duration of construction. **OP:** Emission of GHGs is expected predominantly due to operation of generator, wastewater treatment system, air conditioning system and traveling of vehicles associated with operation of the hospital. The extent of impacts would be minimized by applying mitigation measures proposed to other items. In addition, adopting fuel effective/high performance equipment further contribute reduction of emission of GHG. Overall, considering the nature and scale of project, impact on global warming is expected to be minor.

Source: JICA Survey Team

10.7 Mitigation Measures

The proposed mitigation measures during Construction Phase and Operation Phase are presented in Table 10-8. During Construction Phase, the contractor for construction is responsible of conducting these measures under supervision of PMU/PIU. Also, the cost for adopting mitigation measures is included in construction cost. During Operation phase, engineering section under administration department of each medical facility will be responsible of maintaining infrastructure of each institution, and each section under academy and hospital should be responsible of waste management relevant to their specialty.

Table 10-8 Proposed Mitigation Measures

Item	Mitigation measures
Construction Phase	
Environmental Pollution	
Air pollution	1) To seek to use fuel-economy/ low-emission construction vehicle and machineries. 2) To sprinkle water around the project site dust is generated especially during dry season. 3) To maintain construction vehicles and construction machineries adequately. 4) To install temporal enclosure around the construction site. 5) To give guidance for drivers about idling stop and avoiding excessive load operation such as quick acceleration and overloading.
Water pollution	1) To install appropriate drainage system in the construction site before construction activities commence. 2) To check leakage of oil and chemical products periodically. 3) To install impermeable material around the oil and chemical storage and oil handling area. 4) To train operators of construction machineries in daily maintenance to prevent oil leakage 5) To collect waste oil into the designated container separately and hand over to authorized third party for treatment and disposal.
Solid Waste	1) To handle wastes within the project site and store them with cover until handed over to authorized third party. 2) To segregate waste and recycle or sell to third party as applicable. *3) (for the MCHs require demolition)* *To isolate the area bult with hazardous material with polyethene sheet, seal solid wastes* *To handle and dispose those wastes under instruction of SPCB*
Soil Contamination	Same as water pollution
Noise and Vibration	1) To install temporal fence. 2) To strive to introduce low-nose and low-vibration machineries. 3) To avoid construction at night-time and public holiday 4) To avoid intensive operation of construction machineries that generate noise and vibration.
Ground Subsidence	1) To monitor groundwater level and ground subsidence status periodically and adopt other source in case significant declines are observed.
Offensive Odour	Same as “solid waste”
Natural Environment	
Hydrology	1) To install proper drainage system in the project site.
Social Environment	
Water Usage	Same as ground subsidence
Existing social infrastructures and service	1) To plan timing and route for construction related traffic. 2) To deploy traffic controller 3) To inform foreseen activities to the public as needed.
Landscape	1) To install temporary enclosure wall during construction works. 2) To conduct greening and planting trees around the boundary of project site at the earliest possible timing.
Health and Safety	
Occupational Health and Safety	1) To provide safety and health training to workers when employed and enforce norm of safety construction. 2) To promote use of appropriate personal protective equipment (helmet, protective shoes, glove, etc.). 3) To establish the system for safety and health management at the construction site, and to clarify the responsible person and reporting system. 4) To apply good practices for similar construction.
Community Health and Safety	1) To provide training about public health and infectious diseases for construction workers.

Item	Mitigation measures
Transboundary impacts including Climate Change	1) To adopt fuel-economy/ low-emission construction vehicle and machineries as applicable and economically feasible. 2) To control idling operation of machineries.
Operation Phase	
Environmental Pollution	
Air Pollution	1) To utilize low-pollutant fuel as applicable and financially feasible. 2) To maintain generator periodically to sustain high performance for long term. Apply same measures as in construction phase.
Water Pollution	1) To monitor quality of treated wastewater and check compliance with standards prescribed by SPCB. 2) To install ETP designed for medical institute, and properly operating them following instruction by SPCB. 3) To inspect the rainwater drainage system and maintain it periodically.
Solid Waste	1) To segregate waste by type and hazard level of them in proper container, collect and store them in sealed storage until hand over to authorized third party. 2) To develop manual for waste handling to all medical staff and enforce it to practice.
Soil Contamination	1) To develop management rules for chemical products, and to practices the rules with relevant medical workers and educational staff. 2) To prepare action plans in case of leakage of chemical substance. 3) To collect solid and liquid wastes with infectious or chemical substances separately, store them in sealed container or storage until handed over to authorized third parties for disposal or treatment. 4) To inspect the containers and storages regularly and to maintain them in good condition to prevent accidental leakage. 5) To conduct mitigation measures listed for water pollution and solid waste
Noise and Vibration	1) To install low-noise type system, to inspect them regularly to maintain them in good condition. 2) To prepare concrete enclosure around the facilities that may generate noise and vibration as needed.
Ground Subsidence	Apply same measures as in construction phase.
Offensive Odour	Same as “solid waste”
Natural Environment	
Hydrology	1) To inspect rainwater drainages and maintain them properly
Social Environment	
Water usage	Same as “Ground Subsidence”
Existing Social Infrastructures and Services	1) To separate the traffic route for visitor and non-visitor (staff and third parties) for smooth traffic management in and around the project site. 2) Take same measures as construction phase if appropriate.
Landscape	1) To maintain green zone in order to buffer the appearance of buildings that can be seen from boundaries of project site
Health and Safety	
Occupational Health and Safety	1) To formulate the safety manual for hospital operation, update it regularly and to enforce it to all relevant staff. 2) To provide the safety training for all employees, to formulate the health and safety education plan and to implement it. 3) To provide annual health check for all employees. 4) To monitor occupational risk associated with medical activities such as radiation exposure level, solvent handling and worker’s injuries and provide additional health check to prevent irreversible health damage of staff.
Transboundary impacts including Climate Change	1) To introduce vehicles and machineries that would generate less GHGs, and to maintain them adequately.

Source: JICA Survey Team

10.8 Environmental Monitoring Plan

Proposed monitoring plans for construction phase and operation phase are presented in Table 10-9 and Table 10-10 respectively. These lists are provisional as per preparatory survey, items and frequency shall be added and modified if required by SPCB during application process of Environmental Certification for the medical facilities which should go through EIA procedures.

Table 10-9 Proposed Environmental Monitoring Plan (Construction Phase)

Category	Monitoring item	Monitoring site	Frequency
Air Pollution (Ambient air)	PM_{10}, $PM_{2.5}$, SO_2, NO_x and CO	Near the project site	Monthly
Water Pollution	Maintenance situation of temporary drainage, temporary storm water reservoir, and septic tank	Construction Site	Monthly
Solid waste	<during Demolition only > Amount of Generated and Treated hazardous wastes	Construction Site	Monthly* To be consulted with SPCB and follow the instruction
	Generation and treatment amount of construction and general waste	Construction Site	Monthly
	Status of waste management (if covered or stored properly etc.)	Construction Site	Monthly
Soil Contamination	Oil leakage (daily maintenance record of relevant machineries, record of oil leakage accidents etc.)	Construction Site	Monthly
Noise and Vibration	Noise level, Vibration level	Several points on boundary of the project site	More than monthly, when noise generating activities are conducted
Offensive Odour	Record of unusual smell	In and around construction site	When sensed
Ground subsidence/ Hydrology/ Water Usage	Groundwater level, ground level	Well and several point close to well	Monthly
Existing Social Infrastructures and Services	Number of traffic accident that involved construction related vehicles	Project Site and its surrounding area	Monthly
	Placement of traffic guard in the exit of the construction site	Construction Site	Monthly
Occupational Health and Safety	Implementation of safety training/ safety driving trainings for the construction workers	Project Site	Monthly
	Workers' accidents	Project Site	Monthly
	Safety situation in the construction site	Project Site	Everyday
Common	Complaints from neighbours	Project site and its surrounding	Monthly

Source: JICA Survey Team

Table 10-10 Proposed Environmental Monitoring Plan (Operation Phase)

Item	Monitoring item	Monitoring site	Frequency
Common	Implementation of environmental mitigation plan	Project Site and its surroundings	Monthly
	Complaints from neighbors	Project Site and its surroundings	Monthly
Air Pollution	PM_{10}, $PM_{2.5}$, SO_2, NO_x and CO	Near the project site	Monthly
(Stack Emissions from DG set)	PM, SOx, NOx, HC and CO	Outlet of stack	Once in a month (half year after construction, while generator is operated)
Water Pollution	pH, BOD, TSS, COD, TN, TP, and total Coliform	Outlet of STP	Monthly
		Outlet of ETP	Monthly
Solid Waste	Amount of generated waste by each category	Project Site (waste storage)	Monthly
	Status of waste storage (if there is no leakage, contamination with other categories, etc.)	Project Site (waste storage)	Monthly
Soil Contamination	Oil leakage (daily maintenance record of relevant facilities, record of oil leakage accidents etc.)	Project Site	Monthly
	Leakage of chemical/hazardous liquids	Project Site	Monthly
Noise and Vibration	Implementation status of periodic check of noise generating facilities and the emergency power supply	Project Site	Monthly (while facilities are operated)

Item	Monitoring item	Monitoring site	Frequency
Offensive Odour	Record of unusual smell	In and around construction site	When sensed
Existing Social Infrastructures and Services	Traffic accident, status of traffic congestions	In and around Project Site	Monthly
Occupational Health and Safety	Implementation of safety training for the employees	Project Site	Annual
	Occupational accidents	Project Site	Monthly (Safety and Health Committee)
	Implementation status of employees' health check	Project Site	Annual/Monthly (Safety and Health Committee)
	Employees' radiation dose	Project Site	Annual/Monthly (Safety and Health Committee)

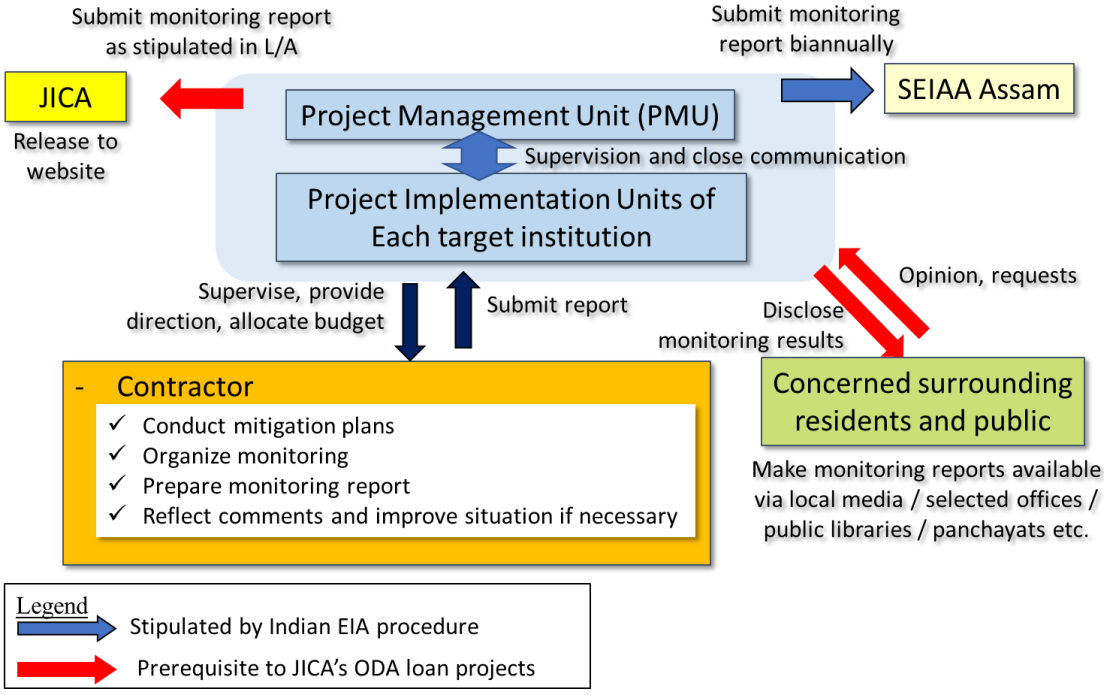
Source: JICA Survey Team

10.9 Implementation Structure of Environmental Management Plan

10.9.1 Environmental Management during Construction Phase

During construction phase, the construction contractor will implement the Environmental Management Plan (EMP) and the Environmental Monitoring Plan (EMoP) under the supervision of the project proponent, PMU/PIU for the project. The construction contractor will undertake obligations for implementation of EMP and EMoP, as well as report of the results to PMU/PIU, then PMU submit the results of Environmental Monitoring to JICA. Also, for the 8(a) and 8(b) categorized project under Indian EIA procedures, PMU/PIU should submit the same report to SEIAA of Assam state biannually on 1st June and 1st December as stipulated under Environmental Clearance. It is recommended that the copy of report shall be made available in selected offices or public libraries or panchayats etc. for interested parties in accordance with JICA's guideline (Source: JICA Survey Team

Figure 10-2).

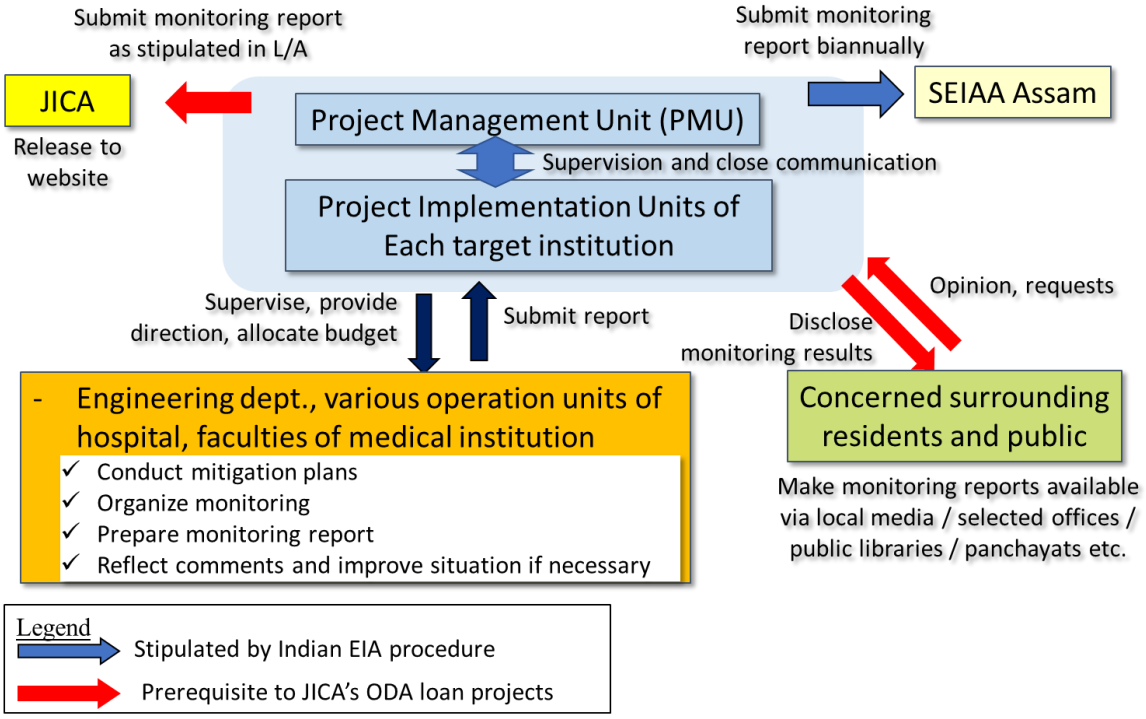


Source: JICA Survey Team

Figure 10-2 Institutional Arrangement for Environmental Management during Construction

10.9.2 Environmental Management during Operation Phase

Institutional arrangement during operation phase follow similar procedures as construction phase. The administration departments of each target facilities shall be responsible of instructing Engineering department for operation and maintenance of infrastructure such as generator sets, wastewater treatment plant and so on. In addition, for waste management and occupational health protection, each unit that dealt with waste and operational risk should be responsible of managing them and report to administration. The proposed institutional structure is presented in Figure 10-3.



Source: JICA Survey Team

Figure 10-3 Institutional Arrangement for Environmental Management during Construction

10.10 Stakeholder Meeting

10.10.1 Outline of Stakeholder Meeting

Initially, stakeholder meeting was planned to be held after approval of the draft final report. However, due to the prevalence of the COVID-19 situation in the state, holding community level gatherings was not recommended nor appropriate. Therefore, it was decided to conduct telephonic interview with nominated community representatives from different sections of the society living in the area. Moreover, Jorhat Medical College Hospital (JMCH) was selected as a sample representative MCH under the project for the stakeholder meeting, considering the largest floor area to be developed by the project. Based on the discussion and recommendation from JMCH, the interviews with 5 community chiefs/representatives nominated by the JMCH were conducted between 4th to 8th January 2022 via telephone call based on the presentation of the project outline and summarized result of environmental and social impact assessment of the project. Each interview lasted between a half to one hour.

The selected five interviewee represents the local community as follows.

1. Citizens who are well respected in the local community and represents the point of views of the last generation.
2. An educationist who generally represents point of views of the current generation and aspirations of the future generation as well and understand what is good for the society.
3. Environmental activists as representative of the farming community and understands the need of the poor section of the society and also understands the value of the environment.
4. Representatives from the Government, who are responsible to provide good healthy environment to the public and aims to provide well-being and happiness to the society.

10.10.2 Results of Interview to Community Representatives

General reaction from the community representatives were very positive toward implementation of the project as requirement of good medical facilities has further got impetus during the COVID-19 pandemic (for details refer Annex VIII). Among others, some of the key issues were highlighted during the stakeholders meeting includes; improvement of public access to health care services is mostly regarded as the positive impact of the project, while some concerns were raised regarding the sentiments attached to the name of the existing hospital that is proposed to be demolished for the new hospital, operation of existing facilities within the campus including noise pollution/issues and counter measures to be adopted for in-patients during demolition and construction phase. In addition, plantation of trees as landscaping and installation of solar power system as alternative non-polluting energy were recommended for considerations.

As mentioned above, the Project is accepted by surrounding community of Jorhat MCH, and it is expected to be positively accepted in sites other than Jorhat MCH. However, considering the varying environmental and social conditions of project sites, the additional measures to invite some public opinions in other project locations shall be conducted by the HFWD to ensure the social acceptability of the Project in the local community.

Chapter 11 Proposed Operation Plan

11.1 Organisation and Personnel

The implementing body of the project is Health and Family Welfare Department (HFWD) (Section 2.1). The following organisations will be established to manage the project:

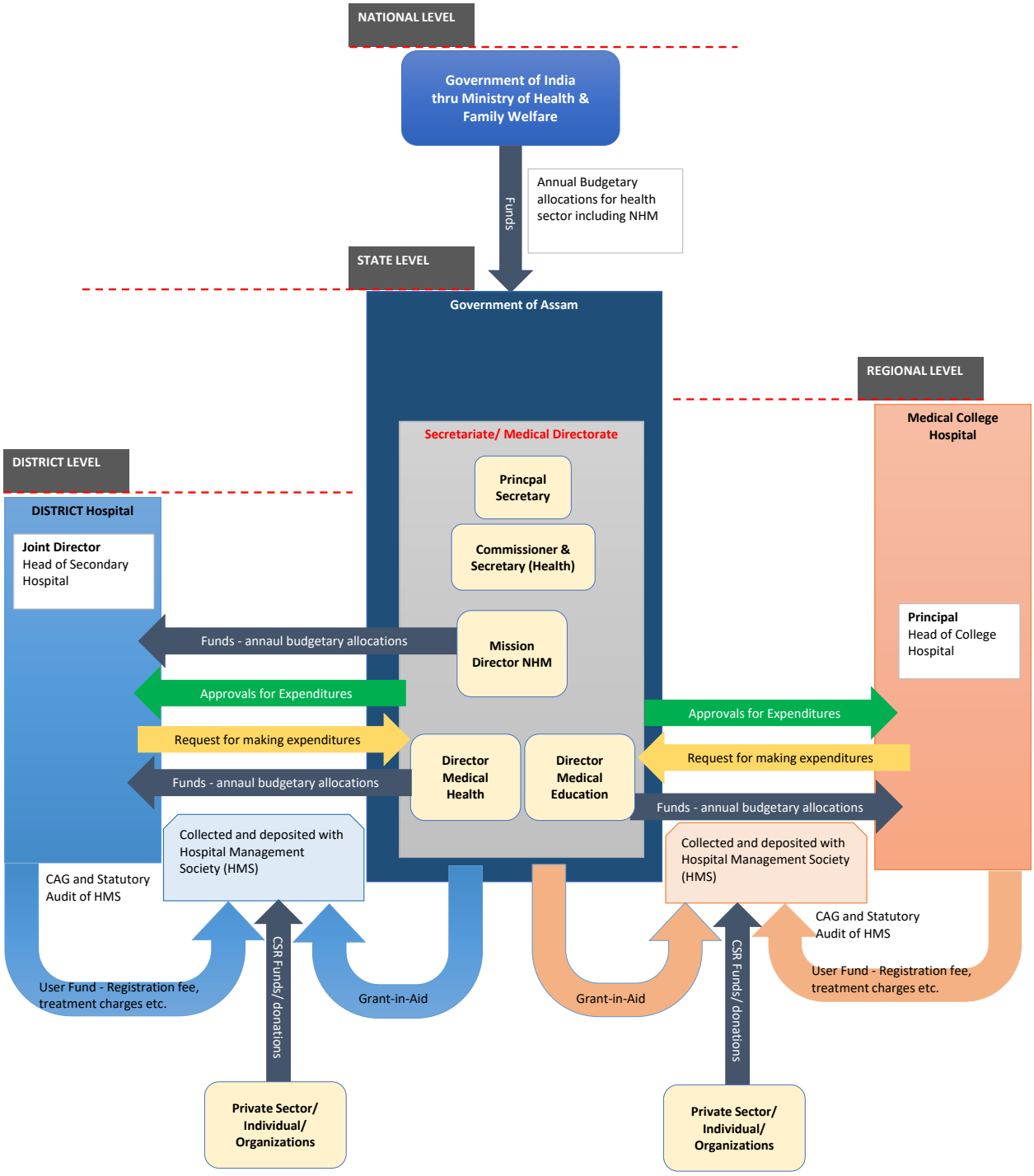
- Governing Body & Executive Committee: Composed of representatives from the Government of India (GOI) and HFWD, Government of Assam, with a state-wide management perspective as required, to supervise the PMU. The committee is the highest authority in the project and is responsible for final decisions and approvals on the most important matters relating to the project. Meetings are held once a year, although extraordinary meetings may be held if necessary.
- Project Management Unit (PMU): the PMU is expected to consist of a representative from the HFWD in the Government of Assam, the Director General of Health Services, the Director General of Medical Education, the National Health Mission, and the Director General of each hospital; in addition, it comprises experts in finance, healthcare management, information technology (IT), facilities and equipment, and personnel training. The PMU is the actual management body of the project. The main responsibilities of the PMU are implementation of the project, which are the development of the project's implementation plan and annual plan, progress management, coordination of relevant institutions, procurement management, risk management, and quality control. It will also provide management and supervision to the PIUs at the candidate facilities and communicate with the management of the candidate facilities to keep their development strategies and policies when required. At the end of each year, an evaluation report is prepared and presented to the S/C. It will also report regularly to the HFWD Principal Secretary through meetings and written correspondence.
- Project Implementation Unit (PIU): PIU is organised in each of the medical institution covered by the project and is responsible for the implementation of the project in the hospital. The PIU is led by the director of each hospital and consists of the deputy directors in charge of medical service and administration, as well as head of accounting, facilities and equipment, and human resources developments. The main responsibilities of the PIU are the development of implementation and annual plans for the project in each hospital, the management and monitoring of progress, the annual evaluation of achievement based on the plan, and the reporting to the PIU on quarterly basis. Each PIU will also be responsible for the collaboration across tertiary, secondary, and primary level's medical institutions in order to establish the Universal Health Coverage (UHC) model, which is the goal of this project. The PIU is responsible for coordinating the improvement of the referral system with higher and lower-level institutions, and coordinating human resource development (providing guidance to lower-level institutions, dispatching medical personnel, etc.).

11.2 Finance and Budget

11.2.1 Government Budget

(1) Budgetary Flow

The budgetary flow in the health sector in Assam is shown in Figure 11-1.



Source: JICA Survey Team

Figure 11-1 Budgetary Flow in Health in Assam

Based on the understanding developed through the discussions with the Government of Assam (GoA) as well as studying the available material, the budgetary fund flow from the Government of India (GoI) to the State Government (Assam), and further to the implementation level in the health sector has been prepared as illustrated in Figure 11-1.

At the national level, the annual budgets are approved and allocated by the Ministry of Health and Family Welfare to the State Government. The budgets are released mainly through the National Health Mission (NHM) and other central government schemes.

State Government makes allocations in the annual budgets for various schemes/programs implemented under the health sector. The Principal Secretary (Health) puts forward proposals to the State Government for budget allocations for various heath sector schemes/programs at the time of annual budget preparation. The budget needs to be approved by the Legislative Assembly. Later approvals are granted by the State Government for the budget releases as per the allocations. The Secretary & Commissioner (Health) assists the Principal Secretary in this process.

The budgets are released to the respective department heads/ heads of program, namely, Director (Health Service), Director (Medical Education), and Mission Director (NHM). The budgets are further released by the authorities viz., Directors or the College Principal or the Joint Director, who are responsible for the operations/implementation of the scheme and programs. The expenditures are made at the college hospital (tertiary level) or at the secondary/ primary hospitals as per the prior approvals from the State Government, and later, utilisation certificates are submitted to report the expenditures made against the allocated budgets.

Every Medical College Hospital has established a 'Hospital Management Society' that is autonomous in functions and decision making. Principal of MCH is Chairperson of the Executive Committee (EC) of the society whereas Superintendent of MCH is member-secretary to the EC of the society. The executive committee is constituted by the state government that includes DME, government and public representatives etc. The society also has a Governing Board that is headed by some public representative e.g. minister, MLA. The society can receive funds from various sources including the donations and grants from the government and other institutions as well as CSR funds. Regularly, the society receives around 3-5 Cr. from the state government as Grant-in-Aid annually. The 'User funds' that is generated by way of patient registration and other treatment/ diagnostic services performed for patients in deposited in society's bank account. The fund is being utilized for engaging contractual staff, operation and maintenance of hospital functions, purchase of consumables like x-ray films, medicines etc. The funds utilization by the society is subject to the CAG audit as well. Statutory audits are also conducted hiring the auditors from open market.

(2) Budget Allocation Process

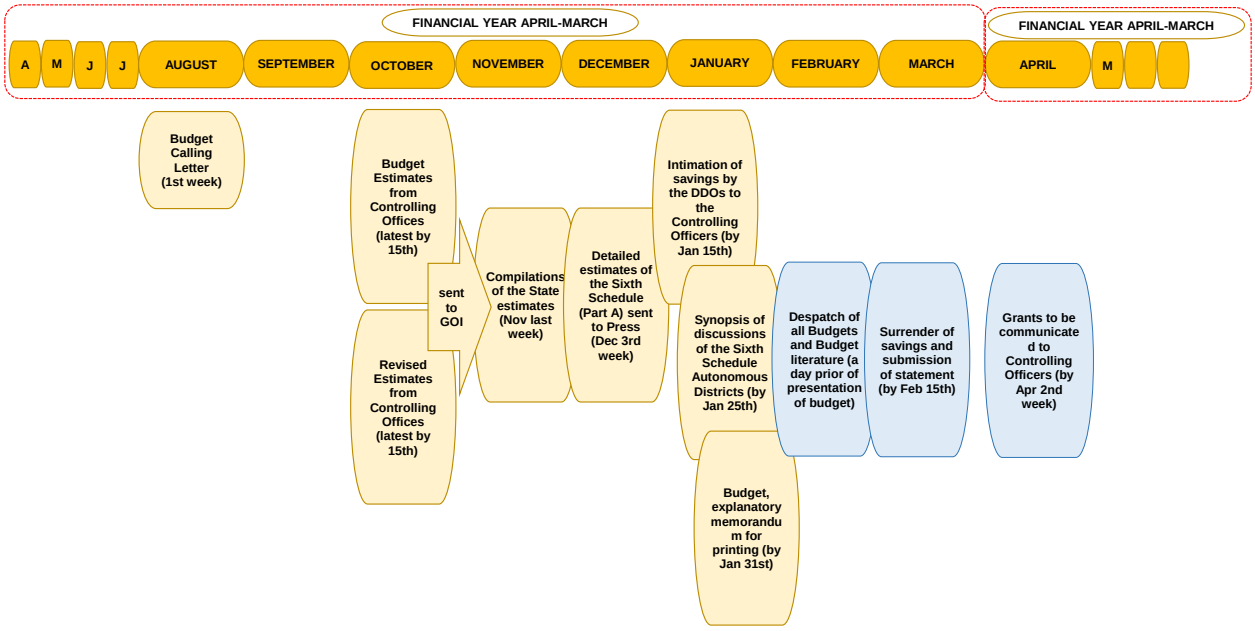
Budget preparation is a complex and extensive exercise that is carried out every financial year. Some of the key steps are summarised as follows:

- The budget cycle normally starts from the first week of August of the current year and lasts until April of the next financial year.

- The commencement of the budget process takes place with the issue of the Budget Circular, which is normally issued in the month of August each year.
- The Drawing and Disbursing Officers (DDOs) are responsible for estimating the receipts and expenditure for all the Detailed Heads of Accounts under the Minor Heads operated by them.
- The Estimating Officer will fill in the forms and send two copies to the Controlling Officer through the prescribed channel or otherwise to the Finance Department, retaining one copy for record in his office. The estimates of revenue and receipts should be prepared based on the existing rates of taxes, duties, fees, etc.
- The estimate of expenditure should be for charges which will be paid during the year, including arrears from previous years and not for liabilities falling due during the coming years.
- Subject to any orders that may be passed by the Finance Minister, the Annual Financial Statement of receipts and expenditure which are to be credited to, or made out of the Consolidated Fund, may be laid before the Assembly in three parts.

The Finance Minister presents the budget to the Assembly on a day fixed for the purpose with a written speech explaining the salient features of the budget, the fiscal health of the government, changes in tax revenues, if any, relief provided in the existing rates of taxes, and important projects and schemes to be undertaken during the ensuing financial year.

The budget allocation process is shown in Figure 11-2.

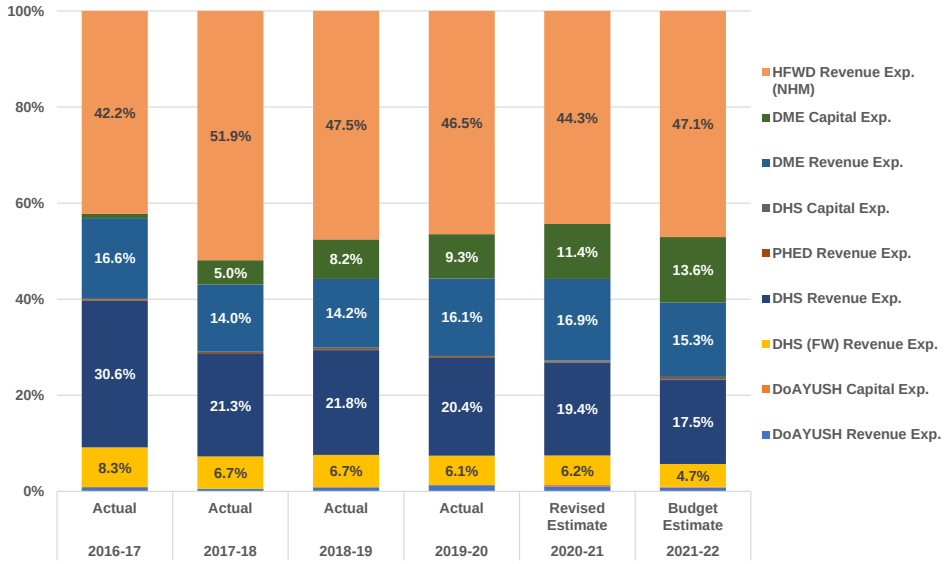


Source: JICA Survey Team

Figure 11-2 Budget Allocation Process

(3) Composition of Budget on Health

The composition of the government expenditure on health by budget entity is shown in Figure 11-3. HFWD (NHM) accounts for nearly half of the total expenditures in Grant No. 29 Medical & Public Health steadily, while capital expenditures of DME have been expanding in the recent years.



Source: [Government of Assam, 2021]

Figure 11-3 Composition of Budget on Health by Budget Entity in Assam

11.2.2 Financing Plan for the Project

(1) Construction

The construction cost of the project will be financed through the Japan International Cooperation Agency (JICA) official development assistance (ODA) loan and Assam government's own fund. The JICA ODA loan's ratio is determined as 85% of the total project cost. The JICA ODA loan will be borrowed by the central government and allocated to the Government of Assam for disbursement of the construction and consulting services for the project.

The other borrower portion such as land acquisition and administration cost will be covered by Assam government's own fund through its budgetary appropriation. (Please refer to Chapter 13 "Project Cost" for the construction cost estimation.)

(2) Medical Equipment

The procurement cost of the medical equipment planned in this project (including primary to tertiary healthcare facilities) is financed by JICA ODA loan and Assam government's own fund.

(3) Operation and Maintenance

Grant subsidy from the Assam government will be the primary source of revenue to recover the operation and maintenance expenses of the project. Hospital service charges and education fees collected from patients and students will be another source of revenue.

As described in Section 2.2.2, given the moderate prospects of economic growth and the upward trend of the government revenue and expenditure with the context of relatively favourable fiscal conditions of the Government of Assam, as well as the sustainable prioritisation of health in government expenditure, the fiscal space for health in Assam including this project is expected to be secured at least in the short to medium term. The Government of Assam has analysed its own fiscal performance and fiscal space and

concluded that there will be enough funding source for the counterpart (non-eligible part) fund for the project. According to the Government of Assam, there has not been any project in the past that has been delayed or stopped due to shortage of budget.

11.3 Operation Management

11.3.1 Facility

The new facility shall be planned and designed with minimum use of advanced and complicated systems such that it is easy to maintain by local technicians. Furthermore, to keep the facility in good condition for long term, daily maintenance and inspections of facilities and machineries are important in accordance with the operation instruction manuals and by knowledgeable technicians.

11.3.2 Medical Waste Management including Biomedical Waste

Biomedical hazardous wastes are brought into the medical waste incineration plant owned by the State Corporation for disposal. The principal guideline follows the "National Guidelines on Hospital Waste Management Based upon the Biomedical Waste Rules" set forth by the Government of India to ensure safe disposal of biomedical waste as per the rules.

Blood bank shall practice first in first out policy for reduction of waste. Adequate measures shall be taken to prevent expiry of blood or blood components.

(1) Policy on Hospital Waste Management

The policy statement aims "to provide for a system for management of all potentially infectious and hazardous waste".

(2) Definition of Biomedical Waste

Biomedical waste means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animal or in research activities pertaining thereto or in the production or testing of biological, including other categories.

(3) Categories of Biomedical Waste

Hazardous, toxic, and biomedical waste has been separated into the following categories for the purpose of its safe transportation to a specific site for specific treatment. Certain categories of infectious waste require specific treatment (disinfection/decontamination) before transportation for treatment and disposal. These categories of biomedical waste are mentioned in Table 11-1.

Table 11-1 Categories of Biomedical Waste

Category	Explanation
No. 1- Human Anatomical Waste	This includes human tissues, organs, and body parts.
No. 2- Animal Waste	This includes animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animal used in research; waste generated by veterinary hospitals and colleges: discharge from hospital and animal houses.
No. 3- Microbiology & Biotechnology Waste	This includes waste from laboratory cultures, stocks or specimens of microorganism live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biological, toxins, dishes, and devices used for transfer of cultures.
No. 4- Waste Sharps	This comprises needles, syringes, scalpels, blades, glass, etc., that may cause puncture and cuts. This includes both used and unusable sharps.
No. 5 - Discarded Medicines and Cytotoxic Drugs	This includes wastes comprising outdated, contaminated, and discarded medicines.
No. 6- Soiled Waste	It comprises item contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, linens, beddings, and other material contaminated with blood.
No. 7- Solid Waste	This includes wastes generated from disposable items, other than the waste sharps, such as tunings, catheters, intravenous sets, etc.
No. 8- Liquid Waste	This includes waste generated form laboratory and washing, cleaning, housekeeping and disinfecting activities.
No. 9- Incineration Ash	This consists of ash form incineration of any biomedical waste.
No. 10- Chemical Waste	This contains chemical used in the production of biological and chemical used in disinfection, insecticides, etc.

Source: Guidelines for District Hospitals (IPHS)

(4) Segregation of Waste

Segregation of waste should be done at each site of generation of biomedical waste, e.g., all patient care activity areas, diagnostic services areas, operation theatre labour rooms, treatment rooms, etc. The responsibility of segregation should be with the generator of biomedical waste, i.e., doctors, nurses, technicians, etc. The biomedical waste should be segregated as per the applicable categories.

(5) Collection of Biomedical Waste

Collection of biomedical waste should be done as per the Biomedical Waste Rules. The collection bags and the containers should be labelled, i.e., symbols for bio-hazard and cytotoxic. A separate container shall be placed at every point of generation for general waste to be disposed of through the Municipal Authority.

The trolleys which are used to collect hospital waste should be designed in such a way that there should be no leakage or spillage of biomedical waste while transporting to the designated site.

(6) Storage of Waste

Storage refers to the holding of biomedical waste for a certain period of time at the site of generation till its transit for treatment and final disposal.

(7) Treatment of Hospital Waste

1) General Waste (Non-hazardous, non-toxic, non-infectious)

The safe disposal of this waste should be ensured by the occupier through the Local Municipal Authority.

2) Biomedical Waste

Monitoring of incinerator/autoclave/microwave shall be carried out once a month to check the performance of the equipment. Table 11-2 shows the method of biomedical waste treatment.

Table 11-2 Method of Biomedical Waste Treatment

Incineration:	In case of the installation of incinerator, the incinerator should be installed and made operational as per specifications and an authorisation shall be taken from the concerned authority for the management and handling of biomedical waste including installation and operation of the treatment facility. Specific requirement regarding the incinerator and norms of combustion efficiency and emission levels, etc. have been defined in the Biomedical Waste Rules. The plastic bags made of chlorinated plastics should not be incinerated.
Deep Burial:	Standards for deep burial are also mentioned in the Biomedical Waste Rules. The cities having less than 5 lakhs population can opt for deep burial for wastes under Categories 1 and 2.
Autoclave and Microwave Treatment:	Standards for autoclaving and microwaving are also mentioned in the Biomedical Waste Rules. The waste under Categories 3, 4, 6, and 7 can be treated by these techniques.
Shredding:	The plastics (IV bottle, IV sets, syringes, catheters, etc.) and sharps (needles, blades, glass, etc.) should be shredded but only after chemical treatment/ microwaving/ autoclaving, ensuring disinfection. Needles destroyers can be used for disposal of needles directly without chemical treatment.
Secured Landfill:	The incinerator ash, discarded medicines, cytotoxic substances, and solid chemical waste should be treated by this option (Categories 5, 9, and 10).
Radioactive Waste:	The management of radioactive waste should be undertaken as per the guidelines of BARC.

Source: Guidelines for District Hospitals (IPHS)

3) Hazardous Wastes

These include wastes from medical, dental, and veterinary practices during treatment or research activities, which may contain either inorganic or organic constitutions. These wastes need to be treated in accordance with Hazardous and Other Wastes Management Rules (2016) by segregating at source duly collecting in containers, stored safely, and transported separately, then handed over to the authorised third party for proper disposition. Also, the project proponent should periodically report the status of waste management to the State Pollution Control Board.

4) Radioactive Wastes

These include cotton, paper, metal, glasses, plastic objects, and other materials that are used for radioactive treatment. These wastes need to be treated in accordance with the guidelines provided by the Atomic Energy Regulatory Board. Generally, radioactive wastes need to be stored in a storage designed exclusively for radioactive material for half-life period for inactivation, then buried in the ground.

11.4 Maintenance Operation

It is important not only to secure human resources in the field of medical and teaching department, but also to procure manpower for facility operation and maintenance. It is also necessary to develop efficient maintenance plan of the facility and equipment in order to keep their sustainable usage.

11.4.1 Facility

Each hospital has a Hospital Management Society who also looks after the general management. The funds for the operation and maintenance are being managed through the users' charges collected and budget-

allocated funds from GoA. Timely action, proper management, and periodical inspection shall be essential for the facility maintenance.

It is required to implement regular check and periodic maintenance based upon the annual maintenance plan and keeping the maintenance records. The daily cleaning will encourage people to use the facilities carefully as well as ensure early detection of damages and/or malfunctions. Regular major inspections/ actions that may need to be carried out are shown in Table 11-3.

Table 11-3 Major Regular Inspections Related to Facility

Building	・ Daily cleaning ・ Repair of parts from wear and tear, damage, and deterioration
Building machineries	・ Switchboard / Regular inspection and management ・ Generator: Supply of oil ・ Lighting / Regular inspection and management ・ Pump, pipe, valve / Regular inspection and management ・ STP, ETP / Water quality monitoring ・ Air conditioner, AHU, exhaust fan / Measurement of air environment and cleaning ・ Firefighting equipment / Regular inspection and management

Source: JICA Survey Team

11.4.2 Medical Equipment

All equipment shall have warranty and/or CMC renewed from time to time as per the life of the equipment. For equipment that requires complicated maintenance checks, it can be managed by local agents located in Assam or Guwahati located around one (1) hour drive from the centre of New Delhi. All equipment should have annual maintenance contract for regular servicing and repair to ensure that they are in optimum working conditions and no equipment/instruments should remain non-functional for unreasonably long time. Outsourcing of services such as laundry, ambulance, dietary, housekeeping and sanitation, waste disposal, etc. should be preferably arranged by the hospital itself. Manpower and outsourcing work could be done through local tender mechanism. (Also refer to Section 7.6 for the details.)

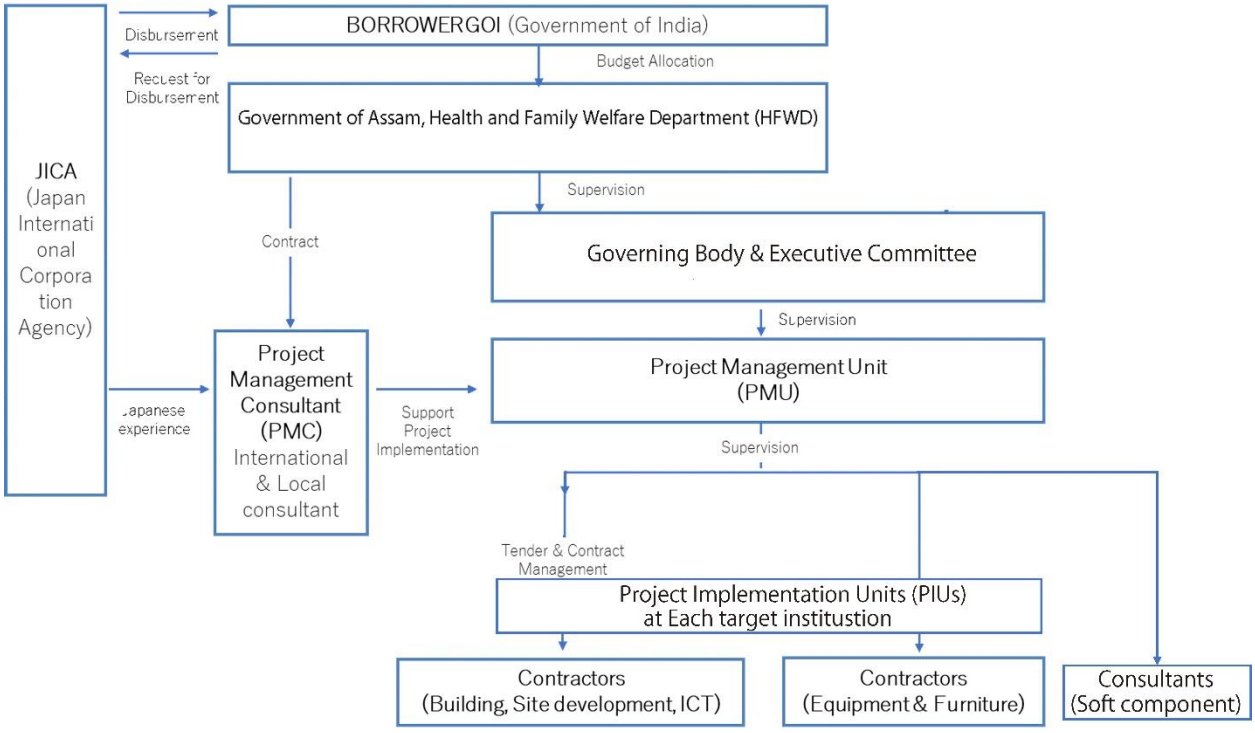
Chapter 12 Project Implementation

12.1 Project Implementation Structure

12.1.1 Project Management Structure and its Functions

The agency related to this project is the Government of Assam, Health and Family Welfare Department (HFWD). It is assumed that the Directorate of Health Services (in charge of medical institutions for district hospitals and primary health centres), the Directorate of Medical Education (in charge of medical colleges and medical college hospitals), and the National Health Mission (maternal and child health, infectious diseases, non-communicable diseases (NCDs) countermeasures) will be involved in the implementation of the project.

Table 12-1 shows the project management structure.



Source: JICA Survey Team

Figure 12-1 Draft of Organisation Chart of the Project

12.1.2 Roles and Responsibilities of Related Organisations

Executing Agency: The executing agency will be the Government of Assam, Health and Family Welfare Department (HFWD). HFWD will handle the necessary tasks for project implementation and stakeholder coordination with JICA. HFWD will establish a Project Management Unit (PMU) within the organisation which shall take all necessary measures in a timely and efficient manner and will be fully responsible for the project implementation.

Governing Body & Executive Committee: Governing Body & Executive Committee shall consist of a representative from the Government of India (GOI) and HFWD of the Government of Assam, consisting of the perspective of state-wide management if necessary and supervising the PMU.

PMU: A Project Management Unit (PMU) will be set up within the HFWD as the executing agency for project implementation. It will consist of representatives from HFWD of the Government of Assam, such as from the Directorate of Health Services, the Directorate of Medical Education, the National Health Mission, and each hospital director. PMU is responsible for the implementation of the project. PMU will communicate with the management of each hospital to know updates regarding its development strategy and direction, and reflect them in the project implementation if necessary. It will have responsibility to report the project to JICA and GOI. For daily administrative and technical project management, the PMU will be supported by the Project Management Consultant (PMC) accordingly to ensure the conceived management plan and implementation, and act as a decision makers and supervisor for daily activities of the project.

PIU: Project Implementation Unit (PIU) is organised in each of the medical institution covered by the project and is responsible for the implementation of the project in the hospital. The PIU is led by the director of each hospital and consists of the deputy directors in charge of medical service and administration, as well as head of accounting, facilities and equipment, and human resources developments. The main responsibilities of the PIU are the development of implementation and annual plans for the project in each hospital, the management and monitoring of progress, the annual evaluation of achievement based on the plan, and the reporting to the PIU on quarterly basis. Each PIU will also be responsible for the collaboration across tertiary, secondary, and primary level's medical institutions in order to establish the Universal Health Care (UHC) model, which is the goal of this project. The PIU is responsible for coordinating the improvement of the referral system with higher and lower-level institutions and coordinating human resource development (providing guidance to lower-level institutions, dispatching medical personnel, etc.).

PMC: Project Management Consultant (PMC) shall be hired by PMU. It is supposed to assist PMU in making necessary reports to the authorities such as JICA and GOI, and coordinate submissions, approvals, and concurrences including communication with all internal and external parties concerned (municipality, authorities, etc.). PMC will consist of a Project Management Expert, Construction Management Expert, Financial Management Expert, Monitoring and Evaluation Expert, Procurement Expert and Supporting Staff, etc. and will support facility design, construction supervision, equipment design, and equipment procurement and installation supervision.

12.2 Project Implementation Schedule

12.2.1 Prerequisites

The overall project implementation schedule is devised based on the prerequisites in Table 12-1. The procurement method of the construction will be EPC mode (Design Build).

Table 12-1 Prerequisites of the Project Schedule

Project Milestone	
Loan Pledge:	February 2022
Signing of L/A:	March 2022
Selection of PMC (By the HFWD)	
Preparation of Terms of Reference (ToR), JICA concurrence:	4.0 months
Releasing RFP, preparation of proposal by prospective consultant:	2.0 months
Evaluation of submitted proposals (QCBS), JICA concurrence:	4.0 months
Negotiations, JICA concurrence, and consulting agreement:	2.0 months
Design Stage (By the PWD&in-house Consultant)	
Basic design:	6.0 months
Bidding Procedure (By the PWD and PMC)	
Preparation of bidding document and JICA concurrence:	4.0 months
Releasing of bidding document and preparation of bid by prospective bidder	3.0 months
Evaluation of submitted bids and JICA concurrence:	5.0 months
Negotiations, JICA concurrence, and awarding of contract:	3.0 months
JICA concurrence and conclusion of contract:	1.0 month

Source: JICA Survey Team

12.2.2 Construction Work Period

In general, the construction schedule of a facility is greatly affected by the geological and climatic conditions of the proposed site. Therefore, it is advisable to determine a realistic schedule by referring to the expertise of local contractors.

In this report, the overall construction period is estimated as in the following Table 12-2

Table 12-2 Estimated Construction Period

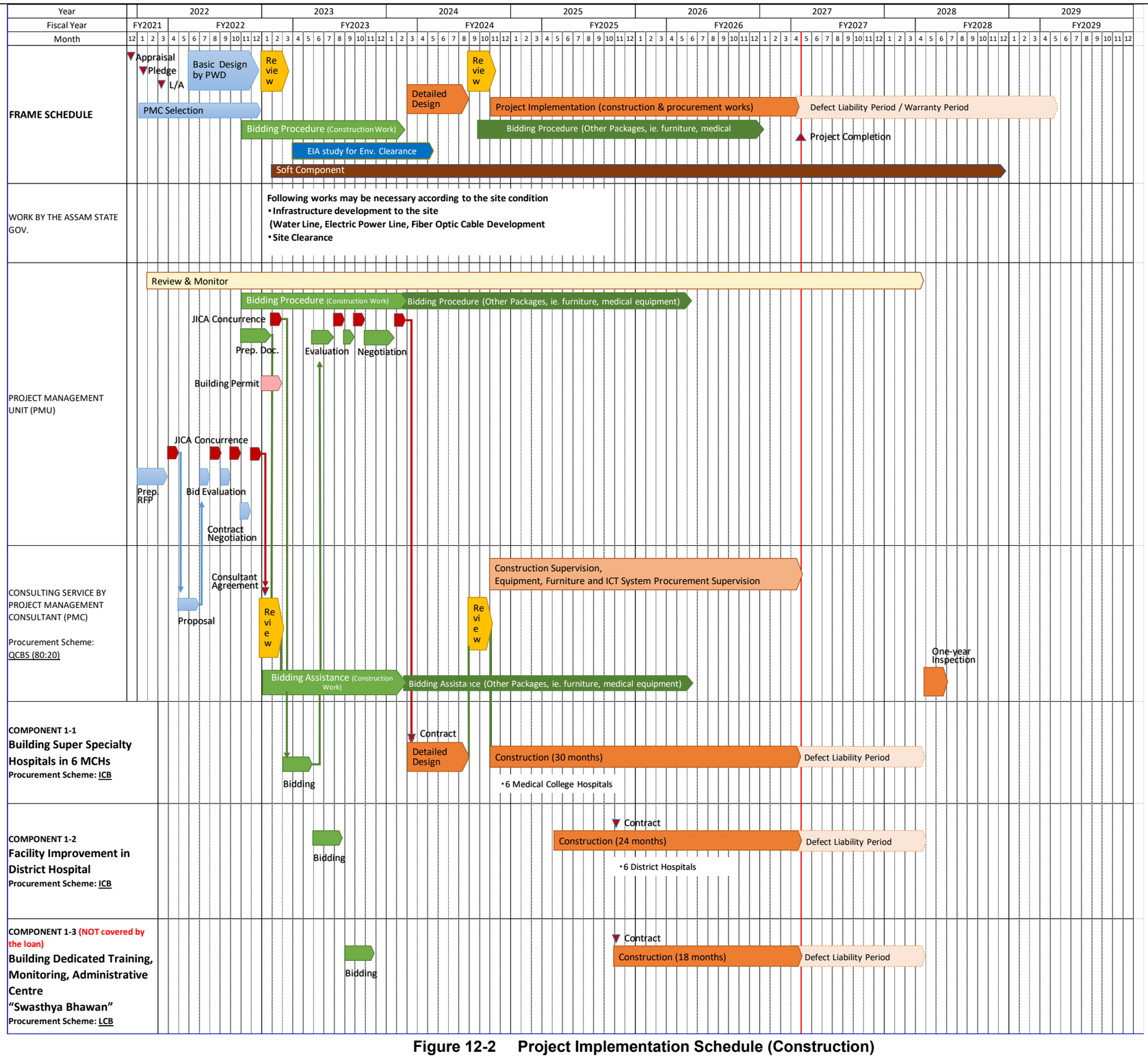
Construction	
Six Super Specialty Wing in Medical College Hospitals	30 months
Eight District Hospital Infrastructure Improvement	18 months
Dedicated Training, Monitoring, Administrative Centre, Swasthya Bhawan	18 months

Source: JICA Survey Team

12.2.3 Project Implementation Schedule

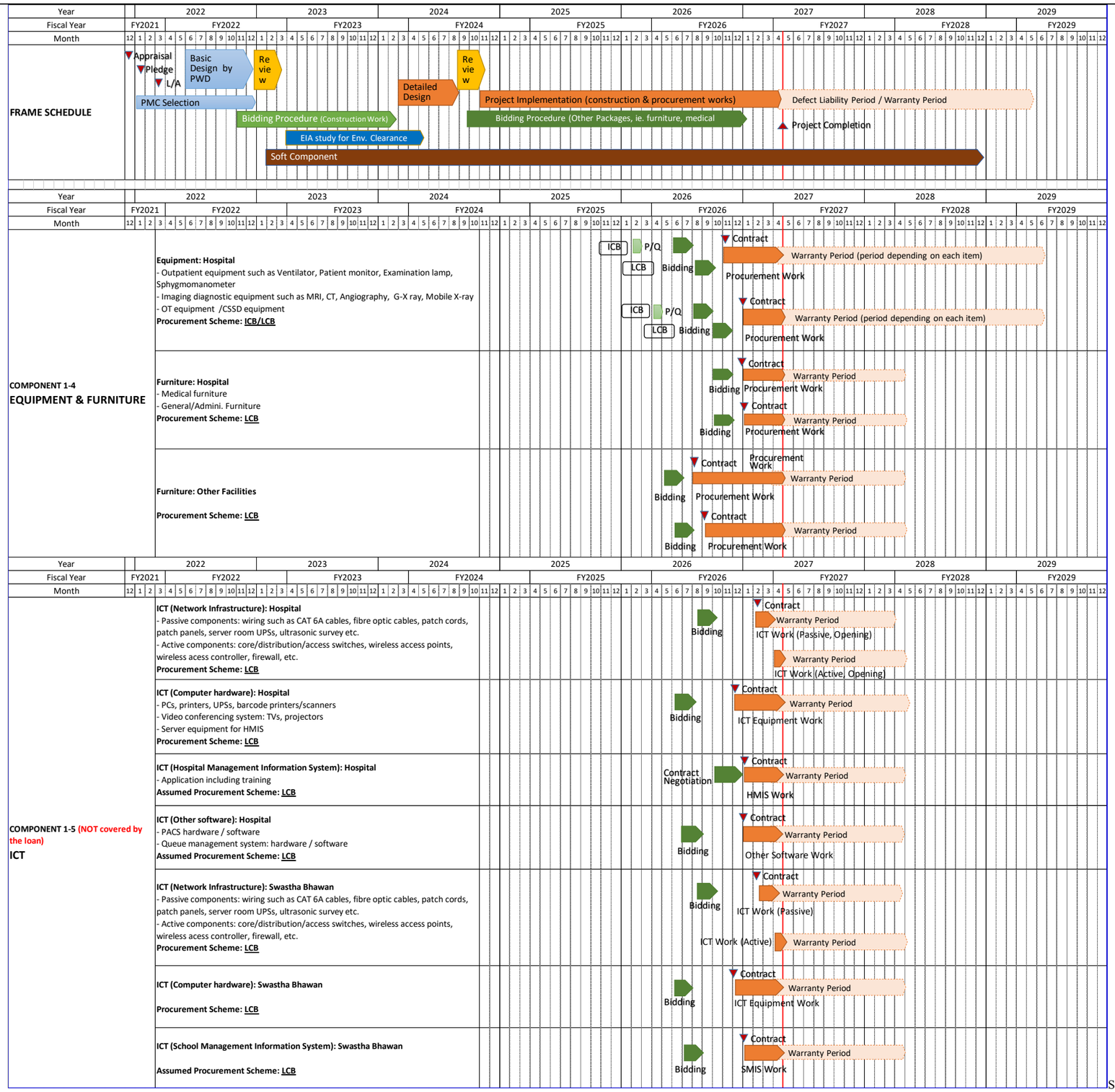
Considering the above necessary period for each process, the project implementation shall be as shown in Figure 12-2, Figure 12-3, and Figure 12-4.

Regarding the EIA procedures in the following schedule, it is assumed that the schematic design is detailed enough to be submitted for building permits and EIA procedures.



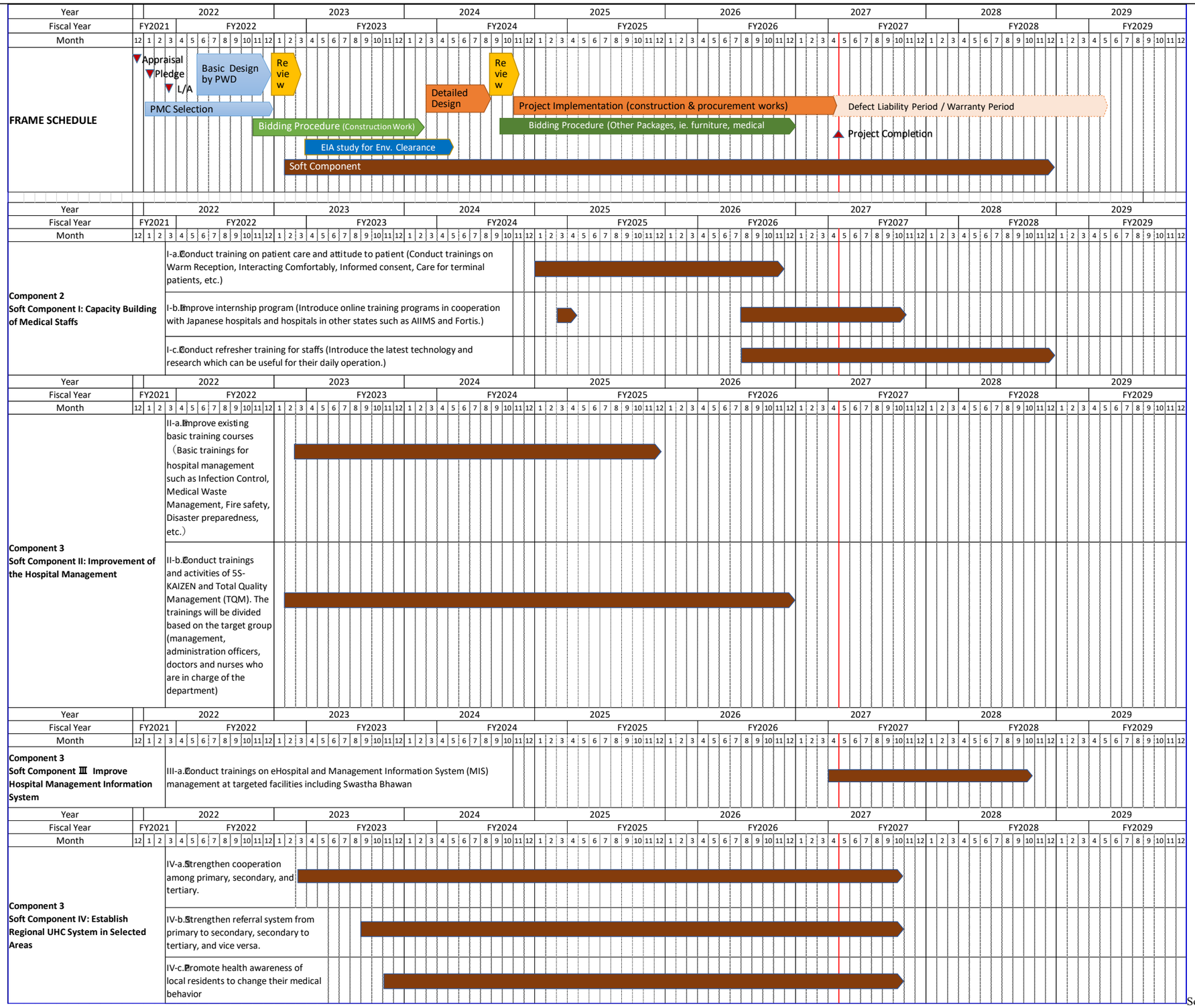
Source: JICA Survey Team

Figure 12-2 Project Implementation Schedule (Construction)



Source: JICA Survey Team

Figure 12-3 Project Implementation Schedule (Medical Equipment, Furniture, and ICT)



Source: JICA Survey Team

Figure 12-4 Project Implementation Schedule (Soft Component)

12.3 Project Implementation Plan

12.3.1 Procurement Plan

Upon construction of a new hospital, the tender for civil construction work shall include civil, structural, architectural, mechanical, electrical and plumbing (MEP), interiors and site development works, and fixed furniture items. Medical equipment and bought out furniture items shall be separated from the construction tender.

(1) Facility Construction

1) Procurement System

Procurement for hospital facility construction will be EPC mode (Design Build), conducted through international competitive bidding (ICB). The proposed construction work is relatively large scale, and both functional and technical requirements are high. This requires that the contractor's workmanship and construction management expertise also be high. It is therefore implement reviews of the candidate contractor's technical capabilities and financial viability.

Procurement for Swasthya Bhawan facility construction will be conducted through local competitive bidding (LCB).

Normally, a government agency, a nodal agency, manages the project on behalf of the HWF Ministry in Assam. The state's Public Works Department (PWD) has a dedicated department that handles most government healthcare projects in Assam, which acts as the nodal agency. The HFWD will be the client of the nodal agency. The nodal agency will appoint in-house consultants and issue tenders for the construction.

PWD is responsible for all procurements related to construction, and issues the RFP and makes the award. PWD shall be the executing agency.

On the other hand, infrastructure requirements for MCH are provided by DME and those for CH are provided by DHS. Thus, the HFWD accords the administrative approvals.

2) Procurement Condition

All necessary construction equipment are available in Assam as currently, similar sized or bigger projects than medical colleges are being executed. Necessary materials including finishing materials are available locally and can also be easily sourced from all over India.

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12.3.3 Public Works Department Cost Norms and Unit Cost Applied to the Project

In India, the unit cost for public buildings is defined by the "Plinth Area Rates" set by the Public Works Department (PWD). Each of the central government PWD (CPWD) and Assam PWD (APWD) has its own

cost. Despite of the above, in June 2021, a notification from the Government of Assam on Schedule of Rates (SOR) for Construction has been issued that all norms and guidelines of the Central Public Works Department (CPWD) (All India) SOR will be followed by the Assam Public Works Department (Building Wing).

The base cost is calculated based on the Plinth Area Rates 2021 published by the Central Public Works Department, which covers the basic construction cost of non-residential buildings. In this base cost, items such as medical gas supply systems are not included. These additional functions that are not listed in the Plinth Area Rates are added considering market price.

12.3.4 Work Allocation of Assam Side

The yen loan project may not cover the overall development of the project. Some infrastructure development works outside/inside the project site are advantageous to be planned/developed prior to the commencement of the works under the yen loan project. Table 12-6 shows the work allocation for the Assam side for the construction component.

Table 12-6 Work Allocation of Assam Side

Land Preparation	・ Land acquisition ・ Site clearance and demolition of existing structure and services if required
Utility System	・ Providing necessary utilities (electric power, telephone/ internet connection, supply water, drainage, etc.) to the site to operate the facilities

Source: JICA Survey Team

12.3.5 Safety Issues during Construction

The following issues during construction are to be considered:

- Secure the construction site by surrounding it with temporary wall.
- Consider enough working and preparation space for the contractor within construction fence/site.
- Limit the number of vehicles entering the construction site, to enable managing access of construction vehicles and labours, and avoid traffic issues.
- Be conscious of reduction of noise and vibration emittance.

Especially because the development of each facility block will be implemented during the operation of the existing facilities, consider safe accessway for the patients, their attendants, visitors, and medical staff during each construction phase. Separate user access route from that of construction vehicle to be planned.

Chapter 13 Project Cost

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13.3 Operation and Maintenance Cost

The operation and maintenance (O&M) costs of the hospitals are generally divided into personnel costs, administrative costs, operation costs, and building and equipment maintenance and repair costs.

13.3.1 Operation and Maintenance Cost of the Proposed Facilities

In general, the facility's O&M consist of operation costs (electricity, telephone, and water charges) and building maintenance costs (cost for building maintenance and purchasing spare parts of mechanical systems, etc.).

The annual O&M cost including the above is roughly estimated as INR 400,000 per bed on average from the average expenditure in the past four years (2016-2020) of Assam Medical College & Hospital (AMCH) and Gauhati Medical College & Hospital (GMCH) including salaries and wages calculated from the four-year expenditure data of MOHFW (Table 13-6). The reason for adopting the past expenditure of AMCH and GMCH is that their records for the hospital were clearly separated from those of the medical colleges.

Table 13-6 Annual Expenditure per Bed

(INR)

Name of Institution	Average Expenditure of Past 4 Years (2016-2020) (A)	No. of Beds (B)	Annual Expense per bed (A) / (B)	Average Annual Expenditure per bed
AMCH	536,544,500	1,315	408,019	417,008
GMCH	972,979,750	2,284	425,998	

Source: JICA Survey Team

Table 13-7 shows the estimated O&M cost of the proposed facilities.

Table 13-7 Annual Estimated O&M Cost of the Proposed Hospitals

(INR)

Name of Institution	No. of Proposed Bed (A)	O&M Cost per Bed (INR) (B)	Annual Estimated Expense (A) x (B)
SMCH	170	417,008	70,891,360
TMCH	200	417,008	83,401,600
JMCH	260	417,008	108,422,080
FAAMCH	50	417,008	20,850,400
DMCH	50	417,008	20,850,400
LMCH	50	417,008	20,850,400
Type 1 (CH)	150	417,008	62,551,200
Type 1 (CH)	150	417,008	62,551,200
Type 1 (CH)	150	417,008	62,551,200
Type 1 (CH)	150	417,008	62,551,200
Type 2 (CH)	50	417,008	20,850,400
Type 2 (CH)	50	417,008	20,850,400
		TOTAL	**617,171,840**

Source: JICA Survey Team

Chapter 14 Monitoring and Evaluation Framework

This chapter describes operation and effect indicators to monitor and evaluate the operation and its effects to achieve the project objectives, and the economic analysis to evaluate the economic viability of the project.

14.1 Monitoring and Evaluation Indicators

14.1.1 Operation and Effect Indicators

The project aims to strengthen the health care system in Assam State and consists of several development components which are outlined as follows (refer to Chapter 5).

(1) Strengthening medical institutions (facilities, equipment)

(2) Strengthening the capabilities of medical professionals

(3) Strengthening the organizational and management capabilities for provision of the medical services

In this section, operation and effect indicators are established for each component above, in order to monitor the achievement of the project goals. In establishing the indicators, clearness and simplicity, which support reliable and sustainable monitoring by the implementing agencies, are taken into account.

Table 14-1 shows the operation and effect indicators proposed for the project. The baseline values are those which are achieved in 2021 (or the latest available data) and the target values are expected values in the two years after project completion (2029).

The operation indicators for the above component (1) includes the “number of newly installed beds”, “bed occupancy rate”, “number of OPD patients”, “number of angiography”, and “number of delivery (including normal delivery and LSCS)”. As for the effect indicators, infant mortality rate (IMR) and maternal mortality rate (MMR) could be proposed because those indicators are closely related to one of the overall goals of the project. However, such mortality rates would be affected not only by the outputs of the project but also by a variety of external factors. Thus, those mortality rates are not included for evaluation of the project.

The operation indicator for the above component (2) is the “cumulative total number of medical staff who have participated in the training(s) related to patient-centered care, improved internship program and refresher training(s)”.

The operation indicators for the above component (3) are the “cumulative total number of staff who have participated in the training(s) and activities of 5S-KAIZEN and Total Quality Management (TQM), training(s) on eHospital and Management Information System (MIS) management” and “cumulative total number of trainers to be trained regarding strengthening referral system and promotion of health awareness of local residents to change their medical behavior”.

Table 14-1 Operation and Effect Indicators

Indicators	Unit	Baseline	Target	Estimation basis / Notes
1. Strengthening medical institutions (facilities, equipment)				
1-1. No. of newly installed bed (in the new super specialty wings at the targeted 6 MCHs)	beds	-	780	Refer to Chapter 6 “Facility Plan”
1-2. Bed occupancy rate (average of the new super specialty wing’ beds at the targeted 6 MCHs)	%	-	80 - 90%	Target value is estimated based on occupancy rates among existing hospitals
1-3. No. of newly installed bed (in the targeted 4 CDHs of Type 1)	beds	-	600	Refer to Chapter 6 “Facility Plan”
1-4. Bed occupancy rate (average of the new beds at the targeted 4 CDHs of Type 1)	%	-	70 - 80%	Target value is estimated based on occupancy rates among existing hospitals
1-5. No. of OPD patients (total of the targeted 8 MCHs and the 6 CDHs)	Persons /year	2,536 K	2,721 K	Baseline value of some targeted hospitals are not available/unobserved during the Survey period. Those missing data are tentatively replaced with the average of observed MCHs/CDHs. Target value is reflected total population growth in Assam.
1-6. No. of angiography (total of the new super specialty wings at the targeted 6 MCHs)	times/ year	-	13,500	Tests and/or catheter interventions 9 times/day x 250 days/year x 6 MCHs
1-7. No. of delivery (including normal delivery and LSCS) (total of the targeted 6 CDHs)	Times /year	15,070	16,171	Target value is reflected total population growth in Assam.
2. Strengthening the capabilities of medical professionals				
2-1. Cumulative total No. of medical staff who have participated in the training(s) related to patient-centered care, improved internship program and refresher training(s)	persons	-	2,558	Refer to Chapter 5 Table 5-3 “Outline of Soft Component (Plan)” Breakdown of No. of target medical staff are 378, 800 and 1,380 for the trainings on patient care, the improved internship program and refresher trainings, respectively.
3. Strengthening the organizational and management capabilities for provision of medical services				
3-1. Cumulative total No. of staff who have participated in the training(s) and activities of 5S-KAIZEN and Total Quality Management (TQM), training(s) on e-Hospital and Management Information System (MIS) management	persons	-	1,820	Refer to Chapter 5 Table 5-3 “Outline of Soft Component (Plan)” Breakdown of No. of target staff are 420 and 1,400 for the trainings and activities of 5S-KAIZEN and TQM and the trainings on e-Hospital and MIS, respectively.
3-2. Cumulative total No. of trainers to be trained regarding strengthening referral system and promotion of health awareness of local residents to change their medical behavior	persons	-	246	Refer to Chapter 5 Table 5-3 “Outline of Soft Component (Plan)” Breakdown of No. of target trainers are 108, 80 and 58 for the activities on patient management system, the public health campaign to prevent diseases and the awareness activities to improve health literacy of the people, respectively.

MCH: Medical College Hospital, CDH: Civil District Hospital, LSCS: Lower segment Caesarean section

Source: JICA Survey Team

14.1.2 Qualitative Effects

The qualitative effects envisaged by the project implementation are as follows:

- Improvement of patients' satisfaction and comfortableness with healthcare services in terms of hospital facility, hospital staff, doctor's behaviour, etc. The public hospitals provide affordable services equally to any individuals of the general public including women and socially vulnerable people; so at least a half of those patients are envisaged to be female.
- Improvement of living environment in the target areas such as enhancement of advanced healthcare, improvement of access to healthcare services among residents. Likewise, the residents in the target areas include women and vulnerable people.
- Improvement of health personnel's satisfaction with working environment, learning environment, etc.
- Development of high-quality health personnel and provision of qualified health personnel in the state through clinical trainings. Likewise, health personnel include women.

14.2 Economic Analysis

14.2.1 General Assumption

Economic analysis is an evaluation method of economic viability of a project by comparing economic benefit, which is calculated by comparing benefit using the "With and Without" case, and economic cost. The economic viability of the project will be evaluated through estimation of economic internal rate of return (EIRR), cost benefit ratio (CBR) and economic net present value (ENPV) in the present analysis.

Since the project consists of several components, which comprehensively cover health sector in Assam and are mutually dependent on each other (refer to Chapter 5), EIRR, CBR and ENPV of the project as a whole are calculated and evaluated rather than component-by-component or facility-by facility. In fact, it would be difficult to estimate EIRR, CBR and ENPV component-by-component or facility-by facility, and it might be also difficult to interpret those fragmented indicators in order to properly evaluate the project with complex setting.

Most of the soft components of the project are not the direct target of economic analysis, because the economic benefit of them is difficult to converted to monetary value. However, it should be noted that the soft components of the project will play an important role to realize the outcome/benefit of other components and of the project as a whole by contributing for improvement of quality and quantity of health personnel and organizational and management capabilities.

The "without" case is set as the case where the public hospitals in the target area are maintained in their current status.

Healthcare services at public hospitals in Assam are basically free of charge, except for some medical services (such as initial consultation (registration) fees and some tests and treatments) and medicines, which are funded by the government tax revenues (in the form of government subsidies). Thus, the hospital service revenue is minimal compared with the project cost. In addition, the government of Assam is planning to expand the coverage of the public health insurance system in the future, which will further reduce the

patient's co-payment (payment at the hospital counter). Moreover, in this survey, it was unable to obtain financial data such as financial statements of public hospitals, as well as information on the public health insurance system in Assam, such as coverage, expenditure and the share of government subsidies in the financial resources. Based on this situation, financial analysis is not implemented because it cannot be said that public hospitals necessarily collect fees from users (patients), and it is difficult to analyze and forecast the fee revenue at the same time.

General assumptions made for the economic analysis are described as per Table 14-2.

Table 14-2 General Assumptions of Economic Analysis

Item	Assumption
Project period	Year 2022 to 2057 - Construction period: 2022 – 2027 (6 years) - Operation period: 2028 – 2057 (30 years)
Exchange rate	USD 1.00 = JPY 114 USD 1.00 = INR 74.5 INR 1.00 = JPY 1.53
Prices	Cash flow projection is expressed in constant prices excluding inflation. Local currency portion of cost and benefit is adjusted with Standard Conversion Factor of 0.9.
Physical contingency	Construction: 5.0% Consulting services: 5.0%
Transfer items	Taxes, interest and subsidies are eliminated from the economic analysis
Hurdle rate for EIRR	10%

Source: JICA Survey Team

14.2.2 Economic Cost

Table 14-3 shows the construction cost as well as the O&M cost of the project, which are mentioned in Chapter 13 and converted to the economic cost.

Table 14-3 (This Part Intentionally Left Blank)

14.2.3 Economic Benefit

(1) Advanced Medical Care

Quantifiable benefit from the provision of advanced medical care is envisaged from the medical treatments of non-communicable diseases (NCDs) such as severe heart and brain diseases. An existing study shows that NCDs are typically present in individuals aged 55 years or older in many developed countries; however, their onset occurs in India a decade earlier (from not less than 45 years of age). Also, according to WHO, NCDs are estimated to account for 63% of total deaths in India. The introduction of angiography devices

in super specialty wings in six medical college hospitals will enable both investigation and treatment surgery to cope with such diseases. The economic benefit in this regard is estimated based on the following assumptions:

- Usage capacity of angiography devices is assumed at nine times per day per unit: of which, use for catheter treatment surgery operation accounts for a third (33%), and medical test usage accounts for the other two thirds (67%). Treatment surgery is operated at 250 days per year.
- Survival rate after the catheter treatment surgery using angiography is assumed at 60%.
- The patients are 45-65 years of age and their economic activities up to 65 will be prolonged for ten years on average. The economic effects are quantified through long-term projection of Assam's income per capita. Since data on long-term projection of the growth rate of Assam's income per capita was not available, the long-term projection of real GDP growth for India, which was published by OECD, was used instead in order to estimate Assam's income per capita in future periods[8].

Table 14-4 Long-term Projection of Income per Capita in Assam

	2025	2030	2035	2040	2045	2050	2055
Income per capita (INR)	114,413	145,701	177,163	207,803	237,968	268,556	301,188

Source: JICA Survey Team based on OECD long-term economic scenarios

This benefit is closely related to the components of "Super Specialty Wings in MCHs" as well as the soft components.

(2) Reducing Patients' Expense (OPD and IPD) at Private Hospitals

In the project, equipment for medical care will be installed at the targeted MCHs and DCHs. The service charge at those public hospitals (OPD and IPD) will be lower than the one at existing private hospitals. It is assumed that the patients use public hospitals instead of the existing private hospitals to reduce their payment after the project implemented. Since information on the cost of providing healthcare services in public hospitals was not available in the survey, the economic benefit in this regard is estimated based on the following assumptions:

- The costs of providing the same healthcare service are assumed to be the same in public hospitals and private hospitals. The costs are not included in the calculation of economic benefit of this project because it is necessary whether the service is provided in a public hospital or a private hospital.
- In private hospitals, patients pay for the fee of healthcare service, which is the sum of the costs and profits. This is equivalent to the revenue of private hospital. On the other hand, public hospitals are not for profit, so they do not add profits to their costs. Therefore, it is assumed that this project will reduce the patients' expense on health equivalent to the amount of profit for private hospitals.

The benefit of reducing patients' expense after the project implementation is calculated as follows:

Benefit of reducing patients' expense = "Profit margin of private hospitals per patient" * "Number of patients at the targeted MCHs and DCHs"

[8] The compound annual growth rates (CAGR) of GDP per capita both for Assam and for India over the past nine years have been almost the same (9.8%), and the growth rates of GDP per capita and GNI per capita for India over the past ten years have been staying at the same level.

Since data on sales and profits of private hospitals for the entire state of Assam or the entire country was not available, data of an individual hospital is used instead. Table 14-5 shows the healthcare service rates at a typical private hospital operated in Assam, namely Apollo Hospitals[9]. According to the Apollo Hospitals Investor Presentation, average EBITDA margin is 22% in the past 12 years. The profit margin of private hospitals per patient is calculated by multiplying the average service rate by EBITDA margin rate.

Table 14-5 Comparison of Hospital Service Rates

	Private Hospitals
OPD revenue per outpatient	INR 7,300
IPD revenue per inpatient	INR 151,000
EBITDA margin	22%

Source: JICA Survey Team and Apollo Hospitals Investor Presentation June 2021

This benefit is closely related to the components of "Critical Equipment in all MCHs" and "Infrastructure Improvement in DCHs" as well as the soft components.

(3) Reducing Travel Costs

The benefit of reducing transportation and accommodation costs for inpatients' families to accompany the inpatients is calculated as follows:

> Reducing transportation and accommodation costs for inpatients' families to accompany the inpatients = "Transportation and accommodation costs per family of inpatient to the nearest MCH" * "Number of patients who would receive medical services at tertiary public hospitals instead of the secondary hospitals unless the project would be in place"

It is assumed that the patients, who would need to receive proper medical services at secondary public hospitals, would have to directly go (bypass) to tertiary public hospitals due to insufficient quality or quantity of services provided by their nearest secondary public hospitals, in the absence of the project. The economic benefit in this regard is estimated based on the following assumptions:

- At least one family member accompanies the inpatient and stays for four days.
- Average distance from where patients live to the nearest tertiary hospitals is 50 km and they use taxi.

Table 14-6 Transportation and Accommodation Costs for Inpatients' Families

	Unit Price	Quantity	Total
Transportation cost per family	INR 1,032 per one way	2 ways	INR 2,065
Accommodation cost per family	INR 1,600 per night	4 nights	INR 6,400

Source: JICA Survey Team and NUMBEO « Taxi Fares in Guwahati, India »

This benefit is closely related to the components of "Infrastructure Improvement in DCHs" as well as the soft components. Although the benefit of reducing travel costs for inpatients' families could be arisen not only from the above assumed situation but also other cases such as eliminating travels to private hospitals, etc., those benefits are not included due to the difficulty of collecting reliable data and making logical assumptions.

14.2.4 Estimation of EIRR

Results of the economic analysis of the entire projects is shown in the following table. Each indicator is calculated based on the following method:

[9] https://www.apollohospitals.com/

EIRR = (Discount rate which makes economic value at 0)

CBR (B/C) = (Net Present Value of Economic Benefits) ÷ (Net Present Value of Economic Costs)

ENPV = (Net Present Value of Economic Benefit) – (Net Present Value of Economic Costs)

Table 14-7 (This Part Intentionally Left Blank)

Table 14-8 shows the economic cash flow projection of the project. Table 14-9 shows the results of the sensitivity analysis. It indicates that O&M cost increase is less sensitive to the EIRR results than construction cost increase. Also, EIRR will be higher than the hurdle rate in case of 20% decrease in hospital services at MCHs and DCHs (OPD, IPD, and advanced medical care) and benefit from transportation and accommodation costs reduction.

Table 14-8 (This Part Intentionally Left Blank)

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Chapter 15 Cooperation between India and Japan (Utilising Japanese Knowledge and Technology)

As an approach to solve the essential issues related to the medical services in Assam, it is conceivable to utilise the Japanese experience and knowledge. Specifically, it includes hospital management, 5S (Sort, Set, Shine, Standardise, Sustain) / Total Quality Management (TQM), human resource development / medical education, medical technology, operation and maintenance system, and infectious disease control.

JICA's scheme for this purpose may include soft components, the incidental technical cooperation projects related to this project, and regular technical cooperation projects. On the other hand, it is also possible to utilize the experience and knowledge of Japanese universities, hospitals, and private companies. Therefore, the following approaches are required for project implementation in order to collaborate with Japanese universities, hospitals, and private companies.

Table 15-1 Approaches to promote India-Japan Cooperation with Japanese Universities, Hospitals and Private Companies

(1)	Survey on the possibility of utilising the technology and knowledge of Japanese universities, hospitals, and private companies for India.
(2)	Analysis of what kind of technology / knowledge is effective for solving issues.
(3)	Needs in Assam confirmation survey and holding workshop in India related to the contents clarified by the needs survey, conduct online seminars for Japanese universities and companies.
(4)	Sign the Memorandums of Understanding with Japanese companies, universities and hospitals that meet the Indian needs

Source: JICA Survey Team

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Annex I Methodology of the Subcontracted Survey

1. EXECUTIVE SUMMARY

The Team Leader of JICA Survey Team – Mr. Hiroshi Abo on behalf of Koei Research & Consulting Inc. Japan (KRC) entered in to a contract with United Engineers Alliance (UEA) Pvt. Ltd. (the Sub-Consultant) on 2nd day of the month of June 2021 for the execution of the Preparatory Survey for Health System Strengthening Project in Assam State, India (the Project) under the contract dated 24th March 2021 between JICA & KRC Consortium.

The assignment commenced from 16th June 2021 is to provide to carry out the Field Survey of the Public Hospitals that includes 7 MCHs and 6 DCHs and 6 PHF (Target Hospitals) for the Survey to support KRC Consortium to effectively design the Project. The services delivered by a team of surveyors with short term inputs in different MCHs and DCHs (Target Hospitals) on priority. The survey aims to find out bottleneck or the challenge in patient services in government hospitals and teaching/learning environment of education in the medical college & hospitals under Level of Satisfaction and Care seeking behaviour. Subsequently, the field survey team will be conducting the survey activities on (i) management & satisfaction and (ii) Facility & Medical Equipment of Target Hospitals.

The main object of the progress report is to highlight the assessment of the current situation of the project parameters, as originally envisaged in the Terms of Reference (TOR), after their findings during the progressive phase. *The report also includes the Surveor's approach and methodology towards successful completion of* the project and perception of the work schedule, personnel deployment and the timelines for the project.

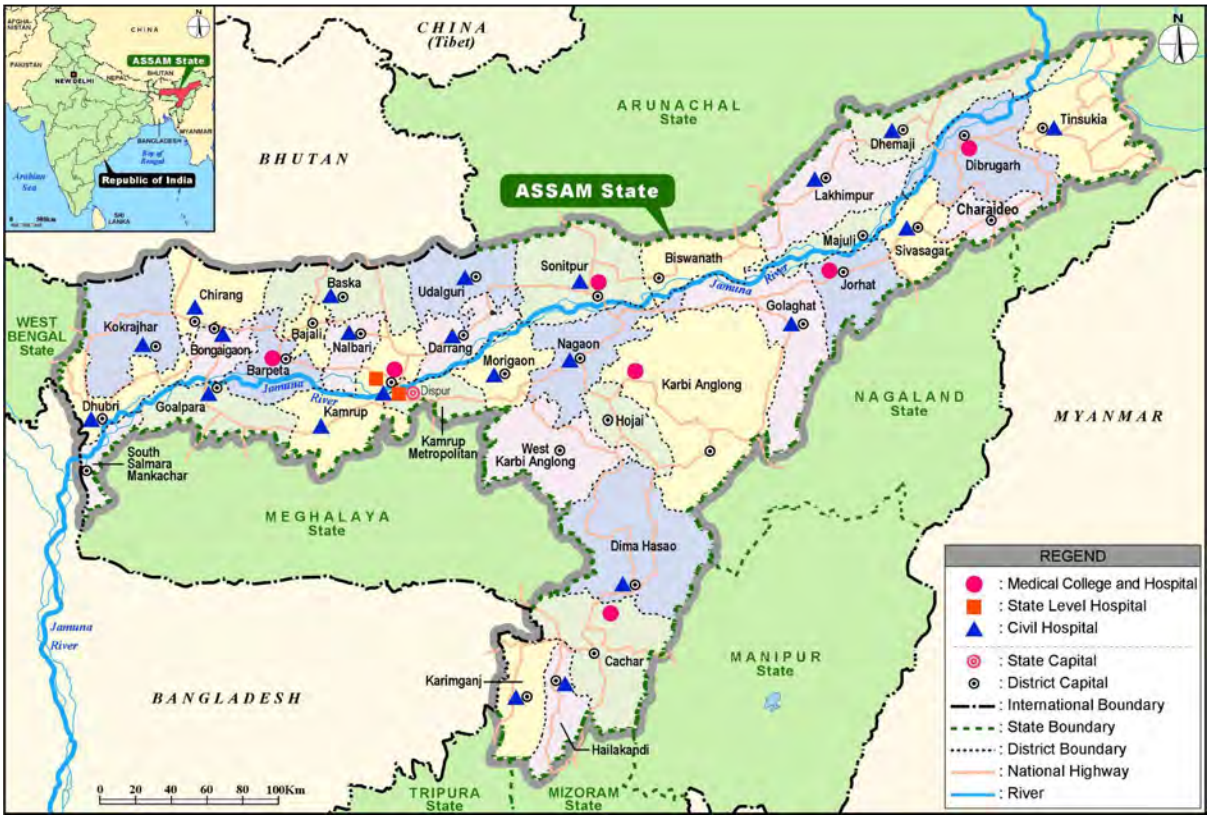


Figure -1

2. INTRODUCTION

2.1 Purpose of the Progress Report

The main purpose of this Final Report is to bring out the field level existing status for planning the Project and to provide information of the services to be completed based on existing scenario.

The final phase has been completed close liaison with KRC, GOA, MCHs and other key stakeholders enabling greater clarity in determining the Survey areas of work and approach to conducting the services.

It is important for the contents of the Final Report to be understood and agreed by the stakeholders in order to be accurate and to accomplish the work.

2.2 Project Background

For universal health coverage (UHC) of Assam people with no one left behind, the State Government requested JICA for assistance on strengthening of health service network through improvement of public hospitals. To formulae of Japanese ODA loan project, JICA will conduct the preparatory study for health system strengthening in Assam State (the study) aiming to identify the scope and prepare the implementation plan. To ensure effectiveness and sustainability of the project, the study will cover not only the health facilities but also the health system, provision and utilization of health services in Assam State. Especially, human resources might be one of the priorities to ensure quantity and quality.

2.3 Overall Objectives

Under the study, the field survey on public hospitals (the survey) will be conducted with the following objectives:

- Collect data and information on facility, medical equipment, as well as operation and management of public hospitals in Assam State
- Collect and analyse information on level of satisfaction and possible determinants of patients and hospital staff

Target Hospitals:

- 7 medical college and hospitals
  The final list of target hospitals included **6 numbers of District Civil Hospitals** and **One Primary Health Facility nearby each District Civil Hospital**. The list is shown below:

The List of Target Medical College & Hospitals and District Civil Hospitals:

No	District Name		Education Hospital		State Level Hospital		District Hospital
1	Barpeta	✓	Fakuriddin Ali Ahmed Medical College & Hospital				Barpeta Civil Hospital Kalgachia
	Bongaigaon						Bongaigaon CH
	Goalpara					✓	200 BEDDED CIVIL HOSPITAL
	Baksa						Dr. Ravi Boro Civil Hospital Baksa
	Chirang						J.S.B CIVIL Hospital Chirang
	Kokrajhar						RNB CIVIL HOSPITAL KOKRAJHAR
	Dhubri						Dhubri Civil Hospital
2	Cachar	✓	Silchar Medical College and Hospital				S.M.Deb Civil Hospital Silchar
	Dima Hasao						Haflong Civil Hospital
	Hailakandi					✓	S.K.Roy Civil Hospital
	Karimganj						Karimganj Civil Hospital
3	Dibrugarh	✓	Assam Medical College and Hospital				
	Tinsukia					✓	LGB Civil Hospital
	Dhemaji						Dhemaji Civil Hospital
4	Jorhat	✓	Jorhat Medical College and Hospital				
	Golaghat						Kushal Konwar Civil Hospital
	Sivasagar					✓	Sivasagar Civil Hospital
	Lakhimpur						North Lakhimpur Civil Hospital
5	Kamrup M	✓	Guwahati Medical College & Hospital (GMCH)		MMCH (Annex Hospital of GMCH)		Sonapur District Hospital
					Ayurbedic College		
	Kamrup R						TRB Civil Hospital
	Nalbari					✓	SMK Civil Hospital
	Darrang						MANGALDAI CIVIL HOSPITAL
	Udalguri					✓	Udalguri Civil Hospital
	Morigaon						Morigaon Civil Hospital
6	Karbi Anglong	✓	Diphu Medical College and Hospital				
	Nagaon						B.P.Civil Hospital (MCH wings Mohkhuhli)
7	Sonitpur	✓	Tezpur Medical College and Hospital				Kanaklata Civil Hospital

Table - 1

2.4 Stakeholders and Beneficiaries

2.4.1 Stakeholders

The main stakeholders are the Health Department, Government of Assam, all the 7 MCHs and Target Hospitals (DCHs/ PHFs), the Project Development Partners (KRC, Yamashita Sekkei Inc., and Nippon Koei India Pvt. Ltd.). The funded and promoted partner is JICA.

2.4.2 Beneficiaries

The main beneficiary is the Health Department and its various organizational units involved in planning and developing the Health System maintenance and improvement project. Benefits also spread to service providers, patients, medical students and the society impacted by strengthening of Health System.

2.5 Team mobilization

The Field Survey Consultancy Service agreement was executed on 02nd June 2021 and the date of commencement of services was declared as 16th June 2021.

There are members in the team who were actively involved in the development of Questionnaires for Level of Satisfaction and Care seeking behavior survey. The team under the leadership of Mr. Dipon Ghosh, Director-UEA, Dr. Nibedita Paul, Team Leader- Survey and Mr. Santanu Hazarika, Civil Engineer together with Mr. Bhopendra Madar, Coordinator and Mr. Rituparna Borkakoti, IT; developed questionnaires for different medical cadres and patients in any MCH/ DCH/ PHF.

The present status of mobilized Surveyors has been represented as tabular form as follows.

Table -2

Sl. No.	Position	Name
1	Team Leader – Field Survey	Dr. Nibedita Paul
2	Surveyor (Coordinator)	Mr. Bhopendra Madar
3	Surveyor (Coordinator & IT)	Mr. Rituparna Borkakati
4	Surveyor	Mr. Abhijit Banik
5	Surveyor	Md. Aakib Ahmed Rezbi
6	Surveyor	Mr Sailodhar Gohain
7	Surveyor	Mr. Krishna Gopal Banik
8	Civil Engineer	Mr. Partha Pratim Sarma
9	Sr. Civil Engineer	Mr. Santanu Hazarika
10	Communicator	Ms. Surabhi Agarwal
11	Surveyor	Mr. Sujal Bhowal
12	Civil Engineer	Md. Wasim Ahmed
13	Surveyor	Md. Rafiqul Haque Ahmed
14	Surveyor	Mr. Ramakant Goala
15	Surveyor	Mr. Pradip Debnath
16	Surveyor	Mr. Chandan Hazarika
17	Civil Engineer	Mr. Nileem Kalita
18	Surveyor	Mr. Suraj Banik

3. THE APPRAISAL OF THE SERVICES PROVIDED.

3.1 General

The Field Survey Consultancy Services are intended to assist KRC and the consortium (Yamashita Sekkei Inc., and Nippon Koei India Pvt. Ltd.) in conducting the field survey for all the 7 MCHs and 6 DCHs/ 6 PHFs (Target Hospitals) our appraisal of the field survey services to be provided, has been formed by:

i. TOR and findings during the progressive phase of Level of Satisfaction;

ii. Status of survey activities;

iii. Needs for ongoing and immediate activities;

iv. Reports and other documents, etc.; and

v. Meeting with the Stakeholders (JICA, HFWD -GoA, DME, DHS, NHM, etc)

3.2 Coordination and Support

Under the overall guidance of KRC & the Consortium, the Field Survey teams are required to work closely with the Health Department, GoA, all the & MCHs and the Target Hospitals. We also anticipate involvement of the representative from each MCH and the Target Hospitals for coordination and support during entire survey activities.

At this current (COVID-19) Pandemic situation and under strict SOP from ASDAMA –The coordination and support from the stakeholders and GoA will finally result in achieving broad goals against defined timeframe.

There are four different departments that are looking after the MCHs, Target Hospitals and Various Government Schemes.

The departments are:

Directorate of Medical Education (DME): Looks after all the operations of Medical College & Hospitals in Assam

Directorate of Health Services (DHS): Looks after all the operations of District Civil Hospitals and Primary Health Facilities in Assam

Directorate of Health and Family Welfare (DHFW): Generally Directorate of Health and Family Welfare is the Department of Assam for implementation of programmes like small family norms, universal immunization programmes and also to implement the **PC PNDT# act**. All programmes are funded by Govt. of India as under **RCH-II programme##**.

National Health Mission (NHM), Assam: NHM supports to provide healthcare to rural population throughout the State Assam with special focus on districts which have weak public health indicators and for weak infrastructure to bring about reduction in child and maternal mortality. NHM also supports to improve universal access to public services for food and nutrition, sanitation and hygiene and universal access to public health care services with emphasis on services addressing women's and children's health and universal immunization. Also to support to improve access to integrated comprehensive primary health care to bring about population stabilization. Generally NHM supports to promote healthy life styles.

Hence, our field survey activities are directly linked to and supported & coordinated by, DME and DHS.

Note: (1) # The PC-PNDT Act [The Preconception and Prenatal Diagnostics Techniques (Prohibition of Sex Determination)] was enacted on 20 September 1994 with the intent to prohibit prenatal diagnostic techniques for determination of the sex of the fetus leading to female feticide.

(2) ## Reproductive and Child Health (RCH) programme is a comprehensive sector wide flagship programme, under the umbrella of the Government of India's (GoI) National Health Mission (NHM), to deliver the RCH targets for reduction of maternal and infant mortality and total fertility rates.

3.3 Summary of the Services

The Field Survey services are being carried out in two phases under the three Components listed in the Terms of Reference (TOR) and shown as below,

Component 1: Level of Satisfaction and Care Seeking Behaviour

1. Level of satisfaction of MEDICAL EDUCATION /TRAINING/ CME;

2. Level of satisfaction of MEDICAL SERVICE PROVIDERS;
3. Level of PATIENT SATISFACTION; and
4. Care seeking behavior of people in Assam.

Component 2A: Management and Satisfaction

1. General Information & Management;
2. Patient statistics; and
3. Human Resources.

Component 2B: Facility and Equipment

1. Existing Facilities and concerns;
2. Availability and size of construction sites for facility expansion;
3. Survey of infrastructure condition (Electrical, Water Supply, Sewage, etc.);
4. Accessibility condition;
5. Access road;
6. Medical Equipment; and
7. Other information.

Accordingly, we feel stage wise Tasks to be performed are as below,

Summary of List of Tasks and its Descriptions

List of Task	Description
1. Preparation, design and approval of questionnaires	Focus technical aspects on activities related to the preparation of questionnaire for the survey works to be undertaken under the programmes. Subsequently, approvals from the concerned authorities.
2: Preparation of Work Plan and Activity Schedule	A detailed work plan and activity schedule for Component 1 and Component (2A & 2B) has been prepared to track the progress within the timeline.
3: Development of Web application online Questionnaire	On finalization of the Questionnaires, the questionnaires shall be converted for online web application App.
4: Selection of Surveyors for the particular MCHs/ Target Hospitals	The Team Leader – Survey shall select the Surveyors as per the requirement and gravity of the services for each MCH and DCH/ PHF.
5: COVID -19 Protocol	All the members of the Survey team are to maintain the COVID-19 protocol strictly to avoid infection.
6: Presentation, Approval and Permissions from GOA and other stakeholders for conducting the survey activities.	Communications from KRC and UEA to GOA and other stakeholders for the necessary approvals, permissions and accessibility for conducting the Survey activities without any hindrance.
7: Registration of the Survey stakeholders from MCH/ DCH	An online registration process has been initiated to register all the sample stakeholders (Doctors, interns, nurse, nursing student and other paramedical staff, etc.) for online interview.
8: Direct interviewing of In-patient and Out-patient of MCH/ DCH	In the presence of the Surveyor and the coordinator, there will be an interview session with the in-patient or out-patient, maintaining the COVID- protocol, using the Android mobile phone or iPad with the Surveyor.
9: Online interviewing of Doctors, Interns, nurse and	After completion of the registration process, there will be automatic generation of an OTP and User Id for each stakeholder for the online interview which will be informed through

List of Task	Description
other staff in MCH/ DCH	SMS to the person concerned. The Surveyor shall follow up and guide the stakeholder for any confusion during the interview session using his/her Android mobile phone or iPad or Laptop/ Desktop.
10: Communication & Reporting	All communication to any stakeholder of GOA/ KRC has to be reported from Director-UEA. There has been What's App group formed within the team of surveyors to report daily activities to the Team Leader- Survey. The team will also take note of the local situation and appraise accordingly to all the team members for their movement and during any adverse situation in relation to the security issue, if any, the concerned team member shall intimate the Team Leader- Survey immediately for necessary decision.
11: Meetings & representations	Director – UEA and Team Leader – Survey shall attend all the necessary meetings that only after requested/invited by KRC. Again the meetings with GOA/ MCHs/ DCHs may be attended by Director-UEA/ Team Leader/ Coordinator on behalf of KRC on the approval of KRC only.
12: Data Filtering and Analysis	After collection of sample data from various stakeholders as per ToR, the data shall be scrutinised, filtered and analysed using Microsoft Excel, SPSS and Python Programming.
13: Preparation of Reports	The draft final report shall be prepared based on the requirement of project need and the sample data. The report shall highlight the various parameters that require for decision making in the development of the project.

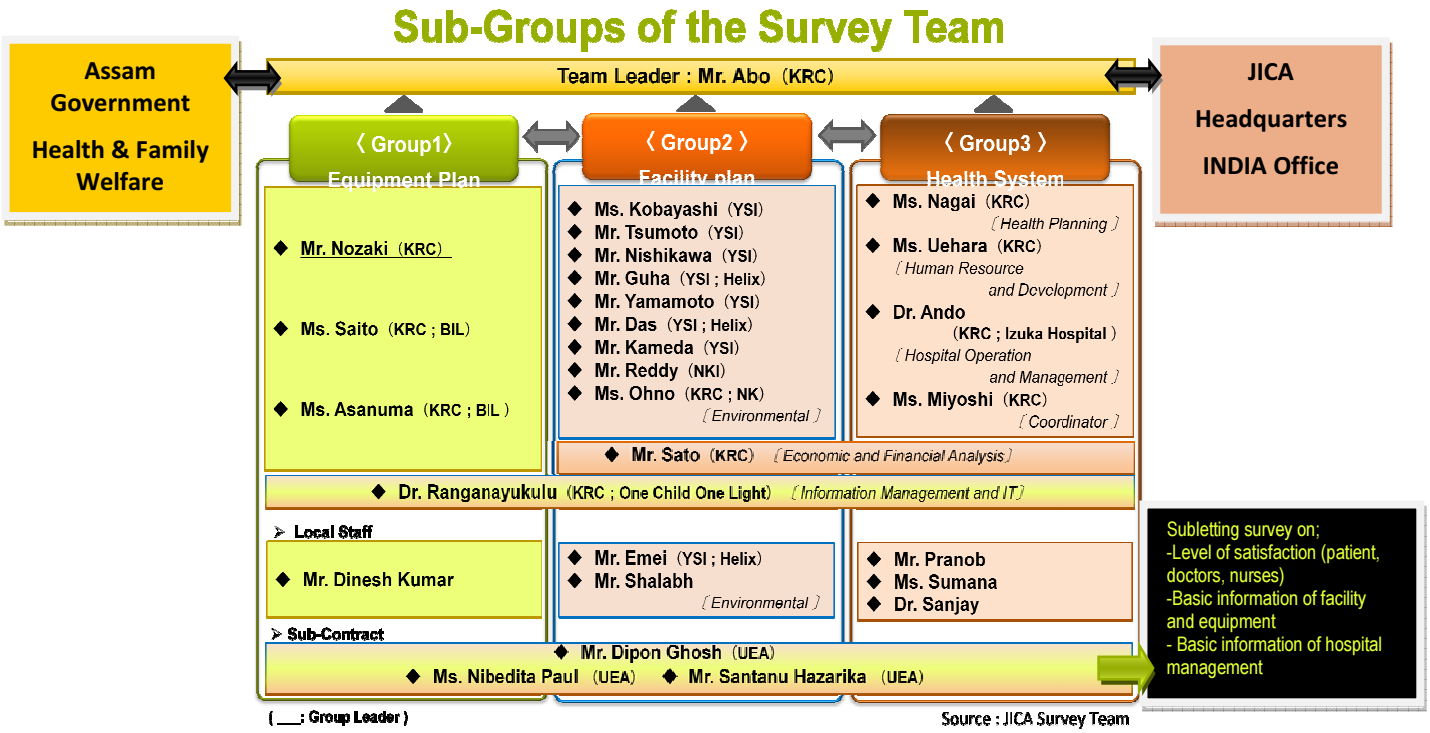
The field survey activity started on 19th July 2021 from Diphu MCH and Silchar MCH.

Due to current COVID-19 situation, preparedness for 3rd Phase of Pandemic, restrictions from travelling at night in curfew and strict SOP from ASDAMA, GoA, the progress of the survey gets affected. Again there is inter-state border dispute between Assam & Mizoram that created security issue for the surveyors' movement. So, to keep the momentum of the survey activities, the surveyors are to keep moving at the places where the security and safety issues are minimum or nil.

4. PROJECT ORGANIZATION AND PROCEDURE

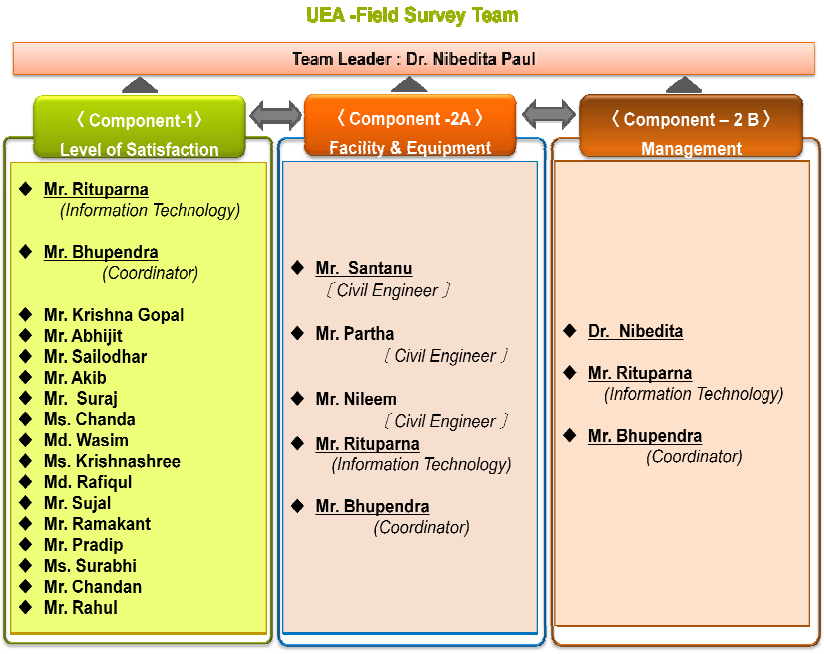
4.1 Project Organisation

4.1.1 Survey Team Structure



4.1.2 Organisation Structure of the Field Survey Services

A dedicated Field Survey team under the leadership of Dr. Nibedita Paul has been established to cover all the 7 MCHs and 6 numbers of DCHs/ PHFs. The entire team is in close coordination with the representatives of the 7 MCHs are on site for the survey activities. Regular communication with the Principal/ Chief Superintendent/ Superintendent is made for any Support in conducting the survey activities. On the other hand, the survey team also communicated DHS for collecting the permission and approval for conducting the survey activities in the selected DCHs/ PHFs.



5. APPROACH & METHODOLOGY

5.1 General Approach

After initial discussion with KRC on 24th May 2021, UEA initiated and started in-house perceptive and assessment on the approach for conducting the survey activities. The first meeting on 8th June 2021 with the entire Survey team, JICA and the Government of Assam showed the light on the concept of the project, the purpose and the objective.

UEA then communicated the initial team members for preparing the work plan, methodology and questionnaires for conducting the survey activities during COVID-19 situation when the infection rates were very high in Assam as compared to other Indian States. Moreover, there was strict SOP from ASDMA, GoA.

The first point rose in the group that we have to avoid direct contacts while interviewing the medical cadres and patients. Accordingly, planning for web application software App was incorporated in the methodology.

After attending series of meetings and discussions with the Survey Team, JICA and HFWD, GoA, we finally able to develop 11 numbers of Questionnaire for Level of Satisfaction and Care seeking behavior and One each set of questionnaire for Facility & Equipment and Management & Satisfaction for all 7 MCH.

There shall be separate set of questionnaires for DCHs/ PHFs for Level of Satisfaction and Care seeking behavior and one each set of questionnaire for Facility & Equipment and Management & Satisfaction.

There are groups of surveyors formed in viewing the current security scenario for conducting the survey activities where the preference of surveyors is from the same district or area to avoid night travelling during curfew for security reasons. However, there are Surveyors (team leader, coordinators and demonstrators) who have to travel to all the selected hospitals for initiating, communicating the stakeholders and conducting the survey activities.

i. Preparation of Questionnaires and Work Plan

The preparation of questionnaires for Level of satisfaction started in the month of June and then the questionnaires were converted in software application for online interviewing.

After discussion with the Principal, GMCH on 12th July 2021, the following sample outlines were drawn & concluded and accordingly the questionnaires were modified and finalized.

The details of sample size for **Level of satisfaction and Care seeking behavior of MCHs** are as follows:

I. Level of satisfaction with Medical Education & Training			
Stakeholder Name	**Sample Size/**	**Survey Item**	**Output**
Professor in MCH (Doctor)	10 number (covering all the departments)	Teaching/ Mentoring environment (facility, equipment, condition, etc.)	Needs for teaching environment improvement
Associate Professor in MCH (Doctor)	10 number (covering all the departments)		
Assistant Professor in MCH (Doctor)	15 number (covering all the departments)		
Doctor (year of experience < =5)	15 number (covering all the departments)	Learning environment (facility, equipment, condition, etc.), contents of education/ training	Incentives to learning, Needs for learning environment improvement
Interns	15 numbers (covering all departments)		
Other Staff	20 numbers (covering all departments)		

II. Level of satisfaction of medical service providers			
Stakeholder Name	**Sample Size**	**Survey Item**	**Output**
Doctor (year of experience > 5)	15 number (covering all the departments)	Working environment/ condition, facility, equipment, retention strategy, etc.	Needs for medical personnel and incentives to retention
Doctor (year of experience < =5)	10 number (covering all the departments)		
Nurse	15 number (covering all the departments)		
Nursing Student	10 number (covering all the departments)		
Other Paramedical Staff (e.g. Pharmaceutical, Laboratory, Medical Equipment operators, etc.)	10 number (covering all the departments)		

III. Level of patient satisfaction			
Stakeholder Name	**Sample Size**	**Survey Item**	**Output**
Patients in OPD of medical college hospitals	50 number (covering all the departments)	Facility, equipment, clinical services/ outcomes, patient services/ hospitality, consideration for the vulnerable, reasons to skip the nearest district hospital, etc.	Needs of patients and their family
Patients in IPD of medical college hospitals	50 number (covering all the departments)		

IV. Care seeking behavior of people in Assam			
Stakeholder Name	**Sample Size**	**Survey Item**	**Output**
Academic experts on medical anthropology/ social medicine	Maximum 2 numbers	Care seeking behavior and its background factors in Assam	Perception on government health services

Proportionately we collected the information of the sample size of DCH/ PHF as per ToR,

The Questionnaires are:
Level of Satisfaction and care seeking behavior

1. Medical Teachers
2. Doctors (> 5 Yrs experience)
3. Doctors (< =5 Yrs experience)
4. Interns
5. Nurse
6. Nursing student
7. Other paramedical staff
8. Academic Experts
9. IPD
10. OPD
11. Middle Class Patients

However, we came to know that the Nursing Education/training and Education for other paramedical training have not included with GMCH, JMCH, TMCH and DMCH. However, we have received the response for students for nursing and other paramedical services in SMCH, AMCH and FAA MCH.

A work plan has been drafted for completing the survey activities within the time limit assigned, however we could able to start the survey activities on 19th July 2021, initiating from DMCH and SMCH after obtaining the permission for inter-district mobility on 16th July 2021. Again on the stakeholders meeting on 3rd August 2021, decision for selection of DCHs/ PHFs is finalized.

On the other hand, we also finalized the questionnaire for Facility & Equipment and Management & Satisfaction and the survey activities started from 29th July 2021.

ii. Planning for Survey Activities

Initially, the team started with 4 members for preparation of questionnaires, work plan and other planning activities. After finalization of the questionnaire and obtaining the permission for accessibility in all 7 MCH, the team communicated to all the 7 MCHs for collecting the contact details of Doctors, Nurse, Interns, and other staff as per the sample size for the registration in the web application.

There were another 6 Surveyors, mobilized for conducting the survey activities of IPD & OPD in DMCH, GMCH, FAA MCH and SMCH. At the same time they were involved in following up with the Doctors, Nurses, etc. for assisting in filling up the online questionnaires. UEA also engaged a communicator who is supporting the Doctors, Nurses, etc. remotely and clarifying all their queries and curiosities on the project. E.g. (a) what is JICA? (b) Will it affect my career, if not answering any question? (c) How is the project helping me as I am retiring shortly? etc. Some were even deleting the SMS that generated after registration of the concerned medical cadre as they are afraid of software hacking of their bank account. Here the communicator plays a very good role to clarify and in boosting their confidence.

After inclusion of 6 DCHs and 6 PHFs, we engaged 9 more Surveyors for expediting the activities.

There are total 18 Surveyors and Engineers engaged in this Survey for conducting the survey activities within the time limit.

iii. Communication with GoA, DME, MCHs, DHS

UEA received over whelming response from the Government of Assam and other stakeholder departments. UEA firstly communicated Dr. Siddharth Singh, IAS Commissioner and Secretary to GoA, HFWD on 24th June 2021 where all the department heads (DME, DHS, NHM, Jt. Director HFWD, etc.) were present. UEA presented the survey plan of actions and requested for their support. UEA submitted the sample questionnaires for Level of satisfaction and care seeking behaviour to GoA.

Again Dr. Singh and Dr. Laxmanan, IAS Mission Director NHM advised UEA to start all the 7 MCH without further delay and accordingly it was then directed and advised to DME for necessary action.

On 25th June 2021, KRC wrote a letter to the Principal Secretary to GoA, HFWD on the accessibility and permission for survey activities.

Again on 7th July, UEA representatives met Prof. (Dr.) Anup Kumar Barman, DME and appraise the methodology using a PPT presentation, subsequently on 8th July 2021 UEA wrote a letter to DME, requesting for informing the Head of all 7 MCHs regarding UEA's engagement for conducting the Satisfaction Survey in all MCH. Accordingly, the DME issued a notification on 9th July 2021 to all MCHs. DME also issued a notification on 16th July 21 for the permission for inter-district vehicle movement for all the surveyors during Lockdown/ Containment/ Curfew areas as per SOP from ASDMA.

In the mean while, UEA met the Principal, GMCH on 12th July 2021 for initiating the Survey activities, Prof. (Dr.) Achyut Baishya then explained to the survey team on the positions of the Medical College & Hospitals. He pointed that there is no such Senior Doctor or Junior Doctor concept in the MCH. The positions are Professor, Associate Professor, Assistant Professor and all of them are involved in teaching as well as in medical service too. He also mentioned that the Nursing College and Paramedical Institute are excluded from GMCH. So, he can support only for those items which are available with GMCH. A separate letter was submitted to him on 13th July 2021 with modified sample size and questionnaires were then modified accordingly.

On 16th and 22nd July 2021, UEA communicated to all 7 MCHs, informing list of Surveyors to be present at the concerned MCH for conducting the survey activities.

Again on 31st July 2021, UEA communicated to all 7 MCHs and shared the questionnaires for (i) Management & Satisfaction and (ii) Facility & Medical Equipment.

Again to acknowledge, UEA received the list of contacts for Doctors, Nurse, Interns, Other Paramedical staffs, etc. from all the MCHs except JMCH and GMCH. However, UEA wrote a letter on 22nd July 2021 to JMCH for further submission of the list as requested.

Again, on the confirmation of DCHs on 4th August 2021 by HFWD, GoA and JICA; a letter from UEA was submitted to Dr. Rathindra Bhuyan, Director of Health Services, Assam for informing the concerned DCHs for survey activities and selection of nearest PHFs that attached to DCHs.

iv. Mobilization of Surveyors

The Surveyors were mobilized in phase manner as the target hospitals are selected and finalized for sample survey by JICA and GoA on 4th August 2021. The initial survey preparation activities were started in the month of June (8th June 2021) for planning & preparation of questionnaires and converting those into web application. The field survey started for Level of satisfaction and Care seeking behavior on 19th July 2021 from DMCH and SMCH and then subsequently FAA MCH.

UEA also engaged Surveyors for (i) Management & Satisfaction and (ii) Facility & Medical Equipment with effect from 29th July 2021 initiated from SMCH.

v. Evaluation, Controlling and Monitoring of Progress

Controlling involves taking management actions, whereas the Evaluation process deals with the comparison of performance with what was planned and drawing appropriate conclusions. At the same time UEA management is monitoring the entire survey activities and its progress.

5.2 Web Application Approach

Considering the ongoing COVID situation in Assam, UEA took the initiative to conduct the survey activities using Web Application App. However, the network and internet connectivity is still a major issue in Assam.

Application Model for Surveying Health System Strengthening, Assam

For conducting the survey under Component -1 i.e. Level of Satisfaction and care seeking behaviour of the Patient, Nurse, Doctors, Professors and students related with Medical or Health departments a web based application based survey model has planned to design which will be running any Android based mobile or web browser and operated through any Android 4G Mobile Handset / Tablet or any Laptop devices.

The data will be saved on the server through cloud based environment which will be again retrieved as and when require for further analysis.

Figure - 2

Importance of HSS Web Based Survey Application

- *Web based survey will be most appropriate during this pandemic situation*
- *Surveyor will be more safe and secured*
- *It will be helpful to collect data systematically*
- *It will also helpful for organization of data*
- *Collected data will be kept more secured*
- *Real time data will be collected*
- *Data will be authenticated*
- *Use of log-in password will help in identification of user/surveyor.*

Main Features of the HSS Web Based Survey Application

- Removes all manual paper work related with the survey
- Parallel data collection Process
- Reduce long time interview process
- Surveyor Identified easily from where data is not submitted as per work schedule
- Survey data are easily accessible for further analysis
- User of the application can easily submitted the data without any fault
- System also indicates the user to identify all left out question before submitting
- The secret key of the application can hides all the records from the surveyor submitted by the user.

Web based Survey Model:

In the web based survey model the "System Administrator" can add the Hospital Wise Surveyor in the System and Generate user login and password for the particular Hospital. The Surveyor can then visit to the Hospital and collect data after interviewing the patients and other staff of the Hospital and submit in the web based model along with the photograph of the concern person and GPS location of the survey.

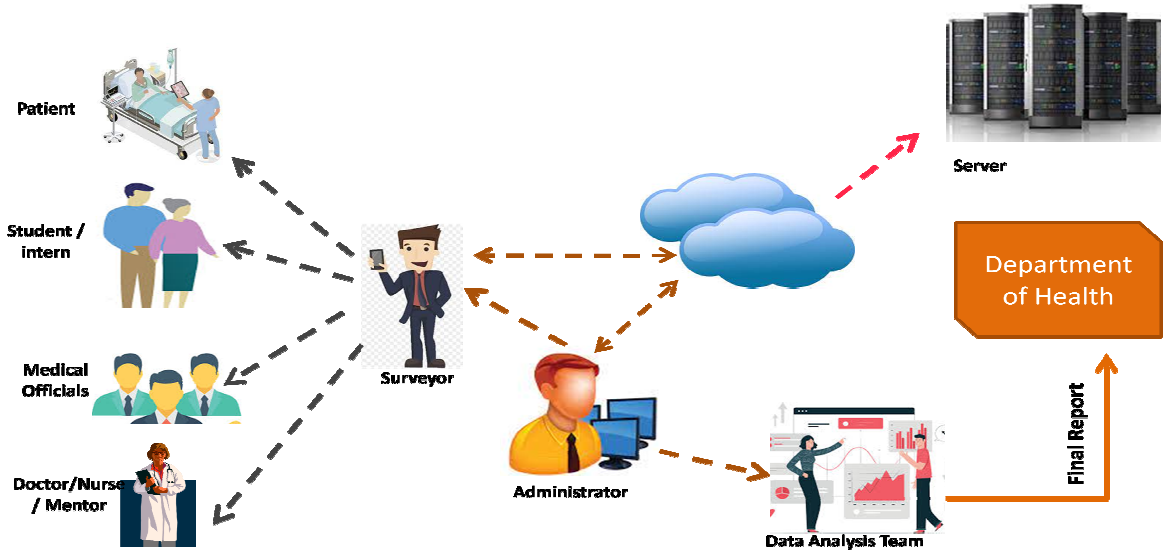


Figure -3

The survey application saved data to the Server through internet which will be retrieved by the system admin as and when require for further analysis of the data.

To view the survey filled up form

Desktop View

Figure -4

Kindly refer our earlier progress report for details of Web application methodology.

5.3 Status of Survey Activities

The survey activities are completed despite the COVID situation and shortage of time; however, after several pursuance's, we are yet to receive the documents from GMCH. The team faced lots of difficulties to enter into the GMCH premises for the collection of photos of the various infrastructure facilities due to COVID situation. We also found the non availability of some of the stakeholders (e.g. nursing student, academic experts, etc.) in some of the MCHs..

5.4 Summary of Correspondences with KRC and Health Department of Government of Assam

From	To	Dated	Subject
PS, GoA	All Stakeholders	8th June 21	Notification: Strengthening Health System and Excellence of Medical Education
KRC	PS, GoA	25th June 21 (Mailed on 28th June 21)	Request for permission for field survey, collecting documents, and movement in lockdown/curfew
KRC	CS, GoA	2nd July 21	Requesting to notify an officer to coordinate with the field survey team for the survey activities in Guwahati Medical College & Hospital and other 6 MCHs
KRC	CS, GoA	25th June 21 (Mailed on 8th July 21)	Request for permission for field survey, collecting documents, and movement in lockdown/curfew
UEA	DME	8th July 21	Requesting for kind support for conducting the field survey activities in Guwahati Medical College & Hospital and other 6 MCHs in Assam.
DME	All MCH	9th July 21	Regarding Preparatory survey for Assam Health System Strengthening Project'
UEA	GMCH	13th July 21	Requesting for kind support for conducting the field survey activities in Guwahati Medical College & Hospital.
UEA	DME	14th July 21	Requesting for granting permission for inter districts Vehicle Movement for conducting the field survey activities in 7 MCHs and Other Target Hospitals in Assam.
DME	UEA	16th July 21	Permission from DME
UEA	6 MCH	22nd July 21	Requesting for kind support for conducting the field survey activities
UEA	7 MCH	31st July 21	Questionnaire for Survey on (1) Management & Satisfaction and (2) Facility & Equipment.
UEA	DHS	4th August 21	Requesting for kind support for conducting the field survey activities in the Six Target Civil Hospitals and One each Primary Health Facility near to the Civil Hospital.
UEA	DME	6th August 21	Requesting for granting permission for inter districts Vehicle Movement for conducting the field survey activities in 7 MCHs and Other Target Hospitals in Assam : for more numbers of surveyors

5.6 Detailed List of Representatives from Health Department of Government of Assam

HFWD, GoA	HFWD, GoA	DME	DHS	MHC
Shri Anurag Goel, IAS Principal Secretary HFWD Government of Assam	Dr. Siddartha Singh, IAS Commissioner & Secretary HFWD Government of Assam	Prof. (Dr.) Anup Kumar Barman, Director, DME 9864065349	Dr. Ratindra Bhuiyan, Director, DHS : 9435100090, Dr. Lalsing, Additional Director DHS: 9101877330,	Guwahati MCH: Dr U K Sarmah: 9435340059, Dr Kuldeep Goswami : 9707049789, Metron: Ms. Anjali Nath : 7002302270
		Prof. (Dr.) N Sarmah, Deputy Director DME: 9864296343	Goalpara: Jt. Director Dr Abhijit Basu : 8876482434, 9435199163	FAA MCH Barpeta: Dr Uddip Talukder: 8753956772
			Hailakandi: Jt. Director Dr Ashutosh Barman : 9435071031	Diphu MCH: Dr Sumitra Hagjer, Principal: 9435144372
			Tinsukia: Jt. Director Dr Altaf Ahmed (JD) :8638851943, 9678084343, Dr Mridul Gogoi (Superintendent CH): 9435528637	Silchar MCH: Dr A K Barua: 9401952153
			Sivasagar: Jt. Director Dr S M Sarmah: 9435093640, 6001813611	Dibrugarh MCH: Dr Rupak Gogoi : 9435031260
			Nalbari: Jt. Director Dr Umesh Phangshu :9954095705	Tezpur MCH: Dr Karuna Hazarika: 9864018665
			Udalguri: Jt. Director Dr. Bramha : 7002626787	Jorhat MCH: Dr Ratna Talukder: 9864015372

NAME AND CONTACT DETAILS OF PRINCIPAL, MEDICAL COLLEGES AND HOSPITALS, ASSAM

Sl. No.	Name of MCH	Name of The Principal	Mobile Phone (+91)	E-mail ID
1	Assam Medical College & Hospital	Dr. Sanjeeb Kakati	87230 51445	principalamch@rediffmail.com; superintendentamc@rediffmail.com
2	Guwahati Medical College & Hospital	Dr. Achyut Baishya	99540 75427	gmch-asm@nic.in
3	Silchar Medical College & Hospital	Dr. Babul Bezbaruah	98640 66772	principlsmc@gmail.com
4	FAA Medical College & Hospital Barpeta	Dr. Ramen Talukdar	9435973537	faamc.barpeta2010@gmail.com
5	Tezpur Medical College & Hospital	Dr. Karuna Hazarika	98640 18665	tmctezpur@gmail.com
6	Jorhat Medical College & Hospital	Dr. Ratna Talukder	98640 15372	jmc-asm@nic.in
7	Diphu Medical College & Hospital	Dr. Sumitra Hagjer	94351 44372	drsumitrahagjer123@gmail.com; principaldiphu1@gmail.com

Annex II Important Modules in the National Health Mission

The following important modules are developed under GOI/NHM guidelines and in use. (there are several other modules for use in NHM related activities)

Sl	Important modules in NHM	Access to DHS/DFW/DME
1	**Swasthya Sewa Dapoon**	Yes
1 (a)	HR – MIS	Yes
1 (b)	Inventory Management	Yes
1 (c)	Civil Works Monitoring System	Yes
1 (d)	Maternal Death Reporting System	Yes
1 (e)	Child Death Reporting and Review System	Yes
1 (f)	ASHA Payment and Performance Monitoring System	Yes
1 (g)	Wage Compensation Scheme for pregnant women of tea gardens	Yes
1 (h)	HWC-CHO Performance Monitoring System	Yes
1 (i)	VHND (Village Health & Nutrition Day) Monitoring System	Yes
3	**Government of India Portals**	
3 (a)	RCH portal	Yes
3 (b)	Health Management Information Management System (HMIS)	Yes
3 (c)	AB-HWC Portal	Yes
3 (d)	NIN Portal	At present only with NHM
3 (e)	IHIP – IDSP	Yes
3 (f)	Nikshya – NTEP	Yes
3 (g)	e-Hospital	
3 (h)	DVDMS – CDAC	
4	**Other Portal**	
4 (a)	24 X 7 Command and Control Centre	Yes
4 (b)	Bio medical equipment maintenance program	Yes
4 (c)	108 – Emergency Referral Transport System	Yes
4 (d)	Chief Minister's Free Diagnostic Service – X-Ray Services	Yes
4 (e)	Chief Minister's Free Diagnostic Service – CT Scan Services	Yes
4 (f)	Chief Minister's Free Diagnostic Service – Laboratory Services	Yes

Annex III NHM - MIS PLAN 2021-22

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Preface:

National Health Policy 2017 emphasize to ensure district-level electronic database of information on health system components. State PIP 2021-22 of Assam focused on building electronic database of all health programmes. However, there may slight changes in the strategies after implementation of National Digital Health Mission which will be communicated on due course of time.

Following activities are prioritized in the financial year 2021-22:

1. **Health Management Information System (HMIS):**

National Health Mission, Assam has implemented HMIS system in the State from 2008-09. 100% facility wise data is uploading every month in the HMIS Web Portal.

In the year 2020-21, State shifted to new HMIS Portal provided by National Health Mission, Assam.

HMIS data is widely used for planning, programme implementation and monitoring & review purposes. District wise, health block wise and facility wise analysis of HMIS data is carried out at State HQ and the analysis report is shared with all stakeholders for taking corrective measures. HMIS data is also used during preparation of District Health Action Plan and State PIP. Review meeting at State level, district level and block level are based on HMIS data. In the year 2021-22, it is proposed to continue use of HMIS data for planning, programme implementation and monitoring purposes.

Following priority activities are proposed in the financial year 2021-22:

i) In the year 2021-22, it is proposed to ensure uploading of 100% facility wise data in the HMIS Portal. Timely uploading of daily report, monthly service delivery data, monthly infrastructure data and district HQ format shall be priority in the financial year 2021-22.

ii) Though new HMIS portal implemented in 2020-21, proper training up to periphery level could not be completed due to restrictions of covid pandemic. Orientation on monthly infrastructure format shall be conducted to ensure data quality. In the year 2021-22, it is proposed to provide orientation of all data handlers.

iii) Focus on data quality issues will be prioritized in 2021-22.

iv) As per decision taken by Government of India, now Rural Health Statistics will be published based on data uploaded in the Infrastructure and HR format of HMIS. Special focus shall be given on the data quality of Infrastructure and HR report.

v) With an objective to improve data quality in HMIS and RCH Portal, **mandatory data validation** system under National Health Mission, Assam will continue in the State.

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All data persons at State, District and Block will visit **at least 10 facilities per month** to validate data uploaded in the HMIS web portal.

vi) Periodic review of HMIS data elements linked with State Health Index of NITI Aayog, SDG Indicators, Rural Health Statistics, District Hospital Ranking, PHC Grading, CHC Grading, SDCH Grading shall be undertaken at State and District level. This will be another focus area for the financial year 2021-22.

2. **RCH Portal, ANMOL, Kilkari and Mobile Academy:**

State has also implemented **Reproductive & Child Health (RCH) Portal** augmented version of Mother & Child Tracking System (MCTS) in the State. State has taken special focus for timely updating of data in the RCH and utilization of data. Verification of Work plan with RCH Register and by visiting house of 2 pregnant women/ mother has been made mandatory for all monitoring officials.

From the month of November 2018, RCH Portal has been implemented in the State. Following activities are prioritized in the financial year 2021-22:

i) In the FY 2021-22, it is envisaged to roll out RCH Portal with 100% coverage of Eligible Couple, Pregnant Women and Children.

ii) **Regular updating of service delivery data and utilization of work-plan shall be focus area for 2021-22 for RCH Portal.**

iii) ANMOL (ANM online) Tablet based version of RCH Portal has been started in 7 aspirational districts of the State. ANMOL will be rolled out in all Sub Centres of the State along with NCD application.

iv) Implementation **of version 2.0 of RCH Register** developed by Ministry of Health & Family Welfare, Government of India will be another major focus area for the financial year 2021-22. Training of ANM and field level staff will be completed within 2nd quarter of the financial year 2021-22. Training of ANMs on the new RCH Register will be taken up during Block level trainings.

v) For smooth implementation of RCH Register 2.0, it is proposed to provide "**Instruction Manual for ANMs on RCH Register 2.0**" to all ANMs in the financial year 2021-22. Instruction manual shall be made available with all ANMs and field level staff after the final version of instruction manual received from Government of India. Orientation on the instruction manual is also proposed to be carried out during monthly block level review meeting cum trainings.

vi) Follow up of pregnant women and children through "**Assam Early Childhood Development Call Centre**" will be continued in 2021-22. Assam MCTS Call Centre

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was made established on 1st April 2013. Assam MCTS Call Centre was upgraded to Assam Early Childhood Development Call Centre on 1st January 2020 to provide services to the pregnant women and children as per guidelines circulated by Government of India.

vii) **Verification** and **validation of phone number of ANM and ASHA** will be focused area in the financial year 2021-22.

viii) **Kilkari** and **Mobile Academy** services of Ministry of Health & Family Welfare, Government of India has been rolled out in the State. In the year 2021-22, it is proposed to focus on awareness activities on Kilkari and Mobile Academy. Awareness is proposed to be carried out in the monthly block level review meeting cum trainings and block/ sectoral level ASHA meetings. Emphasize will be given to capture correct phone number of pregnant women. Pregnant women will be informed about the Kilkari messages at the time of registration of ANC to avail full benefit of the service.

3. **District Vaccine Distribution Management System (DVDMS)**:

State has already started the process of implementation of "**Drugs Vaccine Distribution Management System (DVDMS)**" developed by "Centre for Development of Advance Computing (C-DAC)" under Ministry of Electronics and Information Technology (MeitY). In the year 2021-22 it is proposed to roll out the DVDMS system up to Health & Wellness Centres.

4. **e-Hospital solution**:

Process for implementation of **e-Hospital** solution of NIC in 25 District Hospital and Medical Unit of Assam Secretariat has been started.

In the financial year 2021-22, it is proposed to implement e-Hospital solution in 3 new District Hospitals at Majuli, Hojai and Charaideo districts.

In the year 2021-22, it is proposed the Operational cost of e-Hospital solution including Internet connectivity, AMC, Maintenance, Office Consumables etc. for 29 Hospitals (26 existing + 3 new).

Implementation of "**Mera Aspataal**" application is another priority area for the FY 2021-22.

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5. **Implementation of e-Governance initiatives of Government of India:**

i) **NIN Portal** has been implemented in the State all physical public health facilities has been verified and confirmed. In the financial year 2021-22, it is proposed to focus on 100% updating of data in the NIN portal.

ii) Daily and monthly reporting in the **AB-HWC Portal** shall be continued in the financial year 2021-22.

iii) State has also developed one in-house web application "CHO-HWC Portal" to monitor **Performance Based Incentive** of Health Wellness Centre teams. The system is proposed to be continued in the financial year 2021-22 for monitoring and payment of team based incentive of HWC team including Community Health Officer,

iv) It is proposed to continue the other existing online systems like online SNCU monitoring system, PMSMA Portal, NCD Portal, MCDSR software under SUMAN initiatives, RBSK Portal, DBT Portal, FP-LMIS, etc.

6. **Swasthya Sewa Dapoon – Integrated MIS GIS System:**

State has also implemented "Swasthya Sewa Dapoon - Integrated MIS GIS System" which has been developed using open source technology by using in-house capacity of NHM, Assam. Important modules like "HR-MIS", "Inventory Management System", "ASHA Payment and Performance Monitoring System", "Maternal Death Reporting System", "Infant Death Reporting System", "Child Death Review Monitoring System", "CHO-HWC Performance Monitoring System", "Civil Works Monitoring System", "Wage Compensation Scheme for Pregnant Women of Tea Gardens" etc. have been implemented.

HR-MIS system has been fully implemented in the State and HR data updated for both regular and employees under NHM. Now, all transfer, posting, release and joining of all employees (both Regular and NHM) are done through the online HR-MIS system only. Pay-slip of NHM employees generated through this system only and 100% salary payment is made through PFMS using the HR-MIS system.

Similarly, 100% payment of ASHA incentive made through "ASHA Payment and Performance Monitoring System".

All these applications are proposed to be continued in the financial year 2021-22.

7. **e-Prastuti – Standardization of NHM, Assam website:**

Website of Health & Family Welfare Department and its constituent organizations including NHM, Assam has been developed and hosted under e-Prastuti

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Standardization of website as per guidelines circulated by Web Development Team of NIC. In the year 2021-22, it is proposed to regularly update the website as per e-Prastuti guidelines.

8. **Capacity Building on HMIS and RCH Portal**:

Following capacity building workshops are proposed in the financial year 2021-22:

i) State level workshop covering HMIS, RCH Portal, ANMOL and other IT initiatives

ii) District level quarterly review meeting cum training covering HMIS, RCH Portal, ANMOL and other IT initiatives

iii) Block level monthly review meeting cum training

9. **Capacity Building on Advance Data Analysis – New proposal in collaboration with UNICEF and WHO**:

In the year 2021-22, it is proposed to organize training programme of advance data analysis for State, District and Block level data managers in collaboration with UNICEF and WHO.

The training is proposed to be conduct in virtual platform. Resource person from UNICEF and WHO will provide the training.

Summary of allocation for the year 2021-22:

New FMR (as per RoP, 2021-22)	Activity/Sub-Activity (including PM activities)	Approved Budget 2021-22		Responsible Officer of the activity			Fund allocation for State level activity		Fund allocation for District and Block level activity	
		Quantity/ Target	Budget (Rs. Lakhs)	At State HQ level	At DPMU level	At BPMU level	Quantity/ Target	Fin. allocation (Rs. in lakh)	Quantity/ Target	Fin. allocation (Rs. in lakh)
6.1.2.S.2	Tablets: software for implementation of ANMOL	10714	257.140	Manager-MIS	DDM	BDM	7955	190.920	2759	66.220
9.S.26.1	Training cum review meeting for HMIS & MCTS at State Level	1	4.710	Manager-MIS			1	4.710	0	0.000
9.5.26.2	Training cum review meeting for HMIS & MCTS at District Level	132	72.420	Manager-MIS	DDM		0	0.000	132	72.420
9.5.26.3	Training cum review meeting for HMIS & MCTS at Block Level	1836	101.070	Manager-MIS	DDM	BDM	0	0.000	1836	101.070
12.9.1	Printing of HMIS Formats	2897952	28.980	Manager-MIS	DDM	BDM	0	0.000	2897952	28.980
12.9.4	Any Other (Printing of Instruction Manuals of RCH Register version 2.0)	12S00	12.500	Manager-MIS			12500	12.500	0	0.000
14.2.2	Implementation of DVDMS	1	68.470				1	68.470	0	0.000
16.3.2	Mobility support for HMIS and MCTS	4080	S0.520	Manager-MIS	DDM	BDM	120	3.000	3960	47.520
16.3.3	Operational cost for HMIS & MCTS (incl. Internet connectivity; AMC of Laptop, printers, computers, UPS; Mobile reimbursement)	34	464.000	Manager-MIS	DDM	BDM	1	398.150	33	65.850
16.3.S	Call Centre (Capex/ Opex)	1	456.000	Manager-MIS			1	456.000	0	0.000
17.6	Implementation of Hospital Management System	29	102.340	Manager-MIS	HA		3	33.300	26	69.040
	TOTAL:	**2927280**	**1618.150**				**20582**	**1167.050**		**451.100**

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G) Guidelines for implementation of e-Hospital Solution (Hospital Management System of NIC):

e-Hospital solution of NIC is being implemented in all District Hospitals and Medical Unit of Assam Secretariat.

In the year 2021-22, it is proposed to implement e-Hospital solution in 3 new District Hospitals at Majuli, Hojai and Charaideo.

Following modules are currently available in the e-Hospital application:

i) Patient Registration (OPD & Casualty)
ii) IPD (Admission, Discharge & Transfer)
iii) Billing, Lab Information System
iv) Radiology Information System
v) Clinic
vi) Dietary
vii) Laundry
viii) Store & Pharmacy
ix) OT Management.

1. **One-time cost (Only for District Hospital at Hojai and Majuli):**
   a) An amount of Rs. 7.00 lakhs each is approved for one time cost for implementation of e-Hospital solution at District Hospital of Hojai and Majuli which includes procurement of Computer, Printer, UPS and establishment of Internet connectivity, etc.
   b) 10 numbers of Computer sets with Printer and UPS can be procured for each district hospital.
   c) An amount of Rs. 6.00 lakhs earmarked for procurement of 10 numbers of Computer sets with Printer and UPS.
   d) The allotment of the Desktop Computer and UPS along with Printer can be done priority wise depending on number of Beds, OPD loads, IPD loads, number of Nursing Station/ Ward etc.
   e) Computer, Printer and UPS provided for implementation of e-Hospital solution should be installed in the respective locations like OPD Registration Counter, IPD Registration Counter, Emergency Registration Counter, Laboratory, Store, Dispensing Room, etc.
   f) Internet connectivity should be established in all computers. District Hospital may take Internet Connectivity of any mode based on feasibility/ availability in the location within the budget limit.
   g) It is suggested to buy Data Card (Dongle) with minimum 1 year warranty to overcome the issue of LAN (Local Area Network) Connectivity at District Hospital. Dongle should work for all Internet Service Provider. Based on availability and feasibility of the

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Internet connectivity / bandwidth connection (4G SIM) to be taken from Internet Service Provider. The SIM connection should be on pre-paid basis so that it could be easy to change service provider if there is any Connectivity issue.

h) Fund allocation for District Hospital at Charaideo shall be communicated after the District Hospital is made functional.

2. **Operational Cost:**

a) Operational cost for implementation of e-Hospital solution has been earmarked for each hospital based on OPD, IPD load of the facility.

b) Monthly cost of Internet connectivity, and other operational cost including cost of paper, tonner/ cartridge, etc. may be incurred from this head for implementation of e-Hospital solution.

c) Maintenance of computer, printer etc. may also be incurred from this head. This will be applicable for items not under warranty.

d) Status of warranty period of the items should be assessed before incurring expenditure. In case of items are under warranty period, the same should be rectified through the respective vendors. 270 numbers of Desktop Computer, Printer and UPS provided from NHM State HQ in the financial year 2020-21 are under warranty period. Details of Service Support for Desktop Computer, Printer and UPS:

Item	Make/ Model No	Contact Number for support
Desktop Computer (3 years warranty)	ACER VERITON M4660G	Name of the OEM: M/s Acer India Pvt. Ltd. Tool Free No: 1800116677 1st Level: Name: Sita Sitaraman Mobile No: 033-44272400 E-mail: sita.sitaraman@acer.com 2nd Level: Name: Debjyoti Sanyal Mobile No: 09836466415 E-mail: debjyoti.sanyal@acer.com 3rd Level: Name: Praveen Bisht Mobile No: 09910100474 E-mail: Praveen.bisht@acer.com Name of the Supplier: M/s Eastern Technology Group Contact No: 97060-61650, 98649-8270 E-mail: etgr_solution@yahoo.com etgr.service15@gmail.com

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Item	Make/ Model No	Contact Number for support
UPS (2 years warranty) (Warranty for the battery is 1 Year)	Make: zebronic Model: zeb-u725	Name of the OEM: M/s Zebronics India Pvt Ltd. Tool Free No: 18001217097 Name of the Supplier: M/s Eastern Technology Group Contact No: 97060-61650, 98649-8270 E-mail: etgr_solution@yahoo.com etgr.service15@gmail.com
Printer (3 years warranty)	Lexmark, B2236DW	Name of the OEM: M/s Lexmark International (India) Private Limited. Tool Free No: 0008-0005-01018 1st Level: Name: Ms. Shibani/ Mr. Perumal E-mail: lexsupport@inspirisys.com , perumal.sg@inspirisys.com 2nd Level: Name: Mr. Vijayakumar Srinivasan E-mail: vijaya.srinivasan@lexmark.com 3rd Level: Name: Mr. Rajesh Onkar E-mail: rajesh.onkar@lexmark.com Name of the Supplier: M/s Chandra Enterprises Contact No: 96780-65006, 96780-65001 E-mail: mschandrainfocom@gmail.com mschandraenterprises@rediffmail.com

3 **Financial:**

a) All financial norms should be followed.

b) District wise detail fund breakup may be seen at **Annexure – G**

c) **The expenditure should be booked under the head of account (FMR Code: FMR code 17.6 – Implementation of Hospital Management System)**

d) Total expenditure should not exceed amount allocated for the financial year.

e) Payment related to M/s Luminous Infoways Pvt. Ltd. (empaneled vendor of NIC) shall be made from NHM State HQ. District should not make any payment to M/s Luminous Infoways Pvt. Ltd. However, concerned Superintendent/ Deputy Superintendent shall provide the certificate for completion of work and go-live of e-Hospital solution.

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Annexure – G

Fund breakup for implementation of e-Hospital Solution (Hospital Management System of NIC)

FMR Code: FMR code 17.6 – Implementation of Hospital Management System

Sl	District	Name of the District Hospital	Amount allocated for the FY 2021-22 (Rs. In Lakhs)
1	Baksa	Dr. Ravi Baro Civil Hospital	1.250
2	Barpeta	Barpeta Civil Hospital	2.150
3	Bongaigaon	Bongaigaon Civil Hospital	1.250
4	Cachar	S.M. Dev Civil Hospital	1.250
5	Chirang	JSB CIVIL Hospital	0.500
6	Darrang	Mangaldai Civil Hospital	4.850
7	Dhemaji	Dhemaji Civil Hospital	1.850
8	Dhubri	Dhubri Civil Hospital	4.850
9	Dima Hasao	Haflong Civil Hospital	0.930
10	Goalpara	200 Bedded Civil Hospital	3.000
11	Golaghat	Swahid Kushal Konwar Civil Hospital	3.500
12	Hailakandi	S.K.Roy Civil Hospital	1.850
13	Hojai	District Hospital, Hojai	7.900
14	Kamrup (M)	Medical Unit, Assam Secretariat	0.300
15	Kamrup (M)	District Hospital Sonapur	1.600
16	Kamrup (R)	TRB Civil Hospital	0.930
17	Karimganj	Karimganj Civil Hospital	3.000
18	Kokrajhar	RNB CH Kokrajhar	1.650
19	Majuli	District Hospotal, Majuli	7.900
20	Morigaon	Morigaon Civil Hospital	3.000
21	Nagaon	B P Civil Hospital + MCH wing	4.100
22	Nalbari	SMK Civil Hospital	2.300
23	Sivasagar	Sivasagar Civil Hospital	2.300
24	Sonitpur	Kanaklata Civil Hospital	2.900
25	Tinsukia	LGB Civil Hospital	3.000
26	Udalguri	UDALGURI CIVIL HOSPITAL	0.930
27		State HQ	33.302
		Total	102.342

===xxx===

25.06.2021

Annex IV Hospital Management Information System (HMIS) vendors sample list

Sr No.	Provider	Name of HIS	Nodal Person	Coverage
1	**NIC**	**eHospital**	Mr Naveen Kumar, STD NIC Mob: 9811348896 Email: naveenkumar@nic.in	605 Health Facilities - Onboarded
2	**CDAC**	**eSushrut**	Mr Praveen Srivastava Mob -9811622408 Email: pksrivastava@cdac.in	122 Health Facilities and Railways hospitals
3	**TCS**	**HIS**	Mr Kanaiyalal Kotak Mob – 9033729382 Email: kanaiyalal.kotak@yahoo.com	36 Health Facilities in Gujarat 307 Health Facilities in Tamil Nadu
4	**OASYS Cybernetics Pvt Ltd**	**HIS**	Mr Kumariselvan Mob – 8939879061 Email: Kumariselvan.b@oasys.co	5 Health Facilities in Tamil Nadu
5	**Manorama Infosolutions Pvt. Ltd**	**HIS (Safdurjung Hosp) & Mumbai**	Mr Ashvini Vipul Danigond Mob- 9689891799 Email: ashvini@manoramasoft.com	Safdurjung Hospital and 399 Health Facilities in Mumbai
6	**United Health (Optum Global Solution Ltd)**	**eUpchar**	Dr Bhavnish Mob - 8872681448	56 Health Facilities in Haryana
7	**JK Technosoft Limited**	**HIS**	Mr Manoj Kumar Mob - 9650333503 Email: manoj.kumar@jktech.com	224 Health Facilities in Kerala

Annex V National Health Digital Mission

The National Digital Health Mission (NDHM), is a Government of India initiative, aimed at developing the backbone for a unified digital health infrastructure. Among other objectives, NDHM seeks to bridge the gap amongst multiple stakeholders that are a part of the healthcare ecosystem.

A Unique Health ID will be provided to every citizen which will contain details of their diseases, diagnoses, report, medication etc., in a common database through a single ID. This will essentially be a digitised version of all their health records. This digital database will be linked to the registry of doctors and health facilities across the country.

Digital data/records will help medical college professors conduct/public quality research articles, secure funding from national bodies and improve their professional knowledge through submission of research papers in national and international conferences.

The benefits for registering in NDHM

a. The implementation of NDHM is expected to significantly improve the efficiency, effectiveness, and transparency of health service delivery overall.

b. Patients will be able to securely store and access their medical records (such as prescriptions, diagnostic reports, and discharge summaries), and share them with health care providers to ensure appropriate treatment and follow-up.

Who can enroll on NDHM

Currently it is rolled out in six Union Territories only i.e., Andaman & Nicobar Islands, Chandigarh, Dadra & Nagar Haveli and Daman & Diu, Ladakh, Lakshadweep and Puducherry. We are working on rolling this out nationally.

Participating in NDHM is completely voluntary. There is no fee for registration in the NDHM systems.

Safety and secure on NDHM Systems

NDHM does not store any of your health records. Your health records are stored with healthcare information providers as per their retention policies and are shared over the NDHM network with encryption mechanisms only after your express consent.

Anonymous records can be used by the government to make data driven public policy decisions. However, no individual's information and health data shall be shared without their consent.

Records will be shared with the doctor or health facility only after patient consent. In patient consent one can customize and edit the permissions in terms of duration, type of records visible.

The user will have the option to deactivate/reactivate/delete the health ID/PHR address

NDHM Health Records

NDHM Health Records is a Personal Health Record application through which patients can maintain and manage their health information (and that of others for whom they are authorized) in a private, secure, and confidential environment.

The Personal Health Record (PHR) will be a longitudinal record for each individual on the system, comprising all health data, lab reports, treatment details, discharge summaries etc. related to one episode or a set of episodes, across one or multiple facilities.

The benefits of registering on PHR

- Real-time, Patient-centered, Aggregated Health Records across the facilities, viewing key health information e.g. history, diagnoses, medications, immunization dates, allergies, radiology images, and lab and test results.
- Makes health information available instantly, "whenever and wherever it is needed" and bring together in one place everything about a patient's health
- Interoperable, Sharable, Patient-centered record of key health information for Health Records Exchange between Organizations /Care Providers.
- Ensures efficient Continuity of Care to the Citizens
- Promote Digital capturing of all patient data, using EMRs
- Access Patient data from anywhere
- Achieve operational efficiencies
- Improve Clinical decision making
- Increasing practice efficiencies and cost savings
- Reduce patient waiting time
- Reduced medical errors through better access to patient data
- Improved patient health/quality of care through better disease management and patient education.

User can add their health records on the application. Health records can also be stored in health lockers, which are integrated with NDHM. As of now there are no health lockers but going forward there will be multiple health lockers (public and private players)

The data will be stored on a cloud and as the patient will be the owner of all the data, he/she will have all the rights to manage it. The health lockers integrated with NDHM can also be used for keeping the health records secure in the lockers and the number of integrated health lockers will keep increasing enabling more options for the users.

For patients who have not yet created health ID/PHR address can get their health record linked to their mobile number and can fetch all the linked health records at once, by installing the NDHM health records application.

Also, there are two types of records linking

- HIP (Facility initiated linking)- Once an Individual visits the hospital and creates Health ID. Post individual's one time consent, the facility will link health records with Health ID. SMS is sent to user with an option to download the NDHM health records from google play store and view the records.
- Individual initiated linking through the NDHM health records mobile app.

Health Facility Registry

The Health Facility Registry (HFR) is a comprehensive repository of health facilities of the nation across different systems of medicine. It includes both public and private health facilities including hospitals, clinics, diagnostic laboratories and imaging centres, pharmacies, etc. Enrolling in the Health Facility Registry will enable them to get connected to India's digital health ecosystem

Enrollment in the Health Facility Registry

The Health Facility Registry is open to registration of all health facilities in India providing healthcare services across both modern and traditional systems of medicine such as Modern Medicine (Allopathy), Dentistry, Physiotherapy, Ayurveda, Unani, Siddha, Homeopathy and Sowa-Rigpa systems of medicine. Applications for enrolment in the registry will be verified by the appropriate officials, and once the facility **details have been verified, approval will be given before they are visible to the public.**

Healthcare Professional ID to register in the Health Facility Registry

The Healthcare Professional ID is an authentication mechanism that allows users to access various applications in the NDHM, without having the need to enter user credentials at multiple places. It essentially ensures that no unauthorized person can access the health facility details.

Benefits of registering in Health Facility Registry

Healthcare Professionals enrolling in HPR will have access to several benefits. Some envisaged benefits are covered below and more such benefits will be added over time as adoption of the NDHM ecosystem increases.

- Online presence and discoverability: facilities can share about their specialties available and services offered, address, contact details and geo-location enabling easier access for individuals
- Building trust and reputation: Listing on national platform of verified health facilities
- Ease of doing business: Paperless registration and renewal of licenses, ease in empanelment with insurance agencies, TPAs
- Digital Health Records: Consented access to electronic medical records with seamless retrieval
- Ability to go paperless through e-signature on diagnostic reports, discharge summaries, prescriptions etc.
- Telemedicine: Eligible healthcare facilities can treat individuals remotely through telemedicine

Enrolment in Health Facility Registry is voluntary. However, government health facilities would be required to enroll in the Health Facility Registry, where the respective state/UT government participating in the NDHM requires them to do so..

National Health Authority (NHA) is implementing the National Digital Health Mission (NDHM). NDHM focuses on developing the technological backbone for India's digital ecosystem. Health Facility Registry is a key building block of NDHM under the purview of NHA.

The Health Facility Registry shall act as a single source of truth for all health facilities in the country. Falsification of information or misuse of account shall carry stringent penalties. Further, these health facilities will also need to abide by the rules of conduct placed by various services they are utilizing through the registry.

Information, Education and Communication (IEC) campaigns are being designed and rolled out by NHA in conjunction with the concerned authorities at the state and national level. Integrations with existing digital applications managed by various entities will be used to accelerate adoption.

The main aim of the NDHM initiative is to enable the facilities to be part of a national platform. Additional functionalities will be released in subsequent stages and made available to all facilities equally. In case specific additional functionality is sought, please contact the technical team for support.

There is a functionality within the Health Facility Registry that will allow facilities to link to healthcare professionals working with them. The declaration of association can be initiated by either the doctor or the facility and needs to be approved by the other side.

EMR solution is a digital version of a patient's chart and it contains the patient's medical treatment history from a health facility. EMR Solution can be used within a health facility such as hospital/clinic/diagnostic centre to support patient diagnosis and treatment. The application allows doctors to record clinical information specific to each facility.

NDHM EMR solution is intended to be used as reference application for the HRPs and HIPs to provide them a 'framework' to digitize patient clinical records and enable sharing these records across the care spectrum, while integrating their HRPs with NDHM Ecosystem.

This solution is built very specifically to provide EMR functionalities only as a reference model in order to achieve consent-based Health Record Exchange under the NDHM Ecosystem. Integrators can download the Source Codes provided by the NDHM to their EMR applications.

Refer URL: https://emr.ndhm.gov.in/

Annex VI Visit to Tripura National Information Centre (NIC) and study of eHospital

Introduction:

e-Hospital solution developed by National Informatics Centre (NIC) is being implemented in the existing District Hospitals of the State of Assam. Ministry of Health & Family Welfare, Government of India accorded approval for implementation of eHospital solution in 25 District Hospitals and Medical Unit of Assam Secretariat in the earlier year. At present 15 DHs are using eHospital solution. Training for remaining hospitals going on with the help of empanelled vendor of NIC. Further, in the RoP 2021-22, approval for implementation of eHospital solution 3 new District Hospitals namely at Majuli (100 bedded), Hojai (200 bedded) and Charaideo (100 bedded) received. Further, MoHFW have approved implementation of e-Hospital solution in 4 District Hospitals namely South Salmara Mankachar, Biswanath, West Karbi Anglong and Bajali under ECRP-II. Implementation of e-Hospital solution in all District Hospitals have been approved by Government of India which need to be completed within the financial year 2021-22.

Further, Health System Strengthening Project, JICA is being prepared by Health & Family Welfare Department, Government of Assam. Implementation of robust Hospital Management Information System in the Medical College & Hospitals, District Hospitals and other hospitals to be taken up under this project is one of the main objective of the project.

Government of India is in the process to nationwide rollout of National Digital Health Mission (NDHM) and implementation of Hospital Management Information System in all hospitals is essential to create Health Id for all and access health record through NDHM ecosystem.

e-Hospital solution has been developed by National Informatics Centre (NIC), Tripura.

To understand the detail concept of the e-Hospital solution and feasibility to implement the same in the Medical Colleges of the State, the visit to NIC Tripura was carried out by the following team members:

1. Dr. Ranganayakulu Bodavala, Consultant, JICA project
2. Sri Rahul Dev Chakraborty, State MIS Manager, National Health Mission, Assam

Key persons interacted during the visit:

Following key persons were interacted during the visit:

1. Shri Chayan Kanti Dhar, Scientist-G, State Informatics Officer (SIO), National Informatics Centre (NIC), Tripura
2. Shri Nilkamal Dey Purkayastha, Scientist-C, National Informatics Centre (NIC), Tripura
3. Shri Rudra Pratap Bhattacharjee, Modulist, National Informatics Centre (NIC), Tripura

A. Meeting with Shri Chayan Kanti Dhar, Scientist-G, State Informatics Officer (SIO), National Informatics Centre (NIC), Tripura on 15th September 2021

- Small briefing meeting with Shri Chayan Kanti Dhar, Scientist-G, State Informatics Officer (SIO), National Informatics Centre (NIC), Tripura and Shri Nilkamal Dey Purkayastha, Scientist-C, National Informatics Centre (NIC), Tripura was held.
- It was a very fruitful discussion and SIO, NIC, Tripura briefly described how the e-Hospital project started in Tripura and subsequently rolled out in all parts of the Country.
- The project was initially started in Government Medical College of Tripura and subsequently rolled out in other hospitals.
- More than 600 hospitals in the Country are using e-Hospital solution including big hospitals like AIIMS Delhi, KGMU Lucknow, Dr. Ram Manohar Lohia Hospital Delhi, Lady Hardinge Medical College Delhi, AIIMS Rishikesh, AIIMS Bhupal etc.
- He also informed that, e-Hospital solution has been implemented in other Countries like Gana.
- Integration of e-Hospital with Lab Analyzers is another big achievement.
- The e-Hospital application has also adopted various health vocabulary standards recommended by Ministry of Health & Family Welfare like ICD10 & SNOMED-CT in various modules. Clinicians and care providers can enter ICD10/SNOMED-CT codification into the clinical data so that the EHR generated is more meaningful and reduces the variability in the way data are captured, encoded and used for clinical care of patients and research.
- e-Hospital solution is compliance to EHR standard.
- E-Hospital is a "Software as a Service (SaS) cloud based solution.
- E-Hospital solution is also integrated with National Digital Health Mission (NDHM).
- SIO, NIC, Tripura provided the following suggestions during implementation of e-Hospital solution:
  - All modules of the e-Hospital solution should be implemented to get the actual benefit of the system. By implementing only 2/3 modules like OPD, IPD and Billing will not serve the purpose.
  - Small Programme Management Unit (PMU) should be constituted to run the programme.

B. Demonstration of e-Hospital solution by Shri Nilkamal Dey Purkayastha, Scientist-C, National Informatics Centre (NIC), Tripura and his team on 15th September 2021:

- Detailed demonstration on the e-Hospital solution was provided.
- Following modules of e-Hospital solution are now available on cloud:
  - Patient Registration (OPD & Emergency)
  - IPD (Admission, Discharge & Transfer)
  - Billing
  - Lab Information System (LIS)
  - Radiology Information System (RIS)
  - Clinics
  - Store & Pharmacy
  - Dietary

- Laundry and OT Management
- Online Registration System (ORS)
- eBloodBank

- Key points noted during the demonstration:
  - OPD Registration slip are template based. It can be configured for each hospital based on need. It is a good feature which may solve the issue of prescription audit currently faced by District Hospitals of the State.
  - e-Blood Bank module is also available in e-Hospital. The matter to be discuss whether State have to adopt eRaktkosh of CDAC or e-BloodBank of NIC under e-Hospital.
  - Telemedicine services is integrated with e-Hospital. It is informed that, advanced technology is used which is better than eSanjeevani of CDAC.
  - Online Registration System (ORS) is integrated with e-Hospital. It is a very nice feature and can be very helpful for crowd management and hassle free service to citizen.
  - New National Health Id can be generated as per NDHM framework.
  - Health Id can be generated from NDHM as well as from e-Hospital solution.
  - Health Id can be linked with Aadhar as well as can be generated without Aadhar.
  - Option to validate Health Id during registration.
  - If a patient doesn't bring Health Id, then Health Id can be retrieved using mobile based OTP verification.
  - QR code based Health Id is printed in the OPD slip.
  - Bar code and QR code based Id is printed in the OPD slip. Just by using Bar code scanner or QR code scanner, patient can be tracked in other section of the hospital which minimizes data entry and also reduces error.
  - Option to configure billing type for BPL, APL etc. Rates for various services can also be configured for each hospital separately.
  - During registration, operator can search availability of Doctor and assign a Doctor for each patient.
  - Option is provided to capture the status of COVID vaccination of the patient during OPD registration.
  - Clinic module is very user friendly. Separate template can be prepared for Doctor/ Hospital as per need. It is very helpful to capture detail information of each patient for specialized services like Oncology, Cardiology etc. as per need. Open EHR platform is used for creation of the template. Templates can be created by Doctors with working computer knowledge just selecting the criteria and functions. It is just like creation of web form.
  - Drop down menu option is provided for entry. Drop down list automatically filtered based on characters typed in the box.
  - Doctor can see the rate of tests during advice for test. He can orient the patient about the cost of the test.
  - Doctor can issue special instruction to Laboratory / Technician in the advice to test.
  - Comprehensive Oncology module with complete work flow is available under e-Hospital solution.
  - Que management is also available in the e-Hospital solution.

- Discussion on implementation level points:
  - 24 X 7 support system is available. District NIC can directly contact NIC, Tripura for any technical issue.
  - Implementation of e-Hospital has three options:
    a) Cloud based: There is no need for internal server. Entire database will be stored in cloud. But, need Internet connectivity at each computer.
    b) Local Server based: Data will be stored in the local server of the hospital. No need for Internet connectivity at each computer. But, LAN is required to connect all computers.
    c) Hybrid Model: Initially data will be stored in the local server and can be synchronized with the central server using scheduler. Local server and LAN is required. No need to provide Internet connectivity at each computer, but local server need Internet connectivity.
    d) Bar code scanner and bar code printer is required. Bar code scanner should be made available in each counter for smooth patient flow. Bar code should be used everywhere including OPD counter, Laboratory etc.

Photo: Presentation and Demonstration on e-Hospital solution by Shri Nilkamal Dey Purkayastha, Scientist-C, NIC, Tripura

C. Tripura Medical College and Dr. BRAM Teaching Hospital visited on 16th September 2021:

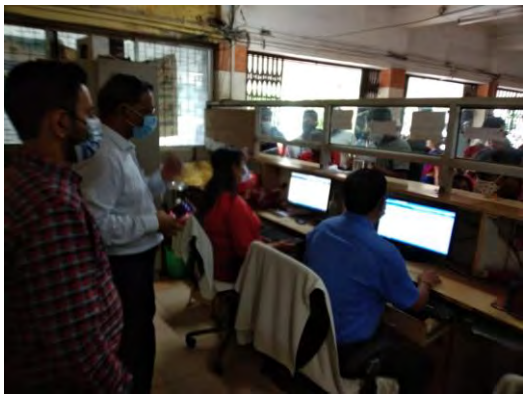
- E-Hospital solution is implemented with Local Server. Two servers are used one for Database and the other for hosting the application. All computers are connected through LAN. Dedicated server room.
- System support team is in-position to provide technical support.
- e-Hospital solution is implemented in OPD Registration counter, IPD registration counter, Billing counter, Wards and Laboratories. Store module is also implemented.
- Computers are not available in Doctors' room and Clinic module is not implemented.

- Separate counter for follow up visit.
- On an average 2 minutes take to register one patient including collection of user charge of Rs. 20/-. For follow up patient less than 1 minute is taken.
- Important feedback of users:
  - Good IT system is need for faster registration. Sometimes keyboard or printers are not working. In case of small issue with IT hardware, it hampered the process of registration. One of the user give one example. One key of the keyboard was not working. It results all patient containing character of the faulty key was missing in the OPD registration slip. It hampered overall implementation till replacement with the new keyboard. It is a very good lesson and we have to prepare plan to avoid such issues.

e-Hospital Modules

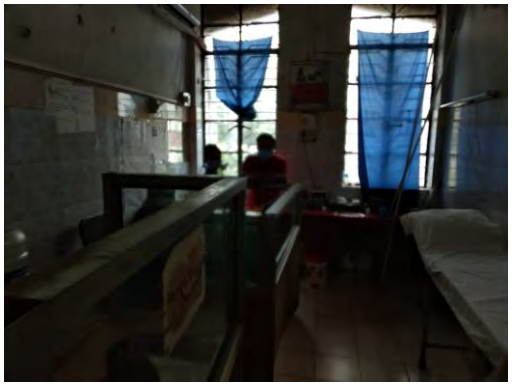
OPD Registration Counter

OPD Registration Counter



OPD Registration Counter

OPD Registration Counter



Computer used in Indoor Ward

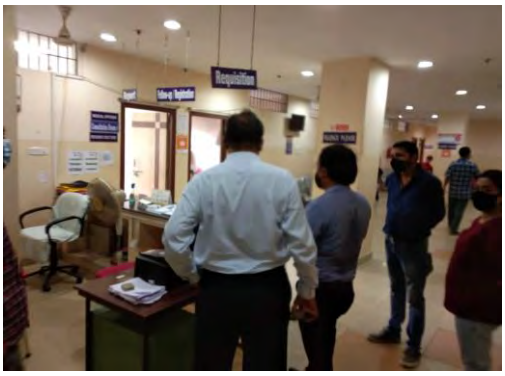
Server Room

Server Room

D. Atal Bihari Vajpayee Regional Cancer Centre, Agartala visited on 16th September 2021:

- Comprehensive Oncology module with complete patient flow implemented in the hospital.
- Tele-consultation system integrated with e-Hospital and used for patient follow up and consultation.
- Option to send prescription through email. Option for digital signature of prescription.
- Patient can share Blood test report through email also. Schedule for Chemo is fixed based on medical records.
- Teleconsultation helped to reduce the number of visits by patients.

Front view



Registration Counter

Teleconsultation Centre

Teleconsultation Centre

E. Agartala Government Medical College & Govind Ballabh Pant Hospital:

- e-Hospital solution is implemented in all the counters in the hospital.
- Laboratory Information System (LIS) module of e-Hospital is integrated with the Lab Analyzers

Registration Counter

Lab Requisition Counter

Annex VII List of Interviewees for ICT Survey Visit

Sr. No	Name	Organization	Designation
1	Dr. Ramen Talukdar	Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta	Principle and Superintendent
2	Dr. Uddip Talukdar	Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta	Dy. Superintendent
3	Dr. Sanjay Bhattacharya	Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta	Dy. Superintendent
4	Prof.(Dr) Karuna Hazarika	Tezpur Medical College and Hospital	Principle and Superintendent
5	Dr. Benudhar Nadh	Tezpur Medical College and Hospital	Head community medicine and incharge - HIS
6	Dr. Madhab Ch. Rajbangshi	Tezpur Medical College and Hospital	Medical Superintendent
7	Dr. Tanvira	Tezpur Medical College and Hospital	Dy. Superintendent
8	Sr. Manager	AMTRON, Guwahati	Head – Hospital information system
9	Dr. Subash CH. Sarma	Ravi Baro Baksa civil hospital	Superintendent
10			Administrator
11	Dr. Dr. Kalita	SMK Civil Hospital, Nalbari	Superintendent
12	Dr. Nabadeep Sarma	Nalbari civil hospital	Administrator
13	Mr. Karuna Brahmma	NHM – Baksa	District Program Manager, NHM
14	Dr. Mubidur Rahman	Baksa	Joint director
15	Dr.Kavita Chowdhury	NIC Guwahati	SPD
16	Chandan	Luminous info way private limited	System Analyst (now moved to other dept)
17	Rahul Chakravarty	NHM – MIS CELL	
18	Pragati	NHM – MIS CELL	
19	Kamal	NHM – MIS CELL	
20	Dr. Rathindra. Bhuyan	Directorate of health services	Director
21	Dr. Lal Sim		Joint Director
22	Dr. Anup Kumar Barman	Directorate of Medical education	Director
23	Dr. Sarma	Directorate of Medical education	Joint Director
24	Sumana das	Study team	
25	Dipon Ghosh	Study team	
26	Nivedita Paul	Study team	
27	Prabhal Ghosh	Study team	

Appendix VIII: Record of Public Consultation (interview to community representatives)

No.	Results
1	<Profile of interviewee> Gender: Male, Profession: lawyer, Age:80's
	<Comments to the proposed project> Date of Interview: 4-Jan-2022 – There is no objection as the upgradation of the existing hospital to SSH would benefit the general citizens(poor people) and thus it will be welcomed by the public. – Local public is sensitive towards the name of the Old Hospital [Jananayak Deveshwar Sharma Civil Hospital] [1], which is proposed to be demolished. Thus, keeping the sentiments of the locals the name of the new SSH to be constructed at the same location is preferred to keep the same name. – Already railway over bridge is being constructed in the vicinity and that is to benefit the local citizens in easing out the traffic flow in the area thus impact on traffic during construction of the hospital would not be a major issue. – Since the new hospital building would be constructed at the same place after demolition of the existing old building thus there would not be any major change in the landscape. – There is no major env or social issue expected still the proposed grievance mechanism is a welcome measure. – During demolition of the existing old building as well as during construction hospital need to take up measures to avoid any inconvenience to the hospitalised patients.
2	<Profile of interviewee> Gender: Female, Profession: Professor, Age: middle
	<Comments to the proposed project> Date of Interview: 6-Jan-2022 – There is no objection as the upgradation of the existing hospital to SSH would benefit the general citizens and thus it is welcomed by the public. – Noise pollution to be addressed during the construction phase to avoid inconvenience to the patients in the existing new hospital building within the same campus – Since the new hospital building would be constructed at the same place after demolition of the existing old building thus there would not be any major change in the landscape apart from additional floors, and the positive impacts of the hospital are much more than any landscape aspect.
3	<Profile of interviewee> Gender: Male, Profession: Civil Service, Age: 50's
	<Comments to the proposed project> Date of Interview: 8-Jan-2022 – The super specialty hospital at JMCH campus would definitely be welcomed by all the sections of society. – The proposed double storey basement parking would definitely help in vehicular/traffic management within and outside the campus. – In built sewage treatment plant/ waste disposal system would help in waste management in the hospital/JMCH campus. – Water quality of the area is not very good in the area so provision should be made for setting up water purification systems to provide safe drinking water to the patients/staff in the new facility. – Solar panels may be installed so that alternate/eco-friendly back up power system can be made.
4	<Profile of interviewee> Gender: Male, Profession: Environmentalist, Age: 50's
	<Comments to the proposed project> Date of Interview: 6-Jan-2022 – There is no objection from the local community as the upgradation of the existing hospital to SSH would benefit the general citizens and thus it is welcomed by the public.

No.	Results
	– Since the new hospital building would be constructed at the same campus after demolition of the existing old building thus there would not be any major change in the landscape apart from additional floors, and the positive impacts of the hospital are much more than any landscape aspect. – Traffic would not be an issue as mostly the construction would be taking place within the campus, moreover it is not like construction of road/over bridge/flyover where there is significant impact on the traffic movement. – It is suggested that Plantation within the Hospital premises should be done as part of landscaping that would enhance the local environment and ambience as well.
5	<Profile of interviewee> Gender: Male, Profession: Civil Service, Age: 40's
	<Comments to the proposed project> Date of Interview: 7-Jan-2022 – There is no objection as the upgradation of the existing hospital to SSH would benefit the general citizens and thus it is welcomed by the public.