Ministry of Health
The Republic of Ghana

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR THE IMPROVEMENT OF HEALTH CARE SYSTEM IN THE NORTHERN REGION IN THE REPUBLIC OF GHANA

FEBRUARY 2022

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE CONSORTIUM OF

MATSUDA CONSULTANTS INTERNATIONAL CO., LTD.
BINKO INTERNATIONAL LIMITED

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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Consortium of Matsuda Consultants International Co., Ltd. and Binko International Limited.

The survey team held a series of discussions with the officials concerned of the Government of Ghana, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to enhancement of friendly relations between our two countries.

Finaly, I wish to express my sinsere appreciation to the officials concerned of the Government of Ghana for their close cooperation extended to the survey team.

February, 2021

Jun SAKUMA
Director General
Human Development Department
Japan International Cooperation Agency

Summary

1. Outline of the Country

The Republic of Ghana (hereinafter referred to as "Ghana"), which gained independence from the United Kingdom in 1957, is located in the western part of the African continent, in the south part of the Sahara Desert. It has a land area of 239,000 km^2, which is about two-thirds the size of Japan. The country is bordered by Burkina Faso to the north, Cote d'Ivoire to the west, and Togo to the east, and faces the Gulf of Guinea to the south. Most of the country's terrain is made up of lowlands in the basin of the Volta River, with a maximum elevation of about 885 meters. The coastal plain extends from the coast to 100 km inland, the western part is a forested plateau, and the eastern part is a flatland in the basin of the Volta River. According to the Köppen climate classification, the whole of Ghana belongs to the tropical climate, however the southern part of the country has a tropical monsoon climate with a lot of rainfall, while Tamale, where the project site is located, has a savanna climate with less rainfall in the northern part. A trade wind from the Sahara Desert called "the Harmattan" blows in, bringing dust from the Sahara Desert from the northeast from December to February

Ghana has a population of about 30.8 million, with a national average population growth rate of 2.1% per annum (Population Census, 2021). The main industries are mining (gold, oil, etc.) and agriculture (cocoa, cassava, etc.). In recent years, the economic status has continued to grow steadily and security condition is relatively stable. It is a lower-middle income country with a GNI per capita of US$2,230 (World Bank, 2020). However, while the southern part of country has high agricultural potential, the northern part has poor growing conditions, which affects the economic gap between the south and the north. Regional disparities are also a challenge, as the northern regions have not benefited from the development that has accompanied the recent economic growth of the Ghana.

2. Background and Outline of the Project

As a result of efforts to achieve Millennium Development Goals by the deadline of 2015, the Republic of Ghana (hereinafter referred to as “Ghana”) has demonstrated improvement of its health circumstances in terms of health indicators, for example halving the mortality rates of mothers and children compared to those of 1990; however, the rate of decline has slowed in recent years, with maternal deaths decreasing from 376 per 100,000 live births in 2005 to 310 in 2017, and under-5 deaths falling from 80 per 1,000 live births in 2008 to 52 in 2017.[1] In addition, the Health Summit held in Ghana in April 2017 revealed the urgency of the need to improve the quality of services at medical facilities in order to reduce the mortality rates of mothers and children because the institutional mortality rates had worsened for both—for mothers, the rate increased from 142 deaths

[1]Ghana Maternal Health Survey 2017, Ghana Statistical Service/Ministry of Health, 2018

per 100,000 live births to 150, and for newborns, the rate increased from 5.34 deaths per thousand live births in 2015 to 6.28.[2] To deal with this issue, the government of Ghana formulated Health Sector Medium Term Development Plan 2018-2021,[3] which aims to achieve Universal Health Coverage (UHC)[4] through fair access to high-quality health care, under Medium Term National Development Policy Framework 2018-2021,[5] the national medium-term plan focusing on social development, including the health care sector.

As a result of stable economic growth in recent years, Ghana is entering a period of societal transition, and demographic trends indicate that the population is gradually aging. In addition, changes in socioeconomic circumstances have given way to lifestyle modifications, which have had an impact on hospital composition; although malaria and other infectious diseases persist, non-infectious diseases are also on the rise, causing health expenditures to increase. Due to factors such as macroeconomic trends and reduced financial aid from donors resulting from Ghana's entry into the ranks of lower middle-income countries, government finances are tight, not enough people have been hired to maintain medical facilities and work in health care, and funds are insufficient for providing high-quality health services. In addition, there is substantial regional inequality in health care services and other social infrastructure, especially in the former Northern Region yet to receive the full benefits of economic development (referring to the Northern Region, the North East Region, and the Savannah Region),[6] where the poverty rate has reached 61%[7] and there is an urgent need to further improve the quality of health care services for regional residents. The Northern Region is one of the former Northern Region with the highest poverty rates, regional inequality and lacks essential health services, and faces problems accessing medical facilities. Tamale Central Hospital (hereinafter referred to as "TCH"), which is positioned administratively as a regional hospital, faces problems such as deteriorating facilities, lack of space for facilities, and insufficient medical equipment and medical specialists, and does not function as a secondary hospital, which is expected of regional hospitals. Furthermore, insufficient facilities and equipment at primary-level medical facilities in the former Northern Region leave them unable to provide proper treatment; consequently, patients who can be treated at the primary and secondary level medical facilities are clustering at Tamale Teaching Hospital (hereinafter referred to as "TTH"), a tertiary hospital.

In light of the background described above, the government of Ghana requested grant aid from

[2]Holistic Assessment of 2017 Health Sector Programme of Work, Ghana Ministry of Health, 2018

[3] The Health Sector Medium-Term Development Plan (HSMTDP) 2018-2021

[4]Aiming to enable everyone to enjoy basic health care services when they need them, at affordable prices

[5] Medium-term National Development Policy Framework, An Agenda for Jobs: Creating Prosperity and Equal Opportunity for All (First Step) 2018-2021

[6]The current Northern Region, the Northeast Region, and the Savannah Region were originally one region, but were split into three during the regional reorganization of February 2019. The administrative functions and systems were not fully transferred to the new regions as of the previous survey, which was conducted in May 2019, but the transition continued in 2020, and statistics and the like have been compiled for each region after the split. In the title of this survey, the name "Northern Region" refers to the former Northern Regions before the reorganization. On the other hand, in the text, the three regions before the reorganization are referred to as the "former Northern Region" and the current Northern Region is simply referred to as the "Northern Region".

[7] Ghana Poverty Assessment 2020, World Bank

the Japanese government for the Project for the Improvement of Health Care System in the Northern Region (hereinafter referred to as “the Project”) for the former Northern Region with the objective to improve referral system and the quality of health care services in that area.

3. Results of Survey and Project Content

In response to the above request by the government of Ghana, the Japan International Cooperation Agency (JICA) conducted a field survey of the Project in May 2019, however the survey was suspended due to the security concerns in the target area. This time, after an interruption of about two years, a preparatory survey will be carried out on a zero-base, taking into account the changes in the environment surrounding the Project and referring to the contents of the previous survey. JICA dispatched a survey team to Ghana from 20 March to 17 April 2021 to consult with the Ministry of Health and other stakeholders. Based on the request by Ghana, the survey team conducted a site survey of Tamale Central Hospital (hereinafter referred to as "TCH") and the district hospitals. Thereafter, the survey team conducted an analysis based on the results of the site survey in Japan, compiled a schematic design, prepared a draft preparatory survey report, and briefed the Ghana officials from 12 to 23 November 2021 to finalize this preparatory survey report.

The project consists of the facility development and the equipment procurement for TCH. The equipment procurement for three district hospitals and the Biomedical Engineering Department in Northern Region (hereinafter referred to as “BME”), and a soft component are aimed at strengthening the capacity as well as to maintain medical equipment.

The project component of TCH consists of the construction of facilities and the provision of equipment essential for clinical activities, with the aim of updating not only facilities for the functions directly related to maternal and child health among the existing functions of TCH, but also for those functions with many users, for which Project implementation can be expected to deliver substantial benefits. The size of the facility is based on the number of patients and consultations over the past three years, and the number of rooms and beds required is planned for 2027, three years after the handover of the facility. The equipment to be installed under the Project has grades that enable the personnel presently assigned at TCH to use them without problems.

Table 1: Facility Components of the Project at TCH

	Block Code	Floor	Main components	Floor Area (m^2)
Clinical Block (two storey)	Block A	GF	OPD: Consultation room (10 rooms), Vital (2 rooms), Waiting hall, Reception, Record, Observation room, Dressing room, Satellite pharmacy etc.	3,022.80
		1st	Maternity department: Delivery room (5 beds), Treatment room, Physical function examination room, Labour room (12 beds), Recovery/Maternity room (32 beds), NICU (13 beds), Mother room, Staff station etc.	
	Block B	GF	MCH: Consultation room (3 rooms), Ultrasound room, Vital, Gynecology examination room, Consulting room (HIV), Reception, Satellite pharmacy, Staff room, CWC, Waiting hall etc. Clinical laboratory: Laboratory (Hematology, Microbiology, Parasitology, Biochemistry), Blood bank depot, Waiting hall etc.	2,521.14
		1st	Theatre & CSSD: Operating theatres (2 rooms), Changing hall, Laundry, Sterilization/Assembly room, etc. Children's ward: Ward (34 beds) etc.	
Annex (single storey)	C	—	Medical gas storage, Compressor room	32.50
	D	—	Blower room	13.26
	E	—	Main-switch room, Transformer room, MDB room	69.30
	F	—	Generator room	39.69
	G	—	Pump room, Reservoir tank	44.10
	H	—	Guardhouse	4.00
	—	—	Covered walkway	60.74
Total Floor Area				5,807.54

Table 2: Main Equipment to be procured for TCH

Department	Description
Outpatient Department	Consultation desk and chair, Diagnostic set, Examination bed, Examination light, Clean linen storage cabinet, Patient monitor, Resuscitation bag for adult, Xray film illuminator etc.
Maternity Department	Ultrasound scanner, Delivery bed, Delivery instrument set, Instrument set for Ob/Gy, ECG, Examination bed for Ob/Gy, Hospital bed with IV stand, Neonatal resuscitation table, Infant warmer, Baby cot, CPAP, Phototherapy unit etc.
MCH (Maternal and Child Health)	Ultrasound scanner, Consultation desk and chair, Diagnostic set, Examination bed for Ob/Gy, Fetal doppler, Delivery instrument set etc.
Clinical Laboratory	Blood bank refrigerator, Blood cell counter, Coagulometer, Electrolyte analyzer, Hormone Analyzer, Semi-auto Biochemistry analyzer etc.
Operation and CSSD Department	Anesthesia machine with ventilator, Surgery instrument set, Shadowless OT lamp, OT table manual, Thyroidectomy Instrument set, Drying machine, High pressure steam sterilizer, Washing machine etc.
Children's Ward	Consultation desk and chair, Diagnostic set, Examination bed, Hospital bed with IV stand, Pediatric bed, Resuscitation bag for pediatrics, Ultrasonic nebulizer etc.

Based on the previous survey results, a site survey was carried out in five districts to select the project hospitals where the medical equipment should be installed. As a result, three hospitals were chosen for the subject of the Project: Savelugu Municipal Hospital, Bimbilla District Hospital, and Kpandai District Hospital. The selected district hospitals are positioned as district referral and sub-referral centres, and receive patients from health centres. As these district hospitals are located too far away from Tamale and cannot be reached in time for emergency transport, it is significant to provide a certain level of diagnosis and treatment on a district basis. These district hospitals will be equipped with new equipment to improve perinatal medical care in the district. In addition, the BME of the Regional Health Department, which is responsible for the maintenance of medical equipment in the project facilities, toolsets and other equipment will be installed to improve their maintenance management capacity. The main equipment for the district hospitals and the BME is as follows.

Table 3: Main Equipment to be procured for District Hospitals and BME

	Description
District Hospitals	Autoclave for DH, Blood bank refrigerator, Delivery bed, Delivery instrument set, ECG, OT table manual, Patient monitor, Shadowless OT lamp, mobile etc.
BME	Maintenance tool set and Oscilloscope

Since the maintenance and management of medical equipment at cooperation target facilities is not being adequately implemented, this is negatively impacting the quality of medical services provided. To ensure that medical equipment is available in a proper condition at all times, workshops will be held on the acquisition of maintenance know-how, strengthening of systems, budget planning and efficient procurement planning through the soft component.

4. Construction Period, and Project Cost borne by Ghana side

The construction period necessary for the Project is estimated to be, 4.5 months for Detail Design and Cost Estimation from the signing of the G/A to the invitation to tender, 2.5 months from the invitation to tender to the commencement of the work, and 17 months for construction work, for a total of 24 months. The time necessary for equipment procurement will be incorporated into the construction work period.

The cost required for the implementation of this Project borne by Ghana side will be approximately 31 million yen.

5. Project Evaluation

(1) Relevance

1) Expected Benefits of this Project

TCH and the three target district hospitals are located in geographically important areas with large beneficiary populations and coverage areas. By clarifying the function and role of TCH, this project is expected to reduce the burden on TTH and improve the referral system. Given the high possibility that this project will contribute to improving the quality of maternal and child health services, this project is deemed to be highly relevant.

2) Human Security

Although Ghana has maintained relatively stable economic growth, its economic foundation, including the country's infrastructure, is still vulnerable and there are large disparities concerning income, region, and gender equality. In the former Northern Region, there are many challenges in terms of medical services particularly high poverty rate of the area. Enhancing the public healthcare facilities covered by the Project will also reduce out-of-pocket expenses for the poor and contribute to improving their financial situation and providing economic support. By ensuring human security and improving the social infrastructure, the Project will contribute to building a stable and sustainable society in Ghana.

3) Consistency with Ghana's National Development Plan

In Ghana, the Health Sector Medium Term Development Plan 2018–2021 indicates following National Policy Objectives.

Objective 1: Ensure sustainable, affordable, easily, accessible healthcare services (UHC). Strategies for strengthening of the referral system and the district and sub-district health systems.

Objective 2: Reduce morbidity, disability mortality and intensify prevention and control of non-communicable diseases. Strategies for strengthening of maternal, newborn care and adolescent health services.

Objective 3: Enhance efficiency in governance and management of the health system. Strategies for implementation of capital investment policy and plan in the health sector.

It will also contribute to the realization of Universal Health Coverage (UHC) in Ghana, which was selected as one of the countries in which to promote UHC at TICAD 7. As the content and objectives of the Project are consistent with the policies of Ghana, the necessity and relevance of the Project are judged to be high.

4) Consistency with Japan's ODA Policy

Ghana emphatically pointed out the need for improving its health sector at TICAD 7, and has been selected as a country in which to promote UHC, placing the country in a highly important role. Including the support that Japan has provided for the Noguchi Memorial Institute for Medical Research (NMIMR), Japan has demonstrated its willingness to strengthen its cooperative relationship with Ghana by providing significant assistance in the health sector, and this project is a part of that. The Japan International Cooperation Agency (JICA) has also implemented pilot efforts for technical cooperation in the Northern Region including "Project for Strengthening Community based Health Services focusing on the Life-Course Approach in the three Northern Regions (2017 -2022)" and "Project for Improving Continuum of Care for Mothers and Children through the introduction of combined MCH Record Book (2018 -2022)." Including in the former Northern Region, these projects aim to promote illness prevention and good health through community health, and also to improve the referral and patient sharing systems, and are expected to generate synergistic benefits with the Project. Based on the above, the implementation of this project is deemed consistent with Japan's ODA policy.

(2) Effectiveness

1) Quantitative Effects

The implementation of this project is expected to have the quantitative effects described below. In the case of TCH and district hospitals, comprehensive support will be provided to TCH for the development of facilities and equipment, the support for district hospitals will be limited to maternal and child health-related equipment.

A Number of outpatients (persons/year): The number of outpatients is expected to increase due to the development of the outpatient department at TCH.

B Number of deliveries (persons/year): Increase in the number of deliveries at project facilities

C Number of cesarean sections (number/year): Increase in the number of cesarean sections at project facilities

D Number of times ultrasound equipment is used (number/year): Increase in the number of times ultrasound equipment is used at TCH.

Objective values for achievable quantitative effectiveness indicators shall be set based on the actual values in 2019[8] at cooperation target facilities. The target year will be 2027, three years after the completion of facilities through the Project.

[8] The number of outpatients at TCH is the average of the 2017-2019 period.

Table 1: Quantitative Effect Indicators and Target Values

Indicator	Reference value (2019) [Actual value]	Target value (2027) [3years after completion of the project]
A Number of outpatients at TCH (persons/year)	93,479	109,800
B Total number of deliveries at project facilities (persons/year)	11,639	15,000
C Total number of cesarean sections at project facilities (number/year):	1,205	1,500
D Number of times ultrasound equipment is used at TCH (number/year)	6,584	8,150

2) Qualitative Effects

The implementation of this project is expected to have the qualitative effects described below.

- Operational efficiency and safety are improved by enhancing the hospital environment and functions.
- Improvement and enhancement of facilities and equipment leads to a better working environment for staff and increases motivation and satisfaction.
- Enhancements to the hospital environment and functions increase patient satisfaction.
- Improvement of the hospital environment increases opportunities for in-hospital training for current and intern staff.
- Each target hospital will adequately receive patients suitable for the level of severity indicated by Ghanaian standards.

In light of the above, the project is highly relevant and considered effective.

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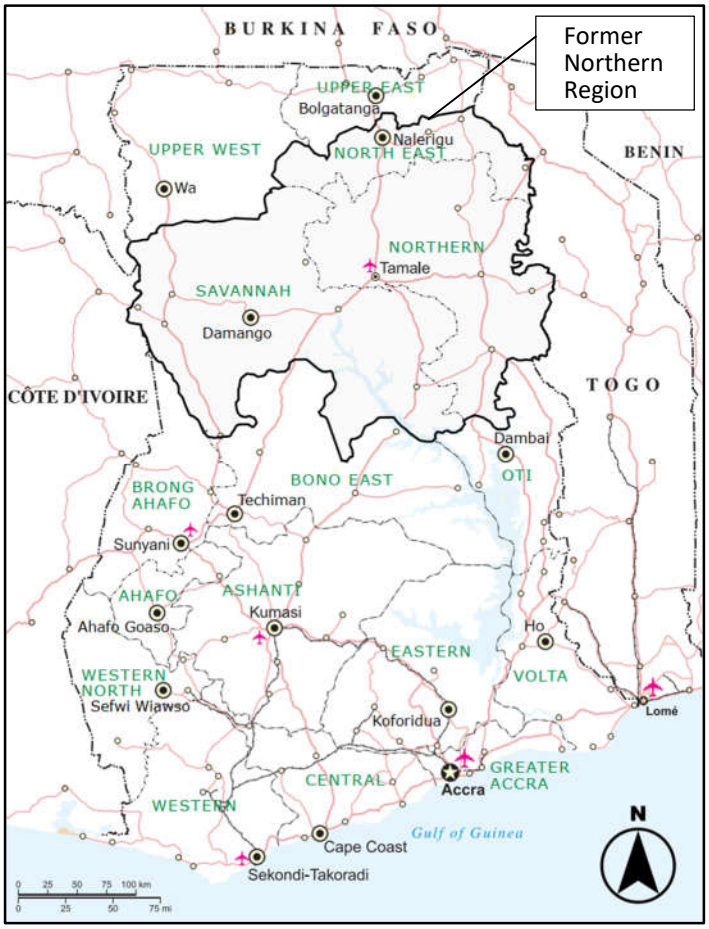
Location Map

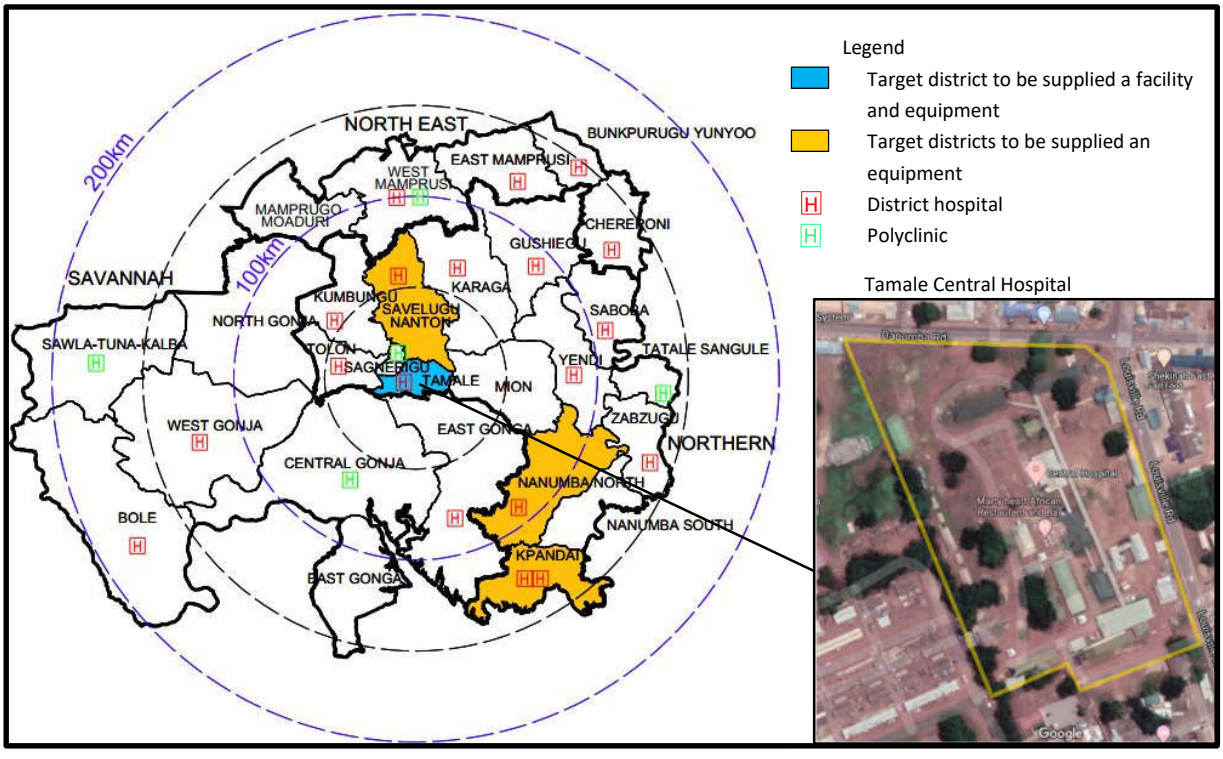
National Map of Ghana



Legend

- National capital
- Regional capital
- Town, village
- Airport
- International boundary
- Regional boundary
- Main road
- Secondary road
- Railroad

Location map of project sites (Tamale Central Hospital and District Hospitals to be equipped)



Perspective

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Abbreviations

ANC	Antenatal Care
A/P	Authorization to Pay
AVR	Automatic Voltage Regulator
B/A	Banking Arrangement
BS	British Standard
CPAP	Continuous Positive Airway Pressure
CHAG	Christian Health Association of Ghana
CHPS	Community-Based Health Association of Ghana
CSSD	Central Sterile Supply Department
CWC	Child Welfare Clinic
DH	District Hospital
DS	Duct Space
ECG	Electrocardiogram
ENT	Ears, Nose and Throat
EPA	Environmental Protection Agency
EPS	Electric Pipe Space
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
G/A	Grant Agreement
GHS	Ghana Health Service
GWCL	Ghana Water Company, Limited
HeFRA	Health Facilities Regulatory Agency
ICU	Intensive Care Unit
IEC	International Electrotechnical Commission
IGF	Internal Generated Fund
IMF	International Monetary Fund
LAN	Local Area Network
LED	Light Emitting Diode
MCH	Maternal and Child Health
M/D	Minutes of Discussions
MDB	Main Distribution Board
MFARI	Ministry of Foreign Affairs and Regional Integration
MOH	Ministry of Health
NEDCo	Northern Electricity Distribution Company
NHIS	National Health Insurance Scheme
NICU	Neonatal Intensive Care Unit

OPD	Outpatient Department
PNC	Postnatal Care
RHD	Regional Health Directorate
TCH	Tamale Central Hospital
TICAD	Tokyo International Conference on African Development
TTH	Tamale Teaching Hospital
UHC	Universal Health Coverage
UPS	Uninterruptible Power Supply
VAT	Value Added Tax

Chapter 1. Background of the Project

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1-1. Project Overview

As a result of efforts to achieve Millennium Development Goals by the deadline of 2015, the Republic of Ghana (hereinafter referred to as "Ghana") has demonstrated improvement of its health circumstances in terms of health indicators, for example halving the mortality rates of mothers and children compared to those of 1990; however, the rate of decline has slowed in recent years, with maternal deaths decreasing from 376 per 100,000 live births in 2005 to 310 in 2017, and under-5 deaths falling from 80 per 1,000 live births in 2008 to 52 in 2017.[9] In addition, the Health Summit held in Ghana in April 2017 revealed the urgency of the need to improve the quality of services at medical facilities in order to reduce the mortality rates of mothers and children because the institutional mortality rates had worsened for both—for mothers, the rate increased from 142 deaths per 100,000 live births to 150, and for newborns, the rate increased from 5.34 deaths per thousand live births in 2015 to 6.28.[10] To deal with this issue, the government of Ghana formulated Health Sector Medium Term Development Plan 2018-2021,[11] which aims to achieve Universal Health Coverage (UHC)[12] through fair access to high-quality health care, under Medium Term National Development Policy Framework 2018-2021,[13] the national medium-term plan focusing on social development, including the health care sector.

As a result of stable economic growth in recent years, Ghana is entering a period of societal transition, and demographic trends indicate that the population is gradually aging. In addition, changes in socioeconomic circumstances have given way to lifestyle modifications, which have had an impact on hospital composition; although malaria and other infectious diseases persist, non-infectious diseases are also on the rise, causing health expenditures to increase. Due to factors such as macroeconomic trends and reduced financial aid from donors resulting from Ghana's entry into the ranks of lower middle-income countries, government finances are tight, not enough people have been hired to maintain medical facilities and work in health care, and funds are insufficient for providing high-quality health services. In addition, there is substantial regional inequality in health care services and other social infrastructure, especially in the former Northern Region yet to receive the full benefits of economic development (referring to the Northern Region, the North East Region,

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[13] Medium-term National Development Policy Framework, An Agenda for Jobs: Creating Prosperity and Equal Opportunity for All (First Step) 2018-2021

and the Savannah Region),[14] where the poverty rate has reached 61%[15] and there is an urgent need to further improve the quality of health care services for regional residents. The Northern Region is one of the former Northern Region with the highest poverty rates, and lacks essential health services, and faces problems accessing medical facilities, poverty, and regional inequality. Tamale Central Hospital (hereinafter referred to as "TCH"), which is positioned administratively as a regional hospital, faces problems such as deteriorating facilities, lack of space for facilities, and insufficient medical equipment and medical specialists, and does not function as a secondary hospital, which is expected of regional hospitals. Furthermore, insufficient facilities and equipment at primary-level medical facilities in the former Northern Region leave them unable to provide proper treatment; consequently, patients who can be treated at the primary and secondary level medical facilities are clustering at Tamale Teaching Hospital (hereinafter referred to as "TTH"), a tertiary hospital.

In light of the background described above, the government of Ghana requested grant aid from the Japanese government for the Project for the Improvement of Health Care System in the Northern Region (hereinafter referred to as "the Project") for the former Northern Region with the objective to improve referral system and the quality of health care services in that area. In response, the Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted a field survey for the Project in May 2019. However, the survey was suspended due to concerns over the state of internal security in the survey area, and this occasion marks the resumption of the survey after a suspension period of roughly two years. This survey was conducted anew to account for changes in the environment surrounding the Project, while referring to the details of the previous survey.

1-2. Natural Conditions of the Target Area

(1) Geology and Climate Condition

Ghana is located in the western part of the African continent, in the south part of the Sahara Desert. It has a land area of 239,000 km^2, which is about two-thirds the size of Japan. The country is bordered by Burkina Faso to the north, Cote d'Ivoire to the west, and Togo to the east, and faces the Gulf of Guinea to the south. Most of the country's terrain is made up of lowlands in the basin of the Volta River, with a maximum elevation of about 885 meters. The coastal plain extends from the coast to 100 km inland, the western part is a forested plateau, and the eastern part is a flatland in the basin of the Volta River.

According to the Köppen climate classification, the whole of Ghana belongs to the tropical

[14]The current Northern Region, the Northeast Region, and the Savannah Region were originally one region, but were split into three during the regional reorganization of February 2019. The administrative functions and systems were not fully transferred to the new regions as of the previous survey, which was conducted in May 2019, but the transition continued in 2020, and statistics and the like have been compiled for each region after the split. In the title of this survey, the name "Northern Region" refers to the former Northern Regions before the reorganization. On the other hand, in the text, the three regions before the reorganization are referred to as the "former Northern Region" and the current Northern Region is simply referred to as the "Northern Region.

[15] Ghana Poverty Assessment 2020, World Bank

climate, however the southern part of the country has a tropical monsoon climate with a lot of rainfall, while Tamale, where the project site is located, has a savanna climate with less rainfall in the northern part. The rainy season in Tamale is from May to October, and the average annual rainfall is about 1,000mm. Temperatures are high throughout the year, with highs reaching 40 degrees Celsius and lows never dropping below 20 degrees Celsius, and from December to February, a trade wind from the Sahara Desert called "the Harmattan" blows in, bringing dust from the Sahara Desert from the northeast.

(3) Topography and Geology

The existing site of TCH has an area of about 3.8 ha, and the overall shape of the property is roughly trapezoidal with about 300 m in the north-south direction and about 150 m in the east-west direction. The property slopes downward gently from the south to the north, and the difference in elevation is 5 meters. The topsoil from the current ground level to a depth of 1.0m consists of medium density sandy and silty clay, below which a clayey gravel layer of about 2.4m is found. Deeper than that is a very dense laterite layer of decomposed and cemented mudstone and sandstone, which is a good ground with an expected bearing capacity of more than 200kN/m2 at GL-1.0m.

(4) Natural Desaster

The flooding has been recorded due to the heavy rain in the area of low ground level on the northeast of the property. However, the soil is well-drained and the water percolates into the ground in a few hours. In terms of seismic history, the magnitude 6.4 earthquake that struck the outskirts of Accra in 1939 is the largest on record. The earthquake records for the area show a cluster along the coastline; no major damage-causing earthquakes have been recorded in the northern area of Ghana to date.

(5) Site Land Survey

The same surveyor of the previous survey was selected as the outsourcing company for this topographic survey. Therefore, the last survey results were effectively used by adding the changes to the last survey map, such as newly constructed wells, ophthalmology outpatient building, hot water supply facilities, etc. As a result of the survey, there are no particular problems with the facility's construction at the site.

(6) Ground Survey

In principal, the results of the geotechnical investigation by the previous survey should be utilized as it is not expected that the underground conditions changes in a short period of time. In the present survey, trial excavation was conducted to confirm the contents of the ground investigation report. Three 1.5m square pits were excavated in the area where the planned facilities are expected to be

located. As a result of the trial excavation, it was confirmed that the soil conditions were consistent with the contents of the geotechnical investigation report from the previous survey.

(6) Infiltration Test

The Waste Management Department of the Tamale Metropolitan has stated that onsite infiltration is the preferred wastewater treatment method for the Project. In order to confirm the infiltration capacity of the soil, infiltration tests based on the British Standard (BS) were conducted at two locations within site at a depth of 2m. By the result of the infiltration test, it is confirmed that the soil at the proposed site has a very high infiltration capacity.

(7) Water Quality Test

The water quality testing was conducted for TCH and three district hospitals that are the target of the Project. The tests included chemical composition and bacteria tests. The test results showed no factors that could adversely affect the medical equipment.

1-3. Environmental and Social Considerations

Under Environmental Assessment Regulations (1999) of Ghana, hospital construction is an act subject to environmental impact assessments (hereinafter referred to as "EIA"). However, given that the Project involves upgrading the functions of existing hospital facilities, social impacts compared to the present, such as new environmental burdens or eviction of residents, are not envisioned. The Northern Region Environmental Protection Agency (hereinafter referred to as "the EPA") requires the Project to be registered for screening, but does not require an EIA, and the Regional Health Directorate (hereinafter referred to as "the RHD") plans to rule an EIA unnecessary within 25 business days of the EPA's application.

However, the RHD is concerned about the disposal of medical waste. TCH's incinerator is currently out of order. Solid medical waste is being collected by a private operator, but the company is only piling it up on a vacant lot on the outskirts of the city, and is not disposing of it properly. Consequently, the RHD wants an incinerator installed under the Project in consideration of the burden on the natural environment, health and safety of the residents. However, this problem is not limited to TCH; the same problem is noted at other medical and health facilities. TTH outsources medical waste disposal to a private operator because its incinerator is out of order. District hospitals also outsource the work to professionals because they either do not have incinerators, or their incinerators are out of order. Furthermore, the Advanced Research Center for Infectious Diseases at the Noguchi Memorial Institute for Medical Research, which was constructed under grant aid from Japan, has not been able to use its incinerator due to lack of repairs since it malfunctioned. In general, incinerator maintenance is regarded as highly difficult because it requires expert knowledge. Conversely, the private operator that serves as TCH's contractor is constructing a solid waste and

liquid waste treatment plant, the former of which is expected to be completed in December 2022. After the completion of the building, the plant facilities such as crushers and sterilizers will be installed. If the facility is completed as planned, it should be able to properly dispose off medical waste generated from the target facilities under the Project; therefore, it is assumed that medical waste disposal under the Project shall be outsourced to the private operator.

Chapter 2. Contents of the Project

Chapter 2. Outline Design of the Project

2-1. Basic Concept of The Project

The Project exists to promote the improvement of the referral system and of the quality of maternal and child health services in target areas, and to contribute to decreasing the mortality rate of pregnant women and newborns in the Northern Region and its surrounding areas of Ghana by constructing new buildings and installing medical equipment with the main goal of upgrading the functions of TCH—namely maternal and child health—and by installing medical equipment for maternal and child health at three selected district hospitals. Concurrently, in order to contribute to effective medical care activities, a soft component is planned to strengthen the system for maintaining medical equipment and ensure the proper and effective use of the equipment over the long term. This is consistent with Sustainable Development Goal (SDGs3), and also contributes to the achievement of UHC in Ghana, which was selected as a focal country for intensive support for UHC under the TICAD 7 (2016) assistance policy of Promoting Resilient Health Systems. The table below shows the overall goal and purpose of the Project.

Table 2-1: Overall Goal and Project Purpose

Overall goal	Contribute to the improvement of the present state and indicators of maternal mortality rates, neonatal mortality rates, and the like in the city of Tamale and surrounding districts in the Northern Region of Ghana.
Project purpose	Strive to improve the referral system and the quality of health care services by installing medical equipment and facilities related to maternal and child health at TCH in addition to installing basic medical equipment at district hospitals.

2-2. Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

The requests from the Ghana side include the installation of facilities and equipment at TCH as well as the installation of equipment at district level medical facilities. TCH's facilities comprise multiple buildings dedicated to different functions. However, most of the buildings are at least 90 years old; facility deterioration is progressing, and lack of the required rooms, space constraints, and the like are inhibiting the provision of health care services. The Project aims to update not only facilities for the functions directly related to maternal and child health among the existing functions of TCH, but also for those functions with many users, for which Project implementation can be expected to deliver substantial benefits. The Project also involves the installation of equipment that corresponds to the upgraded functions in an effort to improve the quality of health care services

provided. In addition, regarding the installation of equipment at district level medical facilities, the Project also aims to improve the intraregional referral system and the quality of health care services by selecting target facilities in areas with topographical hurdles against emergency transport to Tamale, at which to install medical equipment, namely for maternal and child health.

1) Selection Policy for the TCH Facility Component

Existing facilities at TCH are in a state of persistent deterioration, and many have been deemed in need of updating; however, the policy for the component installation of the Project is to narrow the focus to functions that are directly related to maternal and child health under the following criteria, while considering the cost of the Project.

Table 2-2: TCH Facility Component Selection Criteria

- Functions directly related to maternal and child health
- Functions that are difficult to continue using safely due to deterioration, lack of space, etc.
- Functions for which there is no overlap with the activities of other donors
- Functions that require advanced construction techniques/expensive medical equipment

2) Policy for Determining the Scale of Project Facilities

The scale of Project facilities of TCH is determined in response to the number of users and cases in which medical care is provided for each target function. However, given that the facilities are expected to be completed in 2024, future population growth must be factored into the determination of their scale. Under the Project, facility scales are determined based on estimated numbers of users in the target year of 2029—five years after the completion of the facilities—that factor in population growth in the former Northern Region (2.9% per year) based on the population census conducted in 2010.

3) Selection Policy for the Equipment Component

■ TCH Equipment

The Project calls for equipment needed for the services provided at the new facilities of TCH. Discussions shall be held with key people from clinical departments to select equipment to define the scope of cooperation based on the following criteria.

Table 2-3: TCH Equipment Selection Criteria

- Equipment needed to provide health care services at facilities installed under the Project
- Updating of existing equipment that has ceased to function due to deterioration or malfunction
- Equipment commensurate with the technical level of medical personnel
- Equipment found on lists of standard equipment for regional hospitals

- Equipment that can be used sustainably in terms of TCH's capacity to maintain it, and the ease of procuring consumable parts, spare parts, reagents, etc.
- Equipment commensurate with the state of infrastructure (electricity, water supply)

■ Selection Policy for District Level Medical Facilities at which to Install Equipment

The policy for selecting target facilities is to narrow the focus to districts and facilities within the scope of cooperation based on the following criteria, with relations to the referral system and investment effects of Project implementation in mind.

Table 2-4: Selection Criteria for Target Districts

- Districts with large populations (or those expected to experience population growth in the future), and others with large populations of target beneficiaries
- Number of caesarean operations by district (by medical facility)
- Number of OPD patients by district, data expected to be closely related to referrals
- Target area of technical cooperation projects with which synergy with the Project is expected
- Districts with a certain number of in/out referrals

■ Policy for Installing Equipment at District Level Medical Facilities

The policy is to install equipment commensurate with the technical level of medical personnel in consideration of the state of operation of each facility, namely equipment required to provide perinatal health care services. The criteria for selecting the equipment to install in selected target districts are as follows.

Table 2-5: Selection Criteria for Equipment in Target Districts

- Equipment needed to provide health care services at facilities installed under the Project
- Updating of existing equipment that has ceased to function due to deterioration or malfunction
- Equipment commensurate with the technical level of medical personnel
- Equipment found on lists of standard equipment for district hospitals
- Equipment that can be used sustainably in terms of TCH's capacity to maintain it, and the ease of procuring consumable parts, spare parts, reagents, etc.
- Equipment commensurate with the state of infrastructure (electricity, water supply)

(2) Policy for Natural Environmental Conditions

1) Topography

The Project area is located on the existing property of TCH, which is located in the urban center of the city of Tamale. The overall shape of the existing property is a trapezoid, and at roughly 300 m

in the north-south direction and roughly 150 m in the east-west direction with an area of roughly 3.8 ha, there is plenty of space for construction. However, the fact that existing facilities are scattered throughout the property in a pavilion format obviously limits the area available for the Project. The property slopes downward gently from the south to the north, and although land development work will be required, the plan takes into account to reduce construction costs. The connection with the existing buildings has also been considered.

2) Weather Condition

The city of Tamale in the Northern Region in which the Project area is located belongs to the tropical/continental savanna Köppen climate classification, and has clearly separate rainy and dry seasons. The rainy season lasts from May to October, and the city's annual average precipitation is roughly 1,000 mm. Temperatures are high throughout the year, with highs reaching 40°C and lows no lower than 20°C. Furthermore, from December to February, trade winds from the Sahara Desert known as the Harmattan bring in clouds of sand from the northeast, though there are no records of substantial damage. In light of these weather conditions, plans for openings and the like must block radiant heat from roofs and exterior walls, and account for the Harmattan.

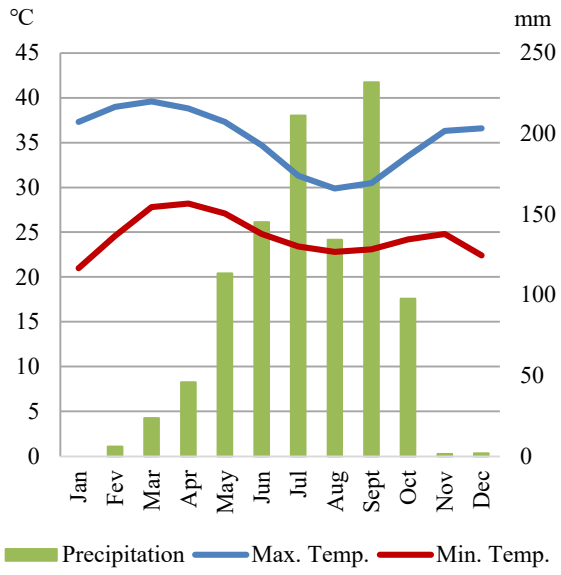

FIgure 2-1: Weather in Tamale (last five years)
Source: Ghana Meterological Agency

3) Insolation and Ultraviolet Rays

Tamale is located near 9°N, and the solar altitude at the summer solstice is accordingly high at 104.4°; the average insolation is roughly 5.4 kWh/m^2, roughly 1.5 times the average in Tokyo. Therefore, the roofs most susceptible to the impact of insolation are double-layered (RC slabs and steel roofs), and efforts are made to reduce the burden of insolation by designing exterior walls with eaves, overhangs, and louvers.

4) Flood Damage/Levels

The property of TCH slopes gently down from south to north, and there are records of flooding in the female ward, mortuary and operating theatre, which are located in the northeast, the lowest point of the site. Conversely, there are no records of inundation in the Children's Ward whose ground floor level is about 2m higher than the lowest point; therefore, the ground floor level of new buildings

under the Project shall be set to at least the elevation of the floor level of the Children's Ward.

5) Wind/Wind Direction (Measures Against the Harmattan and Clouds of Sand)

During the dry season, the majority of winds originate from the northeast and northwest; during the rainy season, winds frequently originate from the southwest and southeast. The trailing 10-year maximum wind speed in 2019 was roughly 11 m/s. In addition, from December to February in the dry season, trade winds from the Northeast known as the Harmattan bring warm air and clouds of sand from the Sahara Desert. In order to prevent dust from entering the building, the north-east wall has only a few opening and the filter also prevents dust from entering through the air supply. In the operating theatre, the air conditioning system is positive pressure.

6) Earthquakes

The area of West Africa surrounding Ghana is generally known to have a low risk of earthquakes; the magnitude 6.4 earthquake that struck the outskirts of Accra in 1939 is the largest on record. Additionally, earthquake records for the area show a cluster along the coastline; no major damage-causing earthquakes have been recorded in the northern area of Ghana to date. Notably, as an area with no earthquakes, the Northern Region—in which the city of Tamale is located—is assigned a seismic factor of zero under the Ghana Building Code.

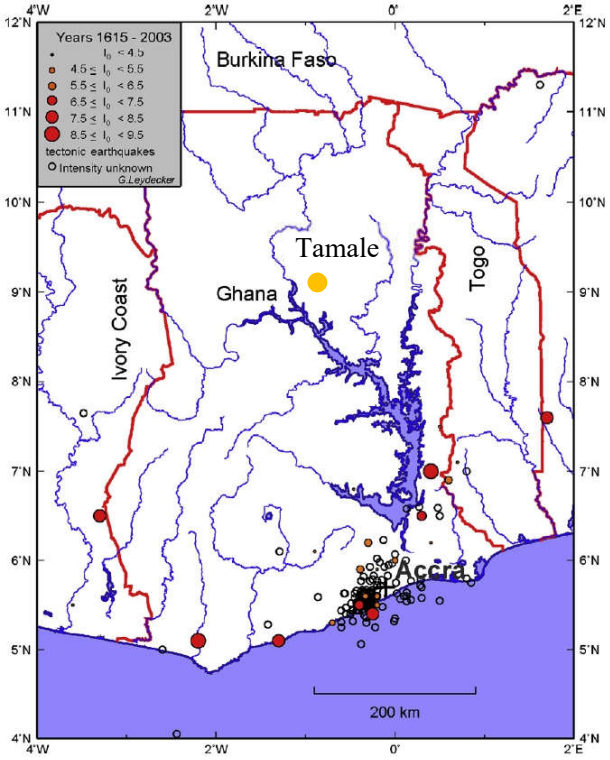

Figure 2-2: History of Earthquake in Ghana and its Environs (1615-2003)
Source: Journal of African Earth Science October 2012

(3) Policy for Socioeconomic Conditions

1) Religion

According to the national census conducted in 2010, 71.2% of Ghana residents adhere to Christianity, while 17.6% adhere to Islam. However, 60% of residents of the former Northern Region are Muslim, and the ratio is particularly high in the city of Tamale (87.6%); therefore, large numbers of Muslims are expected among the users of TCH. Sanitary plans shall consider adhering to the customs of Islam. However, because there is no strict separation between men and women as in Middle Eastern countries, men and women are not separated in plans for waiting areas.

2) Gender

To prevent discomfort between patients and staff members of different genders along their daily flow lines in the hospital, plans shall ensure as much distance as possible between the entrances to men's and women's toilets, and use partition walls and the like to block direct views of the areas from principal routes. The counterpart has requested that hospital rooms in the Children's Ward be separated by symptom rather than gender, and plans shall reflect the details of the request.

3) Economy

According to the International Monetary Fund (IMF), projected changes in commodity prices in Ghana in and after 2021 call for high inflation—9.768% in 2021, 7.519% in 2022, and 7.1% in 2023.[16] Changes in commodity prices from the time of estimation to the envisioned timing of the bidding process shall be incorporated into the process of estimating the cumulative cost of the Project based on the IMF's projections.

(4) Policy for Construction Conditions

1) Construction Standards, Permits

Ghana Building Code 2018 is Ghana's equivalent to the Japanese Building Standards Act. However, it is unclear how the code is handled; for example, there are cases where the British Standard (hereinafter referred to as "BS") is applied. In the course of formulating the Outline Design, applicable standards and important matters shall be reflected based on discussions with the Infrastructure Directorate of the Ministry of Health (hereinafter referred to as "the MOH"). In addition, the construction of Project facilities requires planning permission from the MOH and construction permits, environmental and social consideration permits, and fire permit from the city of Tamale. Because the Japanese Consultant responsible for the Project design is not registered or accredited in Ghana, the consultant must coordinate with relevant organizations to facilitate the acquisition of construction permits.

2) Construction Conditions, Procurement Conditions

Numerous relatively large facility construction sites were seen in the capital city of Accra, and a similarly high number of construction sites were observed in the city of Tamale as well; the construction market is thriving. Most of the construction companies at these construction sites are headquartered within Accra city limits. At Tolon District Hospital (completed in April 2021), a similar facilities project, an Austrian construction company subcontracted a local construction company with a branch in Tamale to perform the construction work, and the quality of the work was

[16] https://www.imf.org/en/Publications/WEO/weo-database/2021/April/weo-report

good.

It is possible to procure construction materials; sand and gravel are extracted and processed on the outskirts of Tamale. It is also possible to procure materials because cement plants, reinforcement bar plants, and other retailers that source from domestic production have been established in Tamale city limits. Most of the tiles, paint, plumbing & electrical fittings, medical gas and other materials for finishing works and ulitity are imported from overseas. Most of these construction materials are transported over land from the capital city of Accra, a fact that must be kept in mind when formulating transport plans.

(5) Policy for Using Local Companies

1) Facilities

The Project shall be implemented under ordinary grant aid; therefore, the Japanese Contractor shall use a Ghanaian contractor to perform the work. The local construction contractor shall be registered with the Contractors' Classification Secretariat in order to participate in the bidding for public works projects in Ghana. In the course of registration, contractors are separated into categories according to their business type, and class according to their scale. Because the Project is characterized by its plan to construct a medical facility, which involves construction with a relatively high degree of difficulty, in a provincial city, it is necessary to proceed with the construction work efficiently by using a local construction company; in the course of selecting the construction company, it is necessary to closely examine the quality of their work on similar projects, their capacity for work, and their financial strength.

2) Equipment

Certified technicians affiliated with local business agents of major manufacturers in Accra are capable of providing the necessary maintenance services. Therefore, even if the equipment breaks down after it is delivered, it is possible to receive services from business agents. In addition, although the regional Biomedical Engineering Department (hereinafter referred to as "the BME Department") provides maintenance of medical equipment at target facilities under the Project, it is necessary to ensure that clinical examination instruments the department is incapable of repairing are provided with maintenance services lasting three years from delivery and including annual maintenance for several years and a free warranty period. During this period, it is essential for TCH to raise the cost of the maintenance contract and maintain it on an ongoing basis.

(6) Policy for Operation and Maintenance

1) Facilities

The MOH, which is the counterpart government agency responsible for the Project, and the Ghana Health Service (hereinafter referred to as "the GHS"), which is the beneficiary agency, have experience with various facility construction projects in the past; therefore, there will be no technical problems in the course of Project implementation. In addition, TCH's Estate Management Department performs daily maintenance and repairs of TCH's facilities. Maintenance expenses are covered by an Internally Generated Fund (hereinafter referred to as "IGF"[17]) allotted in proportion to TCH's hospital revenue; therefore, increases in maintenance expenses have a substantial impact on hospital operation. In consideration of the ease of maintenance and reducing running costs, the Project design will adopt locally circulated materials and construction methods that are ordinary in the target location, while also refraining from requiring special maintenance techniques.

2) Equipment

Essentially, the maintenance of medical equipment at target facilities under the Project is performed by the regional BME Department, and facilities within the scope of cooperation under the Project take it upon themselves to ask business agents in Accra to perform repairs of equipment the department has difficulty repairing. The only medical equipment for which TCH has entered annual maintenance agreements with business agents is X-ray equipment. The plan calls for the regional BME Department and appointed hospital managers responsible for equipment maintenance to perform most of the daily and scheduled preventive maintenance of equipment installed under the Project. In addition, the establishment of a preventive maintenance system for equipment procured under the Project shall be implemented as part of the soft component.

(7) Policy for Grading Facilities/Equipment

1) Facilities

Target facilities under the Project are positioned as regional hospitals, which are secondary medical facilities in terms of health administration; however, the actual services provided are no better than those at primary medical facilities. Regarding facility grades, the basic policy is to adopt solid, highly durable designs in consideration of functionality and maintainability while referencing the details of the designs of other primary and secondary medical facilities and district hospitals.

[17]Profits obtained by health care facilities, which are the sum of remuneration for medical treatment paid to the facilities by the NHIS, and out-of-pocket expenses paid by patients who are not enrolled in the NHIS or who received services not covered by the insurance

2) Equipment

The equipment to be installed under the Project shall have grades that enable the personnel presently assigned at TCH and district hospitals to use them without problems. Notably, as of April 2021, the only personnel capable of using the ultrasound scanner to be installed at TCH are ultrasound technicians assigned to the Antenatal Checkup Scanning Office, and midwives with at least 10 years of clinical experience. To enable more medical personnel to use the ultrasound scanner to be installed, the plan calls for ultrasound technicians (who specialize in scans for obstetrics and gynecology) affiliated with tertiary medical facilities in Accra or Kumasi to be dispatched to TCH through the MOH for roughly two to three weeks to train midwives and issue course completion certificates.

(8) Policy for Construction Methods/Procurement Methods, Construction Schedules

1) Construction Methods

Common local construction methods in Ghana include a frame format that combines reinforced concrete framework with concrete block curtain walls, and wooden or light-gauge steel-frame roof trusses. The same frame format shall be adopted under the Project, and a construction method of combining reinforced concrete slabs with steel sheet roof materials shall be adopted in consideration of durability and reducing the cost of maintenance.

2) Procurement Methods

To facilitate repairs and maintenance after the completion of facility construction, locally procured materials shall be used whenever possible. However, given that the Project involves a medical facility, a portion of materials for which special considerations in terms of material quality are required shall be procured in Japan.

3) Construction Schedules

The rainy season in the city of Tamale lasts from May to October; however, the trailing five-year annual rainfall is only around 940 mm. Records show days with heavy rain in excess of 100 mm. However, this kind of rainfall does not persist; therefore, rainfall has hardly any effect on construction work. In addition, given that there are no problems with land transport from the capital city of Accra to Tamale, no envisioned natural or procurement conditions that could substantially impact the construction schedule are envisioned. However, given the envisioned loss of work efficiency during Ramadan with the majority of Muslims community in the city of Tamale, and the risk factors of placing hot-weather concrete, construction schedules shall be formulated with due consideration of these site-specific problems.

(9) Policy for Equipment Procurement

In consideration of factors such as the quality of medical equipment, regarding Japanese products, only products that conform to the Pharmaceutical Affairs Act of Japan shall be eligible for procurement. Regarding foreign products, only medical equipment manufactured at plants that comply with ISO 13485 (the international standard for quality assurance of medical equipment) and clinical examination equipment manufactured at plants that comply with ISO 9001 (quality management systems) shall be eligible for procurement. No medical equipment or furnishings are manufactured in Ghana; therefore, it is possible to procure products for which competitive bidding cannot be ensured due to limiting sources to Japanese products, or are difficult to maintain, from third countries.

(10) Policy for Construction Supervision

The facility construction work under the Project is characterized by its large scale; the total floor area on the hospital property to which many and unspecified users have access is roughly 5,800 m^2. Therefore, in addition to security management throughout the construction period, the key to work process management is timely procurement of organized quantities of construction materials. In addition, high temperatures throughout the year necessitate accommodations for hot-weather concrete; therefore, creative solutions such as placing concrete at night are necessary. Furthermore, given that Tamale is a provincial city located 600 km away from the capital of Accra, care must be taken to secure skilled labor, which directly impacts the quality of construction work. Regarding these keys to construction work, efforts shall be made to consider policy for supervision, ensure the quality of construction work, adhere to construction schedules, and ensure safety.

(11) Policy for Safety Measures

Domestic security in Ghana is relatively stable. However, domestic security in Burkina Faso, which borders Ghana to the north, has deteriorated rapidly in recent years due to the impact of the unstable state of security in surrounding countries, namely Mali and Niger, and the country has suffered a spate of attacks by terrorist organizations and domestic armed insurgents. Given these circumstances, the threat of terrorism is spreading through the northern area of Ghana. Consequently, efforts shall be made to establish a network for safety measures for the Project and constantly gather information about domestic security and include the security measures in the construction plan.

2-2-2 Basic Plans (Facility Plans/Equipment Plans)

(1) Components within the Scope of Cooperation

The details of the counterpart's requests confirmed before this survey are as follows, and are the same as in the previous survey. However, given that survey work has been suspended for two years since the previous survey, and in consideration of changes to the conditions surrounding the Project, the decision was made to examine the details of the requests and consider the scope of cooperation anew.

Table 2-6: Requested Components by the Ghana Side

Facilities	The following facilities at Tamale Central Hospital - Outpatient Department: Outpatient, Emergency - Diagnostic Department: Clinical Examination Rooms (Laboratories), X-Ray Rooms, Theaters, Central Sterile Supply Rooms - Maternal: Consultation Rooms for Antenatal/Postnatal Care, Labour Ward (Including Delivery Room), Maternal Ward, Neonatal Intensive Care Unit - General Ward: Children's Ward
Equipment	Tamale Central Hospital: Medical equipment required in the above-listed requested facilities. However, a list of requested equipment has not yet been obtained; this shall be confirmed during field surveys. Basic medical equipment packages (stadiometers, height and weight scales, sphygmomanometers, etc.) for district level medical facilities (district hospitals, polyclinics, health centres, clinics) in the region

1) TCH Components within the Scope of Corporation

At the conclusion of the field survey portion of the previous survey, the counterpart agreed that the facility component is a high-priority function. Accordingly, during this survey, priority levels were assigned after further narrowing down the functions, keeping in mind the strengthening of maternal and child health functions while scrutinizing the project cost. The table below shows the functions within the scope of cooperation and the priority of installation agreed to with the counterpart based on the facility component selection criteria (Table 2-2).

Table 2-7: Existing Components of TCH and Components to be Covered by the Project

	Facility component	Priorities agreed in previous survey	Priorities agreed in this survey	Project components	Remarks
OPD	OPD(incl.Eye clinic, ENT, Pediatric)	A	B Pediatric outpatient only A	Yes	Ophthalmology is not covered
	Psychiatry	B	—		
	Emergency Department	A	—		Some functions are complemented by OPD
	Fistula Centre	C	—		
	Pharmacy Department	B	—		
Diagnostic Block	Laboratory	A	B	Yes	
	X-ray	A	—		
	Main theater	A	A	Yes	
	CSSD	A	A	Yes	
Maternity Block	ANC, PNC	A	A	Yes	
	Labour ward (incl. Delivery room)	A	A	Yes	
	Maternal ward	A	A	Yes	
	NICU	A	A	Yes	
Ward	Male ward	B	—		
	Female ward	B	—		
	Children's ward	A	A	Yes	
Support etc.	Administration Department. and Office	C	—		
	Conference hall	B	—		
	Laundry (general)	C	—		
	Mortuary	C	—		
	Staff residences	C	—		
	Store	C	—		
	Incinerator	C	—		

* A: High priority, B: Middle priority, C: Low priority, —: Not covered by the Project

From the above table, the priority levels of Outpatient and Clinical laboratory were lowered from the previous survey, and Emergency and X-Ray Rooms were removed from the functions to install on a priority basis. Regarding Priority B functions, as a result of detailed considerations during domestic analysis, ultimately, both Priority A and Priority B functions were included in the scope of cooperation. Details of the evaluations of Priority A functions from the previous survey are as follows.

■ Outpatient Department

With more than 93,000 outpatients per year, there are substantial benefits to implementing the Project, and the department was deemed to have a strong need for facility installation. However, General Outpatient and ENT were assigned Priority B because of their tenuous relationships with the goal of strengthening maternal and child health; only Pediatric Outpatient was assigned Priority A. However, installing facilities with only Pediatric within the scope of cooperation creates a problem—the existing facilities of Outpatient, ENT, and Observation Rooms for accepting critical-care patients would remain intact in a separate building. As for present Outpatient operations, General Outpatient and Pediatrics involve Physician Assistants providing care in alternating shifts, and there are no staff members specializing in pediatrics to provide outpatient care. Consequently, if only Pediatrics is relocated to new facilities, the Outpatient Department's functions will become scattered and compromise operational efficiency. In addition, new facilities constructed for Outpatient under the Project contain no attached space for receiving critical-care patients (Observation Rooms), making the flow lines from Triage to the Theaters inefficient for pregnant women in need of emergency caesarean sections, and having a negative impact on the hospital's maternal and child health functions. Outpatient Department facilities continue to deteriorate, and its cramped waiting rooms overflow with patients; including all of Outpatient within the scope of cooperation will enhance the convenience of patient use of the facilities by enabling their installation with a proper amount of space for the first time. Therefore, it is recommended to include the entirety of Outpatient functions within the scope. Note that the Eye Clinic is excluded from the scope of cooperation because it is under construction with assistance from the Red Cross.

■ Emergency

At present, the Emergency Building is being used as temporary accommodations for patients suspected of having contracted COVID-19. As a replacement, Observation Rooms from which emergency consultation functions are complemented 24 hours a day have been established in Outpatient. For the Project, Emergency is excluded from the scope of cooperation under the assumption that the present method of operation will be continued. Instead, the decision was made to install Observation Rooms as part of the implementation of Outpatient functions.

■ Clinical Laboratory

The existing Clinical Laboratory was assigned Priority B because it has not deteriorated to the extent that other buildings have. However, with more than 99,000 blood tests per year alone, it is a function that is used quite frequently. In addition, given the importance of blood and urine tests in antenatal checkups, the function is deeply related to maternal and child health as well. Equipping a new building with maternal and child health functions would result in a distance of more than 160 m between the functions and the existing Clinical Laboratory; however, integrating the functions with

clinical examination functions under the Project would increase convenience by enabling pregnant women, who require many antenatal checkups, to receive clinical laboratories without having to travel long distances in punishing heat. Clinical laboratory functions are also essential prior to operations; integrating them with the Theaters and incorporating them into new buildings would also increase the convenience of facility use for medical personnel, who are working with a staff of limited size.

■ X-Ray Rooms

Container-type X-Ray Rooms were installed in 2017 with assistance from the Netherlands. They are distant from the facilities to be installed under the Project, and although this compromises convenience, there are no functional problems; therefore, these facilities are outside the scope of cooperation.

In addition, medical equipment were selected to correspond with functions within the scope of cooperation according to the criteria shown on Table 2-3. Details about equipment to be procured are included in Section 2-2-2 Basic Plans (5) Equipment Plans.

2) District Level Medical Facilities in the Region at which only Equipment is to be Installed

District hospitals in the five districts selected as the scope of equipment installation during the previous survey are positioned as district referral centres and district sub-referral centres, and receive patients from health centres. Given that the aim is to further improve maternal and child health indicators by installing equipment at district hospitals in the former Northern Region that are located long travel distances from Tamale, this survey was conducted within the five districts selected in the previous survey (East Mamprusi, Savelugu-Nanton, Nanumba North, Kpandai, and Tolon).

As a result of surveys of district hospitals and health centres in the five target districts, and consideration of priority in light of the criteria shown on Table 2-4, and to accommodate the counterpart's request for budget allocation to further enhance the installation of facilities and equipment at TCH, three district hospitals (Bimbilla District Hospital, Savelugu Municipal District Hospital, and Kpandai District Hospital) were selected as the scope of cooperation. Providing diagnoses and treatment at a defined level and on an intraregional basis is very meaningful in these target districts because they are located too far away from Tamale for timely emergency transport. In addition, plans were made to install toolsets and the like to improve maintenance functions for the BME Department of the RHD, which is responsible for maintaining medical equipment in facilities within the scope of cooperation as well as these district hospitals.

Table 2-8: District Level Medical Facilities and Priorities for the Survey

	District	District Hospital	Priorities agreed in previous survey	Priorities agreed in this survey	Project facilities
1	East Mamprusi	Beptist Medical Centre	A	－	
2	Savelugu Municipal	Savelugu Municipal District Hospital	A	A	Yes
	Nanton	Tampion Health Centre			
3	Nanumba North	Bimbila District Hospital	A	A	Yes
4	Kpandai	Kpandai District Hospiral	A	A	Yes
		ECGHospital	A	－	
5	Tolon	Tolon Health Centre	A	－	

* A: High priority, －: Not covered by the Project

The Baptist Medical Center and ECG Hospital, which were excluded from the scope of cooperation, are under the jurisdiction of the Christian Health Association of Ghana[18] (hereinafter referred to as "CHAG"). Of these two, the Baptist Medical Center has recently procured essential equipment for opening a Neonatal Intensive Care Unit (hereinafter referred to as "NICU") and equipment for an Intensive Care Unit (hereinafter referred to as "ICU"), and has an abundance of funds compared to other hospitals. In addition, although equipment installation has been delayed at ECG Hospital, it accepts limited numbers of patients because it is located within a 10-minute drive of Kpandai District Hospital, which is within the scope of cooperation. In addition, the Tolon District was excluded from the scope of cooperation because a new district hospital was completed and equipped with facilities and equipment in April 2021. The table below shows clinical activity data from the five target districts of the reconnaissance survey.

Table 2-9: Clinical Activity Data of the Five District Hospitals to be Surveyed

	District	Hospital Name (DH)	Jurisdiction	Catchment area population	No. of outpatients	No. of beds	No. of caesarean sections	No. of Normal Derivery	No. of refer in	No. of refer out	Distance to Tamale	Target Districts of Technical Cooperation
1	East Mamprusi	Baptist Medical Center*	CHAG	150,018	86,240	176	620	2,374	529	171	155km	Yes
2	Savelugu	Savelugu Municipal Hospital*	GHS	109,811	13,087	113	299	3,091	791	423	25km	Yes
	Nanton	Tampion Health Centre	GHS	61,646	2,261	NA	0	236	NA	NA	35km	Yes
3	Nanumba North	Bimbilla District Hospital*	GHS	174,518	106,346	413	413	2,018	900	120	129km	
4	Kpandai	Kpandai District Hospital**	GHS	134,715	25,028	57	57	822	69	61	170km	
		ECG Hospital	GHAG	134,715	8,519	72	72	405	52	35	170km	
5	Tolon	Tolon Health Centre	GHS	88,789	8,918	0	0	978	NA	NA	60km	Yes

*Referral centre, **Sub-referral centre

Source : Prepared by Consortium

[18]An organization under the jurisdiction of the Minister of Health that coordinates the activities of health programs in 344 medical facilities and health training institutions owned by 33 different denominations of the Christian church

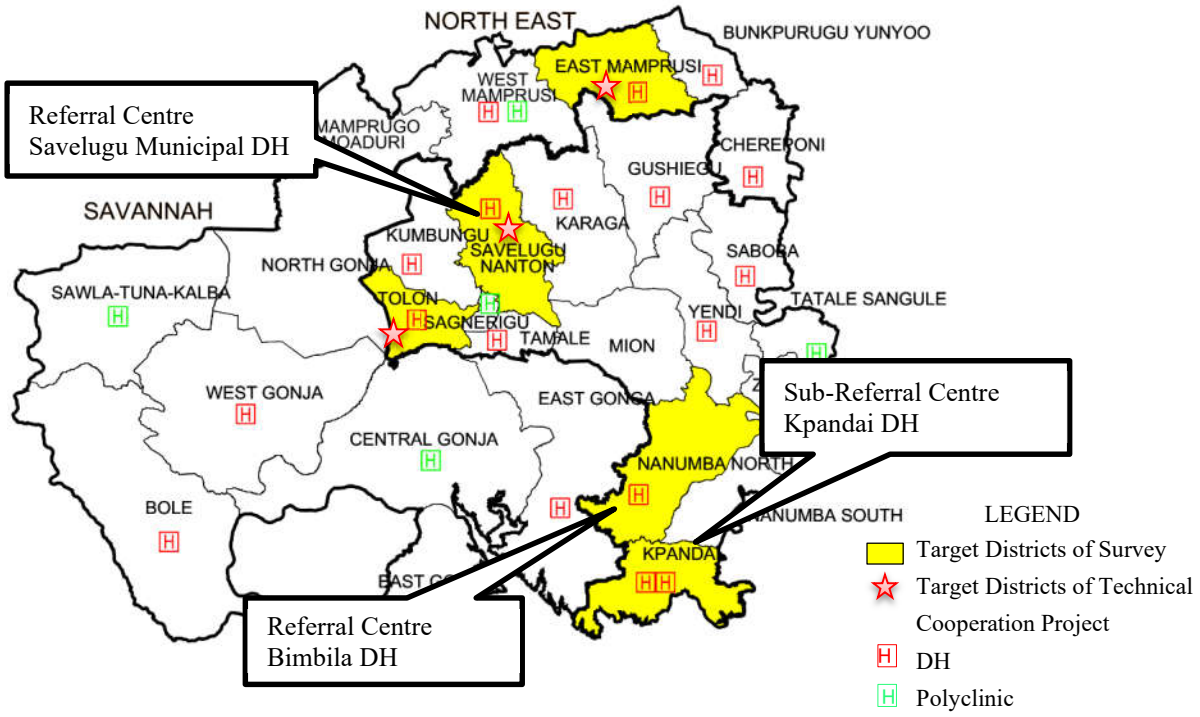

Figure 2-3: Location Map of Target Districts for Field Survey and District Level Medical Facilities covered by the Project

3) Details of the Component of Equipment to be Installed in District Level Medical Facilities (District Hospitals)

The Ghana side did not submit a list of requested equipment for district hospitals; therefore, the state of existing equipment at various facilities was confirmed before a list of equipment to install was formulated, with the essential aim of updating equipment that contributes to improving perinatal medical care in the district, the objective of the Project. The equipment was categorized into Priority A and B, and the Ghana side agreed. Details are included in Section 2-2-2 Basic Plans (5) Equipment Plans.

4) Soft Component

Regarding medical equipment maintenance, it is assumed that equipment do not break down if the end users at each medical facility clean and otherwise conduct daily inspections without fail, and that malfunctions are prevented in many cases if the end users understand how to use the equipment properly. Therefore, the necessity of implementing a software component to strengthen maintenance and management capabilities, including preventive maintenance activities, was confirmed.

(2) Configuration of TCH Project Scale

The scale of TCH facilities is calculated by estimating the number of patients, considering the actual number of patients in the base year and the increase in the number of patients up to the target year, and calculating the necessary number of rooms and beds. As for the actual number of patients as a base, 2020 is the most recent data. However, it is not reliable as data showing the real situation due to the influence of COVID-19, so the average of the past three years starting from 2019 is used. Therefore, the base year will be 2019, and the target year will be 2027, three years after the facility's completion.

1) Calculation Conditions

■ Projection of the Future Number of Patients

According to the 2021 census, the total population of Ghana is 30,792,608, compared to 24,658,823 in the last census conducted in 2010, which implies an 11-year population growth rate of 24.9%, or 2.04% annualized. With this annual growth rate, the population growth rate from 2019 to 2027 is assumed to be 17.5%. The number of general outpatients in the target year will be estimated taking this population growth rate into account.

Based on the population and fertility rate of women of childbearing age (15-49 years) in Northern Region according to the 2010 census, the fertility rate from 2019 to 2027 is estimated to be 24%.

■ Operating Hours and Days of TCH

The daily average number of patients is calculated based on the current operating hours and days of TCH, and serves as a parameter for projecting the future number of patients. The table below shows the operating hours and days of each department relevant to the Project.

Table 2-10: Operating Hours and Days of TCH

Department		Operating hours	Operating day/year	Department		Operating hours	Operating day/year
OPD	Weekday	24H	365	Eye Clinic	Weekday	8:00-17:00	260
	Saturday	24H			Saturday	-	
	Sunday	24H			Sunday	-	
Laboratory	Weekday	24H	365	ANC and PNC	Weekday	7:30-15:00	260
	Saturday	24H			Saturday	-	
	Sunday	24H			Sunday	-	
Pharmacy	Weekday	24H	365	Emergency	Weekday	24H	365
	Saturday	24H			Saturday	24H	
	Sunday	24H			Sunday	24H	

Source: TCH Questionnaires

2) Configuration of Facility Scale

■ Number of Outpatient Consultation Rooms

The number of Consultation Rooms is calculated based on the trailing three-year average number of outpatients from 2016 to 2019. As shown in the following table, the trailing three-year average number of outpatients is 93,479, of which 20,388 are child patients age five or younger.

Table 2-11: Trend in the Number of Outpatients (2016 - 2019)

	2017	2018	2019	Averege
Total Number of OPD Patients	98,048	92,160	90,229	93,479
Number of Child Patients in the above (5 years old or younger)	22,159 (22.6%)	18,616 (20.2%)	19,850 (22.0%)	20,388

Source : TCH Annual Report 2020

Calculating the required number of rooms using the expected daily number of patients in consideration of population growth applied to the numbers of patients on the table above yields an estimate of 10 rooms compared to the current number of rooms, which is seven. In addition, three of those rooms shall be for Pediatrics.

Table 2-12: Calculation of the Number of Consulting Rooms

	Annual No. of Outpatients (p/year)	Annual operation days (day/year)	No. of average daily patient (p/day)	Rate of increasing patients (compared to 2019)	No. of expected daily patients in 202 (p/day)	Crowded opening hours (min/day)	Consultation rooms				
							Average consultation time per room (min*room/p)	Maximum No. of daily patients pe room (p/day*room)	No. of required consultation rooms	No. of planned consultation rooms	No. of existing rooms excluding eye clinic
	A	B	C=A/B	D	E=C*D	F	G	H=F/G	I=E/H		
Total OPD Patients	93,479	365	256	117.5%	301	300	10	30	10.0	10	7
Child Patients (under 5 years)	20,388	365	56	117.5%	66	300	10	30	2.2	3	

■ Number of Necessary Beds in the Maternity Department (Labour Rooms, Maternal, NICU)

The table below shows the trailing three-year average number of births from 2017 to 2019. Based on these figures, parameters such as the average wait time in Labour Rooms and daily average number of deliveries obtained from interviews with TCH were set, and the number of necessary beds in Maternity was calculated.

Table 2-13: Number of Births at TCH (2017 - 2019)

	2017	2018	2019	Average
Normal delivery	4,547	4,533	4,373	4,484
Cesarean section	496	567	612	558

Source: Questionnaire and Interview with TCH

The calculations yielded a result of 7.62 necessary beds for Labour Rooms; however, because births tend to cluster during the nighttime, the planned number of beds is set to 12 to be on the safe side. In addition, the plan calls for five birthing beds compared to the current number, which is four. Note that the current situation is such that Maternity is used for recovery from caesarean section deliveries and for pregnant women who contract preeclampsia or malaria and require admittance and treatment, beds in Labour Rooms are used for recovery after normal deliveries, and patients are discharged six hours after giving birth. These are provisional measures to shorten hospital stays to the extent possible in pursuit of preventing COVID-19 infections. The number of existing Maternity beds is 23, but because all beds are occupied on some occasions, the plan calls for 32 beds, which is the sum of the number of existing Maternity beds and the number of necessary beds for recovery from normal deliveries.

Table 2-14: Calculation of the Number of maternity Beds

						Labour ward				Delivery bed				Maternity ward (post-natal)			
	Annual No. of deliveries (p/year)	Annual operation days (day/year)	Average daily deliveries (p/day)	Birth growth ratio (compared to 2019)	Average daily deliveries adjusted	Average waiting time (day/p)	Number of required beds	Number of planned beds (No. of required beds +4 (for congestion time))	No. of existing beds	No.of deliveries per bed (p/bed)	No. of delivery beds	No. of planned delivery beds (No. of required delivery beds + 3(for congestion	No. of existing beds	Average recovery time (days/p)	No. of required recovery beds	No. of planned beds (No. of required beds + 1(for congestion time)	No. of existing beds (including veranda bed
	A	B	C=A/B	D	E=C*D	F	G=E*F	I=F/H		H	I=E/H			J	K=E*J		
Normal Deliveries	4,484	365	12.28	124.0%	15.23	0.5	7.62	12	11	8	1.904	5	4	0.50	7.615	9	23
Maternity ward total																32	23

The planned number of maternity beds is 32, including the existing 23 beds plus 9 beds required for the recovery of normal deliveries

In addition, the table below shows the number of NICU patients admitted in the past three years, from 2017 to 2019.

Table 2-15: Number of NICU Patients Admitted (2017-2019)

	2017	2018	2019	Average
NICU admission	532	643	639	605

Source: TCH Annural Report

Setting the average length of stay to four days and the bed occupancy rate to 80% based on interviews with TCH yielded a calculation of 11 necessary beds for the NICU. While this number is less than the current number of beds, 13 beds should be planned to maintain the present scale. This is the total number of baby cots and incubators.

Table 2-16: Calculation of the Number of NICU Beds

	Number of low birth weight per year (p/year)	Average days of hospitalisation (days/person) *1	Annual days of hospitalisation (days/year)	Birth growth ratio (compared to 2019)	No. of estimated patients in 2029 (p/day)	No. of estimated patients in 2029 (p/day) with 80% of bed occupancy	No. of required beds	No. of planned beds	No. of existing beds
	A	B	C=A*B	D	E=C*D	F=E/80%	G=F/365	H	
NICU	605	4.00	2,420	124.0%	3,001	3,751.00	11.00	13	13

*1 Based on the interview with TCH

■ Number of Necessary Beds in the Children's Ward

The number of necessary beds is calculated based on the trailing three-year average number of inpatients from 2017 to 2019.

Table 2-17: Trend in the Number of Children's Ward Inpatients (2017-2019)

Number of inpatients	2017	2018	2019	Average
Children Ward	4,069	3,695	3,417	3,727

*1 The number of admissions to children wards is calculated by multiplying the total number of admissions in the TCH Annual Statistics 2020 by the Children ratio

Setting the average length of stay to two days and the bed occupancy rate to 80% based on interviews with TCH yielded a calculation of 32 necessary beds for the Children's Ward. Still, the planned number of beds is 34 to allow for a margin, increasing five beds from the present number.

Table 2-18: Calculation of the Number of Beds in Children's Ward

	Number of patients per year (persons/year)	Average days of hospitalisation (days/person)	Annual days of hospitalisation (days/year)	Birth growth ratio (compared to 2019)	Estimated No. of daily patients in 2029 (days/year)	Estimated No. of daily patients in 2029 (days/year) with 80% of beds occupancy	Number of required beds	No. of planned beds (No. of required beds + 1 (for congestion time)	Number of existing beds
	A	B	C=A*B	D	E	F=E/80%	G=f/365		
Children's Ward	3,727	2.0	7,454	124.0%	9,243	11,554	32	34	29

(3) Facility Layout Plan

The area of the TCH property is roughly 3.8 ha, which is plenty for facility construction; however, the construction area of the Project is limited due to the fact that existing buildings are scattered throughout the property in a pavilion format. In consideration of minimizing the impact on existing facilities and of the impact of construction work on hospital operation, the northwest side of the property is considered to be an appropriate construction area for the Project. The layout plan calls for a compact layout of buildings in this area to allow for the expansion of functions in the future.

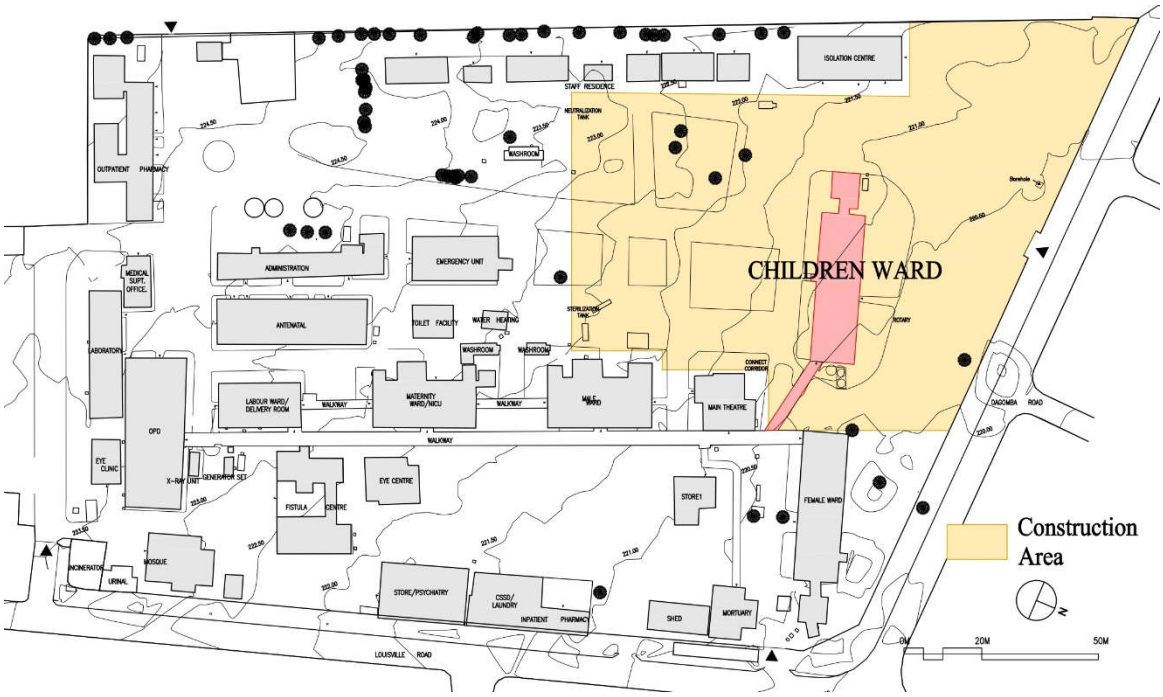

Figure 2-4: Map of TCH in its Present Condition and the Construction Area of the Project

However, because the Children's Ward and unused facilities such as toilets and septic tanks are located in the middle of this construction area, these buildings and structures, which would hinder

the construction work, must be demolished and removed at the counterpart's expense before the bid opening. In addition, regarding the relocation of Children's Ward patients necessitated by the construction work, TCH intends to disperse them between the Female Ward, the Emergency Building, and the Fistula Center.

The scope of cooperation of the Project includes functions for which installation is high-priority, namely functions directly related to maternal and child health; the goal of the Project is not to update all functions of TCH. Accordingly, even functions excluded from the scope of cooperation in this survey must be updated and installed in due order in the future. In these cases, with regard to the expansion of functions in the future, developing south-facing facilities will make it possible to locate future facilities along an east-west axis to prevent exposure to the morning and evening sun. Concurrently, because construction work is possible with existing buildings on the east side remaining intact, it is possible to minimize buildings to be demolished before construction starts. In light of these facts among others, regarding the facility layout under the Project, the area around the current Children's Ward is considered to be appropriate.

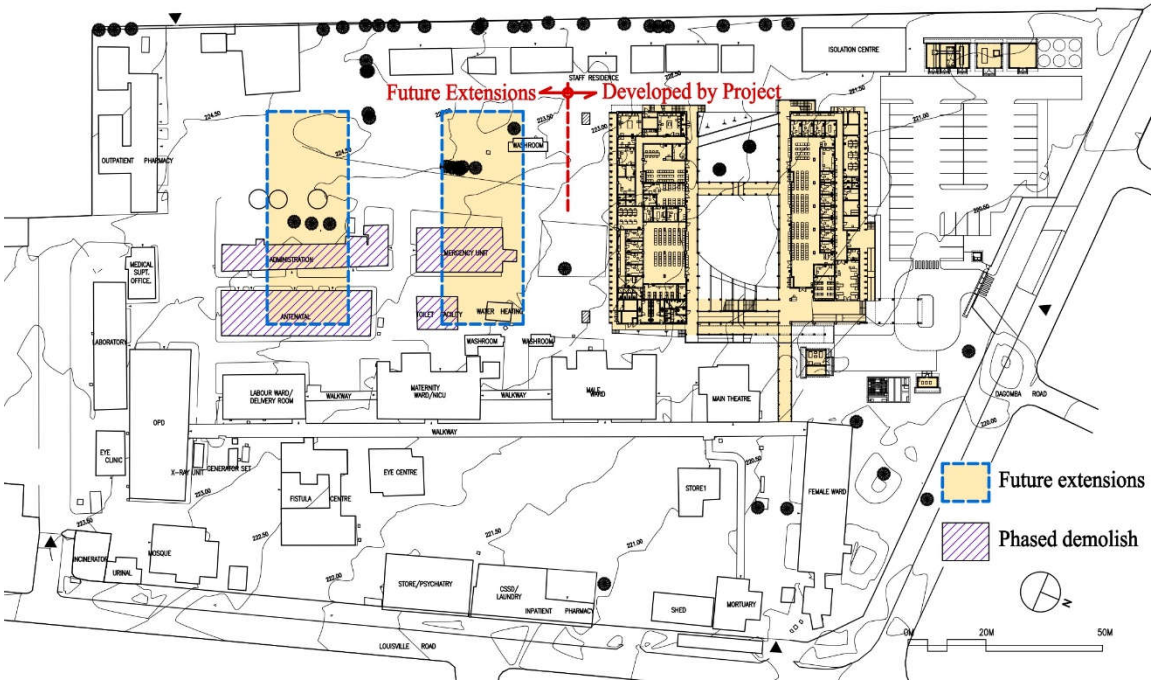

Figure 2-5: Images of Future Expansion

After the handover of the planned facilities, TCH wishes to convert the existing facilities into wards and meeting rooms for new departments. These include a surgical ward for patients undergoing laparotomy and a burns ward. They also plan to demolish some of the more deteriorated facilities.

(4) Building Construction Plans

1) Facility Specifications

A majority of the construction materials—including imports—can be obtained in Ghana. In consideration of the ease of facility maintenance and workability, special specifications and construction methods will not be adopted under the Project; the standard approach is to use construction and finishing methods that are common in Ghana. However, procurement from Japan or third countries will also be considered as needed in order to ensure quality and a consistent supply. The design specifications of the buildings used for the main medical care activities are as follows.

■ Exterior finishing

Roofs: Roofs shall comprise sloped reinforced concrete roofs with steel channel purlins installed on top, followed by insulation material (polystyrene foam, t = 50 mm) and asphalt waterproof sheets, and galvanized sheets (t = 0.58 mm). Concrete slab roofs are adopted to ensure durability, but covering sloped roofs with galvanized sheets reduces the frequency of maintenance for waterproofing. In addition, laying polystyrene foam and waterproof sheets enhances both insulation and waterproofing performance.

Exterior walls: In consideration of the ease of maintenance, mortar undercoats shall be applied to concrete blocks (t = 200 mm), and finished with coating.

Floors: Tiles shall be the standard finish of the floors of exterior corridors, but in consideration of workability, trim tile shall be avoided to the extent possible, and tiles shall be paired with metal trowel-finished mortar. Sloped areas require slip prevention; therefore, brushed mortar shall be the finish of sloped areas.

■ Internal finishing

Floors: Tiles shall be the standard finish of the floors, but metal trowel-finished mortar shall be the finish of service corridors, the Staff Room, the Night Duty Room, stores, mechanical rooms, and other areas used only by staff members. In addition, antimicrobial vinyl flooring sheets shall be used in the Theaters.

Interior walls: Paint coated finishes atop mortar under beds shall be the standard finish, but coatings shall be glossy to the height of the doorframes (FL+2100), and matte beyond that height. However, antimicrobial coating shall be used on all surfaces in treatment rooms and the rooms of the Theater Department. In addition, porcelain tile shall be used for the wet area to a height of FL+2100. Note that the interior walls of the Annex Buildings (except those of the guardhouse) shall be finished with mortar and not coated.

Ceilings: Rock wool acoustic board (t = 12.5 mm) shall be the standard ceiling, but gypsum board (t

= 9.5 mm) + coating shall be used in service corridors, the Night Duty Room, stores, and the like. Calcium silicate sheets (t = 6 mm) shall be used for the plumbing. Antimicrobial calcium silicate sheets shall also be used in the Theaters, Sterilization Room of the Theater Department, and the like.

Doors and windows: Regarding ordinary doors and windows, doors shall be made of steel, windows shall be made of aluminum, and toilet stall doors shall be made of wood.

2) Facility Composition

Considering the state of operation of existing facilities, the various necessary rooms for the components for each facility agreed upon with the counterpart are as listed below. Plans for each room involve ensuring proper space for resolving problems with the lack of space (a maximum of six beds for hospital rooms and waiting areas of the site is commensurate with the number of users), as well as plans for the various rooms that are lacking in terms of operation (a Laundry Room, a Blood Bank Depot, a Mothers' Room, a Child Welfare Clinic (hereinafter referred to as "CWC"), a Family Planning Room, Changing Rooms, and a Night Duty Room).

Table 2-19: Composition of various Rooms by Function at TCH

	Department	Room Composition (main rooms)
1	Outpatient Department	10 Consultation rooms (3 of them pediatric outpatient), Dressing room, Observation room, Vital, Satellite pharmacy, Reception/Account, Record, Staff room, Night duty, Staff washroom, Sluice room, Store
2	MCH (Maternal and Child Health)	3 Consultation rooms, Vital, Ultrasound room, Gynecology examination room, Consulting room (HIV), Family planning room/PNC, CWC, Waiting hall, Reception, Record, Staff room, Washroom
3	Clinical Laboratory	Laboratories (Hematology, Micro biology, Parasitology, Biochemistry), Blood bank depot, Sampling room, Director room, Sluice room
4	Maternity Department	Labour ward, Delivery room, Recovery/Maternal ward, Treatment room, NICU, Mother room, Milk room, Staff station, Staff room, Night duty, Washroom, Shower room, Sluice room
5	Children's Ward	Ward (max. 6 beds/room), Isolation room, Treatment room, Staff station, Account, Staff room, Night duty, Washroom, Shower room, Sluice room
6	Operation and CSSD Department	Operating theatres (large and small), Anteroom, Theater hall (also Recovery room), Pre-washing room, Sterilization/Assembly room, Sterilized store, Laundry, Staff room, Changing room, Washroom

Other than the rooms listed above, plans call for a substation /generator room, water receiving tank/pump room, equipment and machinery room for medical gas and air conditioning—all of which are needed for facility operation—in addition to a covered Connecting Corridor to connect the new building to existing buildings.

3) Floor Plans

Although all existing facilities are located in single-story buildings, the Medical Buildings under the Project are two-story buildings, shortening flow lines between departments and featuring a compact layout in order to ensure space for the expansion of functions in the future. In addition, the

two Medical Buildings shall be located along an east-west axis to protect interior environments from exposure to the morning and evening sun, and will face each other across a courtyard. The floor plans of the two buildings are designed in an effort to make everything universally accessible, and also to prevent the flow lines of patients and staff members from mixing together. Notably, because the ground in its present state slopes downward gently from south to north, the ground floor levels of the two Medical Buildings shall be configured in response to the ground, and connected to each other with ramps. Furthermore, ramps shall be installed for access to the first floors to enable stretchers, carts, and wheelchairs to switch levels. Plans call for the Annex Buildings for facilities to be standalone, single-story buildings.

In addition, clear zoning for each function is needed because Project facilities comprise multiple functions for different users. Plans are designed to prevent the mixing of patients' flow lines to the extent possible by locating departments used by many and unspecified patients—the Outpatient Department, the Antenatal/Postnatal Care Department, and the Clinical Laboratory, which is deeply related to the first two departments—on the ground floor, and departments used by specific users—the Maternity Department, the Children's Ward, and the Theater Department—on the first floor. In addition, to make the layout easy for first-time patients to understand, the Outpatient Department, which has many users, shall be located in an area near the entrance.

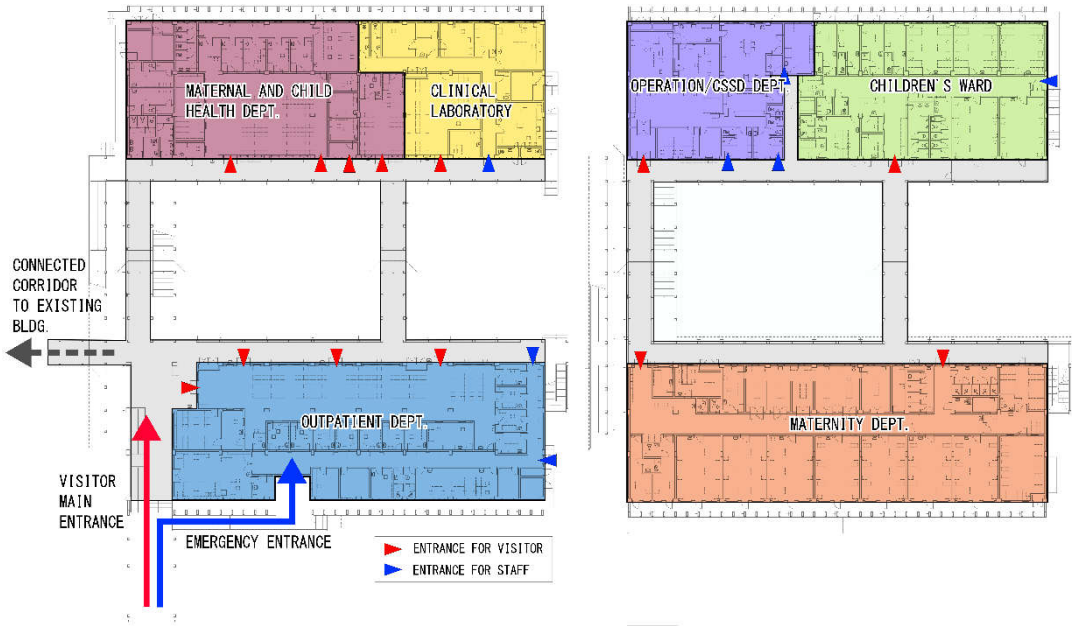

Figure 2-6: Zoning Plan for Each Floor

Note that plans call for clear separation between clean zones and contaminated zones within the buildings in pursuit of preventing hospital-acquired infections. In addition, every effort shall be expended to prevent infections by installing handwashing stations at the entrances to each building and hospital room. Floor plans and room compositions of each department are as follows.

■ Outpatient Department

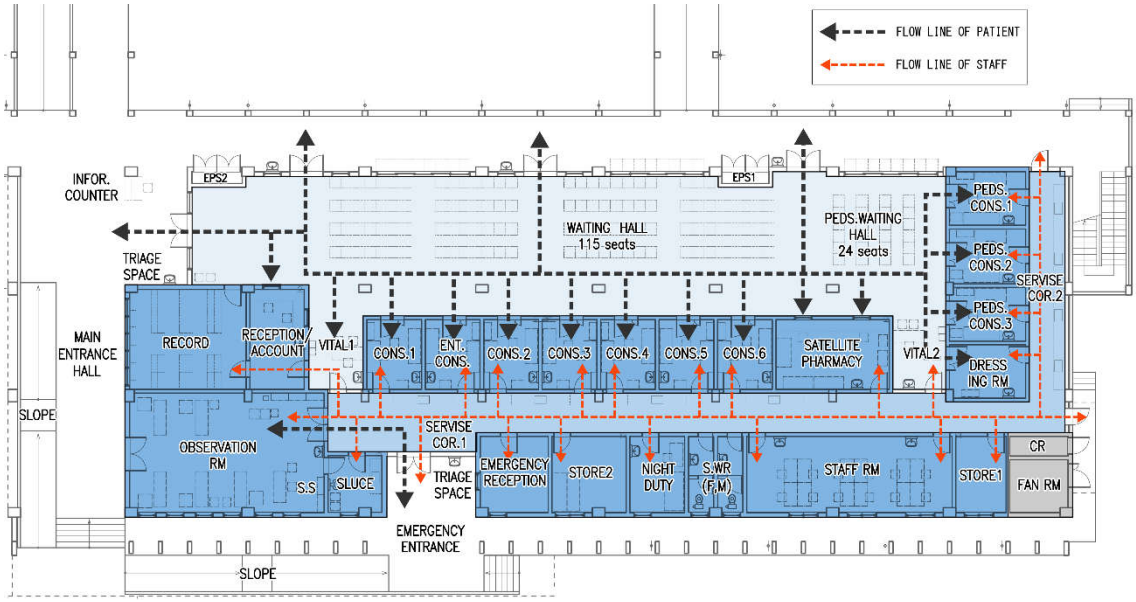

Figure 2-7: Zoning Plan for the OPD

Plans call for the Outpatient Department to be located adjacent to the entrance hall because it is used by many and unspecified patients. Consultation Rooms are situated such that they surround the Waiting Hall, and service corridors for staff members are placed behind the Consultation Rooms to completely separate the flow lines of patients and staff members, and to streamline staff members' flow lines and facilitate their work. Plans call for Observation Rooms in the Outpatient Department with the aim of supplementing emergency medical functions; however, plans also call for a standalone emergency entrance for accessing the observation room in an effort to maintain separation from the flow lines of general users. In addition, because the existing Outpatient Pharmacy is integrated with the storerooms and located on the southern edge of the property, and the new facility to be installed is more than 150 m away, a Satellite Pharmacy shall be installed to improve convenience for patients. An overview of the main rooms is as follows.

Table 2-20: Main Rooms of the OPD

Room Name	Overview	Planned Floor Area
Reception/Accounting/ Clinical Chart Storage	Outpatient Department reception functions to be installed with the same details as existing facilities.	49.51 m^2
Preliminary Examination Rooms	Spaces for conducting preliminary interviews, measuring blood pressure, and the like prior to examining outpatients. To be installed in two separate places in order to mitigate congestion.	11.38 m^2/room
Consultation Rooms	Plans call for 10 Consultation Rooms compared to the current number, which is seven. Three of the rooms shall be for Pediatrics, and one room shall be for ENT. The floor area in each room shall be enough to secure space for installing desks, examination tables, handwashing stations, and the like.	11.38 m^2/room 12.61 m^2/room
Dressing Room	A room for treatment such as suturing and removing sutures. The area shall be the same as the Consultation Rooms.	12.23 m^2

Emergency Reception	To be installed as a standalone facility to separate flow lines with Outpatient Reception.	15.38 m^2
Observation Rooms	Observation Rooms (five beds) shall be installed in the Outpatient Department in line with current operating conditions to supplement emergency medical functions.	64.99 m^2
Waiting Hall	A 139-seat indoor waiting space is to be installed along with 24-seat benches in the outer corridor that can be used during congested times. Benches shall be installed during finishing carpentry work.	267.16 m^2
Night Duty Room	A Night Duty Room is needed because the Outpatient Department, which also fulfills urgent care functions, is in 24-hour operation.	12.60 m^2
Staff Room	In addition to functioning as a space for staff members to rest, the Staff Room also fulfills functions as a disaster prevention center because it is equipped with a disaster alarm panel, a pump control panel, and other monitoring panels linked to facilities.	44.74 m^2

■ Maternal and Child Health Department (MCH)

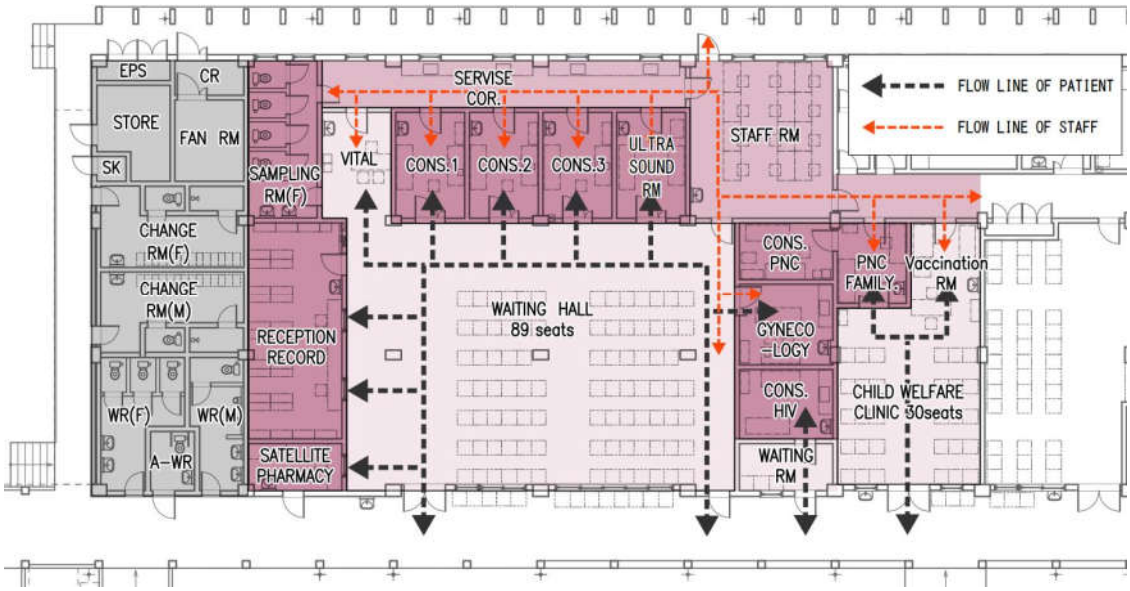

Figure 2-8: Zoning Plan for the MCH Department

A Vital Room, Consultation Rooms (three rooms), an Ultrasound Room, and Gynecological Consultation Rooms are situated such that they surround the Waiting Hall. The service flow lines of staff members are located behind the Consultation Rooms to separate them from patients' flow lines. Plans call for Toilets for Urine Samples to be situated adjacent to the Preliminary Examination Corner to facilitate the flow of samples to inspections. Plans call for a Child Welfare Clinic, a Family Planning/Postnatal Care Room, and an HIV Consultation Room to be situated adjacent to Antenatal/Postnatal Care Outpatient. Plans call for the Child Welfare Clinic and Family Planning/Postnatal Care Outpatient to double as a Waiting Hall. An overview of the main rooms is as follows.

Table 2-21: Main Rooms of the MCH Department

Room Name	Overview	Planned Floor Area
Consultation Rooms	Plans call for three Consultation Rooms compared to the current number, which is two. The floor area in each room shall be enough to secure space for installing desks, examination tables, handwashing stations, and the like.	13.50 m^2/room
Ultrasound Room	One Ultrasound Room shall be installed, the same number as the existing facility.	13.50 m^2
Gynecological Consultation Rooms	The floor area in each room shall be enough to secure space for installing desks, gynecological examination tables, handwashing stations, and the like.	14.00 m^2
Toilets for Urine Samples	To be located adjacent to the Preliminary Examination Space. Four toilet stalls shall be installed.	20.04 m^2
Antenatal/Prenatal Care Waiting Hall	89 indoor seats shall be secured. Benches shall be installed during finishing carpentry work to make the outer corridor available during congested times.	173.12 m^2
Child Welfare Clinic Waiting Hall	30 indoor seats shall be secured. Benches shall be installed during finishing carpentry work to make the outer corridor available during congested times.	43.92 m^2
Antenatal Care/Family Planning Room	Space for counseling shall be secured.	10.50 m^2
HIV Consultation Room	In consideration of privacy, plans call for a standalone waiting room adjacent to the Consultation Room.	12.00 m^2
Staff Room	To be shared with the Clinical Examination Department.	40.08 m^2
Changing Rooms	Plans call for Men's and Women's Changing Rooms for staff members to be shared by all departments (except the Theater Department). One toilet stall and one shower stall shall be installed in each room.	21.71 m^2/room

■ Clinical Laboratory

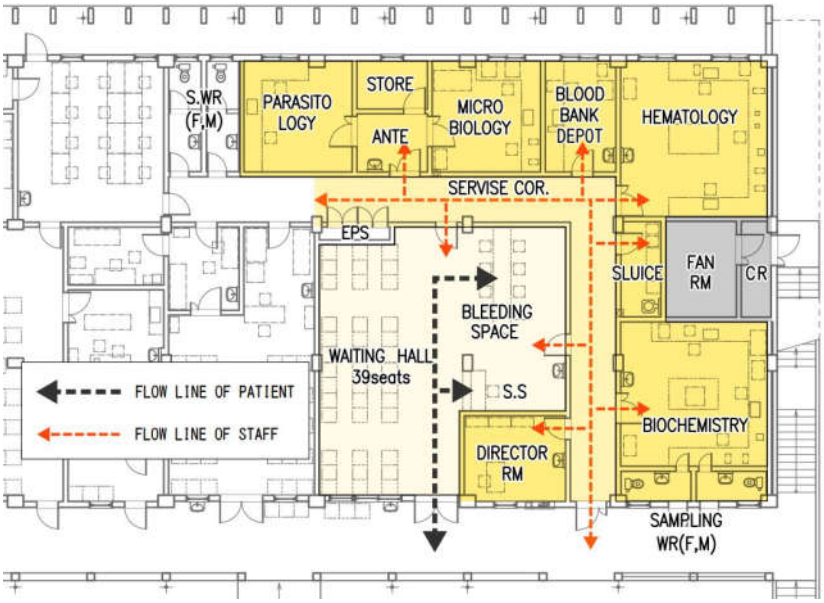

Figure 2-9: Zoning Plan for the Clinical Laboratory

Given the relationship between the Clinical Laboratory and inspections from antenatal and postnatal checkups, plans call for the Clinical Laboratory to be adjacent to Antenatal/Postnatal Care Outpatient. There shall be four Inspection Rooms (Hematology, Biochemistry, Microbiology, Parasitology), and the corridor that connects to these rooms shall be completely separated from the flow lines of general users. Men's and Women's Toilets for Urine Samples shall be installed adjacent to the Biochemistry Inspection Room. Notably, regarding the main unit of the blood bank, the decision was made to continue using existing facilities, but plans call for a Blood Bank Depot for the sole purpose of storing blood for transfusions. Furthermore, plans also call for the 39-seat Waiting Hall to double as space for drawing blood. An overview of the main rooms is as follows.

Table 2-22: Main Rooms of the Clinical Laboratory

Room Name	Overview	Planned Floor Area
Biochemistry Inspection Room	A large laboratory counter shall be installed in the center of the room, and shelves and laboratory counters with sinks attached shall be installed on three sides of the room during finishing carpentry work. Sample Receiving Windows shall be installed between the room and adjacent Toilets for Urine Samples.	36.32 m^2
Blood Inspection Room	A large laboratory counter shall be installed in the center of the room, and shelves and laboratory counters with sinks attached shall be installed on three sides of the room during finishing carpentry work.	39.20 m^2
Microorganism Inspection Room	Shelves and laboratory counters with sinks attached shall be installed during finishing carpentry work. A front room shall be installed as an infection control measure.	21.06 m^2
Parasite Inspection Room	Shelves and laboratory counters with sinks attached shall be installed during finishing carpentry work.	21.06 m^2
Blood Bank Depot	The room is intended to serve as a storage for blood transfusions of the operation theatres.	14.04 m^2
Managers' Room	The Managers' Room in the existing facility shall be relocated to the same place as the Inspection Rooms under the Project because doing so is more efficient. Desks, chairs, and other office furniture are outside the scope of cooperation.	15.47 m^2

■ Maternity Department

Rooms for providing health care services and hospital rooms for treatment and recovery shall be located across the inner corridor from each other, and separate. The Nightingale ward style, in which multiple beds are lined up in one large room, has been adopted for hospital rooms in existing facilities; however, under the guidance of the MOH, the maximum number of beds in one hospital room is six, and plans call for two Labour Rooms and five Postnatal Rooms. Furthermore, two Isolation Rooms shall be installed. Plans call for all of these hospital rooms to have balconies, and to be designed such that they do not feel like enclosed spaces.

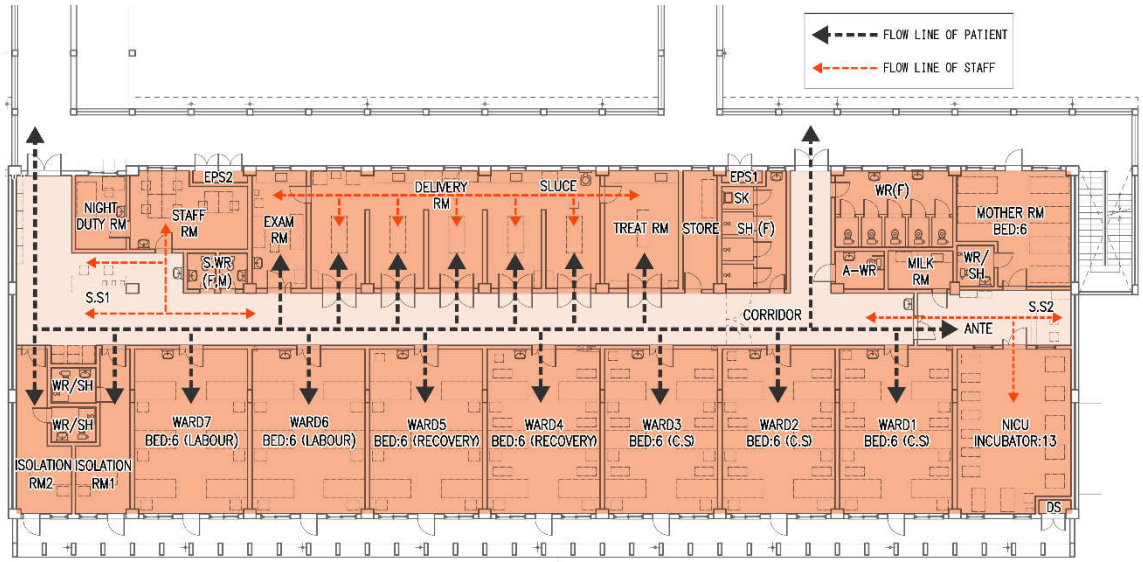

Figure 2-10: Zoning Plan for the Maternity Department

Five birthing beds shall be installed in the Delivery Room, and partition walls and curtains shall be installed to ensure privacy. Plans call for a Treatment Room for discontinuation of pregnancy operations and other procedures, and for a Physiological Function Test Room. An overview of the main rooms is as follows.

Table 2-23: Main Rooms of the Maternity Department

Room Name	Overview	Planned Floor Area
Delivery Room	Each birthing bed shall be separated from the others by partition walls, and connected to the service corridor. Counters with sinks attached shall be installed in the corridor during finishing carpentry work.	93.15 m^2
Treatment Room	To be used for discontinuation of pregnancy operations and other procedures. The room shall feature a gynecological examination table and enough space for treatment.	24.84 m^2
Physiological Function Test Room	An Inspection Room for ultrasound technicians and electrocardiogram inspections.	18.63 m^2
Observation Room	These rooms shall feature ample space for situating six beds. A handwashing station shall be installed in each room.	52.08 m^2/room
Isolation Rooms	Individual rooms. Toilet and shower to be installed.	26.04 m^2/room
Neonatal Intensive Care Unit	The unit shall be large enough to situate a total of 13 beds (baby cots and incubators). The front room shall fulfill the functions of a Staff Station.	52.08 m^2
Mothers' Room	Because it is mothers who care for the patients admitted to the NICU, a place for mothers to stay overnight is necessary. Six beds shall be installed in the Mothers' Room, along with a shower and toilet.	38.44 m^2
Staff Station	To be situated at the main entrance of the Maternity Department. To be situated adjacent to the Staff Room and Night Duty Room, with counters to be installed during finishing carpentry work.	—

■ Theater/Central Sterile Supply Department

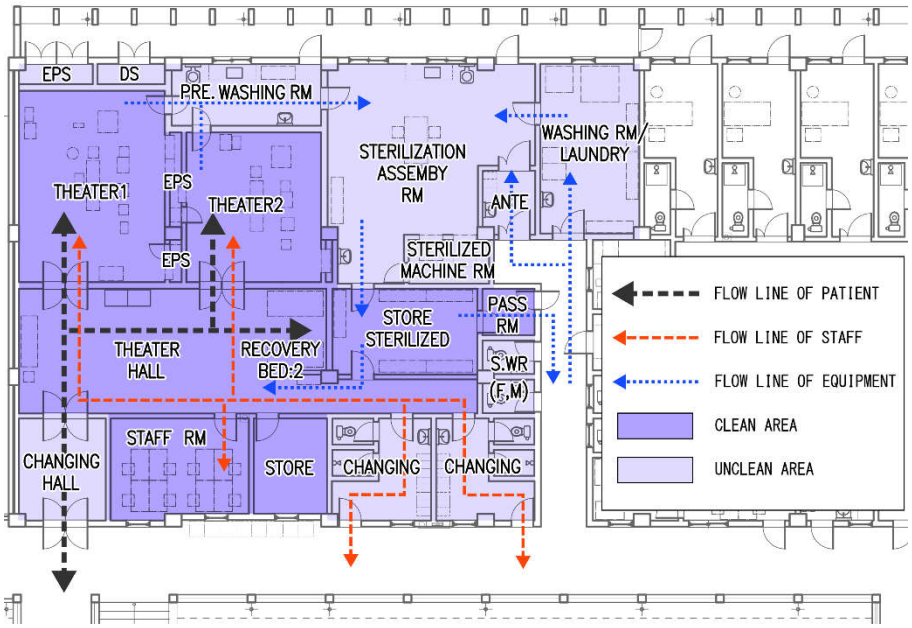

Figure 2-11: Zoning Plan for the Theatre/CSSD

Plans call for two Theaters, one large and one small. The equipment used in the Theaters shall pass through the adjacent Preoperative Washing Room before being treated in the Central Sterile Supply Room, and then stored in the Sterile Storeroom, and shall always travel through the rooms and be treated in this order. Plans call for complete separation between the clean and contaminated areas in the department. An overview of the main rooms is as follows.

Table 2-24: Main Rooms of the Theatre/CSSD

Room Name	Overview	Planned Floor Area
Theaters	Two rooms, one large and one small, shall be installed, the same number as the existing facility.	Large: 47.00 m^2 Small: 37.40 m^2
Theater Hall	To double as a postoperative recovery space (two beds).	65.89 m^2
Preoperative Washing Room	A room for conducting the primary washing of equipment.	16.08 m^2
Central Sterile Supply Room	A worktable is to be situated in the center of the room, and enough workspace to wash and sterilize equipment shall be secured. Two high-pressure steam sterilizers shall be installed.	67.77 m^2
Laundry Room/Laundry	A room for washing surgical gowns, which require sterilization. Linens shall be washed in the existing Laundry.	27.54 m^2
Changing Rooms	The Theater Department shall have its own Men's and Women's Changing Rooms. Toilet and shower to be installed in each room.	16.80 m^2/room

■ Children's Ward

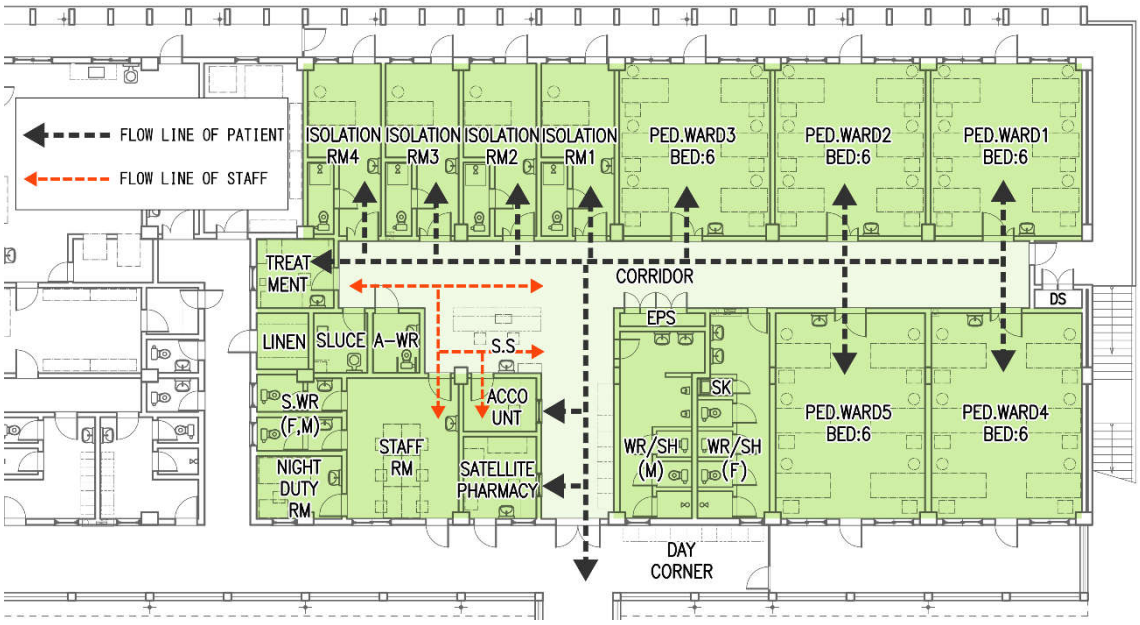

Figure 2-12: Zoning Plan for the Children's Ward

The Nightingale ward style, in which multiple beds are lined up in one large room, has been adopted for hospital rooms in existing facilities. However, under the guidance of the MOH, the maximum number of beds in one hospital room is six; plans under the Project call for five six-bed hospital rooms and four Isolation Rooms (individual rooms complete with a toilet and shower) for Pediatrics. Plans call for all hospital rooms to have a balcony, and to be designed such that they do not feel like enclosed spaces. The department shall also comprise essential treatment rooms for medical care activities, a Staff Station, and rooms needed for accounting and the like. An overview of the main rooms is as follows.

Table 2-25: Main Rooms of the Children's Ward

Room Name	Overview	Planned Floor Area
Hospital rooms	Six ordinary beds or children's beds shall be installed. The rooms shall be large enough to accommodate the corresponding bed size.	Large: 47.00 m^2 Small: 37.40 m^2
Isolation Rooms	Individual rooms. Toilet and shower to be installed.	20.65 m^2/room
Treatment Room	Enough space shall be secured to install desks, examination tables, handwashing stations, and the like.	9.78 m^2
Satellite Pharmacy	Plans call for a Satellite Pharmacy in consideration of patient convenience.	8.79 m^2
Staff Room	Plans call for a Staff Room accessible from both the outer and inner corridors. Men's and women's toilets shall be installed in the room. Furniture is outside the scope of cooperation.	25.56 m^2
Night Duty Room	The Night Duty Room of the Children's Ward shall be accessed from the Staff Room. The room shall be large enough to accommodate one bed and one desk. Furniture is outside the scope of cooperation.	9.38 m^2

- Other
  - Medical Gas Building: The building shall comprise a Cylinder Room for supplying oxygen and a Compressor Room for supplying compressed air.
  - Septic Tank Pump Room: A Blower Room shall be installed adjacent to the septic tank to supply oxygen to the contact aeration tank.
  - Substation Room: To comprise three rooms (a Main Switch Room, a Transformer Room, and a Main Distribution Room), and to comply with the specifications of the Northern Electricity Distribution Company (hereinafter referred to as "NEDCo").
  - Generator Room: A Generator Room shall be installed adjacent to the Substation Room.
  - Water Supply Pump Room: A lifting pump and a fire pump shall be installed in this room. Plans call for an underground pit in the Pump Room to be used as a receiving tank, and footings for installing polyethylene water tanks above ground.
  - Guardhouse: Plans call for the installation of a Guard Room facing the entrance of the Parking Area, in which security personnel are permanently stationed.
  - Connecting Corridor: Plans call for a covered corridor to connect the new building to existing buildings.
  - Parking Area: Plans call for a 41-space parking area. Plans also call for a buffer area on the road entering the parking area to prevent congestion on the front road.

The facility components and areas of the Project based on the above are listed on the following table.

Table 2-26: Facility Components of the Project at TCH

	Block Code	Floor	Main components	Floor Area (m^2)
Clinical Block (two storey)	Block A	GF	OPD: Consultation room (10 rooms), Vital (2 rooms), Waiting hall, Reception, Record, Observation room, Dressing room, Satellite pharmacy etc.	3,022.80
		1st	Maternity department: Delivery room (5 beds), Treatment room, Physical function examination room, Labour room (12 beds), Recovery/Maternity room (32 beds), NICU (13 beds), Mother room, Staff station etc.	
	Block B	GF	MCH: Consultation room (3 rooms), Ultrasound room, Vital, Gynecology examination room, Consulting room (HIV), Reception, Satellite pharmacy, Staff room, CWC, Waiting hall etc. Clinical laboratory: Laboratory (Hematology, Microbiology, Parasitology, Biochemistry), Blood bank depot, Waiting hall etc.	2,521.14

		1st	Theatre & CSSD: Operating theatres (2 rooms), Changing hall, Laundry, Sterilization/Assembly room, etc. Children's ward: Ward (34 beds) etc.	
Annex (single storey)	C	—	Medical gas storage, Compressor room	32.50
	D	—	Blower room	13.26
	E	—	Main-switch room, Transformer room, MDB room	69.30
	F	—	Generator room	39.69
	G	—	Pump room, Reservoir tank	44.10
	H	—	Guardhouse	4.00
	—	—	Covered walkway	60.74
			Total Floor Area	5,807.54

4) Elevation Plans

The city of Tamale experiences roughly 1.5 times the insolation of Tokyo; reducing the burden of insolation of exterior walls is important for energy conservation plans and maintaining comfort in indoor spaces. Accordingly, while large windows are disadvantageous in terms of reducing the burden of insolation, natural ventilation-based temperature control, which does not rely on air conditioners, is preferable in common areas, and natural openings should be secured to enable temperature control during power outages.

- A 3-m outer corridor facing the courtyard shall be installed on the plane of crossbeams along which windows are lined up. In addition, installing PC louvers facing the service balconies on the opposite side shields exterior wall surfaces from direct sunlight while also providing them with rhythm and shading accents, as they tend to be dull.
- No windows shall be installed on the gables, and as for wall thickness, walls shall be double-layered concrete blocks (t = 150 mm) with insulation material (polyethylene foam, t=50 mm) to improve insulation performance.

5) Sectional Plans

- In order to prevent infiltration by dust and rainwater, the design height of the ground floor shall be GL+450 mm.
- Because the design ground level of the Medical Buildings (Building A and Building B) differ, plans call for floor heights of the ground floors of Building A and Building B to be FL+5,000 mm and FL+3,800 mm, respectively, such that the floor levels of the first floors are at the same height. In addition, the floor height of the first floor shall be 2FL+3,600 mm (eave height) in both buildings.
- The floor heights are set to ensure indoor airspace for dealing with the heat, and in consideration of the ceiling cavities needed for facility pipes.
- Plans call for an underground pit for facility maintenance in the ground floor toilets, which shall

be used by many and unspecified patients.

6) Structural Design

The structural design shall comply with the Ghana Building Code. However, BS and Japanese standards shall serve as references for structural conditions not set out in the Ghanaian standards. Note that the limit state design method shall be adopted as the structural design method, modeled after BS, which is the basis of the Ghana Building Code.

■ Structural System

The structures of the Medical Buildings shall consist of bidirectional pure framework structures (rigid-frame structures) of reinforced concrete in basic grids with spans of roughly 6 m, and member sections shall be determined after sufficient consideration of necessary sections from structural calculations in terms of workability and quality assurance.

According to the geotechnical survey report of the previous survey, the topsoil from the current ground level at the proposed construction site to a depth of approximately 0.5m (maximum 1.0m) consists of medium density sandy and silty clay. Beyond that depth is a high-density quartz-clay gravels up to 2.4m thick, which is a good ground with an expected bearing capacity of more than 200kN/m2 at GL-1.0m and 300kN/m2 at GL-1.5m.

Foundations shall comprise independent footings. In addition, foundation bearing capacity shall be 200 kN/m^2 (0.2 Mpa) based on the results of ground surveys; regarding the bottom of pit excavation, GL-1.0 m shall be the supporting soil.

■ Design Loads and External Forces

Design loads and external forces are as follows.

- Dead loads: Shall comply with the Ghana Building Code.

- Concrete:	22 kN/m^3	- Wood:	6.3 kN/m^3-7.7 kN/m^3
- Reinforced concrete:	24 kN/m^3	- Steel:	77 kN/m^3
- Concrete blocks:	20 kN/m^3	- Glass:	20.8 kN/m^3

- Live loads: Shall conform to Ghanaian design standards and Japanese standards.

Table 2-27: Live Load for Structural Design

Room Name	For Floors (N/m^2)	For Framework (N/m^2)	For Earthquakes (N/m^2)
Sloped roofs	250	150	100
Hospital rooms, washrooms,	2,000	1,500	700

toilets			
Offices, Consultation Rooms, Treatment Rooms	3,500	2,200	1,000
Corridors, stairs	4,000	3,700	2,400
Waiting Hall	5,000	4,600	3,000

- Wind load: The reference wind speed shall be 34 m/s based on the Ghana Building Code.
- Seismic load: Historically, earthquakes in Ghana and surrounding countries are clustered along the coastline; no major damage-causing earthquakes have been recorded in Tamale, where the Project area is located. Even in the Ghana Building Code, the horizontal acceleration for Tamale is set to zero; therefore, it is not necessary to consider seismic forces. However, given the functional importance of the building, the design shall be earthquake resistant, with base shear coefficient Co = 0.05 as the seismic load.

■ Structural Materials and Allowable Stress

- Concrete: Ordinary cast-in-place concrete
  - Footings, footing beams, retaining walls: Fc28 = 24 N/mm^2
  - Pillars, beams, floor slabs, walls, stairs, overhangs: Fc28 = 24 N/mm^2
  - Mold floor slab (inner): Fc28 = 24 N/mm^2
  - Mold floor slab (outer): Fc28 = 21 N/mm^2
  - Blinding concrete: Fc28 = 18 N/mm^2 or higher
- Reinforcement steel, steel frames: BS standardized goods
  - Deformed bar: Fy = 500 N/mm^2
  - Steel frames: S275JR Fy = 275 N/mm^2

7) Electrical Installation

■ Main Line Equipment

Regarding the supply of electricity to existing facilities, power is distributed through a shared electrical grid that serves TCH and surrounding areas, and the supply is insufficient to cover the electricity required for Project facilities. Discussion with NEDCo has resulted in the decision to run lines separately from the existing substation to supply electricity to Project facilities. Power will be supplied to Project facilities by using a transformer to lower the voltage from the 11-kV, three-phase, three-wire medium-voltage power grid, which supplies power along the frontage road to the Project site, to three-phase, four-wire 415/240V.

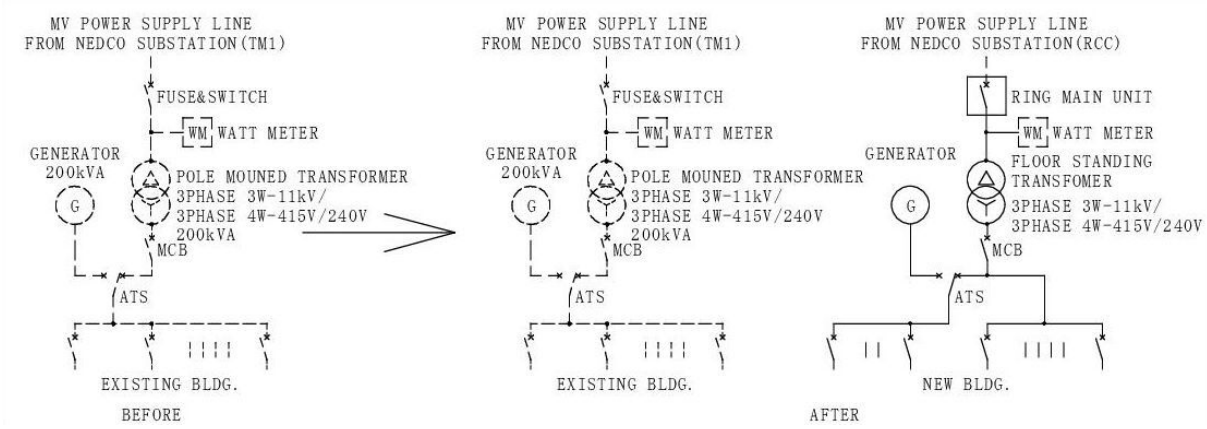

Figure 2-13: Electricity Lead-in Diagram

The Japan side portion of the construction work comprises the construction of the Substation Room, and the section switches, transformer, and electrical equipment downstream of the low-voltage breakers; the counterpart side is responsible for the work of connecting 11-kV medium-voltage cables to the section switches.

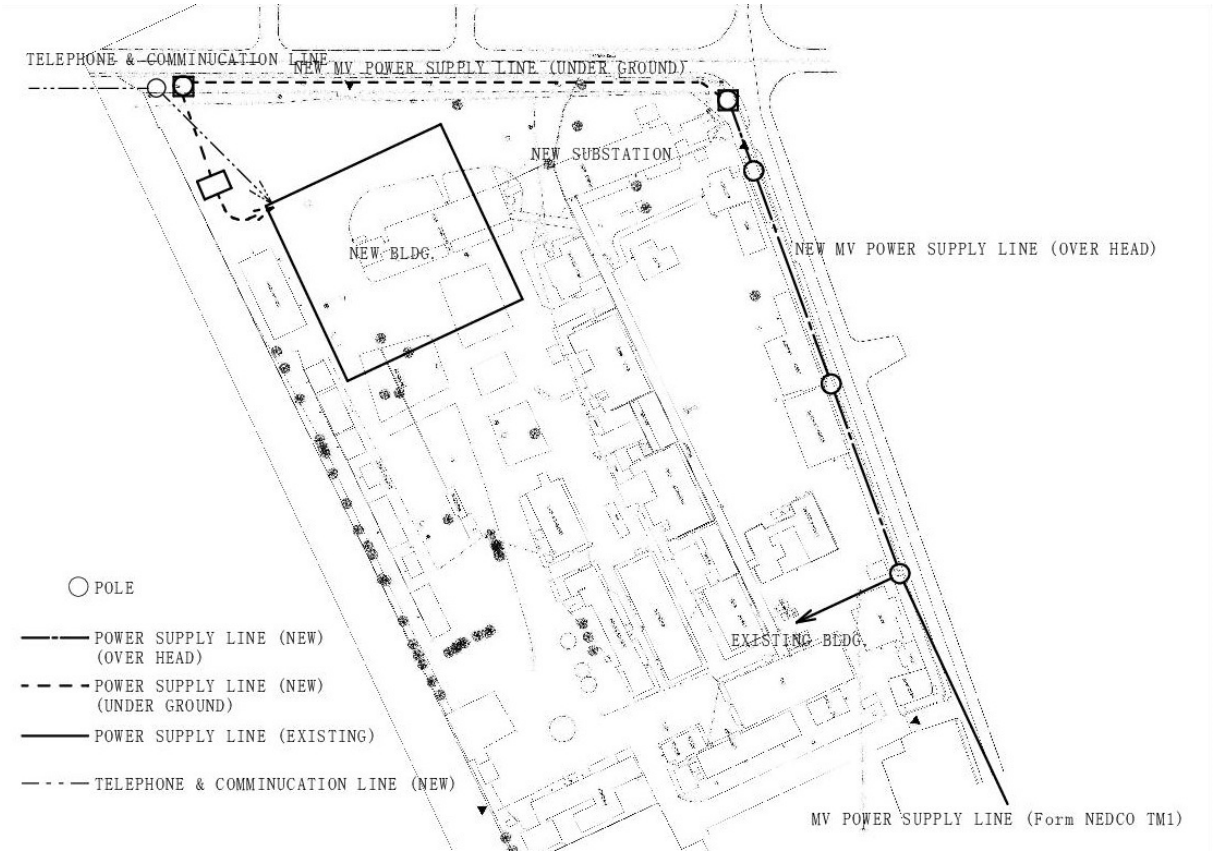

Figure 2-14: Electricity Lead-in Layout Plan

One oil-filled transformer for 11-kV three-phase three-wire/415/240V three-phase four-wire shall be installed in the Transformer Room, and power shall be supplied to Project facilities through a low-voltage main switchboard. The transformer capacity shall be set in response to the electrical

capacitance of the Project.

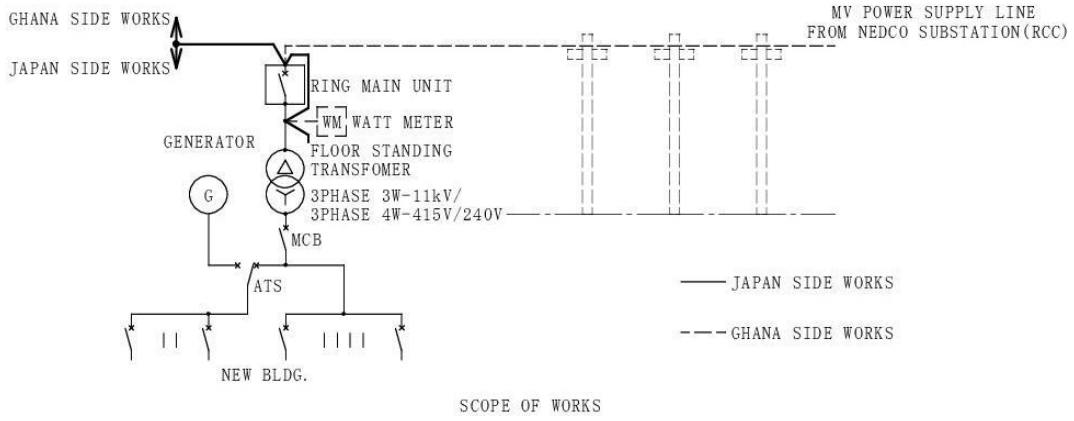

Figure 2-15: Power Supply Single Line Diagram

The electricity supply downstream of the low-voltage main distribution switchboard shall be distributed to the distribution switchboards for each area through electrical main cables. Area distribution switchboards shall distribute power to lighting, electrical sockets, air conditioning equipment, and the like. Underground pipes shall be used in the method of wiring between buildings, and electrical ducts or cable trays shall be used for the wiring within buildings.

■ Emergency Generators

Diesel-engine generators shall be installed to serve as a backup power source during power outages. During the four days of voltage test conducted by the survey team, electricity was out for approximately 20 minutes. Momentary power cuts also occurred several times. Therefore, the weekly power outage time has been set at 40 minutes, and a 200-litre fuel tank will be installed together with the generator. Note that the generators to be installed under the Project will not supply electricity to existing facilities. The scope covered by the generators is as follows.

Table 2-28: Rooms with the Scope of Electricity Supply by Emergency Generator

Type	Target Rooms
Electric lights (100%) Outlets (100%)	Theaters, Theater Hall, Delivery Room, NICU, Labour Rooms, Treatment Rooms, Accounting
Electric lights (100%) Outlets (roughly 50%)	Consultation Rooms
Electric lights (roughly 50%) Outlets (roughly 50%)	Maternity hospital rooms, Clinical laboratories, Satellite Pharmacy, Reception, Pediatric hospital rooms, Waiting Halls
Facilities covered by the generators	Substation Room, Generator Room, telephone/telecommunications system, medical gas supply system/alarm system, disaster prevention system, lifting pumps, wastewater pumps, fire pumps, and other essential medical equipment requiring backup from the generators

■ Lighting/Outlets

Lighting shall be installed in response to the functions of each room, with LED fluorescent light

fixtures as the main type. In addition, plans call for streetlights in the Parking Area to facilitate nighttime use of the facilities and prevent crime, outdoor security lights on exterior walls of each building as needed, minimal garden lighting, and the like. Illuminance in the main rooms shall be configured in accordance with BS as follows.

- Hospital rooms, NICU, corridors 100 lux
- Waiting Halls 200 lux
- Delivery Room 300 lux
- Theater Hall, Consultation Rooms, Treatment Rooms 500 lux
- Theater 1,000 lux

Electrical outlets shall be the universal type with switches attached, and plans call for generators to supply electricity to a portion of the lighting and electrical outlets. In addition, emergency lighting and guide lighting shall be installed where necessary for emergency evacuation.

8) Telecommunications System

■ Telephone System

Plans for Project facilities call for three outside lines and 100 extensions. Regarding the division of construction work, Ghana is responsible for the portion from the main line outside the property to the connection of the new telephone lines to the main switchboard (MDF) inside Project facilities; construction work under the Project includes the switchboard (PABX) downstream of the MDF, the secondary-side wiring routes and wiring of the MDF, and the telephone outlets and telephones.

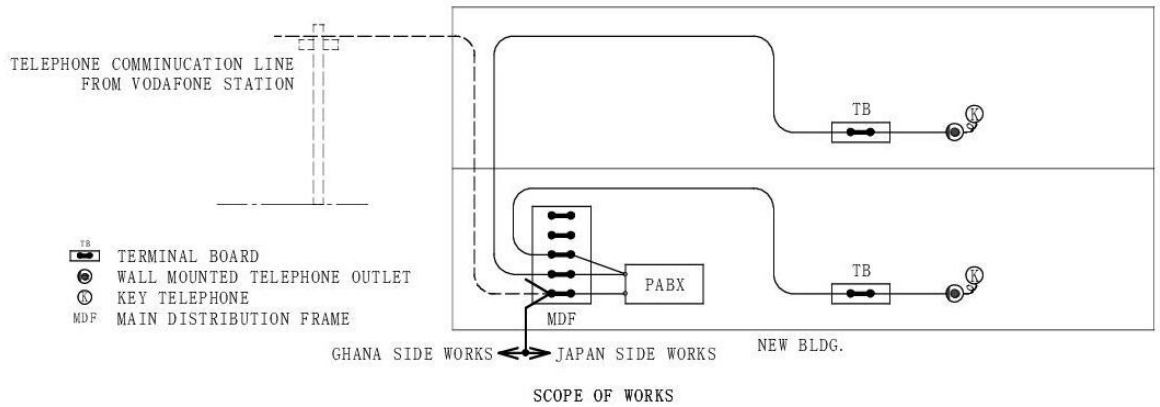

Figure 2-16: Telephone System Diagram

■ LAN System

To accommodate use of the telecommunications network within the hospital, LAN system wiring and ductwork, switching hubs, routers, and LAN outlets shall be installed during construction work under the Project. The Ghana side is responsible for the lead-in from the main line outside the

property, wiring to connect to network equipment (routers, ADSL modems) and connections from existing equipment.

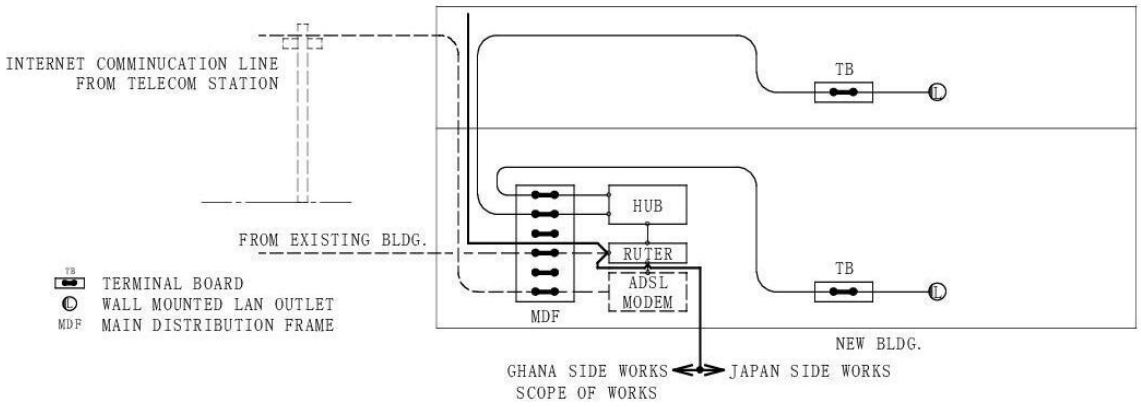

Figure 2-17: LAN System Diagram

■ Broadcasting System

A broadcasting system shall be installed for the purpose of calling patients. The broadcasting system shall comprise amps, microphones, and speakers, and shall be installed in the following rooms.

Table 2-29: Scope of Broadcasting System Equipment

Microphone / Amplifier	Speaker
OPD: Consultation rooms, Satellite pharmacy, Reception	Waiting hall
MCH Department: Consultation rooms, Satellite pharmacy, Reception	Waiting hall
Children's Ward: Staff station	Ward

■ TV/Audiovisual Facilities

A TV system comprising UHF antennae, boosters, splitters, dividers, TV outlets, and coaxial cables shall be installed in the Waiting Halls and hospital rooms during construction work under the Project. The Ghana side is responsible for installing the TVs.

9) Water Supply System

■ Water Source/Supply System

An underground water main has been installed by Ghana Water Company Limited (hereinafter referred to as "GWCL") along the frontage road on the north side of the property. The water supply system of existing facilities comprises a 20A branch from the main that fills reinforced concrete water receiving tanks, a pressurizing supply pump that transmits the water to polyethylene tanks (roughly 54 m^3) adjacent to the Laboratories, and another pressurizing supply pump that distributes

water to the individual facilities. Water shall be supplied to Project facilities from a separate system from the existing system; plans call for the supply to be drawn from a new water main from GWCL's storage tanks.

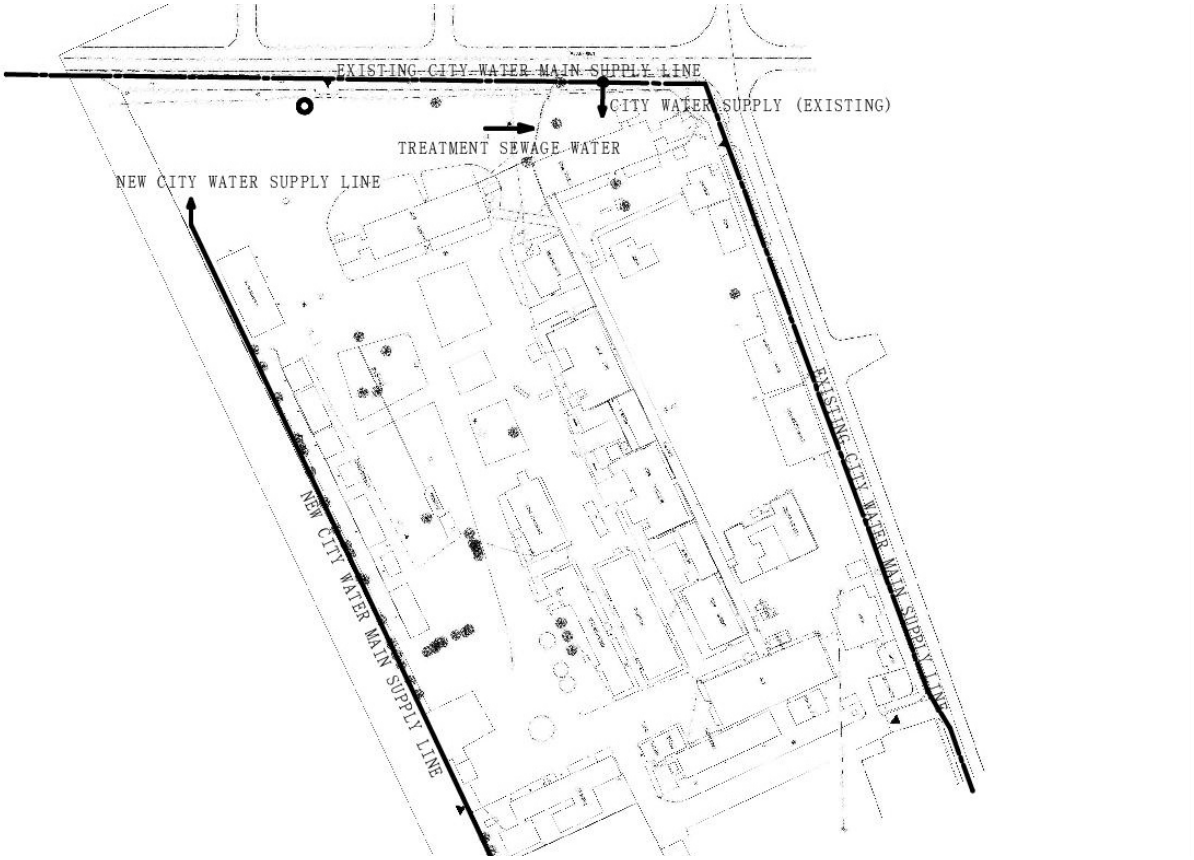

Figure 2-18: City Water Connection Layout Plan

However, the water supply at the Project site is unstable; water supply failures are common, and water pressure is insufficient. Therefore, under the Project, the decision was made to draw water into a reinforced concrete-framed tank in the underground pit of the Water Supply Pump Room, and use a lifting pump to transmit it to above-ground receiving tanks for storage. The capacity of the underground pit is 12 m^3, which is equivalent to one half-day of water consumption, and GWCL requested that the above-ground receiving tanks have sufficient capacity for four days of water consumption (96 m^3); therefore, six polyethylene tanks (roughly 100 m^3) shall be installed. The system is such that a different lifting pump is used to transmit water from the above-ground receiving tanks to an FRP single-panel elevated water tank (12 m^3), where it is stored until it is distributed to individual supply points using the gravity method. The Ghana side is responsible for installing pipes from the city water main to the city water meters, and pipes on the property and inside the buildings, which are downstream of the city water meters, shall be installed during construction work under the Project. However, given the poor state of the water supply around the Project site, plans call for well water to supplement shortages. The Ghana side is responsible for well drilling work; the required water production rate of the well is 70L/min and the depth is estimated to be 50-60m based on the

results of the existing well. The pumps, a water treatment system comprising sand filtration and disinfection by chlorine, and the pipes shall be installed during construction work under the Project.

As for the maintenance of the underground concrete-framed tank, cleaning and inspection of the inside will be required by hand. In this case, it is necessary to store water in the above-ground receiving tanks and elevated water tank beforehand so as not to interfere with the operation of the hospital. A drainage pump for emptying the receiving tanks shall be included in this plan.

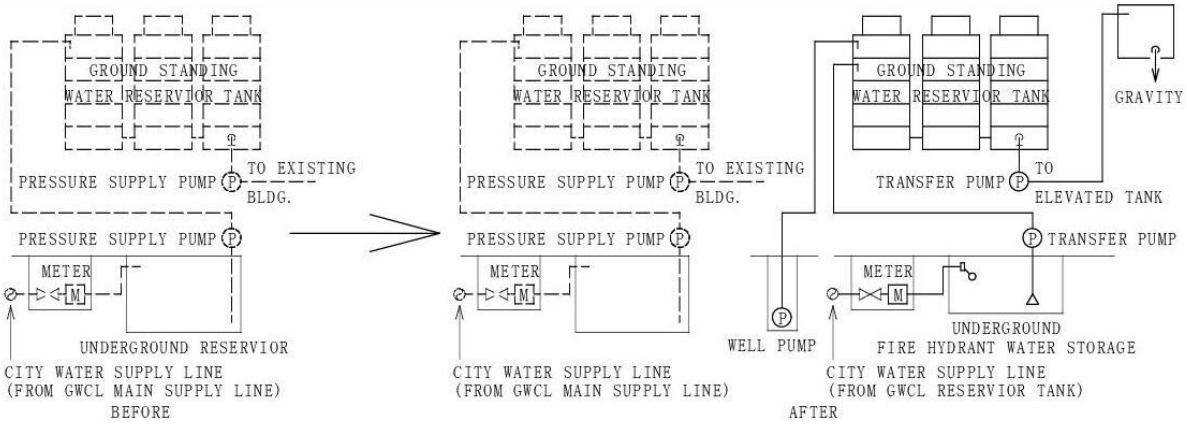

Figure 2-19: Water Supply System Diagram

■ Hot Water Supply System

Hot water storage-type electrical hot water heaters shall be installed in the Delivery Room, the Mothers' Room, the Theater Hall, and Shower Rooms.

■ Plumbing Fixtures

Plans call for the number of toilet stalls to comply with the International Plumbing Code (IPC). Regarding toilet specifications, porcelain Western-style toilets that can be procured locally shall be installed, along with handrails as needed. Handheld shower attachments shall not be installed.

Elbow lever-style faucets shall be used in medical facilities. Service sinks for cleaning shall be installed in rooms that require them. In addition, handwashing stations shall be installed at the entrances to Waiting Halls, hospital rooms, and other areas used by patients to allow users to wash their hands at any time in an effort to prevent hospital-acquired infections and ensure a sanitary environment.

10) Wastewater System

■ Sewage/Miscellaneous Wastewater

The Project area is not served by a sewerage system; however, wastewater from existing facilities is discharged into a drainage ditch installed along the frontage road. Unfortunately, the ditch is

clogged with garbage because it is not cleaned very attentively. The Tamale Metropolitan Assembly Sanitation Department prefers osmotic treatment of wastewater within the Project property; therefore, the plan calls for sewage and miscellaneous wastewater from the Project to undergo simplified purification in a combined-treatment septic tank, and then allowed to leach into the ground via a leaching pit. As a result of the BS-based infiltration tests conducted by the study team, the construction area has a high infiltration capacity (Vp=2.387). Note that the plan calls for a septic tank BOD of 50 ppm.

■ Medical Wastewater

Envisioned medical wastewater from Project facilities includes pharmaceutical wastewater from laboratories and contaminated wastewater from surgical operations and deliveries. Pharmaceutical wastewater shall pass through a neutralization tank, and contaminated wastewater shall pass through a sterilizing tank before ultimately undergoing osmotic treatment within the property. Plans for osmotic treatment within the property must be designed such that wells on the property are not negatively impacted; therefore, permits (including combined-treatment septic tanks) are required from the Tamale City Technical Committee.

■ Rainwater

Plans call for rainwater and drainage from air conditioners to be allowed to leach into soil within the property, with overflow discharged into the drainage ditch.

11) Air Conditioning/Ventilation System

Plans call for an air conditioning system in Waiting Halls, the General Ward, the Mothers' Room, the Night Duty Room, and other rooms outside service areas not used by general patients, which include the Service Station, service corridors, and equipment rooms. Split wall-mounted air conditioners shall be the standard type of air conditioner. However, plans call for enhanced cleanliness and positive pressure in the rooms of the Theater Department and NICU through the use of ceiling cassette-style air conditioners and implementation of sufficient ventilation using medium-efficiency filters and ventilation fans. The rooms in which air conditioners shall be installed are as follows.

Table 2-30: Rooms with Air Conditioning System

Wall mounted	OPD	Consultation room, Dressing room, Vital, Observation room, Reception/Record, Satellite pharmacy, Staff room
	MCH	Consultation room (including Ultrasound room, Consulting room (HIV), Gynecology examination room), Vital, Reception, Record, Satellite pharmacy, Staff room
	Children's Ward	Isolation room, Treatment room, Satellite pharmacy, Account, Staff room

	Maternity Department	Delivery room, Isolation room, NICU, Physical function examination room, Staff room
	Clinical Laboratory	Laboratory (Hematology, Micro biology, Parasitology, Biochemistry), Blood bank depot, Director room
	Theatre/CSSD	Laundry, Sterilization/Assembly Room, Staff room
Ceiling casette	Theatre/CSSD	Operating theatre, Changing hall

In principle, the ventilation system shall be a natural ventilation system. Ceiling fans shall be installed in rooms in which air conditioners are not installed.

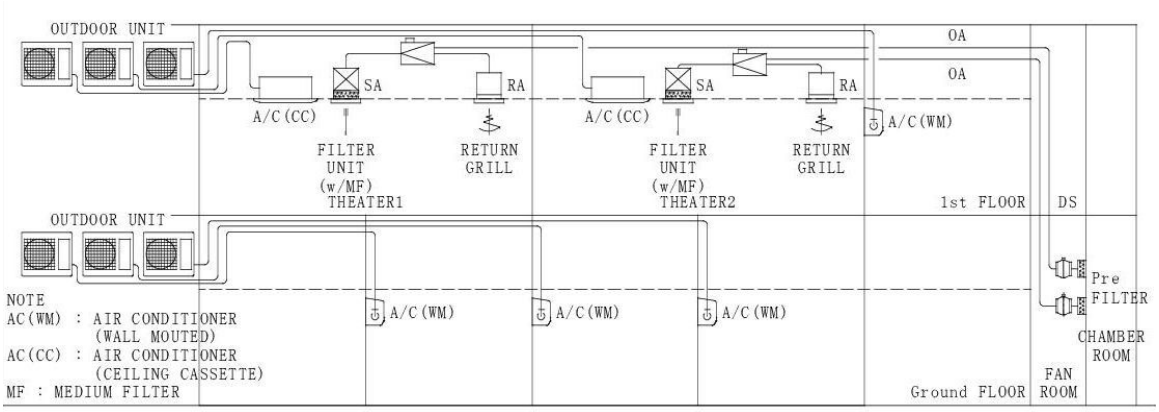

Figure 2-20: Air Conditioning System Diagram

12) Medical Gas System

Regarding the medical gas supply system, which comprises oxygen gas and compressed air, oxygen cylinders shall be centrally managed in the Medical Gas Building, and gas shall be supplied to individual points through pipes in pursuit of safety, operability, and maintainability. Plans call for a 24-cylinder oxygen manifold with each bank capable of covering seven days' worth of demand. The shape of gas outlets shall comply with BS. Rooms in which medical gas is to be installed are as follows.

Table 2-31: Rooms with Medical Gas System

O_2 and Compression air	Operation theatre, Treatment room, NICU, Observation room, Children's ward, Changing hall (recovery space)
O_2	Isolation room, Labour room, Delivery room, Maternal ward (recovery)

13) Disaster Prevention System

In accordance with the Ghana Building Code, an automatic fire alarm system comprising fire alarm control panels, smoke detectors, heat detectors, push-buttons, sirens, and display lamps shall be installed. Note that the Infrastructure Directorate of the MOH has agreed that sprinklers shall not be installed.

14) Fire Extinguishing Equipment

Plans call for indoor fire hydrants (hose reels). In addition, ABC fire extinguishers and CO_2 fire extinguishers shall be installed in accordance with the intended use of each room.

15) Monitoring Cameras

Monitoring cameras shall be installed in the NICU. Monitors shall be installed in the Staff Station.

16) Nurse Call System

Plans call for nurse call buttons to be installed at each inpatient bed. The nurse call system comprises the nurse call buttons, and call lamps installed at the entrances to hospital rooms.

17) Intercom System

The intercom system shall be installed in the Theaters, Theater Hall, and Central Sterile Supply Rooms.

18) Lightning Arresters

Plans call for rooftop conductors to serve as lightning arresters.

19) External works and Landscaping

The major external works and landscaping works are as follows.

- The perimeter wall on the north side of the property adjacent to Project facilities shall be reconstructed.
- The Parking Area and roadways on the property shall be paved with asphalt and marked with lines.
- Corridors on the property adjacent to Project facilities and a portion of the courtyard shall be paved with interlocking pavement and concrete, and benches shall be installed as appropriate.
- Plans call for outside lighting and garden lighting to be installed in the Parking Area, corridors on the property, and the courtyard as necessary.
- Sprinklers shall be installed for vegetation.

20) Other (Oxygen Plant)

At TCH in its present state, individual oxygen cylinders are installed and used where they are needed, and oxygen consumption is not very expensive (31,500 GHS/year). However, because the cylinders are refilled with oxygen in Kumasi, which is roughly 390 km away from Tamale, there could be a lack of oxygen when it is needed; TCH and RHD requested the installation of an oxygen plant. Conversely, standards for installing medical gas in Ghana were not clearly specified during

the survey period, and tertiary hospital TTH is also not maintaining its oxygen plant properly due to an insufficient budget. In light of the above, Project plans call for the continued supply of oxygen from cylinders, and a manifold and central pipe system, and the counterpart has agreed to install an oxygen plant at its own expense with plans to connect in the future.

(5) Equipment Plans

1) Equipment Priority by Department

The priority of equipment installation for each department is as follows.

■ Outpatient Department

Examination rooms in the Outpatient Department shall be equipped with desks, chairs, examination sets, height and weight scales, examination tables, examination lights, and other equipment needed to diagnose outpatients. The main Project equipment is as shown on the table below.

Table 2-32: Main Equipment to be procured for the OPD

No.	Description	Quantity
12	Consultation desk and chair	13
20	Diagnostic set	15
27	Examination bed	16
29	Examination light	5
32	Height and weight scale for adult	2
43	Instrument cabinet	16
57	Medicine trolley	11
64	Patient monitor for adult	2
72	Resuscitation bag for adult	2
74	Resuscitation bag for pediatrics	2
96	Wheel chair	2
97	Xray film illuminator	10

Source: prepared by the Survey Team

■ Clinical Laboratory and Blood Bank Depot

The necessary equipment for operating Clinical Laboratory and the Blood Bank Depot, which exists to provide emergency blood transfusions for pregnant women who have undergone emergency caesarean sections, shall be installed under the Project as shown on the following table. Note that the functions of existing facilities shall continue to be used for the main Blood Bank, which exists for drawing and screening blood for transfusions.

Table 2-33: Main Equipment to be procured for the Clinical Laboratory / Blood Bank

No.	Description	Quantity
7	Blood bank refrigerator	1
8	Blood cell counter	1
14	Coagulometer	1
25	Electrolyte analyzer	1
37	Hormone Analyzer	1
59	Microscope	7
76	Semi-auto Biochemistry analyzer	1
81	Spectrophotometer	1
87	Table top centrifuge	2

Source: prepared by the Survey Team

■ Theater Department/Recovery Room

The essential equipment shown on the table below shall be installed in each of the Major and Minor Theaters. Two beds shall be prepared for the Recovery Room, and the room shall be equipped with recovery beds, patient monitors, and the like.

Table 2-34: Main Equipment to be procured for the Theatre Department

No.	Description	Quantity
1	Anesthesia machine with ventilator	2
17	Defibrillator	1
21	Diathermy machine	2
43	Instrument cabinet	4
53	Major surgery instrument set	2
60	Minor surgery instrument set	3
61	Neonatal resuscitation table	1
62	OT table manual	2
64	Patient monitor for adult	4
71	Recovery bed	2
77	Shadowless OT lamp, double arm	1
78	Shadowless OT lamp, single arm	1

Source: prepared by the Survey Team

■ Central Sterile Supply Room (CSSD)

As of April 2021, 250 to 300 L of linens and small steel objects are sterilized every day in the Central Sterile Supply Room at TCH. Surgical operations, deliveries, and other clinical activities are expected to become more frequent as the population grows and the facilities expand; therefore, the room shall be designed to accommodate roughly 1.3 times the current volume. Note that two machines shall be installed to enable continuous clinical activities during the repair period in case one machine breaks down, or during regular inspections.

Table 2-35: Main Equipment to be procured for the CSSD

No.	Description	Quantity
35	High pressure steam sterilizer M	1
36	High pressure steam sterilizer S	1

Source: prepared by the Survey Team

■ Antenatal Checkup Department (ANC)

Pregnant women who visit for antenatal checkups undergo ultrasound technicians to verify the state of fetal development; therefore, the Ultrasound Room adjacent to the department shall be equipped with ultrasound scanner. The ultrasound scanner shall be equipped the mounting frame with caster to make it possible to examine pregnant women in the Labour Rooms and Maternity Ward as necessary.

Table 2-36: Main Equipment to be procured for the ANC

No.	Description	Quantity
12	Consultation desk and chair	7
20	Diagnostic set	5
27	Examination bed	5
28	Examination bed for Ob/Gy	1
30	Fetal doppler	4
45	Instrument set for Ob/Gy	3
90	Ultrasound scanner	1

Source: prepared by the Survey Team

■ Labour Room

The main equipment to be installed in Labour Rooms is as shown on the following table. The Pharmacy to be shared with the Maternity Ward shall be equipped with medicine refrigerators, medicine closets, and the like in order to store essential pharmaceuticals for pregnant women and inpatients.

Table 2-37: Main Equipment to be procured for Labour rooms

No.	Description	Quantity
4	Bedside locker	12
38	Hospital bed with IV stand	12
63	Overbed table	12

Source: prepared by the Survey Team

■ Delivery Room

The main equipment to be installed in the Delivery Room is as shown on the following table. Note that a Treatment Room shall be installed in the Delivery Room, and the room shall be equipped with a gynecological examination table, suction machine, sets of tools, and other essentials for performing discontinuation of pregnancy and other procedures.

Table 2-38: Main Equipment to be procured for the Delivery Room

No.	Description	Quantity
9	Caesarian instrument set	4
18	Delivery bed	5
19	Delivery instrument set	10
26	Episiotomy instrument set	3
29	Examination light	2
33	Height and weight scale for neonate	2
45	Instrument set for Ob/Gy	1
61	Neonatal resuscitation table	2
92	Vacuum extractor	2

Source: prepared by the Survey Team

■ Postnatal Care/Family Planning Room, Postnatal Care Consultation Room, Child Welfare Clinic (CWC)

The main equipment to be installed in the rooms of the Postnatal Care Department and the Child Welfare Clinic are as shown on the following table. Note that plans call for vaccine refrigerators, vaccine carriers, and other equipment of the Child Welfare Clinic to be transferred from existing facilities for continued use.

Table 2-39: Main Equipment to be procured for PNC Consulting Room and CWC

No.	Description	Quantity
12	Consultation desk and chair	3
27	Examination bed	3
33	Height and weight scale for neonate	2
46	Instrument set for PNC exam	1

Source: prepared by the Survey Team

■ Maternity Ward

Women who are pregnant and have contracted gestational toxicosis or infectious diseases such as tuberculosis are admitted to the Maternity Ward. Sudden births are possible; therefore, the ward shall be equipped with essential equipment for deliveries to a certain extent. The main equipment to be installed is as shown on the following table.

Table 2-40: Main Equipment to be procured for the Maternal Ward

No.	Description	Quantity
19	Delivery instrument set	2
24	ECG	1
28	Examination bed for Ob/Gy	1
30	Fetal doppler	3
38	Hospital bed with IV stand	44
90	Ultrasound scanner	1

Source: prepared by the Survey Team

■ Neonatal Intensive Care Unit (NICU)

The NICU is where care is provided, mainly by neonatal specialists (specialist nurses who have

studied neonatology for three years) to newborns born inside or outside the hospital. Like other kinds of nurses, neonatal specialists are not physicians. Therefore, the level of care they can provide is that of primary medicine; newborns whose conditions do not improve are referred to TTH. Note that six beds shall be installed in the Mothers' Room adjacent to the NICU, and that the newborns admitted to the NICU are breastfed by their mothers. The main equipment to be installed in the NICU is as shown on the following table.

Table 2-41: Main Equipment to be procured for the NICU

No.	Description	Quantity
3	Baby cot	7
5	Bilirubin meter	1
15	CPAP	1
33	Height and weight scale for neonate	1
41	Infant warmer	5
65	Patient monitor for neonate	1
67	Phototherapy unit	3
68	Portable suction machine	1
73	Resuscitation bag for neonate	4

Source: prepared by the Survey Team

■ Children's Ward

The main equipment to be installed in the Children's Ward is as shown on the following table. Young children are those between the ages of one and 14; because patients from a broad range of ages are admitted to this ward, plans call for the installation of both adult beds and children's beds with crib sides.

Table 2-42: Main Equipment to be procured for the Children's Ward

No.	Description	Quantity
12	Consultation desk and chair	1
20	Diagnostic set	1
27	Examination bed	1
38	Hospital bed with IV stand	12
66	Pediatric bed	22
74	Resuscitation bag for pediatrics	4
89	Ultrasonic nebulizer	1

Source: prepared by the Survey Team

■ Equipment to be Installed at District Hospitals

The main equipment to be installed at the three district hospitals targeted for installation (Savelugu Municipal District Hospital, Bimbilla District Hospital, and Kpandai District Hospital) are as shown on the following table.

Table 2-43: Main Equipment to be procured for District Hospitals

No.	Description	Savelugu Municipal DH	Bimbila DH	Kpandai DH
2	Autoclave	1	1	1
7	Blood bank refrigerator	1	1	1
18	Delivery bed	1	1	3
19	Delivery instrument set	2	2	2
24	ECG	1	1	1
62	OT table manual	1	1	1
64	Patient monitor for adult	1	1	1
79	Shadowless OT lamp, mobile	1	1	1

Source: prepared by the Survey Team

■ Regional Biomedical Engineering (BME) Department

The following tools and the like shall be provided for the maintenance of the equipment to be installed at TCH and district hospitals.

Table 2-44: Main Equipment to be procured for the Regional BME

No.	Description	Quantity
100	Maintenance tool set	3
101	Oscilloscope	2

Source: prepared by the Survey Team

2) List of Project Equipment

The list of Project equipment for target facilities is as shown on the following table.

Table 2-45: List of Project Equipment

Equipment for TCH

No.	Description	TOTAL	OPD Department	ANC	PNC / Family Planning / CWC	Laboratory	Operation Dept. / CSSD	Delivery Room	Labour Ward	Maternal Dept.	NICU	Pediatric Ward
1	Anesthesia machine with ventilato	2					2					
3	Baby cot	31								24	7	
4	Bedside locker	78							12	32		34
5	Bilirubin meter	1									1	
6	Blood bank centrifuge	1				1						
7	Blood bank refrigerator	1				1						
8	Blood cell counter	1				1						
9	Caesarian instrument set	4						4				
10	Chair	29	8	4		9				2	2	4
11	Clean linen storage cabinet	9					9					

No.	Description	TOTAL	OPD Department	ANC	PNC / Family Planning / CWC	Laboratory	Operation Dept. / CSSD	Delivery Room	Labour Ward	Maternal Dept.	NICU	Pediatric Ward
12	Consultation desk and chair	25	13	7	3					1		1
13	Couch	6									6	
14	Coagulometer	1				1						
15	CPAP	1									1	
16	Deep freezer	1				1						
17	Defibrillator	1					1					
18	Delivery bed	5						5				
19	Delivery instrument set	12						10		2		
20	Diagnostic set	21	15	5								1
21	Diathermy machine	2					2					
22	Dressing instrument set	1	1									
23	Drying machine	1					1					
24	ECG	1								1		
25	Electrolyte analyzer	1				1						
26	Episiotomy instrument set	3						3				
27	Examination bed	26	16	5	3					1		1
28	Examination bed for Ob/Gy	2		1						1		
29	Examination light	7	5					2				
30	Fetal doppler	7		4						3		
31	Glucometer	2		2								
32	Height and weight scale for adult	5	2	1	1							1
33	Height and weight scale for neona	6			2			2			1	1
34	Hemoglobin meter	1				1						
35	High pressure steam sterilizer M	1					1					
36	High pressure steam sterilizer S	1					1					
37	Hormone Analyzer	1				1						
38	Hospital bed with IV stand	56							12	32		12
39	Hot air sterilizer	1				1						
40	Incubator	1				1						
41	Infant warmer	5									5	
42	Infusion pump with IV stand	1					1					
43	Instrument cabinet	39	16	5	2		4	3		6	1	2
44	Instrument set for dilation and cur	2								2		
45	Instrument set for Ob/Gy	4		3				1				
46	Instrument set for PNC exam	1			1							
47	Instrument trolley	5			1		2			2		
48	Iron rack	4	2	1								1
49	IV stand	36					2					34
50	Kick bucket	2					2					
51	Laryngoscope	1	1									
52	Linen cart	2					2					
53	Major surgery instrument set	2					2					
54	Mayo instrument stand	2					2					

No.	Description	TOTAL	OPD Department	ANC	PNC / Family Planning / CWC	Laboratory	Operation Dept. / CSSD	Delivery Room	Labour Ward	Maternal Dept.	NICU	Pediatric Ward
55	Medicine cabinet	2	1									1
56	Medicine refrigerator	6	1			3		1				1
57	Medicine trolley	13	11							2		
58	Micropipette set	3				3						
59	Microscope	7				7						
60	Minor surgery instrument set	3					3					
61	Neonatal resuscitation table	4					1	2			1	
62	OT table manual	2					2					
63	Overbed table	56							12	32		12
64	Patient monitor	6	2				4					
65	Patient monitor for neonate	1									1	
66	Pediatric bed	22										22
67	Phototherapy unit	3									3	
68	Portable suction machine	2					1				1	
69	Preparation table with chairs	1					1					
70	Pulse Oximeter, finger type	3								3		
71	Recovery bed	2					2					
72	Resuscitation bag for adult	20	2				6	4		8		
73	Resuscitation bag for neonate	8						4			4	
74	Resuscitation bag for pediatrics	12	2				6					4
75	Revolving chair for episiotomy su	1						1				
76	Semi-auto Biochemistry analyzer	1				1						
77	Shadowless OT lamp, double arm	1					1					
78	Shadowless OT lamp, single arm	1					1					
80	Shaker/Mixer	2				2						
81	Spectrophotometer	1				1						
82	Sphygmomanometer	8	3							5		
83	Stretcher	5	2				1	1		1		
84	Suction unit	3	1				2					
85	Surgeon chair	2					2					
86	Syringe pump	6									6	
87	Table top centrifuge	2				2						
88	Thyroidectomy Instrument set	1					1					
89	Ultrasonic nebulizer	2	1									1
90	Ultrasound scanner	2		1						1		
92	Vacuum extractor	2						2				
93	Vein finder	1									1	
94	Washing machine	1					1					
95	Water distiller	1				1						
96	Wheel chair	5	2				1	1		1		
97	Xray film illuminator	11	10	1								
98	Laboratory stool	12				12						
99	Refrigerator for breast milk	1									1	
102	UPS	19	5	1		7	2	2		1	1	
103	AVR	57	5	4		19	3	3		4	17	2
104	AVR for OT	1					1					

District Hospital and BME

No.	Description	Total	BME	Savelugu Municipal DH	Bimbila DH	Kpandai DH
1	Anesthesia machine with ventilator	1				1
2	Autoclave for DH	3		1	1	1
7	Blood bank refrigerator	3		1	1	1
9	Caesarian instrument set	6		2	2	2
18	Delivery bed	5		1	1	3
19	Delivery instrument set	6		2	2	2
21	Diathermy machine	1				1
24	ECG	3		1	1	1
29	Examination light	3		1	1	1
30	Fetal doppler	4		2	1	1
59	Microscope	3		1	1	1
61	Neonatal resuscitation table	2		1		1
62	OT table manual	3		1	1	1
64	Patient monitor	3		1	1	1
67	Phototherapy unit	1		1		
79	Shadowless OT lamp, mobile	3		1	1	1
84	Suction unit	2		1		1
91	Ultrasound scanner, portable	2		1		1
100	Maintenance tool set	3	3			
101	Oscilloscope	2	2			
102	UPS	4		1	1	2
103	AVR	28		11	7	10

3) Basic Specifications of Project Equipment

■ Specifications of Project Equipment

The following table shows the basic specifications of high-value (roughly 1 million JPY or more) Project equipment.

Table 2-46: Specifications of Major Equipment

No.	Description	Main specifications
1	Anesthesia machine with ventilator	Composition: main unit, vaporizer, anesthetic ventilator, standard accessories, N2O gas bottle, UPS Specifications: type: low flow anesthesia; flowmeter: flow range (O2) / flow range (N2O): 0.1 – 10L/min. or wider; gas pressure gauges: with alarms on lower supply pressure of O2, on lower concentration of O2, with O2 flush system; cylinder holder: 2 gas cylinders mountable; vaporizer: sevoflurane and isoflurane; mountable vaporizer: 2 vaporizers, selectable (interlock type); canister: single or double camber, 1,200 ml or more
8	Blood cell counter	Main composition: main unit, power cord, waste fluid tank Main specifications: mode: fully automatic; parameters: at least 18 parameters: WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, LYM%, NE%, PDW, MPV or more; sample volume: less than 50 micro liters for whole blood
9	Caesarian instrument set	Backhaus towel clamp, 130mm：10 Obstetric forceps, Wrigley, 280mm：2 Artery forceps, curved, 150mm：10 Artery forceps, curved, 180mm：2

		Dressing forceps, straight, 1x2, 180mm：4 Dressing forceps, straight, plain, 180mm：4 Peritoneum forceps, Green Armytage, 210mm：12 Sponge holding forceps, 240mm：10 Allis tissue forceps, 4x5 teeth, 150mm：4 Littlewood tissue forceps, 190mm：6 Surgical blade handle No.4：4 Mayo needle holder, 180mm：4 Doyen retractor：4 Langenbeck retractor：2 Morris retractor, 51mm：2 Mayo scissors, curved 180mm：2 Mayo scissors, straight 180mm：2 Spencer ligature scissors：2 Sterilizing case, 360 x 300 x 100mm：1
14	Coagulometer	Main composition： main unit, printer Main specifications： PT, APTT, Fib, TT, or more; sample volume: 25 ul or less; display: LCD; testing time: less than 420 seconds; memory: 100 tests or more; printer: built-in printer
23	Drying machine	Main composition: main unit, AVR Main specifications: drum capacity: 20 kg or more; heating type: electric; drum material: stainless steel; drying program: set by control panel
25	Electrolyte analyzer	Main composition: main unit Main specifications: measurement method: fully automatic; parameters: Na+, K+, Cl-, or more; sample type: whole blood, urine, serum, plasma; throughput: 60 samples / hour or more; sample applicable: syringe, cup or tube; calibration: fully automatic; printer: equipped
35	High pressure steam sterilizer M	Main composition: main unit, water softener, sterilization drums (L, M) Main specifications: type: sliding or swing single door: capacity: 250L or more; material (inside, lid): stainless steel SUS304; material (outer): steel or enamel coating
36	High pressure steam sterilizer S	Main composition: main unit, water softener, sterilization drums (L, M) Main specifications: type: sliding or swing single door: capacity: 150L or more; material (inside, lid): stainless steel SUS304; material (outer): steel or enamel coating
37	Hormone analyzer	Composition: main unit, data management console, barcode reader, waste fluid collection tank Main specifications: throughput: 60 tests / hour; measuring parameter: TSH, T3, T4, PSA, FSH, LH, prolactin, progesterone, estradiol, testosterone, cortisol or more; sample volume: 125μl or less
41	Infant warmer	Main composition: main unit, accessories (skin temperature probe, neonatal temperature detection thermistor probe, probe pad (80 pcs. / box) Main specifications: control system: servo and manual; features: resuscitator equipped including oxygen blender; skin temperature control: 35.0 – 37.5℃ or wider (0.1℃ increment); skin temperature display: 32.0 – 40.0℃ or wider
53	Major surgery instrument set	Standard scissors, straight, S/B, 145mm: 1 Mayo scissors A, straight, 170mm: 1 Mayo scissors B, curved, 170mm: Metzenbaum scissors A, curved, 180mm: 1 Metzenbaum scissors B, curved, 230mm: 1 Wire suture scissors, angular, 120mm: 1 Mosquito forceps, curved, 125mm: 12 Crile forceps A, curved, 140mm: 18 Crile forceps B, curved, 160mm: 12 Pean forceps, curved, 160mm: 12

		Ochsner forceps A, straight, 160mm: 6 Ochsner forceps B, straight, 200mm: 4 Towel clip forceps, 130mm: 1 etc.
60	Minor surgery instrument set	Surgical knife blade No 11, 100 pcs/box: 1 Surgical knife blade No 21, 100 pcs/box: 1 Surgical knife handle No.3: 1 Surgical knife handle No.4: 1 Retractor, one prong: 1 Double ended curette: 1 Probe: 1 Grooved probe: 1 Dressing forceps: 1 Tissue forceps, 1x2: 1 Operating scissors, straight:1 Operating scissors, curved: 1 Kocher hemostatic forceps, 145mm: 1 Mathieu needle holder: 1 Suture needle: 1
62	OT table manual	Main composition: main unit (mattress), accessories (arm rest, shoulder support, anesthesia screen, body support, knee crutch, IV pole with clamp, X-ray cassette holder) Main specifications: elevation: oil hydraulic; tabletop dimensions (overall): 1,900 - 2,130mm x 500 - 590mm; elevation range: 770 - 950mm or wider; Trendelenburg: 25° or more; reverse Trendelenburg: 25° or more
76	Semi-auto biochemistry analyzer	Main composition: main unit Main specifications: main unit: shape: desktop; reagent: open system; assay procedure: semi-automatic; measurement: EPA, time fixed, kinetic, bio-chromatic; throughput: 30 tests / hour or more; reaction disk 25 - 37℃; wavelength: 340 – 620nm or more
77	Shadowless OT lamp, double arum	Main composition: spindle + radial arm assembly, main lamp, sub lamp, support tube and suspension arms, sterile handle, wall panel Main specifications: main lamp: light type: LED; LED number: 80 or more; light intensity: 140,000 lux or more; sub lamp: light type: LED; LED number: 70 or more; light intensity: 100,000 lux or more
78	Shadowless OT lamp, single arm	Main composition: spindle + radial arm assembly, main lamp, support tube and suspension arms, sterile handle, wall panel Main specifications: main lamp: light type: LED; LED number: 80 or more; light intensity: 140,000 lux or more
79	Shadowless OT lamp, mobile	Main composition: main unit Main specifications: type: mobile stand type; light source: LED; LED number: 70 or more; light intensity: 100,000 lux or more
88	Thyroidectomy instrument set	Surgical knife blade set: 1 Surgical knife handle: 1 Standard operating scissors, 14 cm, straight: 2 Standard operating scissors, 14 cm, curved: 2 Mayo operating scissors, 14 cm, curved: 2 Metzenbaum scissors, 14 cm: 2 Dressing forceps, 13 cm: 2 Tissue forceps, 13 cm: 2 Universal dressing forceps, 19cm, operation center type: 2 Dressing forceps for blood vessel, 15 cm, operation center type: 1 Mathieu needle holder, 19cm: 2 Mathieu needle holder, 19cm with diamond tip: 2 Backhaus towel forceps: 12 Tokyo univ. type forceps: 2 Tube forceps: 1

		Probe: 1 Retractor, 2 prong, blunt, pair: 1 etc.
90	Ultrasound scanner	Main composition: main unit, convex transducer, transvaginal transducer, printer, foot switch and cart, UPS or built-in battery Main specifications: beam holder: digital; scanning modes: electronic convex, linear; display modes: B, B/B, M, B/M, B/D, CFM(B) or CWD/PWD; monitor: LCD, 12 inches or more; transducer connector: for 3 or more.
91	Ultrasound scanner, portable	Main composition: main unit, convex transducer, printer, foot switch and cart, UPS or built-in battery Main specifications: beam holder: digital; scanning modes: electronic convex, linear; display modes: B, B/B, M, B/M, B/D, CFM(B) or CWD/PWD; monitor: LCD, 10 inches or more; transducer connector: for 3 or more
94	Washing machine	Main composition: main unit Main specifications: drum capacity: 40kg or more; max. speed: 525 rpm or more; dehydration function: equipped; boiler: electric steam boiler built-in

■ Replacement Parts, Reagents, and Consumable Parts of Project Equipment

At least roughly three months are required for TCH and the district hospitals within the scope of cooperation to establish supply routes for essential parts for scheduled inspections and essential consumable parts for day-to-day operations. In addition, under the soft component, guidance will be provided as to methods of calculating budgets for equipment maintenance, but it will probably take roughly one year after handover to formulate and execute the budgets based on the guidance. Therefore, regarding the cycle of replacement parts, the plan calls for one year's worth of replacement parts recommended by the manufacturers. In addition, the plan calls for enough consumable parts for the first four months after the granting of equipment.

■ Countermeasures for Voltage Variation

As a result of measurements of voltage variation at each facility, automatic voltage regulators (hereinafter referred to as "AVR") to prepare for sudden power outages or voltage variations, or uninterruptible power supplies (hereinafter referred to as "UPS") shall be attached to essential equipment. In addition, emergency generators shall be installed on the construction side, and generator circuits shall run through the Theaters, the Delivery Room, and the like.

■ Countermeasures for Water Quality

The water at target facilities is hard; therefore, plans call for water softeners that correspond to the water quality to be attached to the high-pressure steam sterilizers.

Ministry of Health
The Republic of Ghana

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR THE IMPROVEMENT OF HEALTH CARE SYSTEM IN THE NORTHERN REGION IN THE REPUBLIC OF GHANA

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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE CONSORTIUM OF

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JR
22-002

Ministry of Health
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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Consortium of Matsuda Consultants International Co., Ltd. and Binko International Limited.

The survey team held a series of discussions with the officials concerned of the Government of Ghana, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to enhancement of friendly relations between our two countries.

Finaly, I wish to express my sinsere appreciation to the officials concerned of the Government of Ghana for their close cooperation extended to the survey team.

February, 2021

Jun SAKUMA
Director General
Human Development Department
Japan International Cooperation Agency

Summary

1. Outline of the Country

The Republic of Ghana (hereinafter referred to as "Ghana"), which gained independence from the United Kingdom in 1957, is located in the western part of the African continent, in the south part of the Sahara Desert. It has a land area of 239,000 km^2, which is about two-thirds the size of Japan. The country is bordered by Burkina Faso to the north, Cote d'Ivoire to the west, and Togo to the east, and faces the Gulf of Guinea to the south. Most of the country's terrain is made up of lowlands in the basin of the Volta River, with a maximum elevation of about 885 meters. The coastal plain extends from the coast to 100 km inland, the western part is a forested plateau, and the eastern part is a flatland in the basin of the Volta River. According to the Köppen climate classification, the whole of Ghana belongs to the tropical climate, however the southern part of the country has a tropical monsoon climate with a lot of rainfall, while Tamale, where the project site is located, has a savanna climate with less rainfall in the northern part. A trade wind from the Sahara Desert called "the Harmattan" blows in, bringing dust from the Sahara Desert from the northeast from December to February

Ghana has a population of about 30.8 million, with a national average population growth rate of 2.1% per annum (Population Census, 2021). The main industries are mining (gold, oil, etc.) and agriculture (cocoa, cassava, etc.). In recent years, the economic status has continued to grow steadily and security condition is relatively stable. It is a lower-middle income country with a GNI per capita of US$2,230 (World Bank, 2020). However, while the southern part of country has high agricultural potential, the northern part has poor growing conditions, which affects the economic gap between the south and the north. Regional disparities are also a challenge, as the northern regions have not benefited from the development that has accompanied the recent economic growth of the Ghana.

2. Background and Outline of the Project

As a result of efforts to achieve Millennium Development Goals by the deadline of 2015, the Republic of Ghana (hereinafter referred to as “Ghana”) has demonstrated improvement of its health circumstances in terms of health indicators, for example halving the mortality rates of mothers and children compared to those of 1990; however, the rate of decline has slowed in recent years, with maternal deaths decreasing from 376 per 100,000 live births in 2005 to 310 in 2017, and under-5 deaths falling from 80 per 1,000 live births in 2008 to 52 in 2017.[1] In addition, the Health Summit held in Ghana in April 2017 revealed the urgency of the need to improve the quality of services at medical facilities in order to reduce the mortality rates of mothers and children because the institutional mortality rates had worsened for both—for mothers, the rate increased from 142 deaths

[1]Ghana Maternal Health Survey 2017, Ghana Statistical Service/Ministry of Health, 2018

per 100,000 live births to 150, and for newborns, the rate increased from 5.34 deaths per thousand live births in 2015 to 6.28.[2] To deal with this issue, the government of Ghana formulated Health Sector Medium Term Development Plan 2018-2021,[3] which aims to achieve Universal Health Coverage (UHC)[4] through fair access to high-quality health care, under Medium Term National Development Policy Framework 2018-2021,[5] the national medium-term plan focusing on social development, including the health care sector.

As a result of stable economic growth in recent years, Ghana is entering a period of societal transition, and demographic trends indicate that the population is gradually aging. In addition, changes in socioeconomic circumstances have given way to lifestyle modifications, which have had an impact on hospital composition; although malaria and other infectious diseases persist, non-infectious diseases are also on the rise, causing health expenditures to increase. Due to factors such as macroeconomic trends and reduced financial aid from donors resulting from Ghana's entry into the ranks of lower middle-income countries, government finances are tight, not enough people have been hired to maintain medical facilities and work in health care, and funds are insufficient for providing high-quality health services. In addition, there is substantial regional inequality in health care services and other social infrastructure, especially in the former Northern Region yet to receive the full benefits of economic development (referring to the Northern Region, the North East Region, and the Savannah Region),[6] where the poverty rate has reached 61%[7] and there is an urgent need to further improve the quality of health care services for regional residents. The Northern Region is one of the former Northern Region with the highest poverty rates, regional inequality and lacks essential health services, and faces problems accessing medical facilities. Tamale Central Hospital (hereinafter referred to as "TCH"), which is positioned administratively as a regional hospital, faces problems such as deteriorating facilities, lack of space for facilities, and insufficient medical equipment and medical specialists, and does not function as a secondary hospital, which is expected of regional hospitals. Furthermore, insufficient facilities and equipment at primary-level medical facilities in the former Northern Region leave them unable to provide proper treatment; consequently, patients who can be treated at the primary and secondary level medical facilities are clustering at Tamale Teaching Hospital (hereinafter referred to as "TTH"), a tertiary hospital.

In light of the background described above, the government of Ghana requested grant aid from

[2]Holistic Assessment of 2017 Health Sector Programme of Work, Ghana Ministry of Health, 2018

[3] The Health Sector Medium-Term Development Plan (HSMTDP) 2018-2021

[4]Aiming to enable everyone to enjoy basic health care services when they need them, at affordable prices

[5] Medium-term National Development Policy Framework, An Agenda for Jobs: Creating Prosperity and Equal Opportunity for All (First Step) 2018-2021

[6]The current Northern Region, the Northeast Region, and the Savannah Region were originally one region, but were split into three during the regional reorganization of February 2019. The administrative functions and systems were not fully transferred to the new regions as of the previous survey, which was conducted in May 2019, but the transition continued in 2020, and statistics and the like have been compiled for each region after the split. In the title of this survey, the name "Northern Region" refers to the former Northern Regions before the reorganization. On the other hand, in the text, the three regions before the reorganization are referred to as the "former Northern Region" and the current Northern Region is simply referred to as the "Northern Region".

[7] Ghana Poverty Assessment 2020, World Bank

the Japanese government for the Project for the Improvement of Health Care System in the Northern Region (hereinafter referred to as “the Project”) for the former Northern Region with the objective to improve referral system and the quality of health care services in that area.

3. Results of Survey and Project Content

In response to the above request by the government of Ghana, the Japan International Cooperation Agency (JICA) conducted a field survey of the Project in May 2019, however the survey was suspended due to the security concerns in the target area. This time, after an interruption of about two years, a preparatory survey will be carried out on a zero-base, taking into account the changes in the environment surrounding the Project and referring to the contents of the previous survey. JICA dispatched a survey team to Ghana from 20 March to 17 April 2021 to consult with the Ministry of Health and other stakeholders. Based on the request by Ghana, the survey team conducted a site survey of Tamale Central Hospital (hereinafter referred to as "TCH") and the district hospitals. Thereafter, the survey team conducted an analysis based on the results of the site survey in Japan, compiled a schematic design, prepared a draft preparatory survey report, and briefed the Ghana officials from 12 to 23 November 2021 to finalize this preparatory survey report.

The project consists of the facility development and the equipment procurement for TCH. The equipment procurement for three district hospitals and the Biomedical Engineering Department in Northern Region (hereinafter referred to as “BME”), and a soft component are aimed at strengthening the capacity as well as to maintain medical equipment.

The project component of TCH consists of the construction of facilities and the provision of equipment essential for clinical activities, with the aim of updating not only facilities for the functions directly related to maternal and child health among the existing functions of TCH, but also for those functions with many users, for which Project implementation can be expected to deliver substantial benefits. The size of the facility is based on the number of patients and consultations over the past three years, and the number of rooms and beds required is planned for 2027, three years after the handover of the facility. The equipment to be installed under the Project has grades that enable the personnel presently assigned at TCH to use them without problems.

Table 1: Facility Components of the Project at TCH

	Block Code	Floor	Main components	Floor Area (m^2)
Clinical Block (two storey)	Block A	GF	OPD: Consultation room (10 rooms), Vital (2 rooms), Waiting hall, Reception, Record, Observation room, Dressing room, Satellite pharmacy etc.	3,022.80
		1st	Maternity department: Delivery room (5 beds), Treatment room, Physical function examination room, Labour room (12 beds), Recovery/Maternity room (32 beds), NICU (13 beds), Mother room, Staff station etc.	
	Block B	GF	MCH: Consultation room (3 rooms), Ultrasound room, Vital, Gynecology examination room, Consulting room (HIV), Reception, Satellite pharmacy, Staff room, CWC, Waiting hall etc. Clinical laboratory: Laboratory (Hematology, Microbiology, Parasitology, Biochemistry), Blood bank depot, Waiting hall etc.	2,521.14
		1st	Theatre & CSSD: Operating theatres (2 rooms), Changing hall, Laundry, Sterilization/Assembly room, etc. Children's ward: Ward (34 beds) etc.	
Annex (single storey)	C	—	Medical gas storage, Compressor room	32.50
	D	—	Blower room	13.26
	E	—	Main-switch room, Transformer room, MDB room	69.30
	F	—	Generator room	39.69
	G	—	Pump room, Reservoir tank	44.10
	H	—	Guardhouse	4.00
	—	—	Covered walkway	60.74
Total Floor Area				5,807.54

Table 2: Main Equipment to be procured for TCH

Department	Description
Outpatient Department	Consultation desk and chair, Diagnostic set, Examination bed, Examination light, Clean linen storage cabinet, Patient monitor, Resuscitation bag for adult, Xray film illuminator etc.
Maternity Department	Ultrasound scanner, Delivery bed, Delivery instrument set, Instrument set for Ob/Gy, ECG, Examination bed for Ob/Gy, Hospital bed with IV stand, Neonatal resuscitation table, Infant warmer, Baby cot, CPAP, Phototherapy unit etc.
MCH (Maternal and Child Health)	Ultrasound scanner, Consultation desk and chair, Diagnostic set, Examination bed for Ob/Gy, Fetal doppler, Delivery instrument set etc.
Clinical Laboratory	Blood bank refrigerator, Blood cell counter, Coagulometer, Electrolyte analyzer, Hormone Analyzer, Semi-auto Biochemistry analyzer etc.
Operation and CSSD Department	Anesthesia machine with ventilator, Surgery instrument set, Shadowless OT lamp, OT table manual, Thyroidectomy Instrument set, Drying machine, High pressure steam sterilizer, Washing machine etc.
Children's Ward	Consultation desk and chair, Diagnostic set, Examination bed, Hospital bed with IV stand, Pediatric bed, Resuscitation bag for pediatrics, Ultrasonic nebulizer etc.

Based on the previous survey results, a site survey was carried out in five districts to select the project hospitals where the medical equipment should be installed. As a result, three hospitals were chosen for the subject of the Project: Savelugu Municipal Hospital, Bimbilla District Hospital, and Kpandai District Hospital. The selected district hospitals are positioned as district referral and sub-referral centres, and receive patients from health centres. As these district hospitals are located too far away from Tamale and cannot be reached in time for emergency transport, it is significant to provide a certain level of diagnosis and treatment on a district basis. These district hospitals will be equipped with new equipment to improve perinatal medical care in the district. In addition, the BME of the Regional Health Department, which is responsible for the maintenance of medical equipment in the project facilities, toolsets and other equipment will be installed to improve their maintenance management capacity. The main equipment for the district hospitals and the BME is as follows.

Table 3: Main Equipment to be procured for District Hospitals and BME

	Description
District Hospitals	Autoclave for DH, Blood bank refrigerator, Delivery bed, Delivery instrument set, ECG, OT table manual, Patient monitor, Shadowless OT lamp, mobile etc.
BME	Maintenance tool set and Oscilloscope

Since the maintenance and management of medical equipment at cooperation target facilities is not being adequately implemented, this is negatively impacting the quality of medical services provided. To ensure that medical equipment is available in a proper condition at all times, workshops will be held on the acquisition of maintenance know-how, strengthening of systems, budget planning and efficient procurement planning through the soft component.

4. Construction Period, and Project Cost borne by Ghana side

The construction period necessary for the Project is estimated to be, 4.5 months for Detail Design and Cost Estimation from the signing of the G/A to the invitation to tender, 2.5 months from the invitation to tender to the commencement of the work, and 17 months for construction work, for a total of 24 months. The time necessary for equipment procurement will be incorporated into the construction work period.

The cost required for the implementation of this Project borne by Ghana side will be approximately 31 million yen.

5. Project Evaluation

(1) Relevance

1) Expected Benefits of this Project

TCH and the three target district hospitals are located in geographically important areas with large beneficiary populations and coverage areas. By clarifying the function and role of TCH, this project is expected to reduce the burden on TTH and improve the referral system. Given the high possibility that this project will contribute to improving the quality of maternal and child health services, this project is deemed to be highly relevant.

2) Human Security

Although Ghana has maintained relatively stable economic growth, its economic foundation, including the country's infrastructure, is still vulnerable and there are large disparities concerning income, region, and gender equality. In the former Northern Region, there are many challenges in terms of medical services particularly high poverty rate of the area. Enhancing the public healthcare facilities covered by the Project will also reduce out-of-pocket expenses for the poor and contribute to improving their financial situation and providing economic support. By ensuring human security and improving the social infrastructure, the Project will contribute to building a stable and sustainable society in Ghana.

3) Consistency with Ghana's National Development Plan

In Ghana, the Health Sector Medium Term Development Plan 2018–2021 indicates following National Policy Objectives.

Objective 1: Ensure sustainable, affordable, easily, accessible healthcare services (UHC). Strategies for strengthening of the referral system and the district and sub-district health systems.

Objective 2: Reduce morbidity, disability mortality and intensify prevention and control of non-communicable diseases. Strategies for strengthening of maternal, newborn care and adolescent health services.

Objective 3: Enhance efficiency in governance and management of the health system. Strategies for implementation of capital investment policy and plan in the health sector.

It will also contribute to the realization of Universal Health Coverage (UHC) in Ghana, which was selected as one of the countries in which to promote UHC at TICAD 7. As the content and objectives of the Project are consistent with the policies of Ghana, the necessity and relevance of the Project are judged to be high.

4) Consistency with Japan's ODA Policy

Ghana emphatically pointed out the need for improving its health sector at TICAD 7, and has been selected as a country in which to promote UHC, placing the country in a highly important role. Including the support that Japan has provided for the Noguchi Memorial Institute for Medical Research (NMIMR), Japan has demonstrated its willingness to strengthen its cooperative relationship with Ghana by providing significant assistance in the health sector, and this project is a part of that. The Japan International Cooperation Agency (JICA) has also implemented pilot efforts for technical cooperation in the Northern Region including "Project for Strengthening Community based Health Services focusing on the Life-Course Approach in the three Northern Regions (2017 -2022)" and "Project for Improving Continuum of Care for Mothers and Children through the introduction of combined MCH Record Book (2018 -2022)." Including in the former Northern Region, these projects aim to promote illness prevention and good health through community health, and also to improve the referral and patient sharing systems, and are expected to generate synergistic benefits with the Project. Based on the above, the implementation of this project is deemed consistent with Japan's ODA policy.

(2) Effectiveness

1) Quantitative Effects

The implementation of this project is expected to have the quantitative effects described below. In the case of TCH and district hospitals, comprehensive support will be provided to TCH for the development of facilities and equipment, the support for district hospitals will be limited to maternal and child health-related equipment.

A Number of outpatients (persons/year): The number of outpatients is expected to increase due to the development of the outpatient department at TCH.

B Number of deliveries (persons/year): Increase in the number of deliveries at project facilities

C Number of cesarean sections (number/year): Increase in the number of cesarean sections at project facilities

D Number of times ultrasound equipment is used (number/year): Increase in the number of times ultrasound equipment is used at TCH.

Objective values for achievable quantitative effectiveness indicators shall be set based on the actual values in 2019[8] at cooperation target facilities. The target year will be 2027, three years after the completion of facilities through the Project.

[8] The number of outpatients at TCH is the average of the 2017-2019 period.

Table 1: Quantitative Effect Indicators and Target Values

Indicator	Reference value (2019) [Actual value]	Target value (2027) [3years after completion of the project]
A Number of outpatients at TCH (persons/year)	93,479	109,800
B Total number of deliveries at project facilities (persons/year)	11,639	15,000
C Total number of cesarean sections at project facilities (number/year):	1,205	1,500
D Number of times ultrasound equipment is used at TCH (number/year)	6,584	8,150

2) Qualitative Effects

The implementation of this project is expected to have the qualitative effects described below.

- Operational efficiency and safety are improved by enhancing the hospital environment and functions.
- Improvement and enhancement of facilities and equipment leads to a better working environment for staff and increases motivation and satisfaction.
- Enhancements to the hospital environment and functions increase patient satisfaction.
- Improvement of the hospital environment increases opportunities for in-hospital training for current and intern staff.
- Each target hospital will adequately receive patients suitable for the level of severity indicated by Ghanaian standards.

In light of the above, the project is highly relevant and considered effective.

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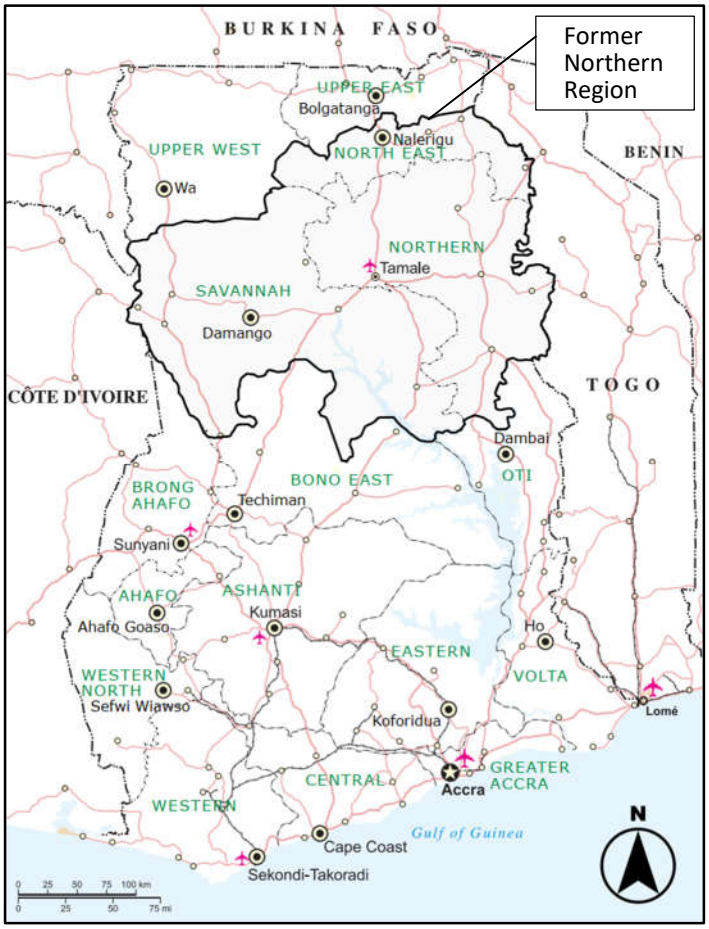
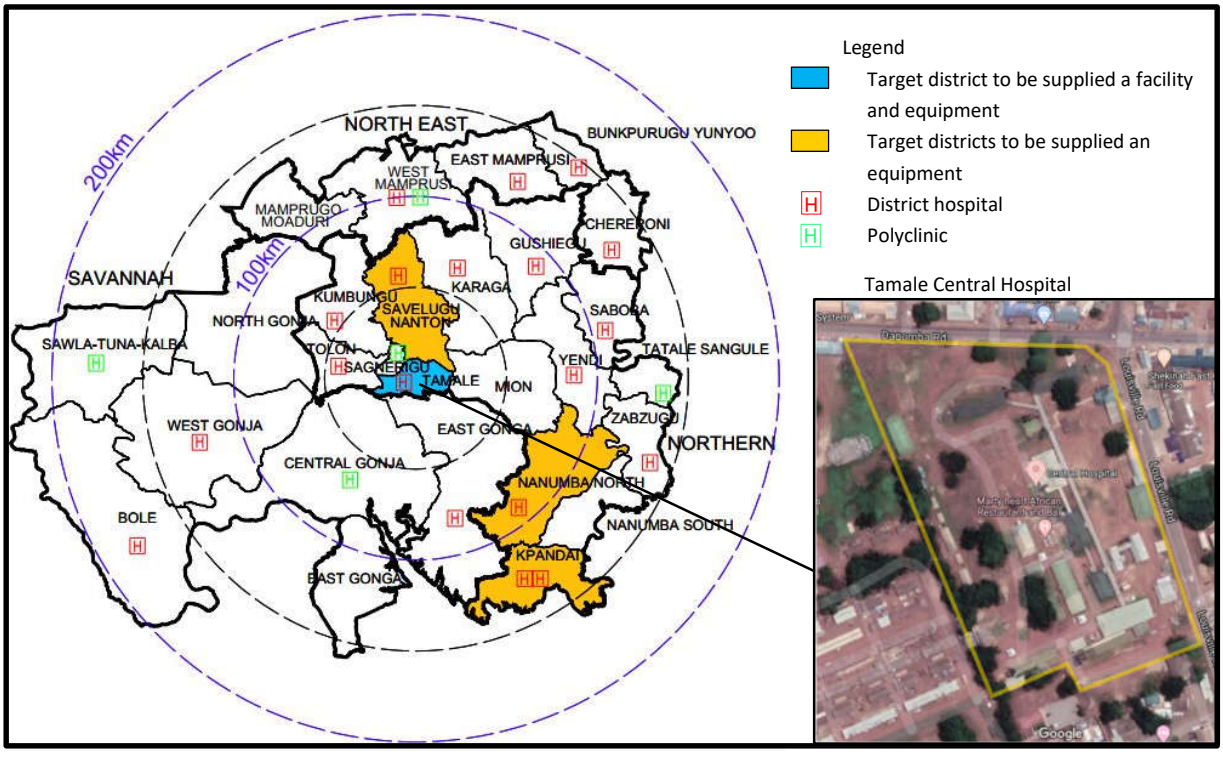
National Map of Ghana



Legend

- National capital
- Regional capital
- Town, village
- Airport
- International boundary
- Regional boundary
- Main road
- Secondary road
- Railroad

Location map of project sites (Tamale Central Hospital and District Hospitals to be equipped)



Perspective

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Abbreviations

ANC	Antenatal Care
A/P	Authorization to Pay
AVR	Automatic Voltage Regulator
B/A	Banking Arrangement
BS	British Standard
CPAP	Continuous Positive Airway Pressure
CHAG	Christian Health Association of Ghana
CHPS	Community-Based Health Association of Ghana
CSSD	Central Sterile Supply Department
CWC	Child Welfare Clinic
DH	District Hospital
DS	Duct Space
ECG	Electrocardiogram
ENT	Ears, Nose and Throat
EPA	Environmental Protection Agency
EPS	Electric Pipe Space
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
G/A	Grant Agreement
GHS	Ghana Health Service
GWCL	Ghana Water Company, Limited
HeFRA	Health Facilities Regulatory Agency
ICU	Intensive Care Unit
IEC	International Electrotechnical Commission
IGF	Internal Generated Fund
IMF	International Monetary Fund
LAN	Local Area Network
LED	Light Emitting Diode
MCH	Maternal and Child Health
M/D	Minutes of Discussions
MDB	Main Distribution Board
MFARI	Ministry of Foreign Affairs and Regional Integration
MOH	Ministry of Health
NEDCo	Northern Electricity Distribution Company
NHIS	National Health Insurance Scheme
NICU	Neonatal Intensive Care Unit

OPD	Outpatient Department
PNC	Postnatal Care
RHD	Regional Health Directorate
TCH	Tamale Central Hospital
TICAD	Tokyo International Conference on African Development
TTH	Tamale Teaching Hospital
UHC	Universal Health Coverage
UPS	Uninterruptible Power Supply
VAT	Value Added Tax

Chapter 1. Background of the Project

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1-1. Project Overview

As a result of efforts to achieve Millennium Development Goals by the deadline of 2015, the Republic of Ghana (hereinafter referred to as "Ghana") has demonstrated improvement of its health circumstances in terms of health indicators, for example halving the mortality rates of mothers and children compared to those of 1990; however, the rate of decline has slowed in recent years, with maternal deaths decreasing from 376 per 100,000 live births in 2005 to 310 in 2017, and under-5 deaths falling from 80 per 1,000 live births in 2008 to 52 in 2017.[9] In addition, the Health Summit held in Ghana in April 2017 revealed the urgency of the need to improve the quality of services at medical facilities in order to reduce the mortality rates of mothers and children because the institutional mortality rates had worsened for both—for mothers, the rate increased from 142 deaths per 100,000 live births to 150, and for newborns, the rate increased from 5.34 deaths per thousand live births in 2015 to 6.28.[10] To deal with this issue, the government of Ghana formulated Health Sector Medium Term Development Plan 2018-2021,[11] which aims to achieve Universal Health Coverage (UHC)[12] through fair access to high-quality health care, under Medium Term National Development Policy Framework 2018-2021,[13] the national medium-term plan focusing on social development, including the health care sector.

As a result of stable economic growth in recent years, Ghana is entering a period of societal transition, and demographic trends indicate that the population is gradually aging. In addition, changes in socioeconomic circumstances have given way to lifestyle modifications, which have had an impact on hospital composition; although malaria and other infectious diseases persist, non-infectious diseases are also on the rise, causing health expenditures to increase. Due to factors such as macroeconomic trends and reduced financial aid from donors resulting from Ghana's entry into the ranks of lower middle-income countries, government finances are tight, not enough people have been hired to maintain medical facilities and work in health care, and funds are insufficient for providing high-quality health services. In addition, there is substantial regional inequality in health care services and other social infrastructure, especially in the former Northern Region yet to receive the full benefits of economic development (referring to the Northern Region, the North East Region,

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[13] Medium-term National Development Policy Framework, An Agenda for Jobs: Creating Prosperity and Equal Opportunity for All (First Step) 2018-2021

and the Savannah Region),[14] where the poverty rate has reached 61%[15] and there is an urgent need to further improve the quality of health care services for regional residents. The Northern Region is one of the former Northern Region with the highest poverty rates, and lacks essential health services, and faces problems accessing medical facilities, poverty, and regional inequality. Tamale Central Hospital (hereinafter referred to as "TCH"), which is positioned administratively as a regional hospital, faces problems such as deteriorating facilities, lack of space for facilities, and insufficient medical equipment and medical specialists, and does not function as a secondary hospital, which is expected of regional hospitals. Furthermore, insufficient facilities and equipment at primary-level medical facilities in the former Northern Region leave them unable to provide proper treatment; consequently, patients who can be treated at the primary and secondary level medical facilities are clustering at Tamale Teaching Hospital (hereinafter referred to as "TTH"), a tertiary hospital.

In light of the background described above, the government of Ghana requested grant aid from the Japanese government for the Project for the Improvement of Health Care System in the Northern Region (hereinafter referred to as "the Project") for the former Northern Region with the objective to improve referral system and the quality of health care services in that area. In response, the Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted a field survey for the Project in May 2019. However, the survey was suspended due to concerns over the state of internal security in the survey area, and this occasion marks the resumption of the survey after a suspension period of roughly two years. This survey was conducted anew to account for changes in the environment surrounding the Project, while referring to the details of the previous survey.

1-2. Natural Conditions of the Target Area

(1) Geology and Climate Condition

Ghana is located in the western part of the African continent, in the south part of the Sahara Desert. It has a land area of 239,000 km^2, which is about two-thirds the size of Japan. The country is bordered by Burkina Faso to the north, Cote d'Ivoire to the west, and Togo to the east, and faces the Gulf of Guinea to the south. Most of the country's terrain is made up of lowlands in the basin of the Volta River, with a maximum elevation of about 885 meters. The coastal plain extends from the coast to 100 km inland, the western part is a forested plateau, and the eastern part is a flatland in the basin of the Volta River.

According to the Köppen climate classification, the whole of Ghana belongs to the tropical

[14]The current Northern Region, the Northeast Region, and the Savannah Region were originally one region, but were split into three during the regional reorganization of February 2019. The administrative functions and systems were not fully transferred to the new regions as of the previous survey, which was conducted in May 2019, but the transition continued in 2020, and statistics and the like have been compiled for each region after the split. In the title of this survey, the name "Northern Region" refers to the former Northern Regions before the reorganization. On the other hand, in the text, the three regions before the reorganization are referred to as the "former Northern Region" and the current Northern Region is simply referred to as the "Northern Region.

[15] Ghana Poverty Assessment 2020, World Bank

climate, however the southern part of the country has a tropical monsoon climate with a lot of rainfall, while Tamale, where the project site is located, has a savanna climate with less rainfall in the northern part. The rainy season in Tamale is from May to October, and the average annual rainfall is about 1,000mm. Temperatures are high throughout the year, with highs reaching 40 degrees Celsius and lows never dropping below 20 degrees Celsius, and from December to February, a trade wind from the Sahara Desert called "the Harmattan" blows in, bringing dust from the Sahara Desert from the northeast.

(3) Topography and Geology

The existing site of TCH has an area of about 3.8 ha, and the overall shape of the property is roughly trapezoidal with about 300 m in the north-south direction and about 150 m in the east-west direction. The property slopes downward gently from the south to the north, and the difference in elevation is 5 meters. The topsoil from the current ground level to a depth of 1.0m consists of medium density sandy and silty clay, below which a clayey gravel layer of about 2.4m is found. Deeper than that is a very dense laterite layer of decomposed and cemented mudstone and sandstone, which is a good ground with an expected bearing capacity of more than 200kN/m2 at GL-1.0m.

(4) Natural Desaster

The flooding has been recorded due to the heavy rain in the area of low ground level on the northeast of the property. However, the soil is well-drained and the water percolates into the ground in a few hours. In terms of seismic history, the magnitude 6.4 earthquake that struck the outskirts of Accra in 1939 is the largest on record. The earthquake records for the area show a cluster along the coastline; no major damage-causing earthquakes have been recorded in the northern area of Ghana to date.

(5) Site Land Survey

The same surveyor of the previous survey was selected as the outsourcing company for this topographic survey. Therefore, the last survey results were effectively used by adding the changes to the last survey map, such as newly constructed wells, ophthalmology outpatient building, hot water supply facilities, etc. As a result of the survey, there are no particular problems with the facility's construction at the site.

(6) Ground Survey

In principal, the results of the geotechnical investigation by the previous survey should be utilized as it is not expected that the underground conditions changes in a short period of time. In the present survey, trial excavation was conducted to confirm the contents of the ground investigation report. Three 1.5m square pits were excavated in the area where the planned facilities are expected to be

located. As a result of the trial excavation, it was confirmed that the soil conditions were consistent with the contents of the geotechnical investigation report from the previous survey.

(6) Infiltration Test

The Waste Management Department of the Tamale Metropolitan has stated that onsite infiltration is the preferred wastewater treatment method for the Project. In order to confirm the infiltration capacity of the soil, infiltration tests based on the British Standard (BS) were conducted at two locations within site at a depth of 2m. By the result of the infiltration test, it is confirmed that the soil at the proposed site has a very high infiltration capacity.

(7) Water Quality Test

The water quality testing was conducted for TCH and three district hospitals that are the target of the Project. The tests included chemical composition and bacteria tests. The test results showed no factors that could adversely affect the medical equipment.

1-3. Environmental and Social Considerations

Under Environmental Assessment Regulations (1999) of Ghana, hospital construction is an act subject to environmental impact assessments (hereinafter referred to as "EIA"). However, given that the Project involves upgrading the functions of existing hospital facilities, social impacts compared to the present, such as new environmental burdens or eviction of residents, are not envisioned. The Northern Region Environmental Protection Agency (hereinafter referred to as "the EPA") requires the Project to be registered for screening, but does not require an EIA, and the Regional Health Directorate (hereinafter referred to as "the RHD") plans to rule an EIA unnecessary within 25 business days of the EPA's application.

However, the RHD is concerned about the disposal of medical waste. TCH's incinerator is currently out of order. Solid medical waste is being collected by a private operator, but the company is only piling it up on a vacant lot on the outskirts of the city, and is not disposing of it properly. Consequently, the RHD wants an incinerator installed under the Project in consideration of the burden on the natural environment, health and safety of the residents. However, this problem is not limited to TCH; the same problem is noted at other medical and health facilities. TTH outsources medical waste disposal to a private operator because its incinerator is out of order. District hospitals also outsource the work to professionals because they either do not have incinerators, or their incinerators are out of order. Furthermore, the Advanced Research Center for Infectious Diseases at the Noguchi Memorial Institute for Medical Research, which was constructed under grant aid from Japan, has not been able to use its incinerator due to lack of repairs since it malfunctioned. In general, incinerator maintenance is regarded as highly difficult because it requires expert knowledge. Conversely, the private operator that serves as TCH's contractor is constructing a solid waste and

liquid waste treatment plant, the former of which is expected to be completed in December 2022. After the completion of the building, the plant facilities such as crushers and sterilizers will be installed. If the facility is completed as planned, it should be able to properly dispose off medical waste generated from the target facilities under the Project; therefore, it is assumed that medical waste disposal under the Project shall be outsourced to the private operator.

Chapter 2. Contents of the Project

Chapter 2. Outline Design of the Project

2-1. Basic Concept of The Project

The Project exists to promote the improvement of the referral system and of the quality of maternal and child health services in target areas, and to contribute to decreasing the mortality rate of pregnant women and newborns in the Northern Region and its surrounding areas of Ghana by constructing new buildings and installing medical equipment with the main goal of upgrading the functions of TCH—namely maternal and child health—and by installing medical equipment for maternal and child health at three selected district hospitals. Concurrently, in order to contribute to effective medical care activities, a soft component is planned to strengthen the system for maintaining medical equipment and ensure the proper and effective use of the equipment over the long term. This is consistent with Sustainable Development Goal (SDGs3), and also contributes to the achievement of UHC in Ghana, which was selected as a focal country for intensive support for UHC under the TICAD 7 (2016) assistance policy of Promoting Resilient Health Systems. The table below shows the overall goal and purpose of the Project.

Table 2-1: Overall Goal and Project Purpose

Overall goal	Contribute to the improvement of the present state and indicators of maternal mortality rates, neonatal mortality rates, and the like in the city of Tamale and surrounding districts in the Northern Region of Ghana.
Project purpose	Strive to improve the referral system and the quality of health care services by installing medical equipment and facilities related to maternal and child health at TCH in addition to installing basic medical equipment at district hospitals.

2-2. Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

The requests from the Ghana side include the installation of facilities and equipment at TCH as well as the installation of equipment at district level medical facilities. TCH's facilities comprise multiple buildings dedicated to different functions. However, most of the buildings are at least 90 years old; facility deterioration is progressing, and lack of the required rooms, space constraints, and the like are inhibiting the provision of health care services. The Project aims to update not only facilities for the functions directly related to maternal and child health among the existing functions of TCH, but also for those functions with many users, for which Project implementation can be expected to deliver substantial benefits. The Project also involves the installation of equipment that corresponds to the upgraded functions in an effort to improve the quality of health care services

provided. In addition, regarding the installation of equipment at district level medical facilities, the Project also aims to improve the intraregional referral system and the quality of health care services by selecting target facilities in areas with topographical hurdles against emergency transport to Tamale, at which to install medical equipment, namely for maternal and child health.

1) Selection Policy for the TCH Facility Component

Existing facilities at TCH are in a state of persistent deterioration, and many have been deemed in need of updating; however, the policy for the component installation of the Project is to narrow the focus to functions that are directly related to maternal and child health under the following criteria, while considering the cost of the Project.

Table 2-2: TCH Facility Component Selection Criteria

- Functions directly related to maternal and child health
- Functions that are difficult to continue using safely due to deterioration, lack of space, etc.
- Functions for which there is no overlap with the activities of other donors
- Functions that require advanced construction techniques/expensive medical equipment

2) Policy for Determining the Scale of Project Facilities

The scale of Project facilities of TCH is determined in response to the number of users and cases in which medical care is provided for each target function. However, given that the facilities are expected to be completed in 2024, future population growth must be factored into the determination of their scale. Under the Project, facility scales are determined based on estimated numbers of users in the target year of 2029—five years after the completion of the facilities—that factor in population growth in the former Northern Region (2.9% per year) based on the population census conducted in 2010.

3) Selection Policy for the Equipment Component

■ TCH Equipment

The Project calls for equipment needed for the services provided at the new facilities of TCH. Discussions shall be held with key people from clinical departments to select equipment to define the scope of cooperation based on the following criteria.

Table 2-3: TCH Equipment Selection Criteria

- Equipment needed to provide health care services at facilities installed under the Project
- Updating of existing equipment that has ceased to function due to deterioration or malfunction
- Equipment commensurate with the technical level of medical personnel
- Equipment found on lists of standard equipment for regional hospitals

- Equipment that can be used sustainably in terms of TCH's capacity to maintain it, and the ease of procuring consumable parts, spare parts, reagents, etc.
- Equipment commensurate with the state of infrastructure (electricity, water supply)

■ Selection Policy for District Level Medical Facilities at which to Install Equipment

The policy for selecting target facilities is to narrow the focus to districts and facilities within the scope of cooperation based on the following criteria, with relations to the referral system and investment effects of Project implementation in mind.

Table 2-4: Selection Criteria for Target Districts

- Districts with large populations (or those expected to experience population growth in the future), and others with large populations of target beneficiaries
- Number of caesarean operations by district (by medical facility)
- Number of OPD patients by district, data expected to be closely related to referrals
- Target area of technical cooperation projects with which synergy with the Project is expected
- Districts with a certain number of in/out referrals

■ Policy for Installing Equipment at District Level Medical Facilities

The policy is to install equipment commensurate with the technical level of medical personnel in consideration of the state of operation of each facility, namely equipment required to provide perinatal health care services. The criteria for selecting the equipment to install in selected target districts are as follows.

Table 2-5: Selection Criteria for Equipment in Target Districts

- Equipment needed to provide health care services at facilities installed under the Project
- Updating of existing equipment that has ceased to function due to deterioration or malfunction
- Equipment commensurate with the technical level of medical personnel
- Equipment found on lists of standard equipment for district hospitals
- Equipment that can be used sustainably in terms of TCH's capacity to maintain it, and the ease of procuring consumable parts, spare parts, reagents, etc.
- Equipment commensurate with the state of infrastructure (electricity, water supply)

(2) Policy for Natural Environmental Conditions

1) Topography

The Project area is located on the existing property of TCH, which is located in the urban center of the city of Tamale. The overall shape of the existing property is a trapezoid, and at roughly 300 m

in the north-south direction and roughly 150 m in the east-west direction with an area of roughly 3.8 ha, there is plenty of space for construction. However, the fact that existing facilities are scattered throughout the property in a pavilion format obviously limits the area available for the Project. The property slopes downward gently from the south to the north, and although land development work will be required, the plan takes into account to reduce construction costs. The connection with the existing buildings has also been considered.

2) Weather Condition

The city of Tamale in the Northern Region in which the Project area is located belongs to the tropical/continental savanna Köppen climate classification, and has clearly separate rainy and dry seasons. The rainy season lasts from May to October, and the city's annual average precipitation is roughly 1,000 mm. Temperatures are high throughout the year, with highs reaching 40°C and lows no lower than 20°C. Furthermore, from December to February, trade winds from the Sahara Desert known as the Harmattan bring in clouds of sand from the northeast, though there are no records of substantial damage. In light of these weather conditions, plans for openings and the like must block radiant heat from roofs and exterior walls, and account for the Harmattan.

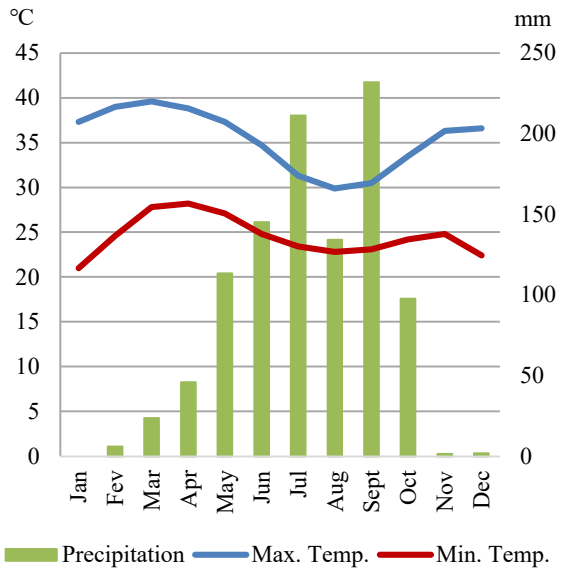


FIgure 2-1: Weather in Tamale (last five years)
Source: Ghana Meterological Agency

3) Insolation and Ultraviolet Rays

Tamale is located near 9°N, and the solar altitude at the summer solstice is accordingly high at 104.4°; the average insolation is roughly 5.4 kWh/m^2, roughly 1.5 times the average in Tokyo. Therefore, the roofs most susceptible to the impact of insolation are double-layered (RC slabs and steel roofs), and efforts are made to reduce the burden of insolation by designing exterior walls with eaves, overhangs, and louvers.

4) Flood Damage/Levels

The property of TCH slopes gently down from south to north, and there are records of flooding in the female ward, mortuary and operating theatre, which are located in the northeast, the lowest point of the site. Conversely, there are no records of inundation in the Children's Ward whose ground floor level is about 2m higher than the lowest point; therefore, the ground floor level of new buildings

under the Project shall be set to at least the elevation of the floor level of the Children's Ward.

5) Wind/Wind Direction (Measures Against the Harmattan and Clouds of Sand)

During the dry season, the majority of winds originate from the northeast and northwest; during the rainy season, winds frequently originate from the southwest and southeast. The trailing 10-year maximum wind speed in 2019 was roughly 11 m/s. In addition, from December to February in the dry season, trade winds from the Northeast known as the Harmattan bring warm air and clouds of sand from the Sahara Desert. In order to prevent dust from entering the building, the north-east wall has only a few opening and the filter also prevents dust from entering through the air supply. In the operating theatre, the air conditioning system is positive pressure.

6) Earthquakes

The area of West Africa surrounding Ghana is generally known to have a low risk of earthquakes; the magnitude 6.4 earthquake that struck the outskirts of Accra in 1939 is the largest on record. Additionally, earthquake records for the area show a cluster along the coastline; no major damage-causing earthquakes have been recorded in the northern area of Ghana to date. Notably, as an area with no earthquakes, the Northern Region—in which the city of Tamale is located—is assigned a seismic factor of zero under the Ghana Building Code.

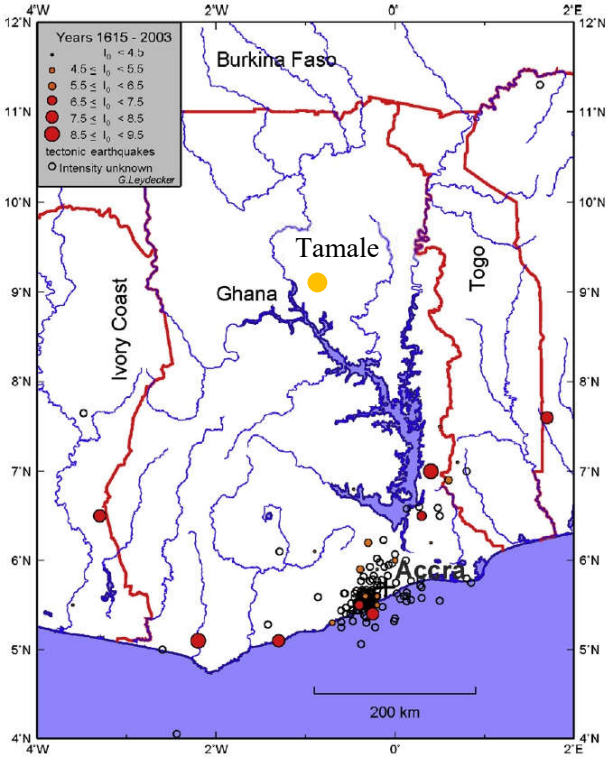


Figure 2-2: History of Earthquake in Ghana and its Environs (1615-2003)
Source: Journal of African Earth Science October 2012

(3) Policy for Socioeconomic Conditions

1) Religion

According to the national census conducted in 2010, 71.2% of Ghana residents adhere to Christianity, while 17.6% adhere to Islam. However, 60% of residents of the former Northern Region are Muslim, and the ratio is particularly high in the city of Tamale (87.6%); therefore, large numbers of Muslims are expected among the users of TCH. Sanitary plans shall consider adhering to the customs of Islam. However, because there is no strict separation between men and women as in Middle Eastern countries, men and women are not separated in plans for waiting areas.

2) Gender

To prevent discomfort between patients and staff members of different genders along their daily flow lines in the hospital, plans shall ensure as much distance as possible between the entrances to men's and women's toilets, and use partition walls and the like to block direct views of the areas from principal routes. The counterpart has requested that hospital rooms in the Children's Ward be separated by symptom rather than gender, and plans shall reflect the details of the request.

3) Economy

According to the International Monetary Fund (IMF), projected changes in commodity prices in Ghana in and after 2021 call for high inflation—9.768% in 2021, 7.519% in 2022, and 7.1% in 2023.[16] Changes in commodity prices from the time of estimation to the envisioned timing of the bidding process shall be incorporated into the process of estimating the cumulative cost of the Project based on the IMF's projections.

(4) Policy for Construction Conditions

1) Construction Standards, Permits

Ghana Building Code 2018 is Ghana's equivalent to the Japanese Building Standards Act. However, it is unclear how the code is handled; for example, there are cases where the British Standard (hereinafter referred to as "BS") is applied. In the course of formulating the Outline Design, applicable standards and important matters shall be reflected based on discussions with the Infrastructure Directorate of the Ministry of Health (hereinafter referred to as "the MOH"). In addition, the construction of Project facilities requires planning permission from the MOH and construction permits, environmental and social consideration permits, and fire permit from the city of Tamale. Because the Japanese Consultant responsible for the Project design is not registered or accredited in Ghana, the consultant must coordinate with relevant organizations to facilitate the acquisition of construction permits.

2) Construction Conditions, Procurement Conditions

Numerous relatively large facility construction sites were seen in the capital city of Accra, and a similarly high number of construction sites were observed in the city of Tamale as well; the construction market is thriving. Most of the construction companies at these construction sites are headquartered within Accra city limits. At Tolon District Hospital (completed in April 2021), a similar facilities project, an Austrian construction company subcontracted a local construction company with a branch in Tamale to perform the construction work, and the quality of the work was

[16] https://www.imf.org/en/Publications/WEO/weo-database/2021/April/weo-report

good.

It is possible to procure construction materials; sand and gravel are extracted and processed on the outskirts of Tamale. It is also possible to procure materials because cement plants, reinforcement bar plants, and other retailers that source from domestic production have been established in Tamale city limits. Most of the tiles, paint, plumbing & electrical fittings, medical gas and other materials for finishing works and ulitity are imported from overseas. Most of these construction materials are transported over land from the capital city of Accra, a fact that must be kept in mind when formulating transport plans.

(5) Policy for Using Local Companies

1) Facilities

The Project shall be implemented under ordinary grant aid; therefore, the Japanese Contractor shall use a Ghanaian contractor to perform the work. The local construction contractor shall be registered with the Contractors' Classification Secretariat in order to participate in the bidding for public works projects in Ghana. In the course of registration, contractors are separated into categories according to their business type, and class according to their scale. Because the Project is characterized by its plan to construct a medical facility, which involves construction with a relatively high degree of difficulty, in a provincial city, it is necessary to proceed with the construction work efficiently by using a local construction company; in the course of selecting the construction company, it is necessary to closely examine the quality of their work on similar projects, their capacity for work, and their financial strength.

2) Equipment

Certified technicians affiliated with local business agents of major manufacturers in Accra are capable of providing the necessary maintenance services. Therefore, even if the equipment breaks down after it is delivered, it is possible to receive services from business agents. In addition, although the regional Biomedical Engineering Department (hereinafter referred to as "the BME Department") provides maintenance of medical equipment at target facilities under the Project, it is necessary to ensure that clinical examination instruments the department is incapable of repairing are provided with maintenance services lasting three years from delivery and including annual maintenance for several years and a free warranty period. During this period, it is essential for TCH to raise the cost of the maintenance contract and maintain it on an ongoing basis.

(6) Policy for Operation and Maintenance

1) Facilities

The MOH, which is the counterpart government agency responsible for the Project, and the Ghana Health Service (hereinafter referred to as "the GHS"), which is the beneficiary agency, have experience with various facility construction projects in the past; therefore, there will be no technical problems in the course of Project implementation. In addition, TCH's Estate Management Department performs daily maintenance and repairs of TCH's facilities. Maintenance expenses are covered by an Internally Generated Fund (hereinafter referred to as "IGF"[17]) allotted in proportion to TCH's hospital revenue; therefore, increases in maintenance expenses have a substantial impact on hospital operation. In consideration of the ease of maintenance and reducing running costs, the Project design will adopt locally circulated materials and construction methods that are ordinary in the target location, while also refraining from requiring special maintenance techniques.

2) Equipment

Essentially, the maintenance of medical equipment at target facilities under the Project is performed by the regional BME Department, and facilities within the scope of cooperation under the Project take it upon themselves to ask business agents in Accra to perform repairs of equipment the department has difficulty repairing. The only medical equipment for which TCH has entered annual maintenance agreements with business agents is X-ray equipment. The plan calls for the regional BME Department and appointed hospital managers responsible for equipment maintenance to perform most of the daily and scheduled preventive maintenance of equipment installed under the Project. In addition, the establishment of a preventive maintenance system for equipment procured under the Project shall be implemented as part of the soft component.

(7) Policy for Grading Facilities/Equipment

1) Facilities

Target facilities under the Project are positioned as regional hospitals, which are secondary medical facilities in terms of health administration; however, the actual services provided are no better than those at primary medical facilities. Regarding facility grades, the basic policy is to adopt solid, highly durable designs in consideration of functionality and maintainability while referencing the details of the designs of other primary and secondary medical facilities and district hospitals.

[17]Profits obtained by health care facilities, which are the sum of remuneration for medical treatment paid to the facilities by the NHIS, and out-of-pocket expenses paid by patients who are not enrolled in the NHIS or who received services not covered by the insurance

2) Equipment

The equipment to be installed under the Project shall have grades that enable the personnel presently assigned at TCH and district hospitals to use them without problems. Notably, as of April 2021, the only personnel capable of using the ultrasound scanner to be installed at TCH are ultrasound technicians assigned to the Antenatal Checkup Scanning Office, and midwives with at least 10 years of clinical experience. To enable more medical personnel to use the ultrasound scanner to be installed, the plan calls for ultrasound technicians (who specialize in scans for obstetrics and gynecology) affiliated with tertiary medical facilities in Accra or Kumasi to be dispatched to TCH through the MOH for roughly two to three weeks to train midwives and issue course completion certificates.

(8) Policy for Construction Methods/Procurement Methods, Construction Schedules

1) Construction Methods

Common local construction methods in Ghana include a frame format that combines reinforced concrete framework with concrete block curtain walls, and wooden or light-gauge steel-frame roof trusses. The same frame format shall be adopted under the Project, and a construction method of combining reinforced concrete slabs with steel sheet roof materials shall be adopted in consideration of durability and reducing the cost of maintenance.

2) Procurement Methods

To facilitate repairs and maintenance after the completion of facility construction, locally procured materials shall be used whenever possible. However, given that the Project involves a medical facility, a portion of materials for which special considerations in terms of material quality are required shall be procured in Japan.

3) Construction Schedules

The rainy season in the city of Tamale lasts from May to October; however, the trailing five-year annual rainfall is only around 940 mm. Records show days with heavy rain in excess of 100 mm. However, this kind of rainfall does not persist; therefore, rainfall has hardly any effect on construction work. In addition, given that there are no problems with land transport from the capital city of Accra to Tamale, no envisioned natural or procurement conditions that could substantially impact the construction schedule are envisioned. However, given the envisioned loss of work efficiency during Ramadan with the majority of Muslims community in the city of Tamale, and the risk factors of placing hot-weather concrete, construction schedules shall be formulated with due consideration of these site-specific problems.

(9) Policy for Equipment Procurement

In consideration of factors such as the quality of medical equipment, regarding Japanese products, only products that conform to the Pharmaceutical Affairs Act of Japan shall be eligible for procurement. Regarding foreign products, only medical equipment manufactured at plants that comply with ISO 13485 (the international standard for quality assurance of medical equipment) and clinical examination equipment manufactured at plants that comply with ISO 9001 (quality management systems) shall be eligible for procurement. No medical equipment or furnishings are manufactured in Ghana; therefore, it is possible to procure products for which competitive bidding cannot be ensured due to limiting sources to Japanese products, or are difficult to maintain, from third countries.

(10) Policy for Construction Supervision

The facility construction work under the Project is characterized by its large scale; the total floor area on the hospital property to which many and unspecified users have access is roughly 5,800 m^2. Therefore, in addition to security management throughout the construction period, the key to work process management is timely procurement of organized quantities of construction materials. In addition, high temperatures throughout the year necessitate accommodations for hot-weather concrete; therefore, creative solutions such as placing concrete at night are necessary. Furthermore, given that Tamale is a provincial city located 600 km away from the capital of Accra, care must be taken to secure skilled labor, which directly impacts the quality of construction work. Regarding these keys to construction work, efforts shall be made to consider policy for supervision, ensure the quality of construction work, adhere to construction schedules, and ensure safety.

(11) Policy for Safety Measures

Domestic security in Ghana is relatively stable. However, domestic security in Burkina Faso, which borders Ghana to the north, has deteriorated rapidly in recent years due to the impact of the unstable state of security in surrounding countries, namely Mali and Niger, and the country has suffered a spate of attacks by terrorist organizations and domestic armed insurgents. Given these circumstances, the threat of terrorism is spreading through the northern area of Ghana. Consequently, efforts shall be made to establish a network for safety measures for the Project and constantly gather information about domestic security and include the security measures in the construction plan.

2-2-2 Basic Plans (Facility Plans/Equipment Plans)

(1) Components within the Scope of Cooperation

The details of the counterpart's requests confirmed before this survey are as follows, and are the same as in the previous survey. However, given that survey work has been suspended for two years since the previous survey, and in consideration of changes to the conditions surrounding the Project, the decision was made to examine the details of the requests and consider the scope of cooperation anew.

Table 2-6: Requested Components by the Ghana Side

Facilities	The following facilities at Tamale Central Hospital - Outpatient Department: Outpatient, Emergency - Diagnostic Department: Clinical Examination Rooms (Laboratories), X-Ray Rooms, Theaters, Central Sterile Supply Rooms - Maternal: Consultation Rooms for Antenatal/Postnatal Care, Labour Ward (Including Delivery Room), Maternal Ward, Neonatal Intensive Care Unit - General Ward: Children's Ward
Equipment	Tamale Central Hospital: Medical equipment required in the above-listed requested facilities. However, a list of requested equipment has not yet been obtained; this shall be confirmed during field surveys. Basic medical equipment packages (stadiometers, height and weight scales, sphygmomanometers, etc.) for district level medical facilities (district hospitals, polyclinics, health centres, clinics) in the region

1) TCH Components within the Scope of Corporation

At the conclusion of the field survey portion of the previous survey, the counterpart agreed that the facility component is a high-priority function. Accordingly, during this survey, priority levels were assigned after further narrowing down the functions, keeping in mind the strengthening of maternal and child health functions while scrutinizing the project cost. The table below shows the functions within the scope of cooperation and the priority of installation agreed to with the counterpart based on the facility component selection criteria (Table 2-2).

Table 2-7: Existing Components of TCH and Components to be Covered by the Project

	Facility component	Priorities agreed in previous survey	Priorities agreed in this survey	Project components	Remarks
OPD	OPD(incl.Eye clinic, ENT, Pediatric)	A	B Pediatric outpatient only A	Yes	Ophthalmology is not covered
	Psychiatry	B	—		
	Emergency Department	A	—		Some functions are complemented by OPD
	Fistula Centre	C	—		
	Pharmacy Department	B	—		
Diagnostic Block	Laboratory	A	B	Yes	
	X-ray	A	—		
	Main theater	A	A	Yes	
	CSSD	A	A	Yes	
Maternity Block	ANC, PNC	A	A	Yes	
	Labour ward (incl. Delivery room)	A	A	Yes	
	Maternal ward	A	A	Yes	
	NICU	A	A	Yes	
Ward	Male ward	B	—		
	Female ward	B	—		
	Children's ward	A	A	Yes	
Support etc.	Administration Department. and Office	C	—		
	Conference hall	B	—		
	Laundry (general)	C	—		
	Mortuary	C	—		
	Staff residences	C	—		
	Store	C	—		
	Incinerator	C	—		

* A: High priority, B: Middle priority, C: Low priority, —: Not covered by the Project

From the above table, the priority levels of Outpatient and Clinical laboratory were lowered from the previous survey, and Emergency and X-Ray Rooms were removed from the functions to install on a priority basis. Regarding Priority B functions, as a result of detailed considerations during domestic analysis, ultimately, both Priority A and Priority B functions were included in the scope of cooperation. Details of the evaluations of Priority A functions from the previous survey are as follows.

■ Outpatient Department

With more than 93,000 outpatients per year, there are substantial benefits to implementing the Project, and the department was deemed to have a strong need for facility installation. However, General Outpatient and ENT were assigned Priority B because of their tenuous relationships with the goal of strengthening maternal and child health; only Pediatric Outpatient was assigned Priority A. However, installing facilities with only Pediatric within the scope of cooperation creates a problem—the existing facilities of Outpatient, ENT, and Observation Rooms for accepting critical-care patients would remain intact in a separate building. As for present Outpatient operations, General Outpatient and Pediatrics involve Physician Assistants providing care in alternating shifts, and there are no staff members specializing in pediatrics to provide outpatient care. Consequently, if only Pediatrics is relocated to new facilities, the Outpatient Department's functions will become scattered and compromise operational efficiency. In addition, new facilities constructed for Outpatient under the Project contain no attached space for receiving critical-care patients (Observation Rooms), making the flow lines from Triage to the Theaters inefficient for pregnant women in need of emergency caesarean sections, and having a negative impact on the hospital's maternal and child health functions. Outpatient Department facilities continue to deteriorate, and its cramped waiting rooms overflow with patients; including all of Outpatient within the scope of cooperation will enhance the convenience of patient use of the facilities by enabling their installation with a proper amount of space for the first time. Therefore, it is recommended to include the entirety of Outpatient functions within the scope. Note that the Eye Clinic is excluded from the scope of cooperation because it is under construction with assistance from the Red Cross.

■ Emergency

At present, the Emergency Building is being used as temporary accommodations for patients suspected of having contracted COVID-19. As a replacement, Observation Rooms from which emergency consultation functions are complemented 24 hours a day have been established in Outpatient. For the Project, Emergency is excluded from the scope of cooperation under the assumption that the present method of operation will be continued. Instead, the decision was made to install Observation Rooms as part of the implementation of Outpatient functions.

■ Clinical Laboratory

The existing Clinical Laboratory was assigned Priority B because it has not deteriorated to the extent that other buildings have. However, with more than 99,000 blood tests per year alone, it is a function that is used quite frequently. In addition, given the importance of blood and urine tests in antenatal checkups, the function is deeply related to maternal and child health as well. Equipping a new building with maternal and child health functions would result in a distance of more than 160 m between the functions and the existing Clinical Laboratory; however, integrating the functions with

clinical examination functions under the Project would increase convenience by enabling pregnant women, who require many antenatal checkups, to receive clinical laboratories without having to travel long distances in punishing heat. Clinical laboratory functions are also essential prior to operations; integrating them with the Theaters and incorporating them into new buildings would also increase the convenience of facility use for medical personnel, who are working with a staff of limited size.

■ X-Ray Rooms

Container-type X-Ray Rooms were installed in 2017 with assistance from the Netherlands. They are distant from the facilities to be installed under the Project, and although this compromises convenience, there are no functional problems; therefore, these facilities are outside the scope of cooperation.

In addition, medical equipment were selected to correspond with functions within the scope of cooperation according to the criteria shown on Table 2-3. Details about equipment to be procured are included in Section 2-2-2 Basic Plans (5) Equipment Plans.

2) District Level Medical Facilities in the Region at which only Equipment is to be Installed

District hospitals in the five districts selected as the scope of equipment installation during the previous survey are positioned as district referral centres and district sub-referral centres, and receive patients from health centres. Given that the aim is to further improve maternal and child health indicators by installing equipment at district hospitals in the former Northern Region that are located long travel distances from Tamale, this survey was conducted within the five districts selected in the previous survey (East Mamprusi, Savelugu-Nanton, Nanumba North, Kpandai, and Tolon).

As a result of surveys of district hospitals and health centres in the five target districts, and consideration of priority in light of the criteria shown on Table 2-4, and to accommodate the counterpart's request for budget allocation to further enhance the installation of facilities and equipment at TCH, three district hospitals (Bimbilla District Hospital, Savelugu Municipal District Hospital, and Kpandai District Hospital) were selected as the scope of cooperation. Providing diagnoses and treatment at a defined level and on an intraregional basis is very meaningful in these target districts because they are located too far away from Tamale for timely emergency transport. In addition, plans were made to install toolsets and the like to improve maintenance functions for the BME Department of the RHD, which is responsible for maintaining medical equipment in facilities within the scope of cooperation as well as these district hospitals.

Table 2-8: District Level Medical Facilities and Priorities for the Survey

	District	District Hospital	Priorities agreed in previous survey	Priorities agreed in this survey	Project facilities
1	East Mamprusi	Beptist Medical Centre	A	－	
2	Savelugu Municipal	Savelugu Municipal District Hospital	A	A	Yes
	Nanton	Tampion Health Centre			
3	Nanumba North	Bimbila District Hospital	A	A	Yes
4	Kpandai	Kpandai District Hospiral	A	A	Yes
		ECGHospital	A	－	
5	Tolon	Tolon Health Centre	A	－	

* A: High priority, －: Not covered by the Project

The Baptist Medical Center and ECG Hospital, which were excluded from the scope of cooperation, are under the jurisdiction of the Christian Health Association of Ghana[18] (hereinafter referred to as "CHAG"). Of these two, the Baptist Medical Center has recently procured essential equipment for opening a Neonatal Intensive Care Unit (hereinafter referred to as "NICU") and equipment for an Intensive Care Unit (hereinafter referred to as "ICU"), and has an abundance of funds compared to other hospitals. In addition, although equipment installation has been delayed at ECG Hospital, it accepts limited numbers of patients because it is located within a 10-minute drive of Kpandai District Hospital, which is within the scope of cooperation. In addition, the Tolon District was excluded from the scope of cooperation because a new district hospital was completed and equipped with facilities and equipment in April 2021. The table below shows clinical activity data from the five target districts of the reconnaissance survey.

Table 2-9: Clinical Activity Data of the Five District Hospitals to be Surveyed

	District	Hospital Name (DH)	Jurisdiction	Catchment area population	No. of outpatients	No. of beds	No. of caesarean sections	No. of Normal Derivery	No. of refer in	No. of refer out	Distance to Tamale	Target Districts of Technical Cooperation
1	East Mamprusi	Baptist Medical Center*	CHAG	150,018	86,240	176	620	2,374	529	171	155km	Yes
2	Savelugu	Savelugu Municipal Hospital*	GHS	109,811	13,087	113	299	3,091	791	423	25km	Yes
	Nanton	Tampion Health Centre	GHS	61,646	2,261	NA	0	236	NA	NA	35km	Yes
3	Nanumba North	Bimbilla District Hospital*	GHS	174,518	106,346	413	413	2,018	900	120	129km	
4	Kpandai	Kpandai District Hospital**	GHS	134,715	25,028	57	57	822	69	61	170km	
		ECG Hospital	GHAG	134,715	8,519	72	72	405	52	35	170km	
5	Tolon	Tolon Health Centre	GHS	88,789	8,918	0	0	978	NA	NA	60km	Yes

*Referral centre, **Sub-referral centre

Source : Prepared by Consortium

[18]An organization under the jurisdiction of the Minister of Health that coordinates the activities of health programs in 344 medical facilities and health training institutions owned by 33 different denominations of the Christian church

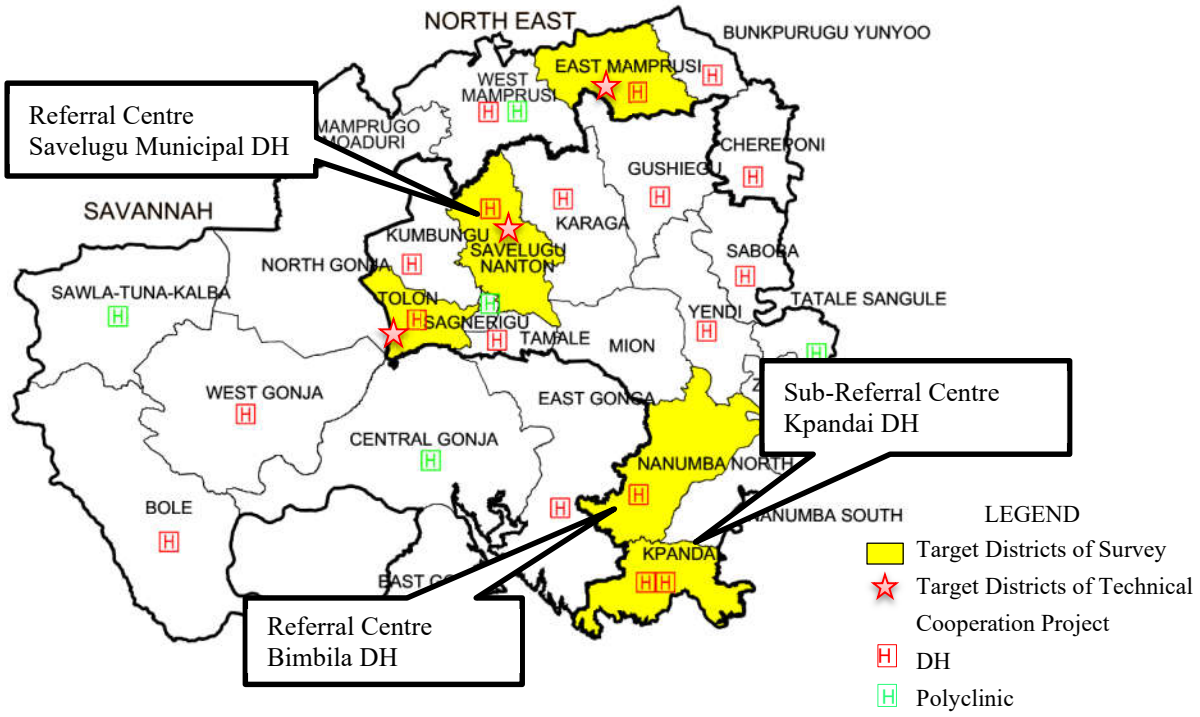


Figure 2-3: Location Map of Target Districts for Field Survey and District Level Medical Facilities covered by the Project

3) Details of the Component of Equipment to be Installed in District Level Medical Facilities (District Hospitals)

The Ghana side did not submit a list of requested equipment for district hospitals; therefore, the state of existing equipment at various facilities was confirmed before a list of equipment to install was formulated, with the essential aim of updating equipment that contributes to improving perinatal medical care in the district, the objective of the Project. The equipment was categorized into Priority A and B, and the Ghana side agreed. Details are included in Section 2-2-2 Basic Plans (5) Equipment Plans.

4) Soft Component

Regarding medical equipment maintenance, it is assumed that equipment do not break down if the end users at each medical facility clean and otherwise conduct daily inspections without fail, and that malfunctions are prevented in many cases if the end users understand how to use the equipment properly. Therefore, the necessity of implementing a software component to strengthen maintenance and management capabilities, including preventive maintenance activities, was confirmed.

(2) Configuration of TCH Project Scale

The scale of TCH facilities is calculated by estimating the number of patients, considering the actual number of patients in the base year and the increase in the number of patients up to the target year, and calculating the necessary number of rooms and beds. As for the actual number of patients as a base, 2020 is the most recent data. However, it is not reliable as data showing the real situation due to the influence of COVID-19, so the average of the past three years starting from 2019 is used. Therefore, the base year will be 2019, and the target year will be 2027, three years after the facility's completion.

1) Calculation Conditions

■ Projection of the Future Number of Patients

According to the 2021 census, the total population of Ghana is 30,792,608, compared to 24,658,823 in the last census conducted in 2010, which implies an 11-year population growth rate of 24.9%, or 2.04% annualized. With this annual growth rate, the population growth rate from 2019 to 2027 is assumed to be 17.5%. The number of general outpatients in the target year will be estimated taking this population growth rate into account.

Based on the population and fertility rate of women of childbearing age (15-49 years) in Northern Region according to the 2010 census, the fertility rate from 2019 to 2027 is estimated to be 24%.

■ Operating Hours and Days of TCH

The daily average number of patients is calculated based on the current operating hours and days of TCH, and serves as a parameter for projecting the future number of patients. The table below shows the operating hours and days of each department relevant to the Project.

Table 2-10: Operating Hours and Days of TCH

Department		Operating hours	Operating day/year	Department		Operating hours	Operating day/year
OPD	Weekday	24H	365	Eye Clinic	Weekday	8:00-17:00	260
	Saturday	24H			Saturday	-	
	Sunday	24H			Sunday	-	
Laboratory	Weekday	24H	365	ANC and PNC	Weekday	7:30-15:00	260
	Saturday	24H			Saturday	-	
	Sunday	24H			Sunday	-	
Pharmacy	Weekday	24H	365	Emergency	Weekday	24H	365
	Saturday	24H			Saturday	24H	
	Sunday	24H			Sunday	24H	

Source: TCH Questionnaires

2) Configuration of Facility Scale

■ Number of Outpatient Consultation Rooms

The number of Consultation Rooms is calculated based on the trailing three-year average number of outpatients from 2016 to 2019. As shown in the following table, the trailing three-year average number of outpatients is 93,479, of which 20,388 are child patients age five or younger.

Table 2-11: Trend in the Number of Outpatients (2016 - 2019)

	2017	2018	2019	Averege
Total Number of OPD Patients	98,048	92,160	90,229	93,479
Number of Child Patients in the above (5 years old or younger)	22,159 (22.6%)	18,616 (20.2%)	19,850 (22.0%)	20,388

Source : TCH Annual Report 2020

Calculating the required number of rooms using the expected daily number of patients in consideration of population growth applied to the numbers of patients on the table above yields an estimate of 10 rooms compared to the current number of rooms, which is seven. In addition, three of those rooms shall be for Pediatrics.

Table 2-12: Calculation of the Number of Consulting Rooms

	Annual No. of Outpatients (p/year)	Annual operation days (day/year)	No. of average daily patient (p/day)	Rate of increasing patients (compared to 2019)	No. of expected daily patients in 202 (p/day)	Crowded opening hours (min/day)	Consultation rooms				
							Average consultation time per room (min*room/p)	Maximum No. of daily patients pe room (p/day*room)	No. of required consultation rooms	No. of planned consultation rooms	No. of existing rooms excluding eye clinic
	A	B	C=A/B	D	E=C*D	F	G	H=F/G	I=E/H		
Total OPD Patients	93,479	365	256	117.5%	301	300	10	30	10.0	10	7
Child Patients (under 5 years)	20,388	365	56	117.5%	66	300	10	30	2.2	3	

■ Number of Necessary Beds in the Maternity Department (Labour Rooms, Maternal, NICU)

The table below shows the trailing three-year average number of births from 2017 to 2019. Based on these figures, parameters such as the average wait time in Labour Rooms and daily average number of deliveries obtained from interviews with TCH were set, and the number of necessary beds in Maternity was calculated.

Table 2-13: Number of Births at TCH (2017 - 2019)

	2017	2018	2019	Average
Normal delivery	4,547	4,533	4,373	4,484
Cesarean section	496	567	612	558

Source: Questionnaire and Interview with TCH

The calculations yielded a result of 7.62 necessary beds for Labour Rooms; however, because births tend to cluster during the nighttime, the planned number of beds is set to 12 to be on the safe side. In addition, the plan calls for five birthing beds compared to the current number, which is four. Note that the current situation is such that Maternity is used for recovery from caesarean section deliveries and for pregnant women who contract preeclampsia or malaria and require admittance and treatment, beds in Labour Rooms are used for recovery after normal deliveries, and patients are discharged six hours after giving birth. These are provisional measures to shorten hospital stays to the extent possible in pursuit of preventing COVID-19 infections. The number of existing Maternity beds is 23, but because all beds are occupied on some occasions, the plan calls for 32 beds, which is the sum of the number of existing Maternity beds and the number of necessary beds for recovery from normal deliveries.

Table 2-14: Calculation of the Number of maternity Beds

						Labour ward				Delivery bed				Maternity ward (post-natal)			
	Annual No. of deliveries (p/year)	Annual operation days (day/year)	Average daily deliveries (p/day)	Birth growth ratio (compared to 2019)	Average daily deliveries adjusted	Average waiting time (day/p)	Number of required beds	Number of planned beds (No. of required beds +4 (for congestion time))	No. of existing beds	No.of deliveries per bed (p/bed)	No. of delivery beds	No. of planned delivery beds (No. of required delivery beds + 3(for congestion	No. of existing beds	Average recovery time (days/p)	No. of required recovery beds	No. of planned beds (No. of required beds + 1(for congestion time)	No. of existing beds (including veranda bed
	A	B	C=A/B	D	E=C*D	F	G=E*F	I=F/H		H	I=E/H			J	K=E*J		
Normal Deliveries	4,484	365	12.28	124.0%	15.23	0.5	7.62	12	11	8	1.904	5	4	0.50	7.615	9	23
Maternity ward total																32	23

The planned number of maternity beds is 32, including the existing 23 beds plus 9 beds required for the recovery of normal deliveries

In addition, the table below shows the number of NICU patients admitted in the past three years, from 2017 to 2019.

Table 2-15: Number of NICU Patients Admitted (2017-2019)

	2017	2018	2019	Average
NICU admission	532	643	639	605

Source: TCH Annural Report

Setting the average length of stay to four days and the bed occupancy rate to 80% based on interviews with TCH yielded a calculation of 11 necessary beds for the NICU. While this number is less than the current number of beds, 13 beds should be planned to maintain the present scale. This is the total number of baby cots and incubators.

Table 2-16: Calculation of the Number of NICU Beds

	Number of low birth weight per year (p/year)	Average days of hospitalisation (days/person) *1	Annual days of hospitalisation (days/year)	Birth growth ratio (compared to 2019)	No. of estimated patients in 2029 (p/day)	No. of estimated patients in 2029 (p/day) with 80% of bed occupancy	No. of required beds	No. of planned beds	No. of existing beds
	A	B	C=A*B	D	E=C*D	F=E/80%	G=F/365	H	
NICU	605	4.00	2,420	124.0%	3,001	3,751.00	11.00	13	13

*1 Based on the interview with TCH

■ Number of Necessary Beds in the Children's Ward

The number of necessary beds is calculated based on the trailing three-year average number of inpatients from 2017 to 2019.

Table 2-17: Trend in the Number of Children's Ward Inpatients (2017-2019)

Number of inpatients	2017	2018	2019	Average
Children Ward	4,069	3,695	3,417	3,727

*1 The number of admissions to children wards is calculated by multiplying the total number of admissions in the TCH Annual Statistics 2020 by the Children ratio

Setting the average length of stay to two days and the bed occupancy rate to 80% based on interviews with TCH yielded a calculation of 32 necessary beds for the Children's Ward. Still, the planned number of beds is 34 to allow for a margin, increasing five beds from the present number.

Table 2-18: Calculation of the Number of Beds in Children's Ward

	Number of patients per year (persons/year)	Average days of hospitalisation (days/person)	Annual days of hospitalisation (days/year)	Birth growth ratio (compared to 2019)	Estimated No. of daily patients in 2029 (days/year)	Estimated No. of daily patients in 2029 (days/year) with 80% of beds occupancy	Number of required beds	No. of planned beds (No. of required beds + 1 (for congestion time)	Number of existing beds
	A	B	C=A*B	D	E	F=E/80%	G=f/365		
Children's Ward	3,727	2.0	7,454	124.0%	9,243	11,554	32	34	29

(3) Facility Layout Plan

The area of the TCH property is roughly 3.8 ha, which is plenty for facility construction; however, the construction area of the Project is limited due to the fact that existing buildings are scattered throughout the property in a pavilion format. In consideration of minimizing the impact on existing facilities and of the impact of construction work on hospital operation, the northwest side of the property is considered to be an appropriate construction area for the Project. The layout plan calls for a compact layout of buildings in this area to allow for the expansion of functions in the future.

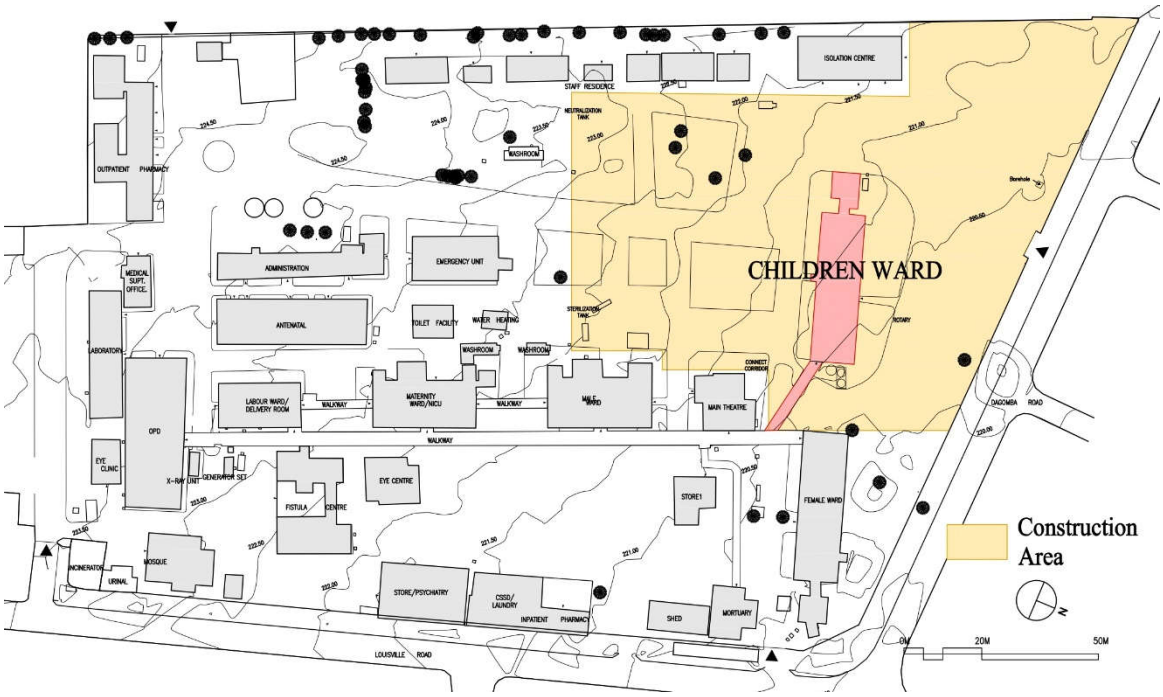


Figure 2-4: Map of TCH in its Present Condition and the Construction Area of the Project

However, because the Children's Ward and unused facilities such as toilets and septic tanks are located in the middle of this construction area, these buildings and structures, which would hinder

the construction work, must be demolished and removed at the counterpart's expense before the bid opening. In addition, regarding the relocation of Children's Ward patients necessitated by the construction work, TCH intends to disperse them between the Female Ward, the Emergency Building, and the Fistula Center.

The scope of cooperation of the Project includes functions for which installation is high-priority, namely functions directly related to maternal and child health; the goal of the Project is not to update all functions of TCH. Accordingly, even functions excluded from the scope of cooperation in this survey must be updated and installed in due order in the future. In these cases, with regard to the expansion of functions in the future, developing south-facing facilities will make it possible to locate future facilities along an east-west axis to prevent exposure to the morning and evening sun. Concurrently, because construction work is possible with existing buildings on the east side remaining intact, it is possible to minimize buildings to be demolished before construction starts. In light of these facts among others, regarding the facility layout under the Project, the area around the current Children's Ward is considered to be appropriate.

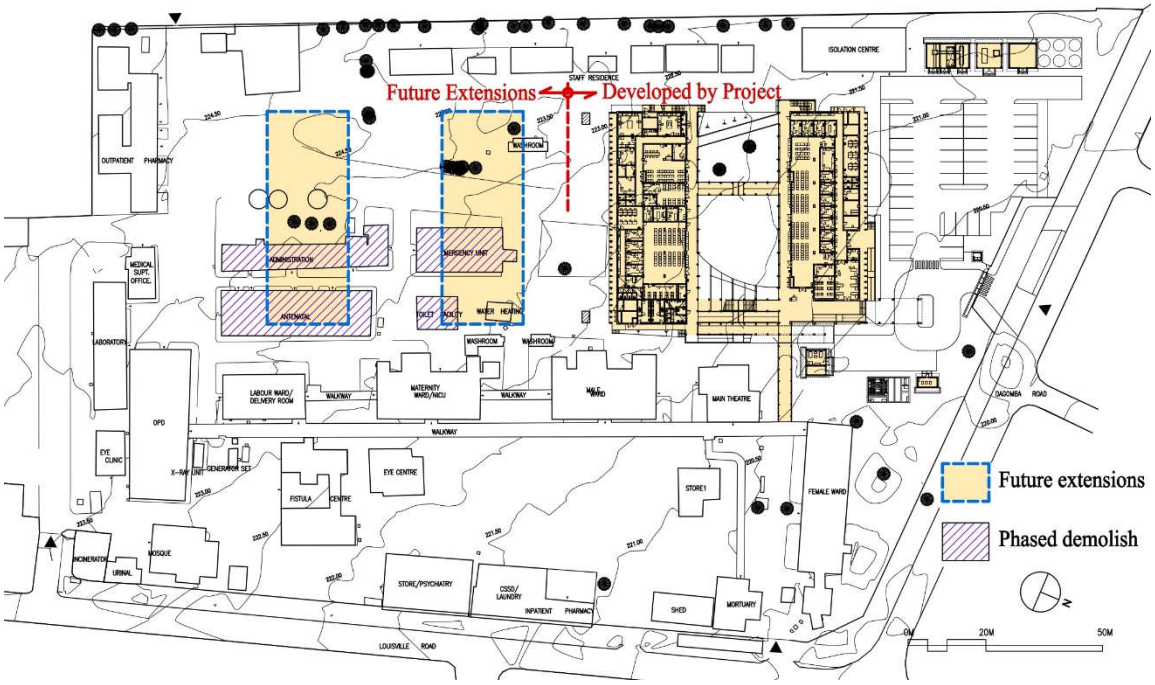


Figure 2-5: Images of Future Expansion

After the handover of the planned facilities, TCH wishes to convert the existing facilities into wards and meeting rooms for new departments. These include a surgical ward for patients undergoing laparotomy and a burns ward. They also plan to demolish some of the more deteriorated facilities.

(4) Building Construction Plans

1) Facility Specifications

A majority of the construction materials—including imports—can be obtained in Ghana. In consideration of the ease of facility maintenance and workability, special specifications and construction methods will not be adopted under the Project; the standard approach is to use construction and finishing methods that are common in Ghana. However, procurement from Japan or third countries will also be considered as needed in order to ensure quality and a consistent supply. The design specifications of the buildings used for the main medical care activities are as follows.

■ Exterior finishing

Roofs: Roofs shall comprise sloped reinforced concrete roofs with steel channel purlins installed on top, followed by insulation material (polystyrene foam, t = 50 mm) and asphalt waterproof sheets, and galvanized sheets (t = 0.58 mm). Concrete slab roofs are adopted to ensure durability, but covering sloped roofs with galvanized sheets reduces the frequency of maintenance for waterproofing. In addition, laying polystyrene foam and waterproof sheets enhances both insulation and waterproofing performance.

Exterior walls: In consideration of the ease of maintenance, mortar undercoats shall be applied to concrete blocks (t = 200 mm), and finished with coating.

Floors: Tiles shall be the standard finish of the floors of exterior corridors, but in consideration of workability, trim tile shall be avoided to the extent possible, and tiles shall be paired with metal trowel-finished mortar. Sloped areas require slip prevention; therefore, brushed mortar shall be the finish of sloped areas.

■ Internal finishing

Floors: Tiles shall be the standard finish of the floors, but metal trowel-finished mortar shall be the finish of service corridors, the Staff Room, the Night Duty Room, stores, mechanical rooms, and other areas used only by staff members. In addition, antimicrobial vinyl flooring sheets shall be used in the Theaters.

Interior walls: Paint coated finishes atop mortar under beds shall be the standard finish, but coatings shall be glossy to the height of the doorframes (FL+2100), and matte beyond that height. However, antimicrobial coating shall be used on all surfaces in treatment rooms and the rooms of the Theater Department. In addition, porcelain tile shall be used for the wet area to a height of FL+2100. Note that the interior walls of the Annex Buildings (except those of the guardhouse) shall be finished with mortar and not coated.

Ceilings: Rock wool acoustic board (t = 12.5 mm) shall be the standard ceiling, but gypsum board (t

= 9.5 mm) + coating shall be used in service corridors, the Night Duty Room, stores, and the like. Calcium silicate sheets (t = 6 mm) shall be used for the plumbing. Antimicrobial calcium silicate sheets shall also be used in the Theaters, Sterilization Room of the Theater Department, and the like.

Doors and windows: Regarding ordinary doors and windows, doors shall be made of steel, windows shall be made of aluminum, and toilet stall doors shall be made of wood.

2) Facility Composition

Considering the state of operation of existing facilities, the various necessary rooms for the components for each facility agreed upon with the counterpart are as listed below. Plans for each room involve ensuring proper space for resolving problems with the lack of space (a maximum of six beds for hospital rooms and waiting areas of the site is commensurate with the number of users), as well as plans for the various rooms that are lacking in terms of operation (a Laundry Room, a Blood Bank Depot, a Mothers' Room, a Child Welfare Clinic (hereinafter referred to as "CWC"), a Family Planning Room, Changing Rooms, and a Night Duty Room).

Table 2-19: Composition of various Rooms by Function at TCH

	Department	Room Composition (main rooms)
1	Outpatient Department	10 Consultation rooms (3 of them pediatric outpatient), Dressing room, Observation room, Vital, Satellite pharmacy, Reception/Account, Record, Staff room, Night duty, Staff washroom, Sluice room, Store
2	MCH (Maternal and Child Health)	3 Consultation rooms, Vital, Ultrasound room, Gynecology examination room, Consulting room (HIV), Family planning room/PNC, CWC, Waiting hall, Reception, Record, Staff room, Washroom
3	Clinical Laboratory	Laboratories (Hematology, Micro biology, Parasitology, Biochemistry), Blood bank depot, Sampling room, Director room, Sluice room
4	Maternity Department	Labour ward, Delivery room, Recovery/Maternal ward, Treatment room, NICU, Mother room, Milk room, Staff station, Staff room, Night duty, Washroom, Shower room, Sluice room
5	Children's Ward	Ward (max. 6 beds/room), Isolation room, Treatment room, Staff station, Account, Staff room, Night duty, Washroom, Shower room, Sluice room
6	Operation and CSSD Department	Operating theatres (large and small), Anteroom, Theater hall (also Recovery room), Pre-washing room, Sterilization/Assembly room, Sterilized store, Laundry, Staff room, Changing room, Washroom

Other than the rooms listed above, plans call for a substation /generator room, water receiving tank/pump room, equipment and machinery room for medical gas and air conditioning—all of which are needed for facility operation—in addition to a covered Connecting Corridor to connect the new building to existing buildings.

3) Floor Plans

Although all existing facilities are located in single-story buildings, the Medical Buildings under the Project are two-story buildings, shortening flow lines between departments and featuring a compact layout in order to ensure space for the expansion of functions in the future. In addition, the

two Medical Buildings shall be located along an east-west axis to protect interior environments from exposure to the morning and evening sun, and will face each other across a courtyard. The floor plans of the two buildings are designed in an effort to make everything universally accessible, and also to prevent the flow lines of patients and staff members from mixing together. Notably, because the ground in its present state slopes downward gently from south to north, the ground floor levels of the two Medical Buildings shall be configured in response to the ground, and connected to each other with ramps. Furthermore, ramps shall be installed for access to the first floors to enable stretchers, carts, and wheelchairs to switch levels. Plans call for the Annex Buildings for facilities to be standalone, single-story buildings.

In addition, clear zoning for each function is needed because Project facilities comprise multiple functions for different users. Plans are designed to prevent the mixing of patients' flow lines to the extent possible by locating departments used by many and unspecified patients—the Outpatient Department, the Antenatal/Postnatal Care Department, and the Clinical Laboratory, which is deeply related to the first two departments—on the ground floor, and departments used by specific users—the Maternity Department, the Children's Ward, and the Theater Department—on the first floor. In addition, to make the layout easy for first-time patients to understand, the Outpatient Department, which has many users, shall be located in an area near the entrance.

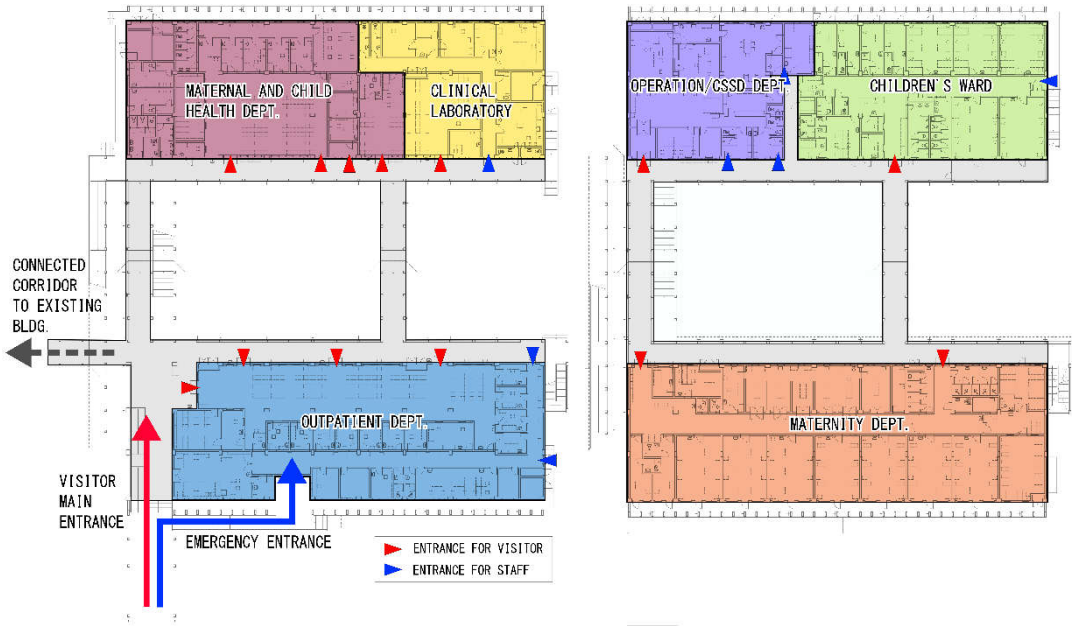


Figure 2-6: Zoning Plan for Each Floor

Note that plans call for clear separation between clean zones and contaminated zones within the buildings in pursuit of preventing hospital-acquired infections. In addition, every effort shall be expended to prevent infections by installing handwashing stations at the entrances to each building and hospital room. Floor plans and room compositions of each department are as follows.

■ Outpatient Department

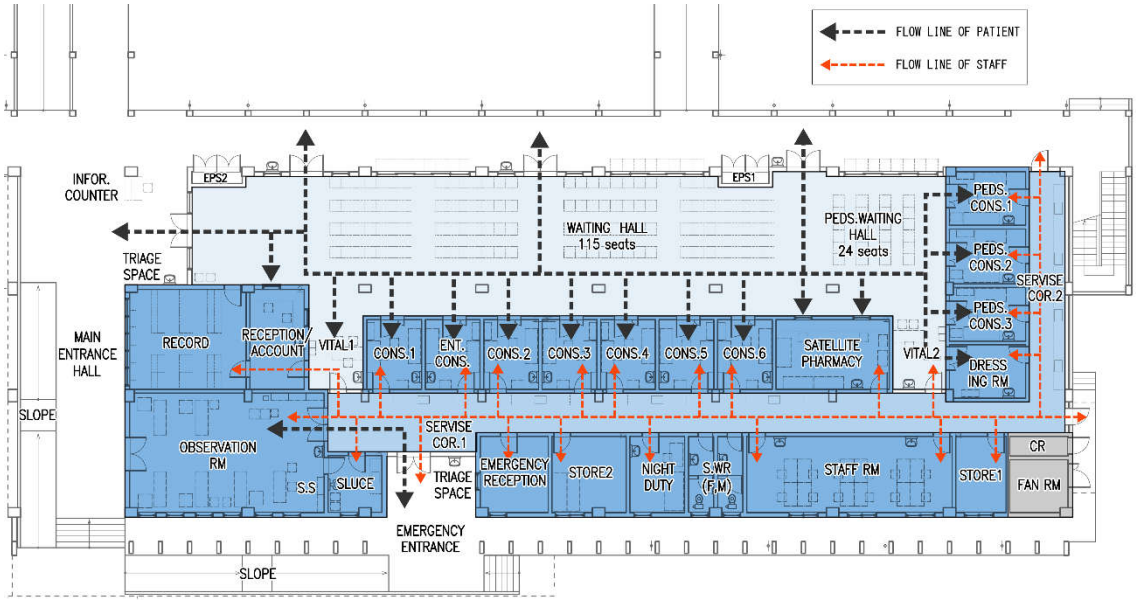


Figure 2-7: Zoning Plan for the OPD

Plans call for the Outpatient Department to be located adjacent to the entrance hall because it is used by many and unspecified patients. Consultation Rooms are situated such that they surround the Waiting Hall, and service corridors for staff members are placed behind the Consultation Rooms to completely separate the flow lines of patients and staff members, and to streamline staff members' flow lines and facilitate their work. Plans call for Observation Rooms in the Outpatient Department with the aim of supplementing emergency medical functions; however, plans also call for a standalone emergency entrance for accessing the observation room in an effort to maintain separation from the flow lines of general users. In addition, because the existing Outpatient Pharmacy is integrated with the storerooms and located on the southern edge of the property, and the new facility to be installed is more than 150 m away, a Satellite Pharmacy shall be installed to improve convenience for patients. An overview of the main rooms is as follows.

Table 2-20: Main Rooms of the OPD

Room Name	Overview	Planned Floor Area
Reception/Accounting/ Clinical Chart Storage	Outpatient Department reception functions to be installed with the same details as existing facilities.	49.51 m^2
Preliminary Examination Rooms	Spaces for conducting preliminary interviews, measuring blood pressure, and the like prior to examining outpatients. To be installed in two separate places in order to mitigate congestion.	11.38 m^2/room
Consultation Rooms	Plans call for 10 Consultation Rooms compared to the current number, which is seven. Three of the rooms shall be for Pediatrics, and one room shall be for ENT. The floor area in each room shall be enough to secure space for installing desks, examination tables, handwashing stations, and the like.	11.38 m^2/room 12.61 m^2/room
Dressing Room	A room for treatment such as suturing and removing sutures. The area shall be the same as the Consultation Rooms.	12.23 m^2

Emergency Reception	To be installed as a standalone facility to separate flow lines with Outpatient Reception.	15.38 m^2
Observation Rooms	Observation Rooms (five beds) shall be installed in the Outpatient Department in line with current operating conditions to supplement emergency medical functions.	64.99 m^2
Waiting Hall	A 139-seat indoor waiting space is to be installed along with 24-seat benches in the outer corridor that can be used during congested times. Benches shall be installed during finishing carpentry work.	267.16 m^2
Night Duty Room	A Night Duty Room is needed because the Outpatient Department, which also fulfills urgent care functions, is in 24-hour operation.	12.60 m^2
Staff Room	In addition to functioning as a space for staff members to rest, the Staff Room also fulfills functions as a disaster prevention center because it is equipped with a disaster alarm panel, a pump control panel, and other monitoring panels linked to facilities.	44.74 m^2

■ Maternal and Child Health Department (MCH)

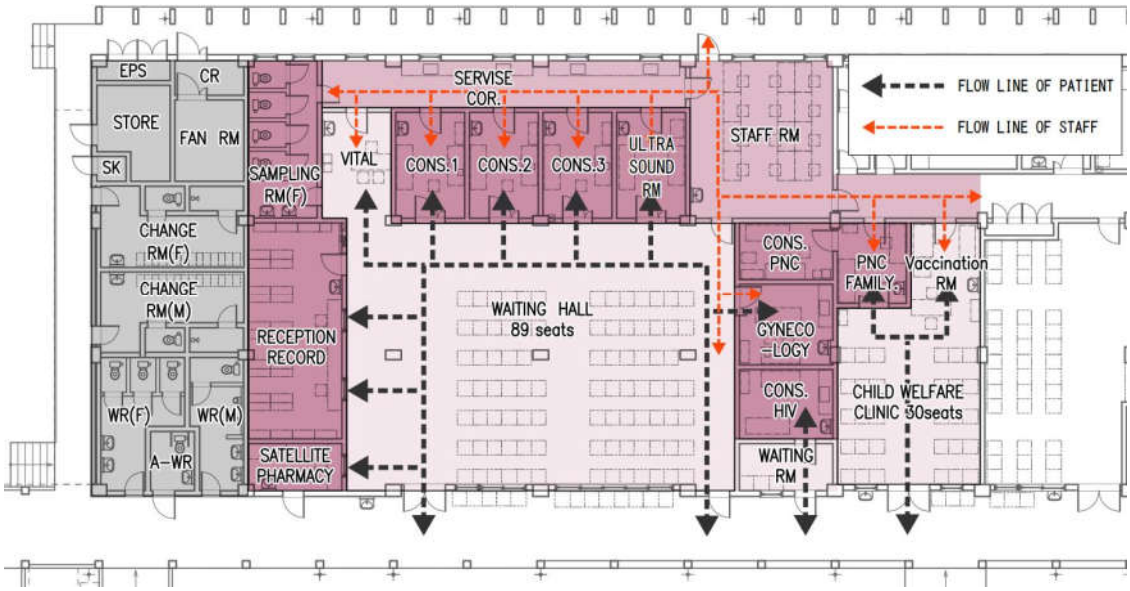


Figure 2-8: Zoning Plan for the MCH Department

A Vital Room, Consultation Rooms (three rooms), an Ultrasound Room, and Gynecological Consultation Rooms are situated such that they surround the Waiting Hall. The service flow lines of staff members are located behind the Consultation Rooms to separate them from patients' flow lines. Plans call for Toilets for Urine Samples to be situated adjacent to the Preliminary Examination Corner to facilitate the flow of samples to inspections. Plans call for a Child Welfare Clinic, a Family Planning/Postnatal Care Room, and an HIV Consultation Room to be situated adjacent to Antenatal/Postnatal Care Outpatient. Plans call for the Child Welfare Clinic and Family Planning/Postnatal Care Outpatient to double as a Waiting Hall. An overview of the main rooms is as follows.

Table 2-21: Main Rooms of the MCH Department

Room Name	Overview	Planned Floor Area
Consultation Rooms	Plans call for three Consultation Rooms compared to the current number, which is two. The floor area in each room shall be enough to secure space for installing desks, examination tables, handwashing stations, and the like.	13.50 m^2/room
Ultrasound Room	One Ultrasound Room shall be installed, the same number as the existing facility.	13.50 m^2
Gynecological Consultation Rooms	The floor area in each room shall be enough to secure space for installing desks, gynecological examination tables, handwashing stations, and the like.	14.00 m^2
Toilets for Urine Samples	To be located adjacent to the Preliminary Examination Space. Four toilet stalls shall be installed.	20.04 m^2
Antenatal/Prenatal Care Waiting Hall	89 indoor seats shall be secured. Benches shall be installed during finishing carpentry work to make the outer corridor available during congested times.	173.12 m^2
Child Welfare Clinic Waiting Hall	30 indoor seats shall be secured. Benches shall be installed during finishing carpentry work to make the outer corridor available during congested times.	43.92 m^2
Antenatal Care/Family Planning Room	Space for counseling shall be secured.	10.50 m^2
HIV Consultation Room	In consideration of privacy, plans call for a standalone waiting room adjacent to the Consultation Room.	12.00 m^2
Staff Room	To be shared with the Clinical Examination Department.	40.08 m^2
Changing Rooms	Plans call for Men's and Women's Changing Rooms for staff members to be shared by all departments (except the Theater Department). One toilet stall and one shower stall shall be installed in each room.	21.71 m^2/room

■ Clinical Laboratory

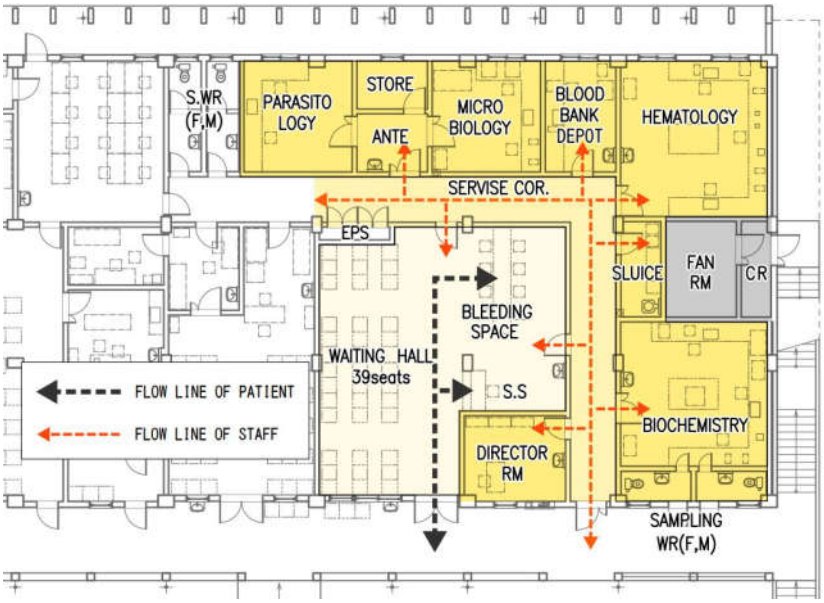


Figure 2-9: Zoning Plan for the Clinical Laboratory

Given the relationship between the Clinical Laboratory and inspections from antenatal and postnatal checkups, plans call for the Clinical Laboratory to be adjacent to Antenatal/Postnatal Care Outpatient. There shall be four Inspection Rooms (Hematology, Biochemistry, Microbiology, Parasitology), and the corridor that connects to these rooms shall be completely separated from the flow lines of general users. Men's and Women's Toilets for Urine Samples shall be installed adjacent to the Biochemistry Inspection Room. Notably, regarding the main unit of the blood bank, the decision was made to continue using existing facilities, but plans call for a Blood Bank Depot for the sole purpose of storing blood for transfusions. Furthermore, plans also call for the 39-seat Waiting Hall to double as space for drawing blood. An overview of the main rooms is as follows.

Table 2-22: Main Rooms of the Clinical Laboratory

Room Name	Overview	Planned Floor Area
Biochemistry Inspection Room	A large laboratory counter shall be installed in the center of the room, and shelves and laboratory counters with sinks attached shall be installed on three sides of the room during finishing carpentry work. Sample Receiving Windows shall be installed between the room and adjacent Toilets for Urine Samples.	36.32 m^2
Blood Inspection Room	A large laboratory counter shall be installed in the center of the room, and shelves and laboratory counters with sinks attached shall be installed on three sides of the room during finishing carpentry work.	39.20 m^2
Microorganism Inspection Room	Shelves and laboratory counters with sinks attached shall be installed during finishing carpentry work. A front room shall be installed as an infection control measure.	21.06 m^2
Parasite Inspection Room	Shelves and laboratory counters with sinks attached shall be installed during finishing carpentry work.	21.06 m^2
Blood Bank Depot	The room is intended to serve as a storage for blood transfusions of the operation theatres.	14.04 m^2
Managers' Room	The Managers' Room in the existing facility shall be relocated to the same place as the Inspection Rooms under the Project because doing so is more efficient. Desks, chairs, and other office furniture are outside the scope of cooperation.	15.47 m^2

■ Maternity Department

Rooms for providing health care services and hospital rooms for treatment and recovery shall be located across the inner corridor from each other, and separate. The Nightingale ward style, in which multiple beds are lined up in one large room, has been adopted for hospital rooms in existing facilities; however, under the guidance of the MOH, the maximum number of beds in one hospital room is six, and plans call for two Labour Rooms and five Postnatal Rooms. Furthermore, two Isolation Rooms shall be installed. Plans call for all of these hospital rooms to have balconies, and to be designed such that they do not feel like enclosed spaces.

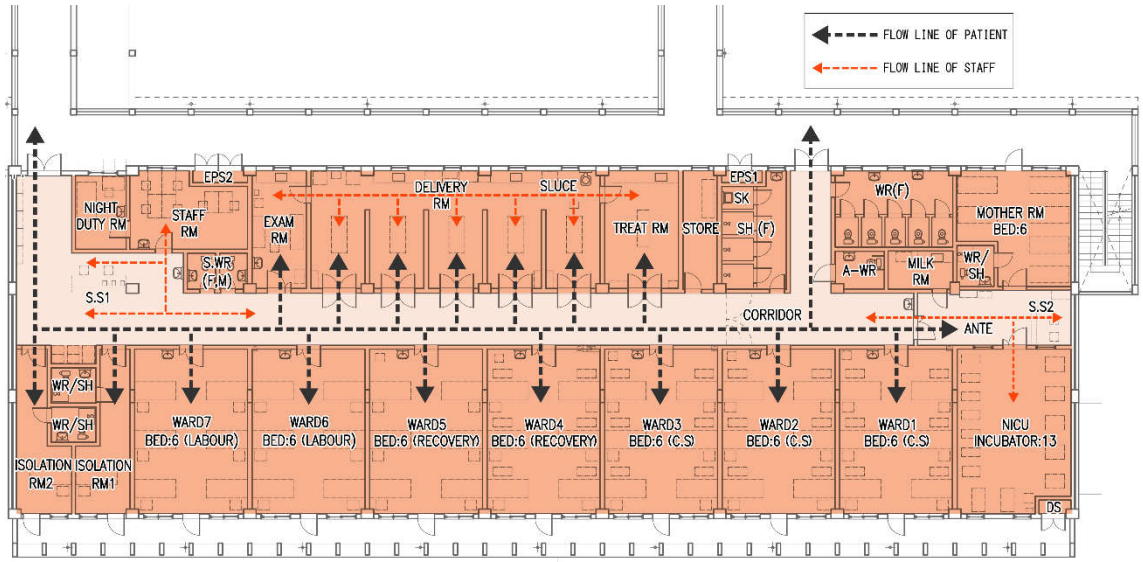


Figure 2-10: Zoning Plan for the Maternity Department

Five birthing beds shall be installed in the Delivery Room, and partition walls and curtains shall be installed to ensure privacy. Plans call for a Treatment Room for discontinuation of pregnancy operations and other procedures, and for a Physiological Function Test Room. An overview of the main rooms is as follows.

Table 2-23: Main Rooms of the Maternity Department

Room Name	Overview	Planned Floor Area
Delivery Room	Each birthing bed shall be separated from the others by partition walls, and connected to the service corridor. Counters with sinks attached shall be installed in the corridor during finishing carpentry work.	93.15 m^2
Treatment Room	To be used for discontinuation of pregnancy operations and other procedures. The room shall feature a gynecological examination table and enough space for treatment.	24.84 m^2
Physiological Function Test Room	An Inspection Room for ultrasound technicians and electrocardiogram inspections.	18.63 m^2
Observation Room	These rooms shall feature ample space for situating six beds. A handwashing station shall be installed in each room.	52.08 m^2/room
Isolation Rooms	Individual rooms. Toilet and shower to be installed.	26.04 m^2/room
Neonatal Intensive Care Unit	The unit shall be large enough to situate a total of 13 beds (baby cots and incubators). The front room shall fulfill the functions of a Staff Station.	52.08 m^2
Mothers' Room	Because it is mothers who care for the patients admitted to the NICU, a place for mothers to stay overnight is necessary. Six beds shall be installed in the Mothers' Room, along with a shower and toilet.	38.44 m^2
Staff Station	To be situated at the main entrance of the Maternity Department. To be situated adjacent to the Staff Room and Night Duty Room, with counters to be installed during finishing carpentry work.	—

■ Theater/Central Sterile Supply Department

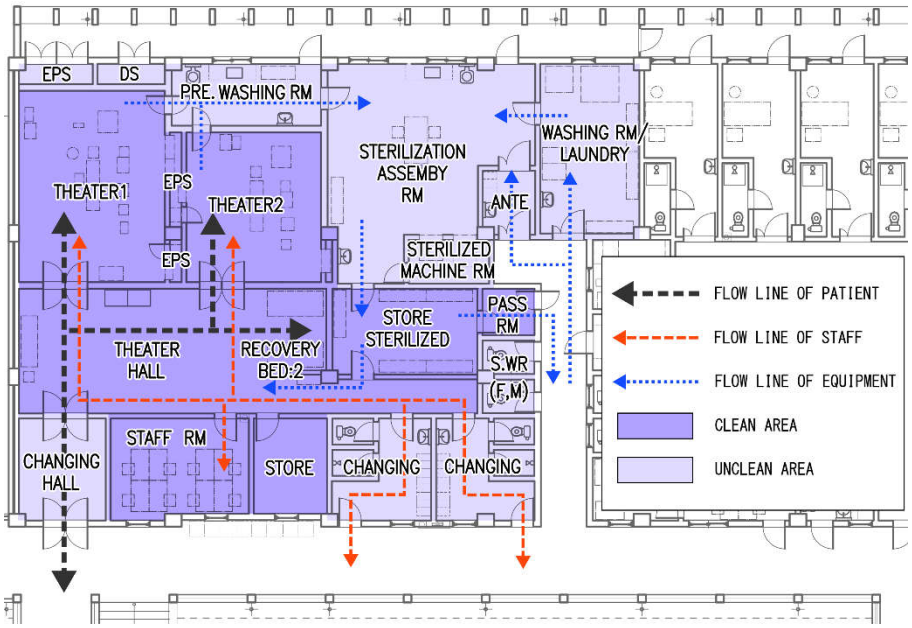


Figure 2-11: Zoning Plan for the Theatre/CSSD

Plans call for two Theaters, one large and one small. The equipment used in the Theaters shall pass through the adjacent Preoperative Washing Room before being treated in the Central Sterile Supply Room, and then stored in the Sterile Storeroom, and shall always travel through the rooms and be treated in this order. Plans call for complete separation between the clean and contaminated areas in the department. An overview of the main rooms is as follows.

Table 2-24: Main Rooms of the Theatre/CSSD

Room Name	Overview	Planned Floor Area
Theaters	Two rooms, one large and one small, shall be installed, the same number as the existing facility.	Large: 47.00 m^2 Small: 37.40 m^2
Theater Hall	To double as a postoperative recovery space (two beds).	65.89 m^2
Preoperative Washing Room	A room for conducting the primary washing of equipment.	16.08 m^2
Central Sterile Supply Room	A worktable is to be situated in the center of the room, and enough workspace to wash and sterilize equipment shall be secured. Two high-pressure steam sterilizers shall be installed.	67.77 m^2
Laundry Room/Laundry	A room for washing surgical gowns, which require sterilization. Linens shall be washed in the existing Laundry.	27.54 m^2
Changing Rooms	The Theater Department shall have its own Men's and Women's Changing Rooms. Toilet and shower to be installed in each room.	16.80 m^2/room

■ Children's Ward

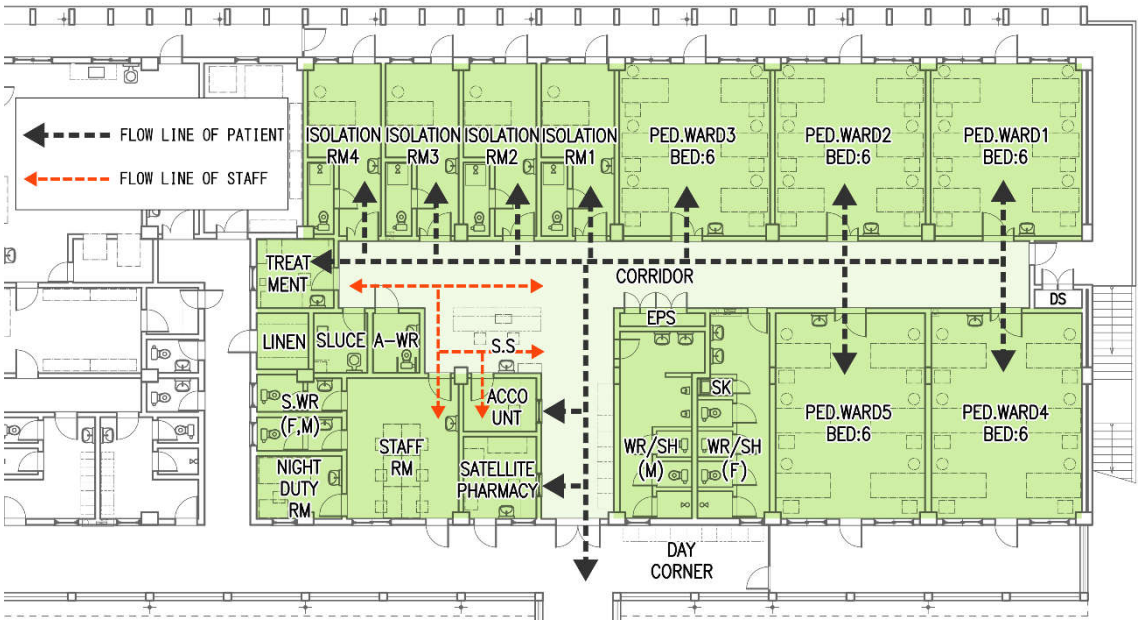


Figure 2-12: Zoning Plan for the Children's Ward

The Nightingale ward style, in which multiple beds are lined up in one large room, has been adopted for hospital rooms in existing facilities. However, under the guidance of the MOH, the maximum number of beds in one hospital room is six; plans under the Project call for five six-bed hospital rooms and four Isolation Rooms (individual rooms complete with a toilet and shower) for Pediatrics. Plans call for all hospital rooms to have a balcony, and to be designed such that they do not feel like enclosed spaces. The department shall also comprise essential treatment rooms for medical care activities, a Staff Station, and rooms needed for accounting and the like. An overview of the main rooms is as follows.

Table 2-25: Main Rooms of the Children's Ward

Room Name	Overview	Planned Floor Area
Hospital rooms	Six ordinary beds or children's beds shall be installed. The rooms shall be large enough to accommodate the corresponding bed size.	Large: 47.00 m^2 Small: 37.40 m^2
Isolation Rooms	Individual rooms. Toilet and shower to be installed.	20.65 m^2/room
Treatment Room	Enough space shall be secured to install desks, examination tables, handwashing stations, and the like.	9.78 m^2
Satellite Pharmacy	Plans call for a Satellite Pharmacy in consideration of patient convenience.	8.79 m^2
Staff Room	Plans call for a Staff Room accessible from both the outer and inner corridors. Men's and women's toilets shall be installed in the room. Furniture is outside the scope of cooperation.	25.56 m^2
Night Duty Room	The Night Duty Room of the Children's Ward shall be accessed from the Staff Room. The room shall be large enough to accommodate one bed and one desk. Furniture is outside the scope of cooperation.	9.38 m^2

- Other
  - Medical Gas Building: The building shall comprise a Cylinder Room for supplying oxygen and a Compressor Room for supplying compressed air.
  - Septic Tank Pump Room: A Blower Room shall be installed adjacent to the septic tank to supply oxygen to the contact aeration tank.
  - Substation Room: To comprise three rooms (a Main Switch Room, a Transformer Room, and a Main Distribution Room), and to comply with the specifications of the Northern Electricity Distribution Company (hereinafter referred to as "NEDCo").
  - Generator Room: A Generator Room shall be installed adjacent to the Substation Room.
  - Water Supply Pump Room: A lifting pump and a fire pump shall be installed in this room. Plans call for an underground pit in the Pump Room to be used as a receiving tank, and footings for installing polyethylene water tanks above ground.
  - Guardhouse: Plans call for the installation of a Guard Room facing the entrance of the Parking Area, in which security personnel are permanently stationed.
  - Connecting Corridor: Plans call for a covered corridor to connect the new building to existing buildings.
  - Parking Area: Plans call for a 41-space parking area. Plans also call for a buffer area on the road entering the parking area to prevent congestion on the front road.

The facility components and areas of the Project based on the above are listed on the following table.

Table 2-26: Facility Components of the Project at TCH

	Block Code	Floor	Main components	Floor Area (m^2)
Clinical Block (two storey)	Block A	GF	OPD: Consultation room (10 rooms), Vital (2 rooms), Waiting hall, Reception, Record, Observation room, Dressing room, Satellite pharmacy etc.	3,022.80
		1st	Maternity department: Delivery room (5 beds), Treatment room, Physical function examination room, Labour room (12 beds), Recovery/Maternity room (32 beds), NICU (13 beds), Mother room, Staff station etc.	
	Block B	GF	MCH: Consultation room (3 rooms), Ultrasound room, Vital, Gynecology examination room, Consulting room (HIV), Reception, Satellite pharmacy, Staff room, CWC, Waiting hall etc. Clinical laboratory: Laboratory (Hematology, Microbiology, Parasitology, Biochemistry), Blood bank depot, Waiting hall etc.	2,521.14

		1st	Theatre & CSSD: Operating theatres (2 rooms), Changing hall, Laundry, Sterilization/Assembly room, etc. Children's ward: Ward (34 beds) etc.	
Annex (single storey)	C	—	Medical gas storage, Compressor room	32.50
	D	—	Blower room	13.26
	E	—	Main-switch room, Transformer room, MDB room	69.30
	F	—	Generator room	39.69
	G	—	Pump room, Reservoir tank	44.10
	H	—	Guardhouse	4.00
	—	—	Covered walkway	60.74
			Total Floor Area	5,807.54

4) Elevation Plans

The city of Tamale experiences roughly 1.5 times the insolation of Tokyo; reducing the burden of insolation of exterior walls is important for energy conservation plans and maintaining comfort in indoor spaces. Accordingly, while large windows are disadvantageous in terms of reducing the burden of insolation, natural ventilation-based temperature control, which does not rely on air conditioners, is preferable in common areas, and natural openings should be secured to enable temperature control during power outages.

- A 3-m outer corridor facing the courtyard shall be installed on the plane of crossbeams along which windows are lined up. In addition, installing PC louvers facing the service balconies on the opposite side shields exterior wall surfaces from direct sunlight while also providing them with rhythm and shading accents, as they tend to be dull.
- No windows shall be installed on the gables, and as for wall thickness, walls shall be double-layered concrete blocks (t = 150 mm) with insulation material (polyethylene foam, t=50 mm) to improve insulation performance.

5) Sectional Plans

- In order to prevent infiltration by dust and rainwater, the design height of the ground floor shall be GL+450 mm.
- Because the design ground level of the Medical Buildings (Building A and Building B) differ, plans call for floor heights of the ground floors of Building A and Building B to be FL+5,000 mm and FL+3,800 mm, respectively, such that the floor levels of the first floors are at the same height. In addition, the floor height of the first floor shall be 2FL+3,600 mm (eave height) in both buildings.
- The floor heights are set to ensure indoor airspace for dealing with the heat, and in consideration of the ceiling cavities needed for facility pipes.
- Plans call for an underground pit for facility maintenance in the ground floor toilets, which shall

be used by many and unspecified patients.

6) Structural Design

The structural design shall comply with the Ghana Building Code. However, BS and Japanese standards shall serve as references for structural conditions not set out in the Ghanaian standards. Note that the limit state design method shall be adopted as the structural design method, modeled after BS, which is the basis of the Ghana Building Code.

■ Structural System

The structures of the Medical Buildings shall consist of bidirectional pure framework structures (rigid-frame structures) of reinforced concrete in basic grids with spans of roughly 6 m, and member sections shall be determined after sufficient consideration of necessary sections from structural calculations in terms of workability and quality assurance.

According to the geotechnical survey report of the previous survey, the topsoil from the current ground level at the proposed construction site to a depth of approximately 0.5m (maximum 1.0m) consists of medium density sandy and silty clay. Beyond that depth is a high-density quartz-clay gravels up to 2.4m thick, which is a good ground with an expected bearing capacity of more than 200kN/m2 at GL-1.0m and 300kN/m2 at GL-1.5m.

Foundations shall comprise independent footings. In addition, foundation bearing capacity shall be 200 kN/m^2 (0.2 Mpa) based on the results of ground surveys; regarding the bottom of pit excavation, GL-1.0 m shall be the supporting soil.

■ Design Loads and External Forces

Design loads and external forces are as follows.

- Dead loads: Shall comply with the Ghana Building Code.

- Concrete:	22 kN/m^3	- Wood:	6.3 kN/m^3-7.7 kN/m^3
- Reinforced concrete:	24 kN/m^3	- Steel:	77 kN/m^3
- Concrete blocks:	20 kN/m^3	- Glass:	20.8 kN/m^3

- Live loads: Shall conform to Ghanaian design standards and Japanese standards.

Table 2-27: Live Load for Structural Design

Room Name	For Floors (N/m^2)	For Framework (N/m^2)	For Earthquakes (N/m^2)
Sloped roofs	250	150	100
Hospital rooms, washrooms,	2,000	1,500	700

toilets			
Offices, Consultation Rooms, Treatment Rooms	3,500	2,200	1,000
Corridors, stairs	4,000	3,700	2,400
Waiting Hall	5,000	4,600	3,000

- Wind load: The reference wind speed shall be 34 m/s based on the Ghana Building Code.
- Seismic load: Historically, earthquakes in Ghana and surrounding countries are clustered along the coastline; no major damage-causing earthquakes have been recorded in Tamale, where the Project area is located. Even in the Ghana Building Code, the horizontal acceleration for Tamale is set to zero; therefore, it is not necessary to consider seismic forces. However, given the functional importance of the building, the design shall be earthquake resistant, with base shear coefficient Co = 0.05 as the seismic load.

■ Structural Materials and Allowable Stress

- Concrete: Ordinary cast-in-place concrete
  - Footings, footing beams, retaining walls: Fc28 = 24 N/mm^2
  - Pillars, beams, floor slabs, walls, stairs, overhangs: Fc28 = 24 N/mm^2
  - Mold floor slab (inner): Fc28 = 24 N/mm^2
  - Mold floor slab (outer): Fc28 = 21 N/mm^2
  - Blinding concrete: Fc28 = 18 N/mm^2 or higher
- Reinforcement steel, steel frames: BS standardized goods
  - Deformed bar: Fy = 500 N/mm^2
  - Steel frames: S275JR Fy = 275 N/mm^2

7) Electrical Installation

■ Main Line Equipment

Regarding the supply of electricity to existing facilities, power is distributed through a shared electrical grid that serves TCH and surrounding areas, and the supply is insufficient to cover the electricity required for Project facilities. Discussion with NEDCo has resulted in the decision to run lines separately from the existing substation to supply electricity to Project facilities. Power will be supplied to Project facilities by using a transformer to lower the voltage from the 11-kV, three-phase, three-wire medium-voltage power grid, which supplies power along the frontage road to the Project site, to three-phase, four-wire 415/240V.

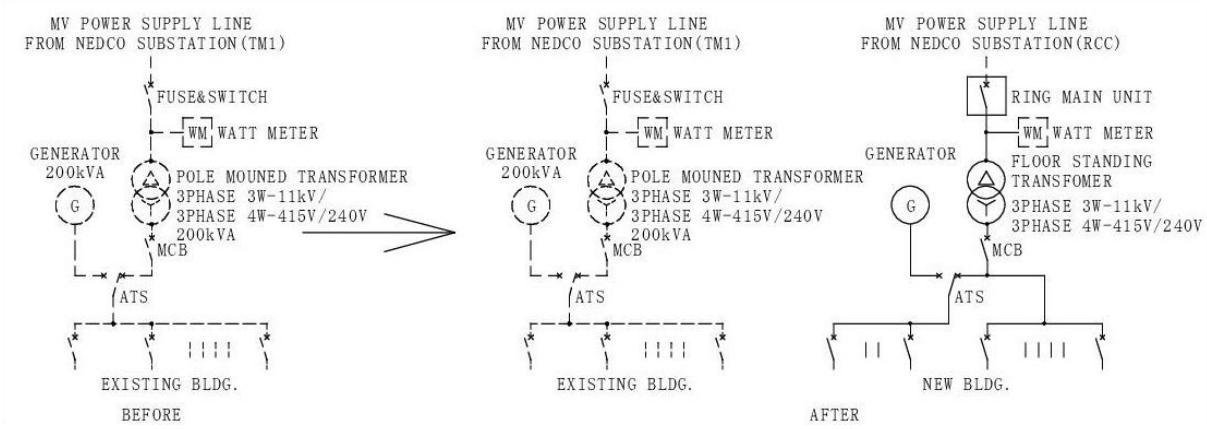


Figure 2-13: Electricity Lead-in Diagram

The Japan side portion of the construction work comprises the construction of the Substation Room, and the section switches, transformer, and electrical equipment downstream of the low-voltage breakers; the counterpart side is responsible for the work of connecting 11-kV medium-voltage cables to the section switches.

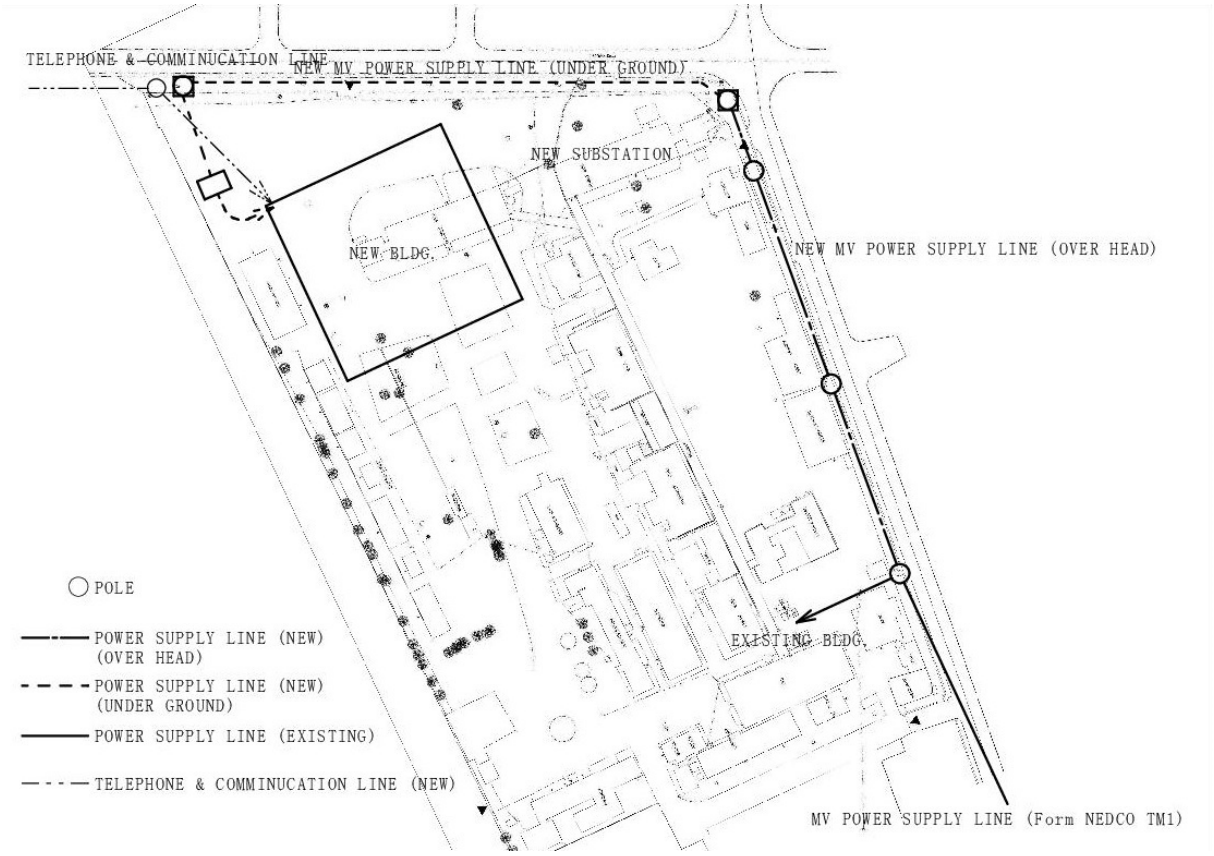


Figure 2-14: Electricity Lead-in Layout Plan

One oil-filled transformer for 11-kV three-phase three-wire/415/240V three-phase four-wire shall be installed in the Transformer Room, and power shall be supplied to Project facilities through a low-voltage main switchboard. The transformer capacity shall be set in response to the electrical

capacitance of the Project.

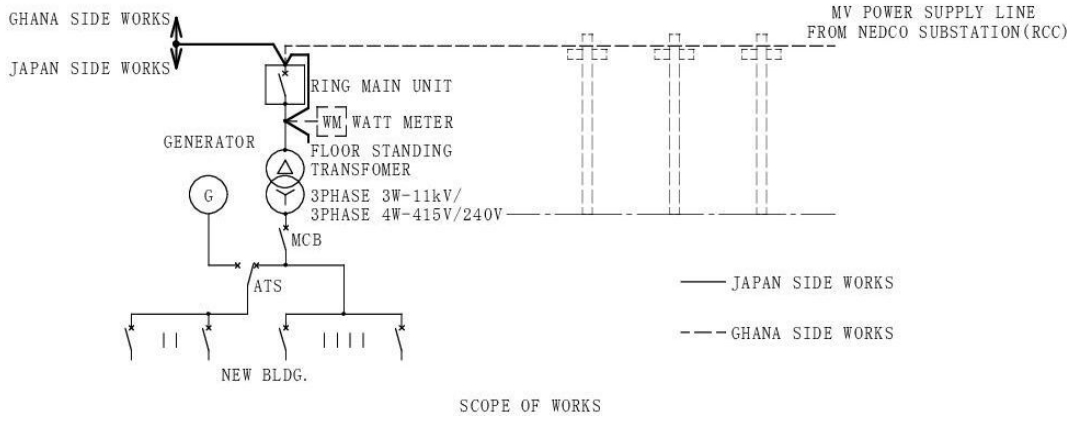


Figure 2-15: Power Supply Single Line Diagram

The electricity supply downstream of the low-voltage main distribution switchboard shall be distributed to the distribution switchboards for each area through electrical main cables. Area distribution switchboards shall distribute power to lighting, electrical sockets, air conditioning equipment, and the like. Underground pipes shall be used in the method of wiring between buildings, and electrical ducts or cable trays shall be used for the wiring within buildings.

■ Emergency Generators

Diesel-engine generators shall be installed to serve as a backup power source during power outages. During the four days of voltage test conducted by the survey team, electricity was out for approximately 20 minutes. Momentary power cuts also occurred several times. Therefore, the weekly power outage time has been set at 40 minutes, and a 200-litre fuel tank will be installed together with the generator. Note that the generators to be installed under the Project will not supply electricity to existing facilities. The scope covered by the generators is as follows.

Table 2-28: Rooms with the Scope of Electricity Supply by Emergency Generator

Type	Target Rooms
Electric lights (100%) Outlets (100%)	Theaters, Theater Hall, Delivery Room, NICU, Labour Rooms, Treatment Rooms, Accounting
Electric lights (100%) Outlets (roughly 50%)	Consultation Rooms
Electric lights (roughly 50%) Outlets (roughly 50%)	Maternity hospital rooms, Clinical laboratories, Satellite Pharmacy, Reception, Pediatric hospital rooms, Waiting Halls
Facilities covered by the generators	Substation Room, Generator Room, telephone/telecommunications system, medical gas supply system/alarm system, disaster prevention system, lifting pumps, wastewater pumps, fire pumps, and other essential medical equipment requiring backup from the generators

■ Lighting/Outlets

Lighting shall be installed in response to the functions of each room, with LED fluorescent light

fixtures as the main type. In addition, plans call for streetlights in the Parking Area to facilitate nighttime use of the facilities and prevent crime, outdoor security lights on exterior walls of each building as needed, minimal garden lighting, and the like. Illuminance in the main rooms shall be configured in accordance with BS as follows.

- Hospital rooms, NICU, corridors 100 lux
- Waiting Halls 200 lux
- Delivery Room 300 lux
- Theater Hall, Consultation Rooms, Treatment Rooms 500 lux
- Theater 1,000 lux

Electrical outlets shall be the universal type with switches attached, and plans call for generators to supply electricity to a portion of the lighting and electrical outlets. In addition, emergency lighting and guide lighting shall be installed where necessary for emergency evacuation.

8) Telecommunications System

■ Telephone System

Plans for Project facilities call for three outside lines and 100 extensions. Regarding the division of construction work, Ghana is responsible for the portion from the main line outside the property to the connection of the new telephone lines to the main switchboard (MDF) inside Project facilities; construction work under the Project includes the switchboard (PABX) downstream of the MDF, the secondary-side wiring routes and wiring of the MDF, and the telephone outlets and telephones.

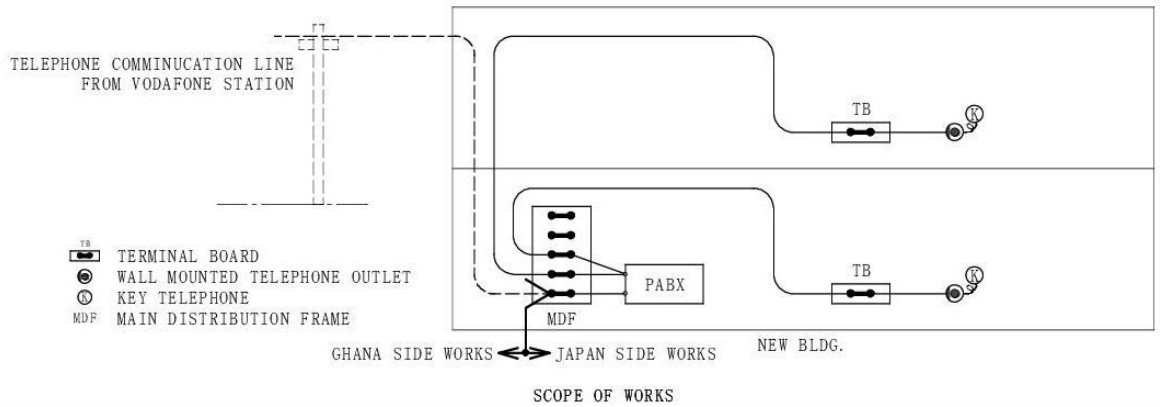


Figure 2-16: Telephone System Diagram

■ LAN System

To accommodate use of the telecommunications network within the hospital, LAN system wiring and ductwork, switching hubs, routers, and LAN outlets shall be installed during construction work under the Project. The Ghana side is responsible for the lead-in from the main line outside the

property, wiring to connect to network equipment (routers, ADSL modems) and connections from existing equipment.

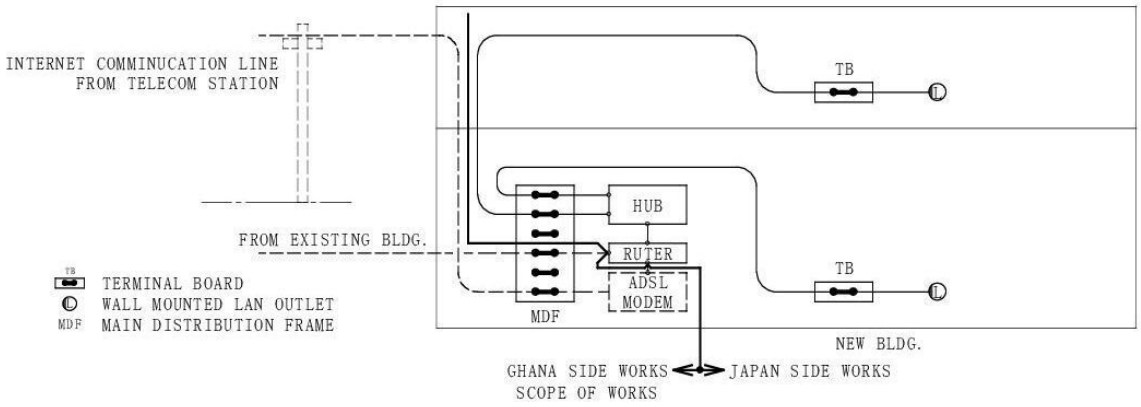


Figure 2-17: LAN System Diagram

■ Broadcasting System

A broadcasting system shall be installed for the purpose of calling patients. The broadcasting system shall comprise amps, microphones, and speakers, and shall be installed in the following rooms.

Table 2-29: Scope of Broadcasting System Equipment

Microphone / Amplifier	Speaker
OPD: Consultation rooms, Satellite pharmacy, Reception	Waiting hall
MCH Department: Consultation rooms, Satellite pharmacy, Reception	Waiting hall
Children's Ward: Staff station	Ward

■ TV/Audiovisual Facilities

A TV system comprising UHF antennae, boosters, splitters, dividers, TV outlets, and coaxial cables shall be installed in the Waiting Halls and hospital rooms during construction work under the Project. The Ghana side is responsible for installing the TVs.

9) Water Supply System

■ Water Source/Supply System

An underground water main has been installed by Ghana Water Company Limited (hereinafter referred to as "GWCL") along the frontage road on the north side of the property. The water supply system of existing facilities comprises a 20A branch from the main that fills reinforced concrete water receiving tanks, a pressurizing supply pump that transmits the water to polyethylene tanks (roughly 54 m^3) adjacent to the Laboratories, and another pressurizing supply pump that distributes

water to the individual facilities. Water shall be supplied to Project facilities from a separate system from the existing system; plans call for the supply to be drawn from a new water main from GWCL's storage tanks.

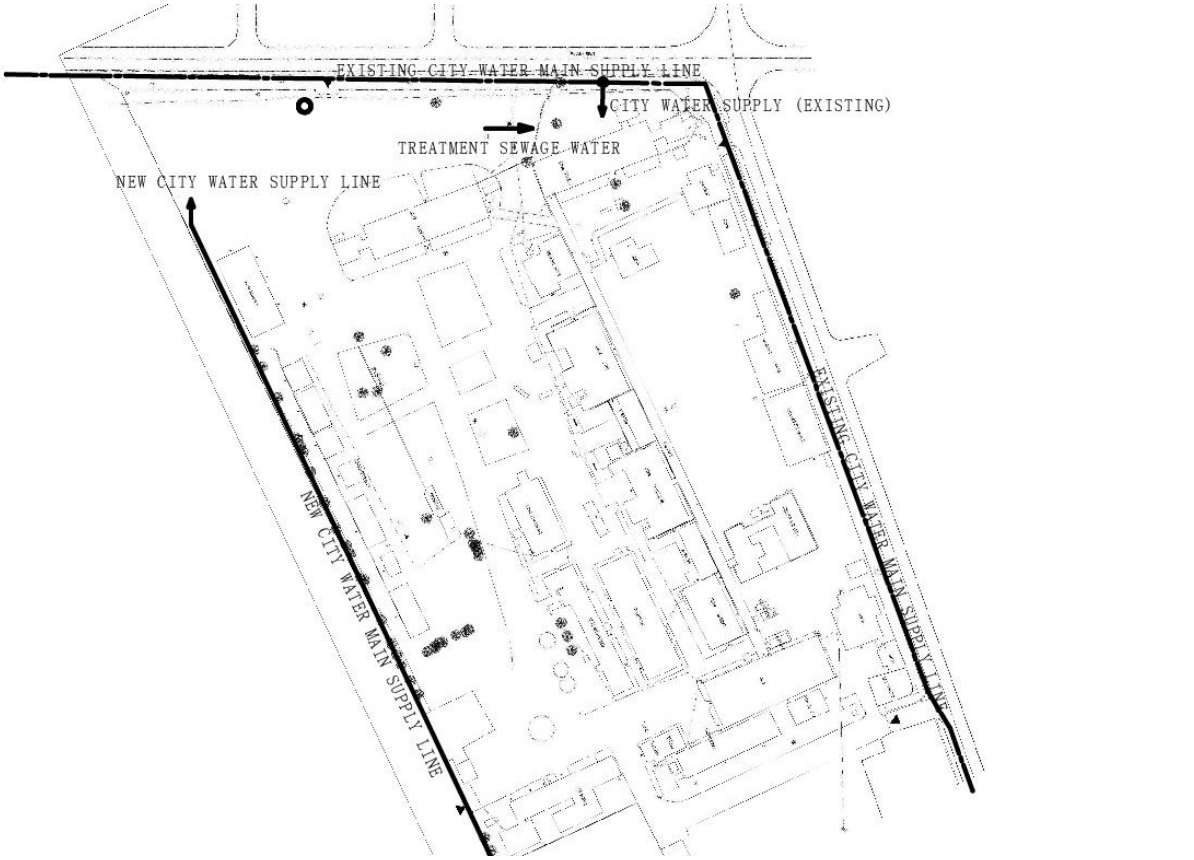


Figure 2-18: City Water Connection Layout Plan

However, the water supply at the Project site is unstable; water supply failures are common, and water pressure is insufficient. Therefore, under the Project, the decision was made to draw water into a reinforced concrete-framed tank in the underground pit of the Water Supply Pump Room, and use a lifting pump to transmit it to above-ground receiving tanks for storage. The capacity of the underground pit is 12 m^3, which is equivalent to one half-day of water consumption, and GWCL requested that the above-ground receiving tanks have sufficient capacity for four days of water consumption (96 m^3); therefore, six polyethylene tanks (roughly 100 m^3) shall be installed. The system is such that a different lifting pump is used to transmit water from the above-ground receiving tanks to an FRP single-panel elevated water tank (12 m^3), where it is stored until it is distributed to individual supply points using the gravity method. The Ghana side is responsible for installing pipes from the city water main to the city water meters, and pipes on the property and inside the buildings, which are downstream of the city water meters, shall be installed during construction work under the Project. However, given the poor state of the water supply around the Project site, plans call for well water to supplement shortages. The Ghana side is responsible for well drilling work; the required water production rate of the well is 70L/min and the depth is estimated to be 50-60m based on the

results of the existing well. The pumps, a water treatment system comprising sand filtration and disinfection by chlorine, and the pipes shall be installed during construction work under the Project.

As for the maintenance of the underground concrete-framed tank, cleaning and inspection of the inside will be required by hand. In this case, it is necessary to store water in the above-ground receiving tanks and elevated water tank beforehand so as not to interfere with the operation of the hospital. A drainage pump for emptying the receiving tanks shall be included in this plan.

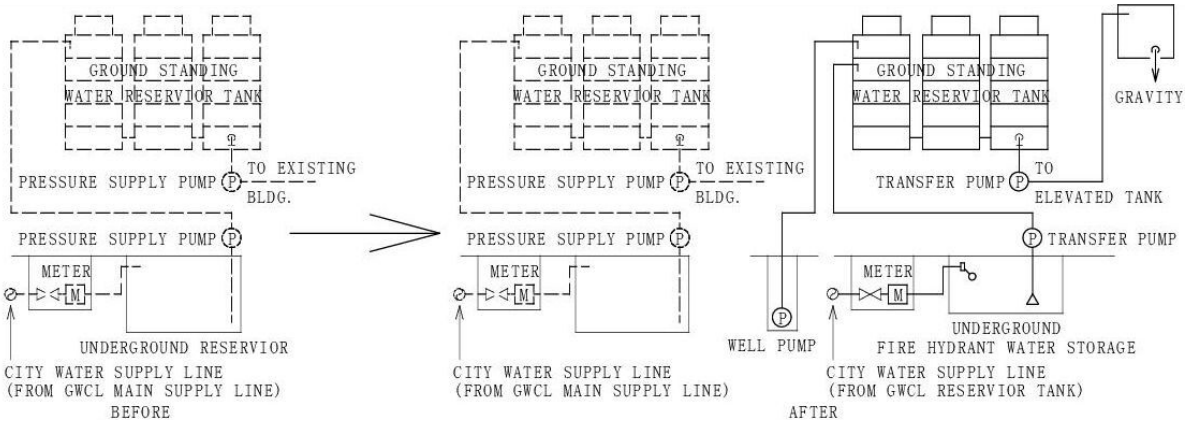


Figure 2-19: Water Supply System Diagram

■ Hot Water Supply System

Hot water storage-type electrical hot water heaters shall be installed in the Delivery Room, the Mothers' Room, the Theater Hall, and Shower Rooms.

■ Plumbing Fixtures

Plans call for the number of toilet stalls to comply with the International Plumbing Code (IPC). Regarding toilet specifications, porcelain Western-style toilets that can be procured locally shall be installed, along with handrails as needed. Handheld shower attachments shall not be installed.

Elbow lever-style faucets shall be used in medical facilities. Service sinks for cleaning shall be installed in rooms that require them. In addition, handwashing stations shall be installed at the entrances to Waiting Halls, hospital rooms, and other areas used by patients to allow users to wash their hands at any time in an effort to prevent hospital-acquired infections and ensure a sanitary environment.

10) Wastewater System

■ Sewage/Miscellaneous Wastewater

The Project area is not served by a sewerage system; however, wastewater from existing facilities is discharged into a drainage ditch installed along the frontage road. Unfortunately, the ditch is

clogged with garbage because it is not cleaned very attentively. The Tamale Metropolitan Assembly Sanitation Department prefers osmotic treatment of wastewater within the Project property; therefore, the plan calls for sewage and miscellaneous wastewater from the Project to undergo simplified purification in a combined-treatment septic tank, and then allowed to leach into the ground via a leaching pit. As a result of the BS-based infiltration tests conducted by the study team, the construction area has a high infiltration capacity (Vp=2.387). Note that the plan calls for a septic tank BOD of 50 ppm.

■ Medical Wastewater

Envisioned medical wastewater from Project facilities includes pharmaceutical wastewater from laboratories and contaminated wastewater from surgical operations and deliveries. Pharmaceutical wastewater shall pass through a neutralization tank, and contaminated wastewater shall pass through a sterilizing tank before ultimately undergoing osmotic treatment within the property. Plans for osmotic treatment within the property must be designed such that wells on the property are not negatively impacted; therefore, permits (including combined-treatment septic tanks) are required from the Tamale City Technical Committee.

■ Rainwater

Plans call for rainwater and drainage from air conditioners to be allowed to leach into soil within the property, with overflow discharged into the drainage ditch.

11) Air Conditioning/Ventilation System

Plans call for an air conditioning system in Waiting Halls, the General Ward, the Mothers' Room, the Night Duty Room, and other rooms outside service areas not used by general patients, which include the Service Station, service corridors, and equipment rooms. Split wall-mounted air conditioners shall be the standard type of air conditioner. However, plans call for enhanced cleanliness and positive pressure in the rooms of the Theater Department and NICU through the use of ceiling cassette-style air conditioners and implementation of sufficient ventilation using medium-efficiency filters and ventilation fans. The rooms in which air conditioners shall be installed are as follows.

Table 2-30: Rooms with Air Conditioning System

Wall mounted	OPD	Consultation room, Dressing room, Vital, Observation room, Reception/Record, Satellite pharmacy, Staff room
	MCH	Consultation room (including Ultrasound room, Consulting room (HIV), Gynecology examination room), Vital, Reception, Record, Satellite pharmacy, Staff room
	Children's Ward	Isolation room, Treatment room, Satellite pharmacy, Account, Staff room

	Maternity Department	Delivery room, Isolation room, NICU, Physical function examination room, Staff room
	Clinical Laboratory	Laboratory (Hematology, Micro biology, Parasitology, Biochemistry), Blood bank depot, Director room
	Theatre/CSSD	Laundry, Sterilization/Assembly Room, Staff room
Ceiling casette	Theatre/CSSD	Operating theatre, Changing hall

In principle, the ventilation system shall be a natural ventilation system. Ceiling fans shall be installed in rooms in which air conditioners are not installed.

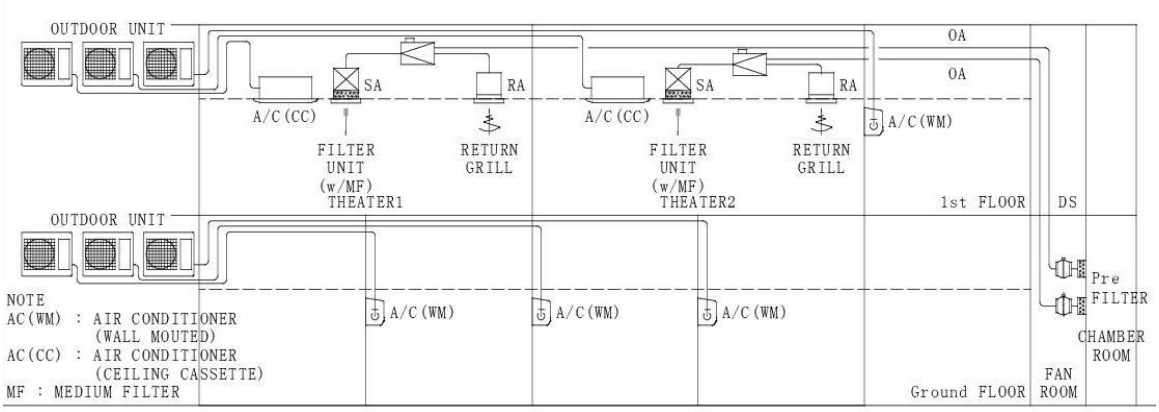


Figure 2-20: Air Conditioning System Diagram

12) Medical Gas System

Regarding the medical gas supply system, which comprises oxygen gas and compressed air, oxygen cylinders shall be centrally managed in the Medical Gas Building, and gas shall be supplied to individual points through pipes in pursuit of safety, operability, and maintainability. Plans call for a 24-cylinder oxygen manifold with each bank capable of covering seven days' worth of demand. The shape of gas outlets shall comply with BS. Rooms in which medical gas is to be installed are as follows.

Table 2-31: Rooms with Medical Gas System

O_2 and Compression air	Operation theatre, Treatment room, NICU, Observation room, Children's ward, Changing hall (recovery space)
O_2	Isolation room, Labour room, Delivery room, Maternal ward (recovery)

13) Disaster Prevention System

In accordance with the Ghana Building Code, an automatic fire alarm system comprising fire alarm control panels, smoke detectors, heat detectors, push-buttons, sirens, and display lamps shall be installed. Note that the Infrastructure Directorate of the MOH has agreed that sprinklers shall not be installed.

14) Fire Extinguishing Equipment

Plans call for indoor fire hydrants (hose reels). In addition, ABC fire extinguishers and CO_2 fire extinguishers shall be installed in accordance with the intended use of each room.

15) Monitoring Cameras

Monitoring cameras shall be installed in the NICU. Monitors shall be installed in the Staff Station.

16) Nurse Call System

Plans call for nurse call buttons to be installed at each inpatient bed. The nurse call system comprises the nurse call buttons, and call lamps installed at the entrances to hospital rooms.

17) Intercom System

The intercom system shall be installed in the Theaters, Theater Hall, and Central Sterile Supply Rooms.

18) Lightning Arresters

Plans call for rooftop conductors to serve as lightning arresters.

19) External works and Landscaping

The major external works and landscaping works are as follows.

- The perimeter wall on the north side of the property adjacent to Project facilities shall be reconstructed.
- The Parking Area and roadways on the property shall be paved with asphalt and marked with lines.
- Corridors on the property adjacent to Project facilities and a portion of the courtyard shall be paved with interlocking pavement and concrete, and benches shall be installed as appropriate.
- Plans call for outside lighting and garden lighting to be installed in the Parking Area, corridors on the property, and the courtyard as necessary.
- Sprinklers shall be installed for vegetation.

20) Other (Oxygen Plant)

At TCH in its present state, individual oxygen cylinders are installed and used where they are needed, and oxygen consumption is not very expensive (31,500 GHS/year). However, because the cylinders are refilled with oxygen in Kumasi, which is roughly 390 km away from Tamale, there could be a lack of oxygen when it is needed; TCH and RHD requested the installation of an oxygen plant. Conversely, standards for installing medical gas in Ghana were not clearly specified during

the survey period, and tertiary hospital TTH is also not maintaining its oxygen plant properly due to an insufficient budget. In light of the above, Project plans call for the continued supply of oxygen from cylinders, and a manifold and central pipe system, and the counterpart has agreed to install an oxygen plant at its own expense with plans to connect in the future.

(5) Equipment Plans

1) Equipment Priority by Department

The priority of equipment installation for each department is as follows.

■ Outpatient Department

Examination rooms in the Outpatient Department shall be equipped with desks, chairs, examination sets, height and weight scales, examination tables, examination lights, and other equipment needed to diagnose outpatients. The main Project equipment is as shown on the table below.

Table 2-32: Main Equipment to be procured for the OPD

No.	Description	Quantity
12	Consultation desk and chair	13
20	Diagnostic set	15
27	Examination bed	16
29	Examination light	5
32	Height and weight scale for adult	2
43	Instrument cabinet	16
57	Medicine trolley	11
64	Patient monitor for adult	2
72	Resuscitation bag for adult	2
74	Resuscitation bag for pediatrics	2
96	Wheel chair	2
97	Xray film illuminator	10

Source: prepared by the Survey Team

■ Clinical Laboratory and Blood Bank Depot

The necessary equipment for operating Clinical Laboratory and the Blood Bank Depot, which exists to provide emergency blood transfusions for pregnant women who have undergone emergency caesarean sections, shall be installed under the Project as shown on the following table. Note that the functions of existing facilities shall continue to be used for the main Blood Bank, which exists for drawing and screening blood for transfusions.

Table 2-33: Main Equipment to be procured for the Clinical Laboratory / Blood Bank

No.	Description	Quantity
7	Blood bank refrigerator	1
8	Blood cell counter	1
14	Coagulometer	1
25	Electrolyte analyzer	1
37	Hormone Analyzer	1
59	Microscope	7
76	Semi-auto Biochemistry analyzer	1
81	Spectrophotometer	1
87	Table top centrifuge	2

Source: prepared by the Survey Team

■ Theater Department/Recovery Room

The essential equipment shown on the table below shall be installed in each of the Major and Minor Theaters. Two beds shall be prepared for the Recovery Room, and the room shall be equipped with recovery beds, patient monitors, and the like.

Table 2-34: Main Equipment to be procured for the Theatre Department

No.	Description	Quantity
1	Anesthesia machine with ventilator	2
17	Defibrillator	1
21	Diathermy machine	2
43	Instrument cabinet	4
53	Major surgery instrument set	2
60	Minor surgery instrument set	3
61	Neonatal resuscitation table	1
62	OT table manual	2
64	Patient monitor for adult	4
71	Recovery bed	2
77	Shadowless OT lamp, double arm	1
78	Shadowless OT lamp, single arm	1

Source: prepared by the Survey Team

■ Central Sterile Supply Room (CSSD)

As of April 2021, 250 to 300 L of linens and small steel objects are sterilized every day in the Central Sterile Supply Room at TCH. Surgical operations, deliveries, and other clinical activities are expected to become more frequent as the population grows and the facilities expand; therefore, the room shall be designed to accommodate roughly 1.3 times the current volume. Note that two machines shall be installed to enable continuous clinical activities during the repair period in case one machine breaks down, or during regular inspections.

Table 2-35: Main Equipment to be procured for the CSSD

No.	Description	Quantity
35	High pressure steam sterilizer M	1
36	High pressure steam sterilizer S	1

Source: prepared by the Survey Team

■ Antenatal Checkup Department (ANC)

Pregnant women who visit for antenatal checkups undergo ultrasound technicians to verify the state of fetal development; therefore, the Ultrasound Room adjacent to the department shall be equipped with ultrasound scanner. The ultrasound scanner shall be equipped the mounting frame with caster to make it possible to examine pregnant women in the Labour Rooms and Maternity Ward as necessary.

Table 2-36: Main Equipment to be procured for the ANC

No.	Description	Quantity
12	Consultation desk and chair	7
20	Diagnostic set	5
27	Examination bed	5
28	Examination bed for Ob/Gy	1
30	Fetal doppler	4
45	Instrument set for Ob/Gy	3
90	Ultrasound scanner	1

Source: prepared by the Survey Team

■ Labour Room

The main equipment to be installed in Labour Rooms is as shown on the following table. The Pharmacy to be shared with the Maternity Ward shall be equipped with medicine refrigerators, medicine closets, and the like in order to store essential pharmaceuticals for pregnant women and inpatients.

Table 2-37: Main Equipment to be procured for Labour rooms

No.	Description	Quantity
4	Bedside locker	12
38	Hospital bed with IV stand	12
63	Overbed table	12

Source: prepared by the Survey Team

■ Delivery Room

The main equipment to be installed in the Delivery Room is as shown on the following table. Note that a Treatment Room shall be installed in the Delivery Room, and the room shall be equipped with a gynecological examination table, suction machine, sets of tools, and other essentials for performing discontinuation of pregnancy and other procedures.

Table 2-38: Main Equipment to be procured for the Delivery Room

No.	Description	Quantity
9	Caesarian instrument set	4
18	Delivery bed	5
19	Delivery instrument set	10
26	Episiotomy instrument set	3
29	Examination light	2
33	Height and weight scale for neonate	2
45	Instrument set for Ob/Gy	1
61	Neonatal resuscitation table	2
92	Vacuum extractor	2

Source: prepared by the Survey Team

■ Postnatal Care/Family Planning Room, Postnatal Care Consultation Room, Child Welfare Clinic (CWC)

The main equipment to be installed in the rooms of the Postnatal Care Department and the Child Welfare Clinic are as shown on the following table. Note that plans call for vaccine refrigerators, vaccine carriers, and other equipment of the Child Welfare Clinic to be transferred from existing facilities for continued use.

Table 2-39: Main Equipment to be procured for PNC Consulting Room and CWC

No.	Description	Quantity
12	Consultation desk and chair	3
27	Examination bed	3
33	Height and weight scale for neonate	2
46	Instrument set for PNC exam	1

Source: prepared by the Survey Team

■ Maternity Ward

Women who are pregnant and have contracted gestational toxicosis or infectious diseases such as tuberculosis are admitted to the Maternity Ward. Sudden births are possible; therefore, the ward shall be equipped with essential equipment for deliveries to a certain extent. The main equipment to be installed is as shown on the following table.

Table 2-40: Main Equipment to be procured for the Maternal Ward

No.	Description	Quantity
19	Delivery instrument set	2
24	ECG	1
28	Examination bed for Ob/Gy	1
30	Fetal doppler	3
38	Hospital bed with IV stand	44
90	Ultrasound scanner	1

Source: prepared by the Survey Team

■ Neonatal Intensive Care Unit (NICU)

The NICU is where care is provided, mainly by neonatal specialists (specialist nurses who have

studied neonatology for three years) to newborns born inside or outside the hospital. Like other kinds of nurses, neonatal specialists are not physicians. Therefore, the level of care they can provide is that of primary medicine; newborns whose conditions do not improve are referred to TTH. Note that six beds shall be installed in the Mothers' Room adjacent to the NICU, and that the newborns admitted to the NICU are breastfed by their mothers. The main equipment to be installed in the NICU is as shown on the following table.

Table 2-41: Main Equipment to be procured for the NICU

No.	Description	Quantity
3	Baby cot	7
5	Bilirubin meter	1
15	CPAP	1
33	Height and weight scale for neonate	1
41	Infant warmer	5
65	Patient monitor for neonate	1
67	Phototherapy unit	3
68	Portable suction machine	1
73	Resuscitation bag for neonate	4

Source: prepared by the Survey Team

■ Children's Ward

The main equipment to be installed in the Children's Ward is as shown on the following table. Young children are those between the ages of one and 14; because patients from a broad range of ages are admitted to this ward, plans call for the installation of both adult beds and children's beds with crib sides.

Table 2-42: Main Equipment to be procured for the Children's Ward

No.	Description	Quantity
12	Consultation desk and chair	1
20	Diagnostic set	1
27	Examination bed	1
38	Hospital bed with IV stand	12
66	Pediatric bed	22
74	Resuscitation bag for pediatrics	4
89	Ultrasonic nebulizer	1

Source: prepared by the Survey Team

■ Equipment to be Installed at District Hospitals

The main equipment to be installed at the three district hospitals targeted for installation (Savelugu Municipal District Hospital, Bimbilla District Hospital, and Kpandai District Hospital) are as shown on the following table.

Table 2-43: Main Equipment to be procured for District Hospitals

No.	Description	Savelugu Municipal DH	Bimbila DH	Kpandai DH
2	Autoclave	1	1	1
7	Blood bank refrigerator	1	1	1
18	Delivery bed	1	1	3
19	Delivery instrument set	2	2	2
24	ECG	1	1	1
62	OT table manual	1	1	1
64	Patient monitor for adult	1	1	1
79	Shadowless OT lamp, mobile	1	1	1

Source: prepared by the Survey Team

■ Regional Biomedical Engineering (BME) Department

The following tools and the like shall be provided for the maintenance of the equipment to be installed at TCH and district hospitals.

Table 2-44: Main Equipment to be procured for the Regional BME

No.	Description	Quantity
100	Maintenance tool set	3
101	Oscilloscope	2

Source: prepared by the Survey Team

2) List of Project Equipment

The list of Project equipment for target facilities is as shown on the following table.

Table 2-45: List of Project Equipment

Equipment for TCH

No.	Description	TOTAL	OPD Department	ANC	PNC / Family Planning / CWC	Laboratory	Operation Dept. / CSSD	Delivery Room	Labour Ward	Maternal Dept.	NICU	Pediatric Ward
1	Anesthesia machine with ventilato	2					2					
3	Baby cot	31								24	7	
4	Bedside locker	78							12	32		34
5	Bilirubin meter	1									1	
6	Blood bank centrifuge	1				1						
7	Blood bank refrigerator	1				1						
8	Blood cell counter	1				1						
9	Caesarian instrument set	4						4				
10	Chair	29	8	4		9				2	2	4
11	Clean linen storage cabinet	9					9					

No.	Description	TOTAL	OPD Department	ANC	PNC / Family Planning / CWC	Laboratory	Operation Dept. / CSSD	Delivery Room	Labour Ward	Maternal Dept.	NICU	Pediatric Ward
12	Consultation desk and chair	25	13	7	3					1		1
13	Couch	6									6	
14	Coagulometer	1				1						
15	CPAP	1									1	
16	Deep freezer	1				1						
17	Defibrillator	1					1					
18	Delivery bed	5						5				
19	Delivery instrument set	12						10		2		
20	Diagnostic set	21	15	5								1
21	Diathermy machine	2					2					
22	Dressing instrument set	1	1									
23	Drying machine	1					1					
24	ECG	1								1		
25	Electrolyte analyzer	1				1						
26	Episiotomy instrument set	3						3				
27	Examination bed	26	16	5	3					1		1
28	Examination bed for Ob/Gy	2		1						1		
29	Examination light	7	5					2				
30	Fetal doppler	7		4						3		
31	Glucometer	2		2								
32	Height and weight scale for adult	5	2	1	1							1
33	Height and weight scale for neona	6			2			2			1	1
34	Hemoglobin meter	1				1						
35	High pressure steam sterilizer M	1					1					
36	High pressure steam sterilizer S	1					1					
37	Hormone Analyzer	1				1						
38	Hospital bed with IV stand	56							12	32		12
39	Hot air sterilizer	1				1						
40	Incubator	1				1						
41	Infant warmer	5									5	
42	Infusion pump with IV stand	1					1					
43	Instrument cabinet	39	16	5	2		4	3		6	1	2
44	Instrument set for dilation and cur	2								2		
45	Instrument set for Ob/Gy	4		3				1				
46	Instrument set for PNC exam	1			1							
47	Instrument trolley	5			1		2			2		
48	Iron rack	4	2	1								1
49	IV stand	36					2					34
50	Kick bucket	2					2					
51	Laryngoscope	1	1									
52	Linen cart	2					2					
53	Major surgery instrument set	2					2					
54	Mayo instrument stand	2					2					

No.	Description	TOTAL	OPD Department	ANC	PNC / Family Planning / CWC	Laboratory	Operation Dept. / CSSD	Delivery Room	Labour Ward	Maternal Dept.	NICU	Pediatric Ward
55	Medicine cabinet	2	1									1
56	Medicine refrigerator	6	1			3		1				1
57	Medicine trolley	13	11							2		
58	Micropipette set	3				3						
59	Microscope	7				7						
60	Minor surgery instrument set	3					3					
61	Neonatal resuscitation table	4					1	2			1	
62	OT table manual	2					2					
63	Overbed table	56							12	32		12
64	Patient monitor	6	2				4					
65	Patient monitor for neonate	1									1	
66	Pediatric bed	22										22
67	Phototherapy unit	3									3	
68	Portable suction machine	2					1				1	
69	Preparation table with chairs	1					1					
70	Pulse Oximeter, finger type	3								3		
71	Recovery bed	2					2					
72	Resuscitation bag for adult	20	2				6	4		8		
73	Resuscitation bag for neonate	8						4			4	
74	Resuscitation bag for pediatrics	12	2				6					4
75	Revolving chair for episiotomy su	1						1				
76	Semi-auto Biochemistry analyzer	1				1						
77	Shadowless OT lamp, double arm	1					1					
78	Shadowless OT lamp, single arm	1					1					
80	Shaker/Mixer	2				2						
81	Spectrophotometer	1				1						
82	Sphygmomanometer	8	3							5		
83	Stretcher	5	2				1	1		1		
84	Suction unit	3	1				2					
85	Surgeon chair	2					2					
86	Syringe pump	6									6	
87	Table top centrifuge	2				2						
88	Thyroidectomy Instrument set	1					1					
89	Ultrasonic nebulizer	2	1									1
90	Ultrasound scanner	2		1						1		
92	Vacuum extractor	2						2				
93	Vein finder	1									1	
94	Washing machine	1					1					
95	Water distiller	1				1						
96	Wheel chair	5	2				1	1		1		
97	Xray film illuminator	11	10	1								
98	Laboratory stool	12				12						
99	Refrigerator for breast milk	1									1	
102	UPS	19	5	1		7	2	2		1	1	
103	AVR	57	5	4		19	3	3		4	17	2
104	AVR for OT	1					1					

District Hospital and BME

No.	Description	Total	BME	Savelugu Municipal DH	Bimbila DH	Kpandai DH
1	Anesthesia machine with ventilator	1				1
2	Autoclave for DH	3		1	1	1
7	Blood bank refrigerator	3		1	1	1
9	Caesarian instrument set	6		2	2	2
18	Delivery bed	5		1	1	3
19	Delivery instrument set	6		2	2	2
21	Diathermy machine	1				1
24	ECG	3		1	1	1
29	Examination light	3		1	1	1
30	Fetal doppler	4		2	1	1
59	Microscope	3		1	1	1
61	Neonatal resuscitation table	2		1		1
62	OT table manual	3		1	1	1
64	Patient monitor	3		1	1	1
67	Phototherapy unit	1		1		
79	Shadowless OT lamp, mobile	3		1	1	1
84	Suction unit	2		1		1
91	Ultrasound scanner, portable	2		1		1
100	Maintenance tool set	3	3			
101	Oscilloscope	2	2			
102	UPS	4		1	1	2
103	AVR	28		11	7	10

3) Basic Specifications of Project Equipment

■ Specifications of Project Equipment

The following table shows the basic specifications of high-value (roughly 1 million JPY or more) Project equipment.

Table 2-46: Specifications of Major Equipment

No.	Description	Main specifications
1	Anesthesia machine with ventilator	Composition: main unit, vaporizer, anesthetic ventilator, standard accessories, N2O gas bottle, UPS Specifications: type: low flow anesthesia; flowmeter: flow range (O2) / flow range (N2O): 0.1 – 10L/min. or wider; gas pressure gauges: with alarms on lower supply pressure of O2, on lower concentration of O2, with O2 flush system; cylinder holder: 2 gas cylinders mountable; vaporizer: sevoflurane and isoflurane; mountable vaporizer: 2 vaporizers, selectable (interlock type); canister: single or double camber, 1,200 ml or more
8	Blood cell counter	Main composition: main unit, power cord, waste fluid tank Main specifications: mode: fully automatic; parameters: at least 18 parameters: WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, LYM%, NE%, PDW, MPV or more; sample volume: less than 50 micro liters for whole blood
9	Caesarian instrument set	Backhaus towel clamp, 130mm：10 Obstetric forceps, Wrigley, 280mm：2 Artery forceps, curved, 150mm：10 Artery forceps, curved, 180mm：2

		Dressing forceps, straight, 1x2, 180mm：4 Dressing forceps, straight, plain, 180mm：4 Peritoneum forceps, Green Armytage, 210mm：12 Sponge holding forceps, 240mm：10 Allis tissue forceps, 4x5 teeth, 150mm：4 Littlewood tissue forceps, 190mm：6 Surgical blade handle No.4：4 Mayo needle holder, 180mm：4 Doyen retractor：4 Langenbeck retractor：2 Morris retractor, 51mm：2 Mayo scissors, curved 180mm：2 Mayo scissors, straight 180mm：2 Spencer ligature scissors：2 Sterilizing case, 360 x 300 x 100mm：1
14	Coagulometer	Main composition： main unit, printer Main specifications： PT, APTT, Fib, TT, or more; sample volume: 25 ul or less; display: LCD; testing time: less than 420 seconds; memory: 100 tests or more; printer: built-in printer
23	Drying machine	Main composition: main unit, AVR Main specifications: drum capacity: 20 kg or more; heating type: electric; drum material: stainless steel; drying program: set by control panel
25	Electrolyte analyzer	Main composition: main unit Main specifications: measurement method: fully automatic; parameters: Na+, K+, Cl-, or more; sample type: whole blood, urine, serum, plasma; throughput: 60 samples / hour or more; sample applicable: syringe, cup or tube; calibration: fully automatic; printer: equipped
35	High pressure steam sterilizer M	Main composition: main unit, water softener, sterilization drums (L, M) Main specifications: type: sliding or swing single door: capacity: 250L or more; material (inside, lid): stainless steel SUS304; material (outer): steel or enamel coating
36	High pressure steam sterilizer S	Main composition: main unit, water softener, sterilization drums (L, M) Main specifications: type: sliding or swing single door: capacity: 150L or more; material (inside, lid): stainless steel SUS304; material (outer): steel or enamel coating
37	Hormone analyzer	Composition: main unit, data management console, barcode reader, waste fluid collection tank Main specifications: throughput: 60 tests / hour; measuring parameter: TSH, T3, T4, PSA, FSH, LH, prolactin, progesterone, estradiol, testosterone, cortisol or more; sample volume: 125μl or less
41	Infant warmer	Main composition: main unit, accessories (skin temperature probe, neonatal temperature detection thermistor probe, probe pad (80 pcs. / box) Main specifications: control system: servo and manual; features: resuscitator equipped including oxygen blender; skin temperature control: 35.0 – 37.5℃ or wider (0.1℃ increment); skin temperature display: 32.0 – 40.0℃ or wider
53	Major surgery instrument set	Standard scissors, straight, S/B, 145mm: 1 Mayo scissors A, straight, 170mm: 1 Mayo scissors B, curved, 170mm: Metzenbaum scissors A, curved, 180mm: 1 Metzenbaum scissors B, curved, 230mm: 1 Wire suture scissors, angular, 120mm: 1 Mosquito forceps, curved, 125mm: 12 Crile forceps A, curved, 140mm: 18 Crile forceps B, curved, 160mm: 12 Pean forceps, curved, 160mm: 12

		Ochsner forceps A, straight, 160mm: 6 Ochsner forceps B, straight, 200mm: 4 Towel clip forceps, 130mm: 1 etc.
60	Minor surgery instrument set	Surgical knife blade No 11, 100 pcs/box: 1 Surgical knife blade No 21, 100 pcs/box: 1 Surgical knife handle No.3: 1 Surgical knife handle No.4: 1 Retractor, one prong: 1 Double ended curette: 1 Probe: 1 Grooved probe: 1 Dressing forceps: 1 Tissue forceps, 1x2: 1 Operating scissors, straight:1 Operating scissors, curved: 1 Kocher hemostatic forceps, 145mm: 1 Mathieu needle holder: 1 Suture needle: 1
62	OT table manual	Main composition: main unit (mattress), accessories (arm rest, shoulder support, anesthesia screen, body support, knee crutch, IV pole with clamp, X-ray cassette holder) Main specifications: elevation: oil hydraulic; tabletop dimensions (overall): 1,900 - 2,130mm x 500 - 590mm; elevation range: 770 - 950mm or wider; Trendelenburg: 25° or more; reverse Trendelenburg: 25° or more
76	Semi-auto biochemistry analyzer	Main composition: main unit Main specifications: main unit: shape: desktop; reagent: open system; assay procedure: semi-automatic; measurement: EPA, time fixed, kinetic, bio-chromatic; throughput: 30 tests / hour or more; reaction disk 25 - 37℃; wavelength: 340 – 620nm or more
77	Shadowless OT lamp, double arum	Main composition: spindle + radial arm assembly, main lamp, sub lamp, support tube and suspension arms, sterile handle, wall panel Main specifications: main lamp: light type: LED; LED number: 80 or more; light intensity: 140,000 lux or more; sub lamp: light type: LED; LED number: 70 or more; light intensity: 100,000 lux or more
78	Shadowless OT lamp, single arm	Main composition: spindle + radial arm assembly, main lamp, support tube and suspension arms, sterile handle, wall panel Main specifications: main lamp: light type: LED; LED number: 80 or more; light intensity: 140,000 lux or more
79	Shadowless OT lamp, mobile	Main composition: main unit Main specifications: type: mobile stand type; light source: LED; LED number: 70 or more; light intensity: 100,000 lux or more
88	Thyroidectomy instrument set	Surgical knife blade set: 1 Surgical knife handle: 1 Standard operating scissors, 14 cm, straight: 2 Standard operating scissors, 14 cm, curved: 2 Mayo operating scissors, 14 cm, curved: 2 Metzenbaum scissors, 14 cm: 2 Dressing forceps, 13 cm: 2 Tissue forceps, 13 cm: 2 Universal dressing forceps, 19cm, operation center type: 2 Dressing forceps for blood vessel, 15 cm, operation center type: 1 Mathieu needle holder, 19cm: 2 Mathieu needle holder, 19cm with diamond tip: 2 Backhaus towel forceps: 12 Tokyo univ. type forceps: 2 Tube forceps: 1

		Probe: 1 Retractor, 2 prong, blunt, pair: 1 etc.
90	Ultrasound scanner	Main composition: main unit, convex transducer, transvaginal transducer, printer, foot switch and cart, UPS or built-in battery Main specifications: beam holder: digital; scanning modes: electronic convex, linear; display modes: B, B/B, M, B/M, B/D, CFM(B) or CWD/PWD; monitor: LCD, 12 inches or more; transducer connector: for 3 or more.
91	Ultrasound scanner, portable	Main composition: main unit, convex transducer, printer, foot switch and cart, UPS or built-in battery Main specifications: beam holder: digital; scanning modes: electronic convex, linear; display modes: B, B/B, M, B/M, B/D, CFM(B) or CWD/PWD; monitor: LCD, 10 inches or more; transducer connector: for 3 or more
94	Washing machine	Main composition: main unit Main specifications: drum capacity: 40kg or more; max. speed: 525 rpm or more; dehydration function: equipped; boiler: electric steam boiler built-in

■ Replacement Parts, Reagents, and Consumable Parts of Project Equipment

At least roughly three months are required for TCH and the district hospitals within the scope of cooperation to establish supply routes for essential parts for scheduled inspections and essential consumable parts for day-to-day operations. In addition, under the soft component, guidance will be provided as to methods of calculating budgets for equipment maintenance, but it will probably take roughly one year after handover to formulate and execute the budgets based on the guidance. Therefore, regarding the cycle of replacement parts, the plan calls for one year's worth of replacement parts recommended by the manufacturers. In addition, the plan calls for enough consumable parts for the first four months after the granting of equipment.

■ Countermeasures for Voltage Variation

As a result of measurements of voltage variation at each facility, automatic voltage regulators (hereinafter referred to as "AVR") to prepare for sudden power outages or voltage variations, or uninterruptible power supplies (hereinafter referred to as "UPS") shall be attached to essential equipment. In addition, emergency generators shall be installed on the construction side, and generator circuits shall run through the Theaters, the Delivery Room, and the like.

■ Countermeasures for Water Quality

The water at target facilities is hard; therefore, plans call for water softeners that correspond to the water quality to be attached to the high-pressure steam sterilizers.

2-2-3 Outline Design Drawings

(1) Building Layout Plan

(2) Ground Floor Plan

(3) 1st Floor Plan

(4) Roof Plan

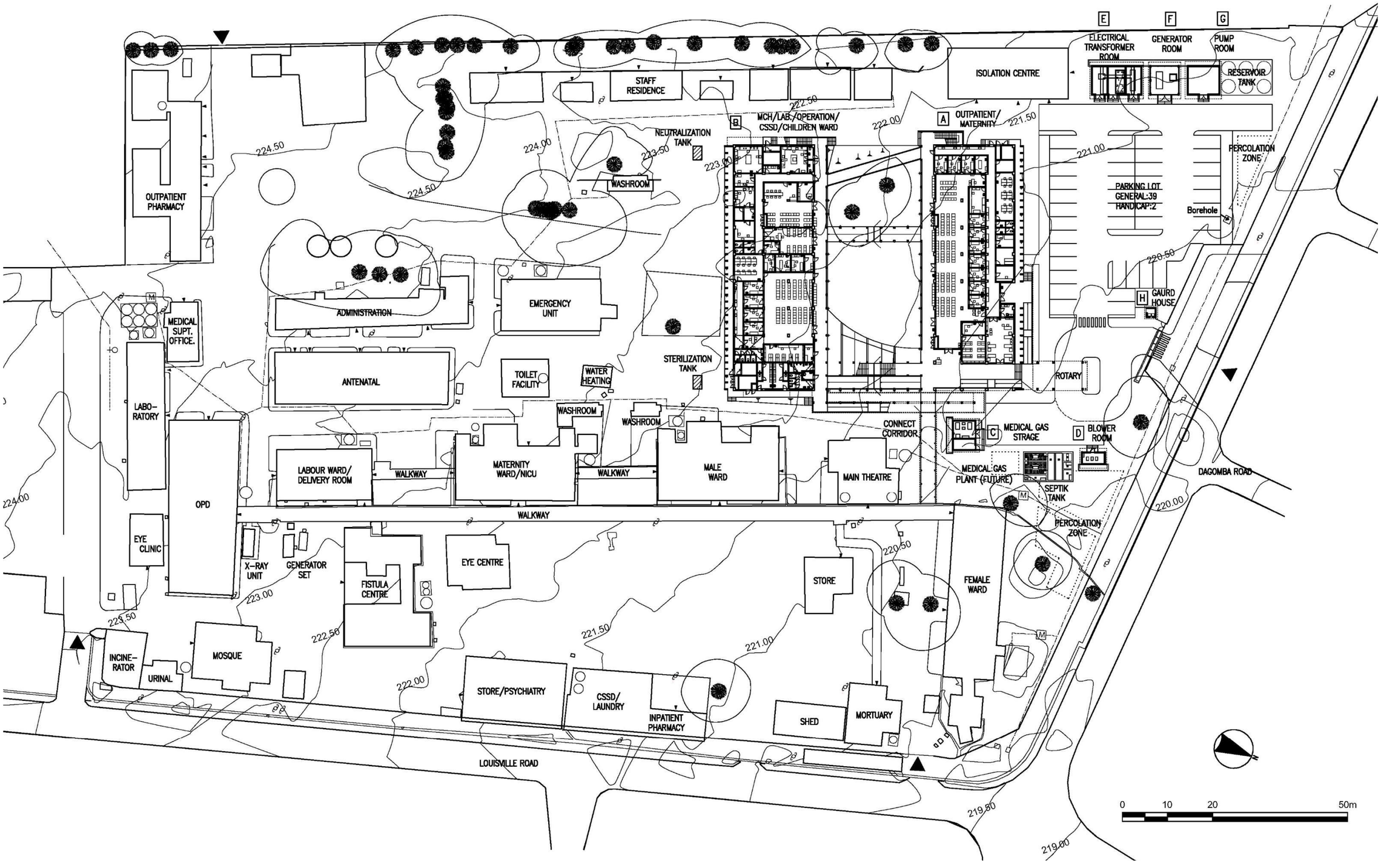
(5) Elevations

(6) Cross Sections

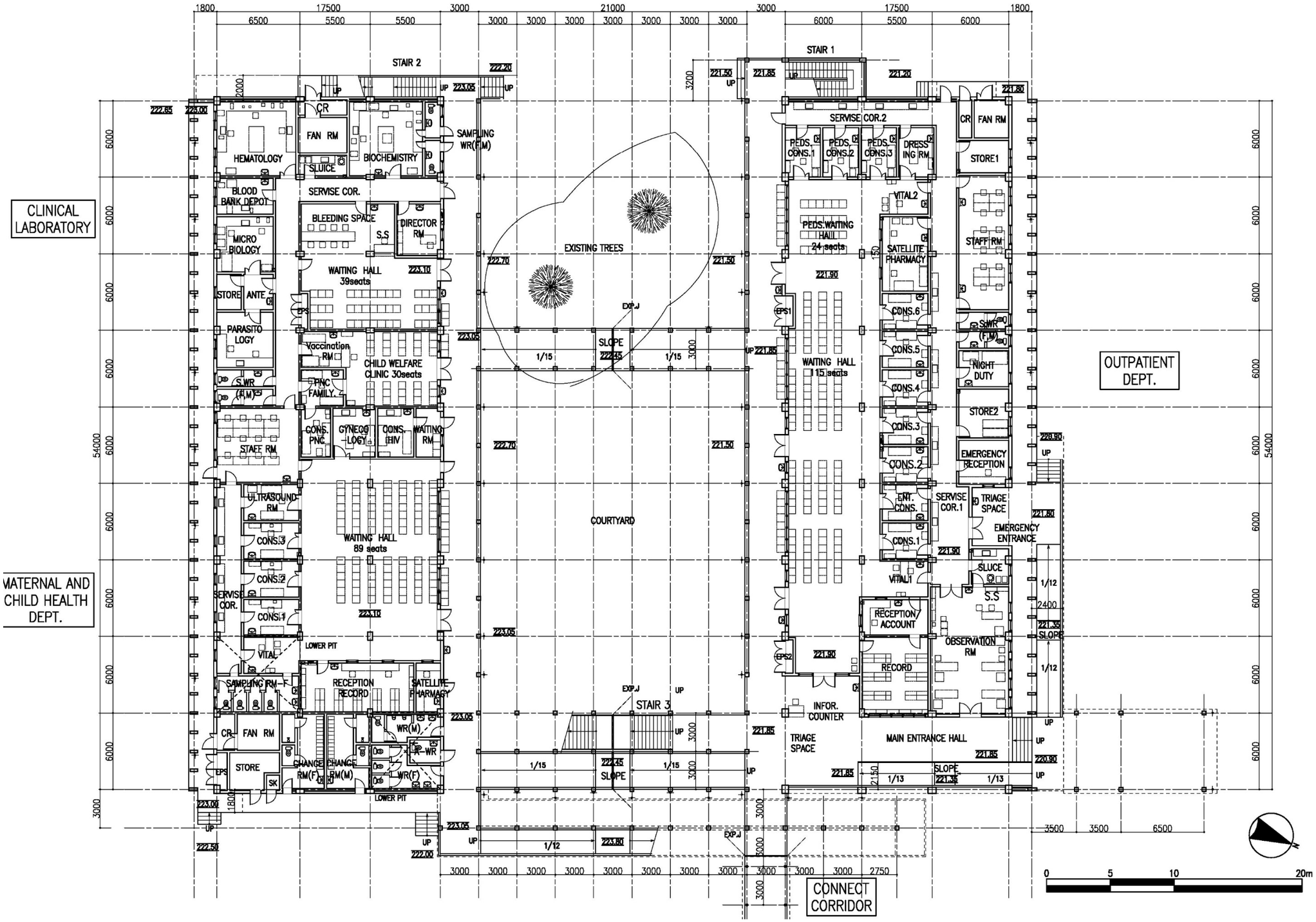
(7) Annex Buildings (Electrical/Transformer Room, Generator Room, PumpRoom/Reservoir Tank)

(8) Annex Buildings (Medical Gas Strage, Guardhouse, Blower Room)

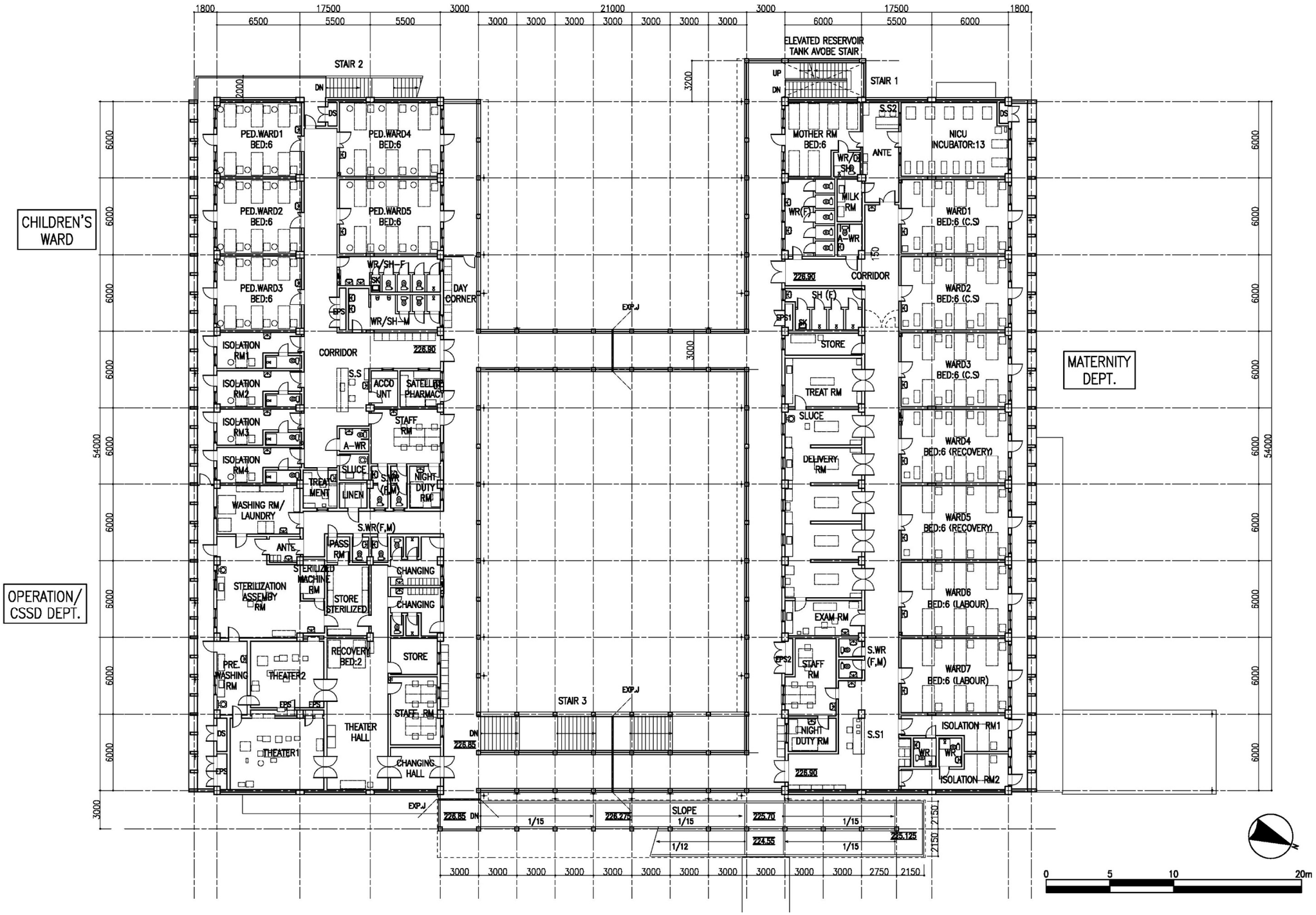
(1) Building Layout Plan



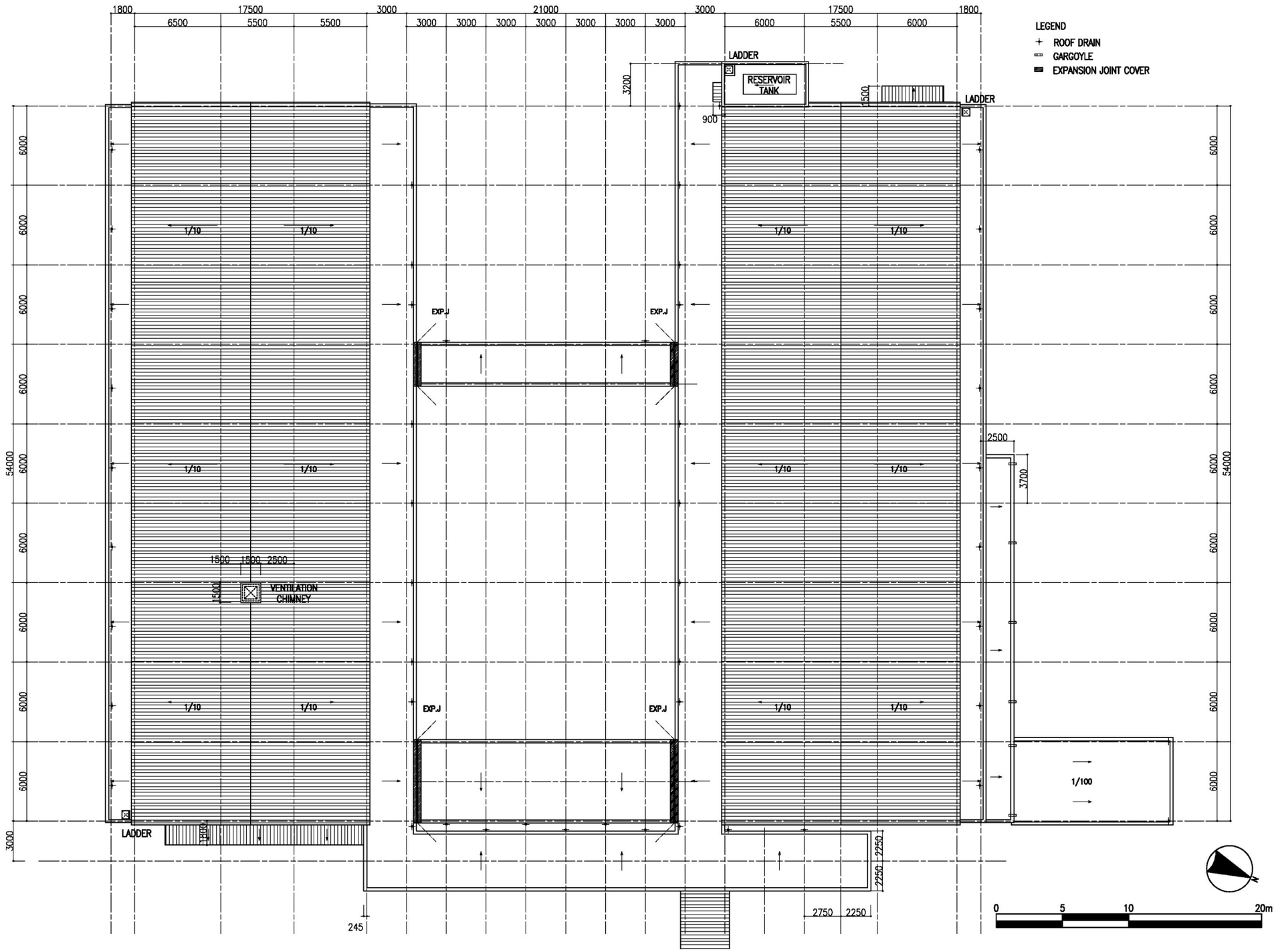
(2) Ground Floor Plan



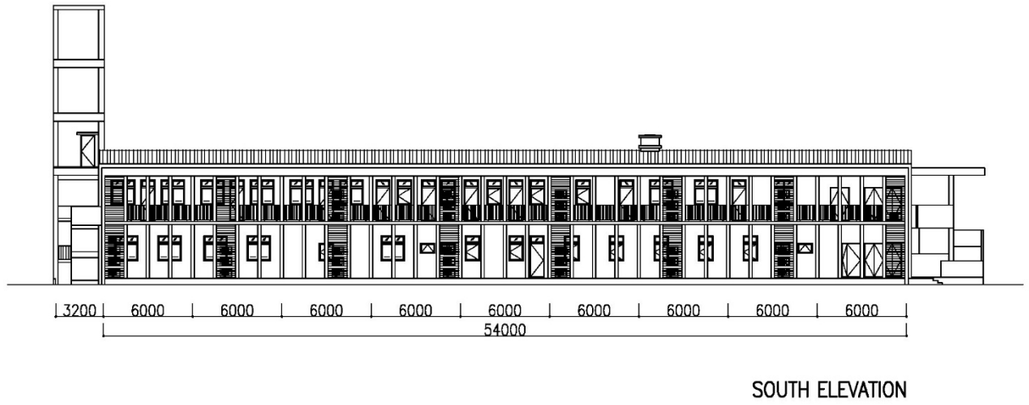
(3) 1st Floor Plan



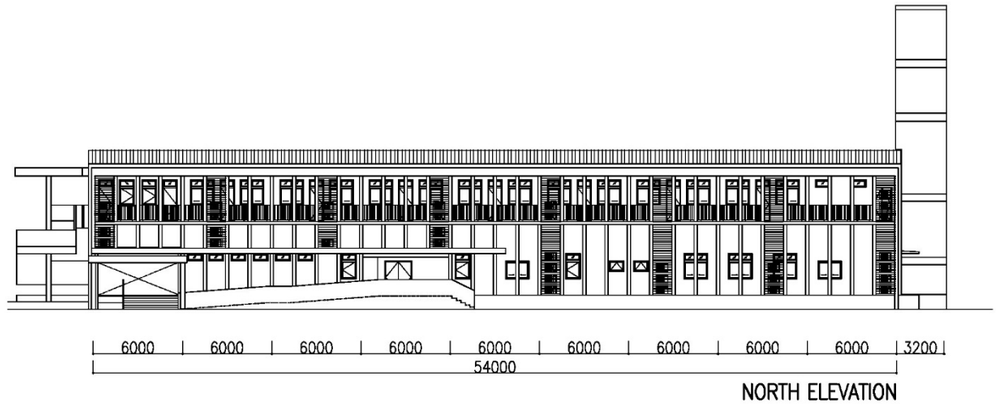
(4) Roof Plan


LEGEND
ROOF DRAIN
GARGOYLE
EXPANSION JOINT COVER
LADDER
RESERVOIR TANK
LADDER
VENTILATION CHIMNEY
EXP.J
EXP.J
EXP.J
EXP.J
LADDER
1/10
1/100
1800
17500
3000
21000
3000
17500
1800
6500
5500
5500
3000
3000
3000
3000
3000
3000
3000
6000
5500
6000
3200
900
1500
2500
3700
1500
1500
1500
2500
2250
2250
2750
2250
245
54000
6000
3000
0
5
10
20m

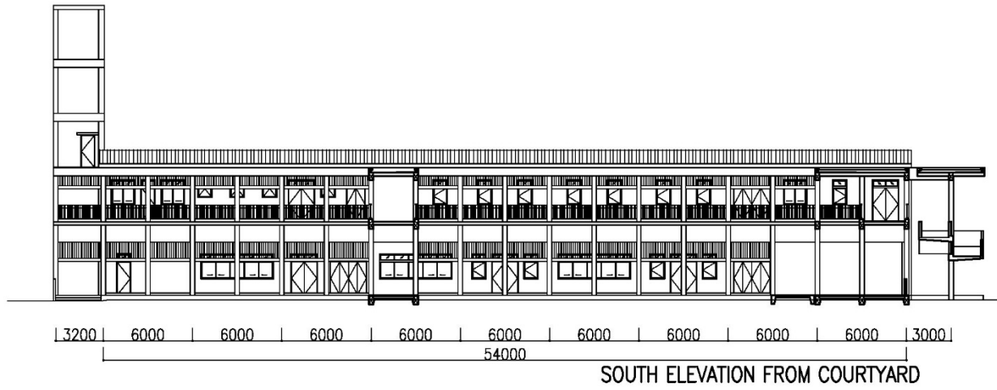
(5) Elevations



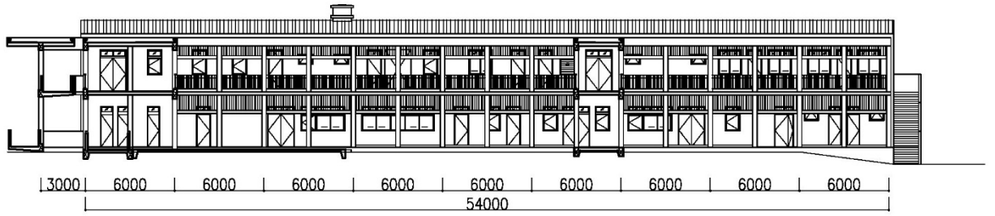
SOUTH ELEVATION



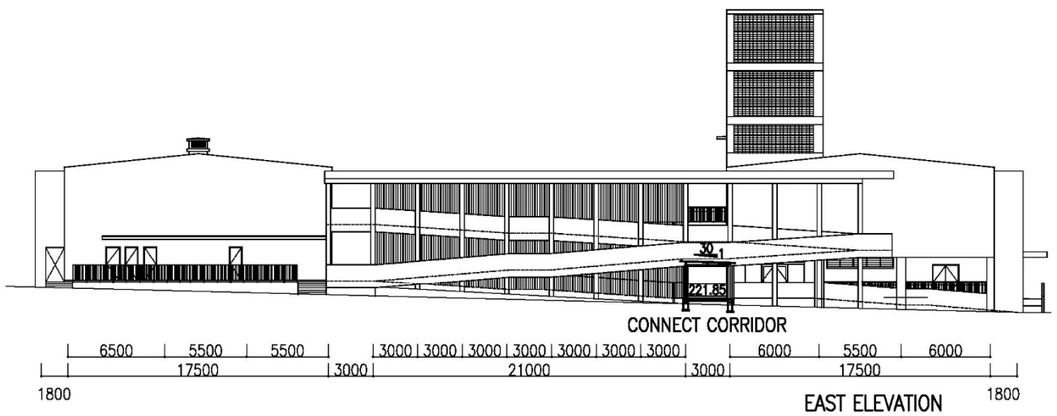
NORTH ELEVATION



SOUTH ELEVATION FROM COURTYARD

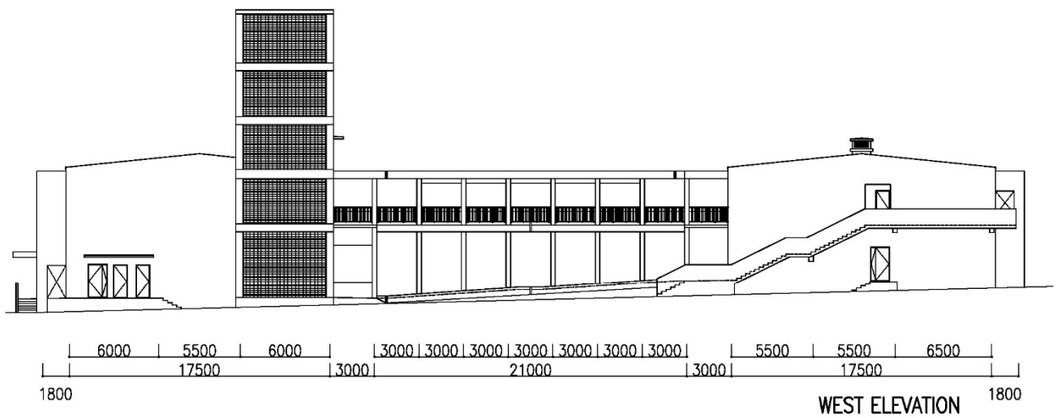


NORTH ELEVATION FROM COURTYARD



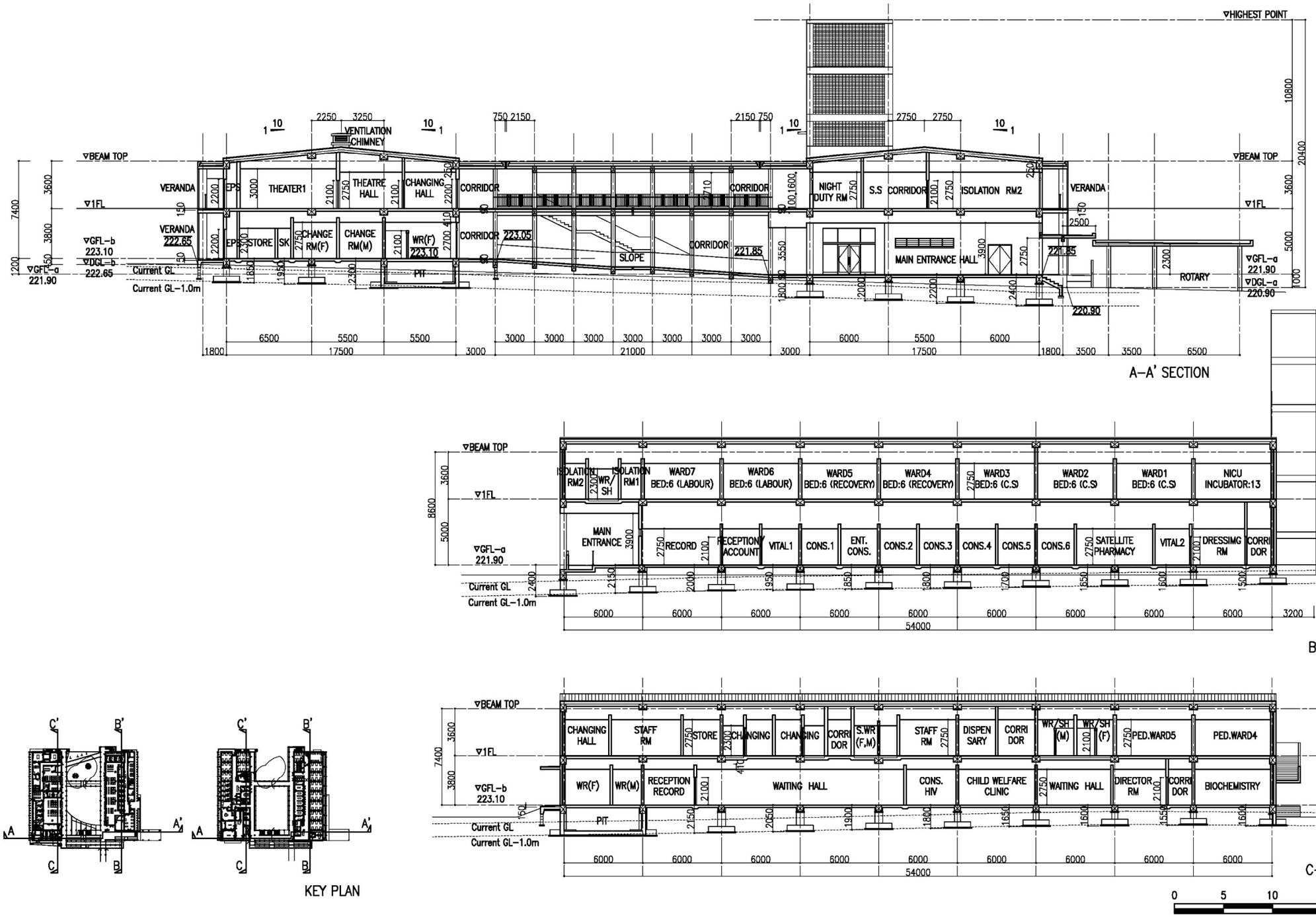
CONNECT CORRIDOR

EAST ELEVATION

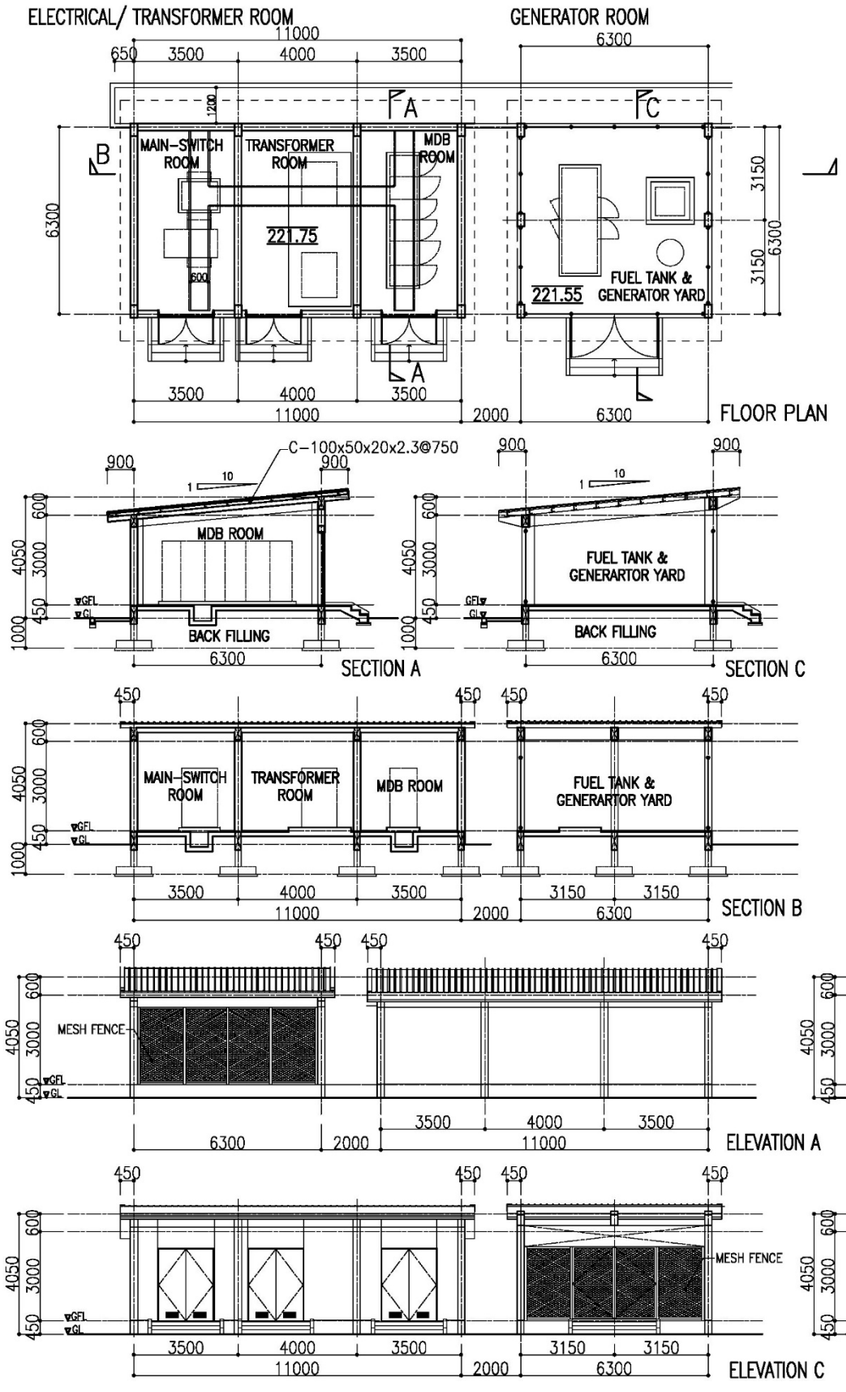


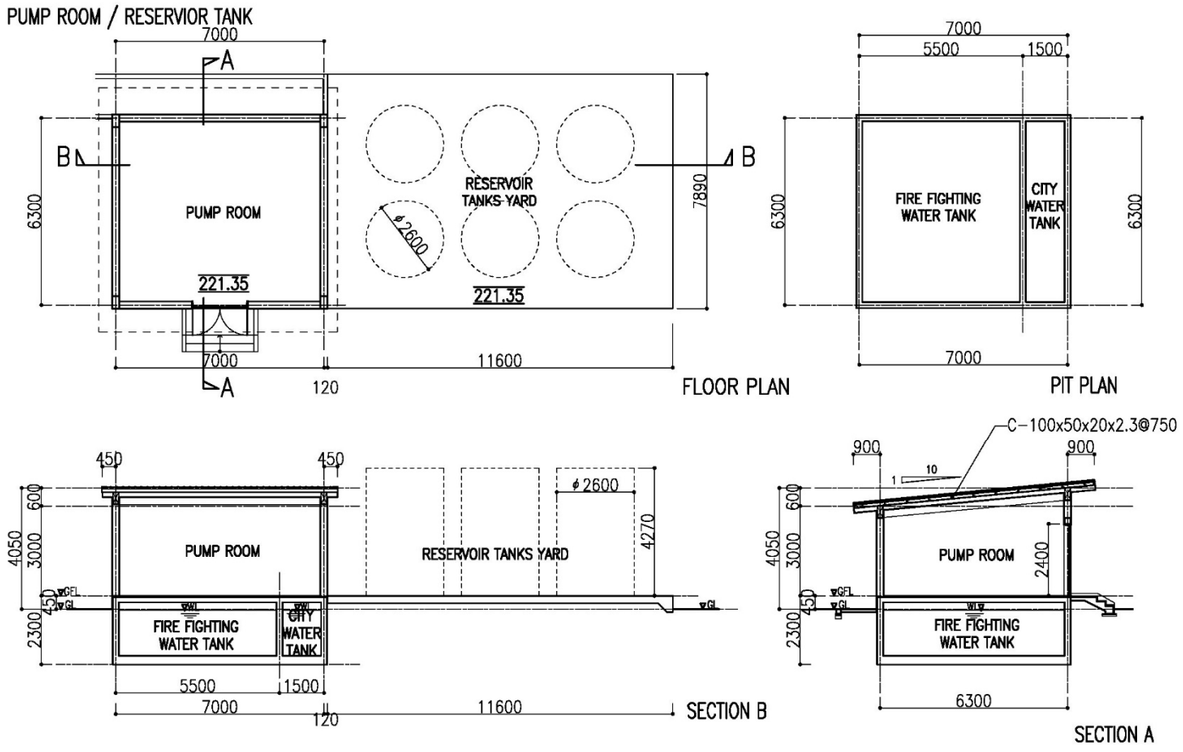
WEST ELEVATION

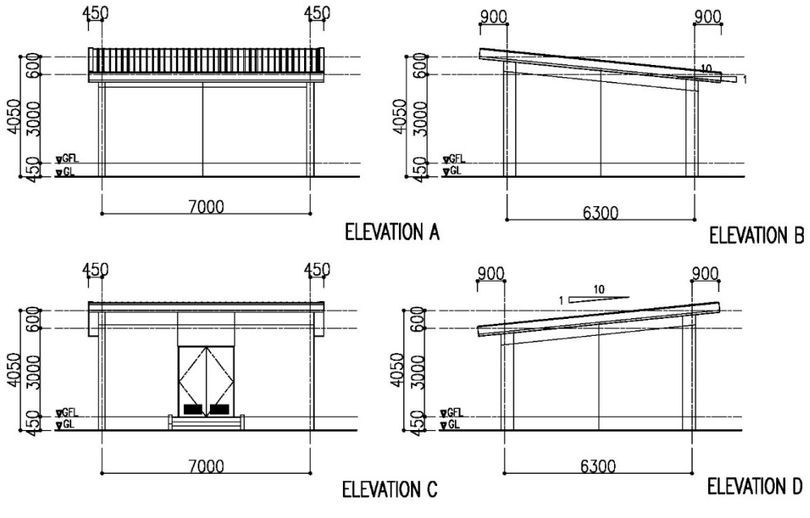
(6) Cross Sections



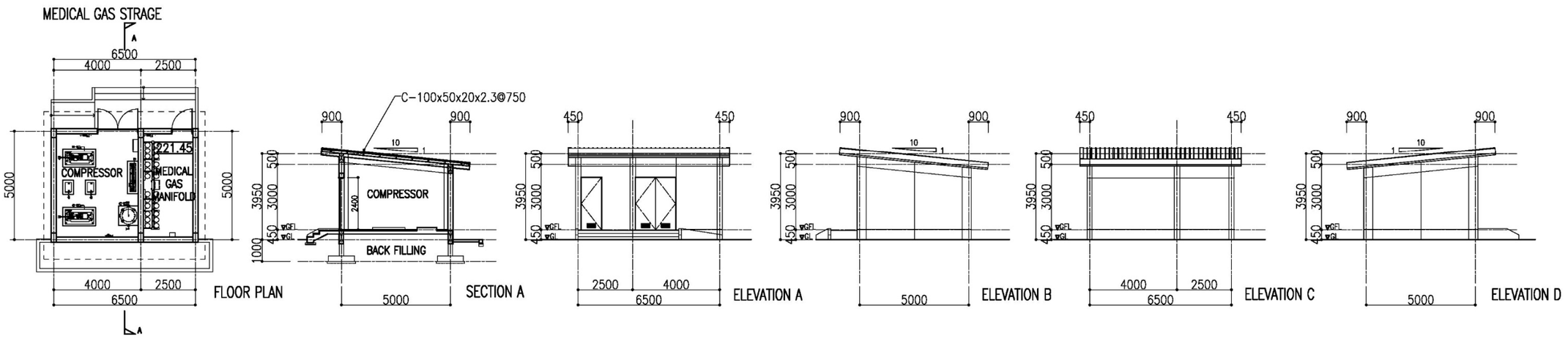
(7) Annex Buildings (Electrical/Transformer Room, Generator Room, PumpRoom/Reservoir Tank)

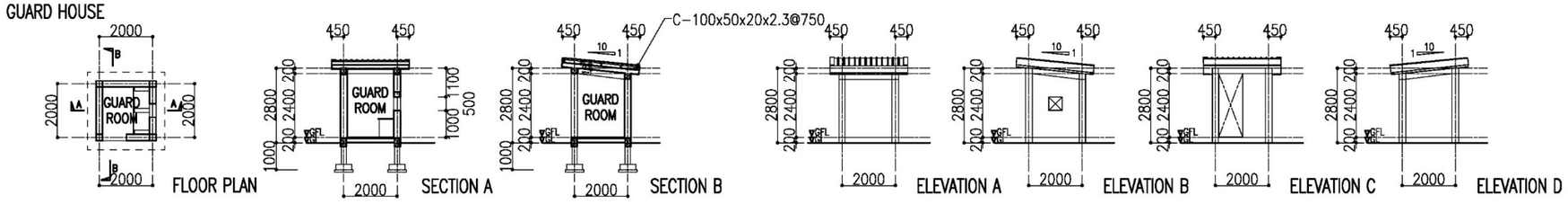


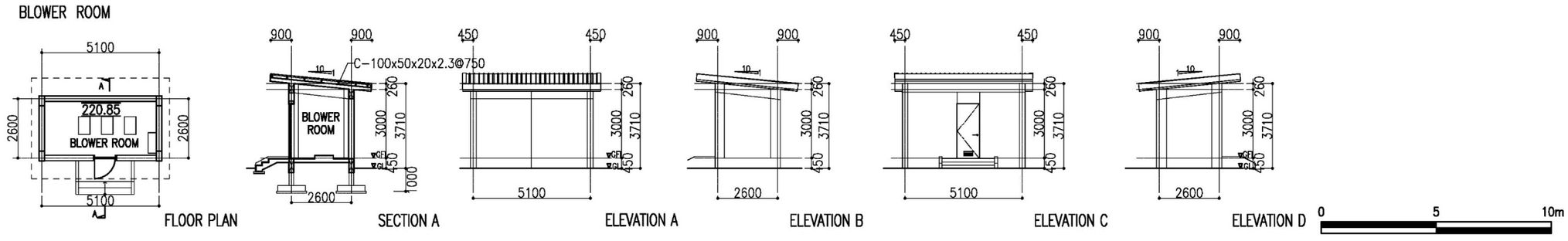




(8) Annex Buildings (Medical Gas Strage, Guardhouse, Blower Room)







2-2-4 Implementation Plans

2-2-4-1 Implementation Policies

(1) Basic Policies for Project Implementation

The Project will be implemented in accordance with the Japanese government's grant aid framework after concluding the process of Japanese government cabinet decision, signing of the Exchange of Notes (E/N) between the two governments, and entering into the Grant Agreement (G/A). Upon concluding these matters, the Government of Ghana and a Japanese consulting firm will enter into a contract and the detailed designs for facilities and equipment will be implemented. Once the detailed design drawings and bidding documents have been completed, a competitive bid will be held among Japanese companies able to meet predetermined qualifications, and then facilities construction and equipment procurement will be carried out separately in accordance with the construction and equipment procurement contract concluded between the selected company and the Government og Ghana.

(2) Project Implementation Structure

1) Implementation Structure in Ghana

The MOH is the executing ministry of the Project. The MOH, as the executing agency, is responsible for the monitoring and supervision of the project implementation and beneficiary agency. The beneficiary agency is the GHS, which is responsible for coordinating with the relevant authorities to ensure smooth implementation and for the use and maintenance of the facilities and equipment after the completion of the Project. The MOH will organize a Project Implementation Unit (hereinafter referred to as "PIU") consisting of key stakeholders to manage the Project. The members of the PIU will be the MOH, GHS, and the Ministry of Finance. The PIU is responsible for organizing the demolition and removal of existing buildings and the installation of power and water supply systems, and also responsible for obtaining the necessary permits, gaining consent from relevant organizations, and other matters. The Ministry of Foreign Affairs and Regional Integration (MFARI) is in charge of concluding the official Exchange of Notes between the two governments to implement the Project.

2) Japan International Cooperation Agency (JICA)

The Japan International Cooperation Agency (JICA) will conclude a G/A with the Ghana side organization and supervise implementation of the Project to ensure it is properly implemented in accordance with Japan's grant aid system.

3) Consultant

In accordance with the Design and Supervision Agreement concluded with the Ghana side executing agency, The Consultant shall provide detailed designs for the facilities and equipment, and supervise construction and procurement based on the contents of this report. The Consultant will also prepare bidding documents, provide support for the selection of construction and procurement companies, and conclude contracts for construction work and equipment procurement. To carry out these tasks efficiently, the Consultant will work in cooperation with the executing agency in Ghana, and dispatch the required supervising engineers to the worksite during the construction and procurement period.

4) Construction/Procurement Companies

A Japanese construction company and equipment procurement company will be selected through a competitive bidding process. These companies will carry out construction work, equipment procurement, and installation within the project implementation period in accordance with the contract concluded with the Ghana side executing agency. The construction company shall establish an efficient construction system locally in Ghana that is appropriate for both the scale and content of the project.

5) Project Implementation Structure

The figure below shows the relationship between each organization and the system for carrying out the project at the project implementation stage.

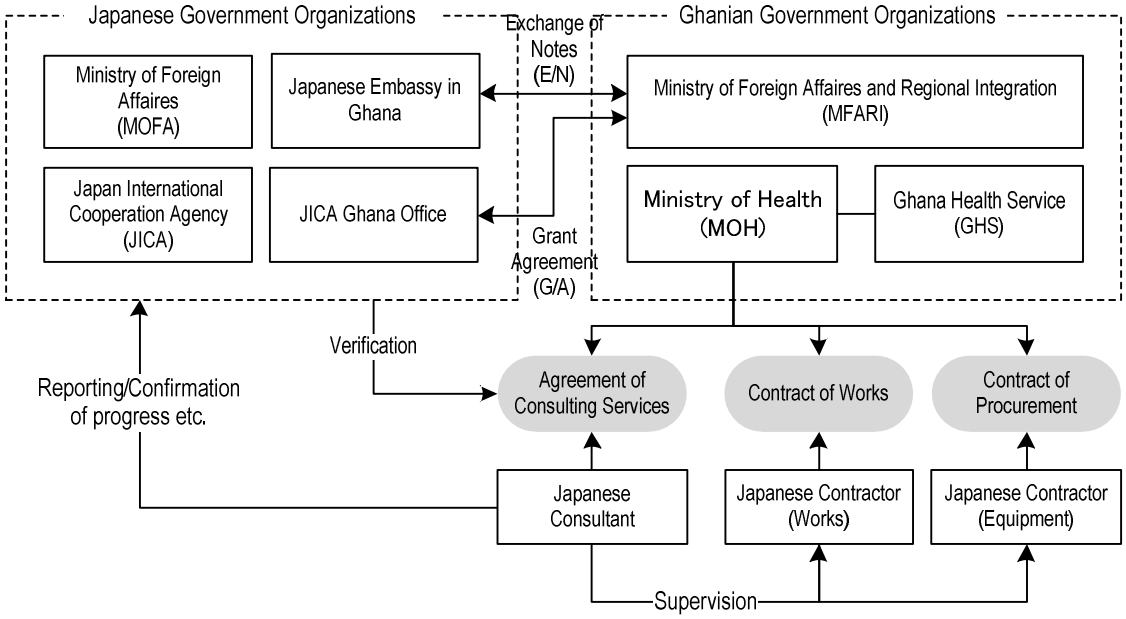


Figure 2-21: Implementation Structure of the Project

2-2-4-2 Implementation Condition

(1) Tax exemption procedures

1) Value Added Tax (VAT)

In Ghana, the refund method will be adopted for VAT exemption. To receive this tax exemption, a master list of eligible items and quantities must be submitted and approved by the National Cabinet. The process for submitting the application is as follows: the GHS is the receiving office, and then the MOH forwards the application to the Ministry of Finance, which in turn forwards it to the Ghana Revenue Authority (GRA) for approval. The GRA will then review the master list. After the GRA completes its review, the master list is submitted to the Cabinet, and next it's sent to the National Cabinet for approval. Because it takes time to obtain approval from the Cabinet, the master list must be prepared with due care to avoid any rework.

2) Customs duties

As with the value-added tax, approval by the Cabinet is required to obtain tax exemption for customs duties. However, due to the time it takes to complete the procedure, it is assumed that imported goods will arrive before approval in some cases. In such cases, under the Customs Act 2015, the contractor can pay the customs duties in advance and be reimbursed after approval. The department responsible for the procedure is the Customs Department.

3) Other

In addition to the above, the Japanese company to which the Project is consigned will be exempt from corporate and income taxes in Japan. However, as fuel tax is not exempted, due caution is necessary.

(2) Important considerations regarding equipment procurement

1) Considerations regarding equipment and material transportation routes and transport methods

Equipment and materials to be procured overseas will be unloaded at Tema Port, inspected by customs, and then transported overland to Tamale City. The distance from Tema Port to Tamale City is around 600 km, however, the roads are well maintained and should be no problem for transporting with 40-foot containers. To facilitate timely equipment installation after facility construction is complete, a container storage area for the equipment will be established in a corner of the construction site, and all the equipment will be transferred to this area before the completion of the facility.

2) Construction of facilities for equipment installation

Facility construction work for equipment installation in the Project includes a three-phase power supply system for the high-pressure steam sterilizers installed in the cleaning and sterilization room, water supply and drainage system (including high-temperature drainage), an exhaust system, and hardware installation for the ceiling-suspended shadowless lamps in the operating theater. These items to be prepared for the facility will be indicated as bidding conditions, and the submission of documents necessary for the work will be requested immediately after the equipment contract is concluded.

2-2-4-3 Scope of Works

The Project will be implemented through cooperation between the Government of Japan and the Government of Ghana in accordance with the grant aid system of the government of Japan. Details of the work allocated to each country is listed below.

Table 2-47: Scope of Works

		Work to be covered by the Japan side	Work to be covered by the Ghana side
Site		▪ None	▪ To secure the planned construction site ▪ To dismantle and remove obstacles to construction, such as the children's ward (Including underground installations) ▪ To cut down or remove the roots that may interfere with construction ▪ To clear the land prior to construction start
Exterior construction		▪ To construct the pavement, drainage, and perimeter walls to be produced in the facility's construction ▪ To install plumbing from the receiving tank to elevated water tank To bury power cables from the substation room to each building	▪ To plant trees and plants on the site ▪ To construct the off-premise paving and drainage facilities to be produced in the facility's construction
Infrastructure	Power	▪ To construct the substation room as well as electrical equipment including conduits and wiring after the section switch ▪ To install an emergency generator	▪ To construct the power grid connection to the section switch and install a power meter
	Water supply	▪ To install the water supply piping and equipment from the receiving tank to each distribution point	▪ To construct the connection of city water supply to the receiving tank ▪ To perform well drilling work (pumps and piping will be provided by the Japan side)

	Drainage	▪ To perform general drainage work, including septic tank facilities	▪ To construct the drainage pipe connection from the last basin on premises to the drainage ditch
	Telephone system	▪ To install the main switchboard and subsequent conduit and wiring (includes telephone switchboard (PABX), phone outlets, and the telephone equipment itself)	▪ To handle the telephone line lead-in work of telephone line to the main switchboard
	Internet	▪ To install routers and the subsequent conduit and wiring for the LAN system. (includes switching hubs and LAN outlets)	▪ To install ADSL modems and lead-in wire to the router ▪ To connect systems to the existing internal network
Medical Gas	Oxygen	▪ To install piping from manifold to outlet	▪ To supply oxygen cylinders
Fixtures and equipment		▪ To install curtain rails ▪ To procure medical curtains	▪ To procure window curtains ▪ Furniture such as desks and chairs for staff rooms
Equipment		▪ To procure and install medical equipment	▪ To remove existing equipment from district hospitals ▪ To install power supplies for equipment as needed

Source: Prepared by the Survey Team

2-2-4-4 Consultant Supervision

(1) Basic Supervision Policy

Based on the framework of Japan's grant aid and purpose of the Outline Design, the Consultant will implement the work in a consistent manner from detailed design to bidding, construction and procurement supervision, and handover. In supervising the construction and procurement processes, the Consultant will maintain close communication with, and report to, the government agencies of both countries, and provide prompt and appropriate advice to those involved in construction and procurement in order to ensure that facilities and equipment achieve the prescribed quality according to contract documents, and are completed without delays.

(2) Construction Supervision System and Tasks

To ensure that construction is properly supervised, the Consultant shall dispatch a Japanese architectural engineer to Ghana to serve as a resident supervisor during the entire construction and procurement period. This person shall perform the services listed below. In addition, due to the need for supervision to respect local customs and social conditions, the plan shall include hiring an architectural engineer who is familiar with local conditions as an assistant engineer that assists the resident supervisor. In Japan, engineers in charge of architectural, structural, electrical, mechanical, and equipment fields will also be assigned under the general manager to supervise the entire project, communicate and coordinate with relevant organizations in Japan, and provide support to the resident

supervisor, who will share supervision duties such as the inspection of materials and equipment procured in Japan. The plan shall also include technical experts who are dispatched short-term at key points in construction supervision based on progress of the work to observe on-site inspections and provide construction guidance.

- Check and approve the construction plan, work plan, construction material and equipment procurement plan, and quality control plan submitted by contractors. Also provide guidance, advice, and adjustments as necessary.
- Check and approve the contents of construction drawings, manufacturing drawings, samples, etc. submitted by contractors.
- Interpret the contract drawings and specifications, and issue instructions based on them.
- Conduct factory inspections of construction materials procured under the Project; conduct pre-shipment inspections of equipment and materials; and check the inspection reports.
- Inspect materials, workmanship, dimensions, and quantities to ensure they are as specified in design drawings. Also, as necessary, be present at inspections during the manufacturing of building materials, and provide guidance and advice to construction contractors to ensure quality and performance.
- Check the safety plan prepared by the construction/procurement contractor, verify that safety measures are being implemented on site to ensure safety during construction, and provide guidance and advice as necessary.
- Mediate disagreements, disputes, or conflicts that arise in construction work between the client and a contractor.
- Make revision suggestions and adjustments to the construction/procurement contract as necessary.
- If a design change becomes necessary, perform the necessary procedures in accordance with JICA guidelines (Guidelines for the Employment of Consultants).
- Inspect construction work, which are milestones for interim payments, and issue the completion certificates required for the payment with the approval of the client.
- Participate in discussions between the client and contractor, and provide necessary advice.
- Monitor the overall process and progress of construction at the site, provide advice and guidance to the contractor as necessary, and periodically report on the progress to relevant organizations in both countries.
- Track the progress of the items assigned to the Ghana side and provide necessary advice and support.
- Conduct inspections upon work completion, attend the handover of facilities, and verify guidance provided by the contractor regarding operation and maintenance.

(3) Procurement Supervision System and Tasks

The main tasks of equipment procurement supervision are as below.

- Meeting with equipment suppliers and verifying equipment manufacturing drawings (in Japan): Verify the procurement and manufacturing plans of equipment suppliers, and check the validity of related documentation including manufacturing drawings and manufacturing schedules.
- Pre-shipment inspection (Japan): Verify shipping preparations with suppliers, and coordinate schedules for pre-shipment equipment inspections to be conducted by a third-party inspection organization, etc.
- Pre-shipment equipment comparison inspection (Japan and third country): Compare the product against the product inspection certificate at the factory packing warehouse. After the components and accessories have been checked and externally inspected and the product has been packaged and ready for shipping, verify the details of the pre-shipment inspection with the Product Inspection Report.
- Local Procurement Supervision (on-site): The resident procurement supervising engineer shall supervise the overall installation of procured equipment and materials, verify the time schedule for delivering equipment and materials, determine the location for temporary storage and unpacking of equipment and materials, hand over the keys to the equipment storage location, and verify the protection method for the facilities and equipment. They will also verify the acceptance/delivery documents (in English) which are required after procured equipment has been installed.
- Pre-warranty expiration inspection (on-site): Based on JICA guidelines (Manual for Design and Cost Estimate for JICA Preparatory Survey), it was judged that this is not an equipment-specific project and no equipment falls under the category of precision equipment. Thus, the Project will not include a defect inspection or pre-manufacturer warranty expiration inspection. However, the person in charge of defect inspections at the facility will interview hospital staff on the operational status of the equipment, whether there have been malfunctions, and how they are dealt with in order to understand equipment status and consider appropriate measures.

2-2-4-5 Quality Control Plan

(1) Facility

The Project shall have clearly defined technical specifications and quality control implemented for the following: Testing and inspection activities necessary to ensure the quality of the frame structure, which greatly affects the durability and performance of the building; inspection of materials and construction accuracy that relates to the buildings finishing grade; measuring and performance inspection of electricity, supply and drainage of water, and mechanical equipment

which are important in providing the facility's functionality. Quality control shall be carried out in accordance with the following, with emphasis on the frame structure, which has a significant impact on durability, and other basic performance aspects as well as major finishings that relate to the grade of the building.

- For the foundation ground, after excavating the foundation, visually confirm that subgrade is consistent with the results of the ground investigation in this survey.
- For the building location, surveying instrument shall be used to set benchmarks, be roped off, and verified in the presence of the Consultant and contractor.
- The public testing laboratory shall be used to test sand, aggregate, water, and reinforcing bar.
- For the construction of major work items, a construction manual shall be prepared that describes the processes, specifications, materials, construction procedures, inspection methods, required quality, etc., and the Consultant shall check and approve the manual.
- Volumetric proportioning shall be used when mixing concrete, and a test mix shall be prepared using the actual aggregate, cement, sand, and water in order to determine the optimum mix. Whenever a different material will be used, another test mix shall be prepared each time and the mix shall be reviewed. Concrete shall have a design strength of Fc24 (24N/mm^2) with quality control implemented through an additional 6N/mm^2 for structural strength correction to raise the strength to 30N/mm^2. As quality control measures, inspect and confirm the slump, concrete temperature, and chloride content at the time of mixing, then verify the designated strength by collecting test pieces for every 50 m^3 of pouring and conducting compressive fracture tests on them.
- When pouring concrete in hot weather, necessary measures shall be taken such as sprinkling water on aggregate to control water temperature before pouring, and protecting the surface by curing under a polythene sheet after pouring.
- From the viewpoint of ensuring quality control, the steel fabrication plant must be carefully selected, and applying an integrated process across every stage from verifying fabrication drawings to fabrication, processing, anti-corrosion treatment, and product inspection. Also, before the concrete is poured, bar arrangement inspection will be conducted in the presence of the Consultant and contractor to check the quantity, position, accuracy, joint and fixing length, and spacer installation.
- For masonry work, quality control of materials shall be carried out by specifying the compressive strength and unit weight. The maximum stacking height shall be 1.2 m, and for decorative stacking, a level string shall be used to ensure a horizontal course run.
- For roofing work, based on manufacturer specifications and standard construction methods, the construction guidelines and construction drawings shall be sufficiently understood. At the construction site, the required accuracy as well as points requiring extra caution such as

connecting sections and supporting hardware shall be clarified and followed by a thorough check.

(2) Equipment

To ensure the quality of medical equipment, a Medical Equipment Manufacture and Sale License will be presented to confirm that the products comply with the Japanese Pharmaceutical Affairs Law. For overseas products, medical equipment must be manufactured at a factory that meets ISO 13485 (International Quality Management System for medical devices).

2-2-4-6 Procurement Plan

(1) Procurement of Construction Materials and Equipment

Since construction materials that can be procured within Ghana are limited to sand, aggregate, cement, and wood, most of the materials and equipment required for the Project will be imported from third countries or processed products made from imported raw materials. However, the construction materials and equipment, including those from third countries, can be reliably procured in Japan. The Project assumes the use of materials and equipment that can be procured in Ghana in consideration of future ease-of-maintenance and management after the facility is completed. Nevertheless, some fittings, distribution boards, control panels, and other electrical panels will be procured from Japan or Europe in order to ensure the required level of quality. Below is an overview of major construction materials and their sourcing area.

Table 2-48: Source of Major Construction Materials

Materials	Local procurement		3rd-country procurement	Japan procurement	Overview/Notes
	Domestic	Import			
Sand/gravel	○				Procurable from quarries and sandpits outside of Tamale.
Cement	○				There are several domestic cement manufacturers. Mainly 32.5 and 42.5 strength class products are available.
Concrete blocks	○				Available from manufacturing plants in Accra and Tamale. Quality must be ensured under proper management
Wood	○	○			Finishing materials can be procured from Accra, and temporary materials can be procured from Accra and Tamale.
Steel (steel frame/rebar)		○			Procurable, with products imported from Europe, China, and India widely available
Steel roofing		○			Procurable, with products imported from Europe, China, and Thailand

					widely available
Waterproofing materials		○			Asphalt waterproofing and coating film waterproofing materials from Europe, etc., are widely available
Tile		○			Products are imported from Europe, China, etc., are widely available. As quality varies, it is important to be mindful of selection, stock availability, and time to import.
Finishing board		○			Mainly imported from Europe. Gypsum board, calcium silicate board, rock wool acoustic board, etc. can be procured locally.
Paint		○			Several manufacturers have local distributors and can perform color matching in Ghana
Fittings/ Glass		○		○	Aluminum fittings are assembled by local suppliers, and mold materials are imported from Europe. For steel fittings, stainless steel doors, etc., procurement from Japan will be considered to ensure quality
Power receiving equipment		○			Since NEDCo (Power Corporation) will ultimately maintain the equipment, it is necessary to use manufacturers who have been approved
Boards	○	○			Third-country products can be procured locally
Electric wire/cable	○	○			BS or IEC standard products are widely available
Lighting equipment		○			LED lighting fixtures from Europe are widely available and procurable in Accra.
Electrical outlets		○			Locally distributed products (European products) are available in Accra
PA equipment		○			Locally distributed products (European products) are available in Accra
Intercom equipment		○			Locally distributed products (European products) are available in Accra
Shared TV equipment		○			Locally distributed products (European products) are available in Tamale
Fire alarm system		○			Locally distributed products (European products) are available in Accra
Water tank	○	○			Locally distributed products are available in Tamale
Pumps		○			Locally distributed products

					(European products) are available in Tamale
Piping material	○	○			Although locally distributed products are available in Tamale, these must be procured in Accra due to product quality
Sanitary ware		○			Locally distributed products (European products) are available in Accra
Drainage equipment		○			Locally distributed products (European products) are available in Accra
Fire extinguishing equipment		○			Locally distributed products (European standards products) are available in Tamale
Air conditioning equipment		○			Although several Chinese and Korean products are available, European products will be adopted for their quality and local availability. Can be procured in Accra.
Air blowers		○			Locally distributed products (European products) are available in Accra
Ducts		○			Can be manufactured locally
Generator		○			Locally distributed products (European products) are available in Accra
Medical gas equipment		○		○	There is a European-built plant in Accra. A similar facility in Tamale uses an oxygen generator manufactured in India. The same supplier in Tamale would be recommendable from the perspective of maintenance ease, however, piping and equipment will be procured from Japan in order to ensure quality.
Septic tank equipment	○	○		○	There is an exclusive supplier in Accra, and while local procurement is the basic policy from the perspective of maintenance ease, piping and equipment will be procured from Japan in order to ensure quality.

(2) Procurement of medical equipment

Medical equipment will be procured from Ghana or Japan in accordance with the principle of grant aid. However, the precision medical equipment or medical furniture planned in the Project are not manufactured in Ghana. For equipment considered desirable to procure from a third country from the perspective of maintainability by a local authorized distributor, these third-country products will be considered provided that the following conditions are met.

- There is a branch or distributor in Ghana and maintenance services can be provided
- No equivalent Ghanaian or Japanese product exists and competitive bidding may not be possible
- The equipment is widely used at similar medical facilities in Ghana
- The cost of regular maintenance including regularly replaced parts and consumables is inexpensive

Table 2-49: Equipment that may be Procured from a Third-country

No.	Item	No.	Item
1	Anesthesia machine with ventilator	2	Autoclave for DH
5	Bilirubin meter	6	Blood bank centrifuge
7	Blood bank refrigerator	8	Blood cell counter
14	Coagulometer	15	CPAP
16	Deep freezer	17	Defibrillator
18	Delivery bed	21	Diathermy machine
23	Drying machine	24	ECG
25	Electrolyte analyzer	28	Examination bed for Ob/Gy
29	Examination light	33	Height and weight scale for neonate
34	Hemoglobin meter	37	Hormone Analyzer
39	Hot air sterilizer	40	Incubator
41	Infant warmer	42	Infusion pump with IV stand
51	Laryngoscope	56	Medicine refrigerator
59	Microscope	61	Neonatal resuscitation table
62	OT table manual	64	Patient monitor
65	Patient monitor for neonate	67	Phototherapy unit
68	Portable suction machine	70	Pulse Oximeter, finger type
76	Semi-auto Biochemistry analyzer	77	Shadowless OT lamp, double arm
78	Shadowless OT lamp, single arm	79	Shadowless OT lamp, mobile
80	Shaker/Mixer	81	Spectrophotometer
86	Syringe pump	87	Table top centrifuge
89	Ultrasonic nebulizer	90	Ultrasound scanner
91	Ultrasound scanner, portable	93	Vein finder
94	Washing machine	95	Water distiller
97	Xray film illuminator	99	Refrigerator for breast milk
102	UPS	103	AVR
104	AVR for OT		

Source : Prepared by the Survey Team

2-2-4-7 Operational Guidance Plan

Following the introduction of planned equipment, installation work, adjustment and commissioning, guidance will be implemented for initial operation and regular operation. This guidance will be provided by the equipment supplier with the Consultant in charge of appropriately supervising this guidance. At the time of handover, the Consultant, together with the regional BME department and equipment procurement company, will confirm the guidance and completion document content together.

2-2-4-8 Soft Component Plan

(1) Background

Medical equipment maintenance at TCH and the three district hospitals covered under the Project is to be performed by each medical facility by utilizing the IGF and at the request of GHS to regional BME departments located across Ghana. However, some operational issues exist in the areas of 1) equipment ledger usage methods, 2) daily inspections, 3) repair procedures when equipment malfunctions, and 4) allotment of equipment maintenance expenses.

1) Equipment ledger usage methods: Although the asset manager prepares an inventory of medical equipment owned by the facilities cooperating in the Project as hospital assets, they do not manage cumulative repair costs used for maintaining equipment, nor do they plan for equipment upgrading. Thus, this list is not sufficient for ordering the periodic replacement parts and consumables needed to keep equipment operational.

2) Daily inspections: Pre-use inspections as well as communication to nurses on the next shift are not being sufficiently carried out in the surgery department and other departments. As this has resulted in omitting necessary checks, equipment is not being used with sufficient patient safety.

3) Repair procedures when equipment malfunctions: Since no central organization has been established for the various hospitals to maintain and manage equipment, when repairs are necessary, the asset manager issues a repair request to the BME department in Tamale. Upon receiving that request, the BME department checks the condition of the medical equipment and then repairs it using spare parts provided by the medical facility. However, since the asset manager is not an end user of the equipment, in many cases, the condition of the equipment is not accurately communicated and it takes too long to identify the malfunctioning part. Also, for medical equipment whose repair exceeds the technical capabilities of the BME department, there is a system to request the medical equipment distributor to repair the equipment, but in many cases, the equipment has been left in a state of disrepair due to a lack of funds to pay for the repair. Furthermore, since two years ago, no budget has been allotted for periodic inspections and the technical guidance that BME provides to medical personnel, there have

been an increasing number of cases in which repair requests are received after the malfunctioning equipment's condition has become more serious. As no procurement system has been established for the procurement of consumables and replacement parts, each medical facility procures these individually. This sometimes interferes with patient services as consumables are sometimes missing, or the replacement parts take time to procure.

4) Allotment of equipment maintenance expenses: The RHD advises each health facility to allocate 10% of its spending on maintenance costs, but has been less than this in many years. As a result, there have been cases where medical equipment, etc., which is difficult to repair and maintain without maintenance agreements with business agents in Accra, was left in disrepair due to not having these maintenance agreements in place.

(2) Necessity of soft components

As mentioned above, since the maintenance and management of medical equipment at cooperation target facilities is not being adequately implemented, this is negatively impacting the quality of medical services provided. To ensure that medical equipment is available in a proper condition at all times, there is a significant need to hold workshops that teach maintenance knowledge, to strengthen the system, and to formulate a budget plan and efficient procurement plan through this soft component plan.

(3) Expected outputs

Shown below are the expected outputs of implementing the soft component.

A Inventory lists that include essential information for equipment maintenance, such as histories of malfunctions, cumulative repair costs, and the state of equipment operation, are created and used.

B End users master methods of conducting daily and scheduled inspections for each piece of installed equipment.

C When equipment malfunctions, managers of equipment in end users' departments relay details about the malfunctions to the regional BME Department through the hospital's asset managers.

D Hospital asset managers further their understanding of the importance of medical equipment maintenance, and allocate appropriate maintenance budgets.

E Regarding the purchase of routinely replaced parts and consumable parts, which are essential for operating equipment, a system is established in which scheduled purchases are made after annual expenditures are calculated in terms of numbers and patients.

F An annual maintenance agreement is established between the hospital and the business agents. For equipment that requires ongoing maintenance by the agents, such as clinical examination equipment.

(4) Activities

The target personnel for software component activities are asset managers, equipment managers, as well as equipment end users at Northern Region BME departments, TCH, and the three district hospitals. Although medical personnel work in shifts, hospitals will be asked to coordinate schedules to ensure training is available to all personnel. Training is to be conducted at TCH in Tamale which contains the largest amount of equipment.

Soft component instructors with comprehensive knowledge, practical experience, and management experience in the safe use and maintenance of medical equipment will be dispatched from Japan. Two persons will be dispatched: one instructor for medical equipment maintenance and management who has experience in the maintenance and management of medical equipment and care in developing countries; and one instructor assistant/training manager.

Activities will be conducted in two sessions: one which is two weeks before the equipment is installed, and the other 11 months after installation. After the first training session, participants will practice what they learned in their daily work. After that, a second session will be held before the expiration of the medical equipment's free warranty period. In this session, content implemented in the first training session will be reviewed, any outstanding issues will be clarified, and kinds will be provided on how to further improve. The following table shows the activities of each session.

Table 2-50: Summary of Soft Component Activities

Session	Result	Description	Main target		Schedule
			Hospitals	BME	
The First Session	General	Appointment of the general equipment manager and equipment managers at the target facilities	○		On delivery of equipment
	A	Creation and utilization of the equipment inventory lists by the equipment maintenance manager and his team and by each clinical department	○	○	
		Creation of maintenance sheets for each equipment (Procurement year, Manufacturer, Model, History of malfunction: operating / no-operating time, Utilization records, Periodic inspection records	○	○	
	B, C, D, E, F	The points of daily check / periodic inspection, instruction of how to use the daily / regular maintenance check sheets	○	○	
		Instruction for the selection of the type, requirements (contents) and fee of maintenance contract; Discussions on narrowing down maintenance content according to budget, equipment usage frequency, and service usage status	○	○	

Session	Result	Description	Main target		Schedule
			Hospitals	BME	
		Frequency and contents of periodical check for each equipment	○	○	
		Instruction for the procurement plan of periodic replacement parts and consumables for each equipment; Creation of ordering list; Guidance on how to create a long-term budget plan for equipment; Creation of budget draft Support for applying for annual maintenance costs for equipment on the management side Procurement of consumables and replacement parts based on the procurement plan, equipment maintenance, and securing of operation ・ Create a medical equipment maintenance manual and have it approved by the hospital director	○	○	
The First Session	E	Establishing a contact route when equipment is out of order (accurate communication of failure details)	○	○	On delivery of equipment
The Second Session	A, B, C, D, E	Implementation training (simulation) using various forms created and prepared in the first session, and guidance on problem extraction and improvement methods	○	○	Just before warranty period expires

2-2-4-9 Implementation Schedule

If the Project is implemented using the Japanese government's grant aid, after the Exchange of Notes (E/N) between the two governments and entering into the Grant Agreement (G/A), the steps below shall be implemented.

(1) Detailed design/Detailed cost estimate

The Consultant shall enter into a Design and Supervision Agreement with the executing agency in Ghana, and prepare detailed design and tender documents based on the contents of this Outline Design. The Consultant shall have meetings with relevant agencies of Ghana side at the initial and final stages of preparing the Detailed Design, and complete the detailed costing work upon approval of the final deliverables. The period from contract signing to work completion is estimated to take approximately 4.5 months.

(2) Bidding

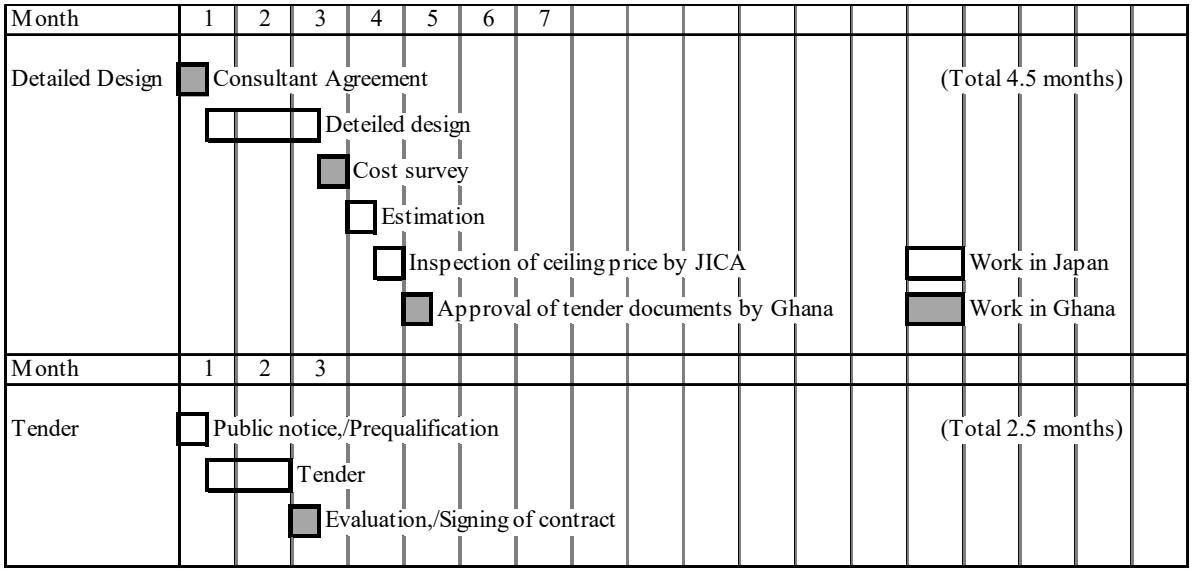
After approval of the bidding documents by the Ghana side executing agency, the Consultant will

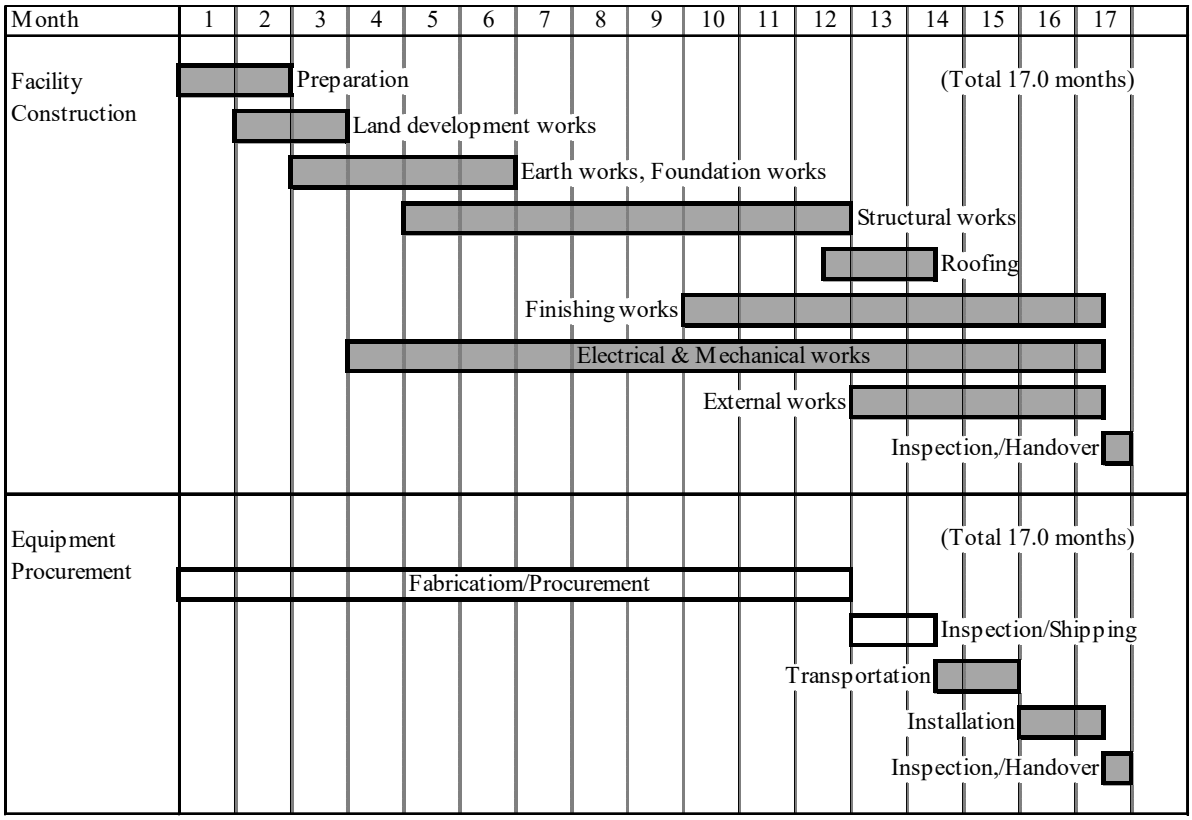
conduct Pre-Qualification (P/Q) in Japan on behalf of the executing agency, and hold a competitive bid in the presence of relevant parties. If the bidder who offers the lowest price and content of that bid is deemed appropriate, that bidder is designated the successful bidder and will enter into a facility construction/equipment procurement contract with the Ghana side executing agency. The period from the public announcement of bids to the conclusion of the contract is estimated to take approximately 2.5 months.

(3) Construction and procurement

After concluding the contract, JICA will provide authorization, and the contractors will begin carrying out facility construction, equipment procurement, and equipment installation. Judging from the scale of the Project and local construction conditions, facility construction as well as equipment procurement and installation is estimated to take approximately 17 months. To achieve this assumes no complications in materials and equipment procurement, prompt procedures and inspections by relevant organizations in Ghana, and that the construction work assigned to the Ghana side is carried out smoothly. Table 2–51 shows the project implementation process that summarizes the above.

Table 2-51: Project Implementation Schedule




Month
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Facility Construction
Preparation
(Total 17.0 months)
Land development works
Earth works, Foundation works
Structural works
Roofing
Finishing works
Electrical & Mechanical works
External works
Inspection,/Handover
Equipment Procurement
(Total 17.0 months)
Fabricatiom/Procurement
Inspection/Shipping
Transportation
Installation
Inspection,/Handover

2-3. Security Plan

Along with Ghana's political stability, the country's security risks are considered to be relatively low compared to other African countries. Nevertheless, many crimes that target foreigners, including robbery, theft, and burglary, occur in urban areas. In the Northern Region where the project site is located as well as its surrounding regions, there have long been conflicts over dominance and between tribal groups and between political party supporters. Although the situation has been relatively stable in recent years, the potential for a major conflict or disorder triggered by a trivial incident makes it necessary to be vigilant in everyday activities.

Furthermore, in Burkina Faso, which borders the north, the security situation has deteriorated rapidly in recent years due to unstable security conditions in neighboring countries such as Mali and Niger, and there has been a series of attacks by terrorist organizations and armed domestic groups. In June of this year, security officials announced that armed groups operating in Burkina Faso were targeting communities in the Tamale region and strengthened security. This demonstrates how the threat of terrorism is spreading from Burkina Faso to the northern region of Ghana. During the implementation of the Project, it is essential to establish a safety network related to project activities with the cooperation of the Embassy, JICA Ghana Office, etc. and make constant efforts to collect security information.

Table 2-52: Assumed Security Risks and Proposal Countermeasures

Security threats	Proposed countermeasures
Attacks by armed groups, acts of terrorism, etc.	It is assumed that the Ministry of Interior, police, etc. will be involved in the safety measures network through the Embassy of Japan, JICA office, and MOH. A system should be established to share information and take action beforehand when large-scale demonstrations are expected.
General crimes (robbery, theft, etc.)	Office/Dormitory: Security measures for perimeter walls and outer wall openings, 24-hour security, etc. Commuting measures: Secure multiple commuting routes, equip vehicles with anti-theft GPS Avoid places where many foreigners gather

2-4. Obligations of Recipient Country

The following is a summary of the items to be borne by the Government of Ghana in implementing the Project under grant assistance from the Government of Japan.

Table 2-53: Responsibilities of the Ghana Side

	Item	Implementation period
Facility construction		
1	Secure land for this project and guarantee land ownership	Before concluding E/N and G/A
2	At TCH, Transfer inpatients to the Children's ward	After concluding E/N and G/A but before bidding announcement
3	At TCH, demolish and remove any existing buildings or structures that may interfere with construction, cut down and remove existing trees and their roots, and clear the construction area.	
4	At TCH, draw in power, municipal water lines, telecommunications to the on-site connection point	Before starting construction
5	At TCH, dig a well as a backup water supply source	
6	At TCH, connect drainage pipes from the drainage basin at the pipe end to the off-site drainage ditch	
7	Procure medical oxygen gas cylinders	
8	Procure equipment such as medical curtains for partitions between beds and general curtains for windows	After handover
Medical equipment		
9	At district hospitals, remove existing equipment from the location where new equipment is to be installed, and secure power supplies (install electrical outlets) as necessary	Before equipment installation
10	Procure medical equipment, general furniture and fixtures not covered by the project	After handover
11	Dispatch an ultrasound technician from a tertiary care hospital to provide guidance so that multiple midwives can operate the ultrasound equipment.	
Soft components		
12	Secure training sites at TCH	During the soft component implementation period
13	Secure a budget to cover training participants' transportation, accommodation and daily allowance, etc.	
Operation and maintenance		
14	Secure the medical personnel necessary to achieve appropriate and efficient use of the facilities and equipment developed in the project	After handover
15	Secure the budget necessary to achieve appropriate maintenance and management of the facilities and equipment developed in the project	
16	Procure consumables, replacement parts, etc. for the facilities and equipment developed in the project	
Procedures		
17	Cover the charges required for concluding banking arrangements (B/A) and for procedures	Immediately after concluding E/N and G/A
18	Cover the charges for issuing Authorization to Pay (A/P) and making payments under each contract	During project implementation
19	Provide exemption from customs duties, domestic taxes, and other financial obligations imposed on Japanese corporations or Japanese nationals in Ghana for products and services procured under the certified contracts	
20	Issue permits necessary for the implementation of the project without delay (environmental impact assessment, construction permit, fire permit)	Prior to announcement of bidding

21	Quickly process customs clearance and tax exemptions for imported materials and equipment	During project implementation
22	Exempt Japanese corporations, Japanese persons and relevant third-country persons connected with the Project from customs duties, domestic taxes and other tax charges imposed on them in Ghana	
23	Provide Japanese persons and relevant third-country persons involved in the Project with the necessary arrangements for entering and staying in Ghana to perform work for the Project	
24	Pay any other expenses required to implement the Project that are not included in the grant aid	During project implementation and after handover
25	Prepare and submit project monitoring reports	During project implementation

The implementation of Ghana side obligations will be led by a project team composed of GHS members. To ensure that the Project can proceed smoothly, appropriate budgetary measures must be implemented in the fiscal year that are commensurate with the counterpart's implementation period.

2-5. Project Operation and Maintenance Plan

(1) Institutional Aspects of Operation and Maintenance

1) Operational Structure of TCH

As there is a shortage of doctors and physician assistants in the existing TCH, to ensure the quality of medical services, it is necessary to secure adequate personnel to enable medical services including consultation, diagnosis, and surgery to be carried out by physicians or physician assistants. In addition, the treatment center to be constructed in the Project will be roughly the same size in terms of the existing number of hospital beds, and there will be no major expansion of functions. However, in accordance with MOH's policy, the number of staff required to operate will increase as hospital rooms will be subdivided into rooms of no more than six beds each. Considering the shifts by department (two or three shifts), a total of 221 medical personnel need to be assigned to the planned facility, as shown in the following table. Since a certain level of nurses and medical staff has already been secured, staff shall be secured in coordination with the existing staff.

Table 2-54: Personnel Required to Operate New Facility

Occupation		Emergency, OPD	Pediatric, ENT	NICU	Labour, Delivery	Maternal ward	ANC, PNC, CWC	Pediatric ward	Anesthesia	Operation (inclu. Obstetrics)	Clinical Lab, Physiology Lab	BME, Maintenance	Admin.	Total
Doctor	Specialist Doctor								1	1				
	Medical Doctor	1	1	1	1	1	1	1	1	1				
	Physician Assistant	8	4	2	2	2	3	2		2				
	Subtotal	9	5	3	3	3	4	3	2	4				36
Nurse	Specialist Nurses								2	2				
	Registered Nurse	7	3	3			2	6	1	5				
	Midwife			9	15	15	16							
	Enrolled Nurse	7	6	6	3		12	12	1	5				
	Community Health Nurse						4							
	Subtotal	14	9	18	18	15	34	18	4	12				142
Other	Pharmacist	3					2	3						
	Lab Technician										18			
	Ultrasound Technician						2							
	BME/Technician											1		
	Administration												10	
	Others						4							
	Subtotal	3					8	3			18	1	10	43
Total		26	14	21	21	18	46	24	6	16	18	1	10	221

2) Maintenance System

■ Facility

The maintenance of TCH's facilities will be carried out by the hospital's Estate Management Department. This department is headed by an Estate Manager and consists of two electricians, one plumber, one carpenter, and an HVAC technician (contracted), and is capable of handling routine

maintenance work.

■ Equipment

TCH and the three cooperation target district hospitals do not have an equipment maintenance department. Instead, the Northern Region BME department is responsible for maintaining the equipment at hospitals. The BME department is composed of nine persons who perform general repairs on medical equipment. Seven are university-level biomedical engineers and the other two are technologists (diploma in engineering/electrical engineering). However, for equipment repairs beyond the capabilities of the department, the hospital itself requests repairs from the distributor in Accra.

(2) Operation and Maintenance Methods

■ Facility

The planned facility is designed to be easy to maintain and manage without advanced systems or complicated specifications. However, to maintain the building in good condition over the long-term, daily cleaning and maintenance inspections must be carried out to take early action against malfunctions arising from wear, damage, and aging. The following describes the maintenance methods for facilities and equipment in the Project.

- Regular cleaning: A cleaning schedule shall be established for every day, every week, every quarter, etc., and regular cleaning is carried out based on it by cleaning staff.
- Regular facility repairs: The planned facility has been designed with maintenance-free materials and finishes in order to minimize the need to maintain items. By being vigilant in performing inspections and adjustments (about once a year) and cleaning moving fittings, there should be no need for repairs or maintenance for several years after handover. After that time, partial touch-up of painted parts (once per 3 years) and repainting (once per 10 years) will be required as repairs against the wear-and-tear and aging of equipment.
- Maintenance of building facilities/equipment: The maintenance of mechanical/electrical equipment will require daily O&M as well as periodic inspections before equipment repair and parts require replacement. Although the proposed facility will consist of general equipment that is widely available locally, it is necessary to establish a system that can ensure the repair and replacement of defects and parts identified through daily O&M and periodic inspections. In accordance with the maintenance manual to be delivered upon completion of construction, simple repairs/servicing and parts replacement must be carried out, and medical gas, pumps, and generators must be periodically inspected by an external contractor.
- Maintenance of exterior facilities/equipment: In addition to daily cleaning and landscaping maintenance around the building, the drainage basin also needs to be inspected and cleaned twice a year. The septic tank needs to be cleaned and sludge removed at least once a year.

■ Equipment

The maintenance of the medical equipment to be maintained in the Project shall be carried out in accordance with the current maintenance system. Accordingly, the maintenance of medical equipment in project facilities will generally be handled by the regional BME department. However, since routine preventive maintenance is important to maintain equipment in good working order, an equipment maintenance manager of each medical facility, who will be appointed through the soft component, will be responsible for equipment maintenance. In a plan designed to ensure that donated equipment to be used for many years in good condition, the soft component will provide guidance on the importance of preventive maintenance and other maintenance activities; the importance of securing a budget for equipment operation and maintenance; daily inspection methods and regular inspection items that can be performed by end users; the importance of concluding maintenance contracts for equipment that is essential for maintaining the diagnostic capabilities of hospitals such as ultrasound scanner, etc.

Of the equipment to be maintained under the Project, clinical examination equipment that cannot be repaired by the regional BME department must be provided with multi-year maintenance service, and including the free warranty period, maintenance services must be provided for three years after handover. The following table shows the equipment that must be provided with multi-year maintenance service and maintenance service content.

Table 2-55: List of Equipment Requiring Multi-year Maintenance Service

No	Item	Maintenance agreements
8	Blood cell counter	- Regular inspections twice a year - On-call service three times a year - Free of charge replacement of spare parts to be replaced during regular inspections
14	Coagulometer	
25	Electrolyte analyzer	
37	Hormone Analyzer	
76	Semi-auto Biochemistry analyzer	
81	Spectrophotometer	

Source : Prepared by the Survey Team

2-6. Project Cost Estimation

2-6-1 Initial Cost Estimation

(1) Costs to be borne by the Japan side

Not to be disclosed until construction and procurement contracts are approved

(2) Cost to be borne by the Ghana side

Table 2-56: Costs to be Borne by Ghana Side

	Item/Content	Amount	
		(in thousands of GHS)	(in thousands of yen)
1	Pre-construction site preparation costs (land preparation, dismantling and removal of obstacles, felling and removal of existing trees and their roots)	304	5,671
2	Cost of licensing/permit applications	5	89
3	Cost of connecting electricity	434	8,092
4	Cost of connecting municipal water	145	2,707
5	Cost of connecting telecommunications	65	1,208
6	Cost of TV reception equipment	5	93
7	Cost of well construction	27	500
8	Construction costs including paving the entrance and constructing drainage ditches	85	1,578
9	Soft component-related expenses (per diems, transportation expenses, etc. for participants)	226	4,208
10	Furniture, fixtures, etc. not included in the Project (furniture, curtains, etc.)	268	5,000
11	Bank charges	122	2,266
	Total	1,686	31,412

(3) Accumulation Conditions

- Estimated as of: April 2021
- Currency exchange rate: 1US$=107.08yen, 1EUR=129.30yen, 1GHS=18.639yen
- Construction/procurement period: Detailed design and construction periods are as listed in the implementation process.
- Other: The Project will be implemented in accordance with the grant aid system of the Government of Japan. In addition, the Project is planned to consider the preliminary costs for the contingencies. However, the application of preliminary costs and the cost rate will be determined by the Ministry of Foreign Affairs in Japan.

2-6-2 Operation and Maintenance Costs

(1) Financial Status of TCH

The following table shows the financial status of TCH over the past five years. A financially independent system is adopted for the operation of medical facilities in Ghana, and although government funding is included in annual budgets, The expenses required to operate the hospital are basically covered by medical fees to offset the labor costs of full-time employees (staff). IGF is the largest source of income from medical activities and its income for the past five years has been on the rise every year, medical fees have declined in 2020 due to the impact of COVID-19. Meanwhile, other major expenditures besides labor costs, which are borne by the government, are medical supplies, medicines, and consumables. Since the procurement of consumables has a significant impact on the annual budget, it is important to acquire better know-how in budget planning through the implementation of the soft component.

Table 2-57: Financial Status of TCH (2016-2020) (GHS)

	2016	2017	2018	2019	2020
Revenue					
Government Fund	7,841,662.02	8,046,021.32	8,991,670.09	15,258,619.20	19,258,736.98
Donor Fund	96,077.50				
Health Insurance Coverage	5,345,605.27	5,483,924.90	5,604,276.94	5,176,320.13	4,014,544.21
Patient charges	328,957.12	764,636.13	1,124,597.05	1,046,280.70	535,835.00
Other					
Total	13,612,301.91	14,294,582.35	15,720,544.08	21,481,220.03	23,809,116.19
Expenditure					
Personnel expenses (Government employment)	7,841,662.02	8,046,021.32	8,991,670.09	15,258,619.20	19,258,736.98
Personnel expenses (IGF)	618,488.11	605,446.71	893,575.69	905,355.83	717,947.93
Education/Training		57,400.00	14,468.00	33,865.92	29,360.00
Facility Management	40,204.30		27,518.50	167,850.46	154,842.96
Utility costs	647,041.96	661,747.46	735,274.96	41,566.95	44,472.98
Pharmaceuticals and medical supplies	825,727.29	778,738.92	1,084,113.27	975,699.24	319,687.66
Medical equipment procurement		13,758.68	8,700.00	18,130.00	
Maintenance (medical equipment)		267,959.10	282,080.36	91,288.49	29,065.07
Consumables	1,413,514.94	3,278,275.27	1,843,768.57	1,838,881.64	2,880,996.55
Other	833,223.62	942,281.32	871,250.42	485,978.60	649,057.95
Total	12,219,862.24	14,651,628.78	13,858,844.17	19,817,236.33	24,084,168.08
Balance	1,392,439.67	-357,046.43	1,861,699.91	1,663,983.70	-275,051.89

Source : Prepared by the Survey Team

(2) Personnel Expenses

The operation of new facilities under the Project will require 221 medical personnel, as shown in Table 2–54, and personnel costs will total 7,708 thousand GHS, as shown in the following table. Note however, that required medical personnel includes existing medical personnel, whose number

is estimated to be 190 and whose personnel cost is estimated to be 6,053,000 GHS. Therefore, it will be necessary to secure a budget for the difference of 1,655 thousand GHS. The following table shows more details on personnel costs for operation and maintenance.

Tabble 2-58: Personnel Expenses of New Facility

Occupation		Number of staff	Annual salary (GHS)	Total (GHS)	Remarks (Number of existing staff)
Doctor	Specialist Doctor	2	153,426.72	307	
	Medical Doctor	9	68,175.72	614	9
	Physician Assistant	25	48,130.20	1,203	10
	Subtotal	36		2,124	19
Nurse	Specialist Nurses	4	43,343.28	173	4
	Registered Nurse	27	34,231.56	924	27
	Midwife	55	34,231.56	1,883	55
	Enrolled Nurse	52	22,085.88	1,148	52
	Community Health Nurse	4	22,085.88	88	4
	Subtotal	142		4,216	142
Other	Pharmacist	8	55,478.64	444	
	Lab Technician	18	27,632.40	497	18
	Ultrasound Technician	2	20,854.20	42	1
	BME/Technician	1	32,280.00	32	
	Administration	10	22,412.40	224	10
	Others	4	32,280.00	129	
	Subtotal	43		1,368	29
Total		221		7,708	190

Source : Prepared by the Survey Team

(3) Maintenance Costs for TCH

The following table shows the maintenance costs for facilities and equipment in the Project, with the annual required maintenance cost estimated at 1,606,517 GHS. While new facilities and equipment will be constructed as a result of the Project, because some facilities and equipment will no longer be used, the estimated amount is not simply an increase in maintenance cost. After the implementation of the Project, the IGF is expected to increase its revenue due to the natural increase in population as well as the expected increase in patients as a result of the new construction. Considering these factors, it is judged that the budget for maintenance costs can be secured based on the past performance of IGF.

Table 2-59: Annual Maintenance Costs for TCH

Item		Annual Costs (GHS)	Remarks
A.	Facility	1,101,840	
1	Electricity Charges	783,319	
2	Fuel Costs	70,735	Diesel oil for generators
3	Communication Charges	12,177	
4	Water Charges	55,804	
5	Medical gas Costs	26,100	
6	Filter Replacement	15,000	

7	Facility repair and maintenance	139,135	
B. Medical Equipment		504,677	
1	Medical Equipment Maintenance Costs	379,000	Regular bi-annual inspections and Annual maintenance, not including parts replacement
2	Annual purchase of consumables	125,677	Consumables and reagents
Total (A+B)		1,606,517	

Details on the estimation of maintenance costs are shown below.

1) Facility

■ Electricity Charge

In calculating the electricity consumption, setting the demand ratio to the power receiving capacity at 40%, the annual electricity charge is estimated to be 783,319 GHS.

Table 2-60: Electricity Charges for TCH

Receiving Capacity (kVA) [a]	Demand Rate [b]	Electricity usage (kWh) [c]=[a]*[b]	Metered rate (GHS/kWh) [d]	Annual Electricity Charges (GHS) [e]=[d]*24h*365day
300	0.4	120	89.42	783,319

■ Fuel Costs

The frequency and duration of power outages are varied with the season. The amount of fuel procured for generators in TCH in 2020 was 12,900L. Assuming that the power situation will continue to be similar to the current situation, the annual fuel cost is estimated to be 70,305 GHS.

Table 2-61: Fuel Costs for TCH

Generator Capacity	Unit Rate (GHS/L) [a]	Fuel Consumption (L/year) [b]	Annual Fuel Costs (GHS) [d]=[a]*[b]
200kVA	5.45	12,900	70,375

■ Telecommunication Costs

Based on Vodafone's estimate, costs assumed at 1,014.75 GHS per month and 12,177 GHS per year.

■ Water Charges

Functions to be developed in the Project include a mix of departments with some that are open 365 days a year and others that are only open on weekdays. Because of this, water usage needs to be calculated separately for weekdays and weekends. If we set water usage on weekdays to 80% of the maximum design usage of 24 m³, and 50% on weekends, the annual water charges are estimated to

be 55,804 GHS.

Table 2-62: Water Charges for TCH

Operational Category	Annual Working Days (day) [a]	Water Consumption		Unit rate (GHS/m3) [d]	Annual Water Charges (GHS) [e]=[c]*[d]
		(m3/day) [b]	(m3/year) [c]=[a]*[b]		
Weekday	260	19	4,940		
Saturday, Sunday	105	10	1,050		
Total	365		≈ 6,000	9.3007	55,804

■ Medical Gas Costs

According to TCH's operational results, 350 cylinders/year of medical gas (O_2) are used for a total of 141 beds, which calculates to 2.5 cylinders/year per bed. Given that 116 beds will be provided in this project, the medical gas (O_2) charges are estimated to be 26,100 GHS/year.

Table 2-63: Medical Gas (O2) Costs for TCH

	Unit rate (GHS/cylinder) [a]	Number of Beds (bed) [b]	No. of cylinders used per year (cylinder) [c]=[b]*2.5	Annual Costs (GHS) [d]=[a]*[c]
Medical Gas (O_2)	90	116	290	26,100

■ HVAC filter replacement costs

The air conditioning and ventilation system in this project will have middle efficiency air filters installed in the air supply and the exhaust vents of the isolation rooms, and HEPA filters installed for the ventilation of operating theaters. These filters need to be replaced periodically at an estimated cost of 15,000 GHS per year.

Table 2-64: Filter Replacement Costs for TCH

Type	Number of Filters [a]	No. of Replacement per Year (no.) [b]	Unit rate (GHS) [c]	Annual Costs (GHS) [d]=[a]*[c]
Middle Efficiency	9	1	1000	9,000
HEPA	2	2	1500	3,000
Total				12,000

■ Facility repair/maintenance costs

Running expenses required for the repair and maintenance of facilities are expected. This includes partial repainting of facilities, adjustment of fittings, inspection charges from specialized equipment suppliers and the replacement of consumables. These routine maintenance costs have been estimated at roughly 139,315 GHS per year.

Table 2-65: Facility Repair and Maintenance Costs

Description	Annual Costs (GHS)	Remarks
Building (general)	63,769	0.1% of the total costs of building works
Electricity and Mechanical (general)	16,855	0.1% of the total costs of Elec & Mech works
Medical Gas	5,658	0.15% of construction costs + consumables
Septic Tank	52,853	0.15% of construction costs + consumables
Total	139,135	

2) Equipment

■ Major Equipment Maintenance Costs

Of the equipment upgraded through this project, the equipment that will require a maintenance contract with an authorized medical equipment distributor in Accra, as well as the estimated cost of the annual maintenance contract are listed in the following table.

Table 2-66: Maintenance Costs for Major Medical Equipment

Equipment No.	Equipment name	Annual cost/Type of contract
14	Blood coagulator	・32,900GHS/unit x 1 unit=32,900GHS Annual maintenance fee including two times periodic inspection, and on call attendance up to three times including spare parts replacement cost.
25	Electrolyte analyzer	・274,800GHS/unit x 1 unit=274,800GHS Annual maintenance fee including two times periodic inspection, and on call attendance up to three times including spare parts replacement cost.
37	Immunoanalyzer	・32,900GHS/unit x 1 unit=32,900GHS Annual maintenance fee including two times periodic inspection, and on call attendance up to three times including spare parts replacement cost.
76	Semi-Automatic biochemistry analyzer	・19,200GHS/unit x 1 unit=19,200GHS Annual maintenance fee including two times periodic inspection, and on call attendance up to three times including spare parts replacement cost.
81	Spectrophotometer	・19,200GHS/unit x 1 unit=19,200GHS Annual maintenance fee including two times periodic inspection, and on call attendance up to three times including spare parts replacement cost.
Total		379,000 GHS / year

Source : Prepared by the Survey Team

■ Medical equipment maintenance costs

The table below shows the annual consumables and amounts required to maintain the operation of equipment at each cooperation target facility.

Table 2-67: Breakdown of Annual Purchase Costs for Equipment and Consumables

Tamale Central Hospital: TCH (GHS)

No.	Description	Q'ty	Amount of consumables per unit required for normal operation	Annual maintenance costs	
				Per unit	Total
1	Anesthesia machine with ventilator	2	CO2 canister 5L/set: 4 sets; Patient breathing circuit 25/set: 2 sets; Mask 5/set: 10 sets	824.63	1,649.26
6	Blood bank centrifuge	1	Test tube 500 pcs.	137.44	137.44
7	Blood bank centrifuge	1	Recording paper: 20 rolls Recording pen: 20 pcs.	2,907.00	2,907.00
8	Blood cell counter	1	Reagent 4 sets Diluting solution 20 sets	4,500.00	4,500.00
14	Coagulometer	1	Reagent (100 tests / set): 5 sets	10,995.00	10,995.00
15	CPAP	1	Nasal cannula 300 pcs.	164.92.00	164.92.00
17	Defibrillator	1	Disposable electrode set (150 / set): 1 set Gel (100g x 2 tube / set): 3 sets	1,998.00	1,998.00
21	Diathermy machine	2	Disposable plate electrode (50 /set): 2 sets	1,649.00	3,298.00
23	Drying machine	1	Filter 2 pcs.	181.42	181.42.00
24	ECG	1	Recording paper 210 mm x 30 m: 10 sets ECG gel, 70g x 2 / set: 2 sets Disposable electrode, adult, 200 / set: 10 sets Disposable electrode, child, 50 / set: 10 sets	2,500.00	2,500.00
25	Electrolyte analyzer	1	Reagent 100 tests / pack: 5 packs Recording paper 100 tests: 5 sets	3,100.00	3,100.00
30	Fetal doppler	7	Jerry 237mL/bottle x 12 pcs. / set: 2 sets	824.63	5,772.41
31	Glucometer	2	Blood sugar test strips for 300 tests	82.46.	164.92
34	Hemoglobin meter	1	Test strips for 1,000 tests	274.87	274.87
35	High pressure steam sterilizer M	1	Door gasket 3 pcs.	164.93	164.93
36	High pressure steam sterilizer S	1	Door gasket 3 pcs.	164.93	164.93
37	Hormone analyzer	1	Reagent for hormone, etc. for 300 tests	4,123.14	4,123.14
41	Infant warmer	5	Skin temperature probe: 2 pcs. Probe pad 80 pcs. / set: 8 sets	1,924.00	9,620.00
42	Infusion pump with IV stand	1	Infusion set 50 pcs. / set: 2 sets	1,649.00	1,649.00
56	Medicine refrigerator	6	Recording paper: 20 rolls Recording pen: 20 pcs.	2,907.00	17,442.00
59	Microscope	7	Immersion oil 5 pcs.	54.97	384.79
64	Patient monitor	6	Disposable ECG electrode, adult, 150 / set: 2 sets Recording paper 50mm x 20m, 10 pcs. / set: 10 sets	1,894.00	11,364.00
65	Patient monitor for neonate	1	Disposable ECG electrode, neonate, 30 pcs. / set: 10 sets Disposable SpO2 probe, neonate, 5 pcs. / set: 6 sets	3,221.00	3,221.00

			Recording paper, 50mm x 20m 10 pcs. / set: 5 sets		
67	Phototherapy unit	3	Eye mask S 12 pcs. / set: 2 sets Eye mask M 12 pcs. / set, 2 sets Eye mask L 12 pcs. / set: 2 sets	1,484.00	4,452.00
68	Portable suction machine	2	Suction tube set: 20 sets	160.00	320.00
76	Semi-auto biochemistry analyzer	1	Reagent set for 500 samples	2,748.00	2,748.00
77	Shadowless OT lamp, double arm	1	Sterile handle	467.00	467.00
78	Shadowless OT lamp, single arm	1	Sterile handle	467.00	467.00
81	Spectrophotometer	1	Reagent set for 500 samples	2,748.00	2,748.00
84	Suction unit	3	Suction tube set: 20 sets	160.00	480.00
86	Syringe pump	6	Syringe 10mL, 100 pcs. / set: 4 sets Syringe 20mL, 50 pcs. / set: 4 sets Syringe 30mL, 50 pcs. / set: 1 set Syringe 50mL, 25 pcs. / set: 1 set	3,023.00	18,138.00
87	Table top centrifuge	2	Tube or blood collection tube 5 - 10 mL, 200 pcs. / set : 2 sets Glass tube 15 mL, 200 pcs. / set: 1 set	368.00	736.00
89	Ultrasonic nebulizer	2	Nebulizing tube set: 20 tubes Nebulizing cup: 100 pcs.	1,924.00	3,848.00
90	Ultrasound scanner	2	Recording paper 18 m x 10 rolls / set: 10 sets Gel 300g x 12 tubes / set: 10 sets	1,099.00	2,198.00
92	Vacuum extractor	2	Suction cup, suction tube set: 100 sets	1,649.00	3,298.00
				Total	125,677.03

Source : Prepared by the Survey Team

Savelugu Municipal DH (GHS)

No.	Description	Q'ty	Amount of consumables per unit required for normal operation	Annual maintenance costs	
				Per unit	Total
2	Autoclave for DH	1	Door gasket 3 pcs.	164.93	164.93
7	Blood bank refrigerator	1	Recording paper: 20 rolls Recording pen: 20 pcs.	2,907.00	2,907.00
24	ECG	1	Recording paper 210 mm x 30 m: 10 sets ECG gel, 70g x 2 / set: 2 sets Disposable electrode, adult, 200 / set: 10 sets Disposable electrode, child, 50 / set: 10 sets	2,500.00	2,500.00
30	Fetal doppler	2	Jerry 237mL/bottle x 12 pcs. / set: 2 sets	824.63	1,649.26
59	Microscope	1	Immersion oil 5 pcs.	54.97	54.97
64	Patient monitor	1	Disposable ECG electrode, adult, 150 / set: 2 sets Recording paper 50mm x 20m, 10 pcs. / set: 10 sets	1,894.00	1,894.00
67	Phototherapy unit	1	Eye mask S 12 pcs. / set: 2 sets	1,484.00	1,484.00

			Eye mask M 12 pcs. / set, 2 sets Eye mask L 12 pcs. / set: 2 sets		
84	Suction unit	1	Suction tube set: 20 sets	160.00	160.00
91	Ultrasound scanner, portable	1	Recording paper, 18 m x 10 roll / set: 10 sets Gel 300g x 12 tubes / set: 10 sets	1,099.00	1,099.00
Total					11,913.16

Source : Prepared by the Survey Team

Bimbila DH (GHS)

No.	Description	Q'ty	Amount of consumables per unit required for normal operation	Annual maintenance costs	
				Per unit	Total
2	Autoclave for DH	1	Door gasket 3 pcs.	164.93	164.93
7	Blood bank refrigerator	1	Recording paper: 20 rolls Recording pen: 20 pcs.	2,907.00	2,907.00
24	ECG	1	Recording paper 210 mm x 30 m: 10 sets ECG gel, 70g x 2 / set: 2 sets Disposable electrode, adult, 200 / set: 10 sets Disposable electrode, child, 50 / set: 10 sets	2,500.00	2,500.00
30	Fetal doppler	1	Jerry 237mL/bottle x 12 pcs. / set: 2 sets	824.63	824.63
59	Microscope	1	Immersion oil 5 pcs.	54.97	54.97
64	Patient monitor	1	Disposable ECG electrode, adult, 150 / set: 2 sets Recording paper 50mm x 20m, 10 pcs. / set: 10 sets	1,894.00	1,894.00
Total					8,345.53

Source : Prepared by the Survey Team

Kpandai DH (GHS)

No.	Description	Q'ty	Amount of consumables per unit required for normal operation	Annual maintenance costs	
				Per unit	Total
1	Anesthesia machine with ventilator	1	CO2 canister 5L/set: 4 sets; Patient breathing circuit 25/set: 2 sets; Mask 5/set: 10 sets	824.63	824.63
2	Autoclave for DH	1	Door gasket 3 pcs.	164.93	164.93
7	Blood bank refrigerator	1	Recording paper: 20 rolls Recording pen: 20 pcs.	2,907.00	2,907.00
21	Diathermy machine	1	Disposable plate electrode (50 / set): 2 sets	1,649.00	1,649.00
24	ECG	1	Recording paper 210 mm x 30 m: 10 sets ECG gel, 70g x 2 / set: 2 sets Disposable electrode, adult, 200 / set: 10 sets Disposable electrode, child, 50 / set: 10 sets	2,500.00	2,500.00
30	Fetal doppler	1	Jerry 237mL/bottle x 12 pcs. / set: 2 sets	824.63	824.63
59	Microscope	1	Immersion oil 5 pcs.	54.97	54.97
64	Patient monitor	1	Disposable ECG electrode, adult, 150 / set: 2 sets	1,894.00	1,894.00

			Recording paper 50mm x 20m, 10 pcs. / set: 10 sets		
84	Suction unit	1	Suction tube set: 20 sets	160.00	160.00
91	Ultrasound scanner, portable	1	Recording paper, 18 m x 10 roll / set: 10 sets Gel 300g x 12 tubes / set: 10 sets	1,099.00	1,099.00
Total					12,078.16

Source : Prepared by the Survey Team

Chapter 3. Project Evaluation

Chapter 3. Project Evaluation

3-1. Preconditions

As preconditions for the implementation of the project, the following items should be addressed by the Ghana side.

(1) Acquisition of permits and approvals

Prior to the construction of the facilities in this project, the Ghanaian executing agency must register the project with the Northern Region's Environmental Protection Agency, as well as apply for and obtain permits including the construction permit from Tamale Metoropolitan Assembly and a fire permit from the Ghana National Fire Station in Tamale. The Ghana side is also responsible for bearing all costs associated with these procedures.

(2) Demolition and removal of the Children's Ward and transfer of inpatients

Any buildings or structures that may interfere with the implementation of this project must be demolished and removed by the Ghana side prior to the public announcement of bids. In this project, these include not only the children's ward and unused washroom structure, but also septic tanks, curbs and other structures. In particular, inpatients in the children's ward must be transferred to rooms in other wings during construction, and TCH is responsible to ensure that this is done.

(3) Smooth implementation of work items on the Ghana side

For the implementation of this project, it is necessary to ensure that the items agreed upon as Ghana side obligations are implemented without delay. In particular, the executing agency is responsible for planning and carrying out site preparation activities (i.e. demolition and removal of existing buildings, etc.) related to facility construction, and is also responsible for securing the budget in advance of installing the power supply, water supply, and telecommunications in coordination with the details and timing of Japan side stakeholders and the commissioned construction company.

3-2. Required Inputs for Achieving the Overall Project Plan

The following items should be addressed by the Ghana side in order to achieve and maintain the effectiveness of this project.

(1) Ensure appropriate staffing and the operation/maintenance budget

The Project is designed to provide the facilities and medical equipment needed for existing health services at TCH and district hospitals. As the Project does not aim to significantly expand operations, such as the establishment of new medical departments, the increase in staffing is only at TCH and minimal in scope. However, since TCH and the district hospitals lack human resources compared with the staffing standards for primary hospitals, especially in terms of doctors and specialists, it will

be necessary to increase the number of personnel regardless of development under the Project. Also, in order for the facilities and equipment developed through this project to be used effectively and for the project's effectiveness to be realized, an appropriate allocation of human resources as well as a budget for operation and maintenance must be secured. Thus, it is essential that the government of Ghana work toward securing a reliable budget. Currently, the operation and maintenance budget comes from the IGF of the health facilities, and it is also important that the NHIS reimburses the health facilities as they claimed without delay.

(2) Implement appropriate maintenance measures for the facilities and medical equipment of the Project

Proper maintenance and management of facilities and equipment as well as systematic budgeting will be necessary to ensure the ongoing use of target facilities and procured medical equipment. As the soft component of this plan will provide technical guidance on the maintenance and management of medical equipment, it is important that the staff of each medical facility, maintenance personnel, and regional BME technicians carry out routine and periodic maintenance based on this guidance. It is also important to secure a maintenance budget from the IGF that will be necessary for the following fiscal year using the budget planning method that is taught at the same time.

(3) Coordination with technical cooperation activities

Japan's ongoing technical cooperation, "Project for Strengthening Community based Health Services focusing on the Life-Course Approach in the former Northern Region (July 2017 - July 2022)," is providing the training and distributing the tools (ledgers, referral forms, feedback forms) needed to improve the referral system by January 2019 in the Northern Region, which is the target area of this project, and the training is being conducted mainly at CHPS and health centres. TTH and TCH, which accept referrals from these health facilities, have also been set as targets for training. The Ghana side is expected to improve the referral system using the forms developed through technical cooperation in order to achieve a synergistic effect between the technical cooperation and establishment of facilities and medical equipment through the Project. In addition, with relation to the "Project for Improving Continuum of Care for Mothers and Children through the introduction of combined MCH Record Book (April 2018 to January 2022)," the establishment of facilities and medical equipment under the Project will encourage more expectant and nursing mothers to use the project facilities, which is expected to increase the use of the Mother and Child Health Handbook.

3-3. External Conditions

The following external factors are assumed to achieve and sustain the effectiveness of this project.

(1) The current vision for the health sector in the Next National Development Plan and the current policy in the National Health Development Plan will be passed on to subsequent plans

The contents of the Project Have been formulated under a couple of upper level plans, more specifically, "to provide affordable, equitable, easily-accessible and quality UHC" which is one of the key policy objectives for the health sector in the current "Coordinated Programme of Economic and Social Development Policies 2017–2024," and to "ensure sustainable, affordable, equitable, easily-accessible healthcare services (UHC)" which is one of the health sector policy objectives in "Health Sector Medium Term Development Plan 2018–2021. To achieve the objective of the Project, the current policy objectives need to be passed on to the subsequent development plan scheduled for revision in 2022.

(2) The political and economic status of Ghana will not be significantly deteriorated

Ghana has maintained political stability since the 1990s with the democratic movement. In recent years, its annual GDP growth rate has been maintained between 2 and 8%, and the country has experienced rapid economic growth. However, Ghana's economy has an unstable structure that is reliant on primary industries such as agriculture and mining. The current government works on fiscal consolidation and job creation. It is important that the political and economic situation continues to be stable in the future.

(3) NHIS reimbursement on claims does not delay

The Ghana NHIS was established in 2003 with an active membership coverage of 35%[19] as of 2017. The NHIS is financed by the National Health Insurance Fund (NHIF), which is 2.5% of the value-added tax[20], Social Security and National Insurance Trust (SSNIT) premiums (2.5%), subscriber premiums, and investment income. Over 95% of disease conditions are covered by the NHIS, and medication on the NHIS Medicines List is also covered. NHIS members are not required to pay for treatment if they are treated for insured disease conditions at the NHIS-credential health facilities. Health facilities claim for health service fees to NHIS, and NHIS reimburses to the health facilities as claimed. NHIS needs to maintain their sound financial management to avoid reduction of IGF income by the delay of reimbursement, affecting operational management in health facilities.

(4) The security situation in the project area and the COVID-19 infection will not worsen.

In Burkina Faso, which borders the north, the security situation has deteriorated rapidly. There have been many attacks by terrorist organizations and domestic armed groups. The threat of terrorism is spreading from Burkina Faso to the northern area of Ghana. In implementing the project, it is necessary to collect security information constantly and take all possible anti-crime measures.

In addition, due to the spread of infectious diseases such as COVID-19, entry into Ghana and movement within the country may be restricted. Furthermore, in an outbreak of infection at the construction site, there is a risk of delays in the construction period and temporary suspension, so it

[19] Holistic Assessment of 2017 Health Sector Programme of Work, Ghana Ministry of Health, 2018
[20] A world Bank Study Ghana National Health Insurance Scheme, World Bank Group, 2017

is necessary to strive for COVID-19 prevention constantly.

3-4. Project Evaluation

3-4-1 Relevance

(1) Expected Benefits of this Project

Tamale in the Northern Region is the central city of northern Ghana, which forms a metropolitan area and plays an important economic and cultural role. It is the most populous city in the North, and the Northern Region ranks sixth in population in Ghana with some 1.98 million people (World Bank, 2019). As the total fertility rate in the Northern Region is 4.4, higher than the Ghanaian average of 4.0, further population growth can be expected in the future.

A tertiary level TTH is located in Tamale, and as the top referral hospital in Northern Ghana it is equipped with specialized functions for critically ill and emergency patients in obstetrics and neonatal care. In reality, the hospital is overwhelmed with patients with minor illnesses and other problems, which prevents it from fulfilling its original purpose as an advanced medical hospital. TCH will be upgraded to provide basic obstetric and neonatal care services as a regional hospital, and to enhance the acceptance of patients with relatively minor illnesses, thereby reducing the excessive intake of patients to TTH and establishing it as a facility that contributes to improving the referral system and medical services in the Northern Region and surrounding areas.

The three district hospitals to which the equipment will be provided are Bimbila District Hospital in Nanumba North District, Savelugu Municipal Hospital in Savelugu District, and Kpandai District Hospital in Kpandai District, each of which is either a district referral centre or a sub-referral hospital located respectively 129 km, 25 km, and 170 km away from Tamale, and are frequently used by local residents.

Based on the above, TCH and the three target district hospitals are located in geographically important areas with large beneficiary populations and coverage areas. By clarifying the function and role of TCH, this project is expected to reduce the burden on TTH and improve the referral system. Given the high possibility that this project will contribute to improving the quality of maternal and child health services, this project is deemed to be highly relevant.

(2) Human Security

Although Ghana has maintained relatively stable economic growth, its economic foundation, including the country's infrastructure, is still vulnerable and there are large disparities concerning income, region, and gender equality. In the former Northern Region, there are many challenges in terms of medical services due to the particularly high poverty rate of the area. As a response to this, TCH and the other public health facilities targeted in the Project have been designed to provide life-saving, health recovery and health maintenance services to women and children who are socially

vulnerable. Enhancing these public healthcare facilities will also reduce out-of-pocket expenses for the poor and contribute to improving their financial situation and providing economic support. By ensuring human security and improving the social infrastructure, the Project will contribute to building a stable and sustainable society in Ghana.

(3) Consistency with Ghana's National Development Plan

In Ghana, through the implementation of its Medium Term National Development Policy Framework 2018–2021, all stakeholders will work to reduce morbidity, mortality and disability by improving management and prevention of communicable and non-communicable diseases, strengthen surveillance against all diseases including vector borne zoonotic diseases locally and those affecting neighboring countries, and access to quality maternal and child health, emergency medical care, mental health and healthy lifestyle. In accordance with this policy, the Health Sector Medium Term Development Plan 2018–2021 says that: Strengthening of the referral system and the district and sub-district health systems are the strategies of the National Policy Objective 1 "Ensure sustainable, affordable, easily, accessible healthcare services (UHC)"; strengthening of maternal, newborn care and adolescent health services is one of the strategies of Objective 2 "Reduce morbidity, disability mortality and intensify prevention and control of non-communicable diseases; and implementation of capital investment policy and plan in the health sector is one of the strategies of Objective 3 "Enhance efficiency in governance and management of the health system. It will also contribute to the realization of Universal Health Coverage (UHC) in Ghana, which was selected as one of the countries in which to promote UHC at TICAD 7. As the content and objectives of the Project are consistent with the policies of Ghana, the necessity and relevance of the Project are judged to be high.

(4) Consistency with Japan's ODA Policy

Ghana emphatically pointed out the need for improving its health sector at TICAD 7, and has been selected as a country in which to promote UHC, placing the country in a highly important role. Including the support that Japan has provided for the Noguchi Memorial Institute for Medical Research (NMIMR), Japan has demonstrated its willingness to strengthen its cooperative relationship with Ghana by providing significant assistance in the health sector, and this project is a part of that. The JICA has also implemented pilot efforts for technical cooperation in the Northern Region including "Project for Strengthening Community based Health Services focusing on the Life-Course Approach in the three Northern Regions (2017 -2022)" and "Project for Improving Continuum of Care for Mothers and Children through the introduction of combined MCH Record Book (2018 - 2022)." Including in the former Northern Region, these projects aim to promote illness prevention and good health through community health, and to also improve the referral and patient sharing systems, and are expected to generate synergistic benefits with the Project. Based on the above, the implementation of this project is deemed consistent with Japan's ODA policy.

3-4-2 Effectiveness

(1) Quantitative Effectts

The implementation of this project is expected to have the quantitative effects described below. In the case of TCH and district hospitals, comprehensive support will be provided to TCH for the development of facilities and equipment, the support for district hospitals will be limited to maternal and child health-related equipment.

A Number of outpatients (persons/year): The number of outpatients is expected to increase due to the development of the outpatient department at TCH.

B Number of deliveries (persons/year): Increase in the number of deliveries at project facilities

C Number of cesarean sections (number/year): Increase in the number of cesarean sections at project facilities

D Number of times ultrasound equipment is used (number/year): Increase in the number of times ultrasound equipment is used at TCH.

Objective values for achievable quantitative effectiveness indicators shall be set based on the actual values in 2019[21] at cooperation target facilities. The target year will be 2027, three years after the completion of facilities through the Project.

Table 3-1: Quantitative Effect Indicators and Target Values

Indicator	Reference value (2019) [Actual value]	Target value (2027) [3years after completion of the project]
A Number of outpatients at TCH (persons/year)	93,479	109,800
B Total number of deliveries at project facilities (persons/year)	11,639	15,000
C Total number of cesarean sections at project facilities (number/year)	1,205	1,500
D Number of times ultrasound equipment is used at TCH (number/year)	6,584	8,150

The calculation method for each target value is as follows

[21] The number of outpatients at TCH is the average of the 2017-2019 period.

Table 3-2 Calculating Method of Quantitative Effect Targets

Indicator	Target value	Calculation method
Number of outpatients at TCH (persons/year)	109,800	2.04% per year is used as the population growth rate quoted from the whole population growth of Ghana and came into 17.5% starting calculation of the base year 2019 up to the target year 2027.
Number of deliveries (persons/year)	15,000	Based on the 2010 census, the number of births in 2010 is estimated in each project district, taking into account the TFR. Similarly, the number of births in 2020 is assessed, and the birth growth rate during that period is calculated. The number of births in the target year is estimated by considering the birth growth rate to the number of births in the base year.
Number of cesarean sections (number/year):	1,500	The WHO states that the ideal cesarean section rate is 10-15%, whereas the cesarean section rate at the target facilities in the last 3 years was about 10%. Therefore, the number of cesarean sections is assumed to be 10% of the number of deliveries.
Number of ultrasound examinations at TCH (number/year)	8,150	Most of the ultrasound examinations are carried out at Antenatal Check Up or during labor or after delivery, which are all related with deliveries. Therefore, it is assumed that the number of examinations is proportional to the number of deliveries. From the 2010 census, considering the birth growth rate in Tamale, it is estimated that 6,251 births in 2027 compared to 5,042 births at TCH in 2019. The number of ultrasound examinations performed in TCH in 2019 was 6,584. As the number of ultrasound examinations for TCH in 2019 was 6,584, the number of ultrasound examinations in 2027 is estimated to be 6,584x(6,251/5,042) ≈ 8,150.

The information referred to in setting the target value is as follows;

- 2021 Population and Housing Census Preliminay Report
- 2010 Population & Housing Census, Regional Analytical Report, Northern Region
- 2010 Population & Housing Census, District Analytical Report, Tamale Metropolis
- 2010 Population & Housing Census, District Analytical Report, Savelugu-Nanton District
- 2010 Population & Housing Census, District Analytical Report, Kpandai District
- 2010 Population & Housing Census, District Analytical Report, Nanumba North District

(2) Qualitative Effects

The implementation of this project is expected to have the qualitative effects described below.

■ Operational efficiency and safety are improved by enhancing the hospital environment and functions.

The construction of new facilities will improve the workflow lines in the hospital, separate clean and contaminated areas, and secure sufficient space, which will improve the operational efficiency and safety of facilities.

- Improvement and enhancement of facilities and equipment leads to a better working environment for staff, and increases motivation and satisfaction.

  Given the significant aging and shortage of facilities and medical equipment, the improvement of these facilities and equipment is expected to provide a better working environment for staff, which will lead to increased motivation and satisfaction. If the level of satisfaction increases, it can be expected to help reduce staff turnover and increase the number of staff with improved skills.

- Enhancements to the hospital environment and functions increase patient satisfaction.

  The quality of medical services provided to patients will be improved by upgrading facilities and medical equipment. Partitions and curtains will be installed to ensure privacy for patients, which will also provide a comfortable environment for child deliveries and procedures, thereby increasing patient satisfaction.

- Improvement of the hospital environment increases opportunities for in-hospital training for current and intern staff.

  Given the significant aging and shortage of facilities and medical equipment, the improvement of these facilities will enable staff to further acquire medical skills and knowledge. As a result, it will be possible to provide patients with more advanced and higher-quality medical services, increase learning and communication among staff and students, and realize good human relations as well as a team-based medical system.

- Each target hospital will adequately receive patients suitable for the level of severity indicated by Ghanaian standards.

  By installing medical equipment and facilities related to maternal and child health at TCH, TCH will be able to accept more patients with higher severity, which will contribute adequate balance of patient intakes between TTH and TCH. As a result, the project contributes to improving the referral system and medical services in the Northern Region and surrounding areas.

  In light of the above, the project is highly relevant and considered effective.

APPENDICES

Appendix 1: Member List of the Survey Team

Field Survey I

Mr. KURASHINA Yoshiro	Leader	Japan International Cooperation Agency
Dr. ITO Tomoo	Technical Adviser	National Center for Global Health and Medicine
Ms. SASAMOTO Kasumi	Cooperation Planning	Japan International Cooperation Agency
Mr. SHIMADA Mitsuhiro	Chief Consultant/ Architectural Planning	Matsuda Consultants International Co., Ltd.
Mr. HASHIMOTO Masao	Deputy Chief Consultant/ Architectural Planner/ Architectural Designer/ Research on Natural Conditions / Environmental and Social Considerations	Matsuda Consultants International Co., Ltd.
Mr. SHINKAI Yasuharu	Facility Planner	Matsuda Consultants International Co., Ltd.
Mr. ASAKAWA Shogo	Construction Planner/ Cost Estimation	Matsuda Consultants International Co., Ltd.
Ms. ASANUMA Yasuko	Equipment Planner	Binko International Limited
Mr. SUZUKI Hajime	Equipment Procurement Planner/ Cost Estimation	Binko International Limited
Ms. TAKAYAMA Yuika	Health Planner	Binko International Limited
Mr. YANO Takahiro	Coordinator	Matsuda Consultants International Co., Ltd.

Field Survey II

Mr. MIYAGAWA Masahito	Leader	Japan International Cooperation Agency
Ms. SASAMOTO Kasumi	Cooperation Planning (remote participation)	Japan International Cooperation Agency
Mr. SHIMADA Mitsuhiro	Chief Consultant/ Architectural Planning	Matsuda Consultants International Co., Ltd.
Mr. HASHIMOTO Masao	Deputy Chief Consultant/ Architectural Planner/ Architectural Designer/ Research on Natural Conditions / Environmental and Social Considerations	Matsuda Consultants International Co., Ltd.
Ms. ASANUMA Yasuko	Equipment Planner	Binko International Limited

Appendix 2: Survey Schedule

Field Survey I

			Leader	Technical Adviser	Cooperation Planning	a. Chief consultant/ Architectural planner	b. Deputy chief/ Architectural plannner/Design/Natural condition reserch/Envi.&social consideration	g. Health care planner	c. Facility planner/Mechanical&Electrical	d. Construction planner/ Cost estimation	e. Equipment planner	f. Equipment procurement planner/Cost estimation	h. Coordinator
1	19 Mar.	Fri.				NRT(Dep. 20:40)-							
2	20 Mar.	Sat.				-ADD-ACC(Arr. 11:20)					DUS-DUB		
3	21 Mar.	Sun.				Documents analysis, Survey in Advance					-ACC(Arr. 7:30)		
4	22 Mar.	Mon.				Courtesy visit to MOH, Discuss on IR w/MOH Meeting w/JICA					←Follow "a"		
5	23 Mar.	Tues.				Courtesy visit to GHS, Discuss on IR w/GHS Discuss w/Infra. Dpt. of MOH					←Follow "a"		←Follow "a"
6	24 Mar.	Wed.				Survey related Subcontracting, Meteorological data collection		ACC-TML	NRT(Dep. 20:40)-		←Follow "g"		
7	25 Mar.	Thurs.				Survey on Tax (discuss w/JICA)		Discuss w/RHD Tolon DH	-ADD-ACC(Arr. 11:20)		←Follow "g"		
8	26 Mar.	Fri.				Survey related Facility Planning Visit to Redge hospital Contract w/Subcontractor		Survey DH/HC in East Mamprusi Discuss w/RHDNE	←Follow "a"		←Follow "g"		
9	27 Mar.	Sat.				ACC(14:00)-TML(15:00)		Survey DH/HC in Savelug Nanton	←Follow "a"		←Follow "g"		
10	28 Mar.	Sun.				Document analysis, Survey on current status of TCH						NRT-	
11	29 Mar.	Mon.				Courtesy visit to RHD/TCH, and Discuss on IR, Survey on Current Status of TCH						-ADD-ACC-TML	
12	30 Mar.	Tues.				Discuss w/TCH (Component) Disuss w/REPA		Discuss w/RHD, TCH	Infra. Survey Survey on construction material		←Follow "a"		
13	31 Mar.	Wed.				Discuss w/TCH (Draft Plan etc.) Visit to TTH					Survey DH/HC in Kpandai Survey DH/HC in Nanumba North		←Follow "a"
14	1 Apr.	Thurs.				Discuss w/Tamale City Assembly, Fire Dept.		Visit to TTH	Infra. Survey ←Follow "a"		Visit to TTH Discuss w/BME		
15	2 Apr.	Fri.				Online Internal Meeting w/JICA HQ							
16	3 Apr.	Sat.				Discuss w/TCH			Visit to Tolon DH Survey on contractors		←Follow "a"		
17	4 Apr.	Sun.		NRT-		Survey related Subcontracting		Documents analysis	←Follow "a"		Documents analysis		
18	5 Apr.	Mon.		ADD-ACC		Review/Revise the Draft Plan		Survey on TCH	←Follow "a"		Survey on TCH		
19	6 Apr.	Tues.				Discuss w/RHD TML-ACC (Arr.12:00)		Data collection	Survey on TCH (maintenance) Survey on medical gas		Discuss w/TCH		←Follow "c"
				Discuss w/JICA Ghana office									
20	7 Apr.	Wed.		ACC-TML Courtesy visit to RHD/TCH		Discuss w/MoH (Infra. Dept), GHS			TML-ACC (Arr.9:00) Survey on construction		Survey on TCH, TTH(maternal, NICU) Discuss w/BME, Survey on medical waste		Courtesy visit to RHD/TCH
21	8 Apr.	Thurs.		Survey DH/HC in Nanumba North		ACC-TML(Arr.10:30) Discuss w/TCH		RHD, TCH data collection	Survey on construction PCR Testing		Survey DH/HC in Nanumba North	TML-ACC Survey on equipment suppliers	
22	9 Apr.	Fri.	NRT-	Visit to TTH, TCH Internal Meeting		Visit to Tolon DH		Discuss w/Savelugu DHD	Material Survey	Survey related Construction/Cost Estimation	Survey on Equipment Planning		
23	10 Apr.	Sat.	ADD-ACC	Visit to CHPS		Survey on TCH (facility condition)		Visit to TTH, Midwife school	ACC-ADD		Documents analysis	Documents analysis	←Follow "a"
				Documents analysis, Discuss w/Survey Team, Preparation for MD									
24	11 Apr.	Sun.	ACC-TML	Progress Report to Team Leader, Preparation for MD					-NRT	Documents analysis	←Follow "a"	PCR Testing	
25	12 Apr.	Mon.	Courtesy visit and Discuss w/RHD/TCH							Survey related Construction/Cost Estimation	←Follow "a"	Survey on equipment suppliers	
			Visit to TTH										
26	13 Apr.	Tues.	Discuss w/RHD, TCH								Visit to Savelugu DH, Kpandai DH	ACC-ADD	
27	14 Apr.	Wed.	Visit to NMIMR								Survey on TCH Discuss w/BME TML-ACC	-NRT	←Follow "a"
			Discussion w/MOF(remote meeting)					Documents analysis					
			Visit to Korle-Bu Teaching Hospital										
28	15 Apr.	Thurs.	Courtesy visit and Discuss w/MOH/GHS, Discuss on MD							PCR Testing			
			PCR Testing			Survey on construction material		Survey on donors		Survey related Construction/Cost Estimation	Procurement		
29	16 Apr.	Fri.	Signature on MD, Report to JICA / Japanese Embassy					Supplementary Survey					←Follow "d"
			Receive PCR Result			Survey on medical gas							
30	17 Apr.	Sat.	ACC-ADD			ACC-ADD				←Follow "a"			←Follow "a"
31	18 Apr.	Sun.	-NRT			-NRT				←Follow "a"			

Abbreviation

NRT= Narita
ADD=Addis Ababa
ACC= Accra
TML= Tamale
DUS=Dushanbe
DUB=Dubai

MOH= Ministry of Health
GHS= Ghana Health Service
TCH= Tamale Central Hospital
TTH= Tamale Teaching Hospital
RHD= Regional Health Directorate
DHD= District Health Directorate
RHDEN=Regional Health Directorate of North East
REPA=Environmental Protection Agency
NMIMR=Noguchi Memorial Institute for Medical Research

DH=District Hospital
HC= Health Centre
IR= Inception Report
MD= Minute of Discussion
TN= Technical Note

Survey Area
Accra
Tamale
Suburban of Tamale

Field Survey II

			Leader	a. Chief consultant/ Architectural planner	b. Deputy chief/ Architectural plannner/Design/Natural condition reserch/Envi.&social consideration	e. Equipment planner
1	11 Nov.	Thurs.	NRT (Dep. 22:30)-			
2	12 Nov.	Fri.	-DXB-ACC (Arr. 12:05)			
3	13 Nov.	Sat.	Document analysis			
4	14 Nov.	Sun.	Document analysis, PCR Testing			
5	15 Nov.	Mon.	Courtesy visit to JICA, Courtesy visit to MOH and GHS, Discuss on draft report			
6	16 Nov.	Tues.	ACC-TML			
			Courtesy visit to Regional Health Directorate (RHD) and TCH, Discuss on draft report			
			Visit to TCH	Technical Disucussion w/TCH Survey on NEDCo		Technical Disucussion w/TCH
7	17 Nov.	Wed.	Survey on the other project TML-ACC	Technical Disucussion w/RHD and TCH	Survey on water company, telephone company	
8	18 Nov.	Thurs.	Survey on the other project	Technical Disucussion w/RHD and TCH		
				Visit to Tolon District Hospital		Visit to site of waste treatment company
9	19 Nov.	Fri.	Video meeting with JICA HQ, JICA Ghana			
				TML-ACC, Document analysis		
10	20 Nov.	Sat.	Survey on the other project	Document analysis		
11	21 Nov.	Sun.	Document analysis			
12	22 Nov.	Mon.	Discuss on MD, Report to JICA, PCR testing			
			Courtecy visit to Ministry of Finance			Supplementary Survey
13	23 Nov.	Thues.	Courtecy visit to Chief Director of MOH			Supplementary Survey
			ACC (Dep. 18:50)-			
14	24 Nov.	Wed.	-DXB			
15	25 Nov.	Thurs.	DXB-NRT (Arr. 17:20)			

NRT=Narita
DXB=Dubai
ACC=Accra
TML=Tamale
MOH=Ministry of Health
GHS=Ghana Health Service
TCH=Tamale Central Hospital
MD=Minute of Discussion

	Survey Area
	Accra
	Tamale

Appendix 3: List of Parties Concerned in the Recipient Country

Ministry of Health (MOH)

Mr. Kwabena Boadu Oku-Afari	Chief Director, MOH
Mr. Ben Ampomah Nkansah	Director, Infra. Directorate, MOH
Dr. Emmanuel N Odame	Director, PPMED(Policy Planning Monitoring & Evaluation), MOH
Dr. Nicholas Adjabu	Head, Biomedical Engineering Unit, ID(Infra. Directorate), MOH
Ms. Maureen Martey	Head, Resource Mobilization (Bilateral Relations)
Ms. Salley E・Posee Tetteh	Head, Project Planning & Cost Estimation
Ms. Esther A. Banewaa	Assistant Director
Ms. Rachael E Maglo	Admin. Manager
Mr. Lucas Amsn	SMR., Admin. Manager
Mr. Peter Korio	SMR., Admin. Manager
Mr. Nicholas Nyagbiornu	Public Health Officer, Bilateral Relations Department
Mr. Theodore Ampousah	Biomedical Engineering Unit
Mr. Kwame Sarfo	Architect_ CIPMU_ID

Ministry of Finance (MOF)

Mr. Leuis K. Amo	Head o Asian Unit, MOF
Mr. Asare Amoyaw S	PEO, MOF
Ms. Maame Moena Asere	NSP, MOF
Ms. Stella Addo Koremterg	P.A, MOF
Ms. Matilda M. Annor	E.P.O, MOF
Mr. Dennis Akorlur	P.E.O, MOF
Ms. Bridgitte Alcomiah	N.S.P, MOF

Ghana Health Service Headquarter (GHS)

Dr. Patrick Kuma-Aboagye	Director General
Dr. Ebo Hammond	Director, HASS(Health Administration & Support Service)
Mr. Gerald Asakeya	Head, Project Mgt. & Planning Unit

Dr. Kafui N. Gebe	Ag. Head, Clinical Engineering Dept., HASS
Dr. Alberto Biritwum Nyarko	Director, PPMED
Dr. Ofori Boadu	Ag. Director, ICD
Mr. Franklin Bezagrebere	Architect
Ms. Deborah Soy	Architect, Estate Management Depertment, HASS
Dr. Mary Eyram Ashinyo	ICD
Mr. John Zienaa	Clinical Engineering Dept., HASS
Mr. Abdul Mumin Ibrahim	Deputy Planning Officer
Mr. Kwabena Mensah Bediako	Clinical Engineer/ Chief Technologist

Ghana Health Services (Northan Region) / Regional Health Directorate

Dr. John B. Eleeza	Regional Director of Health
Dr. Braimah B. Abubakani	Deputy Director Clinical
Dr. Hilarius Abiwu	Deputy Director Public Health
Mr. Raymond .A.Amoh	Regional Estate Manager
Ms. Abibatu Alabama	Regional HRNH
Mr. Nasir Gariba	Regional Clinical Engineer, Head of BME
Mr. Etowi Boye Yakubu	Regional Health Int. Office
Mr. Apam K.Awinsegida	Regional Internal Auditor
Mr. Atampuglo Clement	Deputy Director Finance
Mr. Jeremiah m. Tiimob	Deputy Director Administration
Mr. Roger Gamuo	JICA CHPS PROJECT
Dr. Fualihu I. K. Momori	AAPS
Ms. Ayishziu Issifu	Chief Nursery Midwifery Officer
Mr. Bodza Y. Yao	Health Service Administration

Ghana Health Services (Northeast Region) / Regional Health Directorate

Dr. Abdulai Abukari	Northeast Regional Director

Regional Coordinating Council

Mr. Hm Shani A Shoubu	Regional Minister

Mr. Alhassam Issahalcu	Chief Director
Mr. Jsemiahm Tumob	Dep. Director Administration
Mr. Sadisu Sadigue	Physical Planning Officer

Tamale Metropolitan Assembly

Mr. Gilbert Nuuri-Teg	Metro Coordinating Director
Mr. Martin Ahorlu	Director of waste management

Tamale Central Hospital (TCH)

Mr. Abdulai Fatawu	Director Administration
Ms. Zakania Faida	Senir Officer (Nurse)
Ms. Akamas Seraphina	Procurement Officer
Dr. Mahamadu Mbiniwaya	Head of Medical Support
Mr. Amina Ewuntomah	Nurse Manager
Mr. Jamani Kabiru	Accountant
Mr. Doec Seake-Krnwu	Internal Auditor
Dr. Sualihu I. K. Momori	Chief Pharmaciest
Dr. Ankoah Jacob	Biomedical Scientist
Mr. Ibrahim A. Mugisu	Estate Manager
Mr. Mohammed Rafik	In-Service Coordinator/Training Coordinator
Mr. Felix Osei TUTU	IT Manager
Mr. Mutaru Russit	Biostatisian

Bimbilla District Hospital

Mr. Hashmiru Mohammed Kenneh	Deputy Chief Health Service Administrator

Kpandai District Hospital

Mr. Mohammed Yakubu	Administration

Kpandai ECG Hospital

Mr. David Samani	Administration

Tolon district Ghana Health Services

Mr. Roger G.	Tolon Health Center/ Assistant doctor
Ms. Veronica Akurugu	Tolon Health Center/ Midwife
Mr. Abubakan Hudu	Wantugu Health Center/ Enrolled nurse
Mr. Nantomah Mohammed	Kasaliylil Health Center/ Senior Enrolled Nurse
Ms. Joana Quarcoo	Tolon DHD /District Director
Ms. Awuni Cecilei	Nyankpala Health Center/ Midwife

Sevelugu District Ghana Health Services

Mr. Alhassan suabe	Sevelug District Hospital/Health service Administrator
Ms. Alice Tengfar	Sevelug District Hospital/Health service Administrator
Mr. Salaam Bukari	Sevelug District Hospital/ Health service Administrator
Mr. Mohammed Saani Muffawu	Sevelug Health Center/ Pediatric nurse
Mr. Bright	Sevelug DHD /District Director
Mr. Mohammed Muda	Pong Health Center

Nanton District Ghana Health Services

Mr. Adam	Tampion Health Center/ Representative

Kmudi Health Centre

Mr. Tamakloe Elijah Obebu	Nurse

Makayili Health Centre

Ms. Monica	Midwife

Tamale Teaching Hospital (TTH)

Mr. Iddrisu A. Tanko	Diputy Director Administration
Mr. David Sesime Ahadzi	Diputy Director policy, planning, monitoring

Ridge Hospital (Accra Regional Hospital)

Dr. Emmanuel K. Srofenyoh	Consultant Obstetrician / Gynaecologist Medical Director

Mr. Adam Mohammed Hard	Head of Administration
Mr. Obed Johnson	Estate / Mechanical Engineer

Noguchi Advanced Research Laboratories

Mr. Jacob Apthan Quarm	Facility Manager

Northern Electricity Distribution Company (NEDCO)

Mr. Moses Tawiah	Director, Engineer
Mr. Eric Ofori	Electrical Engineer
Mr. Frank Antwi Boakye	Electrical Engineer
Mr. Tampuri Tayeb	Manager, Planning

Ghana National Fire Service

Mr. Gilbert B Adda	Tamale Metro Fire Commander

Ghana Water Company Limited

Mr. Amidu Musah	Ag. Reginal Cheif Manager(Northern Region)
Mr. Henry Nii Oblie Quarcoo	Regional Tech & Innovation Manager
Mr. Joshua Ampah	Distribution Manager

Ghana Meteorological Agency

Ms. Doris Benson	Meteological Technican

Ghana University

Mr. Emmanuel Anasah	Principal Technologist
Mr. Prince Owusu	Senior Technologist

Embassy of Japan in Ghana

Mr. KATSUMURA Akihisa	First Secretary
Mr. AZUMA Nozomi	Coordinator for Economic Cooperation

Japan International Cooperation Agency (JICA) in Ghana

Mr. ARAKI Yasumitchi	Chief representative

Ms. OZAWA Maki	Senior Representative
Mr. YAMAMOTO Masashi	Representative (infrastructure)
Mr. SHIZUME Takuya	Representative
Ms. AMEMIYA Kozue	Representative
Mr. Prosper Naazumah Tang	Representative

Appendix 4: Minutes of Discussions (M/D)

4-1 Field Survey I

Minutes of Discussions
on the Preparatory Survey for the Project for Improvement of Health Facilities in the Northern Region

Based on the several preliminary discussions between the Government of Republic of Ghana (hereinafter referred to as "Ghana") and Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") of the Project for Improvement of Health Facilities in the Northern Region (hereinafter referred to as "the Project") to Ghana, headed by Mr. Yoshiro KURASHINA, JICA HQs, from 19th March to 18th April 2021.

The Team held a series of discussions with the officials of the Government of Ghana and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Accra, 16, April, 2021

Mr. Yoshiro Kurashina
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Kwabena Boadu Oku-Afari
Chief Director
Ministry of Health
Republic of Ghana

Ms. Yvonne Quansah
Director
Resource Mobilization and Economic Relations
Ministry of Finance
Republic of Ghana

Dr. Patrick Kuma Aboagye
Director General
Ghana Health Service
Republic of Ghana

ATTACHMENT

1. Objective of the Project

The objective of the Project is to strengthen the capacity of Tamale Central Hospital and the function for maternal and child health care (hereinafter referred to as "MCH Care") in District Hospitals. The Project will strengthen the capacity of Tamale Central Hospital through the construction of the facilities and the improvement of the equipment, and the capacity of District Hospitals through the improvement of the equipment, thereby contributing to improve referral system for MCH Care in the Northern Region.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Improvement of Health Facilities in the Northern Region".

3. Project site

Both sides confirmed that the sites of the Project are the Tamale Central Hospital and the District Hospitals selected through the Preparatory Survey in the Northern Region, which is shown in Annex 1.

4. Responsible authority for the Project

Both sides confirmed that the authorities responsible for the Project are as follows:

4-1. The responsible organization of the Project is the Ministry of Health (hereinafter referred to as the "MOH") which shall be responsible for supervising the Executing Agency on behalf of the Government of Ghana.

4-2. The Ghana Health Service (hereinafter referred to as the "GHS") will be the executing agency for the Project. GHS shall coordinate with all the relevant organizations to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant organizations properly and on time. The chart of relevant organizations is shown in Annex 2.

5. Items requested by the Government of Ghana (shown in Annex 3)

5-1. As a result of the discussions, both sides confirmed that the items requested by the Government of Ghana are as follows:

Construction: Tamale Central Hospital (shown in Annex 3-1)

Procurement of Equipment: Tamale Central Hospital and District Hospitals

(shown in Annex 3-2)

5-2. JICA will assess the feasibility of the above requested items through the survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan.

5-3. The Government of Ghana shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in November, 2021.

6. Procedures and Basic Principles of Japanese Grant

6-1. The Ghanaian side agreed that the procedures and basic principles of Japanese Grant as described in Annex 4 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires the Ghanaian side to submit the Project Monitoring Report, the form of which is attached as Annex 5.

6-2. The Ghanaian side agreed to take the necessary measures, as described in Annex 6, for smooth implementation of the Project. The contents of the Annex 6 will be elaborated and refined during the Preparatory Survey and agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 6 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Ghana until 18th April, 2021.

7-2. An official request to the Government of Japan will be submitted before November, 2021.

7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a team to Ghana in order to explain its contents around November, 2021.

7-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Ghanaian side, JICA will finalize the Preparatory Survey Report and send it to Ghana around March, 2022.

7-5. The above schedule is tentative and subject to change.

8. Environmental and Social Considerations

8-1. The Ghanaian side confirmed to give due environmental and social considerations before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

8-2. The Project is categorized as "C" from the following considerations:

Not located in a sensitive area, nor has it sensitive characteristics, nor falls it into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are not likely to be significant.

The Ghanaian side confirmed to conduct the necessary procedures concerning the environmental assessment (including stakeholder meetings, Environmental Impact Assessment (EIA) /Initial Environmental Examination (IEE) and information disclosure, etc.) and make EIA/IEE report of the Project. The EIA/IEE approval shall be received from the responsible authorities and submitted to JICA within one month after the signing of Grant Agreement. The Ghanaian side shall bear the expenses of the procedures.

9. Technical Assistance ("Soft Component" of the Project)

Both sides confirmed necessity of maintenance and management guidance namely 1) Guidance on the importance of maintenance system, 2) Guidance on development of maintenance system and improvement of management capacity and 3) Guidance on development and implementation of annual maintenance planning. These guidance shall be provided as "Soft Component" of the Project.

10. Other Relevant Issues

10-1 Both sides confirmed that the Project would prioritize improvement of existing MCH functions rather than whole overhaul of the Tamale Central Hospital and the District Hospitals.

10-2 Both sides discussed the items requested for the Project and confirmed that the Project may not include all of requests after further analysis of the items on functions to be included, budget for the Project, relation with technical cooperation projects in health sector by JICA and so on.

10-3 Both sides confirmed that oxygen manifold network system provided under the Project is acceptable instead of provision of oxygen plant.

10-4 Both sides confirmed the undertakings by the Ghanaian side specifically pointed

out for the Project are:

(1) Demolition of buildings and clearance of the land in the Tamale Central Hospital. The place of children's ward is most likely to be candidate area for the new building or necessary areas for construction works. The Ghanaian side would demolish and remove existing facilities in the proposed construction area. During the construction works, the Ghanaian side would take necessary measures to keep the children's ward function by temporally transferring the ward to female ward, fistula center, emergency department. Trees and other buildings such as isolation center, staff residences, septic tanks and washrooms may need to be removed as a result of further analysis. Demolition work shall be conducted after the cabinet approval of the Project.

(2) Securing infrastructure

For the proper operation of the hospital and its equipment, security of electricity and water should be assured. The Ghanaian side provides individual distribution of electricity, water supply for the project facilities.

(3) Deadline of questionnaire

MOH and GHS shall provide answers to the Questionnaire submitted by the Team with relevant documents by 30th April 2021.

(4) Deadline of land certificate of ownership

For the planning of facilities and equipment, information on land ownership at the Tamale Central Hospital is essential. The Tamale Central Hospital shall submit land certificate of ownership by November, 2021.

(5) Securing the operation budget

The Ghanaian side would take necessary measures to secure the budget including maintenance of facilities and equipment including consumables and spare-parts. The more details of required budget would be discussed during the visit of next survey team.

(6) Allocation of human resources

For proper utilization of facilities and equipment supported by the Project, human recourses, not only medical staff, but also administrators and technicians, who are dedicated to management and operation at hospital level and personnel at Regional Biomedical Engineering Unit are indispensable. The Ghanaian side would try to allocate these personnel for smooth implementation of the Project.

(7) Procurement and relocation of general furniture

General furniture for the new facilities are out of scope of the Project and the Ghanaian side shall take measures to newly procure or relocate existing items

to the new facilities.

(8) Safety measures

The Ghanaian side shall, at its own expense, provide the Team with security-related information as well as measures to ensure safety of the survey team. During the implementation of the Project the Ghanaian side shall also take necessary measures to secure the safety of consultants, contractors, patients, and medical staff.

(9) Maintenance contract to equipment

To maintain the equipment in good condition and respond to urgent breakdown of the equipment, the Team recommends that the Ghanaian side to conclude the maintenance service contract for some equipment requiring high attention, such as anesthesia machines.

(10) Exemption of customs duties, internal taxes and other fiscal levies

To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted by its designated authority without using the Grant in accordance with the Exchange of Note which will be signed between both governments.

(11) Gender Mainstreaming

Both sides confirmed that following gender element shall be duly reflected in the scope of Preparatory Survey.

1) Suggestion of gender-responsive measures on facility design that reflects gender-specific needs

Annex 1 Project Site (Locations of Tamale Central Hospital, and target districts for District Hospitals)

Annex 2 Chart of relevant organizations

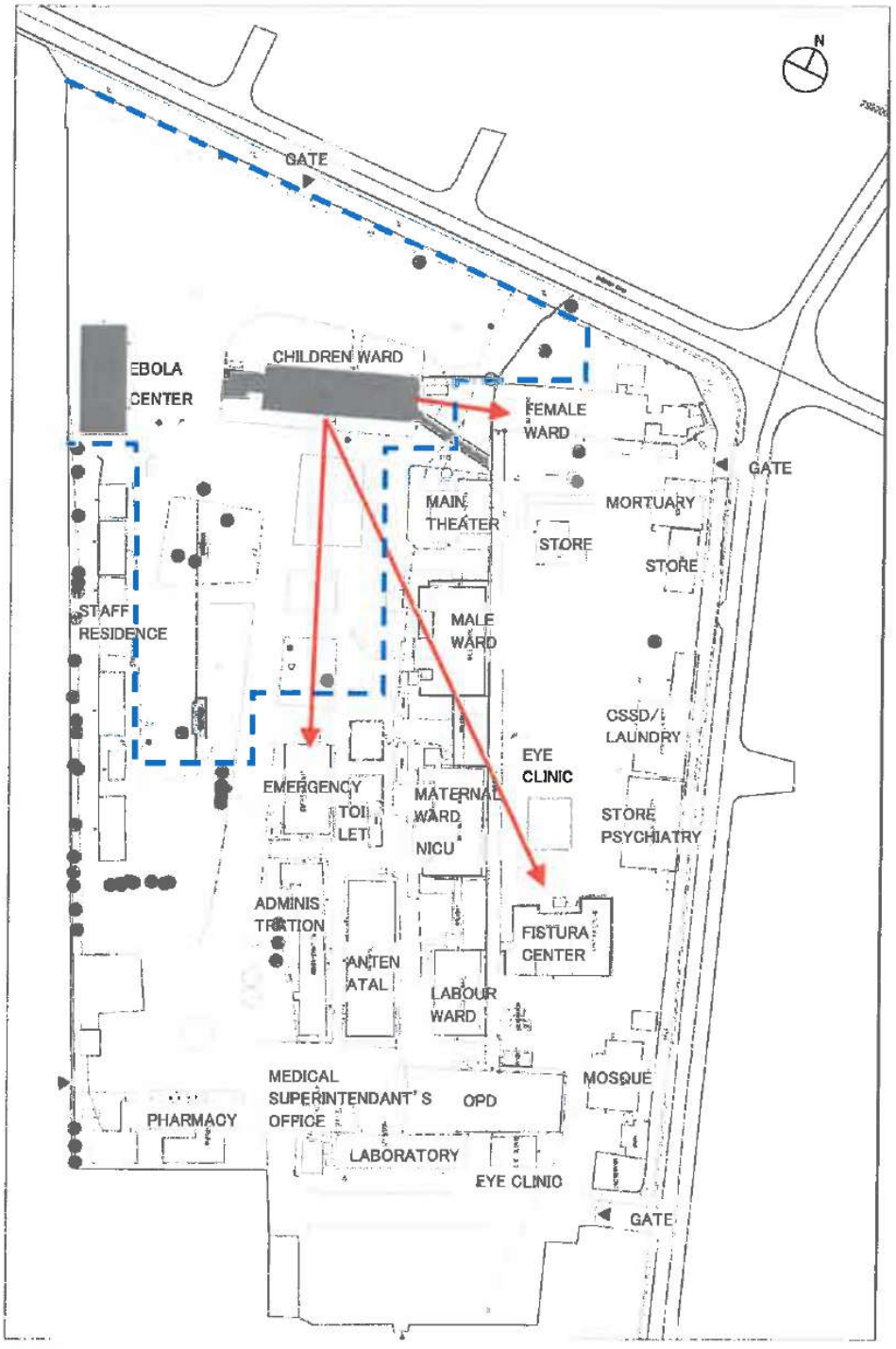
Annex 3 Items requested by Ghana Side

Annex 4 Japanese Grant Aid

Annex 5 Project Monitoring Report (template)

Annex 6 Major Undertakings to be taken by the Government of Ghana

Project site – Tamale Central Hospital Site plan (temporary relocation plan of the children ward)



Project sites – target districts for primary health facilities

	District	Hospital Name (District Hospital)	CHAG	Population covered (District)	No. of OPD	No. of Bed	No. of C/S	No.of Delivery	No of Referral IN(2018)	No of Referral OUT(2018)	Duration to Tamale	Other Project of JICA	Generator	Water supply	Maintenance capacity	Priority for DH	No.of HC	Priority for HC
1	East Mamprusi	**Baptist Medical Center***	○	150,018	86240	176	620	2374	529*	171*	155km	Yes	Yes	Yes	Medium	C	4	C
2	Savelugu	**Savelugu Municipal Hospital***		109811	13087	113	299	3091	791	423	25km	Yes	Yes	Yes	RHD	A	4	C
	Nanton	Tampion Health centre		61646	2261	NA	0	236	NA	NA	35km	Yes	Unknown	Unknown	Unknown	C	4	C
3	Nanumba North	**Bimbilla District Hospital***		174,518	106,346	100	413	2018	900	120	129km	No	Yes	Yes	RHD	A	4	C
4	Kpandai	**Kpandai District Hospital****		134,715	25,028	69	57	822	69	61	170Km	No	Yes	Yes	RHD	A		C
	Kpandai	ECG Hospital	○	134,715	8,519	52	72	405	52	35	170Km	No	Yes	Yes	RHD	C	9	C
5	Tolon	Tolon Health Centre		88,789	8,918		0	978	NA	NA	60km	Yes	NO	Yes	RHD	C	4	C

*Regional Referral Center
** Sub-Regional Referral Cter

Bold Referral Center
NA Not applicable

*only maternity ward

Priority for DH

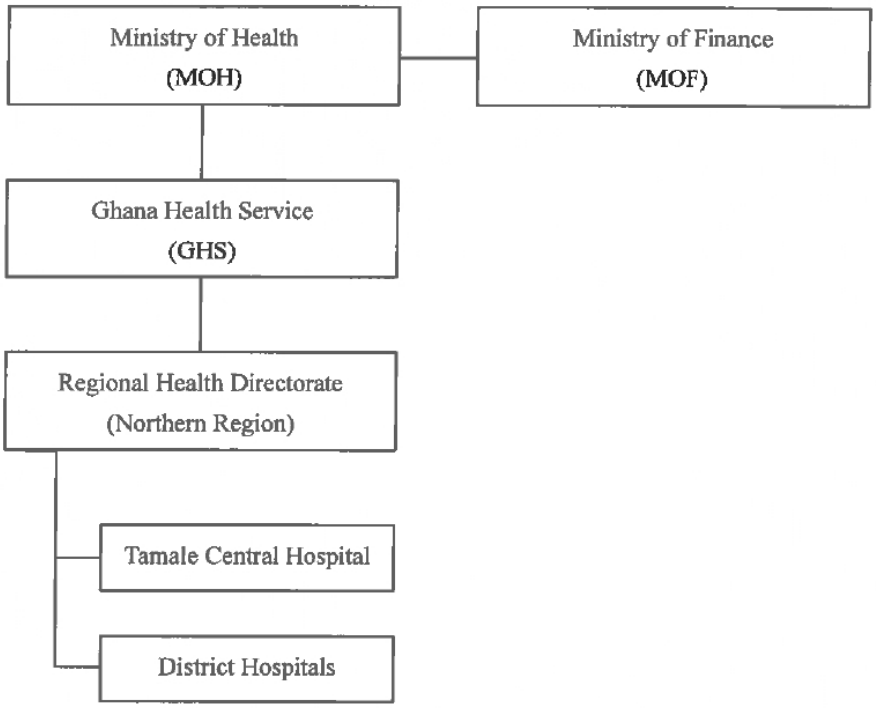
Priority A : High Priority , considered under the Project
(In consideration with regional referral and sub-regional referral)
Priority B :Middle priority
Priority C :Low priority , not to considered under the Project
(For Baptist MC, there is relatively sufficient Internally Generated Fund)

Priority for HC

Priority C :Low priority , not to considered under the Project
(Equipment which can provide services for normal delivery is already equipped.)

Annex 2

Chart of relevant organizations



Items requested by Ghana side – Facilities in Tamale Central Hospital

	Facility component	Maternal/ Neonatal function (High/ Middle/ Low)	Needed for Secondary hospital (Yes/Not)	Facility condition (Old/Small/ Inappropriate)	Equipment condition (New/Old/ Damaged/ Insufficient)	Congestion (Visual & Analysis of QA) (Congestion/ Not)	Overlap with other donors (***/Not)	Construction skill level & Expensive equipment (High/ Middle/ Low)	Priority
OPD	**OPD (incl. ENT, Pediatric)**	Middle	Yes	Old & Inappropriate	Old	Congestion	Eye clinic (Red cross)	Middle	**B** pediatric outpatient is applied "A"
	Psychiatry	Low	Not	-	-	Not Congestion	Not	Middle	
	Emergency Department	Middle	Yes	Old & Inappropriate	Old & Insufficient -	Sufficient	Not	Middle	
	Fistula center	Middle	-	Middle (2009)	-	-	UNFPA	High	
	Pharmacy Department	Middle	Yes	Old & Small	Insufficient	-	Not	Middle	
Diagnostic Block	**Laboratory**	Middle	Yes	Old & Inappropriate	Relatively new	Congestion	Not	High	**B**
	X-ray	Middle	Yes	New & Small	New	Sufficient	Netherland 2017	High	
	Main theater	High	Yes	Old&Small& Inappropriate	Old & Insufficient	Congestion	Not	High	**A**
	CSSD	High	Yes	Old&Small& Inappropriate	Old & Insufficient	-	Not	High	**A**
	Antenatal	High	Yes	Old&Small& Inappropriate	Old	Congestion	Not	Middle	**A**
	Labour ward	High	Yes		Old & Damaged	Congestion	Not	High	**A**
	Maternal ward	High	Yes		Old	Congestion	Not	Middle	**A**
	NICU	High	Yes	Old & Inappropriate	Insufficient	Sufficient	UNICEF (JPN)	High	**A**
Ward	Male ward	Low	Yes	Old & Inappropriate	New	Not Congestion	Not	Middle	
	Female ward	Middle	Yes		Old	Sufficient	Not	Middle	
	Children ward	Middle	Yes		Old	Congestion	Not	Middle	**A**
Support etc.	Administration dept. & Office	Low	-	Old	-	-	Not	Low	
	Conference hall	Low	Yes	-	-	-	Not	Low	
	Laundry (general)	Low	Yes	Old & Inappropriate	Old & Insufficient	-	Not	Middle	
	Mortuary	Low	Yes	New(2017)	New	-	Not	High	
	Staff residences	Low	Not	Old	-	-	Not	Low	
	Store	Low	-	Old & Damaged	-	-	Not	Low	
	Incinerator	Low	Yes	Old & Damaged	-	-	Not	Low	

Priority A: High priority, Priority B: Middle priority

Items requested by Ghana side - Equipment

For TCH (Tamale Central Hospital)

Name of Dept	Sub department	Description	Q'ty	Priority
OPD	Reception & Vital desk	Chair	2	A
		Stretcher	1	A
		Wheel chair	1	A
		Consultation desk and chair	1	A
		Diagnostic set	2	A
		Height and weight scale for adult	1	A
	Consultation room	Examination bed	3	A
		Instrument cabinet	3	A
		Consultation desk and chair	3	A
		Diagnostic set	3	A
		Medicine trolley	3	A
	Physical function test	Ultrasound scanner	1	A
		ECG	1	A
	Procedure room	Examination bed	5	C
		Instrument cabinet	5	C
		Patient monitor	2	C
		Consultation desk and chair	1	C
		Diagnostic set	1	C
		Portable ventilator	1	C
		Laryngoscope	1	B
		Resuscitation bag for adult	2	A
		Resuscitation bag for pediatric	2	A
		Ultrasonic nebulizer	1	B
		Oxygen concentrator	1	C
		Suction unit	1	B
		Examination light	1	B
		Sphygmomanometer	1	B
		Glucometer	1	B
	Dispensary unit	Medicine cabinet	1	A
		Medicine trolley	1	A
		Chair	2	A
		Medicine refrigerator	1	A
	Dressing room	Examination bed	1	A

Annex 3-2

Items requested by Ghana side - Equipment

Name of Dept	Sub department	Description	Q'ty	Priority
		Dressing instrument set	1	A
Diagnostics	Sample collection	Consultation desk and chair	1	C
	Hematology lab	Blood cell counter	1	B
		Hemoglobin meter	1	C
		Table top centrifuge	1	B
		Medicine refrigerator	1	B
		Electrolyte analyzer	1	C
		Microscope	2	B
		Coagulometer	1	C
		Shaker/Mixer	2	B
	Biochemistry lab	Semi-auto Biochemistry analyzer	1	B
		Spectrophotometer	1	C
		Table top centrifuge	1	C
		Medicine refrigerator	1	C
		Microscope	2	C
		Water distiller	1	B
		Hormone Analyzer	1	C
	Microbiology /Parasitology	Incubator	1	C
		Hot air sterilizer	1	C
		Safety cabinet	1	B
		Medicine refrigerator	1	C
		Microscope	2	C
	Blood bank storage	Microscope for cross matching	1	A
		Blood bank centrifuge	1	B
		Blood bank refrigerator	1	A
		Elisa microplate reader and washer	1	B
		Micropipette set	3	A
		Deep freezer	1	A
	Storage	Iron rack	2	A
OT	Trolley bay	Stretcher	1	A
		Wheel chair	1	A
	Main OT	Shadowless OT lamp, double arm	1	A
		OT table manual	1	A

Annex 3-2

Items requested by Ghana side - Equipment

Name of Dept	Sub department	Description	Q'ty	Priority
		Anesthesia machine with ventilator	1	A
		Major surgery instrument set	2	A
		Caesarian instrument set	4	A
		Thyroidectomy Instrument set	1	A
		Instrument trolley	1	A
		Mayo instrument stand	1	A
		Suction unit	1	A
		Portable suction machine	1	A
		Diathermy machine	1	A
		Defibrillator	1	A
		Patient monitor	1	A
		IV stand	1	A
		Surgeon chair	1	A
		Kick bucket	1	A
		Resuscitation bag set for adult	2	A
		Resuscitation bag set for pediatrics	2	A
	Minor OT	IV stand	1	A
		Patient monitor	1	A
		Shadowless OT lamp, single arm	1	A
		OT table manual	1	A
		Anesthesia machine with ventilator	1	A
		Minor surgery instrument set	3	A
		Instrument trolley	1	A
		Mayo instrument stand	1	A
		Suction unit	1	A
		Diathermy machine	1	A
		Surgeon chair	1	A
		Kick bucket	1	A
		Resuscitation bag set for adult	2	A
		Resuscitation bag set for pediatrics	2	A
	Recovery	Recovery bed	2	A
		Patient monitor	2	A
		Infusion pump with IV stand	1	A
		Oxygen concentrator	1	C

Items requested by Ghana side - Equipment

Name of Dept	Sub department	Description	Q'ty	Priority
		Resuscitation bag set for adult	2	A
		Resuscitation bag for pediatrics	2	A
	CSSD	High pressure steam sterilizer M	1	A
		High pressure steam sterilizer S	1	A
		Hot air sterilizer	1	C
		Preparation table with chairs	1	A
		Stainless cabinet with lock	1	A
ANC,PNC,CWC	ANC	Consultation desk and chair	6	A
		Height and weight scale for adult	1	A
		Examination bed for Ob/Gy	1	A
		Examination bed	5	A
		Instrument set for Ob/Gy	3	A
		Diagnostic set for ANC	6	A
		Fetal doppler	1	A
		Instrument cabinet	6	A
	Scan room	Ultrasound scanner	1	B
		Examination bed	1	A
	Labor ward	Hospital bed with IV stand	12	A
		Overbed table	12	A
		Bedside locker	12	A
		Consultation desk and chair	1	A
		Fetal doppler	3	A
		Cardiotocograph	1	C
		Medicine trolley	2	A
		Instrument trolley	1	A
		Instrument cabinet	1	A
		Ultrasound scanner	1	C
		Oxygen concentrator	1	C
		Resuscitation bag set for adult	2	A
	Ward dispensary for labor and maternity	Medicine cabinet	2	A
		Medicine refrigerator	1	A
		Chair	2	A
		Iron rack	1	A

Items requested by Ghana side - Equipment

Name of Dept	Sub department	Description	Q'ty	Priority
	Delivery	Delivery bed	5	A
		Delivery instrument set	10	A
		Neonatal resuscitation table	1	A
		Height and weight scale for neonate	1	A
		Sucker	2	A
		Resuscitation bag for adult	4	A
		Resuscitation bag for neonate	4	A
		Medicine refrigerator	1	A
		Vacuum extractor	1	A
		Forceps for delivery	1	A
		Examination light	2	A
		Table top autoclave	1	C
		Episiotomy set	3	A
		Stretcher	1	A
		Wheel chair	1	A
		Revolving chair for episiotomy suturing	1	A
		Ob/Gy examination set	1	A
	Procedure room	Examination bed for Ob/Gy	1	A
		Vacuum extractor	1	A
		Instrument set for dilation and curettage	2	A
		Resuscitation bag set for adult	2	A
	PNC	Consultation desk and chair	1	A
		Height and weight scale for adult	1	A
		Height and weight scale for neonate	1	A
		Examination bed	1	A
		Instrument set for PNC exam	1	A
		Instrument trolley	1	A
		Instrument cabinet	1	A
	CWC	Consultation desk and chair	2	A
		Height and weight scale for neonate	1	A
		Examination bed	2	A
		Instrument cabinet	1	A
		Height and weight scale for adult	1	A
		File cabinet	1	A

Annex 3-2

Items requested by Ghana side - Equipment

Name of Dept	Sub department	Description	Q'ty	Priority
	Maternity ward	Hospital bed with IV stand	20	A
		Baby cot	15	A
		Overbed table	20	A
		Bedside locker	20	A
		Consultation desk and chair	1	A
		Instrument trolley	1	A
		Instrument cabinet	1	A
		Oxygen concentrator	1	C
		Delivery set	2	A
		Pulse Oximeter, finger type	3	A
		BP apparatus	5	A
		Fetal doppler	1	A
		Ultrasonic nebulizer	1	A
		Stretcher	1	A
		Wheel chair	1	A
		Resuscitation bag set for adult	4	A
	NICU	Infant incubator	2	B
		Infant warmer	3	A
		Baby cot	6	A
		Phototherapy unit	3	A
		Resuscitation bag for neonate	4	A
		Resuscitation table	1	A
		CPAP	1	B
		Portable suction machine	1	A
		Oxygen concentrator	1	C
		Patient monitor for neonate	1	A
		Bilirubin meter	1	A
		Height and weight scale for neonate	1	A
		Glucometer	1	A
		Vein finder	1	A
		Syringe pump	6	A
	Mother room	Couch	6	A
		Bedside locker	6	A
		Baby cot	6	A

Items requested by Ghana side - Equipment

Name of Dept	Sub department	Description	Q'ty	Priority
	Pediatric ward	Hospital bed with IV stand	11	A
		Pediatric bed	23	A
		IV stand	37	A
		Overbed table	37	A
		Bedside locker	37	A
		Consultation desk and chair	1	A
		Height and weight scale for neonate	1	A
		Diagnostic set for pediatrics	1	A
		Ultrasonic nebulizer	1	A
		Oxygen concentrator	1	C
		Resuscitation unit for pediatrics	4	A
	Ward dispensary for children	Medicine cabinet	2	A
		Medicine refrigerator	1	A
		Iron rack	1	A
Support	Laundry	Washing machine	1	A
		Drying machine	1	A
		Linen cart	5	A
		Preparation table with chairs	2	A
		Clean linen storage cabinet	3	A

Notes:

1. AVR and UPS to protect voltage fluctuation and sudden power failure will arrange for necessary medical equipment procured under the Project.

2. Q'ty mentioned in the list subject to be changed at analysis in Japan

Priority A : High priority and consider to be procured under the Project

Priority B: Medium priority and analyze in Japan (Depending on the facility components)

Priority C: Not to be considered under the Project

Items requested by Ghana side - Equipment

For Savelugu Municipal Hospital

Department	Description	Q'ty	Priority
Delivery bed	Delivery bed	1	A
	Examination light	1	A
	Fetal doppler	2	A
	ECG	1	A
	Portable Ultrasound scanner	1	A
	Delivery instrument set	2	A
	Infant resuscitation table	1	A
	Phototherapy unit	1	A
OT	OT table manual	1	A
	Shadowless OT lamp, mobile	1	A
	Patient monitor	1	A
	Suction unit	1	A
	Caesarian instrument set	2	A
CSSD	Autoclave vertical	1	A
Blood bank	Blood bank refrigerator	1	B
	Microscope	1	A

Notes:

1. AVR and UPS to protect voltage fluctuation and sudden power failure will arrange for necessary medical equipment procured under the Project.
2. Q'ty mentioned in the list subject to be changed at analysis in Japan

Priority A : High priority and consider to be procured under the Project

Priority B: Medium priority and analyze in Japan

Items requested by Ghana side - Equipment

For Bimbilla District Hospital

Department	Description	Q'ty	Priority
Delivery	Delivery bed	1	A
	Examination light	1	A
	Fetal doppler	1	A
	ECG	1	A
	Delivery instrument set	2	A
OT	OT table manual	1	A
	Shadowless OT lamp, mobile	1	A
	Patient monitor	1	A
	Caesarian instrument set	2	A
CSSD	Autoclave vertical	1	A
Blood bank	Blood bank refrigerator	1	B
	Microscope	1	A

Notes:

1. AVR and UPS to protect voltage fluctuation and sudden power failure will arrange for necessary medical equipment procured under the Project.
2. Q'ty mentioned in the list subject to be changed at analysis in Japan

Priority A : High priority and consider to be procured under the Project

Priority B: Medium priority and analyze in Japan

Items requested by Ghana side - Equipment

For Kpandai District Hospital

Department	Description	Q'ty	Priority
Delivery	Delivery bed	3	A
	Examination light	1	A
	Fetal doppler	1	A
	Portable Ultrasound scanner	1	A
	ECG	1	A
	Delivery instrument set	2	A
	Neonatal resuscitation table	1	A
OT	OT table manual	1	A
	Anesthesia machine with ventilator	1	A
	Shadowless OT lamp, mobile	1	A
	Patient monitor	1	A
	Suction unit	1	A
	Diathermy machine	1	A
	Caesarian instrument set	2	A
CSSD	Autoclave vertical	1	A
Blood bank	Blood bank refrigerator	1	B
	Microscope	1	A

Notes:

1. AVR and UPS to protect voltage fluctuation and sudden power failure will arrange for necessary medical equipment procured under the Project.
2. Q'ty mentioned in the list subject to be changed at analysis in Japan

Priority A : High priority and consider to be procured under the Project

Priority B: Medium priority and analyze in Japan

Items requested by Ghana side - Equipment

For Regional Biomedical Engineering Section

Description	Q'ty	Priority
Maintenance tool kit	3	A
Oscilloscope	2	A

Notes: Q'ty mentioned in the list subject to be changed at analysis in Japan

Priority A : High priority and consider to be procured under the Project

Japanese Grant

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation
- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal
- Appraisal by the Government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes (hereinafter referred to as "the E/N")
- The Notes exchanged between the GOJ and the Government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")
- Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")
- Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement
- Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation
- Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the project made by the GOJ and JICA. The contents of the Survey are as follows:
- Confirmation of the background, objectives, and benefits of the project and also institutional capacity of relevant agencies of the Recipient necessary for the implementation of the project.
- Evaluation of the feasibility of the project to be implemented under the Japanese Grant

JICA

from a technical, financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the project.
- Preparation of an outline design of the project.
- Estimation of costs of the project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the project. Therefore, the contents of the project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the project after confirming the feasibility of the project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Grant" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the project. However, the prime contractors, namely, constructing and procurement firms, and prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

a) Sharing information on the objective, concept and conditions of design from the

Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

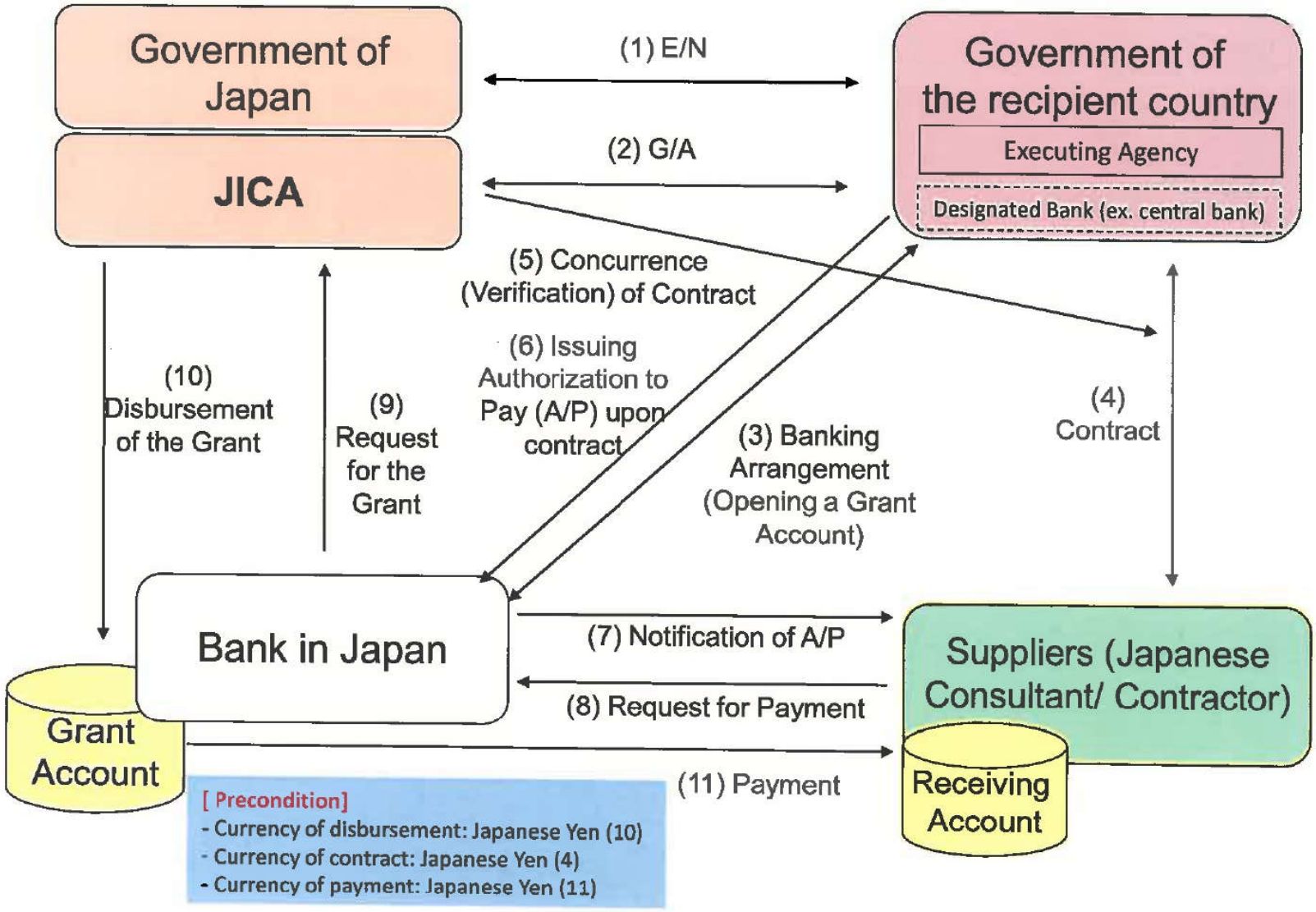
3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

Financial Flow of Japanese Grant (A/P Type)



Annex 4-3

Procedures of Japanese Grant

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before the appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate	-	x		x	x		
2. Appraisal	(2) Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3) Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by the Japanese Government	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet	-		x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail Design (D/D)	-	x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate	-	x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

Notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.
2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

A-1

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Line Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Annex 6

Major Undertakings to be taken by the Government of Ghana

1. Specific obligations of the Government of Ghana which will not be funded with the Grant

(1) Before the Bidding

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within one month after the signing of G/A	MOF/ BOG		
2	To issue A/P to the Agent Bank for the payment to the consultant	within one month after the signing of the contract(s)	MOF/ BOG		
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A				
	1) Advising commission of A/P	within one month after the signing of the contract(s)	MOF/ BOG		
	2) Payment commission for A/P	every payment	MOF/ BOG		
4	To approve IEE/EIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation for EMP and EmoP (and fulfilling conditions of approval, if any)	before notice of the bidding document(s)	EPA/MOH		
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before notice of the bidding document(s)	GHS		
6	To secure and clear the following lands 1) Project sites at Tamale Central Hospital 2) Temporary construction yard and stockyard near the Project area	before notice of the bidding document(s)	GHS		
7	To obtain the Design Permit, Building Permit and Fire Service Approval	before notice of the bidding document(s)	MOH		
8	To clear, level and reclaim the following sites (Final determination would be after the Grant Agreement is concluded) 1) remove utilities underground piping, electrical cables and pole, including its foundation, inside the construction area 2) existing facilities Isolation Center, Children Ward, Staff Residences, Underground Septic Tanks, Washrooms 3) existing structures tree and their roots, flower bed, concrete foundation of old buildings, any buried concrete debris 4) leveling and reclaiming the sites	before notice of the bidding document(s)	MOH/GHS /RCC		
9	To submit Project Monitoring Report (with the result of Detail Design)	before notice of the bidding document(s)	MOH/GHS (RHD)		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to the Agent Bank for the payment to the Contractor(s) and the Supplier(s)	within one month after the signing of the contract(s)	MOF/BOG		
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A				
	1) Advising commission of A/P	within one month after the singing of the contract(s)	MOF/BOG		
	2) Payment commission for A/P	every payment	MOF		
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of Recipient and to assist the Contractor(s) and the Supplier(s) with internal transportation therein				
	1) Tax exemption and customs clearance of the products at the port of disembarkation	during the project	MOH/GHS		
	2) Internal transportation from the port of disembarkation to the project site	during the project	Japan		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the project	MOH GHS (RHD)		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted by its designated authority without using the Grant	during the project	MOF MOH/ GHS		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the project	during the project	MOF MOH		
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant advice effect on the environment, the affected communities, the public or workers	during the construction	GHS (RHD)		
8	1) To submit Project Monitoring Report	every month	GHS (RHD)		
	2) To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within one month after signing of Certificate of Completion for the works under the contract(s)	GHS (RHD)		

9	To submit a report concerning completion of the project	within six months after completion of the project	GHS (RHD)		
10	To provide facilities for distribution of electricity, telecommunication, water supply and drainage and other incidental facilities necessary for the implementation of the project outside the site(s)				
	1) Electricity The drop wiring and internal wiring within the site up to the primary side of the Hi-voltage (or Medium-voltage) switchgear of the transformer	6 months before completion of the construction	GHS (RHD)/ NEDCo		
	2) Telecommunication The drop wiring and internal wiring within the site up to the primary side of the main distribution frame (MDF) or gateway. Network equipment and wiring within the site.	2 months before completion of the construction	GHS (RHD)		
	3) Water supply Setting a basin including a meter and a valve. The connection of the branch piping from the city water supply piping to the meter. Installation of borehole as if necessary.	3 months before completion of the construction	GHS (RHD)/GWC		
	4) Drainage Connection of drainage piping from the final basin to the drainage ditch outside the site	6 months before completion of the construction	GHS (RHD)/RCC		
11	To ensure the safety of persons engaged in the implementation of the Project	during the project	GHS (RHD)/RCC		
12	To take necessary measure for security and safety of the Project site. Traffic control	during the construction	GHS (RHD)/RCC		
13	To ensure that proper personnel, especially for medical equipment dedicated to medical equipment will be allocated to utilize equipment effectively	before taking over	GHS (RHD)/RCC		
14	To ensure the operation cost for participating in the maintenance and operation training of Soft Component including daily allowance, transportation and lodging etc.	during Soft Component	GHS (RHD)/RCC		
15	Removal of obsolete medical equipment by taking appropriate measures and secure the places for planned equipment	before installation of equipment	GHS (RHD)/RCC		
16	Secure electricity power supply (AC power outlets) for the places where new equipment will be setting-up.	before installation of equipment	GHS (RHD)/RCC		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection 4) Engagement of maintenance contract with concerned local agents, if necessary	After completion of the construction	MOH/GHS (RHD)/ RCC		
2	To allocate staffs required for the maintenance of facilities and equipment	After completion of the construction	MOH/GHS (RHD)		
3	Plantation/landscape work of the site	After completion of the construction	GHS (RHD)		
4	Installation of furniture General furniture (office furniture, personal PC etc.)	After completion of the construction	GHS (RHD)		
5	To ensure the operation cost for participating in the maintenance and operation training including daily allowance, transportation and lodging etc.	during Soft Component after completion of the construction	GHS (RHD)		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Minutes of Discussions
on the Preparatory Survey for the Project for
Improvement of Health Facilities in the Northern Region
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between Ministry of Health (hereinafter referred to as "MOH"), Ministry of Finance (hereinafter referred to as "MOF"), Ghana Health Service (hereinafter referred to as "GHS") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 16th April, 2021 and in response to the request from the Government of Republic of Ghana (hereinafter referred to as "Ghana") dated 15th June, 2021, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Improvement of Health Facilities in the Northern Region (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed on the main items described in the attachement.

Accra, 22nd November, 2021

Mr. MIYAGAWA Masahito
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Kwabena Boadu Oku-Afari
Chief Director
Ministry of Health
Republic of Ghana

for Ms. Yvonne Quansah
Director
External Resource Mobilization and
Economic Relations
Ministry of Finance
Republic of Ghana

Dr. Patrick Kuma Aboagye
Director General
Ghana Health Service

1

ATTACHEMENT

1. Objective of the Project

The objective of the Project is to improve qulaity of maternal and child health (hereinafter referred to as "MCH") care and referral system for MCH Care in Northern Region through the construction of the facilities and the improvement of the equipment for Tamale Central Hopital, and the improvement of the equipment for District Hospitals, thereby contributing to improve MCH in the Northern Region.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Improvement of Health Facilities in the Northern Region".

3. Project Site

Both sides confirmed that the sites of the Project are the Tamale Central Hospital and three (3) District Hospitals namely Savelugu Municipal Hospital, Bimbilla District Hospital, and Kpandai District Hospital selected through the Preparatory Survey in the Northern Region, which is shown in Annex 1.

4. Responsible Authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows:

4-1. The Ministry of Finance (hereinafter referred to as the "MOF") will be the recipient (hereinafter referred to as "Recipient") of the grant for the Project on behalf of Government of Ghana.

4-2. The Ministry of Health (hereinafter referred to as the "MOH") is the executing ministry (hereinafter referred to as "Executing Agency") of the Project. Executing Agency shall be responsible for monitoring and supervision of the project implementation and Beneficiary Agency. The Executing Agency will further ensure that relevant authorities involved in the Project shall take care of undertakings assigned them properly and on time. The Executing Agency will constitute a Project Implementation Unit (hereinafter referred to as "PIU") that will be responsible for the management of the project with membership drawn from key stakeholders. The Head of PIU shall be responsible for coordination of the Project. The PIU shall report to the exisiting Steering Commiittee of the MOH.

4-3. The Ghana Health Service (hereinafter referred to as the "GHS") will be the beneficary agency (hereinafter referred to as "Beneficiary Agency") for the Project.

The Beneficiary Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project, ensure that the project is put into prompt use soon upon completion and ensure highest standard for maintenance in all project faciltities. The organization charts are shown in Annex 2.

5. Contents of the Draft Report

After the explanation of the contents of the Draft Report by the Team, the Ghanaian side agreed to its contents. JICA will finalize the Preparatory Survey Report based on the confirmed items shown in Annex 4.

6. Cost Estimate

Both sides confirmed that the cost estimate including the contingency explained by the Team is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, COVID-19, deteriotation in security situation etc. Both sides further confirmed that all cost estimates to be financed by the Government of Ghana as shown in Annexes 5 and 6 are provisional and will be examined further by the Ghanaian side.

7. Confidentiality of the Cost Estimate and Technical Specifications

Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded.

8. Procedures and Basic Principles of Japanese Grant

The Ghanaian side agreed that the procedures and basic principles of Japanese Grant (hereinafter referred to as "the Grant") as described in Annex 3 shall be applied to the Project. In addition, the Ghanaian side agreed to take necessary measures according to the procedures.

9. Timeline for the Project Implementation

The Team explained to the Ghanaian side that the expected timeline for the project implementation is as attached in Annex 5.

10. Expected Outcomes and Indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Ghanaian side will be responsible for the achievement of agreed key indicators targeted in year 2027 and shall monitor the progress for Ex-Post Evaluation based on those indicators.

[Quantitative indicators]

Indicator	Reference value (2017-2019) [Actual value]	Target value (2027) [3years after completion of the project]
A. Number of outpatients at TCH (persons/year)	93,479	109,800
B. Number of deliveries (persons/year)	11,639	15,000
C. Number of cesarean sections (number/year)	1,205	1,500
D. Number of ultrasound examinations at TCH (number/year)	6,584	8,150

[Qualitative indicators]

- Operational efficiency and safety is by enhancing the hospital environment and functions.
- The improvement and enhancement of facilities and equipment leads to a better working environment for staff, and increases motivation and satisfaction.
- Enhancements to the hospital environment and functions increase patient satisfaction.
- Improvement of the hospital environment increases opportunities for in-hospital training for current and intern staff.
- Each target hospital appropriately accepts patients with a severity that matches the level of hospital function indicated by Ghana's standard.

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Ghanaian side is required to provide necessary supportfor the collection of financial, technical and administrative data and information.

12. Technical Assistance ("Soft Component" of the Project)

Technical assistance on the enhancement of the capacity for sustainable operation and maintenance of the products and services is planned under the Project. The Ghanaian side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Report.

13. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 6.

13-1. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in 1. (2) No.5 of Annex 6, both sides confirmed that such customs duties, internal taxes and other fiscal levies, which shall be clarified in the bid

documents by MOF, MOH, and GHS during the implementation stage of the Project.

13-2. Both sides confirmed that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted by its designated authority without using the Grant in accordance with the Exchange of Note which will be signed between both Governments.

13-3. The Ghanaian side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. The possible risks at this point are timely release of funds, currency stability, and accuracy of current estimate. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

13-4. Both sides also confirmed that the Annex 6 will be used as an attachment of G/A.

13-5. Both sides confirmed that GHS (Regional Health Directorate (hereinafter referred to as "RHD"))/ Regional Co-ordinating Council (hereinafter referred to as "RCC") shall take necessary measures to ensure and maintain peace and order/security at the Project location and the persons related to the implementation of the Project, in cooperation with relevant authorities such as police during the Project period. Such security measures shall reasonably reflect needs of the Consultant/the Contractor engaging in the Project, as shown in Annex 6.

13-6. Both sides agreed that in case the additional security cost would be necessary for the implementation of the Project, such cost shall be borne by the Recipient without using the Grant.

13-7. Both sides confirmed demolition of buildings and clearance of the land in the Tamale Central Hospital. The place of children's ward is most likely to be candidate area for the new building or necessary areas for construction works. The Ghanaian side would demolish and remove existing facilities in the proposed construction area. During the construction works, the Ghanaian side would take necessary measures to keep the children's ward functional by temporariy transferring the activities to the female ward, fistula center, emergency department. Trees and other buildings such as septic tanks and washrooms may need to be removed as a result of further analysis. Demolition work shall be conducted after the determination of the Project.

13-8. Both sides confirmed that secured provision of electricity and water should be assured for the proper operation of the hospital and its equipment. The Ghanaian side provides individual distribution of electricity, water supply for the project facilities.

13-9. Both sides confirmed that the Team recommends that the Ghanaian side to

conclude the maintenance service contract for some equipment requiring high attention, such as anesthesia machines to maintain the equipment in good condition and respond to urgent breakdown of the equipment as in part 3 of Annex 6.

13-10. The Ghanaian side would take necessary measures to secure the budget for maintenance of facilities and equipment including procurement of consumables and spare-parts.

13-11. Both sides confirmed that human resources, not only medical staff, but also administrators and technicians, who are dedicated to management and operation at hospital level and personnel at Regional Bio Medical Engineering Unit are indispensable for proper utilization of facilities and equipment supported by the Project, The Ghanaian side would try to allocate these personnel for smooth implementation of the Project.

13-12. Both sides confirmed that general furniture for the new facilities are out of scope of the Project and the Ghanaian side shall take measures to newly procure or relocate existing items to the new facilities.

13-13. Both sides confirmed that the Ghanaian side obtains the Design Permit, Building Permit and Fire Service Approval.

14. Monitoring during the Implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 7. The timing of submission of the PMR is described in Annex 6.

15. Project Completion

Both sides confirmed that the project completes when all the facilities constructed and equipment procured by the Grant are in operation. The completion of the Project will be reported to JICA promptly by the Executing Agency, but in any event not later than six months after completion of the Project.

16. Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") and Ghanaian Environmental Standards are applicable for the Project. The Project is categorized as C of the Guidelines because the Project is likely to have minimal adverse impact on the environment under the Guidelines.

17. Other Relevant Issues

17-1. Design Concept

Both sides confirm that the designs for the project shall be fit for the purposes for which they are intended to be utilized for and shall conform to the basic and clinical standards for ventilation, lighting and user-friendliness as pertains in a tropical environment.

17-2. Multi-year Maintenance Service

Both sides confirm that the multi-year maintenance service for clinical laboratory equipment shall be extended after the expiration of original contract period of three years by GHS.

17-3. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

17-4. Schedule

17-4-1. Schedule of the Survey

If the contents of the Draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Ghanaian side, JICA will finalize the Preparatory Survey Report and send it to Ghana around March, 2022. The schedule is tentative and subject to change.

17-4-2. Project Implementation Schedule

The current schedule is the best case senario, and subject to change due to COVID-19 and othe unforeseen circumstances.

17-5. Gender Mainstreaming

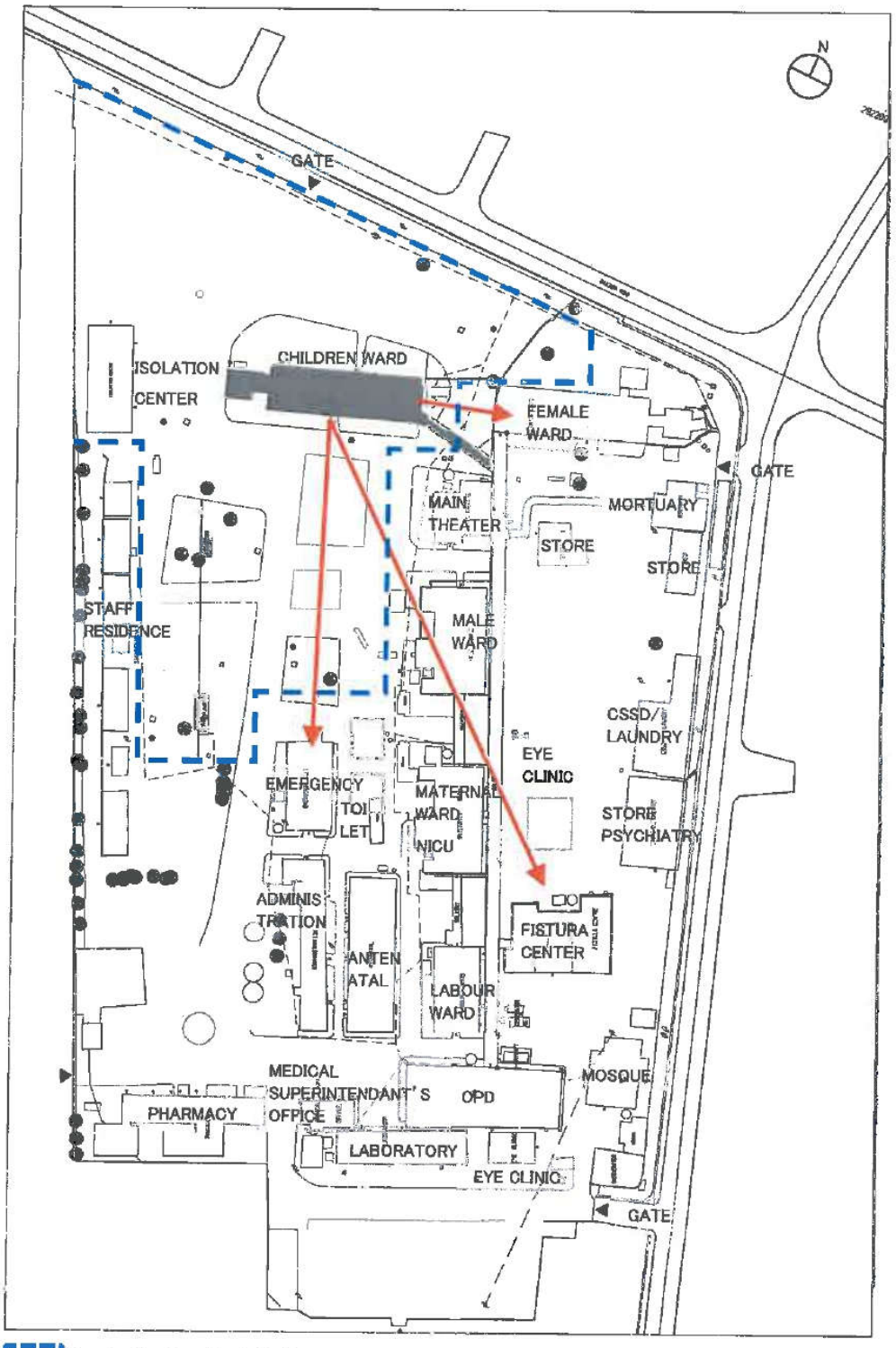
Both sides confirmed that gender mainstreaming should be duly practiced for the Project implementation as the project is categorized as GIP (Gender Equality Project or Project Targeting Women). In particular, both sides agreed on the following gender element to be integrated into the Project.

- Suggestion of gender-responsive measures on facility design that reflects gender-specific needs.

Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Japanese Grant

Annex 4 Facility/Planned Equipment List
Annex 5 Project Implementation Schedule (Tentative)
Annex 6 Major Undertakings to be taken by the Government of Ghana
Annex 7 Project Monitoring Report (template)

Project site – Tamale Central Hospital Site plan (temporary relocation plan of the children ward)



Project sites – target districts for primary health facilities

	District	Hospital Name (District Hospital)	CHAG	Population covered (District)	No. of OPD	No. of Bed	No. of C/S	No.of Delivery	No of Referral IN(2018)	No of Referral OUT(2018)	Duration to Tamale	Other Project of JICA	Generator	Water supply	Maintenance capacity	Priority for DH	No.of HC	Priority for HC
1	East Mamprusi	**Baptist Medical Center***	○	150,018	86240	176	620	2374	529*	171*	155km	Yes	Yes	Yes	Medium	C	4	C
2	Savelugu	**Savelugu Municipal Hospital***		109811	13087	113	299	3091	791	423	25km	Yes	Yes	Yes	RHD	A	4	C
	Nanton	Tamplon Health centre		61646	2261	NA	0	236	NA	NA	35km	Yes	Unknown	Unknown	Unknown	C	4	C
3	Nanumba North	**Bimbilla District Hospital***		174,518	106,346	100	413	2018	900	120	129km	No	Yes	Yes	RHD	A	4	C
4	Kpandai	**Kpandai District Hospital****		134,715	25,028	69	57	822	69	61	170Km	No	Yes	Yes	RHD	A	9	C
	Kpandai	ECG Hospital	○	134,715	8,519	52	72	405	52	35	170Km	No	Yes	Yes	RHD	C		C
5	Tolon	Tolon Health Centre		88,789	8,918		0	978	NA	NA	60km	Yes	NO	Yes	RHD	C	4	C

*Regional Referral Center
** Sub-Regional Referral Ceter

Bold Referral Center
NA Not applicable

*only maternity ward

Priority for DH

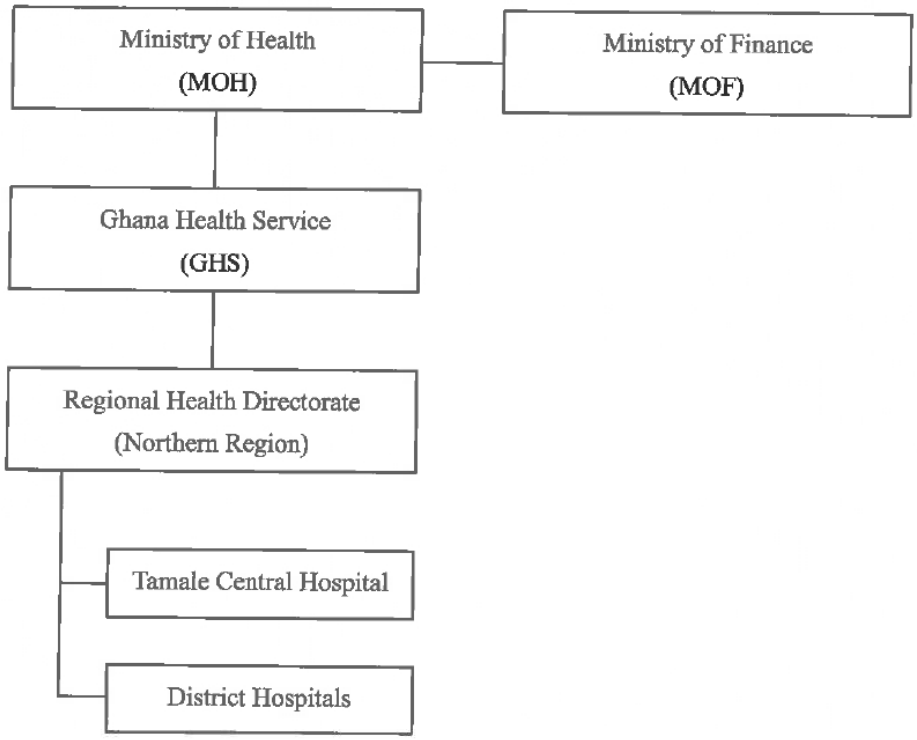
Priority A : High Priority , considered under the Project
(In consideration with regional referral and sub-regional referral)
Priority B :Middle priority
Priority C :Low priority , not to considered under the Project
(For Baptist MC, there is relatively sufficient Internally Generated Fund)

Priority for HC

Priority C :Low priority , not to considered under the Project
(Equipment which can provide services for normal delivery is already equipped.)

Annex 2

Chart of relevant organizations



JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal

-Appraisal by the government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

-The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")

-Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement

-Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

-Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of

relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the concerning organizations of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

Recipient, the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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-

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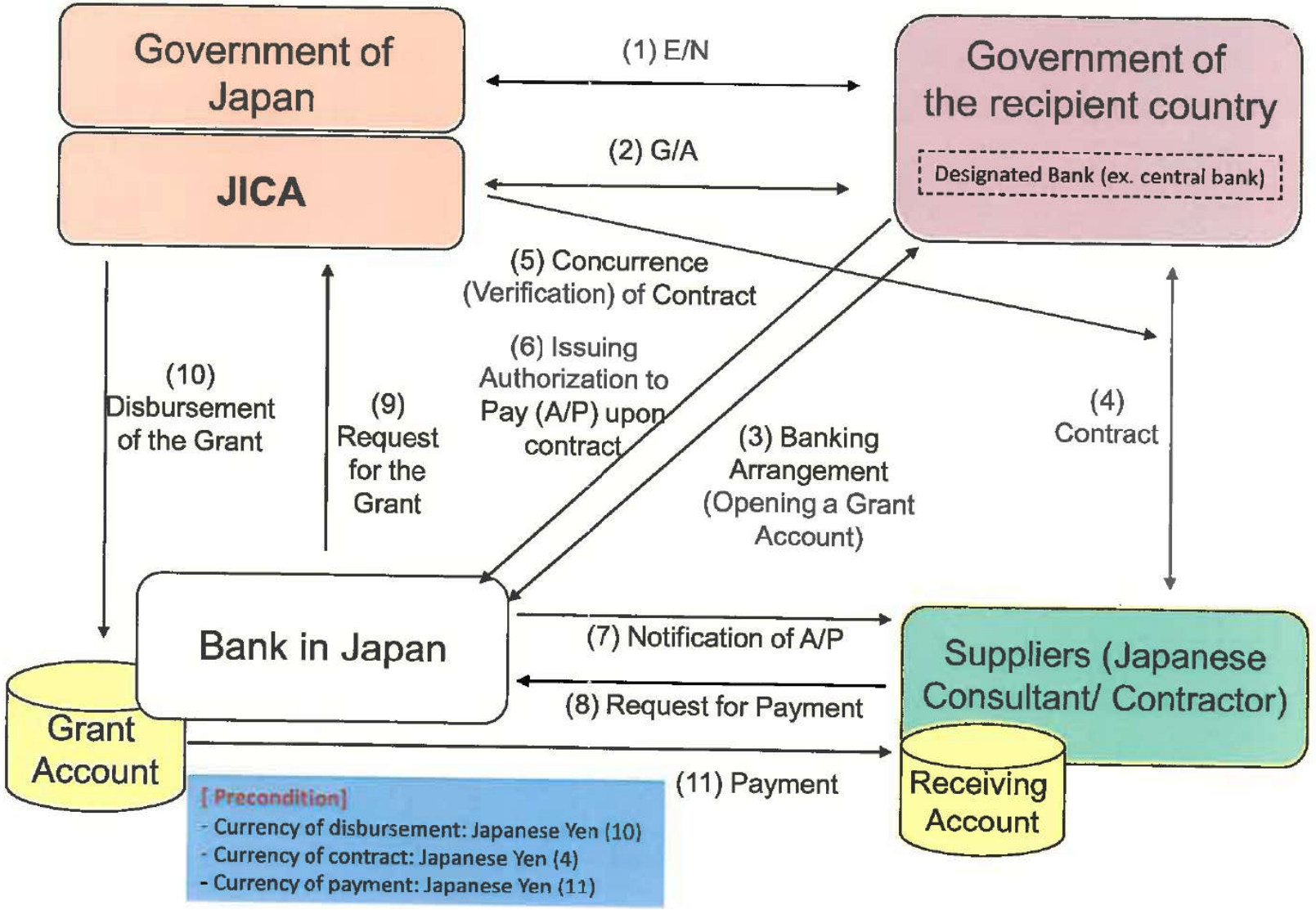
Financial Flow of Japanese Grant (A/P Type)



PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Annex 4-1

Facility List

	Bldg. Code	Floor	Department/Rooms	Floor Area (m^2)
Clinical Block (two storey)	A	GF	**Outpatient Department**: 10 Consultation rooms (3 of them pediatric outpatient), Dressing room, Observation room, Vital, Satellite pharmacy, Reception/Account, Record, Staff room, Night duty, Staff washroom, Sluice room, Store	3,022.80
		1st	**Maternity Department**: Delivery room (5 beds), Treatment room, Physical function examination room, Labour room (12 beds), Recovery/Maternity room (32 beds), NICU (13 beds), Mother room, Milk room, Staff station, Staff room, Night duty, Washroom, Shower room, Sluice room	
	B	GF	**MCH Department**: Consultation room (3 rooms), Ultrasound room, Vital, Gynecology examination room, Consulting room (HIV), Reception, Satellite pharmacy, Staff room, CWC, Waiting hall, Reception, Record, Staff room, Washroom **Clinical laboratory**: Laboratory (Hematology, Microbiology, Parasitology, Biochemistry), Blood bank depot, Waiting hall, Sampling room, Director room, Sluice room	2,521.14
		1st	**Theatre & CSSD**: Operating theatres (2 rooms), Anteroom, Theater hall (also Recovery room), Pre-washing room, Sterilization/Assembly room, Sterilized store, Laundry, Staff room, Changing room, Washroom **Children's ward**: Wards (34 beds), Isolation room, Treatment room, Staff station, Account, Staff room, Night duty, Washroom, Shower room, Sluice room	
Annex (single storey)	C	–	Medical gas storage, Compressor room	32.50
	D	–	Blower room	13.26
	E	–	Main-switch room, Transformer room, MDB room	69.30
	F	–	Generator room	39.69
	G	–	Pump room, Reservoir tank	44.10
	H	–	Guard house	4.00
	–	–	Covered walkway	60.74
			Total Floor Area	5,807.54

Annex 4-2

Planned Equipment List

No.	Description	Q'ty				
		Tamale Central Hospital	Savelugu Municipal Hospital	Bimbilla District Hospital	Kpandai District Hospital	Total
1	Anesthesia machine with ventilator	2	0	0	1	3
2	Autoclave	0	1	1	1	3
3	Baby cot	31	0	0	0	31
4	Bedside locker	78	0	0	0	78
5	Bilirubin meter	1	0	0	0	1
6	Blood bank centrifuge	1	0	0	0	1
7	Blood bank refrigerator	1	1	1	1	4
8	Blood cell counter	1	0	0	0	1
9	Caesarian instrument set	4	2	2	2	10
10	Chair	29	0	0	0	29
11	Clean linen storage cabinet	9	0	0	0	9
12	Consultation desk and chair	25	0	0	0	25
13	Couch	6	0	0	0	6
14	Coagulometer	1	0	0	0	1
15	CPAP	1	0	0	0	1
16	Deep freezer	1	0	0	0	1
17	Defibrillator	1	0	0	0	1
18	Delivery bed	5	1	1	3	10
19	Delivery instrument set	12	2	2	2	18
20	Diagnostic set	21	0	0	0	21
21	Diathermy machine	2	0	0	1	3
22	Dressing instrument set	1	0	0	0	1
23	Drying machine	1	0	0	0	1
24	ECG	1	1	1	1	4
25	Electrolyte analyzer	1	0	0	0	1

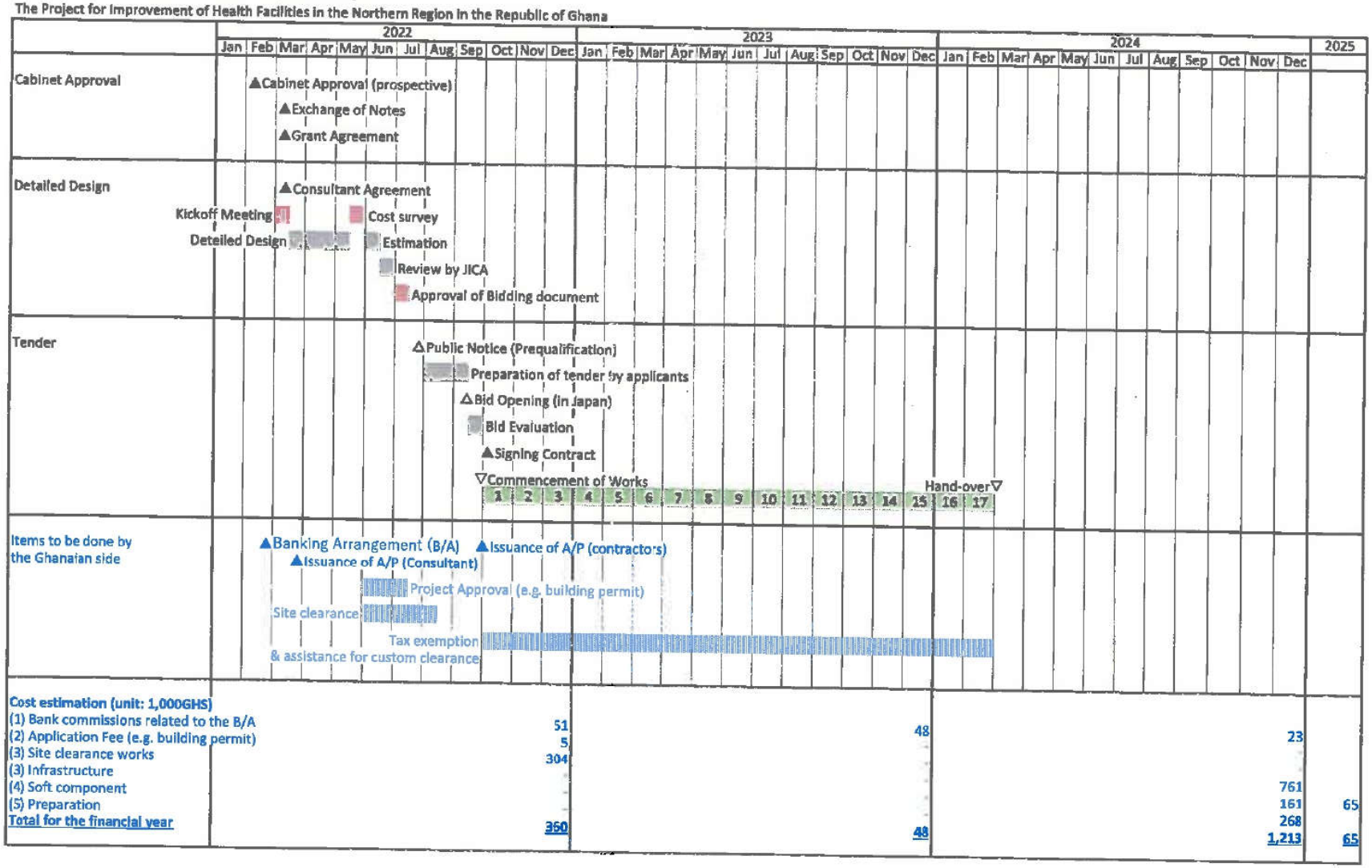
No.	Description	Q'ty				
		Tamale Central Hospital	Savelugu Municipal Hospital	Bimbilla District Hospital	Kpandai District Hospital	Total
26	Episiotomy instrument set	3	0	0	0	3
27	Examination bed	26	0	0	0	26
28	Examination bed for Ob/Gy	2	0	0	0	2
29	Examination light	7	1	1	1	10
30	Fetal doppler	7	2	1	1	11
31	Glucometer	2	0	0	0	2
32	Height and weight scale for adult	5	0	0	0	5
33	Height and weight scale for neonate	6	0	0	0	6
34	Hemoglobin meter	1	0	0	0	1
35	High pressure steam sterilizer M	1	0	0	0	1
36	High pressure steam sterilizer S	1	0	0	0	1
37	Hormone Analyzer	1	0	0	0	1
38	Hospital bed with IV stand	56	0	0	0	56
39	Hot air sterilizer	1	0	0	0	1
40	Incubator	1	0	0	0	1
41	Infant warmer	5	0	0	0	5
42	Infusion pump with IV stand	1	0	0	0	1
43	Instrument cabinet	39	0	0	0	39
44	Instrument set for dilation and curettage	2	0	0	0	2
45	Instrument set for Ob/Gy	4	0	0	0	4
46	Instrument set for PNC exam	1	0	0	0	1
47	Instrument trolley	5	0	0	0	5
48	Iron rack	4	0	0	0	4
49	IV stand	36	0	0	0	36
50	Kick bucket	2	0	0	0	2
51	Laryngoscope	1	0	0	0	1
52	Linen cart	2	0	0	0	2
53	Major surgery instrument set	2	0	0	0	2

No.	Description	Q'ty				
		Tamale Central Hospital	Savelugu Municipal Hospital	Bimbilla District Hospital	Kpandai District Hospital	Total
54	Mayo instrument stand	2	0	0	0	2
55	Medicine cabinet	2	0	0	0	2
56	Medicine refrigerator	6	0	0	0	6
57	Medicine trolley	13	0	0	0	13
58	Micropipette set	3	0	0	0	3
59	Microscope	7	1	1	1	10
60	Minor surgery instrument set	3	0	0	0	3
61	Neonatal resuscitation table	4	1	0	1	6
62	OT table manual	2	1	1	1	5
63	Overbed table	56	0	0	0	56
64	Patient monitor	6	1	1	1	9
65	Patient monitor for neonate	1	0	0	0	1
66	Pediatric bed	22	0	0	0	22
67	Phototherapy unit	3	1	0	0	4
68	Portable suction machine	2	0	0	0	2
69	Preparation table with chairs	1	0	0	0	1
70	Pulse Oximeter, finger type	3	0	0	0	3
71	Recovery bed	2	0	0	0	2
72	Resuscitation bag for adult	20	0	0	0	20
73	Resuscitation bag for neonate	8	0	0	0	8
74	Resuscitation bag for pediatrics	12	0	0	0	12
75	Revolving chair for episiotomy suturing	1	0	0	0	1
76	Semi-auto Biochemistry analyzer	1	0	0	0	1
77	Shadowless OT lamp, double arm	1	0	0	0	1
78	Shadowless OT lamp, single arm	1	0	0	0	1
79	Shadowless OT lamp, mobile	0	1	1	1	3
80	Shaker/Mixer	2	0	0	0	2
81	Spectrophotometer	1	0	0	0	1

No.	Description	Q'ty				
		Tamale Central Hospital	Savelugu Municipal Hospital	Bimbilla District Hospital	Kpandai District Hospital	Total
82	Sphygmomanometer	8	0	0	0	8
83	Stretcher	5	0	0	0	5
84	Suction unit	3	1	0	1	5
85	Surgeon chair	2	0	0	0	2
86	Syringe pump	6	0	0	0	6
87	Table top centrifuge	2	0	0	0	2
88	Thyroidectomy Instrument set	1	0	0	0	1
89	Ultrasonic nebulizer	2	0	0	0	2
90	Ultrasound scanner	2	0	0	0	2
91	Ultrasound scanner, portable	0	1	0	1	2
92	Vacuum extractor	2	0	0	0	2
93	Vein finder	1	0	0	0	1
94	Washing machine	1	0	0	0	1
95	Water distiller	1	0	0	0	1
96	Wheel chair	5	0	0	0	5
97	Xray film illuminator	11	0	0	0	11
98	Laboratory stool	12	0	0	0	12
99	Refrigerator for breast milk	1	0	0	0	1
100	Maintenance tool set	3	0	0	0	3
101	Oscilloscope	2	0	0	0	2
102	UPS	19	1	1	2	23
103	AVR	57	11	7	10	85
104	AVR for OT	1	0	0	0	1

Project Implementation Schedule (Tentative)

The Project for Improvement of Health Facilities in the Northern Region in the Republic of Ghana



Cost estimation (unit: 1,000GHS)			
(1) Bank commissions related to the B/A	51	48	23
(2) Application Fee (e.g. building permit)	5		
(3) Site clearance works	304		
(3) Infrastructure	-		761
(4) Soft component	-		161
(5) Preparation	-		268
Total for the financial year	360	48	1,213

	2025
	65
	65

Annex 6

Major Undertakings to be taken by the Government of Ghana

1. Specific obligations of the Government of Ghana which will not be funded with the Grant

(1) Before the Bidding

unit: 1,000 GHS

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within one month after the signing of G/A	MOF/ BOG		
2	To issue A/P to the Agent Bank for the payment to the consultant	within one month after the signing of the contract(s)	MOF/ BOG		
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A				
	1) Advising commission of A/P	within one month after the signing of the contract(s)	MOF/ BOG		
	2) Payment of commission for A/P	every payment	MOF/ BOG	11	
4	To approve IEE/EIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation for EMP and EmoP (and fulfilling conditions oof approval, if any)	before notice of the bidding document(s)	EPA/MOH	1	
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before notice of the bidding document(s)	MOH/GHS		
6	To secure and clear the following lands 1) Project sites at Tamale Central Hospital 2) Temporary construction yard and stockyard near the Project area	before notice of the bidding document(s)	MOH/GHS		
7	To obtain the Design Permit, Building Permit and Fire Service Approval	before notice of the bidding document(s)	MOH	4	
8	To clear, level and reclaim the following sites (Final determination would be after the Grant Agreement is concluded) 1) remove utilities underground piping, electrical cables and pole, including its foundation, inside the construction area 2) existing facilities Children Ward, Underground Septic Tanks, Washrooms 3) existing structures tree and their roots, flower bed, concrete foundation of old buildings, any buried concrete debris 4) leveling and reclaiming the sites	before notice of the bidding document(s)	MOH/GHS /RCC	304	
9	To submit Project Monitoring Report (with the result of Detail Design)	before notice of the bidding document(s)	MOH/PIU		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to the Agent Bank for the payment to the Contractor(s) and the Supplier(s)	within one month after the signing of the contract(s)	MOF/BOG		
2	To bear the following commissions to the Aagent Bank for the banking services based upon the B/A				
	1) Advising commission of A/P	within one month after the singing of the contract(s)	MOF/BOG		
	2) Payment commission for A/P	every payment	MOF	111	
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of Recipient and to assist the Contractor(s) and the Supplier(s) with internal transportation therein				
	1) Tax exemption and customs clearance of the products at the port of disembarkation	during the project	MOH/GHS		
	2) Internal transportation from the port of disembarkation to the project site	during the project	Japan		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the project	MOH		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted by its designated authority without using the Grant	during the project	MOF/ MOH		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the project	during the project	MOF/ MOH/GHS		
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant advice effect on the environment, the affected communities, the public or workers	during the construction	MOH/PIU		
8	1) To submit Project Monitoring Report	every month	MOH/PIU		
	2) To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within one month after signing of Certificate of Completion for the works under the contract(s)	MOH/PIU		
9	To submit a report concerning completion of the project	within six months after completion of the project	MOH/PIU		

10	To provide facilities for distribution of electricity, telecommunication, water supply and drainage and other incidental facilities necessary for the implementation of the project outside the site(s)				
	1) Electricity The drop wiring and internal wiring within the site up to the primary side of the Hi-voltage (or Medium-voltage) switchgear of the transformer	6 months before completion of the construction	MOH/GHS /NEDCo	434	
	2) Telecommunication The drop wiring and internal wiring within the site up to the primary side of the main distribution frame (MDF) or gateway. Network equipment and wiring within the site.	2 months before completion of the construction	MOH/GHS	65	
	3) Water supply Setting a basin including a meter and a valve. The connection of the branch piping from the city water supply piping to the meter. Installation of borehole as if necessary.	3 months before completion of the construction	MOH/GHS /GWC	172	
	4) Drainage Connection of drainage piping from the final basin to the drainage ditch outside the site	3 months before completion of the construction	MOH/GHS /RCC	4	
	5) TV Subscription contract for TV	before taking over	MOH/GHS /RCC	5	
	6) Pavement Pavement repair works on the outside of the site around the new entrance	3 months before completion of the construction	MOH/GHS /RCC	81	
11	To ensure the safety of persons engaged in the implementation of the Project	during the project	PIU/RCC		
12	To take necessary measure for security and safety of the Project site. Traffic control	during the construction	Contractor/ PIU		
13	To ensure that proper personnel, especially for medical equipment dedicated to medical equipment will be allocated to utilize equipment effectively	before taking over	MOH/GHS		
14	To ensure the operation cost for participating in the maintenance and operation training of Soft Component including daily allowance, transportation and lodging etc.	during Soft Component	MOH/GHS	161	
15	Removal of obsolete medical equipment by taking appropriate measures and secure the places for planned equipment	before installation of equipment	GHS (RHD)/ RCC		
16	Secure electricity power supply (AC power outlets) for the places where new equipment will be setting-up in three (3) district hospitals.	before installation of equipment	MOH/GHS /3 Hospitals		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection 4) Engagement of maintenance contract with concerned local agents, if necessary	After completion of the construction	MOH/GHS /RHD	1,596 per year	
2	To allocate staffs required for the maintenance of facilities and equipment	After completion of the construction	MOH/GHS		
3	Plantation/landscape work of the site	After completion of the construction	MOH/GHS		
4	Installation of furniture General furniture (office furniture, personal PC etc.)	After completion of the construction	MOH/GHS	268	
5	To ensure the operation cost for participating in the maintenance and operation training including daily allowance, transportation and lodging etc.	during Soft Component after completion of the construction	MOH/GHS	65	

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Beneficiary Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Ministry

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Beneficiary Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-8 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement
- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement
- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*
Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:

	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Appendix 5

Project for the Improvement of Health Care System in the Northern Region in the Republic of Ghana
Soft Component Plan

1. Background of Planning the Soft Component

1-1 Purpose of the Project

The establishment of basic health care services has been delayed in the Northern Region, the target region of the Project for the Improvement of Health Care System in the Northern Region in the Republic of Ghana (hereinafter referred to as "the Project"). Tamale Central Hospital (hereinafter referred to as "TCH"), which is positioned as a regional hospital, is not sufficiently fulfilling its functions as a regional hospital due to many problems such as deteriorating facilities, lack of space for facilities, insufficient medical devices, and a lack of the medical specialists that should be assigned to a hospital of its standing. Furthermore, TCH and district hospitals (hereinafter referred to as "DH"), which provide the same services as TCH, are unable to provide adequate medical treatment due to insufficient facilities; consequently, patients are clustering at Tamale Teaching Hospital (hereinafter referred to as "TTH"), a higher-level hospital. The crowding keeps TTH so busy providing examinations and treatment for mildly ill patients that the hospital is unable to focus on its intended role of providing tertiary health care services.

The Project aims to improve referrals and the quality of health care services by installing facilities and medical devices at TCH and installing medical devices at district hospitals in the region, and its purpose is to contribute to the improvement of maternal mortality rates, neonatal mortality rates, and other health indicators in the region through efforts to improve the quality of health care services, an urgent issue throughout Ghana. This is consistent with Sustainable Development Goal (SDG) 3, and also contributes to the achievement of Universal Health Coverage (UHC) in Ghana, which was selected as a focal country for intensive support for UHC under the TICAD VI (2016) assistance policy of Promoting Resilient Health Systems.

In addition to improving TCH through the integrated installation of facilities and equipment, Project plans call for the installation of equipment to improve health care services involving births at three district hospitals—Savelgu Municipal District Hospital, Bimbilla District Hospital, and Kpandai District Hospital—to strengthen the entire region's referral system. Plans also call for strengthening the region's medical device maintenance system by equipping the Biomedical Engineering Department (hereinafter referred to as "the BME Department"), which is responsible for maintaining medical devices throughout the region, with basic repair equipment and measuring instruments.

1-2 Present State and Challenges Relating to Use of Equipment

Maintenance of medical devices at TCH and the three DH within the scope of the Project is presently implemented by regional BME Departments throughout the country (in the case of the Northern Region, the department is located in the city of Tamale) in response to requests from the Ghana Health Service (hereinafter referred to as "the GHS") using an Internally Generated Fund (a fund created using hospital revenue, hereinafter referred to as "IGF") secured by each medical facility.

However, the funds are not being used properly with respect to (1) equipment ledger usage methods, (2) daily inspections, (3) repair procedures when equipment malfunctions, and (4) allotment of equipment maintenance expenses; therefore, improvement is necessary.

First, regarding the present state of (1) equipment ledger usage methods, asset managers have created inventory lists of medical devices owned by target facilities as hospital assets, but are not performing actions such as tracking the cumulative cost of equipment repairs and drafting plans to update equipment, and the lists do not contain details that can be used to order routinely replaced parts or consumable parts that are essential for equipment utilization.

Next, regarding (2) daily inspections, equipment is not being used in a state where the pursuit of patient safety is sufficient because confirmation items are sometimes skipped due to the lack of implementation of preliminary inspections in the Theater Department and other departments and insufficient communication to nurses on subsequent shifts.

Regarding (3) repair procedures when equipment malfunctions, the flow is such that asset managers at each hospital request repairs from the BME Department in Tamale. Having received the requests for repairs, the BME Department checks the condition of the medical devices and performs the repairs using spare parts supplied by the medical facility; however, because the asset managers are not the end users of the equipment, they often do not properly communicate the nature of the equipment breakdown, meaning that it takes time to identify the locations of the problems. Regarding medical devices that are beyond the technical capacities of the BME Department, the system is such that the BME Department or the hospital requests repairs directly from the business agents that sell the medical devices; however, there are occasional cases in which the devices remain out of order for failure to raise money to pay the expense of repairs and transportation for the business agents' engineers to visit from Accra. Technical guidance for medical personnel and scheduled inspections were conducted by the BME Department two times per year using a budget allocated from the GHS. However, the government of the Northern Region has not provided the budget to the BME Department for roughly two years; it is not possible to implement preventive maintenance activities, and the regional BME Department is receiving an increasing number of repair requests from hospitals only after the status of malfunctioned equipment has become critical.

Medical facilities procure consumable parts, which are essential for utilizing medical devices, and replacement parts, which are essential for performing repairs and conducting scheduled inspections,

individually; a systematic procurement system has not been established, resulting in shortages of consumable parts and prolonged procurement times for replacement parts that inhibit patient services.

Regarding (4) allotment of equipment maintenance expenses, the Regional Health Directorate (RHD) of the Northern Region has advised medical facilities to allocate 10% of expenditures on each facility to maintenance expenses, but in many fiscal years, the percentages are lower. Consequently, for clinical examination instruments and other equipment for which maintenance is difficult without concluding maintenance agreements with business agents in Accra, maintenance agreements are not properly concluded, and there are cases where equipment breaks down and is left in that state for lack of maintenance.

In order to resolve these issues, the plan under the Project is to implement soft component activities toward improving the maintenance of medical devices.

2. Soft Component Objective

The objective of the soft component of the Project is to strengthen the maintenance systems at target facilities at which medical devices are installed so that the devices can continue to be used in good shape for a long time.

3. Soft Component Outcomes

3.1 Inventory lists that include essential information for equipment maintenance, such as histories of malfunctions, cumulative repair costs, and the state of equipment operation, are created and used.

3.2 End users master methods of conducting daily and scheduled inspections for each piece of installed equipment.

3.3 When equipment malfunctions, managers of equipment in end users' departments relay details about the malfunctions to the regional BME Department through the hospital's asset managers.

3.4 Hospital asset managers further their understanding of the importance of medical device maintenance, and allocate appropriate maintenance budgets.

3.5 Regarding the purchase of routinely replaced parts and consumable parts, which are essential for operating equipment, a system is established in which scheduled purchases are made after annual expenditures are calculated in terms of numbers and patients, applications for necessary expenditures are made without fail when securing budgets, and budgets are implemented.

3.6 Regarding clinical examination instruments and other equipment that requires constant

maintenance service by business agents, agreements between hospitals and business agents are continuously concluded after the expiration of the multi-year insured maintenance agreement period under the grant aid project.

4. Methods for Confirming Outcome Achievement

The level of outcome achievement shall be confirmed using the following methods.

Table 1: The method of achievement confirmation

The method of achievement confirmation	Corresponding items in "Result of the Soft Component Program"
(1) Paper proficiency test	3.1、3.2、3.3
(2) Operation (update) status of the inventory list of the procured equipment	3.2
(3) The procurement plan of replacement parts and consumables	3.5
(4) The status of the conclusion of Annual Maintenance Contract with local agent (including periodical check)	3.6
(5) Long-term budget plan for equipment (The Budget plan for the Annual Maintenance contract and its application status)	3.4
(6) Creation of daily checklist for each device and its usage status	3.1
(7) Flow chart for repair in case malfunction occurs	3.3
(8) Daily checklist and periodical checklist	3.2
(9) Medical equipment maintenance manual	3.1～3.6

5. Soft Component Activities (Input Plan)

The activity plan for the soft component shall be implemented in two separate sessions. The main reasons for splitting the plan into two sessions are given in the following three points.

1) Medical personnel cannot clearly envision their questions as to methods of maintaining equipment until they actually use it in clinical practice.
2) In addition, they cannot clearly envision their questions about utilizing items such as logs for preventive maintenance activities they have learned (e.g. daily inspection logs) until they actually start using them.
3) The timing of guidance should take into account the fact that negotiations for concluding maintenance agreements are done before free warranty periods expire. In addition, it is best to first observe the frequency of equipment usage to enable the selection of agreement details suited to actual usage.

The targets for the soft component are the regional BME Department, and the asset managers, equipment managers, and end users of TCH and the three district hospitals (hereinafter referred to as "the 3DH"). Notably, because medical personnel work in shifts, the hospitals are asked to coordinate shifts so that the medical personnel from each have equal opportunities to undergo the training. The training venue is located in Tamale, specifically at TCH, which has the most equipment installed.

The tables below show the equipment and people within the scope of soft component guidance, and the activity plan.

Table 2: Target equipment for soft component (TCH)

Department	Equipment name
OPD	Ultrasonic nebulizer, Suction unit, Examination light, Glucometer
ANC, PNC, CWC	Ultrasound scanner, Fetal doppler, Height and weight scale for neonate
Laboratory	Blood cell counter, Hemoglobin meter, Table top centrifuge, Electrolyte analyzer, Microscope, Coagulometer, Semi-auto biochemical analyzer, Spectrophotometer, Water distiller, Hormone analyzer, Incubator, Hot air sterilizer, Blood bank centrifuge, Blood bank refrigerator, Medicine refrigerator, Deep freezer
OT, Recovery	Shadowless OT lamp, OT table manual, Anesthesia machine with ventilator, Suction unit, Portable suction machine, Diathermy machine, Defibrillator, Patient monitor, Neonatal resuscitation table, Infusion pump with IV stand
CSSD	Hight pressure steam sterilizer
Laundry	Washing machine, Drying machine
Delivery room, Treatment room	Delivery bed, Neonatal resuscitation table, Vacuum extractor, Examination light
Maternity ward, Examination room	Fetal doppler, Ultrasound scanner, ECG, Ultrasonic nebulizer
NICU	Infant warmer, Phototherapy unit, Neonatal resuscitation table, CPAP, Portable suction machine, Patient monitor for neonate, Bilirubin meter, Height and weight scale for neonate, Glucometer, Vein finder, Syringe pump
Pediatric ward	Height and weight scale for neonate, Ultrasonic nebulizer

Target equipment for soft component（3DH）

Department	Equipment name
Delivery room	Delivery bed, Examination light Fetal doppler, ECG, Ultrasound scanner, portable, Neonatal resuscitation table, Phototherapy unit
OT, Recovery	Shadowless OT lamp, mobile, OT table manual, Anesthesia machine with ventilator, Suction unit, Patient monitor
CSSD	Autoclave for DH
Blood bank	Blood bank refrigerator, Microscope

Target equipment for soft component（biomedical department）

Department	Equipment name
BME	Oscilloscope

Table 3: Soft component participants

Affiliation	Title	Number of people	Activity	Session to participate
TCH and 3DH	Hospital Director, Asset Manager	Each 1	・ Explanation of equipment management activity plan ・ Introduction of maintenance equipment ・ Explanation of the importance of equipment maintenance (prevention of electric shock due to leakage current to patients and medical staff, etc.) ・ Introduction of ideas for keeping	The first 1, 7

Affiliation	Title	Number of people	Activity	Session to participate
			motivation up, such as an award system for excellent staff based on the maintenance report status	
	General equipment manager Equipment managers (at each department)	3 to 5 people	・ Guidance on how to manage regular equipment inspections (every six months) ・ Instruction of lifetime maintenance and renewal of equipment ・ Guidance on long-term procurement methods for periodic replacement parts / consumables ・ Instruction on how to update the equipment inventory ・ Guidance on how to deal with equipment failures ・ Guidance on equipment that requires a maintenance contract with the manufacturer's agent and the contents of the maintenance contract	The first-1~8 The second 9
	End-users (doctors / nurses)	5 to 10 from every department	・ Guidance on the effectiveness, quality, and safety of medical devices ・ Guidance on point recognition and operation methods when using medical equipment and during daily inspections ・ Explanation of maintenance equipment	The first -1, 2, 3, 4, 5, 6, 8, 9 The second 9
BME Department	Biomedical engineer	At least 4	・ Guidance on inventory creation and management method ・ Instruction of daily inspection and regular inspection methods ・ Guidance on how to make a purchase plan for periodic replacement parts and consumables ・ How to deal with problems	The first -1~8 The second 9

Table 4: Implementation plan of soft component program

Session	Result	Implementation No.	Description	Main target		Schedule
				Hospitals	BME	
The First Session	General	1.	Appointment of the general equipment manager and equipment managers at the target facilities	○		On delivery of equipment
	3.1	2.	Creation and utilization of the equipment inventory lists by the equipment maintenance manager and his team and by each clinical department	○	○	
		3.	Creation of maintenance sheets for each equipment (Procurement year, Manufacturer, Model, History of malfunction: operating / no-operating time, Utilization records, Periodic inspection records	○	○	

Session	Result	Implementation No.	Description	Main target		Schedule
				Hospitals	BME	
	3.2 3.4 3.5 3.6	4.	The points of daily check / periodic inspection, instruction of how to use the daily / regular maintenance check sheets	○	○	
		5.	Instruction for the selection of the type, requirements (contents) and fee of maintenance contract; Discussions on narrowing down maintenance content according to budget, equipment usage frequency, and service usage status	○	○	
		6.	Frequency and contents of periodical check for each equipment	○	○	
		7.	Instruction for the procurement plan of periodic replacement parts and consumables for each equipment; Creation of ordering list; Guidance on how to create a long-term budget plan for equipment; Creation of budget draft Support for applying for annual maintenance costs for equipment on the management side Procurement of consumables and replacement parts based on the procurement plan, equipment maintenance, and securing of operation Create a medical equipment maintenance manual and have it approved by the hospital director	○	○	
The First Session	3.5	8.	Establishing a contact route when equipment is out of order (accurate communication of failure details)	○	○	On delivery of equipment
The Second Session	3.1 3.2 3.3 3.4 3.5	9.	Implementation training (simulation) using various forms created and prepared in the first session, and guidance on problem extraction and improvement methods	○	○	Just before warranty period expires

6. Soft Component Instructors

People with comprehensive knowledge, practical experience, and management experience in methods of safely utilizing and maintaining medical devices will be dispatched from Japan as soft component instructors to lay a foundation by providing guidance on creative solutions in medical device maintenance in practice in medical settings in Japan (e.g. contacting clinical engineers even when minor malfunctions are discovered in daily inspections to overcome those malfunctions, ensuring equipment safety and effectiveness by having end users implement scheduled inspections to the extent possible). In addition, to further enhance the effects of the soft component and strive for the outcomes of input to

take hold and last, it is critical to develop an understanding of the status of trainees and target hospitals and adjust the training content and materials as needed. Plans for the people to dispatch are as follows.

- In-hospital guidance on equipment maintenance (1 person):
  A person with at least 10 years of experience in medical device maintenance and working in medical settings in developing countries. This person shall create the soft component training materials.

- Assistance with guidance/course coordination (1 person):
  This person shall make various arrangements, including selecting suitable trainees from multiple target facilities, creating lists of trainees to enable them to partake in training sessions in Tamale, and arranging for the RHD to pay transportation expenses, daily allowances, and the like to each hospital. The person shall handle logistics, including creating registers of trainees, visit the trainees of the soft component, check to make sure they understand the content, and assist with guidance as needed.

7. Soft Component Implementation Schedule

Session No. 1 shall start two weeks before equipment is installed, and requires 1.0 months (field operations). (In-hospital guidance on equipment maintenance: 0.77 P/M, Assistance with guidance/course coordination: 1.00 P/M). Regarding in-hospital guidance on equipment maintenance, the materials to be used during the training shall be created in Japan before the start of Session No. 1 (0.50 P/M). By starting the training two weeks before the equipment is handed over, it will be possible to provide guidance on the software components based on the extent to which the end user has thoroughly understood the initial operational guidance provided by the technician dispatched by the supplier, and to provide guidance using the actual equipment, which is expected to result in a high degree of retention.

Session No. 2 shall start roughly 11 months after equipment installation is complete, and requires 0.53 months (field operations). (Only the person providing in-hospital guidance on maintenance travels to Ghana) 13.7 months are required from the start to the completion of the soft component. Regarding in-hospital guidance on equipment maintenance, after the completion of Session No. 2, tasks such as compiling a completion report for the soft component shall be implemented in Japan (0.55 P/M).

Table 5: Soft Component Implementation Schedule

Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Domestic	Local
Equipment installation		▲																
Handing over			▲															
Guidance and instructions on maintenance of hospital equipment	1st. session 0.5	0.7	7PM									2nd.session 0.5	3PM			0.5	5PM 1.05	1.30
Guidance assistance / training supervising	0.50PM		1.00PM															1.00
Implementation status report of soft component		▲																
Completion report																▲		

8. Soft Component Outputs

The following are submitted as outputs of soft component implementation.

The method of achievement confirmation
(1) Results of paper proficiency tests
(2) Implementation status of daily inspection using regular format
(3) Operation (update) status of the equipment management inventory list
(4) The procurement plan of periodical replacement parts and consumables
(5) (Draft of) the Conclusion of Annual Maintenance Contract with local agent (including periodical checks)
(6) Presentation documents and videos used for instruction
(7) Long-term budget plan for equipment (draft)
(8) Operation status of management sheets for each equipment

9. Responsibilities of the Partner Country Implementing Agency

9-1 Recipient Country Responsibilities Pertaining to Implementation of the Soft Component

- The four hospitals (including TCH) should adjust shifts and other working hours to enable asset managers, physicians, physician assistants, nurses, co-medical staff members (e.g. lab technicians), equipment managers, their teams, and other trainees to attend training. In addition, an equipment maintenance manager should be appointed at least two weeks before the start of the soft component instruction, and a list of attendees from each hospital should be prepared and communicated to the consultant at least one week in advance.
- The RHD must adjust working hours to enable the regional BME Department to partake in training.

- Securing/executing budgets for transportation expenses and daily allowances for trainees from district hospitals
- Arranging soft component training venues

9-2 Recipient Country Responsibilities Pertaining to Medical Device Maintenance

In order to put the details of practical guidance under the soft component into practice, each hospital must properly allocate money for annual maintenance agreement expenses, and consumable parts, replacement parts, and other maintenance expenses and running costs; therefore, each hospital must implement properly scaled budgetary measures from IGF.

In addition, because large-scale medical device installation shall be implemented at TCH under the Project, the regional BME Department should permanently station one biomedical engineer at TCH to solidify the maintenance system.

Attachment 1: Soft Component Implementation Schedule

Attachment 1. Schedule of Soft Component
First session

			Guidance and instructions on maintenance of hospital equipment 0.77MM	Guidance assistance / Training supervising 1.0MM
Day 1		Fri		NRT－ADD
Day 2		Sat		－ACC (Accra)
Day 3		Sun		Team MTG
Day 4		Mon		MTG in JICA, MTG in MOH; Explanation on contents of the soft component Accra - Tamale
Day 5		Tue		Tamale, RHD (incl. BME dept.) Explanation on contents of the soft component
Day 6		Wed		Savelugu Hospital Final logistics coordination such as confirmation of attendees
Day 7		Thu		Bimbilla Hospital Final logistics coordination such as confirmation of attendees
Day 8	Day 1	Fri	NRT－ADD	Kpandai Hospital Final logistics coordination such as confirmation of attendees
Day 9	Day 2	Sat	-ACC (Accra)	Team MTG
Day 10	Day 3	Sun	Accra - Tamale	Team MTG
Day 11	Day 4	Mon	Written exam on skill proficiency	Exam scoring; Attendee list summary
Day 12	Day 5	Tue	Explanation of equipment management activity plan; Introduction of maintenance equipment; Explanation of importance of maintenance	Patrol to check participants' understanding
Day 13	Day 6	Wed	Creation and management of equipment inventory lists by the equipment maintenance manager and his team, and by each clinical department	
Day 14	Day 7	Thu	Creation of maintenance sheets for each equipment (procurement year, manufacturer, model, history of malfunction: operating / no-operating time, utilization records, periodic inspection records)	
Day 15	Day 8	Fri	Idem.; Summary of the first week	
Day 16	Day 9	Sat	Team MTG	
Day 17	Day 10	Sun	Team MTG	
Day 18	Day 11	Mon	Guidance on daily / regular inspection points and how to use daily / regular inspection forms (surgery / sterilization dept.)	
Day 19	Day 12	Tue	Guidance on daily / regular inspection points and how to use daily / regular inspection forms (obstetrics related dept.)	
Day 20	Day 13	Wed	Instruction for the selection of the type, requirements (contents) and fee of maintenance contract; Discussions on narrowing down maintenance contents according to the budget, equipment usage frequency, and service usage status	
Day 21	Day 14	Thu	Frequency and contents of periodical check for each equipment; Presentation of a draft of medical equipment maintenance manuals	
Day 22	Day 15	Fri	Instruction for the procurement plan of periodic replacement parts and consumables for each equipment; Creation of ordering lists	
Day 23	Day 16	Sat	Team MTG	
Day 24	Day 17	Sun	Team MTG	
Day 25	Day 18	Mon	Guidance on how to create a long-term budget plan for equipment; Creation of a budget draft; Approval of medical equipment maintenance manuals by the hospital director	
Day 26	Day 19	Tue	Support for applying for annual maintenance costs for equipment on the management side; Procurement of consumables and replacement parts based on the procurement plan; Equipment maintenance; Securing of operation	
Day 27	Day 20	Wed	Establishing a contact route when equipment is out of order (accurate communication of failure details); Total summary	
Day 28	Day 21	Thu	Tamale - Accra Report MTG in JICA; Report MTG in MOH	
Day 29	Day 22	Fri	ACC - ADD	
Day 30	Day 23	Sat	- NRT	

Second session

		Guidance and instructions on maintenance of hospital equipment 0.53MM
Day 1	Fri	NRT－ADD
Day 2	Sat	－ACC (Accra)
Day 3	Sun	Team MTG
Day 4	Mon	MTG in JICA, MTG in MOH; Explanation on contents of the 2nd. session of soft component Accra - Tamale
Day 5	Tue	Confirmation of practical status of the first session with RHD and BME Dept
Day 6	Wed	Practical training (simulation) using various check sheets prepared in the 1st. session at TCH;
Day 7	Thu	Extraction of problems;
Day 8	Fri	Guidance on improvement methods
Day 9	Sat	Discussion witn BME dept. about improvement points and issues
Day 10	Sun	Team MTG
Day 11	Mon	Practical guidance in Savelugu Hospital
Day 12	Tue	Practical guidance in Bimbilla Hospital
Day 13	Wed	Practical guidance in Kpandai Hospital
Day 14	Thu	Tamale - Accra; Report MTG in JICA, Report MTG in MOH
Day 15	Fri	ACC - ADD
Day 16	Sat	- NRT

First Breakdown of Preparation in Japan

A. Practical guidance on appointing equipment maintenance managers and preventive maintenance activities	・ Text for electrical safety/classification of medical equipment (B, BF, CF) (roughly one page) ・ Definition of roles and division of duties of equipment maintenance managers (roughly 2-3 pages) ・ Guidance on methodology of daily inspections before and after use (introduction of key points for the earliest possible discovery of problems with equipment) roughly four pages (Divide equipment into equipment for Theaters, the Delivery Room, diagnostic imaging, and clinical inspections, and compile inspection items for each piece of equipment) ・ Guidance on scheduled inspection items that can be inspected inside the hospital (Compile one page of information for each piece of equipment (e.g. portable artificial respirators, open/closed incubators, light therapy equipment), roughly 4-5 pages) ・ Roles of the UPS (important points to remember during use, and the underlying reasoning) from medical equipment connected to generator circuits to generator engagement, roughly one page Total: Roughly 14 pages
B. Management of equipment inventory lists, repair histories	・ Inventory list, one-page template (2-3 examples from other countries) ・ Records for when equipment malfunctions, one-page template (2-3 examples from other countries) Total: 2 pages (+6 examples)
C. Establishment of repair notification system	・ Written history of repairs (Reasons why equipment became non-operational, factors behind malfunctions, equipment downtime (write information such as the state of the equipment at the time of the receiving inspection), one page (three examples from past projects) Total: 2 pages (+3 examples)
D. Creation of daily inspection/scheduled inspection logs for each piece of equipment	・ Create daily inspection logs/scheduled inspection logs, referring to manuals and factoring in specifics of each piece of equipment within the scope of guidance Equipment within the scope of guidance: 51 types x 3 pages = 153 pages
	Total: 170 pages

*Consolidation of documents (e.g. literature surveys, referring to manufacturers' manuals) leading to creation of texts: 2 days

*Creation of documents, inquiries to/communication with manufacturers: 7 days

*Communication with Ghana, coordination, revision: 1 day

Second Breakdown of Ex-Post Work in Japan

A. Consolidation of relevant documents	・ Consolidation of photographs of guidance, lists of attendees, results of pre-tests/post-tests, questionnaire survey results; revision and improvement of inventory lists, inspection logs, and the like needed to align them with circumstances in the partner country and make them easier for the partner country to use: Total of 2 days
B: Creation of soft component completion notice	・ Organization of soft component completion notice in Japanese regarding details of two instances of guidance at a total of four hospitals: Total of 4 days
C. English translation of soft component completion notice	・ English translation of documents from B, internal proofreading: Total of 2 days

D. Explanation/discussion of details of soft component completion notice	・ Explanation/discussion/revision with the MoH, RHD, regional BME Department, and TCH: Total of 3 days
	Total: 11 days

Appendix 6: References

No.	Title	Type	Date	Issue/Writer
1	2018 Ghana Building Code	Paper	2018	Ghana Standard Authority
2	Medium-Term National Development Policy Framework: An Agenda for Jobs: Creationg Prosperity and Equal Opportunity for All 2018-2021	Digital copy	Dec. 2017	National Development Planning Commission
3	Medical Equipment Policy and Guideline	Digital copy	June 2018	Ministry of Health
4	Holistic Assessment of 2019 Programme of Work	Digital copy	Apr. 2020	Ministry of Health
5	Tamale Central Hospital 2020 Annual Report	Digital copy	2021	Tamale Central Hospital
6	Performance Review Narrative (Annual 2020)	Digital copy	2021	Savelugu Municipal Hospital
7	Annual Performance Review 2020	Digital copy	2021	Baptist Medical Centre
8	Annual Performance Review 2020	Digital copy	2021	ECG Hospital
9	ECG Hosputal Financial Report 2020	Digital copy	2021	ECG Hospital
10	Annual Performance Review	Digital copy	2021	Kpandai District Hospital
11	Case Statistics for Cesarean Section at TCH	Digital copy	2019 2020	Tamale Central Hospital
12	Ghana National Healthcare Quality Strategy (2017-2021)	Digital copy	Dec.2016	Ministry of Health
13	The Budget Statement and Economic Policy (2016, 2017, 2018, 2019, 2020)	Digital copy	—	Government of Ghana
14	Ghana 2021 Population and Housing Census	Digital copy	Nov. 2021	Ghana Statistical Service
15	Weather statistics in Tamale (2015, 2016, 2017, 2018, 2019)	Digital copy	—	Ghana Meteorological Agency
16	Reference drawings (excerpt) 5 Districts / General Hospitals and 1 Polyclinic 参考図面（抜粋）	Digital copy	July 2019	Ministry of Health

Appendix 7: Topographical Survey Map (Scale 1/1200)