**Kingdom of Cambodia**
**Ministry of Health**

# THE DATA COLLECTION SURVEY ON PROJECT FOR UPGRADING QUALITY OF HEALTH SERVICES OF SELECTED PROVINCIAL HOSPITALS IN THE KINGDOM OF CAMBODIA

# FINAL REPORT

**November 2023**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC.**
**KOEI RESEARCH & CONSULTING INC.**

| |
|---|
| 1R |
| JR (P) |
| 23-033 |

# TABLE OF CONTENTS

**Appendices**

# ACRONYMS

| | |
|---|---|
| ADB | Asia Development Bank |
| AHWR | Annual Health Welfare Report |
| AusAID | Australian Agency for International Development |
| AY | Academic Year |
| CA | Catchment Area |
| CamLIS | Cambodia Laboratory Information System |
| CHE | Current Health Expenditure |
| CMS | Central Medical Store |
| CP | Capital and Provincial |
| CPA | Complementary Package of Activities |
| CPA3+ | Extended Complementary Package of Activities |
| CPD | Continuing Professional Development |
| CSSD | Central Sterile Supply Department |
| CT | Computed Tomography |
| CTG | Cardiotocography |
| D&D | Decentralization and De-concentration |
| DH | District Hospital |
| DHRD, MOH | Deployment and Management and Human Resource |
| DHS | Demographic and Health Survey |
| DM | District and Municipal |
| DP | Department of Personnel |
| ECG | Electrocardiogram |
| EEG | Electroencephalogram |
| EIRR | Economic Internal Rate of Return |
| EMG | Electromyograph |
| ENT | Ear, Nose, Throat (ward) |
| ER | Emergency Room |
| FIRR | Financial Internal Rate of Return |
| G/A | Grant Agreement |
| GDP | Gross Domestic Product |
| GIZ | German Agency for International Cooperation |
| HbA1c | Hemoglobin A1c |
| HC | Health Center |
| HCP | Health Coverage Plan |
| HCU | High Care Unit |
| HEF | Health Equity Fund |
| H-EQIP | Health Equity and Quality Improvement Project |
| HMIS | Health Management Information System |
| HP | Health Post |
| HPC | Health Professional Council |
| HRH | Human Resources for Health |
| HSP3 | Third Health Strategic Plan |
| HSP4 | Forth Health Strategic Plan |
| HWDP3 | Third Health Workforce Development Plan |
| ICD-10 | International Classification of Diseases, 10$^{th}$ revision |
| ICU | Intensive Care Unit |
| IMF | International Monetary Fund |
| IP | Inpatient |
| IPC | Infection Prevention Control |
| IT | Information Technology |
| JICA | Japan International Cooperation Agency |
| KOFIH | Korea Foundation for International Healthcare |
| L/A | Loan Agreement |
| MCC | Medical Council of Cambodia |
| MEDEM | Medical Equipment Maintenance and Management System |

| | |
|---|---|
| MEE | Medical Equipment Engineer |
| MEF | Ministry of Economy and Finance, Cambodia |
| MMR | Maternal Mortality Ratio |
| MNCU | Mother-Newborn Care Unit |
| MOE | Ministry of Environment, Cambodia |
| MOH | Ministry of Health, Cambodia |
| MPA | Minimum Package of Activities |
| MRI | Magnetic Resonance Imaging |
| NCD | Non-Communicable Diseases |
| NCSD | National Council for Sustainable Development |
| NGO | Non-Governmental Organization |
| NH | National Hospitals |
| NICU | Neonatal Intensive Care Unit |
| NIPH | National Institute of Public Health |
| NSP | National Strategic Plan |
| NSSF(-C) | National Social Security Fund (for Civil Servants) |
| OBGY | Obstetrics and Gynecology |
| OD | Operational District |
| OJT | On-the-job Training |
| OOP | Out of Pocket |
| OP(D) | Outpatient (Department) |
| PACS | Picture archiving and communication system |
| PAI | Public Administrative Institute |
| PCA | Payment Certification Agency |
| PCI | Percutaneous Coronary Intervention |
| PCR | Polymerized Chain Reaction |
| PHD | Provincial Health Department |
| PH | Provincial Hospital |
| PMRS | Patient Management and Registration System |
| PPP | Public Private Partnership |
| RCT | Regional Training Center |
| RH | Regional Hospital/ Referral Hospital |
| STEPS | WHO STEPwise approach to NCD Risk Factor Surveillance |
| TB | Tuberculosis |
| UHC | Universal Health Coverage |
| USAID | United States Agency for International Development |
| VHV | Village Health Volunteer |
| WHO | World Health Organization |

# Project Sites Map

# Photos

| | |
|---|---|
|  |  |
| Interview at the Phnom Penh Municipal Hospital | Automated biochemical analyzer purchased at Joint Partnership (PPP) at Siem Reap Provincial Hospital |
|  |  |
| Site visit with Personal Protective Equipment (PPE) at the Svay Rieng Provincial Hospital | Explaining the purpose of the survey at Kampong Cham Provincial Hospital |
|  |  |
| Interview with Financial officers at the Kampot Provincial Hospital | Visiting the ward at the Kampong Cham Provincial Hospital |
|  |  |
| Discussion with the Governor and Deputy Governor at the State Government Building (Battambang Province) | Interview at the Battambang Provincial Hospital |
|  |  |
| PCR testing equipment (Genexpert) used for tuberculosis testing at the Stung Treng Provincial Hospital | Interview at the Sung Treng Provincial Hospital |

# Executive Summary

## 1. Survey Background and Objectives

Cambodia has made significant progress in economic growth and poverty reduction in the past few decades, improving key health outcomes including the reduction of maternal mortality. Despite the progress, the challenges of economic disparity and health inequity remain. As the Cambodian population is increasingly aging, the disease structure has also changed with an increasing burden of non-communicable diseases (NCDs) as a major cause of deaths. In this context, Cambodia's Ministry of Health (MOH) is accelerating efforts to achieve universal health coverage (UHC) by improving access to health services, developing health infrastructure, ensuring a stable supply of health care equipment and materials, and securing sufficient health human resources through its health policies and plans.

Based on the long history of support by the Japan International Cooperation Agency (JICA) in the health sector of Cambodia, the Cambodian government has recently requested JICA to expand its cooperation to support their efforts in strengthening health facilities, equipment and human resources. Subsequently, JICA has commenced the Data Collection Survey on the Project for Upgrading Quality of Health Services of Selected Provincial Hospitals in the Kingdom of Cambodia. The survey has two objectives: 1) to analyze the current situation of the healthcare service delivery system in Cambodia, and the status of healthcare facilities, equipment, and human resource management in the selected municipal and provincial hospitals; and 2) To collect necessary information for the formulation of a regional hospital development plan and a human resource development plan.

## 2. Justification

The survey findings revealed various gaps in the health system of Cambodia. One of the key findings is the shortage of specialized doctors to provide advanced medical services for NCDs at the subnational level. At present, resources for and patients with NCDs are highly concentrated at national hospitals. In response to the high demand for advanced medical care to deal with the increasing burden of NCDs among the ageing population, MOH is proposing to upgrade some of the municipal and provincial hospitals as "regional hospitals" under the upcoming fourth Health Strategic Plan 2022-2030 (HSP4). Although the definitions, roles, and types of services of regional hospitals have yet to be finalized, they are intended to provide a tertiary level of specialty care with highly specialized equipment and expertise in addition to the national hospitals.

Among the studied hospitals, the survey team found that Siem Reap, Battambang, and Kampong Cham Provincial Hospitals were more equipped to provide further advanced medical services (e.g., cardiology, neurology, and cancer treatment) as regional hospitals. In addition, diagnosis and treatment in major NCD-related clinical departments could be strengthened for the other four hospitals, namely, Kampot, Svay Rieng, and Stung Treng Provincial Hospitals and Phnom Penh

Municipal Hospital. For the functioning of the upgraded hospitals, it is critical to deploy necessary human resources, particularly specialist doctors, and train existing personnel to provide required advanced medical services through capacity building measures.

Based on the initial concept, the survey team facilitated discussions with MOH, MEF, target hospitals and key development partners to put together a proposal of the overall objective, functions, vision and roadmap for the regional hospital development. The overall framework is the following.

| | |
|---|---|
| **Objective of regional hospital development** | To serve as referral hospitals for provincial hospitals and health facilities at the lower levels as well as for the general population in order to reduce the regional disparity of advanced medical services and NCD-related patient concentration in national hospitals |
| **Functions of regional hospital** | 1) Provision of advanced medical services as Regional Referral Hospitals (e.g. cardiology, neurology)<br>2) Provision of medical education/training particularly for advanced medical skills<br>3) Provision of technical supervision to the lower level health units |

The MOH's provisional roadmap for regional hospital development is shown below. The primary focus of this survey is written in red. To realize the establishment of functional regional hospitals in Cambodia, it is expected that MOH will define the official strategies and details of the regional hospital development and take necessary and timely steps including making decisions on the legal status and management structures of the regional hospitals and allocating necessary human resources.

| Phase | Action | Time flame |
|---|---|---|
| Defining the functions/ requirements/targets | 1. Finalization of HSP4<br>2. Formulation of Hospital Development Plan (MoH/WB) | 1. 2022<br>2. 2022 |
| Defining the legal status, etc. | 1. MoH and MEF to discuss the legal status and management bodies (MoH or provinces) of Regional Hospitals | To be determined (TBD) |
| Upgrading the clinical capacity including infrastructure | 1. 7 Regional Hospitals' infrastructure development<br>2. Capacity development of relevant medical professionals<br>3. Further development by MoH with support of partners as required | 1. 2030<br>2. 2030<br>3. TBD |
| Upgrading the hospital management capacity | 1. Hospital management capacity development<br>2. Further development by MoH with support of partners as required | 1. 2030<br>2. TBD |

The proposed facility, equipment and human resource development plans for regional hospitals summarized below are designed as part and parcel of the Cambodian government's vision for the regional hospital development.

## 3. Regional Hospital Development Plan

### 3-1. Objective

To reduce the regional disparity of medical care through upgrading the target municipal and provincial hospitals by strengthening their advanced medical services and CPA3 functions as regional hospitals.

### 3-2. Target Sites

The following seven municipal and provincial hospitals are proposed to be upgraded to regional hospitals based on a set of selection criteria.

- Municipal Hospital (1): Phnom Penh
- Provincial Hospitals (6): Stung Treng, Svay Rieng, Kampong Cham, Kampot, Battambang and Siem Reap

### 3-3. Strategies

(1) Strengthening the focused areas of advanced medical services, namely orthopaedics, cardiology, cardiothoracic surgery, gastroenterology, surgical gastroenterology, urology, pulmonology, neurology, neurosurgery, medical oncology and surgical oncology.

(2) Upgrading to two types of hospitals with advanced medical services (i.e. Type A and Type B hospitals) as described below.

| **Type** | **Hospital** | **Clinical fields to be strengthened (both medicine and surgery are included)** | | |
|---|---|---|---|---|
| | | Gastroenterology, Urology, Pulmonology, Orthopedics | Oncology | Cardiology, Neurology |
| A | Siem Reap<br>Battambang<br>Kampong Cham | Same level as national hospitals for diagnosis and treatment (Radiology: MRI, CT, X-lay, X-TV, mammography) | Pathology, Surgery, Chemotherapy, General medicine, Palliative care | Diagnosis, General medicine, PCI, surgery (same level as national hospital) |
| B | Kampot<br>Stung Treng<br>Phnom Penh<br>Svay Rieng | | Pathology, General medicine/follow up, palliative care | Diagnosis, General medicine |

(3) Strengthening CPA 3 functions

(4) Strengthening training functions for advanced medical services for Type A hospitals

(5) Establishing catchment areas of the regional hospitals

### 3-4. Components

The regional hospital development plan is composed of the following two components based on the above-mentioned strategies.

| | Components | Target facilities |
|---|---|---|
| 1 | Upgrading provincial hospitals to Type A hospitals (facilities and medical equipment) | Siem Reap Provincial Hospital<br>Battambang Provincial Hospital<br>Kampong Chan Provincial Hospital |
| 2 | Strengthening municipal and provincial hospitals as Type B hospitals (facilities and medical equipment) | Kampot Provincial Hospital<br>Stung Treng Provincial Hospital<br>Svay Rieng Provincial Hospital<br>Phnom Penh Municipal Hospital |

## 4. Proposed Design for the Regional Hospital Development Plan

### 4-1. Overall Facility Plan

The key components of the facility plan for Type A hospitals are to establish the new Advanced Medical Service Department and improve and modernize the facilities for the General Medical Service Department as a regional hospital. The plan for Type B hospitals aims to strengthen the diagnostic functions of the Advanced Medical Service Department and improve and modernize the General Medical Service Department.

Each hospital will be composed of the following departments.

| Medical Service Department | | Type A | Type B |
|---|---|---|---|
| Out-patient Department (Advance and General Medical Services) | | ✓ | ✓ |
| Chemotherapy Out-patient Department | | ✓ | |
| Diagnostic Imaging Department | | ✓ | ✓ |
| Endoscopy Department | | ✓ | ✓ |
| Laboratory Department | | ✓ | ✓ |
| Physiological Department | | ✓ | ✓ |
| Medicine Supply Department | | ✓ | ✓ |
| Operation Department | Advanced Medical Service | ✓ | |
| | General Medical Service | Existing Facility | ✓ |
| ICU Department | Surgical/Internal Medicine | ✓ | ✓ |
| Angiography Department | | ✓ | |
| Physiotherapy Department | | ✓ | ✓ |
| Patient Ward | | ✓ | ✓ |
| Teaching and Training Department | | ✓ | ✓ |

### 4-2. Equipment Plan

The main medical equipment planned for the two types of hospitals is listed in the following table.

| Medical Service Department | | Type A | Type B | Major Medical Equipment |
|---|---|---|---|---|
| Out-patient Department | | ✓ | ✓ | Client PC (PACS), diagnostic set, examination couch, blood pressure meter, weighing scale |
| Chemotherapy Out-patient Department | | ✓ | | Client PC (PACS), chemotherapy reclining chair, infusion pump, syringe pump |
| Diagnostic Imaging Department | | ✓ | ✓ | Client PC (PACS), MRI, CT, general X-ray, fluoroscopy X-ray, mammography, ultrasound |
| Endoscopy Department | | ✓ | ✓ | Client PC (PACS), upper gastrointestinal fiberscope, upper gastrointestinal fiberscope, bronchoscope |
| Laboratory Department | | ✓ | ✓ | Client PC (PACS), cryostat microtome, hematology analyzer, biochemistry analyzer |
| Physiological Department | | ✓ | ✓ | Client PC (PACS), electroencephalograph (EEG), electromyography (EMG), pulmonary function analyzer |
| Medicine Supply Department | | ✓ | ✓ | Client PC (PACS), electrical balance, medicine cabinet, medicine trolley |
| Operation Department | Advanced Medical Service | ✓ | | Client PC (PACS), X-ray C-arm, operating microscope, operating light, operating table, electrosurgical unit, anesthesia apparatus, vital sign monitor |
| | General Medical Service | ✓ | ✓ | Client PC (PACS), operating light, operating table, electrosurgical unit, anesthesia apparatus, vital sign monitor |
| ICU Department (Surgical/Internal Medicine) | | ✓ | ✓ | Client PC (PACS), blood gas analyzer, ventilator, vital sign monitor, infusion pump, syringe pump |
| Angiography Department | | ✓ | | Client PC (PACS), angiography, intra-aortic balloon pump (IABP), blood gas analyzer |
| Physiotherapy Department | | ✓ | ✓ | Client PC (PACS), sling therapy bed, parallel bar, ultrasonic therapy machine |
| Patient Ward | | ✓ | ✓ | Client PC (PACS), bed, bedside cabinet, overbed table, IV stand, blood pressure monitor |
| Teaching and Training Department | | ✓ | ✓ | Laparoscopy simulator, endoscope simulator, bronchoscopy training system |

### 4-3. Human Resource Requirements

In order to provide advanced and specialized medical care, it is necessary to secure the scope and skills of each specialist in specialized medical care as well as to satisfy the number of personnel required. The survey team proposed the required number of personnel taking into consideration the current status of each hospital. The timely deployment of such personnel to each target hospital by the Cambodian government is essential for the functioning of regional hospitals. At the same time, utilization of existing personnel at each target hospital should be considered as much as possible to curb additional costs for human resources. Some of the key actions required by relevant government authorities and the target hospitals in relation to the human resource development for regional hospitals include incorporating human resources needs and measures for the regional hospital development into the HSP4, developing detailed human resource plans in line with the implementation schedule, ensuring the allocation of a sufficient budget to implement the human resource plans, and devising training systems and programs.

### 4-4. Implementation Schedule

The following three options are suggested with regard to the implementation schedule of the hospital upgrading.

| Option | Feature |
|---|---|
| 1 | Design and construct all seven hospitals at the same time |
| 2 | Stagger the timing in four lots<br>(Lot 1: SR, Lot 2: ST and KP, Lot 3: BB and KC, Lot 4: PP and SV) |
| 3 | Divide the plan into two phases<br>(2 agreements: Phase 1-SR, ST and KP,<br>Phase 2- BB, KC, PP and SV) |

*SR: Siem Reap, BB: Battambang, KC: Kampong Cham, PP: Phnom Penh, ST: Stung Treng, SV: Svay Rieng, KP: Kampot

Staggering the timing or dividing the period of designing and construction of the target hospitals (Option 2 or 3) is considered more feasible given the required number of construction personnel to mobilize and medical personnel to allocate and train as well from the perspective of quality control. Specifically, upgrading Siem Reap Provincial Hospital first is proposed, followed by the rest of the Type A and B hospitals.

4-5. Cost

Confidential

## 5. Economic and Financial Analysis

5-1. Economic Analysis

The survey team conducted an economic analysis to evaluate the effectiveness of the proposed plan from the viewpoint of Cambodia's national economy. The economic internal rate of return (EIRR) was adopted as an evaluation indicator, using annual cash inflow (economic benefit) and cash outflow (economic cost) with the discounted cash flow method. Reduction of opportunity cost, reduction of NCD-related cost, and decrease in maternal and neonatal mortality are considered as economic benefits, and investment and operations and maintenance costs are considered as economic costs. The EIRR of the plan from annual net cash flow from 2023 to 2060 totaled 18.5%. This exceeds the commonly used 12%, which is the benchmark of the social discount rate for projects in developing countries. Therefore, the plan was considered feasible from the viewpoint of Cambodia's national economic development.

5-2. Financial Analysis

The financial feasibility of the plan was also assessed. Specifically, the survey team verified the financial feasibility of the annual cashflow using the financial internal rate of return (FIRR) and analyzed the likelihood of the revenue covering the expenditures. As a result, FIRR was negative for all target hospitals.

## 6. Public Private Partnership

The financial impact of the public private partnership (PPP) method on large medical equipment such as CT and MRI was studied by establishing a model for Type A hospitals. The results show

that the financial impact of this type of PPP is negative. This is considered because a large proportion of revenue is dependent on large medical equipment and it exceeds the initial investment. Since the hospital's share of PPP is less than half, financial performance is higher if the hospital procures, operates, and maintains the equipment by itself. However, there are some merits of introducing this type of PPP, which include the efficient response in the event of an equipment breakdown and saving the cost of maintenance engineers covered. At the same time, this might remove the opportunities for the hospital to improve relevant medical skills and techniques. In addition to the improvement of the target hospitals, it is proposed that introduction of the PPP modality for the construction, operation and maintenance of the hospitals be studied for the improvement of cost effectiveness of Cambodia's national health services in the future.

## 7. Environmental and Social Considerations

In Cambodia, irrespective of the type of individual or association, initial-environmental impact assessment (IEIA) or a full EIA must be conducted on any proposed project by submitting the documentation on the activities to the Ministry of Environment (MOE). Therefore, it is necessary to obtain approval from the MOE prior to its commencement of the regional hospital development plan by applying for environmental approval. However, since the details are still under development, it is unclear whether the initial or full EIA should be implemented. As no location of any of the target hospitals is part of a nature conservation area, an application for environmental approval is not necessary in this regard. However, obtaining prior permission from the authorities is required for almost all buildings in accordance with the construction law. Other necessary environmental considerations include permission for importing medical devices, registration of medical devices and management of medical waste of newly introduced equipment. In the target provinces other than Stung Treng, where the current space is limited, the regional hospital development plan will be implemented within the existing sites. Even in Stung Treng, resettlement of residents is not expected in the potential new site.

## 8. Human Resource Development Plan for Regional Hospitals

Based on the human resource requirements and human resource development plan for the regional hospitals, the survey team discussed how to increase the implementation capacity and ensure the optimal impact of the proposed facility and equipment plans.

The following two projects have been proposed as possible technical cooperation by JICA to provide complementary support for the capacity building of newly assigned human resources and existing human resources in the target hospitals, so that they can provide high-quality specialized medical services and become sustainable regional hospitals from a management perspective.

| | |
|---|---|
| **【Technical Cooperation 1】** | Strengthening regional hospitals for providing advanced medical services by training relevant medical professionals |
| **【Technical Cooperation 2】** | Strengthening hospital management of regional hospitals |

## 9. Conclusion

The proposed plan has been assessed feasible from the viewpoint of Cambodia's national development because EIRR exceeded the 12% of benchmark of social discount rate. However, FIRRs for all the hospitals become negative, meaning that the expected revenue cannot cover expected capital and O&M expenditures. In addition, for most hospitals, even the expected O&M expenditure cannot be covered with the expected revenue, meaning that a government subsidy is necessary to maintain the hospital's effective operation and management. The amount of subsidy differs from hospitals, but for instance, the amount equivalent to the additional personnel cost would be required.

In order to implement the proposed plan successfully, the key requirements by the relevant government authorities include the following:

(1) Finalization of the overall national strategy of the regional hospital development;
(2) A clear decision on the legal and operational status of the regional hospital and successful transition of the target hospitals as per the decision; and
(3) Development and implementation of the plan for employment, recruitment and capacity building of medical personnel required for the plan, especially specialists in advanced medical care.

An additional study was conducted for two selected hospitals to expedite the realization of the regional hospital development. The results of the additional study (as of October 2023) are summarized in Appendix D.

# Chapter 1 Introduction

## 1-1 Background

Cambodia has achieved steady economic growth of about 7% on average for more than 20 years. In 2015, the gross national income per capita of Cambodia reached US$1,070, and the World Bank upgraded Cambodia from a low-income country to a lower-middle-income country, demonstrating the success of the country's longstanding efforts in poverty reduction and economic development. In addition, Cambodia's Human Development Index increased from 0.364 in 1990 to 0.594 in 2019, showing rapid improvement over the past 30 years. To the contrary, the economic disparity in the country remains large, and the disparity between urban and rural areas is an urgent issue in Cambodia.

The Ministry of Health (MOH) of Cambodia chose the "provision of quality health care services and ensuring equitable access to healthcare" the main theme of the third Health Strategic Plan 2016-2020 (HSP3). In accordance with the HSP3, MOH is making efforts to improve access to health care services, develop health infrastructure, ensure a stable supply of health care equipment and materials, and secure sufficient health human resources in terms of quality and quantity. MOH, with the support of the World Health Organization (WHO), is currently formulating the fourth Health Strategic Plan 2021-2030 (HSP4), which is likely to include a plan to upgrade some provincial hospitals to the level of national hospitals, and have them function as regional hospitals. In Cambodia, where population aging is expected to continue, strengthening the functions of advanced medical care that can respond to the emerging needs, such as non-communicable diseases (NCDs) is an extremely important measure for the country to maintain robust economic growth. Improving access to health care is also in line with the principles of universal health coverage (UHC).

Japan's economic cooperation with Cambodia began in 1959. In the health sector, the Japan International Cooperation Agency (JICA) has continuously provided technical cooperation and grant assistance since the 1990s in the areas of maternal and child health, tuberculosis control, human resource development, and infrastructural development. Japan is the top donor to Cambodia in cumulative terms. On the basis of JICA's past contribution to the Cambodian health sector, the Cambodian government has requested JICA to extend its cooperation to strengthen health facilities, equipment, and human resources to meet the increased health needs. Accordingly, JICA has dispatched a survey team to collect the necessary information for the project formulation.

## 1-2 Objectives

- To analyze the current situation of the healthcare service delivery system in Cambodia, and the status of healthcare facilities, equipment, and human resource management in the selected municipal and provincial hospitals; and
- To collect necessary information for the formulation of a regional hospital development plan and a human resource development plan.

### 1-3 Survey Scope and Methods

The survey team conducted a total of three studies: (1) a situation analysis, (2) a readiness and aptitude study for regional hospital candidates, and (3) a proposal for a regional hospital development plan including a human resource development plan.

#### 1-3-1 Situation Analysis

The survey team analyzed the current situation of the health sector in the following areas through desk reviews, questionnaire surveys, interviews, field visits and observations:

- Service delivery
- Human resources
- Health financing
- NCD management

#### 1-3-2 Readiness and Aptitude Study for Regional Hospital Candidates

Selected municipal and provincial hospitals were assessed to determine whether they could potentially become regional hospitals. The current situation of the national hospitals was also studied to understand the highest standard of medical services and hospital management in Cambodia.

(1) Selected Municipal and Provincial Hospitals

- Municipal Hospital: Phnom Penh
- Provincial Hospitals: Stung Treng, Svay Rieng, Kampong Cham, Kampot, Battambang and Siem Reap

(2) Selection Criteria

1) Geographical distribution following the current location of regional training centers
2) Accessibility and population size
3) Existing facility infrastructures including land availability
4) Current clinical capacity of the hospital(s) including human resources
5) Potential areas for economic development and popular tourism destination

The detailed selection process is described in Chapter 4.

#### 1-3-3 Proposal for Regional Hospital Development Plan and Human Resource Development Plan

Based on the above-mentioned study results, the survey team proposed the regional hospital development plan including the human resource development plan.

An additional study was conducted for two selected hospitals to expedite the realization of the regional hospital development. The results of the additional study (as of October 2023) are summarized in Appendix D.

### 1-4 Schedule

The study was conducted from June 2021 to November 2023.

### 1-5 Survey Team

The survey was conducted by the consultants as listed below.

| Area of Responsibility | Name of Consultant | Affiliation |
|---|---|---|
| Team leader/Health planning | Haruyo Nakamura/ Akiko Hirano | International Development Center of Japan Inc. (IDCJ) |
| Deputy leader/Health planning 2 | Nami Takashi | IDCJ |
| Facility design/Construction planning/ Cost estimation | Mitsuhiro Nasu | INTEM Consulting, Inc. |
| Facility design 2/Construction planning 2/ Cost estimation 2 | Kentaro Nishiyama | Koei Research & Consulting Inc. (KRC) |
| Facility design 3/Construction planning 3/ Cost estimation 3 | Mutsumi Gando | KRC |
| Hospital management | Yoshihisa Yamazaki | KRC |
| Equipment planning/Cost estimation | Tamotsu Nozaki | KRC |
| Human resource development plan | Teruki Akao | IDCJ |
| Hospital financial analysis | Yoji Sakakibara/ Yumiko Yamada | IDCJ |
| Environmental and social considerations | Mioko Tamura | IDCJ |
| Environmental and social considerations 2 | Takanori Hayashida | IDCJ |

# Chapter 2 Overview of the Health Sector

## 2-1 Health Status

### 2-1-1 Demographic Trends

Looking at the demographic trends, while Cambodia's population is still young, the number of births has decreased in the past 30 years of rapid economic growth (Figure 2-1). If this trend continues, Cambodia will become an "aging society" between 2030 and 2035, with 7% of the population aged 65 or older and an "elderly society" between 2050 and 2055, with more than 14% of the population aged 65 or older. Cambodia will also exceed 21% of the 65 or older population between 2070 and 2075, becoming a "super-aged society" like Japan is today.

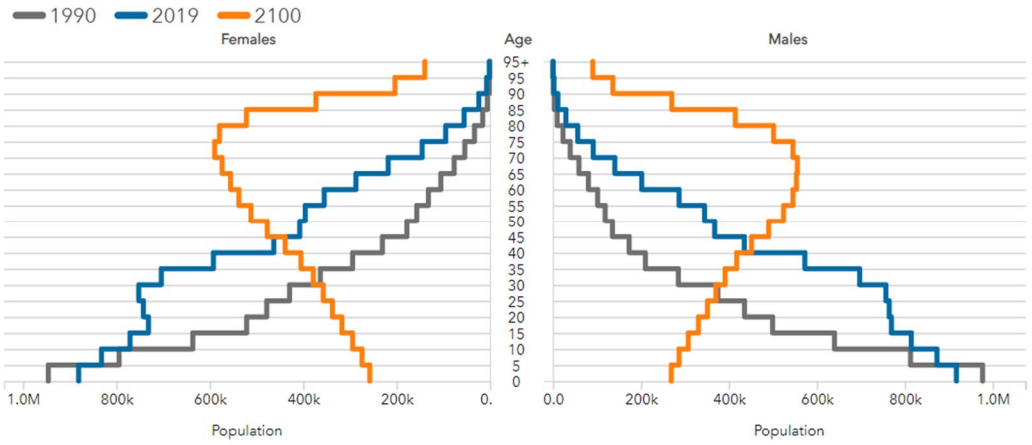



**Figure 2-1: Population Pyramid of Cambodia (1990, 2019 and 2100 Projections)**

Sources: Institute for Health Metrics and Evaluation (2021). Institute for Health Metrics and Evaluation (2021), Data for 2019 and 2100 are projections based on Global Burden of Disease 2017.

While the life expectancy has been extending over the years, it is lower than in neighboring countries as shown in Figure 2-2 below.

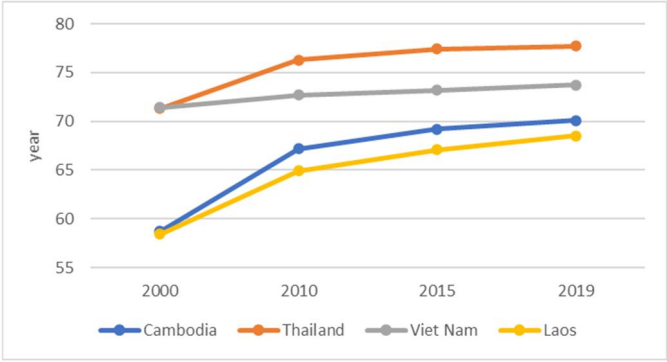



**Figure 2-2: Trend of Life Expectancy**

Source: WHO Global Health Observatory Data Repository

### 2-1-2 Mortality and Morbidity Trends

(1) Mortality

The disease structure in Cambodia is also changing. In terms of mortality, while infectious diseases, and maternal and child and nutrition-related diseases were the major leading causes of death in 2009, NCDs have increased significantly between 2009 and 2019 (Figure 2-3).

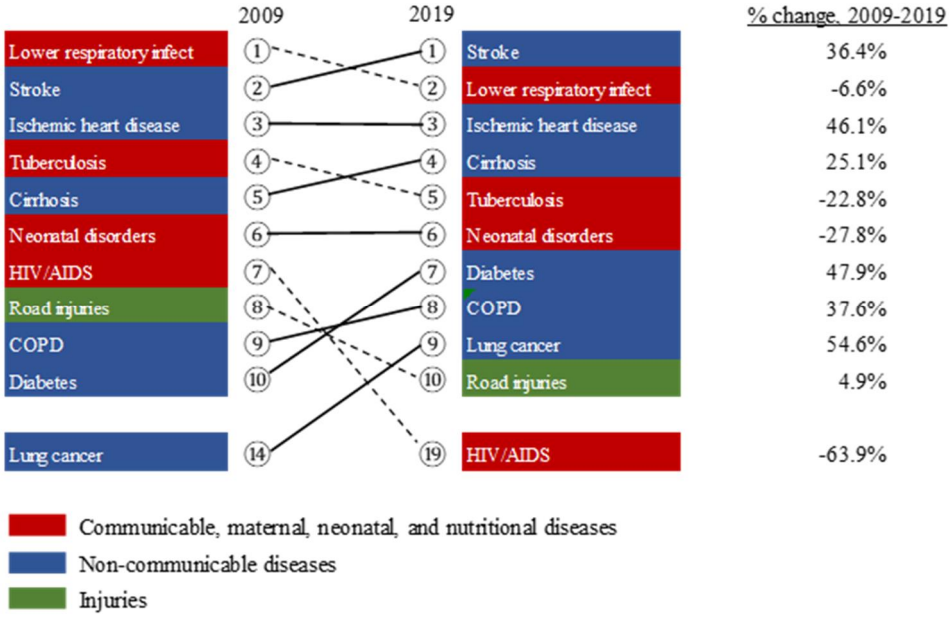



**Figure 2-3: Changes in Major Causes of Death in Cambodia from 2009 to 2019**
Source: Institute for Health Metrics and Evaluation (2021)

(2) Maternal and Child Health

The trend of the maternal mortality ratio (MMR) is shown in Figure 2-4. While it has been declining steadily over the years, the level is still high compared with neighboring countries.

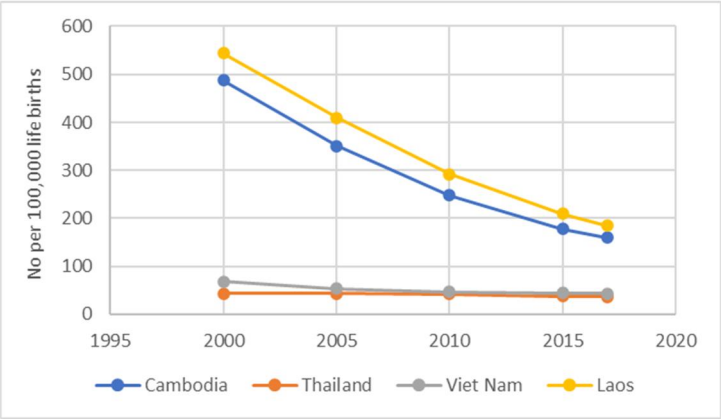



**Figure 2-4: MMR Trend in Cambodia and Neighboring Countries**

Source: WHO Global Health Observatory Data Repository

(3) Communicable Diseases

Cambodia has made major advances in the control of communicable diseases. As shown in the previous section, the burden of communicable diseases has become less significant over the years.

HIV and AIDS

HIV prevalence among the general population (15-19 years) fell from 1.6% in 2000 to 0.6% in 2014 with over 90% survival after 12 months of ARV treatment.[1] The recent trend of estimated new HIV infection and the number of people living with HIV is also decreasing as shown below.

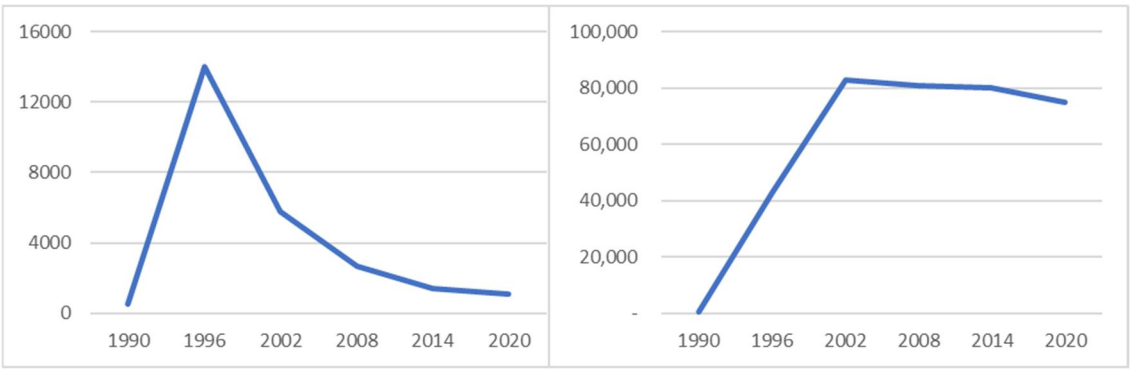



**Figure 2-5: Estimated Number of New HIV Infections (left) and People Living with HIV (right)**

Source: UNAIDS

Tuberculosis (TB)

The estimated number of people developing TB has decreased from 63,000 in 2010 to 46,000 in

[1] HSP3

2020.[2] According to the HSP3, multi-drug resistance is low at 1.4% for new cases and 10% for retreatment for the last ten years.

Malaria

Malaria incidence was at the lowest point ever (0.07 per 1,000,000 populations) in 2015, and malaria death cases have dropped from 219 in 2009 to 10 cases in 2015.[3]

(4) NCDs

NCDs are already the largest cause of mortality in Cambodia as seen in the previous section. These are responsible for 64% of all deaths, and there is a 23% of probability that the population is dying between 30 and 70 years from one of the four NCDs (i.e., cancer, cardiovascular disease, diabetes and chronic respiratory disease) (2019).[4] The prevalence of the risk factors is summarized below.[5]

| |
|---|
| Tobacco<br><br>Some form of tobacco is used by 6% of women, a slight decrease from self-reported tobacco use in 2010 Demographic and Health Survey (DHS). Tobacco use is much higher among men with 32% indicating that they smoked cigarettes, and 5% reported using other forms of tobacco. Women and men in rural areas, those with less education and those in the lower wealth quintiles are more likely to use tobacco.[6] |
| Alcohol<br><br>Alcohol use is concern. On average, men drink nearly three times as much as women and one in six male drinkers had drunk six or more drinks at one sitting in the past month. In 2012, an association was found between alcohol consumption and tobacco use in Cambodia, whereby men who smoked were twice as likely to have drunk alcohol in the past week. Among young people aged 15–19 years, 42% of males and 27% of females are current drinkers, and about 10% are considered heavy episodic drinkers. |
| Physical inactivity<br><br>Globally, physical inactivity is one of the leading risk factors for NCDs. The 2016 STEPwise Approach to NCD Risk Factor Surveillance (STEPS) showed that 8% of adults aged 18–69 years in Cambodia were sufficiently physically active; however, most did not meet the WHO recommendation of 150 minutes of moderate–intense physical activity per week or the equivalent. This figure was lower among men (5.5%) than women (11%). The least active group was women aged 18–29 (18.2%). It was found that 76.6% of total physical activity was related to work, 17.8% to transport, and 5.6% to recreation. |

[2] Tuberculosis situation in 2020 Cambodia
[3] HSP3
[4] Prevention and Control of Non-communicable Diseases in Cambodia: The case for investment, WHO, 2019.
[5] Source is WHO (2019) Prevention and control of noncommunicable diseases in Cambodia unless stated otherwise
[6] DHS 2014

| |
|---|
| Unhealthy diet<br><br>Unhealthy diets are summarized by salt consumption. Sodium consumption in Cambodia is high. According to the 2016 STEPS, the estimated average intake of 8.5g of salt per day by adults is higher than the WHO recommendation of < 5 g of salt per day. Men had a higher intake of salt (9.2 g) than women (7.6g). |
| Metabolic risk factors<br><br>High levels of metabolic factors such as blood pressure, body mass index and blood lipid levels significantly increase the risk of a cardiovascular event. The 2016 STEPS indicated that 19.2% of adults in Cambodia (16.9% of women and 22.0% of men) are overweight, and 3% are obese. The prevalence of raised blood glucose among adults was 9.6%, and 45% of adults over 18 years had high total cholesterol. The prevalence of raised blood pressure was 14.2%, indicating consumption of diets with high levels of trans- and saturated fats and salt. |

## 2-2 Governance

### 2-2-1 Health Sector Reform

Cambodia's administrative structure is divided into four levels: central (national), provincial (including municipality), district (including cities and *Khans*) and commune (including *Sangkats*) levels. The details of the subnational structure are described in the table below.

**Table 2-1: Administrative Structures of Cambodia**

| Administrative Management | Number | |
|---|---|---|
| Municipality/Provinces | Municipality | 1 |
| • Elected Councils | Provinces | 24 |
| • Governing Boards | Total | 25 |
| Cities/Khans/Districts | Cities | 26 |
| • Elected Councils | Khans | 12 |
| • Governing Boards | Districts | 159 |
| | Total | 197 |
| Sangkats/Communes | Sangkats | 227 |
| • Elected Councils | Communes | 1,406 |
| • Village Leaders | Commune/Sangkat | 1,633 |
| | Villages | 14,119 |

Source: HSP3

On the basis of the administrative structure, the health sector reform has been implemented since the 1990s under the leadership of MOH. The reform was introduced as part of the National Public Administrative Reform process with an aim of improving the effectiveness, efficiency and accountability of public service delivery.[7] The main objective of the reform is to improve and expand the coverage of primary health care. A district-based health system approach has been adopted based on the lesson learned that the previous administrative-based health service delivery system did not meet the essential health needs of the population. Emphasizing the population and

[7] WHO. The Kingdom of Cambodia Health System Review, 2015.

accessibility-based health system organization, the Cambodian health system is now composed of three levels, namely central, provincial and operational district levels, with clear roles and functions as described in the next section. Aside from the structural reorganization, health sector reform has involved efforts such as the redefinition of the health system and the types of services at each level, rational distribution of resources (e.g., finance, infrastructure, manpower, equipment), redistribution and retraining of health staff and budgetary reform and new financing of health services. Consecutive Health Strategic Plans were also introduced in the 2000s as a strategic management tool to ensure the investment of available resources in common goals.

### 2-2-2 Roles and Functions under the Health System

As explained in the HSP3 (2016-2020), MOH's mandate is to lead and manage the entire health sector (both public and private). It has the sole authority to organize and deliver public health services. Some of the key functions are the following:

- Defining health policy and developing health plans and strategies
- Developing regulations/guidelines
- Monitoring, controlling and evaluating the administrative and technical work of institutes subordinate to MOH
- Conducting research
- Managing resources (human, material, financial and information) at all levels
- Overseeing production, trade and distribution of drugs and equipment in all public and private health facilities.

The organizational chart of MOH is shown in the figure below.

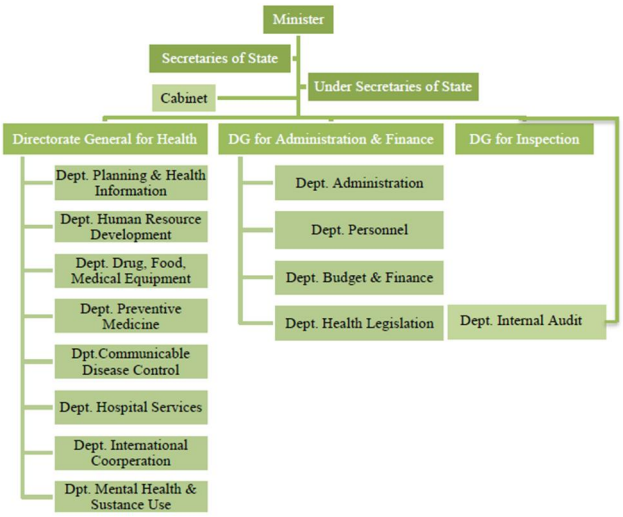



**Figure 2-6: MOH Organizational Chart**

Source: HSP3

The roles and functions of the two lower levels (i.e., provincial and operational district) are summarized in the following table.

**Table 2-2: Roles and Functions of Provincial and Operational District Levels**

| | Number of Departments and Offices | Roles and Functions |
|---|---|---|
| Provincial Level | 25 Municipal/ Provincial Health Departments | The main role is to link MOH and ODs through functions including:<br>• Interpretation/dissemination/implementation of national health policies and health strategic plans through annual planning and budgeting;<br>• Supporting ODs by supervision and monitoring and evaluation;<br>• Ensuring equitable distribution and effective utilization of available financial and human resources;<br>• Providing continuing education to health personnel in the province<br>• Performing delegated regulatory functions of private health providers and pharmaceutical products. |
| Operational District (OD) Level | 94 OD Offices covering 197 administrative Districts/Khans/ Communes | The main role is to implement the OD health objectives through functions including:<br>• Interpreting/disseminating/implementing national policies;<br>• Maintaining effective/efficient/comprehensive health services according to the national clinical practice guidelines/protocols;<br>• Ensuring equitable distribution and effective utilization of available financial and human resources;<br>• Mobilizing additional resources for district health services<br>• Providing in-service training to hospital and health center staff<br>• Providing support to Health Centers/Health Posts and Referal Hospitals through supportive supervision, monitoring and evaluation. |

### 2-2-3 Decentralization and Deconcentration

Another key governance effort in Cambodia relevant to the health sector is the Decentralization and Deconcentration (D&D) reforms, which began in the early 2000s and continue to be the priority under the National Strategic Development Plan (2019-2023). The reforms are intended to improve public service delivery by strengthening the capacity of sub-national administrations. Specifically, the responsibilities for providing government services have been shifted to the sub-national administrations, including the commune/*Sangkat*, district, municipal, or *Khan*, and capital and provincial (CP) levels of government.[8] In particular, a substantial number of functions were transferred to the district and municipal (DM) level as the main tier for service delivery in 2019.[9] As part of the ongoing D&D efforts, with the support of development partners, the government of Cambodia is in the process of clarifying the roles and responsibilities among tiers of sub-national administrations and improving public financial management systems. Some of the remaining challenges are related to legal and operational matters, such as the procedures for

[8] The World Bank. https://www.worldbank.org/en/country/cambodia/publication/decentralization-and-deconcentration-d-d-reforms-bring-public-service-delivery-closer-to-people
[9] The World Bank. Cambodia Intergovernmental Fiscal Architecture Study, 2021.

budget transfer, changes in the public financial management processes and the establishment of new accountability and reporting lines.

According to the recent World Bank report,[10] MOH is one of the priority ministries for the D&D process and, as a result, the second most deconcentrated after the Ministry of Education, Youth and Sports, with 40% of its recurrent spending executed at the sub-national level. MOH has assigned functions performed by the provincial health departments (PHDs) to CP administrations, and the CP administrations have further delegated the transferred functions to the respective DM and commune and Sangkat administrations. The transferred functions include the provision of services at referral hospitals, health centers (HCs) and health posts (HPs). This means that the sub-national administrations are accountable to the MOH for following national health policies and guidelines, with directors of PHDs accountable to the respective councils and boards of governors and lower-level officials (e.g. referral hospitals, HCs) accountable to the director of the PHD. With regard to budgetary matters, MEF is responsible for transferring the budget to CP administrations. The board of governors at the CP level is required to prepare an annual work plan and budget for the health sector in the jurisdiction with the technical support of the respective PHD. The Governor of CP is the original budget authorizer during the budget execution, but the authority shall be delegated to the director of the PHD.

### 2-2-4 Key National Health Policies and Plans

This section explains some of the key national health policies and plans. Specific technical policies such as human resources and financing will be explained in the respective sections of this report.

(1) Third and Fourth Health Strategic Plans

The most recent Third Health Strategic Plan (HSP3) was for the period between 2016 and 2020. It was launched by MOH in May 2016 after consultation with a wide range of stakeholders and with financial and technical support from development partners including JICA. The HSP3 is viewed as the MOH's strategic management tool to achieve the long-term vision of the health sector development, which states that all people in Cambodia have better health and well-being, thereby contributing to sustainable socioeconomic development. The details of the HSP3 including its goals and objectives are described in the table below.

**Table 2-3：Framework of HSP3**

| | |
|---|---|
| **Strategic Priorities** | 1) Sustaining and further improving access and coverage with a renewed focus on improving the quality of health services across geographical areas;<br>2) Increasing financial risk protection across socioeconomic groups when accessing needed health care. |

[10] The World Bank. Cambodia Intergovernmental Fiscal Architecture Study, 2021.

| | |
|---|---|
| **Health Policy Goal** | To improve health outcomes and increase financial risk protection across the population. |
| **Health Development Goals** | 1) Improve reproductive health and reduce maternal, new-born and child mortality and malnutrition,<br>2) Reduce morbidity and mortality due to main communicable diseases,<br>3) Reduce morbidity and mortality due to NCDs and other public health problems, and<br>4) Make the health system more accountable and responsive to the health needs of the population. |
| **Strategic Objectives** | 1) The population will have access to comprehensive, safe and effective quality health services at public and private health facilities.<br>2) There will be stable and sustained financing of healthcare services with increased financial risk protection when accessing healthcare services;<br>3) The health system will have the adequate number of well-trained, competent and well-motivated staff with appropriate skill mix and professional ethics.<br>4) Public health facilities are adequately supplied with medicines, health commodities, equipment and amenities, with effective essential supportive services;<br>5) Public health facilities have basic infrastructure, appropriate advanced medical equipment and technology and Information Technology;<br>6) Health and health-related data/information are reliable, accurate, timely and of high quality and used, with strengthening disease surveillance and response system and promoting health research; and<br>7) Strong health institutional capacity at all levels, including leadership and management competency, together with enforced regulation and local accountability in health. |

The development of the Fourth Health Strategic Plan (HSP4) has been delayed due to the COVID-19 pandemic. It is currently being drafted by MOH with the technical guidance of the Technical Working Group for Health. According to the draft shared at previous consultation meetings, HSP4 will cover the period between 2022 and 2030 and the possible strategic objectives include the following:

- Strengthen capabilities for preparedness and response to disease outbreaks, including the COVID-19 pandemic and beyond, and public health threats and emergencies;
- Prevent ill health and reduce premature deaths due to NCDs (including mental health and aging), communicable diseases, reproductive, maternal, newborn and child health, malnutrition, and other public health-related priorities;
- Advance quality, while making health services more geographically and financially accessible, and medically and culturally accepted.

In line with the ongoing governance efforts of the Cambodian government as explained earlier, the HSP4 aims to reorganize the public health system with a focus on primary health care and local innovation as illustrated below.

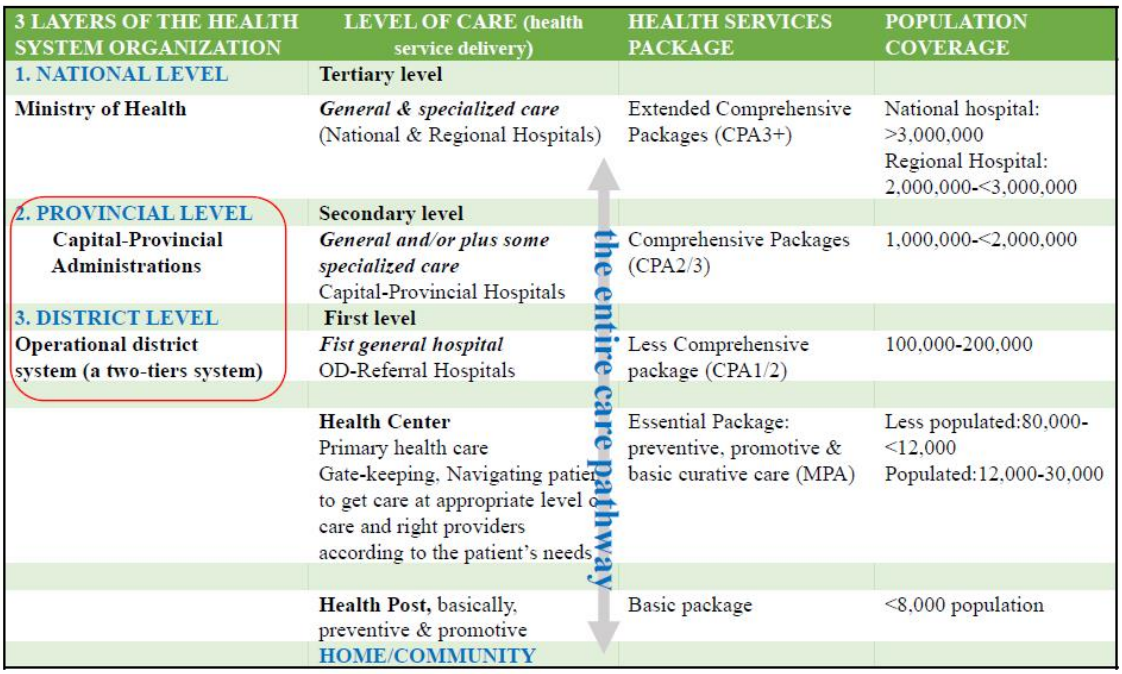



**Figure 2-7: Reorganization of the Public Health System Drafted for HSP4**

Source: "Consultation on Health Strategic Plan 2022-2030 (HSP4), MOH

One of the notable changes from the current system suggested in the draft is the introduction of the "Extended Comprehensive Package of Activities" (CPA3+) at the tertiary level in addition to the existing Complementary Package of Activities (CPA) 1-3 system (the detail of the CPA system is explained under the next section on health services). In the plan, aside from national hospitals which cover a population of more than 3 million, regional hospitals will be included at the tertiary level under the responsibility of MOH to cover a population between 2 million and 3 million. Both national and regional hospitals are designed to provide a higher level of specialty care with highly specialized equipment and expertise. While definitions, exact roles and types of services of the regional hospital have yet to be determined in the drafting process, the ongoing discussion highlights MOH's commitment to realizing the new concept.

(2) National Strategic Plan for the Prevention and Control of Noncommunicable Diseases: Cardiovascular Disease, Cancer, Chronic Respiratory Disease and Diabetes (2013-2020)

The National Strategic Plan (NSP) for the Prevention and Control of NCDs: Cardiovascular Disease, Cancer, Chronic Respiratory Disease and Diabetes (2013-2020) has not been updated yet. However, according to the MOH officials interviewed, these four diseases remain priorities for NCD control in Cambodia. The key strategic objectives and strategies of the NSP are the following:

- Reduce population exposure to common factors: 1) accelerate tobacco control; 2) scale up alcohol control; 3) promote healthy diets and physical activity; 4) immunize against cancer

causing infections;

- Pursue cost-effective detection, treatment and palliative care: 1) provide integrated management of NCDs through primary care; 2) provide single-visit screening and early treatment for cervical cancer; 3) increase access to palliative care (central and local);
- Enhance NCD surveillance: 1) establish a hospital-based cancer registry; 2) improve data collection on NCD care; 3) monitor risk factors through consistent national surveys at regular intervals;
- Strengthen governance and resourcing for NCD: 1) strengthen NCD coordination across MOH; 2) develop a national multi-sectoral action plan for NCD prevention and control, and establish a whole government mechanism to oversee implementation; 3) establish a dedicated fund for NCD prevention and control from tobacco and alcohol taxation.

The strategies are divided into short, medium and long terms. Given financial and human resource limitations, instead of implementing all the cost-effective interventions simultaneously, it is suggested to take a staged approach with the highest priority activities to be undertaken first.

## 2-3 Health Services

### 2-3-1 Health Service Provision

(1) Health System

The current Cambodian health system is organized into three levels: central, provincial and operational district levels (Figure 2-8). The roles and functions of each level are clearly defined.

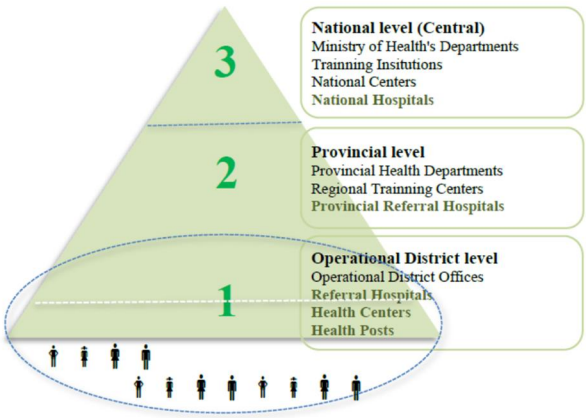



**Figure 2-8: Three Levels of the Public Health System**

Source: HSP3

The health coverage plan (HCP) is a framework for developing the health system infrastructure, based on a combination of population and geographic criteria, taking into account quality of care and availability of resources.

**Table 2-4: Criteria for the Establishment of Health Facilities**

| Facility | Population Size | Accessibility (Distance) |
|---|---|---|
| Referral hospital | Optimal size: 100,000<br>Range: 80,000 to 200,000 | In populated areas; within 2 hours drive or boat journey and in rural areas; not more than 3 hours drive or boar journey |
| Health center (HC) | Optimal size: 10,000<br>Range: 8,000-12,000 | Within 10 km or 2hrs walk maximum for the catchment area population |
| Health post (HP) | Range: 2,000-3,000 | Distance from a commune or village to the nearest HC is more than 15 km, with geographical barriers (river, mountain, or poor roads) |

Source: HSP3

(2) Categories of Health Services

The type of health services delivered by the health centers and referral hospitals are defined by the "MOH's Guidelines for Minimum Package of Activities (MPA)" and the "MOH's Guidelines for Complementary Package of Activities (CPA)" respectively. CPA is classified into three categories.

The main roles of referral hospitals and the definition of CPA categories are summarized below.

Role of referral hospitals:

- To support primary health care as a problem-solving entity and possess resources available at all times for the district health system. Since the referral hospital has greater expertise than the health centers, it is required to provide medical support, namely diagnostic services, inpatient services, specialized consultations, emergency care, and rehabilitation services.
- To provide education to patients and their attendants, and to provide orientation and continuing education to health staff.
- To provide technical support and supervision if requested by the technical bureau of the operational district.
- To conduct a clinical audit of death

CPA definition:

CPA 1: A referral hospital that conducts no major surgery (without general anesthesia), but should, at the least, provide obstetric services;

CPA 2: A referral hospital that has more activities than the first category but less than the third category, namely emergency care services and major surgery (with general anesthesia);

CPA 3: A referral hospital that has the most activities, namely it provides major surgery (with general anesthesia) and more activities (both number of patients and activities) than the second category, and in addition, has various specialized services.

Source: National Guidelines on Complementary Package of Activities for Referral Hospital Development from 2006 to 2010

### 2-3-2 Infrastructure

The CPA provide facility planning guidelines for medical facilities in Cambodia, including guidelines for building, electricity supply, water supply, sewage system, incinerator, placenta pit, hygiene system/toilet, and mortuary services in "Chapter 5: Infrastructure of the CPA." In addition, as a supplement to the CPA, "Building Brief – Referral Hospitals, 4. Standard Hospital Design" provides facility design policies for CPA 1, 2, and 3, and existing hospitals are planned according to these guidelines.

The building brief was created in 2003 and does not necessarily meet the current design requirements for hospital facilities.

According to the Cambodia Health System Review (2015), the number of health facilities is as explained in the table below.

**Table 2-5: Type and Number of Health Facilities in Cambodia (2012-2013)**

| Type of facility | Designated number | Functioning 2012 | Functioning 2013 |
|---|---|---|---|
| National Hospitals | 8 | 8 | 8 |
| Operational Districts | 81 | 81 | 81 |
| Referral Hospitals: | 91 | 82 | 85 |
| Provincial Hospitals | 24 | 24 | 24 |
| Referral Hospitals | 67 | 58 | 61 |
| Health Centres | 1024 | 1020 | 1085 |
| Health Posts | | 86 | 86 |

Source: Kingdom of Cambodia Health System Review 2015

### 2-3-3 Medical Equipment

The MPA and CPA guidelines issued by the MOH summarize the system of medical service delivery as follows.

**Table 2-6: Content of Medical Services Required by MPAs**

| # | Clinical Service Department | MPA |
|---|---|---|
| 1 | Outpatient Consultation Services | ☑ |
| | Communicable Diseases Service | ☑ |
| 2 | Non-communicable Diseases Service and Other Health Problems | ☑ |
| 3 | Health Education and Health Promotion | ☑ |
| 4 | Outreach Service | ☑ |

Source: Guidelines on Minimum Package of Activities for Health Center Development, 2008- 2015, MOH

**Table 2-7: Content of Medical Services According to CPA Level**

| # | Department | CPA1 | CPA2 | CPA3 |
|---|---|---|---|---|
| 1 | Pediatrics | ☑ | ☑ | ☑ |
| 2 | Internal Medicine | ☑ | ☑ | ☑ |
| 3 | Surgery | | ☑ | ☑ |
| 4 | Obstetrics & Gynecology | ☑ | ☑ | ☑ |

| | | | | |
|---|---|---|---|---|
| 5 | Outpatient Consultation | ☑ | ☑ | ☑ |
| 6 | Communicable Diseases & TB | ☑ | ☑ | ☑ |
| 7 | Pharmacy | ☑ | ☑ | ☑ |
| 8 | Operating Theatre | | ☑ | ☑ |
| 9 | Emergency | ☑ | ☑ | ☑ |
| 10 | Diagnostic Imaging (Imagery) | ☑ | ☑ | ☑ |
| 11 | Ophthalmology | | | ☑ |
| 12 | ENT | | | ☑ |
| 13 | Dental | ☑ | ☑ | ☑ |
| 14 | Sterilization | ☑ | ☑ | ☑ |
| 15 | Laboratory Examination | ☑ | ☑ | ☑ |
| 16 | Blood Bank | | | ☑ |

Source: National Guidelines on Complementary Package of Activities for Referral Hospital Development from 2006 to 2010, MOH, "Second version was written on 15 December 2006"

Typical medical equipment required for each of the medical service departments is as follows:

**Table 2-8: Typical Medical Equipment Required by MPA**

| # | Department | Equipment |
|---|---|---|
| 1 | Outpatient Consultation | Otoscope, Weighing scale, Sphygmomanometer (Adult & Child), Stethoscope, Tongue depressor, Thermometer, |
| 2 | Vaccination | Vaccine refrigerator, Vaccine carrier, Ice pack |
| 3 | Treatment | Kidney basin, Forceps, Scissors, Needle holder, Scalpel handle, Instrument tray, Dressing cart, Examination light |
| 4 | Childbirth, Newborn & Reproductive Health | Scissors, Forceps, Scalpel handle, Kidney basin, Bedpan, Delivery bed, Sphygmomanometer, Stethoscope, Dressing cart, Examination light, Thermometer, Aspirator, Infant scale, measuring rod, Instrument tray |
| 5 | Laboratory Examination | Alcohol lamp, Reagent bottles, Microscope slides, Hemoglobin meter |
| 6 | Others | Sterilizer, Sterilizing drum, |
| 7 | HCs with Dental Department | Dental unit & chair, Elevators, ART (Atraumatic Restorative Treatment) instrument set |

Source: Guidelines on Minimum Package of Activities for Health Center Development, 2008 ~ 2015, MOH

**Table 2-9: Typical Medical Equipment Required for CPA3**

| # | Department | Equipment |
|---|---|---|
| 1 | Pediatrics | Height & Weight Scales, Sterilizer, Bronchoscope, Examination Table, etc. |
| 2 | Internal Medicine | Height and Weight Scales, Diagnostic Set, Blood Pressure Meter, Electrocardiograph, Ultrasound Scanner, Examination Table, etc. |
| 3 | Surgery | Simple Treatment Set, Sterilizer, Examination Table, etc. |
| 4 | Obstetrics & Gynecology | Fetal Doppler, Fetal Monitor (CTG), Colposcope, Gynecological Examination Table, Weight & Height Scales, Examination Table, Examination Light, Blood Pressure Meter, Ultrasound Scanner, etc. |
| 5 | Outpatient Consultation | Height & Weight Scales, Blood Pressure Meter, Electrocardiograph, Examination Table, etc. |
| 6 | Communicable Diseases & TB | Sterilizer, Incubator, Safety Cabinet, Fume Hood, etc. |
| 7 | Pharmacy | Medicine Cupboards, Medicine Racks, etc. |
| 8 | Operating Theatre | Operating Table, Operating Light, Anesthesia Machine, Vital Sign Monitor, Suction Machine, Electrocautery, Defibrillator, etc. |

| | | |
|---|---|---|
| | Intensive Care Unit (ICU) | Vital Sign Monitor, Ventilator, Infusion pump, Syringe pump, Suction Machine, etc. |
| 9 | Emergency | Stretcher, Resuscitator, Mobile X-ray Machine, Ultrasound Scanner, Defibrillator, Suction Machine, etc. |
| 10 | Diagnostic Imaging (Imagery) | General X-ray Machine, Mobile X-ray machine, Ultrasound Scanner, etc. |
| 11 | Ophthalmology | Anterior Ocular Diagnosis: Slit Lamp, Refraction Adjustment: Ophthalmoscope, Visual Field Testing: Perimeters, Fundus Diagnosis: Fundus Camera, Surgery: Operating Microscope, Other: Laser Machine, etc. |
| 12 | ENT | ENT Treatment Unit & Chair, Audiometer, etc. |
| 13 | Dental | Dental Unit & Chair, Sterilizer, etc. |
| 14 | Sterilization | Ultrasonic Cleaner, High-Pressure Steam Sterilizer, Instrument Cabinet, etc. |
| 15 | Laboartory Examination | Hematology Analyzer, Biochemistry Analyzer, Blood Coagulation Analyzer, Electrolyte Analyzer, Electrophoresis Apparatus, Blood Gas Analyzer, Immunoassay Analyzer, etc.、 |
| 16 | Blood Bank | Blood Storage Refrigerator, Freezer, Blood Separation Machine, Blood Transfusion Testing machine, etc. |

Source: Prepared by the JICA survey team based on CPA guideline

## 2-4 Human Resources

### 2-4-1 Policies for Human Resources for Health

Aligned with HSP3, the strategy for developing human resources for health (HRH) is specified in the Health Workforce Development Plan 2016-2020 (HWDP3). The HWDP3 was developed by two departments, which are mainly responsible for tasks related to HRH within the MOH, namely the Department of Personnel (DP) (recruitment, deployment and management) and Human Resource Development (DHRD) (pre- and in-service education). The following five strategic objectives are stated in the HWDP3.[11]

1. Adopt a unified approach to health workforce planning, to ensure health workforce development is responsive to population and service needs.
2. Enable effective delivery of health services by promoting equitable distribution, and ensuring retention and skill mix of health workers.
3. Address workforce needs, including the workplace environment, to ensure optimal staff productivity, motivation and participation.
4. Improve the quality of education and training to meet the skill and development needs of the workforce in a changing demographic and epidemiological environment.
5. Strengthen health workforce regulations and management to ensure quality of service delivery.

The Health Workforce Development Plan 2021-2030 (HWDP4) is currently in the process of development in conjunction with the formulation of the HSP4.

[11] Ministry of Health-Royal Government of Cambodia, 2016. *Health Workforce Development Plan 2016-2020*. pp.1-43.

### 2-4-2 Public System for Pre-service Education

To enroll in a bachelor's or associate degree program at health education institutions, applicants must pass the National Entrance Examination. The examination is conducted in order to evaluate the competencies of the applicants as well as to regulate the number of HRH production. The basic requirement for taking the examination is a high-school diploma.[12] After graduation, the students' knowledge and skills are tested by the National Exit Examination, and only after they pass the examination, are they eligible to work in the medical field.[13] When it comes to specialized doctor programs, applicants are selected not by the above entrance examination but by a separate Competitive Examination.[14]

There are seven public health education institutions in Cambodia.[15] Among them, the University of Health Science (UHS) is under the jurisdiction of MOH. This had been the only health education institution in the country from its establishment in 1946 to 2000, and various degree programs are currently offered (Figure 2-9).[16] Also, UHS is the only public health education institution that provides specialized doctorate programs and, together with the International University (private institution), these are the only two health education institutions that offer specialized doctorate programs in the country.[17] Those with a Bachelor of Medical Sciences (six year program) or a Medical Doctor Diploma (Bachelor of Medical Sciences plus two additional years) are eligible to apply for the programs, and the duration for each specialized program is from three to four years.[18] Scholarships are offered to some of the best students to study in France in the final year of the program.[19] In addition, under the jurisdiction of MOH, RTCs are located in four provinces, and nurses and midwives are trained in each region (Table 2-10). Furthermore, the National Institute of Public Health (NIPH) under the jurisdiction of MOH offers master's degree programs in public health, epidemiology, nutrition, hospital administration and community health development.[20] Finally, the Health Science Institute of Royal Cambodian Armed Forces under the jurisdiction of the Ministry of National Defense also trains HRH including doctors, nurses, and midwives.

---

[12] Some private health education institutions accept students without a high-school diploma. (DHRD)

[13] The examination is held twice a year, and one can take it up to four times. If it is not successful by the fourth trial, one last chance is given after one additional year of supplementary training at a health education institute. (DHRD)

[14] Information from University of Health Sciences (UHS)

[15] University of Health Sciences, 2020. *University of Health Sciences Strategic Plan 2019-2023*. pp.1-106.

[16] An associate degree program in Medical Bioengineering is provided in collaboration with the Institute of Technology of Cambodia. (UHS)

[17] Information from DHRD

[18] Specialized doctorate programs for Ophthalmology, Ear-Nose-Throat and Psychiatry are for three years, and the others are for four years. (Information from UHS)

[19] Information from DHRD

[20] National Institute of Public Health, 2018. *School of Public Health*. [online] Available at: <https://niph.org.kh/niph/niph-school/index.html> [Accessed 19 April 2022].

**Table 2-10: Provinces Covered by Each RTC**

| RTC | Provinces Covered |
|---|---|
| RTC Battambang | Battambang, Siem Reap, Pursat, Banteay Meanchey, Oddar Meanchey and Pailin |
| RTC Kampong Cham | Kampong Cham, Svay Rieng, Prey Veng, Kampong Thom and Tbong Kmoum |
| RTC Kampot | Kampot, Takeo, Koh Kong, Preah Sihanouk and Kep |
| RTC Stung Treng | Stung Treng, Kratie, Preah Vihear, Ratanakiri and Mondulkiri |

Source: Prepared by the survey team based on the information from MOH and Kampong Cham RTC

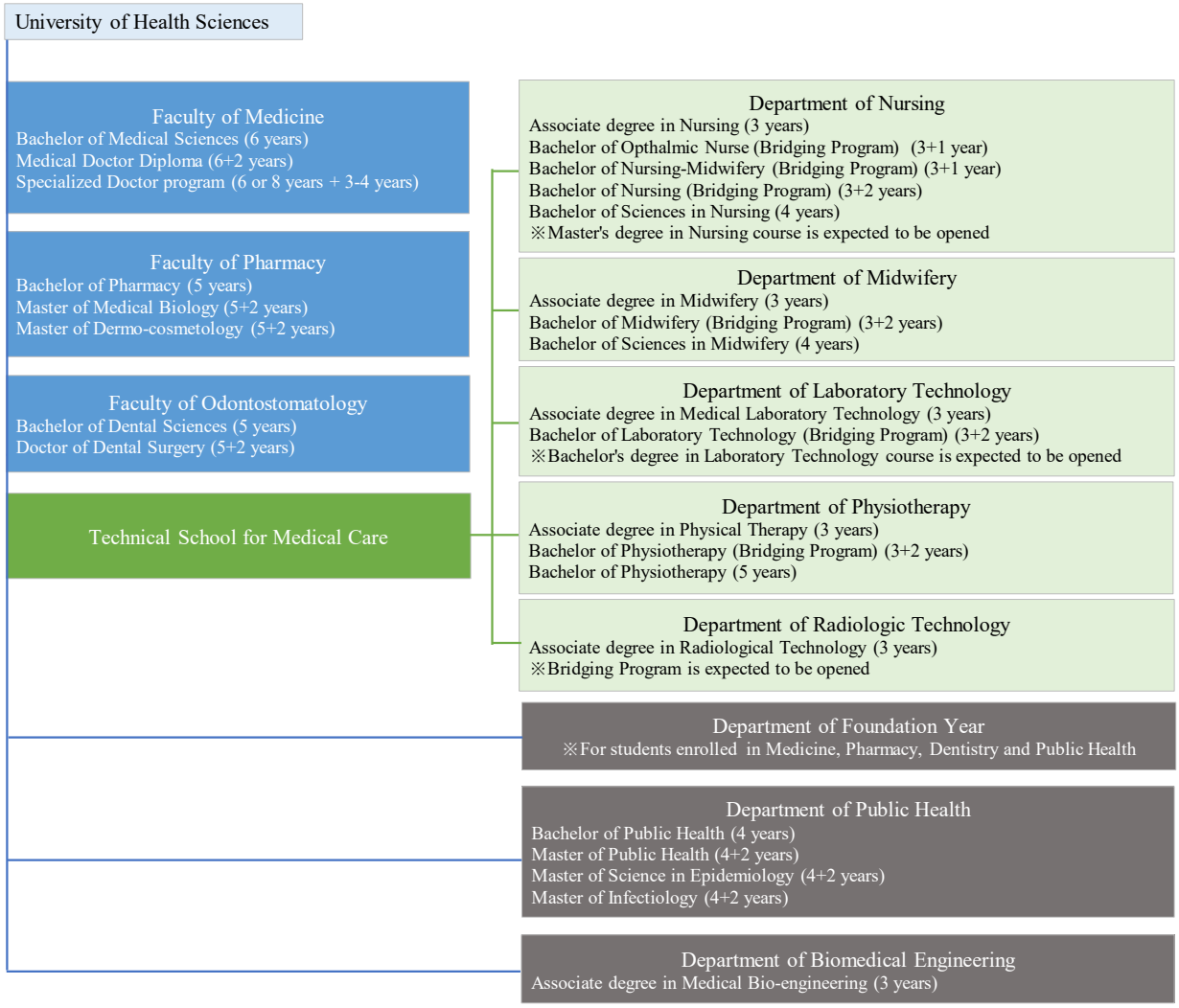



**Figure 2-9: Degree Programs Offered at UHS**

Source: Prepared by the JICA survey team based on the information from UHS

### 2-4-3 Public System for Recruitment and Deployment

As the process of D&D is in progress in the country, roles and functions of sub-national administration in HRH management are being reviewed and redefined. The current annual flow of employment and deployment of HRH is shown in Figure 2-10, and the details are described below.

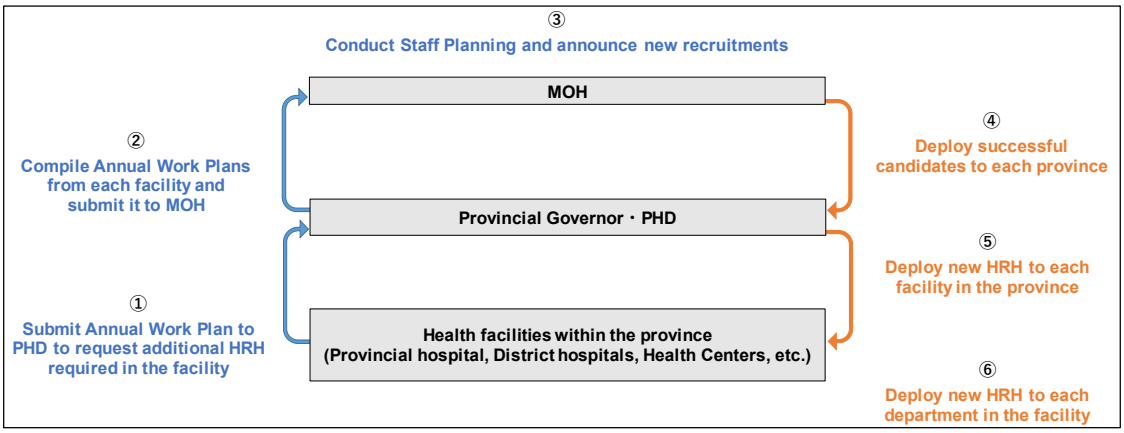



**Figure 2-10: Flow of HRH Employment and Deployment**

Source: Prepared by the JICA survey team based on the information from DP and Kampong Cham PHD

① Each health facility reports the number of additionally required HRH for each profession to the Provincial Health Department (PHD) in a form of an Annual Work Plan.

② PHD compiles the Annual Work Plans from each health facility in the province and submits them to the provincial governor. The plan is submitted to MOH upon approval of the governor.

③ MOH conducts staff planning while considering Annual Work Plans from provinces, the staffing standards and the current deployment status, and announces recruitment for new HRH for each province (e.g., 2 surgeons and 30 nurses for Kampong Cham province).

④ The National Examination Committee conducts the Annual Civil Service Examination for applicants, and successful candidates are registered as civil servants. Then, the MOH, together with the Ministry of Civil Service, considers staffing and deploys recruited personnel to each province while considering the provinces desired by each person. The personnel belong to each province and are under probation for the first 12 months.

⑤ PHD allocates recruited personnel to each health facility within the province in consideration of the requests and current situation of the facilities.

⑥ Each health facility assigns the new personnel to each department within the hospital in consideration of the requests and current situation of the departments.

Relocation to other health facilities is normally based on individuals' requests. In the case of health facilities under the jurisdiction of MOH such as national hospitals, approval of the MOH is required. For relocation from one province to another, approvals from the provincial governor in the current province and the destination are needed. If the relocation is within the province,

approval from the provincial governor is required.[21]

## 2-5 Health Financing

### 2-5-1 Trends of Current Health Expenditure

Table 2-11 shows current health expenditure (CHE) in Cambodia, growth rates, and CHE as a share of GDP. CHE in 2019 was approximately US$ 1.9 billion, which has almost doubled since 2011. The growth of CHE fluctuates by year, but it has grown 10.6% on average from 2010 to 2019. CHE is increasing in accordance with the GDP growth. CHE as a share of GDP is 6.7% on average and it was 7.0% in 2019.

**Table 2-11: Trends in Current Health Expenditure and GDP**

Unit: million US$

| Year | Current health expenditure | Growth rate | GDP (current) | GDP growth rate (current) | CHE as a share of GDP |
|---|---|---|---|---|---|
| 2010 | 776 | - | 11,242 | - | 6.9% |
| 2011 | 963 | 24.0% | 12,830 | 14.1% | 7.5% |
| 2012 | 1,021 | 6.0% | 14,054 | 9.5% | 7.3% |
| 2013 | 1,082 | 6.0% | 15,228 | 8.4% | 7.1% |
| 2014 | 1,119 | 3.5% | 16,703 | 9.7% | 6.7% |
| 2015 | 1,118 | -0.1% | 18,050 | 8.1% | 6.2% |
| 2016 | 1,224 | 9.5% | 20,017 | 10.9% | 6.1% |
| 2017 | 1,269 | 3.7% | 22,158 | 10.7% | 5.7% |
| 2018 | 1,510 | 19.0% | 24,417 | 10.2% | 6.2% |
| 2019 | 1,868 | 23.7% | 26,729 | 9.5% | 7.0% |

Source: WHO, Global Health Expenditure Database

In Cambodia, there are several health financing schemes to cover health services. Among them, financing schemes run by the government include 1) the Health Equity Fund (HEF), 2) social health insurance for the private sectors run by the National Social Security Fund (NSSF), and 3) social health insurance for civil servants run by the National Social Security Fund for Civil Servants (NSSF-C).

HEF is a scheme introduced in 2000, covering approximately 3.2 million poor people. HEF provides the targeted beneficiaries with medical services at public facilities free of charge. Eligible beneficiaries are identified through Pre-ID Poor and Post-ID Poor processes. ID Poor is a qualification that covers not only health services but also scholarships and food assistance. The

[21] Information from DP and Kampong Cham PHD

Ministry of Planning is in charge of supervising the system. HEF is jointly financed by the Cambodian government and donor's pool funds called the Health Equity and Quality Improvement Project (H-EQIP). The Cambodian government contributes around 60-70% of the total HEF expenditures.[22]

The NSSF was established in 2007 under the Ministry of Labour and Vocational Training and is operated through contributions. The Health Insurance Scheme was launched in 2016 and covers workers in large enterprises as well as small and medium enterprises with approximately 1.7 million workers as of 2019.[23] For the NSSF-C, the pension scheme is currently in operation.

As indicated in Figure 2-11, a large part of Cambodia's CHE is borne by the household's out of pocket (OOP) spending. OOP spending by households is increasing every year, which accounts for US$1.2 billion or 64.4% of the total CHE in 2019. Contributions by the government account for US$489 million or 26.2% of the total CHE in 2019. This has not increased for the past seven years, accounting for about 26%. According to the Cambodia National Health Accounts 2012-2016, of the government expenditure, 61% was spent on the central level and 39% on the provincial level in 2016.

[22] "Expanding Health Equity Fund Coverage for People Living with HIV in Cambodia" http://www.healthpolicyplus.com/ns/pubs/18412-18740_CambodiaPLHIVHEFCoverage.pdf
[23] Policy Brief: The National Social Security Fund and Its Implications for CWEA Members http://www.cweacambodia.org/en/news-update/232/policy-brief-the-national-social-security-fund-and-its-implications-for-cwea-members

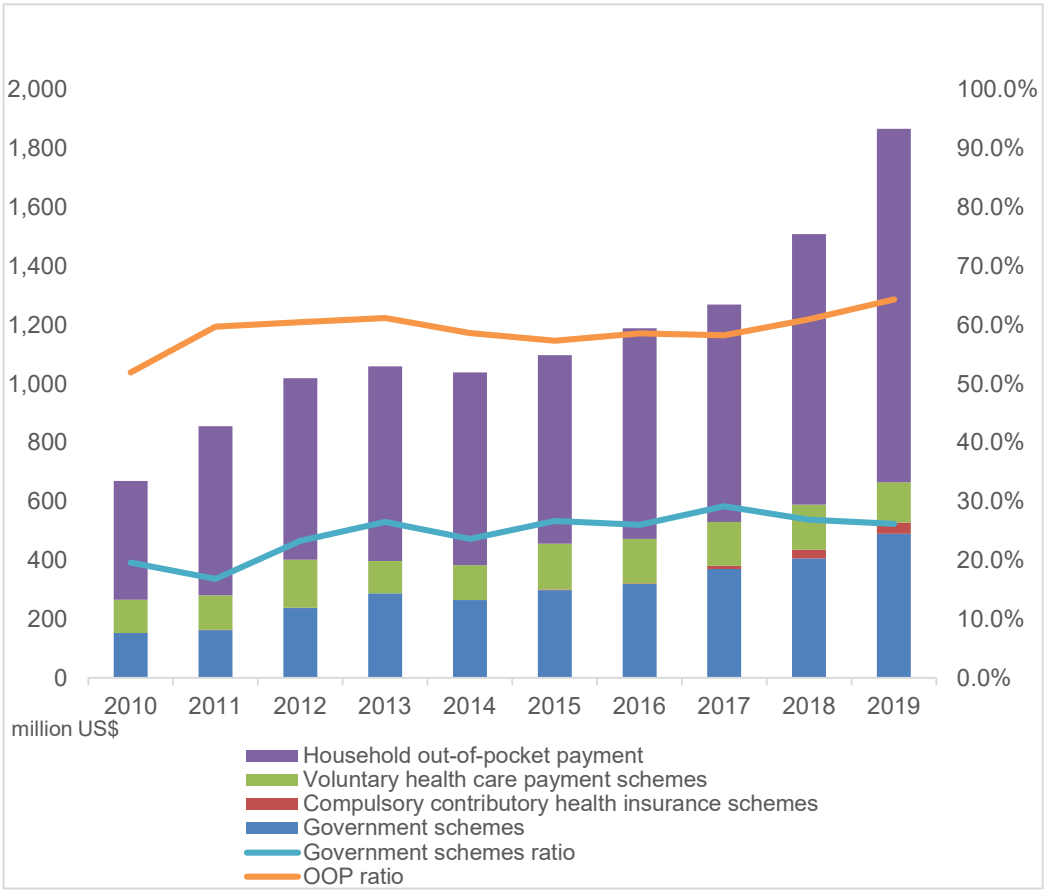



**Figure 2-11: Current Health Expenditure by Financing Scheme**

Source: WHO, Global Health Expenditure Database

### 2-5-2 Expenditure by the Ministry of Health

The expenditure by the MOH in 2021 was 1,017 billion riels (approximately US$248 million), which increased by about 6% compared with the 2020 expenditure. The expenditure by the MOH accounts for around 3.3% of the total national expenditure.

According to the annual budget database of the Cambodian government, the expenditure by the MOH was largely divided into goods and services and public intervention. Around 30% of the expenditure is used for goods and services, of which medical supplies and equipment, services and personnel represent the major portion. The remaining 70% is used for public intervention, most of which is used for social benefit. Table 2-12 shows the MOH's expenditure trends from 2018 to 2021.

**Table 2-12: Trends in the Annual Expenditure by the Ministry of Health**

Unit: million Riel

| | 2018 | | 2019 | | 2020 | | 2021 | |
|---|---|---|---|---|---|---|---|---|
| Total national expenditure | 23,428,298 | | 25,765,028 | | 31,095,855 | | 30,491,336 | |
| **MOH expenditure** | **820,304** | | **931,572** | | **961,462** | | **1,017,836** | |
| **1. Goods and Services** | 289,498 | 35.3% | 294,136 | 31.6% | 317,206 | 33.0% | 280,029 | 27.5% |
| Goods | 171,162 | 20.9% | 155,231 | 16.7% | 174,429 | 18.1% | 159,813 | 15.7% |
| Medical supplies and equipment | 148,416 | 18.1% | 132,336 | 14.2% | 150,336 | 15.6% | 137,214 | 13.5% |
| Services | 25,825 | 3.1% | 32,130 | 3.4% | 31,303 | 3.3% | 20,366 | 2.0% |
| Personnel | 92,511 | 11.3% | 106,775 | 11.5% | 111,474 | 11.6% | 99,850 | 9.8% |
| **2. Public Intervention** | 530,560 | 64.7% | 637,190 | 68.4% | 644,011 | 67.0% | 737,570 | 72.5% |
| Social benefit | 483,213 | 58.9% | 581,788 | 62.5% | 588,831 | 61.2% | 682,981 | 67.1% |
| **3. Other Expenditure** | 246 | 0% | 246 | 0% | 245 | 0% | 237 | 0% |

Note: The total of 1) goods and services, 2) public intervention, and 3) another expenditure is the MOH's expenditure.
Source: Cambodia National Budget, Annual Budget Database

### 2-6 ICT/Digital Health

MOH is in the process of developing the national digital health policy which is aligned with the government policy (i.e. Cambodia Digital Economy and Society Policy Framework 2021-2035). One priority of the policy is reportedly to expand the Patient Management and Registration System (PMRS) in public hospitals as explained below.

The digitization of medical information in public health care facilities (CPA 1, 2 & 3 and HCs) in Cambodia has its origins in the need to organize information on patients who are receiving medical care services by HEF refunds. Each healthcare facility can request a refund for the consultation fees to the HEF office based on the diagnostic and treatment records of patients who were eligible to benefit from the HEF. In preparation for this claim (payment request), records of outpatient consultations and inpatient admissions, including patient information (personal information), are now managed electronically. This is referred to as the PMRS. The Payment Certification Agency (PCA) is responsible for the payment of consultation fees to healthcare facilities.

Cambodia Laboratory Information System (CamLIS) for the procurement of laboratory equipment and management of laboratory information for the public healthcare facilities has also been introduced. The details of the system are explained in Chapter 3-3.

In addition, electronic patient records have been introduced in some public hospitals (Battambang Provincial Hospital and Phnom Penh Municipal Hospital, etc.) and private hospitals. Public hospitals are still in the trial stage. The system has been developed by a private company, and is known as "Peth Yoeung." However, "Peth Yoeung" is not yet a functional system as it is not linked to PMRS and the properties of patient data reside with the software provider, a private vendor.

### 2-6-1 PMRS

PMRS is a web-based database used by all public health facilities in Cambodia to record patient profiles, patient history access to health care services, and reimbursement of health services in the Health Equity Fund scheme.

The system has been in use at public health facilities, including provincial hospitals, district hospitals, HCs, and former district hospitals since 2014. By using this system, health facility officers can record usage data and revenue data from services provided at their health facilities and can even download reports for submission to the MOH. PMRS works with most browsers, but the recommended browser is Mozilla Firefox because PMRS works best with the software.

A special feature of PMRS is the technology system used by PCA for verification and confirmation of health services under HEF. PMRS has been used for submitting HEF claims to PCA. As of April 2019, 6 national hospitals, 24 provincial hospitals, 86 district hospitals, 64 former district hospitals and 1,123 HCs tried to introduce PMRS to their facilities.[24] The exact number of health facilities using PMRS at present could not be confirmed by PCA.

## 2-7 Cooperation by JICA and Development Partners

### 2-7-1 Key Development Partners

(1) The World Bank

The World Bank has supported the Health Equity and Quality Improvement Project (H-EQIP) since 2017, which is now entering Phase 2 after an appraisal process. The first phase financed both demand and supply side interventions with two aims: 1) to remove financial barriers to access and increase utilization of health services by the poor through the HEF; and 2) to strengthen a nationwide network of health facilities and consolidate the HEF. According to the survey team's interview with the World Bank, the H-EQIP support included building 45 health centers in Stung Treng and other provinces, emergency obstetric wards in 50 referral hospitals, and 2 provincial hospitals in Pailin and Oddar Meanchey with some major delays in construction. Phase 2 is

[24] Payment Certification Agency (PCA).

starting in 2022 with the objective of improving equitable utilization of quality health services for the Cambodian population, particularly the poor and vulnerable. The Cambodian government has proposed infrastructure development to support new referral hospitals ranging from CPA1 and CPA3 with the financing of US$24 million. Details of the necessary support will be determined after the formulation of an infrastructure development plan which will identify the gaps and needs of hospitals in the country including buildings, equipment, human resources, labs and emergency medical services. Based on the analysis, the World Bank will discuss the priorities of hospital infrastructure investment with the MOH and MEF together with other development partners including JICA. The survey team, JICA and the World Bank representatives have agreed that JICA's support to the seven hospitals should be incorporated into the infrastructure development plan to ensure complementarity and harmonization of donor support.

(2) WHO

In moving toward UHC, WHO has supported the Cambodian government on the basis of the Country Cooperation Strategy (2016-2020). The Strategy was aligned with the HSP3 with 4 strategic priorities: 1) providing leadership for priority public health programmes; 2) advancing UHC; 3) strengthening the capacity for health security; and 4) engaging in multisectoral collaboration and fostering partnership. Programs to address the challenges of NCDs are included, such as developing national guidelines for the management of major NCDs (e.g. hypertension, diabetes and cervical cancer) through a primary care approach. As the Cambodian government is currently developing the HSP4, the Country Cooperation Strategy has not been updated yet. WHO is supporting the MOH in developing the new HSP4 together with other development partners. Once the HSP4 is finalized, the new Country Cooperation Strategy for WHO Cambodia will be developed to align with the HSP4.

The interview with WHO representatives revealed that the current thinking of the HSP4 is to prioritize primary healthcare, sustainable financing, health behavior, and community engagement, digital health and innovation, governance, and risk management. While WHO's main focus is on primary health care as a center of the health system, they have shown an understanding of the usefulness of the hospital upgrading as part of the overall health system strengthening.

(3) Asia Development Bank

The Asia Development Bank (ADB) has supported the Greater Mekong Subregion Health Security Project in Cambodia as well as Lao PDR, Myanmar and Vietnam since 2017 through a concessional loan. The project is intended to develop core health system capacities to respond to public health threats of national and international concern through three outputs: 1) improvement of regional cooperation and communicable disease control in border areas; 2) strengthening of national disease surveillance and outbreak response systems; and 3) improvement of laboratory

services and hospital infection prevention and control. In response to the COVID-19 pandemic, an output to strengthen the emergency preparedness and response capacity for COVID-19 has been added as a fourth output. The ADB project document published in September 2021[25] indicated that the additional financing for the fourth output will support the following: 1) laboratory services and hospital infection prevention and control in 8 provincial hospitals and 73 district referral hospitals; 2) equipping 14 provincial hospitals with the means to provide emergency clinical care for COVID-19 patients, including upgraded oxygen supply; and 3) strengthening surveillance and response capacity for COVID-19 and other communicable diseases nationwide. The total project cost is around US$58 million. One of the financing sources includes the Japan Fund for Poverty Reduction.

(4) Other Relevant Cooperation

| Government | Relevant Support[26] |
|---|---|
| Republic of Korea | "Establishing the University of Health Science Teaching Hospital Project" (2019-2023) is a concessional loan project to nurture a professional health workforce with good quality of education and to provide high standard health services by establishing a teaching hospital as part of UHS. According to the information obtained from UHS, the bed capacity was being reviewed and the construction was yet to commence. |
| China | A grant project to support the construction of function rooms of relevant departments and service rooms and the supply of medical equipment for Tboung Khmum Hospital was implemented between 2019 and 2021. According to the interview conducted at the hospital by the survey team in March 2022, the project cost was approximately $US65 million. The hospital has a capacity of 300 beds. While waiting for the grand opening, it had recruited only half of the required human resources, and user fees had not been set up yet at the time of the interview. |

### 2-7-2 JICA

JICA has supported various health projects in Cambodia for decades, particularly in the area of maternal and child health care. Although Cambodia has made progress in reducing maternal and child mortality rates, they remain relatively high in the Southeast Asian region, particularly the infant mortality rate. According to Japan's current Country Assistance Policy for Cambodia, the enhancement of health and medical care is included as part of the priority pillar of social development. In strengthening the health sector with a focus on maternal and child health care from the perspective of health systems strengthening, JICA's past and present support has involved human resource development and organizational and system development, the construction of hospitals, and the provision of medical equipment. Some of the recent support by

[25] ADB. Proposed Loan and Administration of Grant for Additional Financing Kingdom of Cambodia: Greater Mekong Subregion Health Security Project, September 2021.
[26] Cambodia ODA Database: http://odacambodia.com/documents/introduction.asp

JICA is highlighted in the table below.

**Table 2-13: Recent Health Projects by JICA**

| | Project Name and Scheme | Duration | Project Details |
|---|---|---|---|
| 1 | Project for Improving Continuum of Care with Focus on Intrapartum and Neonatal Care (Technical Cooperation) | May 2016 to May 2022 | With an overall goal to reduce neonatal mortality in target provinces, the project support includes strengthening training and supervision on intrapartum and immediate newborn care, improving the management of sick newborns and preterm/low birth weight infants and strengthening follow-up for neonates. Lessons learned and evidence from the project will be disseminated so that they will be incorporated into national policies and guidelines. |
| 2 | Project for Strengthening In-service Training System in Cambodia (Technical Cooperation) | December 2021 to December 2026 | The project has recently started with the purpose to strengthen the in-service training system for nurses. Project outputs include the development of national guidelines for in-service training for nurses and in-service training plans and curriculum, the implementation of prioritized new training courses using various training methods (online, face-to-face, practical training and on-the-job training), and the establishment of a monitoring system for the operation of in-service training. It is implemented by the Department of Human Resource Development of MOH. Project sites include Phnom Penh, Kampong Cham and Battambang while TOT and online training courses will be conducted nationwide. |
| 3 | Project for Improvement of Referral Hospitals in Siem Reap Province (Grant Aid) | G/A signed in October 2020 (69 months) | The grant agreement (G/A) was agreed upon with the Cambodian government for strengthening the health system of Siem Reap province and improving access to basic health and medical services. Project sites are Siem Reap Provincial Referral Hospital and four District Referral Hospitals. Within the implementation period, it is expected to complete the construction of the target facilities (e.g. surgery, emergency, operation) and support the maintenance of medical equipment for 3 years after its delivery. |
| 4 | Project for Improvement of Battambang Provincial Referral Hospital (Grant Aid) | Began in January 2018 and handed over in June 2020 | The project was implemented with an aim to strengthen the subnational health system through building new facilities (emergency, internal medicine ICU, surgery, ear, nose and throat, operation, laboratory, etc.) and providing necessary medical equipment (X-ray, ultrasound, ICU beds, etc.) to the Provincial Referral Hospital. |
| 5 | Project for Strengthening Human Resources Development System of Co-medicals (Technical Cooperation) | June 2010 to June 2015 | The project started as the phase two of the Project for Human Resources Development for Co-Medicals (2003-2010) to address the remaining issues such as the lack of a systematic mechanism for capacity building of teaching staff and insufficient regulations for controlling the quality of health professionals. It had two main pillars with a focus on nursing and midwifery: 1) developing a training system for existing and new teachers; and 2) developing a regulatory framework for health professionals. |

Source: JICA survey team

Some of the lessons learned and outputs from the above-mentioned projects by JICA that should be incorporated into the proposed facility, medical equipment and human resource development plans for regional hospitals are as follows:

- Facility and equipment plans should ensure the maximization of the infrastructure and human resources strengthened through the past grant aid projects for the provincial hospitals (Projects 3 and 4 in the above table).
- The following experiences from the past and current JICA projects should be considered:
  - ✓ Incorporate effective training designs (training methods, manuals, locations, trainers, etc.), particularly from the experiences of Projects 1 and 2
  - ✓ Assess the issues of sustainability after the completion of Project 5 in relation to the capacity and systems strengthened for co-medicals and whether there are existing beneficiaries (e.g., medical engineers) who can be tapped as trainers
  - ✓ Linking the human resources of nurses to be supported by Project 2 to the required nurses for the regional hospitals

# Chapter 3 Survey Results

Key population data of the seven-target municipality and provinces are summarized below.

**Table 3-1: Key Data of Target Municipality and Provinces**

| Data | Battambang | Kampong Cham | Kampot | Phnom Penh | Siem Reap | Stung Treng | Svay Rieng |
|---|---|---|---|---|---|---|---|
| Population*1 | 997,169 | 899,791 | 593,829 | 2,281,951 | 1,014,234 | 165,713 | 525,497 |
| Population density/km$^2$*1 | 85 | 198 | 122 | 3,361 | 98 | 15 | 177 |
| Estimated poverty rate (2014) *2 | 20 | 19 | 20 | 3 | 21 | 25 | 14 |
| Literacy rate (2013) *3 | 81.1 | 76.3 | 81.4 | 91.3 | 75.3 | 65.3 | 83.3 |
| Share of labors engaged in establishments (%) *4 | 5.1 | 8.5 | 2.5 | 33.3 | 5.6 | 0.7 | 3.2 |
| Number of health facilities | | | | | | | |
| Municipal/ Provincial hospital | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| District hospital *5 | 3 | 10 | 3 | 4 | 3 | 0 | 2 |
| Health center *5 | 74 | 134 | 48 | 17 | 64 | 10 | 37 |

Sources: *1=Cambodia Population Census 2019, *2= Multidimensional Poverty Analysis -Cambodia 2019, *3=Cambodia Inter-censal Population Survey 2013, *4=Cambodia Economic Census 2011, *5=.Health Facilities in Cambodia 2010, Open Development Cambodia (Note: Number of Kampong Chang includes the facilities in Tbong Khmum province)

## 3-1 Health Service Delivery

### 3-1-1 Access to Advanced Medical Services

It was reported that many of the advanced medical services for NCDs are concentrated in national hospitals. Below is an overview of the studied national hospitals and a list of the major diseases, of which more than 70% of total out- and in-patients, who were registered in the provincial hospitals and national hospitals, are treated by the national hospitals.[27]

**Table 3-2: Overview of National Hospitals**

| | Hospital | Medical services |
|---|---|---|
| 1 | Calmett Hospital | It is the biggest general hospital in Cambodia. Major clinical departments include gastroenterology, cardiology, neurology, urology, diabetes, nephrology, oncology, communicable diseases, orthopaedics, and obstetrics and gynecology. Advanced medical services are available including chemotherapy and radiotherapy for cancer treatment. |
| 2 | Khmer Soviet Friendship Hospital | The numbers of beds and outpatients are among the largest in Cambodia. Major clinical departments include internal medicine, gastroenterology, pulmonology, urology, oncology, communicable diseases, pediatrics, psychiatry, and obstetrics and gynecology. Radiotherapy is available. It was reported that it functions as a referral hospital for low-income populations with relatively lower user fees. |

Source: Each hospital

[27] Selected the diseases with which number of patients are more than 100 per year from HMIS in 2020.

**Table 3-3: List of Major Diseases with Outpatients Concentrated in the National Hospitals**

| | Disease | Related clinical field | ICD-10 | No of patients | Proportion of patients in NHs[*1] |
|---|---|---|---|---|---|
| 1 | Cerebral Infarction | Neurology | I63 | 1,569 | 90.1% |
| 2 | Epilepsy, unspecified | | G40.9 | 5,221 | 78.1% |
| 3 | Manic episode | | F30 | 130 | 76.2% |
| 4 | Angina pectoris | Cardiology | I20 | 679 | 73.3% |
| 5 | Acute pulmonary edema | Pulmonology | J81.0 | 271 | 97.4% |
| 6 | Pyothorax | | J86 | 157 | 100.0% |
| 7 | Acute respiratory failure | | J96.0 | 163 | 100.0% |
| 8 | Malignant neoplasm of bronchus and lung | Pulmonology | C34 | 119 | 100.0% |
| 9 | Hepatitis B | Gastroenterology | B16 | 1,529 | 93.7% |
| 10 | Liver abscess | | K75.0 | 300 | 97.3% |
| 11 | Abdominal mass | | R19.0 | 296 | 94.9% |
| 12 | Liver mass | | R93.2 | 151 | 97.4% |
| 13 | Other abdominal hernia | Gastroenterology/ oncology | K45 | 190 | 74.7% |
| 14 | Hemorrhoid | | K64.9 | 1,339 | 87.8% |
| 15 | Peritonitis | | K65 | 779 | 97.9% |
| 16 | Cholelithiasis | | K80 | 756 | 94.2% |
| 17 | Malignant neoplasm of colon | | C18 | 194 | 100.0% |
| 18 | Malignant neoplasm of liver and intrahepatic bile | | C22 | 261 | 98.9% |
| 19 | Malignant neoplasm of pancreas | | C25 | 199 | 99.5% |
| 20 | Malignant neoplasm of palate | Oral/Oncology | C05 | 135 | 100.0% |
| 21 | Polyosteoarthritis | Orthopedics | M15 | 1,613 | 86.9% |
| 22 | Osteoarthritis of hip | | M16 | 150 | 96.7% |
| 23 | Fracture of pelvis | | S32.8 | 118 | 88.1% |
| 24 | Fracture of femur | | S72 | 1,305 | 94.6% |
| 25 | Solitary cyst of breast | Oncology/OBGY | N60.0 | 1,543 | 82.6% |
| 26 | Clinical field | | C50 | 611 | 99.8% |
| 27 | Neurology | OBGY | O00 | 579 | 87.4% |
| 28 | Hydatidiform mole | | O01 | 177 | 94.4% |
| 29 | Gestational Hypertension | | O13 | 112 | 94.6% |
| 30 | Cardiology | | C53 | 660 | 99.5% |
| 31 | Pulmonology | | C55 | 104 | 99.0% |
| 32 | Malignant neoplasm of ovary | | C56 | 130 | 100.0% |
| 33 | Bipolar affective disorder | Mental health | F31 | 602 | 83.4% |
| 34 | Intentional self-harm, all kinds | | X60 | 511 | 93.7% |
| 35 | Sunburn | Dermatology | L55 | 119 | 95.8% |
| 36 | Calculus of kidney | Urology | N20.0 | 885 | 85.1% |
| 37 | Uretheral Stone | | N21 | 464 | 98.7% |
| 38 | Calculus in bladder | | N21.0 | 120 | 90.8% |

Note: NH=National Hospital

Source: HMIS 2020

**Table 3-4: List of Major Diseases with Inpatients Concentrated in the National Hospitals**

| | Disease | Related clinical field | ICD-10[28] | No of patients | Proportion of patients in NHs[*1] |
|---|---|---|---|---|---|
| 1 | Malignant neoplasm of bronchus and lung | Pulmonology | C34 | 945 | 96.5% |
| 2 | Emphysema | | J43 | 265 | 80.4% |
| 3 | Acute pulmonary edema | | J81.0 | 1,605 | 79.1% |
| 4 | Multiple drug resistance TB confirmed by culture | | U50.0 | 179 | 78.8% |
| 5 | Hepatitis C | Gastroenterology | B17.1 | 330 | 86.7% |
| 6 | Cholelithiasis | | K80 | 1,156 | 70.8% |
| 7 | Other diseases of pancreas | | K86 | 178 | 70.8% |
| 8 | Malignant neoplasm of esophagus | Gastroenterology/oncology | C15 | 122 | 99.2% |
| 9 | Malignant neoplasm of stomach | | C16 | 367 | 98.1% |
| 10 | Malignant neoplasm of colon | | C18 | 699 | 98.0% |
| 11 | Malignant neoplasm of rectum | | C20 | 148 | 94.6% |
| 12 | Malignant neoplasm anus and anal canal | | C21 | 349 | 98.3% |
| 13 | Malignant neoplasm of liver and intrahepatic bile | | C22 | 821 | 95.5% |
| 14 | Malignant neoplasm of gallbladder | | C23 | 191 | 100.0% |
| 15 | Malignant neoplasm of pancreas | | C25 | 181 | 95.0% |
| 16 | Malignant neoplasm of palate | Oral/Oncology | C05 | 482 | 99.6% |
| 17 | Unspecified osteoporosis | Orthopedics | M81.99 | 140 | 92.9% |
| 18 | Polyosteoarthritis | | M15 | 154 | 67.5% |
| 19 | Breast mass | Oncology/OBGY | N63 | 292 | 93.2% |
| 20 | Malignant neoplasm of breast | | C50 | 1,625 | 98.0% |
| 21 | Placenta previa | OBGY | O44 | 405 | 71.4% |
| 22 | Malignant neoplasm of cervix uteri | | C53 | 1,427 | 91.0% |
| 23 | Malignant neoplasm of uterus, part unspecified | | C55 | 179 | 92.2% |
| 24 | Malignant neoplasm of ovary | | C56 | 467 | 98.1% |
| 25 | Calculus in ureter | Urology | N20.1 | 674 | 81.3% |
| 26 | Calculus in urethra | | N21.1 | 442 | 89.6% |
| 27 | Malignant neoplasm of prostate | | C61 | 133 | 97.0% |
| 28 | Malignant neoplasm of bladder | | C67 | 177 | 99.4% |

Note: NH=National Hospital
Source: HMIS 2020

### 3-1-2 Overview of the Target Hospitals

All seven municipal and provincial hospitals qualify as CPA3. The major characteristics of the hospitals are summarized below.

[28] International Classification of Diseases, 10th revision.

**Table 3-5: Major Indicators of Seven Municipal and Provincial Hospitals**

| | Battambang | Kampong Cham | Kampot | Phnom Penh | Siem Reap | Stung Treng | Svay Rieng |
|---|---|---|---|---|---|---|---|
| No of beds sanctioned*1 | 390 | 280 | 155 | 150 | 370 | 120 | 168 |
| Bed Occupancy Rate*1 | 85% | 100% | 89% | 47% | 95% | 75% | 100% |
| No of OP | 88,859 | 39,298 | 16,574 | 35,822 | 86,333 | 6,408 | 30,801 |
| No of IP | 17,627 | 24,107 | 11,599 | 4,928 | 23,962 | 8,247 | 17,439 |
| OP without referral (%) | 89.7% | 97.5% | 95.0% | 99.1% | 87.0% | 98.8% | 97.5% |
| OP from other provinces (%) | 10.5% | 41.8% | 41.4% | 45.0% | 15.8% | 0.0% | 7.0% |
| Referred patients to NHs*1 | 143 | 2,067 | 641 | 142 | 147 | 195 | 1,566 |
| No of HEF users | NA | 7,645 | 1,599 | 1,316 | 4,334 | 2,827 | 2,681 |
| Average hospitalization days | 5.3 | 4.2 | 3.7 | 3.8 | 5.3 | 4.1 | 3.6 |

Source:*1= Hospitals, others=HMIS 2020

The recent trends of inpatients (IP) and outpatients (OP) for the seven target hospitals are shown below. Overall, the number rose until 2019. The number in 2020 may have been affected by COVID-19.


**Figure 3-1: Trends of Outpatients and Inpatients in Target Hospitals (2015-2020)**

Source: HMIS

### 3-1-3 Assessment of Health Services at the Target Hospitals

(1) CPA3 Service Provision

| | SIEM REAP | BATTAM BANG | KOMPONG CHAM | KAMPOT | STUNG TRENG | PHNOM PENH | SVAY RIENG |
|---|---|---|---|---|---|---|---|
| # of beds | 370 | 390 | 280 | 155 | 120 | 150 | 168 |
| BOR | 95 | 85 | 99.6 | 88.9 | 75 | 47 | 100 |
| Patient flow | | | | | | | |
| Triage | | | | | | | |
| Central registration | | | | | | | |
| Emergency | | | | | | | |
| ICU | | | | | | | |
| General Medicine | | | | | | | |
| General Surgery | | | | | | | |
| Paediatrics | | | | | | | |
| Obstetrics and gynaecology | | | | | | | |

Note: Green means meeting the CPA3 standard fully, Orange means partially, and Gray means none.

**Figure 3-2: CPA3 Service Provision**

Source: Prepared by the JICA Survey Team with the hospitals' responses to the questionnaire

Figure 3-2 shows the service provision status according to the CPA3 guidelines. The status of patient flow, triage, and central registration was assessed through self-evaluation by each hospital according to the descriptions in the CPA3 guidelines. The status of emergency, ICU, general medicine, general surgery, pediatrics, and obstetrics and gynecology was assessed by detailed interviews about the number of cases for the diseases as exemplified in the guidelines and the necessity of referral to higher hospitals such as the national hospitals in Phnom Penh.

In terms of outpatient management such as patient flow, triage, and central registration, Siem Reap and Battambang Hospitals met the CPA3 standards for all three items, and Kampong Cham, Phnom Penh, and Svay Rieng Hospitals met two items. Kampot Hospital did not meet the CPA3 standards for triage and central registration, and Stung Treng Hospital did not meet any of the three items.

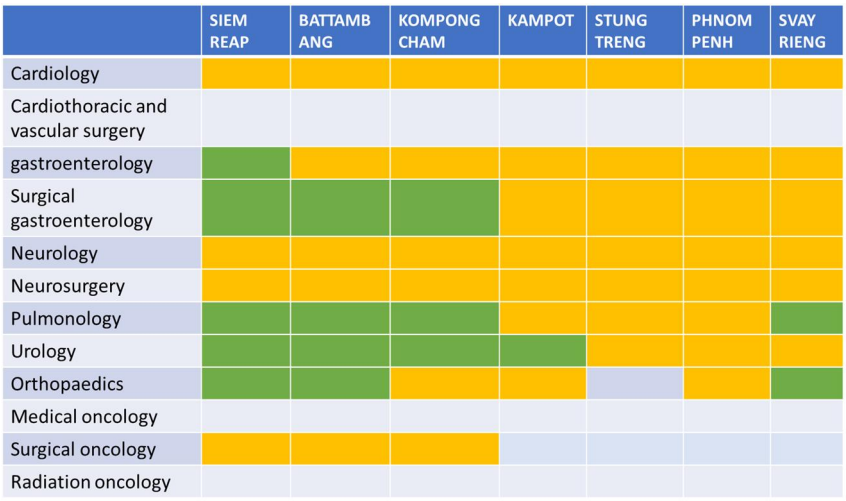
Regarding ICU and emergency, severe cases requiring advanced medical care such as myocardial infarction, stroke, severe head injury, and respiratory failure were referred to higher hospitals by all seven hospitals.

Regarding general medicine, Siem Reap, Battambang, and Kampong Cham Hospitals dealt with heart failure, hypertension, digestive ulcers, chronic kidney diseases, and communicable diseases, but at the remaining four hospitals, the treatment of heart failure, chronic kidney diseases, and severe infectious diseases, such as severe pneumonia was inadequate, and they were referred to higher hospitals.

As for general surgery, the hospitals operated on appendicitis, inguinal hernia, and conducted minor surgery, but it was not sufficient for severe cases such as peritonitis and emergency cases such as pelvic fracture or complicated trauma except for Siem Reap and Battambang Hospitals. In particular, Stung Treng Hospital was not able to deal with orthopedic diseases.

Similarly, in pediatrics and obstetrics and gynecology, overall, the services were inadequate for severe cases requiring respiratory and circulatory management.

(2) Advanced Medical Services Provision




Note: Green means providing a certain level of advanced services, Orange means partially, and Gray means none.

**Figure 3-3: Advanced Medical Service Provision**

Source: Prepared by the JICA Survey Team

The current status of medical care provided by advanced medical services is shown by the specialized clinical department (Figure 3-3). Since the seven target hospitals are not divided into these specialized clinical departments, the judgment was made based on the medical treatment situation of related departments such as internal medicine, surgery, ICU, and emergency.

As for cardiology, as mentioned above, the response to angina pectoris and myocardial infarction was partial, and acute treatment such as percutaneous coronary intervention (PCI) was not implemented. Cardiothoracic and vascular surgery for open heart surgery was not performed in any of the seven hospitals.

Regarding gastroenterology, except for Siem Reap Hospital, the readiness for emergency cases such as gastrointestinal bleeding was insufficient. In surgical gastroenterology, hospitals other than Siem Reap, Battambang, and Kampong Cham Hospitals did not adequately deal with severe cases such as peritonitis.

In neurology and neurosurgery, all seven hospitals were inadequate in dealing with severe cases, such as stroke and severe head injury. In pulmonology, hospitals other than Siem Reap,

Battambang, Kampong Cham, and Svay Rieng treated severe pneumonia and respiratory failure inadequately.

Similar to the above, severe cases and emergency cases were not treated sufficiently for orthopedic surgery and urological surgery.

Regarding cancer therapy, Siem Reap, Battambang, and Kampong Cham Hospitals could provide surgeries on some parts, but chemotherapy (medical oncology) and radiation therapy (radiation oncology) were not performed in any of the seven hospitals.

### 3-1-4 Hospital Management Structure

Target hospitals form hospital management committees as well as other types of committees in areas such as financing, user fees, and infection prevention control (IPC).

In terms of the user fee-setting, while the details vary from hospital to hospital, the process is generally as follows. The hospital committee on user fees studies the issues related to the fees and propose the fees to the PHD. Some provinces have the provincial health service user fee committee, comprised of PA officers as well as NGOs and community members, who review the proposed user fees. In the other provinces, the consultation with the community is done by the hospital committee before proposals are made to the PHD. Some provinces reported that final approval was required by the MOH, whereas others indicated that it was not required.

While the D&D policy has been implemented, it was reported that the D&D process is still underway, and it seems that certain influences of the MOH remain in some places such as setting user fees in the provincial hospitals. It was also reported in some provinces that the user fees are usually instructed to be set lower than the ones of the national hospitals.

### 3-1-5 NCD Services at Different Levels

Based on the interviews and questionnaires with the selected health facilities, service provisions related to NCDs at different levels are summarized below.

**Table 3-6: NCD-related Facilities and Services at Different Levels**

| Disease | Availability of Facility/Service |
|---|---|
| Cardiovascular disease (mainly ECG, Cardio-echo, Blood biochemical test, CT) | HC: no facility<br>DH: ECG available, insufficient blood biochemical test facility<br>PH: all available except one PH for cardio echo and two PHs for CT<br>Most the patients with heart failure are usually referred to the national hospitals |
| Hypertension | VHV: advocacy, health education, referral<br>HC: diagnosis, medication, referral of the patients without improvement to the hospitals<br>DH: diagnosis and treatment |
| Diabetes (including fasting blood glucose and HbA1c test) | VHV: advocacy, health education, referral. Some communities have a peer support group<br>HC: medication and monitoring/follow up. Some HCs provide fasting blood glucose tests, but no HbA1c |

| Disease | Availability of Facility/Service |
|---|---|
| | DH: diagnosis, medication, monitoring<br>PH: fasting blood glucose and HbA1c test available except for one PH |
| Complications such as retinopathy or kidney disorder | HC, DH: referral to the hospital<br>PH: 5 PHs responded to provide treatment for complications, however, hemodialysis is only available for Siem Reap hospital |
| Cancer | HC: screening for cervical cancer is conducted since 2020<br>DH: no services<br>PH: while some PHs conduct surgery, almost all cancer patients are referred to the national hospitals as no further treatment such as chemotherapy is available |

Note: PH: provincial hospital, DH: district hospital, HC: health center, VHV: village health volunteer
Source: Community, health center and district hospital in Kampong Cham, 7 target municipal and provincial hospitals

## 3-2 Infrastructure

### 3-2-1 Current Conditions of Hospital Facilities

The target hospitals are arranged with numerous facilities scattered throughout the premises, resulting in long lines of flow for patients and staff, as well as difficult outdoor movement. This situation is inefficient for providing medical services and complicates facility operations. With the modernization of medical services, decentrally located facilities have functional problems and are no longer able to operate efficiently. The detailed assessment of the current conditions and site plans of each hospital will be explained in the next chapter.

### 3-2-2 Building Standards

The latest standard for building regulations in Cambodia is stipulated in the Law on Construction 2019, but this standard and its related regulations mainly control land development and the construction industry, and do not specify design standards for facilities. In Cambodia, building specifications and quality are generally determined by the owner or donor, and applications for construction of facilities designed in accordance with the design standards of other countries, including Japan, have been approved.

In Cambodia, the construction boom continued through 2019, but construction work temporarily diminished in 2020 due to COVID-19. It is expected to recover after COVID-19 has abated. To date, construction costs have been increasing every year and are expected to continue to rise. Already, the cost of marine transportation has increased due to COVID-19, and rebar prices have risen to extreme levels.

## 3-3 Medical Equipment

### 3-3-1 Current Status of the Existing Equipment

While it is said to be difficult to maintain and sustainably acquire consumable supplies after equipment procurement, it was confirmed that the main equipment used in ophthalmology

services and laboratory testing[29] was well maintained in the studied hospitals.

In the background, it was confirmed that AusAID is providing continuous support for ophthalmology services in collaboration with other donor organizations and NGOs, and that the Cambodia Laboratory Information System (CamLIS),[30] which WHO is developing for public healthcare facilities (hospitals and HCs) in Cambodia in collaboration with the MOH, is contributing to proper management of laboratory equipment for laboratory testing.

CamLIS is a system for procuring laboratory equipment and centrally managing laboratory information. Laboratory information is submitted from each health care facility to the central database server, and it appears that a certain amount of budget is allocated for renewing and maintaining laboratory equipment in order to make effective use of the system. The number of national and public health care facilities that are members of CamLIS has increased from 35 in 2018 to 46 in 2019.

| | |
|---|---|
|  |  |
| Biochemistry Auto Analyzer at Siem Reap Provincial Hospital | PCR Machine used for TB testing (GeneExpert) at Stung Treng Provincial Hospital |
|  |  |
| (Photo in foreground) Slit lamp essential for anterior segment diagnosis at Kampot Provincial Hospital | Surgical microscope used in ophthalmology at Phnom Penh Municipal Hospital |

[29] Biochemical tests (analysis of hepatobiliary and pancreatic functions, kidney, electrolytes, lipids, proteins, etc.) and blood tests (analysis of red blood cells, white blood cells, platelets, PLT, etc.) are performed in all hospitals. Serum (antibody) tests (for inflammation, autoantibodies, infectious diseases, blood types, blood transfusions, etc.), microbiology (for bacteria, viruses, etc.), and genetic testing using nucleic acid amplification (for coronavirus, tuberculosis, etc.) are also performed in many, but not all hospitals.

[30] https://www.who.int/cambodia/news/detail/11-02-2019-cambodia-laboratory-information-system-(camlis)-a-national-web-based-laboratory-information-system-to-enhance-public-health-in-cambodia

### 3-3-2 Service Departments with Inadequate Equipment

The following equipment is necessary for each department, but it has not yet been introduced. Hospital officials explained that the reasons were due to difficulties with the budget allocation and oversight when submitting applications to purchase equipment for the next fiscal year:

1) Equipment used in ICUs and recovery rooms (ventilator,[31] infusion pump, etc.);
2) Equipment used for rehabilitation (equipment for occupational therapy, physical therapy, etc.);
3) Equipment used in operating theatres (e.g., electrocautery, various type of rigid scopes, laparoscopes, etc.); and
4) Equipment used in the physiological function testing department (electrocardiographs, electroencephalographs, pulmonary function testing machine, etc.), and endoscopes used in tests for gastrointestinal diseases.

| | |
|---|---|
|  |  |
| Video fiberscopes at<br>Siem Reap Provincial Hospital | Electrocardiograph at<br>Kampong Cham Provincial Hospital |

### 3-3-3 Support for Provision of Medical Equipment by Japan

All seven hospitals received the medical equipment through the support of Japan. Four hospitals, namely Kampong Cham, Battambang, Svay Rieng, and Siem Reap Hospitals procured the equipment through hospital construction projects. As of March 2022, Siem Reap Hospital was in the process of installing piles to strengthen the soft ground.

The status of existing equipment, such as the name of the manufacturer and model number, the year of installation, as well as the operating status, can be checked using the medical equipment inventory system introduced in the previous technical cooperation projects: Medical Equipment Maintenance and Management System Dissemination Project (known as MEDEM-1) (2006-2008) and Strengthening Medical Equipment Management in Referral Hospitals Project (known as MEDEM-2) (2009-2014).

[31] This equipment was procured for treating the infected patients with COVID-19.

**Table 3-7: Outline of Japan's Support for Provision of Medical Equipment**

| | Hospital | Outline | Period |
|---|---|---|---|
| 1 | Phnom Penh Municipal | Provision of X-ray machine, ultrasound, vital sign monitor, etc. | G/A: March 2012 |
| 2 | Battambang Provincial | 1) Provision of X-ray machine, ultrasound, vital sign monitor, etc.<br>2) Construction of central diagnostic & treatment building, and provision of the related medical equipment | G/A: March 2012<br>G/A: March 2017 |
| 3 | Siem Reap Provincial | 1) Provision of X-ray machine, ultrasound, vital sign monitor, etc.<br>2) Construction of central diagnostic & treatment building & operating theatre building, and provision of the related medical equipment<br>3) Provision of dialysis machines by Japan's Rotary Clubs [32] | G/A: March 2012<br>G/A: October 2020<br><br>From 2013～ |
| 4 | Stung Treng Provincial | Provision of X-ray machine, ultrasound, vital sign monitor, etc. | G/A: March 2012 |
| 5 | Kampong Cham Provincial | 1) Construction of training building by the Embassy of Japan in Cambodia through the grass-roots project<br>2) Construction of surgical and obstetrics & gynecology building, and provision of the related medical equipment | Implemented in 2014<br><br>E/N: May 2008 |
| 6 | Kampot Provincial | Provision of X-ray machine, ultrasound, vital sign monitor, etc. | G/A: March 2012 |
| 7 | Svay Rieng Provincial | 1) Provision of X-ray machine, ultrasound, vital sign monitor, film processor, etc.<br>2) Construction of emergency, obstetrics & gynecology buildings, and provision of the related medical equipment | G/A: March 2012<br>G/A: March 2015 |

Source: Based on the interviews with the respective hospitals, and web information collected by the JICA survey team

### 3-3-4 Maintenance of Medical Equipment

(1) Status of Medical Equipment Maintenance

It was difficult to maintain quality control and respond to repairs on some medical equipment. Malfunctioning occurred due to the inadequate capacity of the equipment maintenance technicians and the lack of maintenance budget. The issues involved the following equipment:

1) Equipment used in operating rooms (anesthesia machines, vaporizers of anesthesia machine, electrosurgical units)
2) Equipment used in the ICU (vital sign monitors, infusion pumps, ventilators, X-ray machines, ultrasounds, etc.)
3) Equipment used for laboratory testing, etc.

In addition, the field survey found that the heaters of sterilizers had deteriorated due to a lack of consideration of water quality measures (hard water to soft water).

[32] In 2013, the Rotary Club of Takatsuki Higashi supported provision of dialysis machines (Nipro brand). The Rotary Club of Sukagawa, Fukushima Prefecture, and the Osaka Urban Rotary Club are also providing support in this area.

| | |
|---|---|
|  |  |
| Mobile X-ray machine under repair at Siem Reap Provincial Hospital | Vital sign monitors under repair at Kampot Provincial Hospital |

(2) Challenges of Medical Equipment Maintenance

The Cambodian government has been improving medical equipment maintenance in referral hospitals through the implementation of MEDEM-1 and MEDEM-2 Projects.[33]

Some referral hospitals have continued to submit quarterly equipment management monitoring sheets to the MOH even after the completion of the above-mentioned projects.

However, some hospitals have faced difficulty recruiting new maintenance technicians as the people retire, and they have also experienced difficulty in raising funds for repairs.

There are some general X-ray machines that have been left unattended for as long as three months due to the inability to promptly allocate funds for repairs, which can exceed US$3,000 (e.g., improper insertion of the bucky table cassette at Kampong Cham Provincial Hospital and failed X-ray collimator iris control at Phnom Penh Municipality Hospital).

In Battambang, the Korea Foundation for International Healthcare (KOFIH) supported the construction of a medical equipment workshop building and conducted capacity development training for maintenance technicians from 2016 to 2019. The hospital seemed to be the most well-equipped among the seven target hospitals visited in terms of equipment maintenance and management.

(3) Status of Medical Equipment Vendors in Phnom Penh

Major equipment manufacturers such as GE Healthcare and Siemens have established local subsidiaries in Phnom Penh to develop their equipment sales businesses. Many other equipment manufacturers use Cambodian companies as their agents for equipment sales and after-sales services. Local subsidiaries of GE Healthcare and Siemens also work in partnership and collaboration with Cambodian companies to handle equipment sales and after-sales services.

[33] Project on Promotion of Medical Equipment Management System : MEDEM-1 (2006-2008), Project for Strengthening Medical Equipment Management in Referral Hospitals：MEDEM-2 (2009-2014)

Interviews with two representative private hospitals in Phnom Penh explained that equipment purchases are skewed because only a few vendors have the technical capacity to provide adequate after-sales services.

Sunrise Hospital, which was established and opened in 2016 and is managed by three Japanese companies, also installed MRIs, CT scans, and angiography. This equipment is expensive, and it is difficult to secure the necessary quality control and routine maintenance. Therefore, they use GE Healthcare products.

The table below shows the equipment agents and vendors interviewed in this survey regarding their equipment sales and the structure of the after-sales services. Although many agents are engaged in the sales of Japanese manufacturers' products, it appears that improving the skills of the technicians responsible for after-sales services is a major issue. Among them, No. 1, 2, 4, 5 and 6 companies (in bold) are considered to have a certain level of after-sales service capacity.[34]

**Table 3-8: Equipment Agents and Vendors Interviewed**

| No | Companies in Cambodia | Information on dealings of medical equipment |
|---|---|---|
| **1** | **Dynamic Pharma** | **Handling all types of medical equipment, manufacturers located in Switzerland, Germany, USA, Japan (Cannon Medical, Olympus, Terumo, etc.), largest in number of staff (including administrative and technical)** |
| **2** | **DKSH Ltd.** | **Handling all types of medical equipment, manufacturers located in USA (Equipment for surgical operations), Germany (laboratory testing), UK (Vital singe monitors), Spain (Sterilizers), and Japan (Horiba/laboratory testing), etc.** |
| 3 | Nipon Corporation | Handling of Japanese manufacturers' products (Canon Medical, Nihon Kohden, Toitu, Shinei, Yoshida, Tomy, Kubota, Takeuchi, Yamada, OG Giken, etc.) |
| **4** | **Kuang Hsien Medical Instrument Co., Ltd.** | **Handling laboratory testing, manufacturers located in Germany, USA, Taiwan, and Japan/Sysmex, etc.)** |
| **5** | **SCI Company Ltd.** | **Handling of the equipment of GE Healthcare** |
| **6** | **MEES** | **Handling of all types of equipment, manufacturers located in the USA, China, Germany and Japan/Fuji film, etc.)** |
| 7 | MET Group | Handling of all types of equipment, manufacturers located in Korea, Taiwan, China, Japan/Shimadzu and Nihon Kohden, etc.) |
| 8 | Cambodia Scientific Co., Ltd. | Handling of all types of equipment, manufacturers located in USA, China, UK, Japan/Pentax, Shimadzu, etc.) |
| 9 | MEDICOM Co., Ltd. | Handling of all types of equipment manufacturers located in France (Operating table, operating light), UK (Vital sign monitors, anesthesia machines, etc.) |
| 10 | KIMTECH Co., Ltd. | Handling of all types of equipment, manufacturers located in Korea (Ultrasound), China (Operating table), Hungary (Electrosurgical unit), France and Italy (Laboratory testing), Japan (Fukuda ME/monitors, Obayashi/X-ray machines), etc. |
| 11 | Mongkulborey Import & Export Co., Ltd. | Handling of laboratory equipment, manufacturers located in Spain, China, etc. |

Source: Prepared by the JICA survey team with the information from the respective companies in Phnom Penh

[34] Determined by the number of technicians, the nature and number of skills training and courses they have experienced, and the availability of equipment such as simulators and testers used to quality control of medical equipment at the workshop.

### 3-3-5 Collaboration with the Private Sector in Equipment Operation and Maintenance

Because of the high maintenance costs of CT, four of the seven studied hospitals provide diagnostic services in partnership (Public Private Partnership: PPP) with medical equipment dealers and other private companies. The hospital provides space for the equipment, and the supplier is responsible for maintenance. The hospital and the equipment supplier share the income from patients (medical consultation fees). The proportion of income from patients is approximately 60% to the equipment supplier, 20% to the hospital, and the remaining 20% to the medical staff as allowances.

For example, in Battambang, SCI Company Ltd. Has provided the equipment. The provincial hospital arranged the space/room for the CT equipment, radiographer, and utility expenses, such as electricity, water, etc. However, SCI Company Ltd. was responsible for the supply and equipment maintenance. When their contractual period expired, a private hospital in Battambang took over the ownership of the equipment from SCI Company Ltd. Diagnostic fees for CTs are set from US$90 to US$100 per scan for general imaging and from US$140 to US$160 per scan for contrast imaging at all of the hospitals.

The public hospitals that have installed CTs under the regular contract with SCI Company Ltd. Are Kosamak National Hospital, Khmer Soviet Friendship National Hospital, Svay Rieng Provincial Hospital, and Takeo Provincial Hospital.

In terms of the available services in the private facilities particularly with the advance medical equipment, it was reported that large hospitals in Phnom Penh such as Sunrise Japan Hospital Phnom Penh, Royal Phnom Penh Hospital, Singapore Medical Center Cambodia, and Cho Ray Phnom Penh Hospital own an MRI. While the survey team could not study the entire private facilities, it was assumed that the availability of advanced medical equipment such as MRI is quite limited in private facilities outside Phnom Penh.

## 3-4 Human Resources

### 3-4-1 Status of Human Resources for Health at the National Level

(1) Recruitment and Deployment

In order to meet the Cambodian population's health needs, the HSP3 has aimed to secure two health workers (doctors, nurses and midwives) per 1,000 people by 2020.[35] Figure 3-4 shows changes in the number of newly recruited government health workers between 2016 and 2019. Although there are slight fluctuations, it can be seen that the number of new recruitments has been increasing overall.[36]

[35] Department of Planning and Health Information, MOH, 2016. *The Third Health Strategic Plan 2016-2020 (HSP3)*.
[36] In 2020 and 2021, there were no new recruitments due to the novel corona virus (COVID-19) pandemic. (DP)

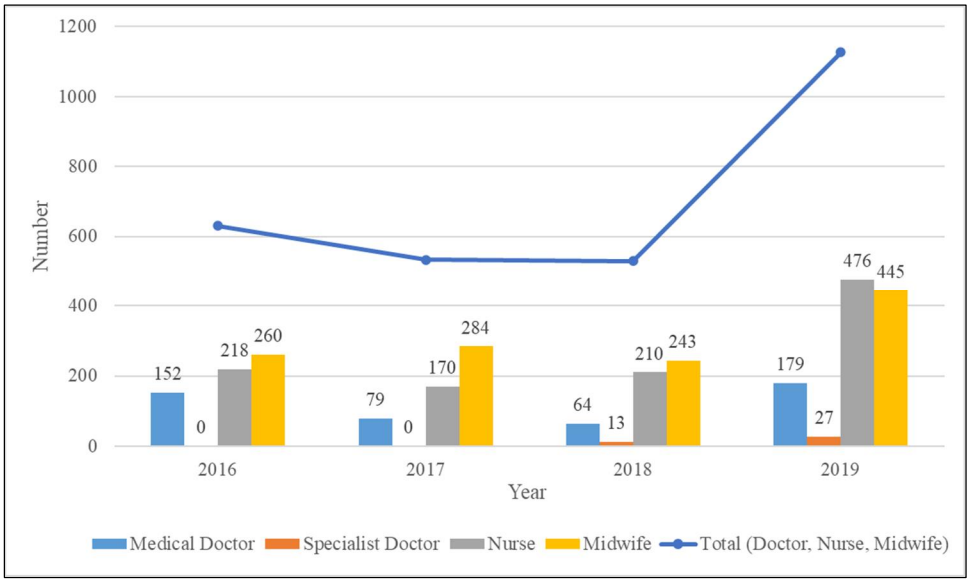



**Figure 3-4: Transition in the Number of Newly Recruited Government Health Workers**

Source: Prepared by the JICA survey team based on AHWR 2020[37] and information from DP (on Specialist Doctors)

However, there is still a shortage in the absolute number of health workers at the national level. Table 3-9 shows the status of government health workers as of January 2022, and it shows that the number per 1,000 people is only 1.60. In addition, while a relatively large number of nurses and midwives are deployed in provincial areas, 75% of specialists are concentrated in central health facilities including national hospitals.

**Table 3-9: Number of Government Health Workers per 1,000 People**

| Qualification | | Central | | Province | | Total No. | No. of Health Workers (per 1,000 people) |
|---|---|---|---|---|---|---|---|
| | | Number | % | Number | % | | |
| **Doctor** | Specialist Doctor | 637 | 75% | 207 | 25% | 4,522 | 0.29 |
| | Medical Doctor | 877 | 28% | 2,202 | 72% | | |
| | Medical Assistant | 185 | 31% | 414 | 69% | | |
| **Nurse** | Bachelor Nurse | 123 | 28% | 321 | 72% | 12,309 | 0.79 |
| | Associate Nurse | 2,410 | 26% | 6,784 | 74% | | |
| | Primary Nurse | 43 | 2% | 2,628 | 98% | | |
| **Midwife** | Bachelor Midwife | 32 | 7% | 426 | 93% | 8,011 | 0.52 |
| | Associate Midwife | 389 | 7% | 5,037 | 93% | | |
| | Primary Midwife | 9 | 0% | 2,118 | 100% | | |
| **Total Health Workers** | | **4,705** | **19%** | **20,137** | **81%** | **24,842** | **1.60** |

Source: Prepared by the JICA survey team based on Census in 2019[38] and information from the Department of Personnel

[37] Technical Working Group for HRH Planning, 2021. *Annual Health Workforce Report (AHWR) 2020*. pp.1-58.
[38] National Institute of Statistics-Ministry of Planning, 2020. *General Population Census of the Kingdom of Cambodia 2019*. p.147.

Table 3-10 shows the number of specialist doctors in the country by specialty. [39] While a certain number of traumatology and gastrointestinal surgeons are deployed in the provincial areas, most of the specialists are concentrated in the central area for other specialties. It should be noted that these data are for civil servants only and do not include non-civil servants working in private facilities. HRH information at private facilities was not available at the offices/institutions contacted in this survey.

**Table 3-10: Number of Specialist Doctors by Specialty**

| | Area of Specialty | Central | Province | Total |
|---|---|---|---|---|
| Surgical | Respiratory System | 1 | 0 | 1 |
| | Nephrology | 6 | 1 | 7 |
| | Urology | 11 | 2 | 13 |
| | Neurology | 10 | 0 | 10 |
| | Abdomen and Thoracic | 16 | 0 | 16 |
| | Gastrointestinal | 10 | 6 | 16 |
| | Traumatology | 9 | 10 | 19 |
| | General Surgery | 10 | 19 | 29 |
| | Other specialties (Surgical) | 10 | 4 | 14 |
| **a) Total (Surgical)** | | **83** | **42** | **125** |
| Internal | Neurology | 9 | 1 | 10 |
| | Neurology (brain) | 1 | 0 | 1 |
| | Pulmonology | 15 | 7 | 22 |
| | Anesthesiology | 77 | 14 | 91 |
| | Hepato-gastroenterology | 11 | 1 | 12 |
| | Oncology | 13 | 1 | 14 |
| | Cardiology | 27 | 4 | 31 |
| | Endocrinology | 9 | 3 | 12 |
| | Radiology | 46 | 8 | 54 |
| | General medicine | 91 | 23 | 114 |
| | Others specialties (Internal) | 255 | 103 | 358 |
| **b) Total (Internal)** | | **554** | **165** | **719** |
| **Specialist Doctors total (a+b)** | | **637** | **207** | **844** |

Source: Prepared by the JICA survey team based on information from DP

(2) Pre-service Education

The latest data obtained on the status of pre-service education for HRH by profession in the country was for the 2016-2017 academic year (AY) (Table 3-11). Apparently, a number of HRH are trained not only in public but also at private health education institutions in areas such as medicine, nursing, and midwifery. As for the fields of kinesthesia and radiology, which were all trained at UHS, the numbers of intakes and graduates are limited for this year. However, the numbers of intakes have increased since then, and 29 and 25 graduates are expected to complete, respectively, in AY2022-2023 according to the UHS Strategic Plan 2019-2023.[40] In addition, the associate degree program in medical bio-engineering was opened in 2019, and eight students will enroll each year, of whom six are expected to graduate after three years.

[39] "Other specialties (Surgical)" includes oral and maxillofacial, plastic surgery, pediatric, aesthetic and inflammation, and "Other specialties (Internal)" includes pediatric, ophthalmology, dermatology, bomedicine, obstetrician-gynecology, psychiatry, otolaryngology, tropical medicine and mental health.

[40] University of Health Sciences, 2020. *University of Health Sciences Strategic Plan 2019-2023*. pp.1-106.

**Table 3-11: Status of Pre-service Education for HRH by Profession (AY2016-2017)**

| Degree | Level | Intake | | | Graduate | | |
|---|---|---|---|---|---|---|---|
| | | Public | Private | Total | Public | Private | Total |
| Medicine | Bachelor | 391 | 344 | 735 | 419 | 486 | 905 |
| Nursing | Bachelor | 381 | 248 | 629 | 43 | 141 | 184 |
| | Associate | 1114 | 367 | 1481 | 864 | 2000 | 2864 |
| Midwifery | Bachelor | 134 | 94 | 228 | 13 | 59 | 72 |
| | Associate | 1079 | 115 | 1194 | 909 | 1343 | 2252 |
| Pharmacy | Bachelor | 198 | 271 | 469 | 172 | 74 | 246 |
| Laboratory | Bachelor | 0 | 0 | 0 | 0 | 96 | 96 |
| | Associate | 146 | 68 | 214 | 157 | 548 | 705 |
| Kinesthesia (Physiotherapy) | Associate | 22 | 0 | 22 | 11 | 0 | 11 |
| Radiology | Associate | 6 | 0 | 6 | 14 | 0 | 14 |
| Others (Dentistry, Public Health, etc.) | | 315 | 169 | 484 | 217 | 175 | 392 |
| Total | | 3786 | 1676 | 5462 | 2819 | 4922 | 7741 |

Source: Prepared by the JICA survey team based on AHWR 2020

In addition, as mentioned earlier, pre-service education for specialist doctors is provided at UHS and International University only, and most doctors are trained at the former.[41] The status of pre-service education for specialist doctors for each specialty is shown in Table 3-12.[42]

[41] Information from DHRD

[42] "Other specialties" include Ear-Nose-Throat, Psychiatry, Pediatric Surgery, Plastic and Reconstructive Surgery, Dermatology, Gyneco-Obstetrics, Internal Medicine, Ophthalmology and Pediatrics.

**Table 3-12: Status and plan of Pre-service Education for Specialist Doctors by Specialty**

| No. | Specialized Doctor Program | Intake | | | | Graduate | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2017 \| 2018 | 2018 \| 2019 | 2019 \| 2020 | (4 yrs) 2020-2024 | 2017 \| 2018 | 2018 \| 2019 | 2019 \| 2020 | (3 yrs) 2020-2023 |
| 1 | Pathology | N/A | N/A | 6 | 24 | 9 | N/A | - | 4 |
| 2 | Anesthesiology, Intensive Care and Emergency Medicine | 10 | 2 | 11 | 44 | 5 | 19 | 32 | 25 |
| 3 | Oncology | 5 | 5 | 6 | 24 | 5 | 5 | 7 | 11 |
| 4 | Cardiology | 8 | 5 | 15 | 60 | 6 | 14 | 8 | 22 |
| 5 | Orthopedic and Traumatologic Surgery | 7 | 8 | 10 | 40 | 5 | 11 | 9 | 19 |
| 6 | General and Digestive Surgery | 10 | 2 | 10 | 40 | 4 | 13 | 10 | 20 |
| 7 | Diabetology-Endocrinology and Metabolic Diseases | 6 | 3 | 7 | 28 | 7 | 3 | 9 | 15 |
| 8 | Hapato-Gastroenterology | 5 | 7 | 5 | 20 | 3 | 10 | 5 | 12 |
| 9 | Radiology and Medical Imaging | 10 | 8 | 16 | 64 | 9 | 12 | 23 | 25 |
| 10 | Neuro-Surgery | 5 | N/A | 7 | 28 | 3 | 6 | 5 | 9 |
| 11 | Pneumology | 8 | 8 | 10 | 40 | 7 | 3 | 5 | 19 |
| 12 | Uro-Surgery | 5 | 5 | 10 | 40 | 2 | 9 | 8 | 15 |
| 13-21 | Other specialties | 75 | 61 | 83 | 332 | 113 | 126 | 92 | 167 |
| Total | | 154 | 114 | 196 | 784 | 178 | 231 | 213 | 363 |

*N/A indicates 'no data available'. Also, the numbers in red are the projections according to the UHS Strategic Plan.
Source: Prepared by the JICA survey team based on information from UHS and UHS Strategic Plan (2020)

While programs in various specialties are offered, with a total of 21 disciplines, most courses accept no more than 10 students annually. It was pointed out that the limited number of clinical practice sites is one of the main challenges in increasing the number of intakes since students in these specialized programs spend most of their time in hospitals for clinical trainings.[43,44] Currently, the UHS University Hospital project is underway in support of South Korea, but the progress has been delayed, and at the time of this survey, construction had not yet started.[45]

(3) In-service Education

As a national system for in-service education, continuing professional development (CPD) programs are organized by health professional councils (HPCs). HPCs are established for five

[43] Information from DHRD and UHS
[44] To be a clinical practice site, the following three conditions must be met: 1. There are patients in the field of the students' specialization, 2. There are facilities and equipment that are appropriate and sufficient for students' training and 3. Preceptors at the clinical practice site are well qualified and skilled to train students.
[45] Information from UHS

professional areas (i.e., medicine, nursing, midwifery, dentistry, and pharmacy), and it is mandatory for each health professional in the country to be registered with a relevant HPC. In addition, licenses to practice are issued and managed by HPCs as well. For a renewal of the license, obtaining a certain number of CPD points by participating in the CPD programs is required. The actual trainings are planned and implemented by CPD training providers, which have been approved by HPCs.

For example, the Medical Council of Cambodia (MCC) requires 60 CPD points over three years (at least 15 points per year) to renew a license.[46] There are various formats of the programs, including workshops, skill trainings, and group discussions on cases, and the CPD points allocated to each program are evaluated and determined by MCC. In addition to entities such as public and private health education institutions as well as national hospitals, medical professional associations/societies are also authorized by MCC as CPD training providers.[47] Furthermore, even the organizations (e.g. private companies) that are not recognized as CPD training providers may be permitted to provide CPD programs if they collaborate with those approved by MCC.[48]

Thus, opportunities are provided to improve knowledge and skills through in-service education in the CPD programs. However, trainings for medical doctors and specialist doctors are highly specialized, and depending on the content/specialties, there are challenges in the preparation and provision of training courses.[49]

(4) Salary and Incentives

Salaries from the government for civil servants consist of a basic salary and functional allowance. The former is classified into three categories according to the level of qualifications, and the amount is determined based on the ranks and classes within each category (Table 3-13). In addition, an individual's rank and class are reviewed regularly considering factors such as one's performance and the length of service, and there is a possibility of an increase in the amount. However, the amount for the latter is fixed for each profession and does not change unless the rates are revised. Table 3-14 shows the amounts of functional allowance for doctors, nurses and midwives.

[46] Medical Council of Cambodia, 2020. *Guidelines for Continuing Professional Development For Medical Practitioners*. pp.1-14.

[47] In Cambodia, there are associations/ societies for various specialties, including cardiology, dermatology, gastroenterology, neurology (internal/surgical) and orthopedics, and they are utilized for networking and capacity building for health professionals. (Cambodian Society of Medicine) For example, according to Cambodian Society of Orthopedics and Traumatology, the society not only conducts skill trainings and case sharing in the annual workshops but also provides trainings on procedures of orthopedic surgeries and highly specialized knowledge.

[48] Information from MCC

[49] Information from DHRD

**Table 3-13: Amount of Basic Salary by Category**

| Category | Degree Level | Basic Salary (monthly) | |
|---|---|---|---|
| | | Lowest class | Highest class |
| A | Bachelor or above | 862,500KHR (212USD) | 1,375,000KHR (340USD) |
| B | Associate | 750,000KHR (185USD) | 1,175,000KHR (290USD) |
| C | Other degrees or certifications (minimum level of general or technical knowledge training) | 662,500KHR (163USD) | 975,000KHR (240USD) |

Source: Prepared by the JICA survey team based on the information from DP[50]

**Table 3-14: Amount of Functional Allowance for Doctors, Nurses and Midwives**

| Profession | Functional Allowance (monthly) |
|---|---|
| Specialist Doctor | 730,000KHR (180USD) |
| Medical Doctor | 680,000KHR (168USD) |
| Bachelor Nurse/ Bachelor Midwife | 630,000KHR (155USD) |
| Associate Nurse/ Associate Midwife | 620,000KHR (153USD) |

Source: Prepared by the JICA survey team based on the information from DP[51]

In addition, to encourage civil servants to work in difficult/remote areas, the following incentives are provided as regional allowances (Table 3-15). The relevant areas are defined based on factors such as transportation and accessibility. [52]

**Table 3-15: Types and Amounts of Regional Allowances**

| Type of Allowance | | Amount (monthly) |
|---|---|---|
| Difficult Areas | | 80,000KHR (20USD) |
| Remote Areas | Type 1 | 100,000KHR (25USD) |
| | Type 2 | 120,000KHR (30USD) |

Source: Prepared by the JICA survey team based on the information from DP[53]

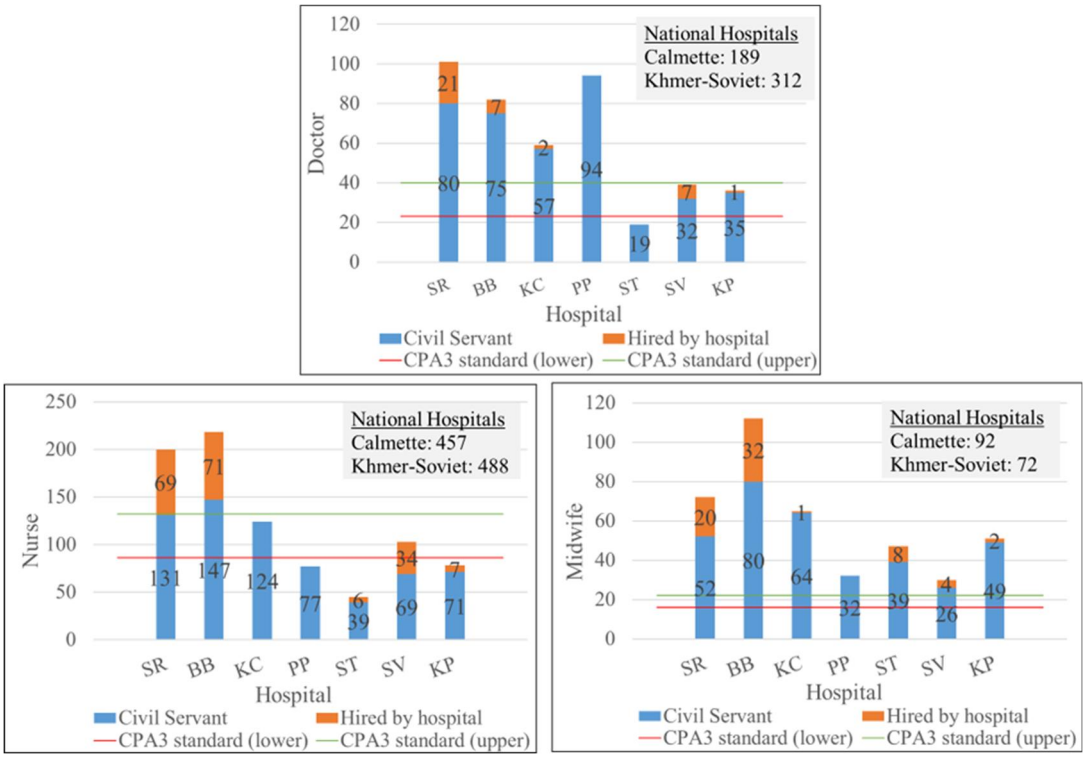
The levels of basic salary and functional allowance have been continuously improved. However, it is still not sufficient to meet the cost of living, and further improvement is needed along with allowances to promote working in provincial/rural areas. [54]

[50] Royal degree on organizing the public servants' positions (2014)
[51] Sub-degree on correction and increase of civil servants' benefits (2020)
[52] With the development of the transportation network in recent years, the relevant areas are reviewed annually. (DP)
[53] Sub-degree on regional allowance for civil servants in education and health sector (2015)
[54] Technical Working Group for HRH Planning, 2021. *Annual Health Workforce Report (AHWR) 2020*. pp.1-58.

### 3-4-2 Status of Human Resources for Health at the Target Hospitals

(1) Deployment

Compared with the standards set for the CPA3 hospitals, the current status of doctors, nurses, and midwives in each target hospital is shown in Figure 3-5[55] As for doctors, the standard number (23-40) is met at all the target hospitals but Stung Treng Provincial Hospital. Regarding nurses, the standard number (86-132) is met except at Phnom Penh Municipal Hospital, Stung Treng Provincial Hospital, and Kampot Provincial Hospital. For Svay Rieng Provincial Hospital, the standard is achieved with the recruitment of personnel by the hospital. The standard number for midwives (16-22) is achieved at all target hospitals.




*SR: Siem Reap, BB: Battambang, KC: Kampong Cham, PP: Phnom Penh, ST: Stung Treng, SV: Svay Rieng, KP: Kampot

*Data for National Hospitals are only for civil servants

**Figure 3-5: Status of Doctors, Nurses, and Midwives in Each Target Hospital with CPA3 Standards**

Source: Prepared by the JICA survey team based on questionnaire results and information from DP (on national hospitals)

In addition, it has been reported by the hospitals that, even if the standard numbers are met, additional doctors (especially specialists) and nurses are required for some hospitals to fulfill the

[55] Levels of health services to be delivered at public referral hospitals are classified into CPA 1 (lowest) to CPA 3 (highest), and the standard numbers of personnel are also defined for each level. The target hospitals in this survey are all CPA 3. (Ministry of Health, 2014. *Guidelines on Complementary Package of Activities for Referral Hospital Development*. pp.1-126.)

needs of patients as provincial/municipal hospitals. Particularly, Kampot Provincial Hospital and Stung Treng Provincial Hospital reported the needs for more than twice as many nurses as the current numbers.[56] In addition, many hospitals have reported a shortage of medical equipment engineers, and the current status at each hospital compared to the CPA standard number (5-7) is as shown in Table 3-16. At Kampong Cham Provincial Hospital, for example, medical equipment engineers are not present. Therefore, when medical equipment is broken, they request private companies to repair the equipment. This incurs a large cost as well as time.[57]

**Table 3-16: Status of Medical Equipment Engineers at each Target Hospital**

| | With relevant qualification | Without relevant qualification | Total |
|---|---|---|---|
| Siem Reap Provincial Hospital | 1 | 0 | 1 |
| Battambang Provincial Hospital | 0 | 0 | 0 |
| Kampong Cham Provincial Hospital | 0 | 0 | 0 |
| Phnom Penh Municipal Hospital | 0 | 2 | 2 |
| Stung Treng Provincial Hospital | 0 | 1 | 1 |
| Svay Rieng Provincial Hospital | 0 | 1<br>*hired by the hospital | 1 |
| Kampot Provincial Hospital | (Electronic Engineer) 1 | 0 | 1 |

Source: Prepared by the JICA survey team based on questionnaire results

In addition, the status of specialist doctors at each target hospital is shown in Table 3-17.[58] As mentioned above, there is a shortage of specialists in each target provincial/municipal hospital, and the gap in the status compared to national hospitals can be seen. In particular, the number of specialist doctors are limited at Stung Treng Provincial Hospital, Svay Rieng Provincial Hospital and Kampot Provincial Hospital, with a total of five or fewer. When it comes to the distribution of specialties, specialists in oncology and neurology, for example, are concentrated in national hospitals.

[56] Based on questionnaire results
[57] Information from Kampong Cham Provincial Hospital
[58] "Other specialties (surgical)" includes oral and maxillofacial, plastic surgeon, pediatric and aesthetic and inflammation, and "Other specialties (internal)" includes pediatric, ophthalmology, dermatology, biomedicine, obstetrician-gynecology, psychiatry, otolaryngology, mental health, infectious diseases, and nephrology.

**Table 3-17: Status of Specialist Doctors at Each Target Hospital**

| | Area of Specialty | CM | KS | SR | BB | KC | PP | ST | SV | KP |
|---|---|---|---|---|---|---|---|---|---|---|
| Surgical | Respiratory System | 1 | | | | | | | | |
| | Nephrologist | | 6 | | | | | | | |
| | Urology | 3 | | 2(2) | 2 | | 1 | | | |
| | Neurology | 3 | 6 | 1 | | 1 | | | | |
| | Abdomen and Thoracic | | 9 | 3(1) | | | | | | |
| | Gastrointestinal | 2 | 8 | | 3 | | 1 | | | |
| | Traumatology | 5 | | 3(1) | 3 | 1 | | | | |
| | General Surgery | | 5 | | 3 | 1 | | | | 1 |
| | Other Specialties (Surgical) | 3 | 4 | | 3 | | | | | |
| **a) Total (Surgical)** | | **17** | **38** | **9(4)** | **14** | **3** | **2** | **0** | **0** | **1** |
| Internal | Neurology | 5 | 2 | | | | | | | |
| | Pulmonology | | 7 | 2 | | | 2 | | | |
| | Anesthesiology | 29 | 23 | 4(2) | | 2 | 3 | | | 1 |
| | Hepato-gastroenterology | 7 | | 1(1) | | | | | | 1 |
| | Oncology | 8 | 4 | | | | | | | |
| | Cardiology | 17 | | 2(1) | 1 | | | | | |
| | Endocrinology | 6 | | | | | | | | |
| | Radiology | 12 | 8 | 2 | 1 | | | | | |
| | General Medicine | 12 | 57 | | | 1 | | | 1 | |
| | Other specialties (Internal) | 30 | 43 | 14(4) | 5 | 8 | 18 | | 2(1) | 2 |
| **b) Total (Internal)** | | **126** | **144** | **25(8)** | **7** | **11** | **23** | **0** | **3(1)** | **4** |
| **Specialist Doctors total（a+b）** | | **143** | **182** | **34(12)** | **21** | **14** | **25** | **0** | **3(1)** | **5** |

*Blank parts mean '0'. Also, the numbers in brackets indicate the personnel recruited by the hospitals included in the total.
*Data for national hospitals are only for civil servants
*CM: Calmette Hospital, KS: Khmer-Soviet Friendship Hospital, SR: Siem Reap, BB: Battambang, KC: Kampong Cham, PP: Phnom Penh, ST: Stung Treng, SV: Svay Rieng, KP: Kampot
Source: Prepared by the JICA survey team based on questionnaire results and information from DP (on national hospitals)

The system of recruitment and deployment of HRH is as explained earlier, but in most cases, the actual number of deployments is smaller than the one requested by provinces.[59] In addition to the shortage in the absolute numbers of specialist doctors and medical equipment engineers in the country, the lack of applicants for recruitment posts in provinces was pointed to as another challenge. Although reasons for choosing one's workplace vary, some of them obtained from interviews were as follows (BOX 3-1).

[59] Information from Kampong Cham PHD, Siem Reap PHD and Svay Rieng PHD

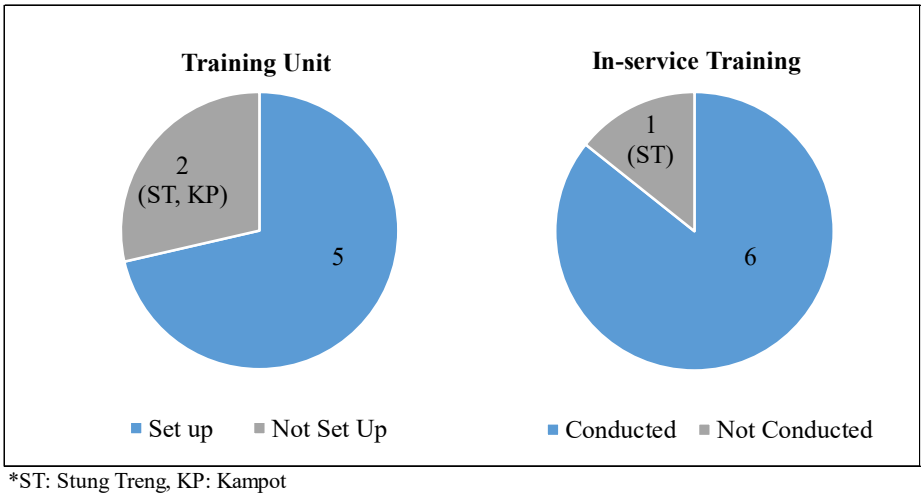
**BOX 3-1: Reasons for Choosing One's Workplace**

- As it is my hometown, I can spend time with my family
  .....(Specialist doctors at Calmette Hospital and Kampong Cham Provincial Hospital)
- There are facilities/ equipment and co-workers that I can improve my skills with.
  .....(Specialist doctors at Calmette Hospital and Kampong Cham Provincial Hospital)
- For my private life, it is more enjoyable to live in a city
  .....(Specialist doctor at Calmette Hospital)
- Good relationship with preceptors was established during clinical trainings in school years
  ..... (Specialist doctors at Kampong Cham Provincial Hospital)

In addition, even if specialist doctors are deployed to a provincial hospital as requested, there are cases in which they leave the hospital due to insufficient facilities and equipment with which to improve their skills.[60] Given such a shortage of human resources, some hospitals hire personnel by using their budget allocations (e.g., income from user fees).[61]

(2) In-service Education

CPA3 hospitals are required to set up a training unit and provide in-service education to strengthen the capacity of health staff.[62] The status at each hospital is shown in Figure 3-6.




*ST: Stung Treng, KP: Kampot

**Figure 3-6: Status of Organizing a Training Unit and In-service Education at Each Hospital**

Source: Prepared by the JICA survey team based on questionnaire results

[60] Information from Svay Rieng PHD

[61] At Phnom Penh Municipal Hospital, approvals from MOH and municipal health department are needed to recruit health personnel by the hospital, and only non-health personnel can be hired freely. (Phnom Penh Municipal Hospital)

[62] Ministry of Health, Cambodia, 2014. Guidelines on Complementary Package of Activities for Referral Hospital Development. pp.1-126.

Training units have been established at five hospitals other than Stung Treng Provincial Hospital and Kampot Provincial Hospital. For the two hospitals that have not organized the unit, the lack of human resources to manage the unit was the common reason. As for Stung Treng Provincial Hospital, the limited space in the hospital was mentioned as an additional reason. For Kampot Provincial Hospital, however, a setting up of the unit is currently underway with the support of a consultant from the German Agency for International Cooperation (GIZ). In-service education is conducted at six hospitals other than Stung Treng Provincial Hospital, and, in addition to case sharing and training, leadership training for hospital task management (Phnom Penh Municipal Hospital) and trainings on standard operating procedures (Kampot Provincial Hospital) are conducted in some hospitals. In addition, although a training unit has not been established at Kampot Provincial Hospital, trainings on infection prevention and control in the hospital as well as sharing of medical knowledge with other hospitals within the province via online conferencing tools are conducted. At Stung Treng Provincial Hospital, the lack of human resources capable of providing trainings was reported as the reason for not conducting in-service education.[63]

In addition to the above, on-the-job trainings (OJTs) on specialized technical skills for a certain period of time are also conducted at national hospitals (BOX 3-2). Such collaborations between national hospitals and provincial hospitals can be coordinated directly between the hospitals or may be mediated by MOH.[64]

**BOX 3-2: Examples of On-the-job Training at a National Hospital**

- Some surgeons from Kampong Cham Provincal Hospital had been accepted and trained for 2-3 months. After the they returned to the province, follow-ups on questions are conducted remotely.
- Two doctors from Siem Reap Provincial Hospital were accepted and trained on infectious diseases. After their returning to the province, follow-ups on questions are carried out remotely.
- Doctors from a province were accepted for some weeks or months and trained on the usage of endoscopes and ventilators.

Source: Specialist doctor at Calmette hospital

However, these trainings are often initiated based on visions and policies of the director of each provincial hospital, and the number of personnel accepted varies largely by province.[65] For example, at Calmette Hospital, the largest number of doctors is accepted from Kampong Cham Provincial Hospital, followed by ones from Siem Reap Provincial Hospital. Thus, the degree of collaboration with national hospitals for OJTs differs for each provincial hospital, and there seems to be room for improvement in the institutionalization of the system.

[63] Based on questionnaire results
[64] Information from a specialist doctor at Calmette hospital
[65] Information from a specialist doctor at Calmette Hospital

OJT is also provided between provincial hospitals (e.g., doctors in Battambang Hospital are trained at Siem Reap Hospital) as well as by private hospitals, though often organized through personal networks.[66]

(3) Incentives and Management

Financial incentives are provided at all seven target hospitals, using sources including user fee income and grants from H-EQIP.[67] [68] In some hospitals, additional incentives such as bonuses for priority services (e.g., emergency care) (Siem Reap Provincial Hospital) and certificates for well-performing departments (Kampot Provincial Hospital) are offered. In hospitals with high user fee income, the amount distributed to each staff is larger accordingly. Therefore, the total amount of one's income is highly subject to where the person works.[69]

In Cambodia, many government health personnel engage in dual practices (e.g., working in a private sector facility) to earn additional income and, according to HWDP3, the percentage is more than 50% of the total. Although it is not illegal, registration with each relevant HPC is required when working in a private medical facility.[70] The registration status is currently in the process of improvement, and it was not possible to obtain the data on the specific percentage of doctors who are engaging in such practices from MCC.[71] However, based on the impression of the interviewees at Kampong Cham Provincial Hospital, about 90% of the specialist doctors in the hospital are engaging in dual practices while the detailed number is not monitored in the hospital. Reasons for engaging in such practices included earning additional income as well as improving one's medical skills and complementing the services of public medical facilities. In addition, there is a disciplinary committee in the hospital, and the performance of medical staff in each clinical department is evaluated at times without prior notice. The evaluation criteria include, for example, the number of medical staff working in the department at the time of the evaluation, the number of patients, and the content of services provided. Since the points given based on the evaluation determine the number of grants provided by H-EQIP, in practice, this evaluation regulates the behavior of medical staff who are engaged in dual practices.[72]

### 3-5 Financial and Asset Management

The survey team collected financial information of the target hospitals in September 2021. This section summarizes revenue/expenditures and asset management of the target hospitals.

---

[66] Information from Siem Reap Provincial Hospital
[67] Based on questionnaire results
[68] Health Equity and Quality Improvement Project (H-EQIP): A project undertaken by the World Bank to improve access to quality health services. Service Delivery Grants are provided to the hospitals based on evaluations of hospitals' performance conducted quarterly. (World Bank, 2022. *Cambodia Health Equity and Quality Improvement Project (H-EQIP)*. [online] Available at: <https://projects.worldbank.org/en/projects-operations/project-detail/P157291> [Accessed April 23, 2022])
[69] Information from DP and a specialist doctor at Calmette hospital
[70] Technical Working Group for HRH Planning, 2021. *Annual Health Workforce Report (AHWR) 2020*. Pp.1-58.
[71] According to a survey in 2017 targeting health personnel in 35 hospitals in 22 provinces, about 66% of doctors, 39% of nurses and 33% of midwives were engaging in dual practices. (JICA, 2017. *Kingdom of Cambodia Data Collection Survey on Human Resources for Health and Health Facility*. pp.1-165.)
[72] Information from Kampong Cham Provincial Hospital

### 3-5-1 Revenue and Expenditure Items

Accounting systems of the target hospitals consist of the following two parts: national and provincial budget operations and the third-party operation. Revenue and expenditure items of the target hospitals are tabulated in the table below.

Revenue items are divided into two categories. One is from the government sector, involving government budgets (from MOH or PHD), government contributions, and central medical storage (CMS). The other category includes user fees, insurance, and other revenues.

Expenditure items include compensation of employees, pharmaceuticals, materials and services, and consumption of fixed capital. These items are compiled using the same itemization as the "Cambodia National Health Accounts (2012–2016)" in order to compare them with the average expenditure structure of national and provincial hospitals in the report.

**Table 3-18: Revenue and Expenditure Items of the Target Hospitals**

| Revenue and Expenditure Items | Description |
|---|---|
| **Revenue Items** | |
| Government budget | This is a budget received by provincial hospitals through budget requests to PHD and MOH. The use of the funds is set, and the expenses are controlled by the same codes as those of government agencies.<br>Siem Reap Provincial Hospital makes a clear distinction between the budget received from PHD and the budget received from MOH. Budget revenue from PHD started in 2019 and around 75% of the government budget comes from the PHD. Twenty-five percent of the budget comes from MOH. The separation is not observed in other hospitals. |
| Government contribution | Provincial hospitals receive government contributions and/or contributions from NGOs. In addition to the fixed amount of the government contribution as CPA3 hospitals, the provincial hospitals receive different kinds of contributions from government and NGOs.<br>Phnom Penh Municipal Hospital receives performance-based contribution from the government. |
| CMS | Provincial hospitals receive in-kind donations of medical supplies (pharmaceutical (drugs and non-pharmaceuticals) and accessories, as well as medical supplies, such as laboratory, x-ray, dental supplies, etc.). The analysis in this section converts in-kind goods into monetary values. |
| User fee | This is a compensation received by provincial hospitals directly from patients; 60% may be used for personnel costs, 1% for taxes to the government, and 39% for hospital maintenance and operations. |
| HEF | This is a fund that makes payments on behalf of the poor who are unable to pay their medical bills. It covers about 20% of the population and is financed by development partners and the Cambodian government. Sixty percent of the HEF can be used for personnel costs and 40% for the maintenance and operation of the hospital. |
| Private insurance | Private insurance is part of the revenue at municipal and provincial hospitals in Phnom Penh and Kampong Cham. This is paid for by private medical insurance |

| | |
|---|---|
| | that patients have voluntarily purchased, and so far, this has been observed in the urban areas. |
| NSSF | This is a public insurance for people working in companies, government offices, etc. Only public employees are covered in 2022. |
| Other revenues | These are revenues from non-hospital services. Other revenue is taxed at 75% by the MEF. Due to the high tax rate, only Siem Reap Provincial Hospital collects parking fees among the provincial hospitals for which information was collected. |
| **Expenditure items** | |
| Compensation of employees | This includes the compensation and benefits paid to regular and irregular employees. The government budget only covers remuneration and allowances for regular employees during their working hours, while bonuses for regular employees and remuneration and allowances for non-regular employees are paid from user fees and other sources. |
| Pharmaceuticals | This is an expenditure related to pharmaceuticals. Medical supplies procured by the CMS are listed in this item. |
| Materials and services | This is an expenditure for operation and maintenance of the hospitals. Examples are water supply and sewerage, electricity, communication, and maintenance of the hospital building. Both government budget and user fees are used for the maintenance and services. |
| Consumption of fixed capital | This is an expenditure for large medical facilities. Phnom Penh Municipal Hospital, Stung Treng Provincial Hospital and Svay Rieng Provincial Hospital are listed in this item from the seven hospitals interviewed. |
| Other | Other expenditure items described above. |

Source: JICA Survey Team

### 3-5-2 Revenue and Expenditure of the Target Hospitals

The JICA survey team conducted interviews in September 2021 regarding the financial status of seven target hospitals. The financial data from 2016 to 2020 is shown from Table 3-19 to Table 3-25. As indicated in Table 3-19, Phnom Penh Municipal Hospital has the following characteristics:

- Government budget and CMS are major revenue items. The government budget is larger than the CMS.
- The hospital receives a performance-based grant. Only Phnom Penh Municipal Hospital receives such a contribution, and therefore, the budget may come from the Phnom Penh municipal government.
- User fees include HEF, and these two expense categories are not managed separately. In 2019, the HEF accounted for approximately one-third (32%) of the sum of the user fees and HEF.
- Private health insurance is a part of the revenue, but the proportion is small.
- The major expenditure item is compensation of employees. Expenses for the employees increase faster than other expenditure items.
- Phnom Penh Municipal Hospital listed the consumption of fixed capital. This amounts to

approximately 1 to 2% of the total expenditure.

**Table 3-19: Revenue and Expenditure of Phnom Penh Municipal Hospital**

Unit: KHR

| Items | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue** | **7,561,027,700** | **9,529,311,200** | **10,275,310,500** | **12,364,015,600** | **11,700,423,800** |
| Government budget | 3,614,608,600 | 4,736,090,300 | 4,819,421,700 | 6,403,980,700 | 5,736,213,800 |
| Government contribution | 200,000,000 | 250,000,000 | 250,000,000 | 300,000,000 | 350,000,000 |
| Performance -based grant | - | - | 33,177,600 | 263,308,400 | 125,728,200 |
| CMS | 2,745,989,969 | 3,088,294,207 | 3,225,838,930 | 3,158,772,722 | 3,499,450,076 |
| User fee (including HEF) | 943,143,100 | 1,417,475,800 | 1,336,200,300 | 1,351,536,800 | 1,252,221,800 |
| Private health insurance | 2,984,000 | 2,767,500 | 1,253,000 | 2,280,000 | 6,980,000 |
| NSSF | 54,304,000 | 34,683,500 | 609,419,000 | 884,137,000 | 729,830,000 |
| **Expenditure** | **7,435,096,001** | **9,573,782,158** | **10,248,005,517** | **12,271,385,038** | **11,244,017,322** |
| Compensation of employees | 3,497,799,940 | 4,590,944,580 | 5,221,102,214 | 5,794,547,355 | 6,198,777,140 |
| Pharmaceuticals | 2,780,249,450 | 3,116,961,580 | 3,460,612,200 | 3,431,492,400 | 3,537,851,000 |
| Materials and services | 1,108,816,611 | 1,778,427,998 | 1,501,654,103 | 2,790,605,283 | 1,455,286,182 |
| Consumption of fixed capital | 48,230,000 | 87,448,000 | 64,637,000 | 254,740,000 | 52,103,000 |
| Others | - | - | - | - | - |
| **Balance** | **125,929,730** | **-44,471,065** | **27,304,983** | **92,630,562** | **456,406,478** |

Source: Compiled by the JICA Survey Team based on interviews with Phnom Penh Municipal Hospital

Battambang Provincial Hospital has the following characteristics (refer to Table 3-20):

- The CMS is larger than the government budget. The gap between the two items is widening.
- The amount of HEF exceeded the amount of user fees in 2019. HEF is increasing faster than the user fees.
- NSSF has been listed since 2019. The proportion of the revenue is small.
- Regarding the expenditure, pharmaceuticals are larger than the compensation of employees, but the gap is narrowing.
- While other target hospitals calculate the balance of the revenue and expenses and in most cases have a small positive balance, Battambang Provincial Hospital keeps both revenue and expenses at the same amount.

**Table 3-20: Revenue and Expenditure of Battambang Provincial Hospital**

Unit: KHR

| | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue** | **18,452,079,140** | **20,581,621,993** | **20,681,378,078** | **25,531,572,166** | **23,282,523,515** |
| Government budget | 6,278,850,000 | 6,912,850,000 | 6,864,964,800 | 7,028,468,100 | 7,057,948,100 |
| government contribution | 200,000,000 | 250,000,000 | 250,000,000 | 300,000,000 | 350,000,000 |
| Grant from NGO | - | - | - | 88,752,000 | 88,752,000 |
| CMS | 8,800,000,000 | 9,685,405,593 | 8,960,382,978 | 12,467,302,066 | 10,125,932,415 |
| User fee | 1,766,269,140 | 2,386,238,400 | 2,324,712,300 | 2,477,053,000 | 2,150,487,000 |
| HEF | 1,406,960,000 | 1,347,128,000 | 2,281,318,000 | 2,962,535,000 | 3,019,404,000 |

| | | | | | |
|---|---|---|---|---|---|
| NSSF | - | - | - | 207,462,000 | 490,000,000 |
| Other | - | - | - | - | - |
| **Expenditure** | **18,452,079,140** | **20,581,621,993** | **20,681,378,078** | **25,531,572,166** | **23,282,523,515** |
| Compensation of employees | 5,791,247,484 | 6,537,729,840 | 7,149,807,011 | 7,838,562,060 | 7,893,954,660 |
| Pharmaceuticals | 10,247,811,871 | 11,537,762,381 | 10,835,742,194 | 14,688,227,983 | 12,757,250,635 |
| Materials and services | 2,026,936,619 | 2,070,281,116 | 2,226,989,069 | 2,482,211,319 | 1,973,488,665 |
| Consumption of fixed capital | - | - | - | - | - |
| Other | 386,083,166 | 435,848,656 | 468,839,804 | 522,570,804 | 657,829,555 |

Source: Compiled by the JICA Survey Team based on interviews with Battambang Provincial Hospital

Siem Reap Provincial Hospital has the following characteristics (refer to Table 3-21):

- The hospital has received the budget from the PHD since 2019. Only Siem Reap Provincial Hospital listed budget from the PHD and that of the MOH separately. The budget from the PHD is larger than that of the MOH.
- The CMS is the largest revenue item.
- NSSF has been listed since 2019. The proportion of the revenue is small.
- Siem Reap Provincial Hospital operates a parking lot and collects parking fees. Out of the seven hospitals, only Siem Reap Provincial Hospital collects other revenues. However, since 75% of the other revenues must be paid as taxes, there is little incentive for the provincial hospital to increase other revenues.
- The largest expenditure item is the pharmaceuticals. However, the gap with the compensation of employees is narrowing.

**Table 3-21: Revenue and Expenditure of Siem Reap Provincial Hospital**

Unit: KHR

| | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue** | **20,488,516,079** | **72,076,253,411** | **26,009,411,498** | **29,050,677,210** | **29,804,481,990** |
| Budget from PHD | - | - | - | 4,809,440,105 | 5,308,460,860 |
| Budget from MOH | 4,479,945,080 | 5,754,958,860 | 6,159,916,185 | 1,755,977,020 | 1,671,432,340 |
| Government contribution | 200,000,000 | 250,000,000 | 250,000,000 | 300,000,000 | 350,000,000 |
| CMS | 10,773,365,499 | 60,291,895,751 | 12,791,734,713 | 14,080,696,685 | 13,943,750,390 |
| User fee | 4,083,177,000 | 4,941,443,000 | 5,168,901,500 | 5,848,182,400 | 5,794,873,900 |
| HEF | 797,980,000 | 670,700,000 | 933,116,000 | 1,228,916,000 | 1,639,204,000 |
| NSSF | - | - | - | 1,004,065,000 | 1,094,323,000 |
| Others (Parking service) | 154,048,500 | 167,255,800 | 705,743,100 | 23,400,000 | 2,437,500 |
| **Expenditure** | **20,456,615,879** | **72,067,059,201** | **25,967,303,525** | **28,740,427,210** | **29,485,106,990** |
| Compensation of employees | 6,080,091,000 | 7,725,716,150 | 8,959,862,262 | 10,194,083,105 | 11,052,502,660 |
| Pharmaceuticals | 11,813,422,499 | 61,421,460,451 | 14,130,003,513 | 15,719,218,385 | 16,009,285,090 |
| Materials and services | 2,503,414,180 | 2,852,957,500 | 2,801,841,350 | 2,741,052,720 | 2,347,187,340 |
| Consumption of fixed capital | - | - | - | - | - |
| Others | 59,688,200 | 66,925,100 | 75,596,400 | 86,073,000 | 76,131,900 |
| **Balance** | **31,900,200** | **9,194,210** | **42,107,973** | **310,250,000** | **319,375,000** |

Source: Compiled by the JICA Survey Team based on interviews with Siem Reap Provincial Hospital

Stung Treng Provincial Hospital has the following characteristics (refer to Table 3-22):

- Stung Treng Provincial Hospital manages only a part of the government budget (government support and government contributions), while the other government budget portions that pay for water, electricity, etc. are managed by the PHD. Therefore, the finance department of the provincial hospital does not have data on water and electricity usage.
- More than half of the revenue excluding the government budget is the CMS, but user fees and HEF are increasing rapidly in recent years.
- The major expenditure item is pharmaceuticals while compensation of employees has rapidly increased in recent years.
- Stung Treng Provincial Hospital listed the consumption of fixed capital. The percentage is around 3 to 7% of the total expenditure.

**Table 3-22: Revenue and Expenditure of Stung Treng Provincial Hospital**

Unit: KHR

| Items | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue (excluding government budget)** | **4,541,619,267** | **5,268,217,086** | **4,872,212,176** | **6,405,128,285** | **5,027,250,470** |
| Government Aid | 644,000,000 | 469,000,000 | 519,000,000 | 469,000,000 | 469,000,000 |
| Government contribution | 200,000,000 | 250,000,000 | 250,000,000 | 300,000,000 | 350,000,000 |
| Grant from NGO | - | - | - | - | - |
| CMS | 2,337,798,267 | 3,057,158,586 | 2,694,966,676 | 3,662,918,285 | 2,481,639,470 |
| User Fee | 690,181,000 | 872,588,500 | 835,451,500 | 1,129,613,500 | 1,035,761,000 |
| HEF | 669,640,000 | 619,470,000 | 545,682,000 | 758,004,000 | 549,384,000 |
| NSFF | - | - | 27,112,000 | 85,592,500 | 141,466,000 |
| Other | - | - | - | - | - |
| **Expenditure (excluding government budget)** | **3,763,262,267** | **4,806,751,786** | **4,430,102,876** | **5,907,743,285** | **4,564,987,870** |
| Compensation of employees | 833,584,000 | 1,087,839,000 | 1,032,024,200 | 1,447,688,500 | 1,257,383,900 |
| Pharmaceuticals | 2,388,123,267 | 3,105,884,786 | 2,743,390,676 | 3,786,778,785 | 2,630,349,970 |
| Materials and services | 283,055,800 | 397,746,000 | 479,723,500 | 520,011,900 | 545,971,000 |
| Consumption of fixed capital | 258,499,200 | 215,282,000 | 174,964,500 | 153,264,100 | 131,283,000 |
| Others | - | - | - | - | - |
| **Balance** | **778,357,000** | **461,465,300** | **1442,109,300** | **497,385,000** | **462,262,600** |

Source: Compiled by the JICA Survey Team based on interviews with Stung Treng Provincial Hospital

Kampong Cham Provincial Hospital has the following characteristics (refer to Table 3-23):

- The major revenue items are government budget, CMS and user fees including HEF. The percentages were 50%, 30%, and 20%, respectively and were fixed for the period from 2016 to 2020.
- The major expenditure item is pharmaceuticals, which accounts for more than half of the total expenditures. Compensation of employees is gradually increasing.

**Table 3-23: Revenue and Expenditure of Kampong Cham Provincial Hospital**

Unit: KHR

| Items | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue** | **27,057,638,918** | **28,620,860,186** | **31,691,775,448** | **32,542,240,373** | **30,111,713,341** |
| Government budget | 12,601,195,214 | 14,267,855,964 | 15,620,070,884 | 14,904,933,789 | 15,246,484,546 |
| Government contribution | 200,000,000 | 250,000,000 | 250,000,000 | 300,000,000 | 350,000,000 |
| Grant from NGO | 170,502,000 | - | 269,997,300 | 289,599,300 | 148,837,500 |
| Central Medical Store | 8,167,272,657 | 8,670,342,854 | 8,734,846,948 | 8,319,900,846 | 7,206,000,730 |
| User fee (including HEF) | 4,665,828,200 | 4,521,200,600 | 5,397,144,360 | 7,076,009,870 | 5,763,509,570 |
| Private insurance | - | - | 1,394,000 | 513,000 | 1,714,000 |
| NSSF | 14,128,000 | 60,348,000 | 296,753,000 | 988,843,000 | 813,383,000 |
| Other | 1,238,712,847 | 851,112,768 | 1,121,568,956 | 662,440,568 | 581,783,995 |
| **Expenditure** | **26,653,081,968** | **28,785,564,645** | **31,816,974,468** | **32,187,672,797** | **30,599,670,343** |
| Compensation of employees | 5,340,801,649 | 6,588,029,246 | 8,514,946,808 | 9,688,748,761 | 10,062,422,035 |
| Pharmaceuticals | 18,017,418,451 | 18,657,685,526 | 18,990,254,952 | 17,925,501,147 | 15,558,202,592 |
| Materials and services | 639,675,535 | 527,281,786 | 655,089,940 | 548,830,400 | 929,722,450 |
| Consumption of fixed capital | - | - | - | - | - |
| Others | 2,655,186,333 | 3,012,568,087 | 3,656,682,768 | 4,024,592,489 | 4,049,323,266 |
| **Balance** | **404,556,950** | **-164,704,459** | **-125,199,020** | **354,567,576** | **-487,957,002** |

Source: Compiled by the JICA Survey Team based on interviews with Kampong Cham Provincial Hospital

Kampot Provincial Hospital has the following characteristics (refer to Table 3-24):

- The survey team could not receive information on government budget from Kampot Provincial Hospital. Therefore, Table 3-24 tabulates revenue and expenditure items excluding the government budget.
- The major revenue item is CMS, which accounts for more than three-fourth of the total revenue.
- The major expenditure item is pharmaceuticals, which accounts for more than 80% while compensation of employees has gradually increased in recent years.

**Table 3-24: Revenue and Expenditure of Kampot Provincial Hospital**

Unit: KHR

| Items | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue (excluding government budget)** | **10,525,592,708** | **11,904,344,447** | **12,044,098,360** | **13,797,647,907** | **9,831,348,135** |
| Government contribution | 100,000,000 | 187,000,000 | 300,000,000 | 300,000,000 | 300,000,000 |
| Grant from NGO | - | - | - | 28,769,300 | 88,865,780 |
| CMS | 8,829,612,908 | 10,046,349,947 | 10,146,668,860 | 11,426,874,907 | 7,307,590,135 |
| User fee | 1,595,979,800 | 1,359,276,000 | 989,133,700 | 1,356,589,100 | 1,287,204,220 |
| HEF | - | 37,917,000 | 287,717,000 | 314,300,000 | 326,888,000 |
| NSFF | - | 273,801,500 | 320,578,800 | 371,114,600 | 520,800,000 |
| Other | - | - | - | - | - |
| **Expenditure** | **10,526,347,252** | **11,903,979,336** | **12,044,421,005** | **13,800,676,617** | **9,438,631,855** |
| Compensation of employees | 957,587,800 | 1,002,596,700 | 958,457,700 | 1,247,863,800 | 1,334,254,800 |
| Pharmaceuticals | 8,880,884,708 | 10,079,641,847 | 10,156,824,660 | 11,493,078,007 | 7,409,455,135 |
| Materials and services | 171,544,100 | 276,700,400 | 325,203,600 | 418,791,100 | 413,855,000 |
| Consumption of fixed | - | - | - | - | - |

| Items | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| capital | | | | | |
| Others | 516,330,644 | 545,040,389 | 603,935,045 | 640,943,710 | 281,066,920 |
| **Balance** | **-754,544** | **365,111** | **-322,645** | **-3,028,710** | **392,716,280** |

Source: Compiled by the JICA Survey Team based on interviews with Kampot Provincial Hospital

Svay Rieng Provincial Hospital has the following characteristics (refer to Table 3-25):

- Both revenue and expenditure amounts are increasing gradually.
- The main revenue items are the government budget and CMS. From 2016 to 2020, their percentages have remained constant at about 50% and 30%, respectively.
- Percentages of HEF and NSSF are small, but the amounts are gradually increasing.
- The major expenditure item is pharmaceuticals, which accounts for more than 80%. Compensation of employees has increased rapidly in recent years.
- Svay Rieng Provincial Hospital listed the consumption of fixed capital. The percentage is around 1 to 2% of the total expenditures.

**Table 3-25: Revenue and Expenditure of Svay Rieng Provincial Hospital**

Unit: KHR

| Items | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| **Revenue** | **14,959,714,436** | **17,260,803,327** | **19,607,275,709** | **21,349,986,780** | **21,439,684,825** |
| Government budget | 7,926,194,500 | 9,229,242,900 | 10,139,208,650 | 10,945,268,700 | 11,123,017,700 |
| Grant from NGO | 264,360,000 | 77,616,000 | 62,720,000 | 38,600,000 | 42,800,000 |
| Central Medical Store | 4,706,371,836 | 5,528,195,527 | 6,115,859,159 | 6,576,429,980 | 6,360,487,625 |
| User fee | 1,560,446,100 | 1,638,323,900 | 1,604,997,900 | 1,783,474,100 | 1,697,519,500 |
| HEF | 502,342,000 | 482,656,000 | 783,268,000 | 865,964,000 | 957,932,000 |
| NSFF | - | 304,769,000 | 901,222,000 | 1,140,250,000 | 1,257,928,000 |
| Other | - | - | - | - | - |
| **Expenditure** | **14,894,162,956** | **17,191,088,927** | **19,379,517,409** | **21,168,586,900** | **21,235,434,385** |
| Compensation of employees | 3,454,680,000 | 4,049,356,600 | 4,555,352,900 | 5,014,001,100 | 5,648,544,380 |
| Pharmaceuticals | 8,231,347,566 | 9,614,873,377 | 10,881,397,859 | 11,705,501,280 | 11,343,971,125 |
| Materials and services | 1,212,347,140 | 1,364,558,500 | 1,577,512,120 | 1,709,690,440 | 1,661,161,150 |
| Consumption of fixed capital | 277,107,900 | 328,893,600 | 294,380,900 | 432,151,540 | 269,901,400 |
| Others | 1,718,680,350 | 1,833,406,850 | 2,070,873,630 | 2,307,242,540 | 2,311,856,330 |
| **Balance** | **65,551,480** | **69,714,400** | **227,758,300** | **181,399,880** | **204,250,440** |

Source: Compiled by the JICA Survey Team based on interviews with Svay Rieng Provincial Hospital

Table 3-26 shows the composition of revenue and expenditures of the interviewed municipal/provincial hospitals. In Phnom Penh, Kampong Cham, and Svay Rieng, the government budget and contributions account for around 50% of the total revenue, and the percentage of the CMS is approximately 30%. In Battambang and Siem Reap, the proportion of the government budget and contribution is one-fourth to one-third of the total revenue, and the percentage of CMS is nearly half of the total revenue. The revenue from user fees, HEF, NSSF, etc., accounts for around 20% in Phnom Penh, Battambang, and Svay Rieng and near 30% in Siem Reap.

**Table 3-26: Composition of Revenue and Expenditures of the Interviewed Target Hospitals (Average of 2018 and 2019)**

Unit: percent

| Revenue & expenditure items | Phnom Penh | Battam-bang | Siem Reap | Stung Treng* | Kampong Cham | Kampot* | Svay Rieng |
|---|---|---|---|---|---|---|---|
| **Revenue (KHR 000)** | **11,319,663** | **23.106,475** | **27,530,044** | **5,638,670** | **32,111,008** | **12,920,873** | **20,478,638** |
| Government budget & contribution, etc. | 53 | 32 | 24 | 14 | 49 | 2 | 52 |
| Central Medical Storage | 28 | 46 | 49 | 56 | 27 | 84 | 31 |
| User fee, HEF, NSSF, etc. | 19 | 22 | 27 | 30 | 24 | 12 | 17 |
| **Expenditure (KHR 000)** | **11,259,695** | **23,106,474** | **27,353,865** | **5,168,923** | **32,002,324** | **12,922,549** | **20,274,052** |
| Compensation of employees | 49 | 35 | 35 | 24 | 28 | 8 | 24 |
| Pharmaceuticals | 31 | 55 | 55 | 63 | 58 | 84 | 56 |
| Materials and services | 19 | 10 | 10 | 10 | 2 | 3 | 8 |
| Consumption of fixed capital | 1 | 0 | 0 | 3 | 0 | 0 | 2 |
| Others | 0 | 2 | 0 | 0 | 12 | 5 | 11 |

Note: * Government budget is not included in the revenue and expenditure

Source: Calculated by the survey team based on the interviews

Regarding the composition of the expenditure, the compensation of employees occupies around half of the total expenditure in Phnom Penh Municipal Hospital, 35% in Battambang and Siem Reap, 28% in Kampong Cham, and 24% in Svay Rieng. Expenditure for pharmaceuticals accounts for more than 55% of the total expenditure in Battambang, Siem Reap, Kampong Cham, and Svay Rieng, while the percentage of the expenditure for pharmaceuticals is 30% in Phnom Penh Municipal Hospital.

Compared to the composition of average expenditure of national and provincial hospitals (Table 3-27), the main difference is that the target hospitals interviewed spend more on pharmaceuticals than on the compensation of employees. Other differences are lower expenditures on materials and services and fixed capital at the target hospitals.

**Table 3-27: Composition of Expenditure of the Total Health Sector, National Hospitals, and Provincial Hospitals in Cambodia in 2016**

Unit: percent

| | Government Health Expenditure | National Hospital | Provincial Hospital |
|---|---|---|---|
| Expenditure amount (US$ million) | 268.6 | 32.5 | 32.0 |
| Compensation of employees (%) | 37 | 49 | 41 |
| Pharmaceuticals (%) | 20 | 24 | 36 |
| Materials and services (%) | 29 | 22 | 19 |
| Consumption of fixed capital (%) | 14 | 6 | 4 |
| Others (%) | 0 | 0 | 0 |

Source: Cambodia National Health Accounts (2012–2016), WHO, April 2019

### 3-5-3 Asset Management

The seven target hospitals interviewed maintain asset registers to keep track of their assets. The asset registers record land, buildings, automobiles, large medical equipment, and office equipment. However, since assets are managed at a price of acquisition and are not valued at market value, the asset register is only updated when an asset listed in the register is destroyed or an equivalent asset is acquired. In addition, although the MOH used to be the owner of the land and buildings, the process of rewriting the ownership of land and buildings to the PHD is underway as part of the decentralization process.

### 3-5-4 Process of Construction of Hospital Buildings and Procurement of Large Medical Equipment

The hospital's management committee formulates the plans for constructing a new hospital building or procuring large medical equipment at the municipal/provincial hospitals. After the management committee devises these plans, it is proposed to the PHD. If the PHD or the provincial government can raise funds (or find international donors who can provide funds), they are used to construct the hospital building or install the large medical equipment.

If the provincial government has difficulty preparing a budget, the PHD will apply to the MOH to use their budget or find a donor. In practice, the construction of hospital buildings and the introduction of large medical equipment are always carried out with the support of donors, including NGOs. The hospital's management committee implements the construction of hospital buildings and procures large medical equipment.

### 3-5-5 Introduction of Public Administration Enterprise: An example of Khmer-Soviet Friendship Hospital

A method for municipal/provincial hospitals to become more autonomous in terms of decision making and financial management is to convert to "Public Administration Institute (PAI)," as some national hospitals have done. The survey team interviewed Khmer-Soviet Friendship Hospital, a national hospital, to compare financial and asset management with the target hospitals. The hospital transformed into a PAI in June 2009.

According to the Sub Decree on the transformation of Khmer-Soviet Friendship Hospital to the Public Administration Enterprise (No: 96 ANK.BK dated June 20, 2009), the Khmer-Soviet hospital, after being transformed into a PAI, has the following characteristics.

- The hospital is a legal entity with financial autonomy.
- The hospital has a board of directors which heads its management. The members are representatives from MOH (chairperson), council of ministers, MEF, Phnom Penh, director of the hospital, and hospital staff. In addition, one expert in health science is also a member of the board.
- The hospital may purchase, exchange, or sell movable and immovable assets with approval of MOH and MEF and the enforced law.

- The director and accountant must submit management reports and an annual financial report to the board of directors for verification and approval no less than three months prior to the closing date.
- The director shall submit development programs and annual budget plans to MOH and MEF for approval 15 days after the meeting of the board of directors. MEF is granted a period of one month from the acknowledged date to verify and prepare necessary suggestions/recommendations to MOH. MOH and MEF have two months from the date of receiving the consigned documents from the director of the hospital for approval.
- The minister of MEF shall nominate one financial controlling officer at the hospital responsible for pre- and post-checks of the hospital's expenditures of the budget from ministries, provincial, and other administrative public organizations.
- The management of front-line managers is under the monitoring of the General Inspectorate Department of the MEF and the management of accounting is under the monitoring of the Department of Accounting of the National Treasury and General Inspectorate of the MEF, respectively.

Organizations transformed into PAIs will be able to manage the acquisition and sale of assets themselves, but at the same time, they must submit financial reports to the board of directors and will be monitored by the MEF. According to the Financial Officer of Khmer-Soviet Friendship Hospital, one benefit of the shift to PAI was the reduction in paperwork due to fewer guidelines. Another benefit was the diversification of the revenue. Khmer-Soviet Friendship Hospital started to collect donations to upgrade medical technologies and raised US$30,000. It is expected that the municipal/provincial hospitals would collect new revenues other than medical services if those hospitals are transformed into the PAI. For example, Siem Reap Provincial Hospital has to pay 75% of the revenue from the parking service as a tax (refer to Table 3-18 "Other Revenues"). If the tax rate on non-hospital service revenues were reduced by transferring to PAI, the municipal/provincial hospitals would have greater potential to increase revenues by introducing services such as parking or kiosks, and more efficient real estate management.

The accounting system of Khmer-Soviet Friendship Hospital consists of two parts: the national treasury budget operation and the third-party operation. The government budget covers salaries and other incentives for civil servants in the public functioning cadre and the items such as expenditures on water and electricity. Khmer-Soviet Friendship Hospital also receives the CMS. This structure is similar to that of the target hospitals, and it is not expected to change even if they become PAIs.

Since Khmer-Soviet Friendship Hospital is a national hospital, there were no significant obstacles to its transformation into a PAI. While it was not clear in this survey whether the PAI converted municipal/provincial hospitals would be under the jurisdiction of MOH or the municipal/provincial government, its conversion would require close coordination among the government including PHD, MOH, and MEF. In addition, it would be necessary to improve the ability of managers and accountants of the hospitals to prepare management and financial reports

to be submitted to the board of directors. Therefore, it is anticipated that the conversion of the provincial/municipal hospitals to PAIs might require at least two to three years of coordination between the provincial/municipal governments, MOH, and MEF, as well as simultaneous capacity building to strengthen hospital management and hospital finance.

### 3-6 Environmental and Social Considerations

This section reviews how the target hospitals organize their structure for medical waste treatment and the points to consider when introducing new medical equipment to the upgraded hospitals from the viewpoint of environmental considerations of natural resources. In addition, the chapter reviews the Cambodian and JICA environmental and social guidelines to be considered in formulating detailed plans for the proposed regional hospital development.

Environmentally conscious development is a global initiative represented by the Sustainable Development Goals, and such consideration is no exception for the sector of health and infrastructure improvement. This section first reviews Cambodia's recent environment-friendly development guidelines, its approach to waste, and the cooperation policies of donor countries, including Japan.

#### 3-6-1 Cambodia's Environmental Initiatives

(1) Efforts by the Government of Cambodia

In Cambodia, more than 75% of the population lives in rural areas. The concentration of population in urban areas peaked at 3.4% in 2013, and since then, it has shown a gradual downward trend. In fact, Agriculture and natural resources support the livelihoods of the majority of the people in Cambodia (BOX 3-3), thus conservation of the natural environment that supports these rural populations should capture great attention.

**BOX 3-3: Importance of the Rural Environment as an Economical Foundation in Cambodia - Comparison with Japan –**

It is estimated that 30% of Cambodia's land is agricultural land (2016) and agriculture, forestry, and fisheries account for 22% of Cambodia's GDP*. The conservation of the natural environment and the development of sustainable agriculture, forestry and fishery industries are important issues directly linked to the lives of citizens not only from the viewpoint of industrial importance but also from the standpoint of ensuring resilience to climate change, which is now one of the greatest global concerns.[73]

**Table 3-28: Comparison of Rural Areas in Cambodia and Japan**

| | Cambodia | Japan |
|---|---|---|
| Rural population as percentage of total population | 76.2 (2019) | 8.3 (2019) |
| Agriculture as a percentage of the total working population[74] | 34.5 (2019) | 3.4 (2019) |
| Percentage of agriculture, forestry and fisheries to GDP (%) | 22.8 (2020) | 1.0 (2019) |
| Area of agricultural land in national land (%) | 31.5 (2016) | 12.3 (2016) |
| Forest Area in National Land (%) | 49.2 (2016) | 68.4 (2016) |

*Data compiled from ILO and FAO

[73] United Nations Food and Agriculture Organization (FAO) Country Profile
[74] International Labour Organization (ILO) data

Given these circumstances, the country established the National Council for Sustainable Development (NCSD) by Royal Decree in 2015. The Cambodian Ministry of Planning has recognized "the 4th Rectangular Strategy" as its highest priority, and, therefore is committed to sustainable natural resources, environmental management and response to climate change based on plans and policies such as the National Strategic Development Plan and the Industrial Development Policy. It has also formulated the National Policy on Green Development and National Strategic Plan on Green Development (2013-2030). This policy aims to improve people's living conditions and welfare by balancing economic development efforts with environmental protection, indigenous cultural conservation, social stability, and sustainable consumption of natural resources. The Cambodian Ministry of the Environment (MOE), which is primarily responsible for the Cambodian environment, has established the National Environment Strategy and Action Plan (2016-2023) to mainstream environmental issues not only in the MOE but also in the policies and plans of other ministries and agencies, since the environment is closely related to other fields, such as investments in development. The Green Development Plan also aims to develop a green economy with effective use of natural resources, environmental sustainability, green employment, technology, finance, credit, and investment.

As mentioned, there are no exceptions in the health sector to consider environmentally friendly development. For example, in the Climate Change Strategic Plan (2014-2023), the MOH is required to: 1) respond to vectors and waterborne pathogens that may be associated with climate change by enhancing the infrastructure and human resources of the health care sector; and 2) strengthen information and research capabilities on the impacts and vulnerabilities of climate change in the health sector, thereby contributing to the formulation of strategic plans by the Ministry as well as for other sectors.

(2) Trends in Development Guidelines for Environmental Considerations by Development Partners

Based on the above-mentioned policy of environmental considerations by the Cambodian government, development partners have formulated an aid policy within the framework of international development assistance (United Nations Development Assistance Framework (2019-2023)) from the viewpoint of combining environmental concerns directly linked to people's lives and measures against climate change for health and sustainability. Out of the five achievements of the United Nations Development Assistance Framework in Cambodia at present, Outcome 3 is defined as Supporting Sustainable Livelihoods. It is aimed to enable people, particularly those in socially vulnerable situations, to live in a safer, healthier, more secure, ecosystem-balanced environment that can enhance resilience to natural disasters and shocks caused by climate change. In an effort to tackle climate change, the Cambodian government has approved the United Nations Framework Convention on Climate Change (UNFCCC). The United Nations Development Assistance Framework recognizes that Cambodia is extremely vulnerable to soil, waste, and unplanned exploitation of natural resources. In addition, it is well known that

the level of vulnerability to climate change increases with the poverty rate.

(3) Japan's Environmental Aid Policy for Cambodia

Japan's policy for national development cooperation[75] (July 2017) states that Cambodia will "support further strengthening of the economic and social infrastructure toward the realization of a mid-to-high income country by 2030" as an overall goal. As part of this policy, the enhancement of medical services addressed in the current plan will contribute to the "improvement of quality of life" as the second of the three objectives. This includes the development of infrastructure for the improvement of the urban living environment and the promotion of health care efforts for the achievement of UHC. Thus, the achievement of a satisfactory living environment, including the natural environment, and health must be considered as a single complex challenge. As one of is efforts, Japan recently implemented the Project for Capacity Building of MOE staff to improve the implementation of the Environmental Impact Assessment (EIA) and Pollution Control Law and Regulations (2017-2021).

(4) Approaches to Waste Management in Cambodia

In Cambodia, the Act on Environmental Conservation and Natural Resource Management was enforced in December 1996. In cooperation with other ministries, non-government entities, the private sector, and international organizations, the MOE controls pollutants such as hazardous chemical substances and hazardous waste in water, soil, and air. To ensure the quality of the environment, the MOE will assess the environmental impact of the pollutants and monitor the discharge of chemical substances and other hazardous substances when the development project is implemented. Cambodia's laws and regulations on waste management are summarized below.

**BOX 3-4: Cambodia's Laws and Regulations on Waste Management**

- The Law on Environmental Protection and Natural Resource Management (1996)
- The Sub-decree on Solid Waste Management (1999)
- The Sub-decree on Environmental Impact Assessment (1999)
- The Prakas on the delegation of responsibilities to the provincial/municipality departments by the implementation of the Sub-decree on the Monitoring of Water Pollution and Waste Management (1999)
- The Prakas on the Organisation and Functioning of the Environmental Provincial-Municipal Department (1999)
- Guidelines prepared by the Ministry of Environment and the NGO, COMPED, to recommend the implementation of the Sub-decree on Solid Waste Management (1999)
- The Inter-Ministerial Prakas of the Ministry of Interior and Ministry of Environment on Waste and Solid Waste Management in Provinces/Municipalities of the Kingdom of Cambodia (2003)

Regarding waste, the Ministerial Order on Solid Waste Management was issued in 1999 and subsequently revised in 2015. The MOE included the obligation to develop guidelines for the safe

[75] Ministry of Foreign Affairs, Japan, "Policy on Development Cooperation by Country to the Kingdom of Cambodia" (July 2017)

management of hazardous waste. The categories of solid, general, and hazardous waste are specified in the mentioned Order.

The Order also included the necessity of examination and approval by the MOE for waste disposal facilities. At the time of the current study, Cambodia had no special treatment (recycle facilities (for plastic, medical waste, and e-waste) or treatment facilities (for plastic and e-waste) other than those for medical waste treatment. It is also specified that if waste is transferred across national borders, it must be in accordance with the Basel Convention.[76]

In Cambodia, as in neighboring countries such as Vietnam and Thailand, a system for disposing of waste other than medical waste at incineration facilities has not yet been established. However, in Vietnam and Thailand, landfill sites are constructed and organized for disposal. In Cambodia, waste collected by contractors is still limited to the areas of urban districts along major roads. In most rural areas, the waste is left untapped or accumulated, or incinerated in open spaces. Regardless of the global interest in waste disposal of PET bottles and other plastic containers as the cause of pollution every year, the awareness of residents in Cambodia has not significantly increased.

(5) Medical Waste in Cambodia

In Cambodia, medical waste is stored and incinerated as part of hazardous waste approved by the MOE in accordance with the Cabinet Order on Water Pollution and Solid Waste Management. However, there are no regulations concerning the management of hazardous waste and hazardous substances. It is mandatory for the MOH to develop a legal framework for dealing with environmental and social risks in the health sector. To date, the MOH has established the following regulations and guidelines.[77]

**BOX 3-5 : Cambodia's Regulations on Medical Waste Disposal**

- The National Policy on Medical Waste Management (Health Care Waste Management (HCWM)) was enacted in 2009 and aims to prevent health and environmental damage by properly treating and managing all medical waste. Cambodia also signed the Stockholm Convention, and the aforementioned national policies are in accordance with the agreements of the Convention.[78]
- The Ministerial Ordinance (Prakas; Ministerial Order) of the Ministry of Health specifies detailed regulations on HCWM, including definitions, sorting, collection, transportation, storage, disposal, and disposal methods. In addition to incineration, autoclaves and microwave treatment methods are also specified in the Ministerial Ordinance.
- The National Guidelines for Infection Prevention Control (Infection Prevention Control (IPC)) (2017 revision) are widely disseminated in Cambodian hospitals in connection with hospital waste management. This guideline describes detailed measures and procedures for standard hygiene

[76] Basel on the Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.
[77] Ministry of Health, Cambodia: COVID-19 Emergency Response Project (P173815) updated Environmental and Social Management Framework (ESMF)
[78] Stockholm Convention: Formal name is Stockholm Convention on Persistent Organic Pollutants (POPs), Stockholm Convention on Persistent Organic Pollutants

measures, infection prevention, and specific procedures for managing patients in isolation units/centers. This is in compliance with the WHO guidelines for IPC in health care facilities.

### 3-6-2 Field Survey Results

(1) Status of Infrastructure Development at Target Hospitals

The information collected at each hospital in the field survey is summarized in the following table.

**Table 3-29: Infrastructure and Natural Environment Overview of the Target Hospitals**

| | Phnom Penh | Battamba-ng | Siem Reap | Stung Treng | Kampong Cham | Kampot | Svay Rieng |
|---|---|---|---|---|---|---|---|
| Internet | The Internet was widespread. In the digital transformation proposed in this plan, it is considered that connection with an optical line is necessary. Every hospital has an infrastructure that can be switched to an optical line as needed in the future.[79] | | | | | | |
| Power supply, generator in case of power failure | Power supply is stable. Since it is almost only a "planned" power failure that lasts only for a few hours, it is within the range in which continuous supply by an auxiliary generator is possible, and it has not become a major problem. Yet some wards in the hospital do not have connections to generators (e.g., Kampot TB (provisional COVID) wards) | | | | | | |
| Natural disaster situation | Several hours of flooding (10 cm, a few hours) only during torrential rains, but not serious. | No problem | Flooding due to waterway construction. A partially eutrophic reservoir. The founding ceremony for construction held in Dec. 2021, and it has been eliminated at present. | Large-scale flooding every 3 years (around 2 wks), and backflow of sewage also occurs. | Drainage courses for the entire site were prepared under the initiative of the director of the hospital. There is no serious flood. | There is no serious flood. | There is no serious flood. |
| Drinking tap water | Having safe drinking water and people drink it. | Safe drinking water and certified, but none are drinking. | Having safe drinking water and people drink it. | There is no safe drinking water. | Some water supplies are potable, but not certified. | Safe drinking water and certified, but none are drinking. | Some water supplies are available, but not certified. |
| Public sewerage | In all hospitals, it was explained that the drainage of the hospital was connected to the public sewerage system. Organic effluents, including blood, are diluted, bleached, and flowed to the drain. Public sewerage systems are combined sewerage systems for sewage and rainwater. As a result, sewage treatment does not catch up during the rainy season, thus the water may temporarily flood, which raises concerns about hygiene problems. | | | | | | |
| Organic wastewat-er treatment | Organic effluent from each ward is diluted, bleached, and passed to the drainage outlet. It is connected to the public sewerage system and is treated and discharged. Infectious blood is incinerated in Battambang. | | | | | | |

[79] S.I Group Co. Than Ltd's SINET networks

| | Phnom Penh | Battamba-ng | Siem Reap | Stung Treng | Kampong Cham | Kampot | Svay Rieng |
|---|---|---|---|---|---|---|---|
| Septic tanks | Installed for x-ray Room and Pathology Lab | The Australian Red Cross installed Septic Tanks (Two Chambers and Two Filters) on each ward | Under maintenance | Installed for the lab. Other wards were installed with the undergro und infiltratio n layer, but water leakage occurred. | Installed for X-ray rooms, pathology laboratories, and obstetrics/ gynecology/ surgery wards | Installed for pathology laboratories only. A septic tank had been installed in an adjacent river, but it failed. | All wards except the Ophthal mologic Ward pass through the same septic tanks. |

As a countermeasure to the clogging of the drainage pipe of the high-floor ward, the piping is cut off and the drainage water flows directly to the ground.

In the target areas, infrastructure development through Japan's support has been carried out in many cases, particularly from the viewpoint of securing water resources and disaster prevention. The following table shows Japan's assistance over the past 15 years and the infrastructure assistance provided by other development partners. The tourism industry, which is one of the development industries in Cambodia, is being tackled by the whole country, and places like Siem Reap, an industrial development city, have been selected as a model city for the concept of "Smart City" which was also implemented by ASEAN. As a result, it has become a city which attracts attention from all over the world.

**Table 3-30: Infrastructure Development Project in Target Areas**

| Target Land | Category | Project Name | Timing of Conclusion, etc. | Details |
|---|---|---|---|---|
| Phnom Penh | Environmental management | Sewerage System Development Project | November 19th G/A | Construction of sewage treatment facilities in Lake Tungegg due to inadequate natural purification systems in septic tanks, open channels, lakes, marshes, and wetlands |

| Target Land | Category | Project Name | Timing of Conclusion, etc. | Details |
|---|---|---|---|---|
| | Water Resources and Disaster Prevention | The Project for Flood Defense and Drainage Improvement (4th) | October, 17 G/A | The fourth term in the project from 2002. Improvement of the functions of existing pumping stations through the renovation of main drains and installation of dust collectors |
| | Resources and Energy | Metropolitan Transmission and Distribution Grid Expansion and Construction Project | April, 14 May 18th Loan agreement (L/A) | Supporting Phnom Penh, which accounts for 7% of the total power in the country, with the new and increased number of electric transformation stations (two sites) and expansion of the transmission network (new fictional transmission lines, underground transmission lines, and wiring lines)[80] |
| | Water Resources and Disaster Prevention | Phnom Penh Water Supply Corporation, Niroth Water Supply Service | Mar. 09 L/A | Development of water supply facilities (water purification plants, treated water pipes, sewage pipes) with a capacity of 130,000 tons |
| Battambang | Water Resources and Disaster Prevention | Water supply and sanitation improvement project (World Bank: WB) | ~June 24th | Water supply from urban areas to rural areas to Commune levels by expanding new water pipes |
| | Water Resources and Disaster Prevention | Provincial Water Supply and Sanitation Project | 4th quarter of 2021 bidding targets | Providing Sustainable Water Piping and Sanitation Services |
| | Water Resources and Disaster Prevention | Water Supply Expansion Project | June 13 G/A | Expansion of water supply facilities (water intake pumps, water pipes, water purification plants, water supply pipes, water distribution pipelines, etc.), and development of water quality analysis equipment, etc. |
| | Water Resources and Disaster Prevention | The Project for Replacement and Expansion of Water Distribution Systems in Provincial Capitals | March 2011 G/A | Support for the upgrading and expansion of the water distribution network and the development of equipment necessary for that purpose (including Prussat and Sihanoukville) |
| Siem Reap | Water Resources and Disaster Prevention | Water supply and sanitation improvement project (WB) | ~June 24th | Connection from rural to urban sewerage systems |
| | Traffic and Disaster Prevention[81] | Japan ASEAN Cooperation Smart JAMP | ~March, 22 | Planning for introduction of road-monitoring closed-circuit television (CCTV) |

[80] Phnom Penh Metropolitan Area Transmission and Distribution Grid Expansion Project: https://www.jica.go.jp/oda/project/CP-P22/index.html

[81] Ministry of Land, Infrastructure, Transport and Tourism (Japan): support measures for smart cities through cooperation between Japan and ASEAN https://www.mlit.go.jp/report/press/content/001421952.pdf

| Target Land | Category | Project Name | Timing of Conclusion, etc. | Details |
|---|---|---|---|---|
| | | Smart City Survey | | |
| | Water Resources and Disaster Prevention | Urban Water Supply Project (Asia Development Bank: ADB) | 90% completed in 2nd quarter of 2009 for facility construction | The water supply area in Siem Reap expands. |
| | Water Resources and Disaster Prevention | Water Supply Expansion Project I, II | On March 12, October 21 L/A | Support for the development of water intake facilities, water purification plants, water distribution pipes, and other water supply facilities |
| Stung Treng | Water Resources and Disaster Prevention | Urban Water Supply Project (ADB) | 90% completed in 2nd quarter of 2009 for facility construction | New water supply systems are introduced into Stung Treng. |
| | Resources and Energy | "Sesan Downstream 2 Hydropower Plant Dam (Lower Sesan 2)" | (Operation started on December 18) | Joint ventures in Cambodia, China and Vietnam[82]<br>The dam was constructed along the Mekong River tributary. Its output is 400 megawatts. |
| Kampong Cham | Water Resources and Disaster Prevention | Water supply and sanitation improvement project (WB) | ~June 24th | Water supply from urban areas to rural areas to Commune levels by expanding new water pipes |
| | Water Resources and Disaster Prevention | Provincial Water Supply and Sanitation Project | 4th quarter of 2021 bidding targets | Providing Sustainable Water Piping and Sanitation Services |
| | Water Resources and Disaster Prevention | Urban Water Supply Project (ADB) | 90% completed in 2nd quarter of 2009 for facility construction | Improvement of existing water supply systems. Improvement of facility operation, maintenance, and management capabilities |
| | Water Resources and Disaster Prevention | Water Supply Expansion Project | June 13 G/A | Expansion of water supply facilities (water intake pumps, water pipes, water purification plants, water supply pipes, water distribution pipelines, etc.), and development of water quality analysis equipment, etc. |
| Kampot | Water Resources and Disaster Prevention | Water Supply Expansion Project | June 15 G/A | Support will be provided for the construction of water intake and purification facilities, the installation of water pipes, transmission and |

[82] A joint venture of the major Cambodian conglomerate Royal Group, the Chinese state-run HydroLanchan International Energy (Hydrolancang International Energy), and the Vietnamese Electric Power Corporation (EVN). This is a collaboration of the Chinese company Hydrolancang International, the Cambodian company Royal Group, and the Vietnamese company, Vietnam Electricity

| Target Land | Category | Project Name | Timing of Conclusion, etc. | Details |
|---|---|---|---|---|
| | | | | distribution pipes, and the maintenance of equipment such as water quality test equipment. |
| | Resource and Energy | Mekong Regional Power Network Development Project (Cambodia Growth Corridor) | March 07 L/A | Supporting the construction and expansion of related substations and distribution lines by constructing two 230 kilovolts transmission lines in the section between Kampot and Sihanoukville |
| Svay Rieng | Water Resources and Disaster Prevention | Urban Water Supply Project (ADB) | 90% completed in 2nd quarter of 2009 for facility construction | Improvement of existing water supply systems. Improvement of facility operation, maintenance, and management capabilities |
| | Resources and Energy | Cambodia Solar Power Project (ADB)[83] | Operation started on October 17 | Cambodian utility-scale solar Photovoltaic (PV) project with a capacity of 10 MWp DC |
| | Resources and Energy | Southern Economic Corridor Distribution Plan | September 16 G/A | Supporting the development of a new distribution network that connects diesel power generation to the nation's key power systems |

(2) The Surrounding Environment of the Hospital and Impact of the Implementation of the Plan

The following table summarizes the conditions around the hospital and the current state of waste disposal confirmed in the field visit.

**Table 3-31:Surrounding Environment of the Target Hospitals**

| | Phnom Penh | Battambang | Siem Reap | Stung Treng | Kampong Cham | Kampot | Svay Rieng |
|---|---|---|---|---|---|---|---|
| Illegal residents, etc. on the streets or in hospitals | There are residents on the surrounding roads. | There are residents on the surrounding roads. | There are no temporary stores under construction in the vicinity. | Residents on the premises | Only temporary stores on the surrounding roads | Only temporary stores on the surrounding roads | Only temporary stores on the surrounding roads |
| Presence or absence of monuments and memorial trees on the premises | No monuments or trees were identified in the hospital during the interview at any of the hospitals that should be noted at the time of renovation. | | | | | | |

[83] Asian Development Bank: Cambodia: Cambodia Solar Power Project: https://www.adb.org/projects/50248-001/main#project-pds

One problem surrounding the hospital is that illegal temporary residents or stalls/shops were occupying the part of the six meter sidewalk between the hospital and the public road (referred to in the photograph below). This could be the causes of traffic congestion in front of the hospital and waste dumping and malodor on the road. Illegal residents or stores were found in all target hospitals other than Siem Reap where the surrounding roads were being developed. The wastewater was a merging sewage system, so there was no problem. However, there were some dangerous places where a large amount of trash flowed into a side ditch and where there was no cover for a rainwater drain that had been destructed by the weight of a vehicle. Another issue found for the environment was that the stray dogs in the hospital could be a cause of hygiene problems.

| | |
|---|---|
|  |  |
| The sidewalks and parking spaces surrounding the hospital are some of the hospital's premises. | Illegal stalls (restaurant) were found on the sidewalk / parking space of the hospital. Also, the broken lid of the rainwater drainage was abandoned. |

In particular, in Battambang, where traffic congestion was a major concern, the province planned to prepare and provide a warehouse nearby the hospital for these illegal stores. In Svay Rieng, measures have been taken to prevent intrusions with ropes or installed signs, to indicate that the area is prohibited for stores. In addition, police patrol the area and warnings have been issued. As a result, there were no "stores" as seen in other regions.

The necessity of responding to these dwellings and store owners in this plan as environmental concerns depends on the physical scope of the environmental assessment by the MOE (e.g., within several kilometers in radius). If it is judged that an approach to the target resident or the store owner is necessary based on the results of the assessment, the response is decided after discussions with provincial governments. The MOE established guidelines on resettlement (July 2021) in compliance with these guidelines. It is considered necessary for the project owner to consider the

possibility of litigation against noise and vibration caused by construction work.[84]

(3) Handling of Waste Generated in the Hospital

In each hospital, discharged wastes was divided into general and medical waste. In accordance with the MOE's regulations, recovery of general waste was carried out by recovery contractors approved by the MOE, and treatment of medical waste was carried out by on site incineration facilities. Only at Phnom Penh Municipal is the incineration carried out by the Red Cross facility due to air pollution since it is in a highly populated area. The following table summarizes waste-related organizations and facilities.

**Table 3-32: Waste Management System of Each Hospital**

| | Phnom Penh | Battambang | Siem Reap | Stung Treng | Kampong Cham | Kampot | Svay Rieng |
|---|---|---|---|---|---|---|---|
| General waste (Private Recovery Operators) | Private collectors certified to be compliant with instructions from the MOE | | | | | | |
| | Cintri Cambodia. Co. LTD | Cintri Cambodia. Co. LTD | GAEA Plc. | Private partners | Cintri Cambodia. Co. LTD | GAEA Plc. | Private partners |
| Medical waste | Red Cross Collection | Incinerators (cremation, electromagnetic waves, conventional type) | Incinerator (cremation, conventional type) | Hospital incinerator (electromagnetic wave, conventional type) | Hospital incinerators (cremation, electromagnetic waves, conventional type) | Hospital incinerator (electromagnetic wave, conventional type) | Hospital incinerator (electromagnetic wave, conventional type) |
| Waste central storage | Installed but left-unlocked, waste scattering | Installed, locked, but waste scattering | Installed, but left-unlocked. Landfill is a disposal site for municipal solid waste. | No installation | Installed, Locked, Labeled, thus no management problems | Installed, but left-unlocked | No installation |
| Incineration ash AND placenta and organic waste pits (storage containers) | Red Cross Collection | Both of them were installed on the premises, sealed, but drug vials were left unattended. | Both are installed on the premises. | Neither is installed on the premises (left in the vicinity or buried in the soil). | Installation on site, no problem | Only placenta pits on the site. Incineration ash left in the vicinity | No incineration ash or placental pit (left in the vicinity or buried in the soil) |
| Pharmaceutical and antibiotic waste | The amount of waste is small, but if it occurs, the Provincial health Department (PHD) collects and processes it. | | | | | | |

Source: JICA survey team

[84] Guidebook for involuntary resettlement
https://drive.google.com/file/d/1c6hAKAiOfAskkL6IHMlqhZUSJUHtEEdm/view

| | |
|---|---|
|   |   |
| Conventional type incinerators can take up a higher volume of waste at a time, yet the gas exhaust and major ash are the concern | Microwave type incinerator and their process waste are abandoned around the facility. |

(4) Current Status and Challenges of Medical Waste in Hospitals

The importance of proper disposal of medical waste lies in the high risk of the failure of proper disposal. These risks include transmission of pathogens, injuries during handling, air, soil, and water pollution, ecosystem impacts (rivers and wildlife), and social impacts. For these reasons, insufficient human resource development for the safe handling of resources, infrastructure, and medical waste managers has become a problem.[85]

In the management of waste in the hospital, it is necessary to confirm the response in two stages: 1) handling of waste in each ward where it has occurred, and 2) management from the ward to the final treatment. Although there are some differences among the hospitals observed, since the waste disposal system is a soft component that varies on a daily basis, in this section the challenges and the background of the challenges are analyzed without identifying/mentioning the particular hospital.

1) Handling of waste in each ward:

At all hospitals, medical waste sorting posters, produced by the United States Agency for International Development (USAID) were placed, and personnel were well informed of the basics of medical waste sorting. Specifically, infectious, pathological, sharps, chemical, pharmaceutical, heavy metal, cytotoxic, radioactive waste categories and containers (with lids), the utilization of proper poly bags, and the origin at the predetermined location were arranged and handled. USAID updated its technical guidelines for medical waste in 2019. In Cambodia, an incinerator for the treatment of medical waste was provided in cooperation with UNICEF. Also with Chinese governmental funding, UNDP carried out projects to strengthen the capacity to dispose of medical

[85] Sector Environmental Guidelines Healthcare Waste (USAID)
https://www.usaid.gov/sites/default/files/documents/1864/FINAL_HCW_SEG_508_12.02.19.pdf

waste.[86, 87]

Issues that have been sporadically identified:

| Proper processing | | Current situation |
|---|---|---|
| Labeled trash collection containers. | → | Trash is scattered in the hospital. |
| Sorting of general waste vs. medical waste | → | Mixed due to lack of thorough installation of containers. |
| Use a capped container or large enough bags for trash and collect them when 80% full to make sure sealing of the container. | → | The lid is stuffed to the extent that it does not close/seal and is left untouched. |
| Prevent exposure of the medical waste collection containers to direct sunlight or rain. | → | Left outdoors, exposed to rain and sunlight. |
| Medical waste uses a dedicated, poly bag that is highly durable. | → | Dedicated bags are not supplied on time. Because these are expensive, general garbage bags are used, and durability is low. |

Source: JICA survey team

| | |
|---|---|
|  |  |
| Organic waste disposal bags (operating rooms) that are suspected to be reused due to blood adherence | Collection of medical waste in isolated wards is not catching up. |
|  |  |
| Medical waste separation containers and plastic bags match in color, so there is no confusion. | All the plastic bags inside are black (for general waste) and may be confused at the time of collection. |

[86] Addfield :12Installations across Cambodia https://addfield.com/case-studies/medical-waste-cambodia/
[87] United Nations Development Programme in Cambodia: https://www.kh.undp.org/content/cambodia/en/home/projects/sscaf-covid-19-regional-project---learning-from-chinas-experienc.html

Background of identified challenges:

- Regarding waste disposal in hospitals, each ward introduces the use of trash cans and sorting at the time of briefing to the new patients and their visitors. In Cambodia, since the care of most hospitalized patients was provided by their family members, relatives, and visitors who tend to change from time to time, it is difficult to ensure a thorough understanding of the contents of the briefing.
- Though the impact of the COVID-19 pandemic seemed to be large, the import of the exclusive poly bag for the medical waste was stagnant, causing prices to rise and resulting in a shortage of the product. Even at one of the national hospitals visited, the COVID-19 crisis had resulted in a ten-day shortage of poly bags for medical waste.
- There is a high turnover rate of cleaners to keep up with regulations. The high risk of infection may be attributed to the impact of COVID-19 on inpatients and hospital income declines resulted in lower wages of the cleaners.

2) Final processing of waste from the wards:

In regard to solid waste, all general waste is collected by private companies (annual contracts that set the number of collections, companies that comply with the requirements of the MOE), and medical waste is collected in Phnom Penh by the Cambodian Red Cross. In other provincial hospitals, waste is disposed of by incineration and firing facilities within the facility or dumped into the site without pretreatment.

At the hospitals where central waste storage has been installed, the signs are recognizable even from a distance. International support for the placenta collection pit was also well installed, and the pit was controlled by locking it in order to prevent illegal dumping from the surrounding clinic. However, the following problems were found.

Issues that have been sporadically identified:

| Appropriate measures | | Current situation |
|---|---|---|
| Use of the introduced cremation incinerator and rapid cooling function to suppress the generation of dioxins. | → | To incinerate a large amount at a time and the handling is quite simple, the conventional type is mainly used over the cremation incinerator. |
| Periodic inspections are carried out for septic tanks for hazardous medical wastewater. | → | Regular inspections are to be carried out once every several years, but the implementation system is unknown. |
| The underground permeation system of the wastewater is functioning, and the cleaned water is discharged out of the hospital. | → | Some wards cut off the drainage pipes in response to the clogging of the drainage pipes. Construction defects are not followed up. |
| The central waste storage unit is locked and not accessible to the public. | → | No person in charge is present. Also the central storage unit is unlocked, thus general access is possible. |
| The inside of the storage unit is thoroughly and properly cleaned. | → | In some cases, waste syringes overflowed from the collection container, and scattering of glass pieces was visible. |

| | | |
|---|---|---|
| Incinerator ash is collected as general waste and disposed in designated landfills or stored in a hermetic concrete pit. | → | Incineration ash and main ash are dumped around the incinerator or in the landfill area in the hospital. The airtightness of the pit is doubtful. |
| The empty COVID-19 vaccine vials are also incinerated and disposed of accordingly. | → | An empty vial of the COVID-19 vaccine was dumped untreated (Photo below). |
| All general waste is regularly gathered and collected by contractors. | → | In some cases, general waste is incinerated in open spaces. Collection frequency is irregular. |
| For infectious waste, a radiation incinerator is used. | → | Radiation incinerator is not operated due to lack of personnel who can operate the instrument. Conventional incinerators are used instead. |
| Disabled medical equipment is confirmed, deleted from the equipment list, and properly processed (recycling, demolition, or secondhand sales) | → | The disabled medical equipment is used as a spare for usable parts, stored in a warehouse, dumped on the back of the site of a hospital, or sold to the informal sector.[88] |
| Waste treatment by type is not thoroughly implemented. | → | Incineration and disposal of dry batteries, etc. |

Source: JICA survey team

**BOX 3-6 : Amount of Waste Treated Before and After COVID-19**

It should be pointed out that this survey resulted in a visit to a hospital during the COVID-19 pandemic which is an unusual condition relative to normal years. In Cambodia, the first community-acquired infection with COVID-19 was confirmed in November 2020. In February of 2021, more than 100 people were identified for infection for the first time. As shown in the table below, the volume of waste increased rapidly in 2021.

This explains the reason for the support provided for the introduction of incinerators, as described above. Electromagnetic and cremate incinerators are inherently simple and safe operations, but there are many benefits that conventional incinerators do not offer, such as short-term detoxification, volume reduction, and noxious exhaust gas emission, resulting in pollution reduction and shredding, making them suitable for sharps/glass.

**Table 3-33: Changes in Medical and General Waste Emissions in Battambang PRH Before and After COVID-19 Pandemic**

| | Waste by weight (kg)* | | | |
|---|---|---|---|---|
| | Sharp Waste | Other Medical Waste | General Waste | Total |
| 2019 | 992 | 5,732 | 32,654 | 39,378 |
| 2020 | 899 | 5,573 | 33,652 | 40,124 |
| 2021 | 1,110 | 9,938 | 51,655 | 62,703 |

*Sum of waste recorded between June, July, and August of the year.
Prepared by the JICA survey team

[88] Interview with the Ministry of the Environment


Vials dumped between incinerator ash pits (concrete tubes) (left photograph: empty vials of COVID-19 vaccine).


Waste is scattered in the waste central storage unit within the hospital.

COVID-19 vaccine syringes have not been properly disposed.

Good practices:
In hospitals where there was overwhelmingly little abandoned trash, there were a number of “5S” signs in the hospital, and staff were cleaning. The JICA Overseas Cooperation Volunteer Activities are also supporting the 5S awareness.

3) Analysis of the background of the problems:

During the interview at each hospital, it was revealed that general and medical waste management

had received minimal attention in the hospital. Although the highest importance in waste treatment is sorting and disposal according to inappropriate procedures, there was the impression that only the sorting received suitable attention in the waste management for most the hospitals.

It was confirmed that the provision of personal protective equipment (PPE) to prevent the spread of COVID-19 was organized by the MOH and multilateral organizations, but the supervision of the destruction and disposal of this protective equipment had not yet been thoroughly explained.[89]

- In the hospitals, the waste treatment is sorely responsible by the IPC Committee. An IPC committee consisted of the head of each ward and consisted of approximately 12 members. In fact, a waste management team (WMT) is supposed to be designated separately to be responsible for managing the disposal methods, but it had not yet been organized (see Box below). The IPC team acts only in accordance with IPC guidelines (2010 or 2017). In other words, the health care waste management guidelines of MOH/WHO (2011) had not been well-informed or introduced.
- Especially in hospitals where there was a problem with waste disposal, most of the IPC-related training sponsored by MOH is attended by managers such as the deputy director, and no direct guidance is given to practitioners.
- Group vaccinations for COVID-19 resulted in the generation of large quantities of syringes and other consumables of medical waste in a short period of time, but no guidance or cost support for waste disposal had been provided by MoH/MoE at the time of distribution.
- Collection dates, wards, and quantities are not recorded (tracked) in some provinces and are not managed until final disposal, so it cannot be confirmed if materials were dumped inappropriately.
- The characteristics of electromagnetic waves and cremation incinerators are not well known, and technical training has not been provided. Electromagnetic and cremation incinerators are originally simple and safe operations. They have many advantages not found in older incinerators, such as detoxification in a short period of time, volume reduction rate, no discharge of harmful exhaust gases resulting in pollution reduction and the crushing of sharps/glass. With such advantages, many incinerators have been introduced since the COVID-19 pandemic,[90,91] yet the practitioners are not well informed on these facts.
- Cremations are expensive for diesel fuel, and electromagnetic firing furnaces may be unsuitable for Cambodia, where electricity costs are relatively expensive.
- In particular, the MOE has not yet examined measures for e-waste of medical equipment. At

[89]UNDP, Ministry began medical waste project | Phnom Penh Post
[90] Phnom Penh Post:50 new furnaces burn 100 tons of COVID waste daily | Phnom Penh Posthttps://phnompenhpost.com/national/50-new-furnaces-burn-100-tonnes-covid-waste-daily
[91] Construction & Property News: New Large-Scale COVID-19 Waste Incinerators Begin Operation https://construction-property.com/four-new-large-scale-covid-19-waste-incinerators-begin-operation/

present, reselling to the informal sector is the only means (interview with the MOE). In reality, however, it is difficult to sell used medical equipment that lacks proper maintenance. The construction of a dismantling facility is currently discussed with private companies (interview with the MOE). Export guidance for the disposal of medical equipment has not been developed.

### 3-7 Challenges and Opportunities of the Health System

Major challenges and opportunities of the target hospitals in relation to the medical service provision are summarized below.

In terms of CPA 3 services, Siem Reap, Battambang and Kampong Cham Provincial Hospitals provided sufficient general medical services as per CPA3 standards. The other four hospitals tend to provide inadequate general medical treatment, particularly for severe cases such as heart failure, chronic kindly diseases, or severe pneumonia. For general surgery, while all hospitals provided minor surgeries, it was not sufficient for the treatment of severe cases except for Siem Reap and Battambang. In addition, ICU and emergency services were inadequate at all hospitals.

For advanced medical services, Siem Reap, Battambang and Kampong Cham Provincial Hospitals provided more or less appropriate levels of services in the NCD-related clinical departments such as gastroenterology, pulmonology, and orthopaedics. For cardiology and neurology, advanced treatments such as PCI or surgery were not provided at any of the hospitals.

In terms of cancer, while the three hospitals mentioned above conducted surgeries on some parts, chemotherapy and radiation therapy were not performed at any of the hospitals.

Regarding human resources, the required number of health personnel as per the CPA 3 standards is in general achieved at the target hospitals. However, there is a shortage of specialist doctors compared with national hospitals, particularly at Stung Treng, Svay Rieng, and Kampot Hospitals. As for pre-service trainings for specialist doctors, programs in a total of 21 disciplines are offered at UHS. Although the number of graduates from each program is in general limited to less than 10 annually, specialists in various fields including oncology and cardiology enter the field every year. Opportunities for in-service training/OJT for advanced medical services are reportedly limited. However, while it often depends on the director's visions and personal networks, advanced medical service trainings are organized at some of the target hospitals in collaboration with national hospitals, other provincial hospitals as well as private hospitals.

# Chapter 4 Proposed Implementation of the Regional Hospital Development Plan

## 4-1 Justification

### 4-1-1 Relevant Challenges and Efforts in Cambodia

The key findings of the survey indicated the gaps of the health system in responding to the health needs of the Cambodian people. In relation to epidemiological trends, Cambodia is experiencing an increased burden of NCDs with the aging population. The survey revealed the shortage of specialized doctors to provide advanced medical services for NCDs at a subnational level. Resources to deal with NCDs are concentrated at the national level, and high proportions of patients with major NCDs are treated at national hospitals. The increasing burden of NCDs and the lack of adequate access to quality health services poses great challenges for health financing while Cambodian households are still grappling with high OOP spending.

Against this backdrop, the government of Cambodia has accelerated its efforts to address regional disparities in access to and coverage of quality health services including NCDs through recent health policies (e.g., HSP3, National Strategic Plan for the Prevention and Control of NCDs (2013-2020)). The HSP4, which is in the drafting process, would reportedly aim to ensure an approach to high quality clinical management of NCDs for people in Cambodia as part of the goals in 2030 and expect to take further steps by introducing regional hospitals in the public health service delivery system under the auspices of MOH, specifically at the tertiary level in addition to the existing national hospitals. Although definitions, roles, and types of services of regional hospitals have yet to be finalized, they are intended to provide a higher level of specialty care with highly specialized equipment and expertise along with existing national hospitals.

As seemingly aimed by the HSP4, it was considered necessary to upgrade medical services to provide high quality clinical management of NCDs. Therefore, the regional hospital development plan is proposed below in this chapter to strengthen medical services of major NCD-related clinical departments of target hospitals to almost the same level as national hospitals, through improvement and modernization of the hospital infrastructure

It was found that the three target hospitals, namely Siem Reap, Battambang, and Kampong Cham Provincial Hospitals, appeared to have the necessary foundation to be upgraded as regional hospitals to provide further advanced medical services including for cardiology, neurology and cancer treatment. However, the provision of radiation therapy was considered difficult at the target hospitals. In addition, from the perspective of improving access to advanced medical services for the regional population, diagnosis and treatment for major NCD-related clinical departments could be strengthened at the other four hospitals.

It is critical to deploy necessary human resources particularly specialist doctors at the target hospitals for the upgrading as regional hospitals. Details of the required human resources are explained in 4-3-2. While, at present, there is a shortage of specialists at the target hospitals, the MOH was of the opinion that it could be feasible to allocate the necessary human resources in the next ten years. In addition, it is also possible to train the existing personnel at each hospital to provide required advanced medical services through measures such as the institutionalization of in-service training including OJT in national hospitals. It is also expected that digitalization will be enhanced in the health sector based on the planned national digital health strategy to strengthen the functions of regional hospitals including the skill development.

### 4-1-2 Overall Framework of Regional Hospital Development

In light of the situation where the conceptualization of regional hospitals is in the early stages of MOH's policy development process, the survey team facilitated discussions with stakeholders including MOH, MEF, provincial departments/hospitals, and development partners to put together a proposal of the overall objective, functions, vision and a roadmap for the regional hospital development. The framework explained below is expected to be incorporated into MOH's future policies, plans and programs including the HSP4.

**Table 4-1: Proposed Objective and Functions of Regional Hospitals**

| | |
|---|---|
| **Objective of regional hospital development** | To serve as referral hospitals for provincial hospitals and health facilities at the lower levels as well as for the general population in order to reduce the regional disparity of advanced medical services and NCD-related patient concentration in national hospitals |
| **Functions of regional hospital** | 1) Provision of advanced medical services as Regional Referral Hospitals (e.g., cardiology, neurology)<br>2) Provision of medical education/training particularly for advanced medical skills<br>3) Provision of technical supervision to the lower level health units |

As illustrated below, the proposed vision for the regional hospital development entails steps to achieve the overall objective vis-à-vis the plan proposed by this survey. The immediate target through the plan is to achieve the coverage of one regional hospital per 2-2.5 million population, hence 4-7 regional hospitals in total. This number is considered appropriate when referring to neighboring countries such as Thailand and Vietnam, in which one tertiary hospital covers 2 million population.[92] The level of coverage is also in line with the current plan drafted by MOH for the HSP4 as discussed in Chapter 2: one regional hospital per 2-3 million. Beyond 2030, MOH is expected to continue the efforts to develop more regional hospitals in order to achieve the objective.

[92] Calculated based on the following sources: https://www.who.int/vietnam/health-topics/hospitals (WHO); https://www.ispor.org/docs/default-source/conference-ap-2018/thai-1st-plenary-for-handouts.pdf?sfvrsn=268f61e4_0 (MOH Thailand).

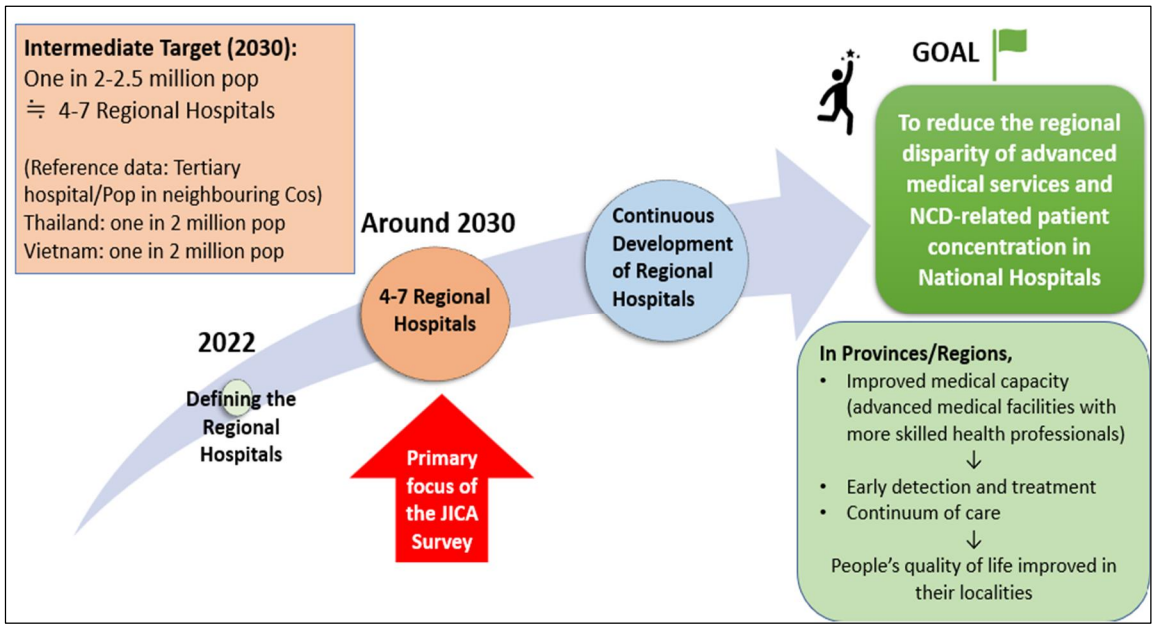



**Figure 4-1: Proposed Vision for Regional Hospital Development**

Source: JICA survey team

Based on the proposed vision, the survey team also discussed the rough timeline for the regional hospital development as a roadmap as explained below. The primary focus of this survey is written in red, showing how and when the plan will contribute to the overall vision of MOH. As mentioned below in the first phase of the roadmap, it is essential that the overall strategies and details of the regional hospital development will be officially stipulated in the HSP4 and/or the hospital development plan, followed by the defining of the legal status and management structures. The target municipal and provincial hospitals are currently under the jurisdiction of the local governments due to the D&D policy. The expectation of the regional hospitals to become semi-autonomous (i.e., PAI) as practiced by the national hospitals has been discussed with MOH and MEF. A clear decision on the legal status and successful transition of the hospitals as per the decision is essential for the realization of the regional hospital development.

**Table 4-2: MOH's Provisional Roadmap for Regional Hospital Development**

| Phase | Action | Time flame |
|---|---|---|
| Defining the functions/ requirements/targets | 1. Finalization of HSP4<br>2. Formulation of Hospital Development Plan (MoH/WB) | 1. 2022<br>2. 2022 |
| Defining the legal status, etc. | 1. MoH and MEF to discuss the legal status and management bodies (MoH or provinces) of Regional Hospitals | To be determined (TBD) |
| Upgrading the clinical capacity including infrastructure | 1. 7 Regional Hospitals' infrastructure development<br>2. Capacity development of relevant medical professionals<br>3. Further development by MoH with support of partners as required | 1. 2030<br>2. 2030<br>3. TBD |
| Upgrading the hospital management capacity | 1. Hospital management capacity development<br>2. Further development by MoH with support of partners as required | 1. 2030<br>2. TBD |

Source: JICA survey team

The proposed plan for regional hospital development including human resource development plan is summarized below.

## 4-2 Regional Hospital Development Plan

### 4-2-1 Objective

The objective is to reduce the regional disparity of medical care through upgrading the target municipal and provincial hospitals by strengthening their advanced medical services and CPA3 functions as regional hospitals.

### 4-2-2 Target Sites

The MOH has proposed that the following seven municipal and provincial hospitals be upgraded to regional hospitals.

| | |
|---|---|
| Municipal Hospital | Phnom Penh |
| Provincial Hospital | Stung Treng, Svay Rieng, Kampong Cham, Kampot, Battambang and Siem Reap |

The detailed selection process is summarized below.

**Table 4-3: Selection Criteria and Definition**

| | Criteria | Definition |
|---|---|---|
| 1 | Geographical distribution following the current location of regional training centers | Province with a Regional Training Center |
| 2 | Accessibility and population size | Province with one million population and over or 100 pop/km2 and over (2019) |
| 3 | The existing facility infrastructures including land availability | Provincial hospitals with conducive facility infrastructure such as building standards, land availability and distance based on the CPA guideline |

| | | |
|---|---|---|
| 4 | Current clinical capacity of the hospitals including human resources | Provincial hospital with higher numbers of Ips for stroke, ischemic heart disease and cirrhosis (HMIS 2020) |
| 5 | Potential areas for economic development and popular tourism destination | Province with more than 5% of the total number of the national establishment (Economic Census 2011) and recent development of Special Economic Zone |

Source: JICA survey team

The provinces that met the selection criteria are marked with an X. Next, the provinces with more X marks, highlighted in blue, were selected with consideration of geographic distribution (Table 4-4).

**Table 4-4: Selection Results**

| CA*1 | No | Province | 1) RTC | 2) Population | 3) Hospital infrastructure | 4) Clinical capacity | 5) Economic potential |
|---|---|---|---|---|---|---|---|
| 1 | 1 | Stung Treng | X | | X | | |
| | 2 | Ratanak Kiri | | | | | |
| | 3 | Mondul Kiri | | | | | |
| 2 | 4 | Kampong Cham | X | X | X | X | X |
| | 5 | Kratie | | | | X | |
| | 6 | Kampong Thom | | | | X | |
| | 7 | Tbong Khmum | | | X | | |
| 3 | 8 | Svay Rieng | | X | X | X | X |
| | 9 | Prey Veng | | X | X | | X |
| 4 | 10 | Phnom Penh | X | X | X | | |
| | 11 | Kampong Chhnang | | | | | |
| | 12 | Kampong Speu | | X | | | |
| | 13 | Kandal | | X | | | X |
| | 14 | Takeo | | X | | | X |
| 5 | 15 | Kampot | X | X | X | X | X |
| | 16 | Kep | | X | | | |
| | 17 | Sihanoukville | | X | | | |
| | 18 | Koh Kong | | | | | |
| 6 | 19 | Battambang | X | X | X | X | X |
| | 20 | Banteay Meanchey | | X | X | | |
| | 21 | Pailin | | | | | |
| | 22 | Pursat | | | | | |
| 7 | 23 | Siem Reap | | X | X | X | X |
| | 24 | Oddar Meanchey | | | | | |
| | 25 | Preah Vihear | | | | | |

Note: *1= The numbering of CA (catchment areas) corresponds to the numbering in Figure 4-2

### 4-2-3 Strategy

(1) Strengthening the focused areas of advanced medical services

Selection of the clinical fields (Table 4-5Table 4-5) in which advanced medical services are to be strengthened was done based on the following factors:

(i) Diseases with a high burden as a major cause of death;

(ii) Concentration of patients in the national hospitals; and

(iii) Diseases affecting the life prognosis.

**Table 4-5: Focused Clinical Fields to be Strengthened**

| | |
|---|---|
| 1 Orthopaedics | 5. Pulmonology |
| 2-1. Cardiology | 6-1. Neurology |
| 2-2. Cardiothoracic surgery | 6-2. Neurosurgery |
| 3-1. Gastroenterology | 7-1. Medical oncology |
| 3-2. Surgical gastroenterology | 7-2. Surgical oncology |
| 4. Urology | |

(2) Upgrading to two types of hospitals with advanced medical services – Type A and Type B

Based on the current clinical capacity of target hospitals, it is proposed to support the upgrading of selected advanced treatments for cancer, cardiology and neurology, namely chemotherapy, PCI, and surgery, only in Siem Reap, Battambang and Kampong Cham Provincial Hospitals. The remaining advanced medical services are strengthened for all target hospitals as shown below.

**Table 4-6: Advanced Medical Services to be Strengthened by Type**

| Type | Hospital | Clinical fields to be strengthened (both medicine and surgery are included) | | |
|---|---|---|---|---|
| | | Gastroenterology, Urology, Pulmonology, Orthopedics | Oncology | Cardiology, Neurology |
| A | Siem Reap<br>Battambang<br>Kampong Cham | Same level as national hospitals for diagnosis and treatment (Radiology: MRI, CT, X-lay, X-TV, mammography) | Pathology, Surgery, Chemotherapy, General medicine, Palliative care | Diagnosis, General medicine, PCI, surgery (same level as national hospital) |
| B | Kampot<br>Stung Treng<br>Phnom Penh<br>Svay Rieng | | Pathology, General medicine/follow up, palliative care | Diagnosis, General medicine |

The detailed advanced medical services to be strengthened for each clinical field and target diseases are listed below

**Table 4-7: Advanced Medical Services for Type A Hospitals**

| Clinical Field | Targeted Disease | Advanced Medical Service |
|---|---|---|
| Oncology | Cancer (chest, abdomen, gynecology, nephrology, thyroid, leukemia) | Pathological diagnosis, surgery, chemotherapy, palliative care |

| | | |
|---|---|---|
| Cardiology | Myocardial infarction, angina pectoris | PCI, cardiovascular surgery |
| Neurology | Stroke, head trauma, brain tumor | Neurological surgery, rehabilitation |
| Orthopedics | Severe trauma | Operation for severe surgical case |
| Urology | Ureter stones | Percutaneous surgery |
| Gastroenterology | Severe gastroenteric disease | Gastroenterological care |

**Table 4-8: Advanced Medical Services for Type B Hospitals**

| Clinical Field | Targeted Disease | Advanced Medical Service |
|---|---|---|
| Oncology | Cancer (chest, abdomen, gynecology, nephrology, thyroid, leukemia) | Pathology, palliative care |
| Cardiology | Myocardial infarction, angina pectoris, | Diagnosis, general medicine |
| Neurology | Stroke, head trauma, brain tumor | Diagnosis, general medicine, rehabilitation |
| Orthopedics | Severe trauma | Operation for severe surgical case |
| Urology | Ureter stones | Percutaneous surgery |
| Gastroenterology | Severe gastroenteric disease | Gastroenterological care |

(3) Strengthening CPA 3 functions

Strengthening of CPA 3 functions is supported as required depending on each hospital's circumstance.

(4) Strengthening training functions for advanced medical services

The training function of Type A hospitals will be strengthened particularly for advanced medical services.

(5) Establishing catchment areas of the regional hospitals

The provisional catchment areas for the seven regional hospitals and the one for advanced treatment with three Type A hospitals and national hospitals in Phnom Penh are illustrated below.

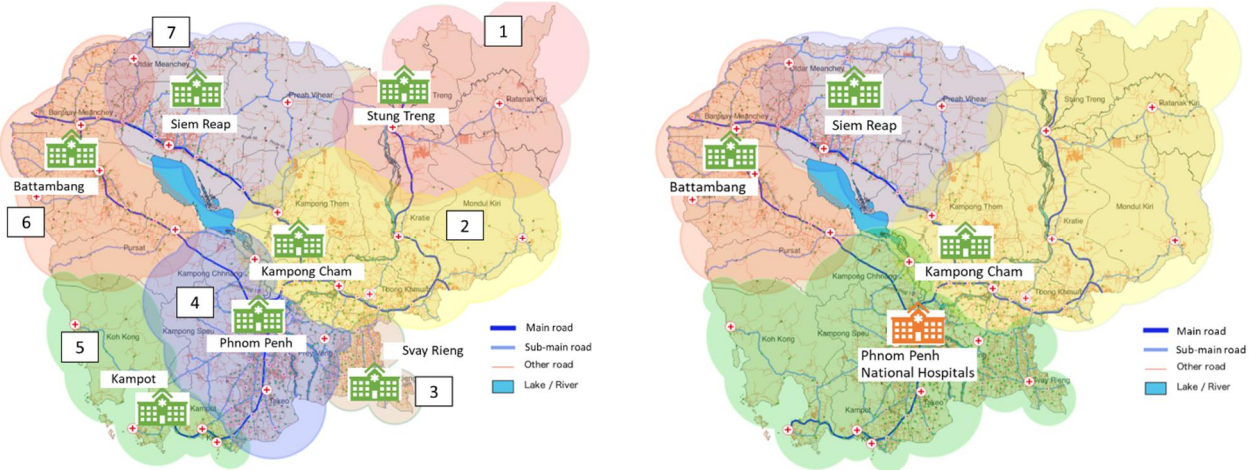



**Figure 4-2: Catchment Areas of 7 Regional Hospitals (left) and Catchment Areas with 3 Regional Hospitals and National Hospitals (right)**

### 4-2-4 Component

The plan has two components as seen below.

**Table 4-9: Components and Facilities**

| | Components | Target facilities |
|---|---|---|
| 1 | Upgrading provincial hospitals to Type A hospitals (facilities and medical equipment) | Siem Reap Provincial Hospital<br>Battambang Provincial Hospital<br>Kampong Cham Provincial Hospital |
| 2 | Strengthening municipal and provincial hospitals as Type B hospitals (facilities and medical equipment) | Kampot Provincial Hospital<br>Stung Treng Provincial Hospital<br>Svay Rieng Provincial Hospital<br>Phnom Penh Municipal Hospital |

### 4-2-5 Expected Outcomes

The following outcomes are expected as a result of the development of regional hospitals:

(1) Demand Side

- People's quality of life will be improved through early detection and treatment.
- Continuum of care will be improved through better access to nearby facilities.
- Travel time and cost to patients and their families to seek advanced medical services will be reduced.
- Overall patient waiting time for the advanced medical services will be reduced.

(2) Supply Side

- Regional medical capacity will be improved, which will also encourage health personnel to work in the regions.
- New medical services such as regular medical check-ups for workplaces can be created to increase the hospital's income.
- Regional hospitals can be the destination for medical tourism for neighboring countries.

## 4-3 Proposed Design for Regional Hospital Development Plan

Below is the proposed design if the regional hospital development plan is supported by the JICA loan project.

### 4-3-1 Outline of the Design

(1) Overall Facility Plan

1) Outline of the Facility Plan

The key components of the facility plan for the Type A hospitals are to establish the new Advanced Medical Service Department and improve and modernize the facilities for the General

Medical Service Department as a regional hospital. The plan for Type B hospitals aims to strengthen the diagnostic functions of the Advanced Medical Service Department and improve and modernize the General Medical Service Department.

Each type of hospital will be composed of the following medical service departments:

**Table 4-10: Main Medical Service Departments**

| Medical Service Department | | Type A | Type B |
|---|---|---|---|
| Out-patient Department (Advanced and General Medical Services) | | ✓ | ✓ |
| Chemotherapy Out-patient Department | | ✓ | |
| Diagnostic Imaging Department | | ✓ | ✓ |
| Endoscopy Department | | ✓ | ✓ |
| Laboratory Department | | ✓ | ✓ |
| Physiological Department | | ✓ | ✓ |
| Medicine Supply Department | | ✓ | ✓ |
| Operation Department | Advanced Medical Service | ✓ | |
| | General Medical Service | Existing Facility | ✓ |
| ICU Department | Surgical/Internal Medicine | ✓ | ✓ |
| Angiography Department | | ✓ | |
| Physiotherapy Department | | ✓ | ✓ |
| Patient Ward | | ✓ | ✓ |
| Teaching and Training Department | | ✓ | ✓ |

The number of beds proposed for each target hospital is shown below.

**Table 4-11: Number of Beds Proposed for Each Target Hospital**

| Facility | | Battambang | Siem Reap | Kampong Cham |
|---|---|---|---|---|
| **Existing Facility** | **General bed** | 195 | 80 | 201 |
| | **ER** | 10 | 9 | 6 |
| | **Surgical ICU** | 10 | 23 | 8 |
| **Sub-total (A)** | | 215 | 112 | 205 |
| **Advanced Medical Service Block** | **General bed** | 292 | 106 | 106 |
| | **ICU** | 12 | 12 | 12 |
| | **HCU** | 40 | 20 | 20 |
| **General Medical Service Block** | **General bed** | 192 | 368 | 133 |
| | **Internal ICU** | 19 | 24 | 17 |
| **Sub-total(B)** | | 555 | 530 | 288 |
| **Total (A)+(B)** | | **770** | **642** | **503** |

| Facility | | Stung Treng | Phnom Penh | Kampot | Svay Rieng |
|---|---|---|---|---|---|
| **Existing Facility** | **General bed** | | | 92 | 72 |
| | **ER** | | | | 7 |
| | **Surgical ICU** | | | | 6 |
| **Sub-total (A)** | | | | 92 | 85 |
| **General Medical Service Block** | **General bed** | 323 | 280 | 402 | 189 |
| | **ER** | 10 | 8 | 8 | |
| | **Surgical ICU** | 12 | 12 | 12 | |
| | **Internal ICU** | 16 | 16 | 16 | 16 |
| **Sub-total (B)** | | 361 | 316 | 438 | 205 |
| **Total (A)+(B)** | | **361** | **316** | **530** | **290** |

2) Design Summary of Each Medical Service Department

**Out-patient Department**

For the General Medical Service Department, it is planned to set up consulting rooms for CPA3 standard medical services and consulting rooms for hypertension, diabetes, HIV, and psychiatry. Each treatment room will have a service corridor in the back of the room for workability for the nurses.

For the Advanced Medical Services Department, consulting rooms are planned for the Neurology, Gastroenterology, Orthopedics, Respiratory, Oral Surgery, Urology, Gynecology, Breast Surgery, and Cardiology Departments. A common treatment room is planned for each consulting room, and a service corridor will be installed behind the consulting and treatment rooms to facilitate the nurses' working space.

**Physiological Department**

This consists of an intravenous room, consulting room, waiting hall, and WC.

**Diagnostic Imaging Department**

This consists of an MRI room, CT room, X-TV room, general X-ray room, ultrasound room, PACS server room, operation room, and staff room. For the control room, each diagnostic imaging equipment will be operated in the same room, taking into consideration the workability and livability of the radiology technologists.

**Endoscopy Department**

This consists of an upper endoscopy room, a lower endoscopy room, a waiting hall, a reception area, a recovery room, and a washing room.

**Laboratory Department**

This consists of blood sampling, blood transfusion, biochemical laboratory, pathology laboratory, bacterial lab, staff room, and bacterial plans in the anteroom.

**Physiological Department**

This consists of electrocardiograph (ECG), echocardiography, electroencephalogram (EEG), electromyography (EMG) machines, and a reception and waiting hall.

**Operation Department**

For the Advanced Medical Services in Type A hospitals, it is planned to create operating theaters for OBGY, orthopedics, abdominal uro-surgery, neurosurgery, a hybrid operating theater, as well as a CSSD and recovery room. The hybrid operating rooms are planned to be air-conditioned at a clean level of 100, and the other operating rooms will be air-conditioned at a clean level of 10,000.

For the General Medical Services in Type A and B hospitals, four operating rooms, CSSD, a recovery room, etc are planned. The operating theaters are planned to be air-conditioned with a clean level set at 10,000.

**ICU**

ICU rooms with ordinary ICU beds and ICU for infectious diseases with an attached anteroom are proposed. In Cambodia, patient care is generally provided by the patient's family, so a WC for patient caregivers should be planned in the ICU.

Access to the infectious disease ICU should be separate from general access.

The concept of the tele ICU can be proposed at the later stage of designing the plan by arranging the data control room to centrally monitor the patients of all ICUs.

**Vertical Flow Line**

While an elevator and stairways are proposed for vertical movement in the hospital, a ramp from the ground floor to the operating room should be provided in case of a power outage.

3) Overall Facility Design Policy

The main points to be considered in the regional hospital design are as follows:

i. Quality of building structures: Building strength calculations will be based on the Japanese structural standards apart from the issues related to earthquakes.
ii. Quality of building materials: Materials will be based on the Thailand Industrial Standards.
iii. Fire fighting and evacuation plan: Firefighting standards and building standards related to hazards will be in accordance with the Japanese standards.
iv. Hospital design: Hospital facilities will be in accordance with international standards.

4) Medical Service Departments supported by Japanese Grant Aid Projects and proposed Regional Hospital Development Plan

Facilities of Siem Reap, Battambang, Kampong Cham, and Svay Rieng Provincial Hospitals have been developed with support of Japanese grant aid projects. The facility plan of this plan will utilize and complement the existing medical service functions supported by the grant aid projects and develop facilities for the provision of new medical services.

The table below indicates the division of roles between the medical service departments supported by the grant aid projects and the new hospitals with additional medical service departments proposed for the plan.

**Table 4-12: Medical Service Departments Supported by JICA's Grant Aid Projects and Proposed Regional Hospital Development Plan**

| Hospital | Department | |
|---|---|---|
| | Facilities supported by Grant Aid Project | New Hospital |
| Battambang | Emergency department | Outpatient departments (surgery, internal medicine, dentistry, dermatology, urology, otolaryngology, hypertension, diabetes, psychiatry) |
| | General medical surgical department | Ophthalmology |
| | Patient wards | Physiotherapy department |
| | | Clinical laboratories |
| | | Chemotherapy department |
| | | Diagnostic imaging department |
| | | Physiology department |
| | | Endoscopy department |
| | | Specialist medical surgery department |
| | | Angiography department |
| | | Pharmaceutics |
| | | Biomedical Engineering department |
| | | Teaching and Training department |
| | | Patient wards |
| Siem Reap | Pharmaceutics | Outpatient departments (internal medicine, dentistry, dermatology, urology, otolaryngology, hypertension, diabetes, psychiatry) |
| | Emergency department | Physiotherapy department |
| | General medical surgical department | Clinical laboratories |
| | Patient wards | Chemotherapy department |
| | | Diagnostic imaging department |
| | | Physiology department |
| | | Endoscopy department |
| | | Specialist medical surgery department |
| | | Angiography department |

| | | |
|---|---|---|
| | | Pharmaceutics |
| | | Teaching and Training department |
| | | Patient wards |
| **Kampong Cham** | Emergency department | Outpatient departments (surgery, internal medicine, dentistry, dermatology, urology, otolaryngology, hypertension, diabetes, psychiatry) |
| | General medical surgical department | Physiotherapy department |
| | OBGY | Clinical laboratories |
| | Patient wards | Chemotherapy department |
| | | Diagnostic imaging department |
| | | Physiology department |
| | | Endoscopy department |
| | | Specialist medical surgery department |
| | | Angiography department |
| | | Pharmaceutics |
| | | Teaching and Training department |
| | | Patient wards |
| **Svay Rieng** | Outpatient departments (surgery) | Outpatient departments (internal medicine, dentistry, dermatology, urology, otolaryngology, hypertension, diabetes, psychiatry) |
| | Emergency department | Diagnostic imaging departments |
| | General medical surgical department | Physiology departments |
| | OBGY | Clinical laboratories |
| | Patient wards | Endoscopy departments |
| | | Physiology departments |
| | | Pharmaceutics |
| | | Teaching and Training department |
| | | Patient wards |

(2) Outline of Facility Plan for Each Hospital

A detailed facility plan of each hospital is attached as Appendix A.

**A-1 Battambang Provincial Hospital**

The site is surrounded by roads, with the main gate on the south side of the road. Temporary housing is located on the northern and western property boundaries of the site.

The main buildings include an outpatient block, a surgical block, an internal medicine ICU block, an ophthalmology block, an internal medicine obstetrics ward block, and a COVID-19 Lab. The Internal Medicine and Obstetrics Block is currently used as a facility for receiving COVID-19 critical care patients. In addition, construction of a new block and renovation of existing facilities for the Mother and Newborn Care Unit is underway with the support of KOFIH.

**Outline of the Proposed New Hospital Plan**

It is proposed to construct the Advanced Medical Service Block in the area north of the internal medicine ICU where temporary staff quarters for COVID-19 are currently located. In consideration of the future increase in the number of outpatients and the number of beds, the General Medicine Service Building will be constructed by demolishing the existing OPD block.

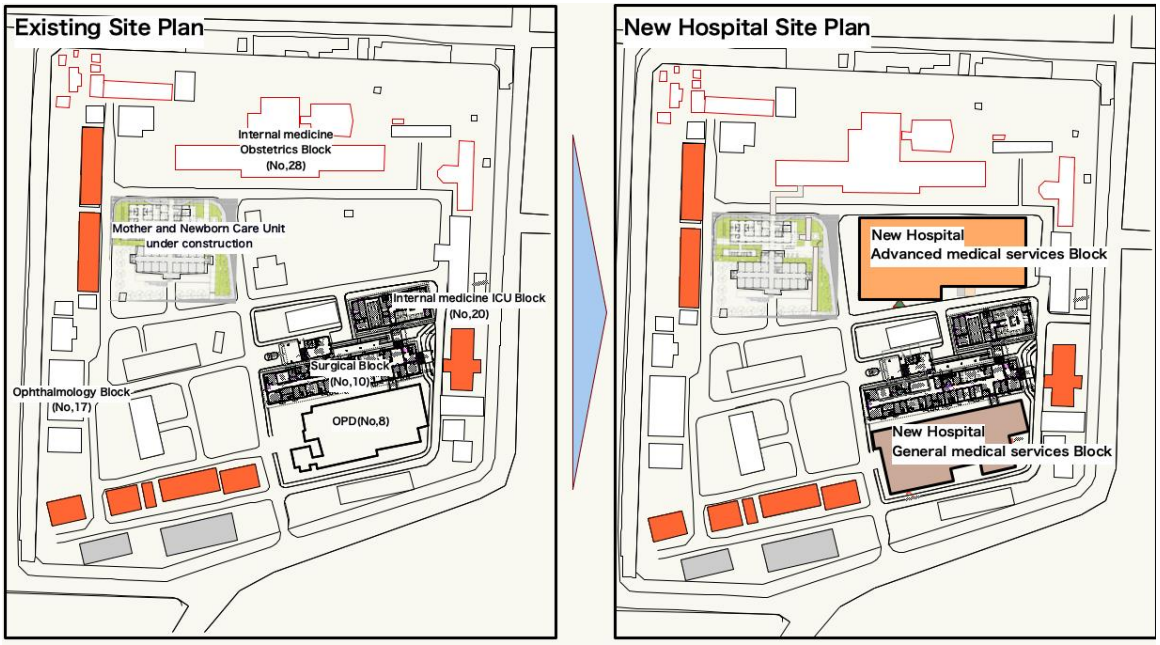



**Figure 4-3: Battambang Provincial Hospital Site Plan**

Source: JICA survey team

**Table 4-13: Layout of the Medical Service Department on Each Floor**

| Advanced Medical Services Block | | | General Medical Service Block | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | OPD<br>Chemotherapy<br>Diagnostic imaging<br>Physiological<br>Endoscopy<br>Medicine Storage/Supply<br>Biomedical Eng. | 3,341 | Ground | OPD<br>Ophthalmology<br>Physiotherapy | 2,213 |
| | | | 1st | Laboratory | 1,723 |
| | | | 2nd | Patient Ward<br>Internal medicine ICU | 1,705 |
| 1st | Operation/ICU<br>Angiography | 3,314 | 3rd | Patient Ward | 1,705 |
| 2nd | Patient Ward/HCU | 2,687 | 4th | Patient Ward | 1,705 |
| 3rd | Patient Ward/HCU | 2,687 | 5th | Patient Ward | 1,705 |
| 4th | Patient Ward/HCU | 2,687 | | | |
| 5th | Patient Ward/HCU | 2,687 | | | |
| 6th | Teaching&Training<br>Conference Hall | 1,905 | | | |
| **Total Floor Area 30,064m²** | | | | | |

## A-2 Siem Reap Provincial Hospital

The site is triangular, with the main gate located on the west side of the street. The southern site boundary is adjacent to a house facing the neighboring property. The existing main buildings include an emergency room block, an obstetrics and gynecology block, a laboratory, and a dialysis and dental block. The Emergency Surgery Block was newly constructed with Japanese grant aid, while the OBGY was built in 2013 with Korean aid, including outpatient consultation rooms for diabetes and hypertension on the first floor, as well as a CT room. Other improvements were made to the ophthalmology department with assistance from Australia. Several facilities are scattered throughout the site, many of which are dilapidated.

### Outline of the New Hospital Plan

When the Japan grand aid building is completed, there will be an outpatient operating room, an emergency room, an operating room, and a surgical ward. Internal medicine, otolaryngology, and dentistry remain in the existing facilities. Since these facilities are cramped and consist of old buildings, including these departments in the development plan for this plan will improve and enhance the hospital's functioning. A new facility for this department will be developed as the General Medical Services Building. The foundation of the Emergency Surgery Block is under construction with support of the Japanese grant aid project, with completion scheduled for June 2023. The construction of the new hospital under this plan is proposed to start in 2026, and, therefore, there will be no overlap of the construction schedule.

The construction of the new hospital will require the demolition of existing facilities (surgery, NICU, psychiatric building, pharmacy building, etc.). Since the functions of these facilities will be transferred to the new surgery building when it is completed, the plan is to dismantle these facilities and construct the new hospital.

While the construction of a heliport was proposed by the PHD, it was found to be difficult to include it in the plan due to the various assumed requirements and conditions.

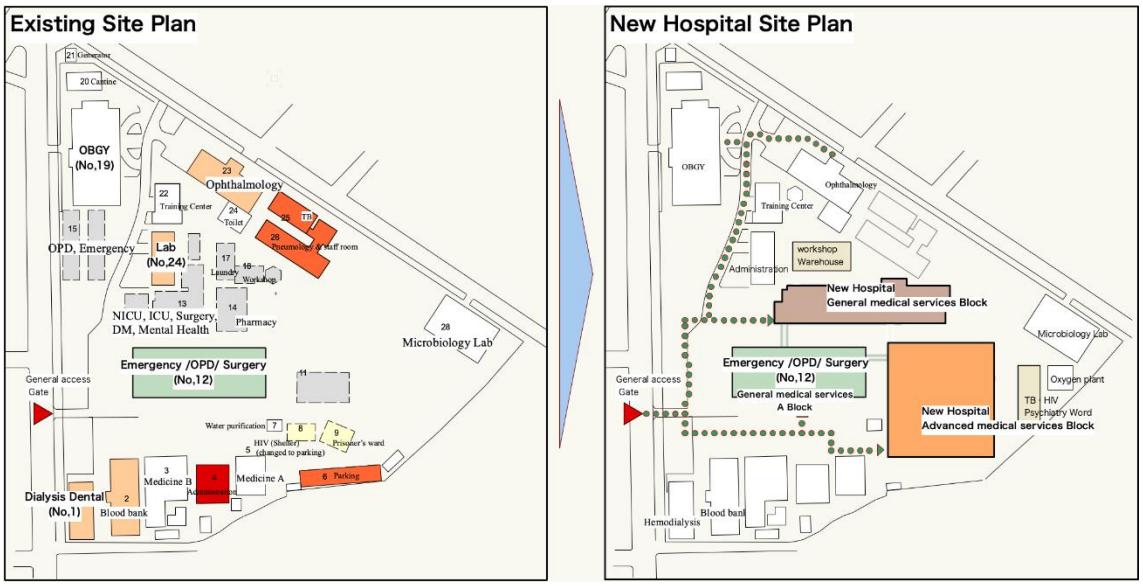



**Figure 4-4: Siem Reap Provincial Hospital Site Plan**

Source JICA survey team

**Table 4-14: Layout of the Medical Service Department on Each Floor**

| **Advanced Medical Services Block** | | | **General Medical Service Block** | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | OPD<br>Chemotherapy<br>Diagnostic imaging<br>Physiological<br>Endoscopy<br>Medicine Storage/Supply<br>Laboratory | 3,232 | Ground | OPD<br>Physiotherapy | 1,688 |
| | | | 1st | Patient Ward<br>Internal medicine ICU | 1,904 |
| | | | 2nd | Patient Ward | 1,898 |
| | | | 3rd | Patient Ward | 1,898 |
| 1st | Operation/ICU<br>Angiography | 3,333 | 4th | Patient Ward | 1,898 |
| | | | 5th | Patient Ward | 1,898 |
| 2nd | Patient Ward/HCU | 1,932 | 6th | Patient Ward | 1,898 |
| 3rd | Patient Ward/HCU | 1,932 | | | |
| 4th | Teaching&Training<br>Conference Hall | 1,264 | | | |
| | | | | | **Total Floor Area 24,775m²** |

## A-3 Kampong Cham Provincial Hospital

The site is bordered by roads on the north, east, and south sides, with a temporary store operating on the south sidewalk.

The main facilities are an OB/GYN and surgical ward, a surgical emergency ward, an ICU medical block, and an OPD triage block built with Japanese assistance. The OPD Triage Block was renovated in 2018. The CT equipment has been installed in the renovated former surgical block.

The existing three operating rooms in the surgical emergency ward are insufficient, so the old surgical block will be renovated, and two additional operating rooms will be added in the plan.

The Lab Block was built in 2013 and does not have a functional room layout. In addition, the overall building is noticeably dilapidated.

The pediatric ward, including the NICU, is dilapidated and has leaky obstructions. The ophthalmology wing is also run-down.

**Outline of the New Hospital Plan**

The new hospital will be constructed by demolishing the internal medicine ICU and the former surgery block. The construction of these buildings is old, and although the internal medicine wing has been renovated, it will not be able to handle future increases in patient volume.

The hospital has space next to the former surgical block, so the former surgical block and the internal medicine ICU facility will be demolished to build the new hospital.

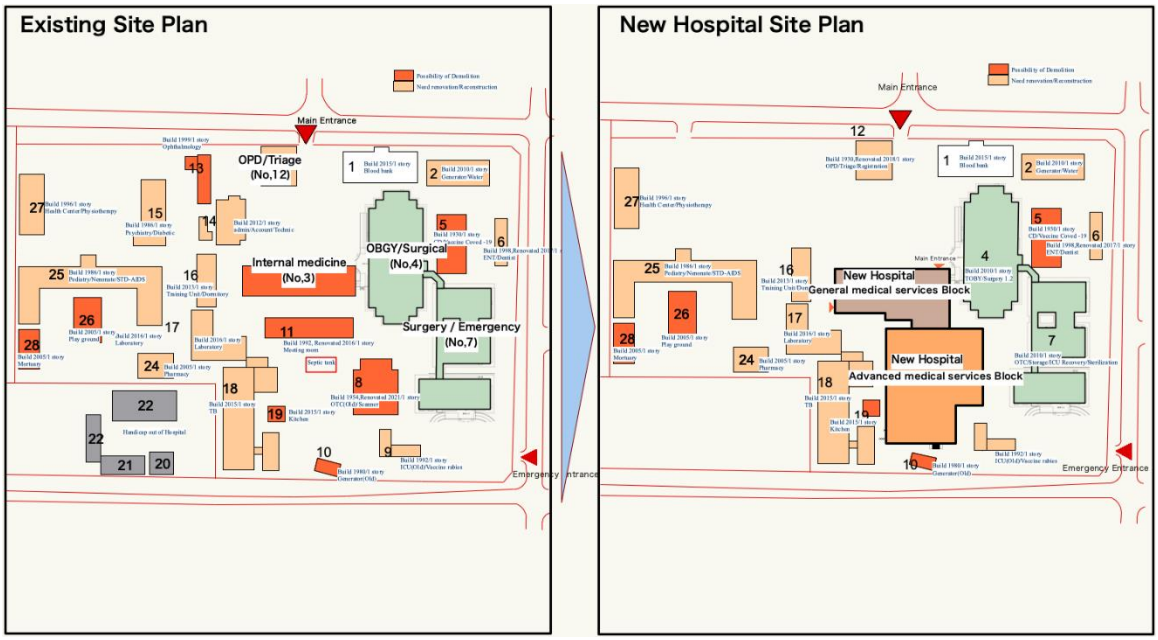



**Figure 4-5: Kampong Cham Provincial Hospital Site Plan**

Source: JICA survey team

**Table 4-15: Layout of the Medical Service Department on Each Floor**

| Advanced Medical Services Block | | | General Medical Service Block | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | OPD<br>Chemotherapy<br>Diagnostic imaging<br>Physiological<br>Endoscopy<br>Medicine Storage/Supply<br>Laboratory<br>Physiotherapy | 3,161 | Ground | OPD | 1,583 |
| | | | 1st | OPD<br>Ophthalmology | 1,377 |
| | | | 2nd | Patient Ward<br>Internal medicine ICU | 1,366 |
| | | | 3rd | Patient Ward | 1,366 |
| 1st | Operation/ICU<br>Angiography | 3,161 | 4th | Patient Ward | 1,366 |
| 2nd | Patient Ward/HCU | 1,944 | | | |
| 3rd | Patient Ward/HCU | 1,944 | | | |
| 4th | Teaching&Training<br>Conference Hall | 1,264 | | | |
| **Total Floor Area 18,532m²** | | | | | |

**B-1 Stung Treng Provincial Hospital**

The site is surrounded by roads, except for the health center and residences adjacent to the northeast side. The main buildings are the Outpatient, Emergency, and Laboratory Buildings (Buildings 1 and 2), the Surgery and Obstetrics and Gynecology Building (Building 2), the Ophthalmology Building (Building 11), the Pharmacy Building (Building 4), and the CT Building (Building 27).

The Outpatient, Emergency, and Laboratory Blocks have the basic layout of a hospital, but the design is outdated and room sizes and layout need to be improved.

In addition, there are problems with the water supply and drainage systems, and the underfloor drainage pipes are not properly connected.

Because Stung Treng district is a flood-prone area, each building is constructed with the first floor raised 1.8 meters above the ground. In addition, because the buildings are dispersed, access to each building is difficult.

As a hospital facility, it is generally cramped and inadequately equipped to provide medical services. However, due to the small size of the site, planning for improvements or new construction of the facility should be considered for a different site.

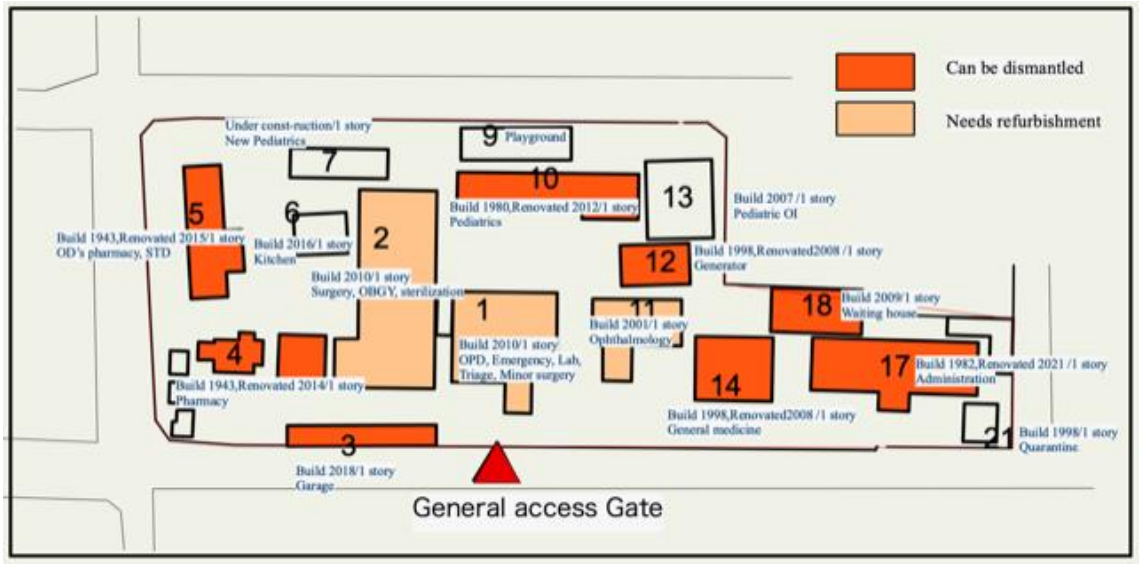



**Figure 4-6: Existing Site Plan of Stung Treng Provincial Hospital**

Source: JICA survey team

### Outline of the New Hospital Plan

The current site is too cramped and densely built-up to provide sufficient space for the new hospital.

After discussions with the hospital and PHD, it was decided that a new site for the hospital would be provided. Several sites were proposed by PHD for the new hospital. The new site is close to the city center with a distance of 3 km, close to a major access road, and sufficiently large. In addition, it will not face the problem of rainwater drainage .

The plan for the new hospital is to construct a Type B hospital with a pregnant women's accommodation facility including service departments (laundry, kitchen, waste disposal building).

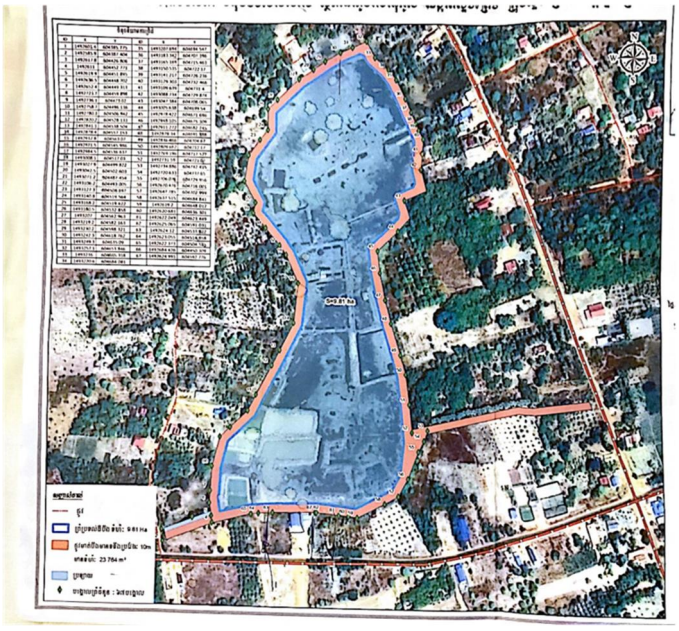


**Figure 4-7: Candidate Location Map of New Hospital Site**

Source: Stung Treng PHD


**Figure 4-8: Stung Treng Provincial Hospital Site Plan**

Source: JICA survey team

**Table 4-16: Layout of the Medical Service Department on Each Floor**

| **MAIN BLOCK (General & Advanced Medical Service)** | | | **Obstetrics and Gynecology Block** | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | OPD<br>Diagnostic imaging<br>Physiological<br>Endoscopy<br>Physiotherapy<br>Laboratory<br>Medicine Storage/Supply | 3,571 | Ground | OPD<br>Delivery<br>NICU<br>Operation | 1,218 |
| | | | 1st | Patient Ward | 1,219 |
| | | | 2nd | Patient Ward | 1,219 |
| | | | Ophthalmology Block | | |
| 1st | Operation/ICU | 3,038 | Ground | OPD<br>Operation | 366 |
| 2nd | Patient Ward/HCU<br>Internal medicine ICU | 2,426 | 1st | Patient Ward | 366 |
| 3rd | Patient Ward | 2,426 | Emergency Block | | |
| 4th | Teaching&Training<br>Conference Hall | 1,580 | Ground | Emargency | 459 |
| | | | | | |
| | | | | | **Total Floor Area 17,888m²** |

## B-2 Phnom Penh Municipal Hospital

The site is bordered by a road on the north side and the other property boundaries face adjacent land.

The facility consists of four buildings: an outpatient consultation, obstetrics, gynecology, and

general administration building (Building 1); an ophthalmology building (Building 2); a pediatrics, dentistry, and otolaryngology building (Building 3); an emergency, ICU, medical, surgical, and lab surgery department building (Building 5); and a psychiatric and pharmacy department building (Building 4).

Building No. 5 is old, and the rooms for each department, including the examination rooms, operating rooms, and sterilization rooms, are small. In addition, there is no direct access from the outside to the surgical halls, and the cleanliness and contamination zones are not always clear.

The ICU attached to the emergency department is not a room separated by walls, but is an open room with strong emergency room characteristics. This place is used, as there is no ICU in the surgical department.

**Outline of the New Hospital Plan**

The existing emergency, surgical and lab department buildings will be demolished to make way for the new hospital. During construction, those functions will be accommodated in rooms in other buildings. The hospital site is narrow and the facilities are crowded. Patients often come to the hospital by car or motorcycle, and finding parking space has become a problem.

Currently, the vacant space on the site is used for parking cars and motorcycles, but there is no space left.

The hospital has requested for the plan to consider securing a parking space for the new hospital.

In this plan, the first floor of the building is planned to be used as a parking lot.

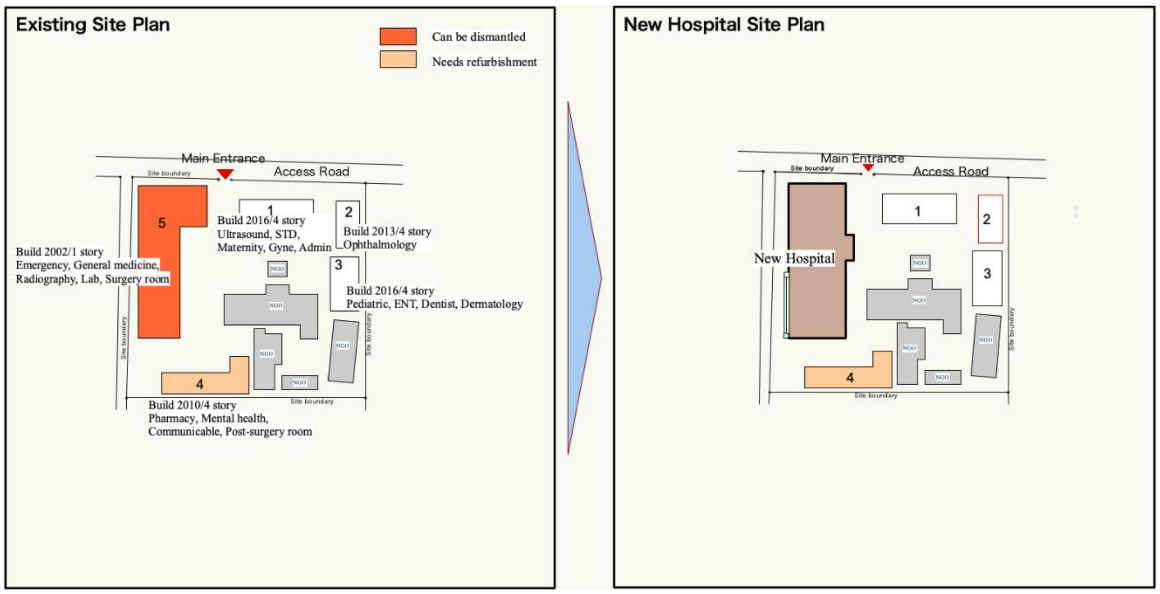



**Figure 4-9: Phnom Penh Municipal Hospital Site Plan**

Source: JICA survey team

**Table 4-17: Layout of the Medical Service Department on Each Floor**

| MAIN BLOCK (General & Advanced Medical Service) | | | | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | Emergency<br>Parking | 2,559 | 4th | Patient Ward<br>Internal medicine ICU | 2,310 |
| 1st | OPD<br>Physiological<br>Diagnostic imaging<br>Medicine storage/supply | 2,559 | 5th | Patient Ward | 2,310 |
| | | | 6th | Patient Ward | 2,310 |
| | | | 7th | Teaching&Training<br>Conference Hall | 1,646 |
| 2nd | Operation/ICU<br>Laboratory<br>Endoscopy | 2,559 | | | |
| 3rd | Obstetrics and gynecology | 2,310 | | | |
| **Total Floor Area 18,563m²** | | | | | |

## B-3 Kampot Provincial Hospital

The site is rectangular in shape and surrounded by roads.

The main facilities are divided into two parts: buildings (Nos. 1, 2, and 7) for OPD, emergency, imaging, surgery, and ICU, and a hospital ward.

The buildings (Nos. 1, 2, and 7) were constructed in 2008 and provide most of the diagnostic and therapeutic services and are currently being expanded. However, the building is deteriorating, and architectural deterioration can be seen everywhere. Some of the columns are cracked, suggesting that the foundation has settled. There are also many cracks in the walls, which show signs of rain penetration. Both the general internal medicine and pediatric wards are old and in poor condition.

### Outline of the New Hospital Plan

There is a vacant lot in the middle of the site and that space will be used for the construction of the new hospital.

The new hospital will provide most medical services, except for the ophthalmology wing, which will be supported by Australia.

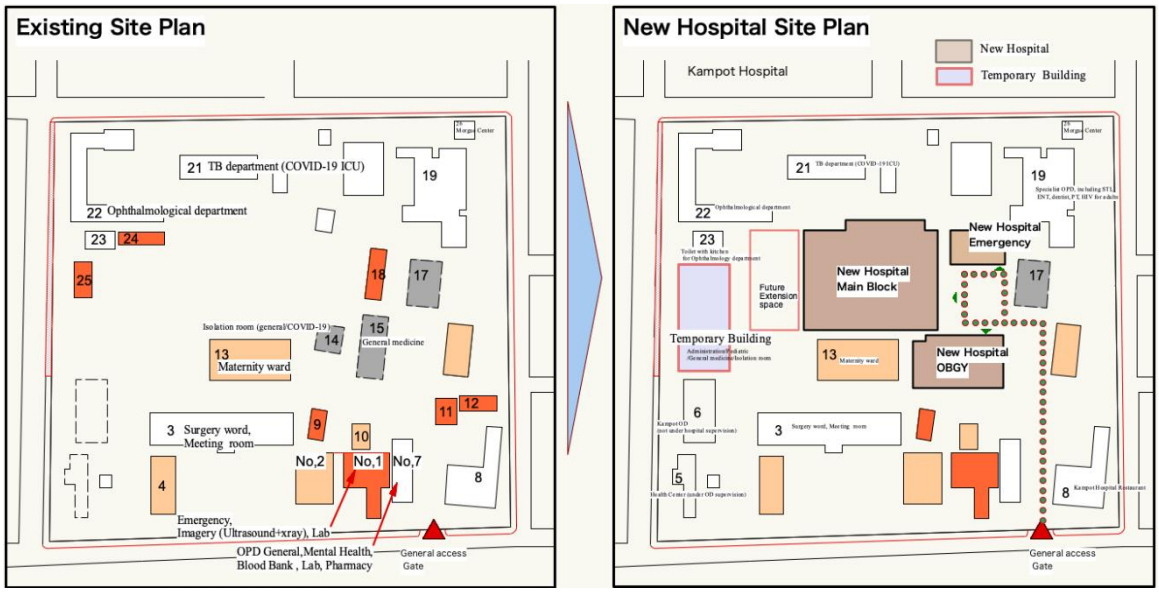



**Figure 4-10: Kampot Provincial Hospital Site Plan**

Source: JICA survey team

**Table 4-18: Layout of Medical Service Department on Each Floor**

| **MAIN BLOCK (General & Advanced Medical Service)** | | | **Obstetrics and Gynecology Block** | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | OPD<br>Diagnostic imaging<br>Physiological<br>Endoscopy<br>Physiotherapy<br>Laboratory<br>Medicine Storage/Supply | 3.553 | Ground | OPD<br>Delivery<br>NICU<br>Operation | 1,219 |
| | | | 1st | Patient Ward | 1,219 |
| | | | 2nd | Patient Ward | 1,219 |
| | | | Emergency Block | | |
| 1st | Operation/ICU | 3,056 | Ground | Emergency | 459 |
| 2nd | Patient Ward/HCU<br>Internal Medicine ICU | 2,463 | | | |
| 3rd | Patient Ward | 2,323 | | | |
| 4th | Patient Ward | 2,323 | | | |
| 5th | Patient Ward | 2,323 | | | |
| 6th | Patient Ward | 2,323 | | | |
| 7th | Teaching&Training<br>Conference Hall | 1,653 | | | |
| **Total Floor Area 22,914m²** | | | | | |

## B-4 Svay Rieng Provincial Hospital

The site is triangular and surrounded by roads. The main buildings include the Main Block (emergency/OPD/X-ray/surgery obstetrics). There are also the Administrative/Lab Block and Surgical Pediatrics Block (No.2), the Internal Medicine Disease Block (No.3), and the

Ophthalmology Block (No.5). The main block was completed in 2017 with Japanese grant aid and is the central building of the hospital.

**Outline of the New Hospital Plan**

The site does not provide space for a new hospital, so after discussions with the hospital, it was decided to demolish the medical, dental, and CT block on the west side of the main block to build a new hospital.

The facilities supported by the grant aid project are limited to strengthening the surgical and obstetric and gynecological departments, and the existing facilities providing other medical services are dilapidated and require improvement. In addition, as the provincial hospital is suggested to be a Type B hospital under the plan, services that do not exist, such as the diagnostic imaging department, will be added and strengthened.

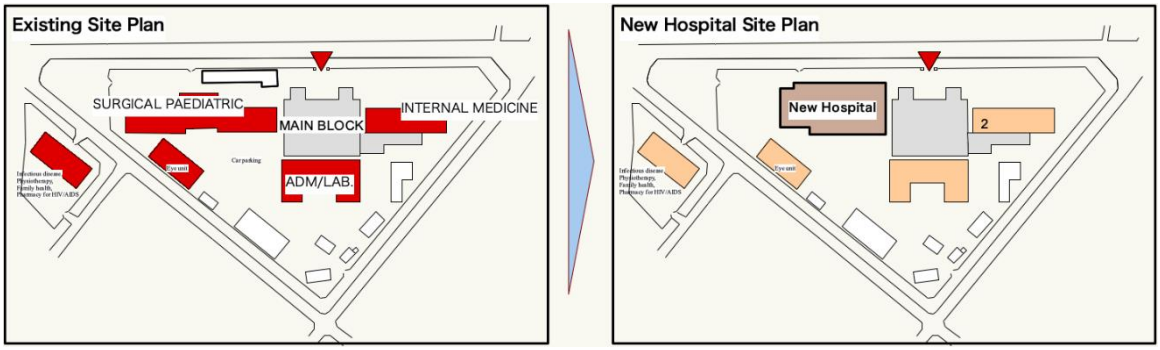



**Figure 4-11: Svay Rieng Provincial Hospital Site Plan**

Source: JICA survey team

**Table 4-19: Layout of the Medical Service Department on Each Floor**

| **MAIN BLOCK (General & Advanced Medical Service)** | | | | | |
|---|---|---|---|---|---|
| **Floor** | **Department** | **Area m²** | **Floor** | **Department** | **Area m²** |
| Ground | OPD<br>Diagnostic imaging | 1,495 | 2nd | Patient Ward<br>Internal medicine ICU | 1,271 |
| 1st | Physiological<br>Laboratory<br>Endoscopy<br>Physiotherapy<br>Medicine storage/supply | 1,271 | 3rd | Patient Ward | 1,271 |
| | | | 4th | Patient Ward | 1,271 |
| | | | 5th | Patient Ward | 1,271 |
| | | | 6th | Teaching&Training<br>Conference Hall | 1,234 |
| | | | | | |
| **Total Floor area 9,084m²** | | | | | |

(3) Operation of Hospital Facilities During a Pandemic

During a pandemic, access lines should be separated for general patients and infected patients.

1. Separation of access to the site → Set up a dedicated gate separate from the main gate
2. Separation of lines of flow within the facility → Zoning of the interior of the facility,

separating the green zone, yellow zone, and red zone (the plan should allow for separation)

3. Securing the infectious disease triage area → Secure an external space that can be protected from rain and sunlight (temporary structures are also possible)

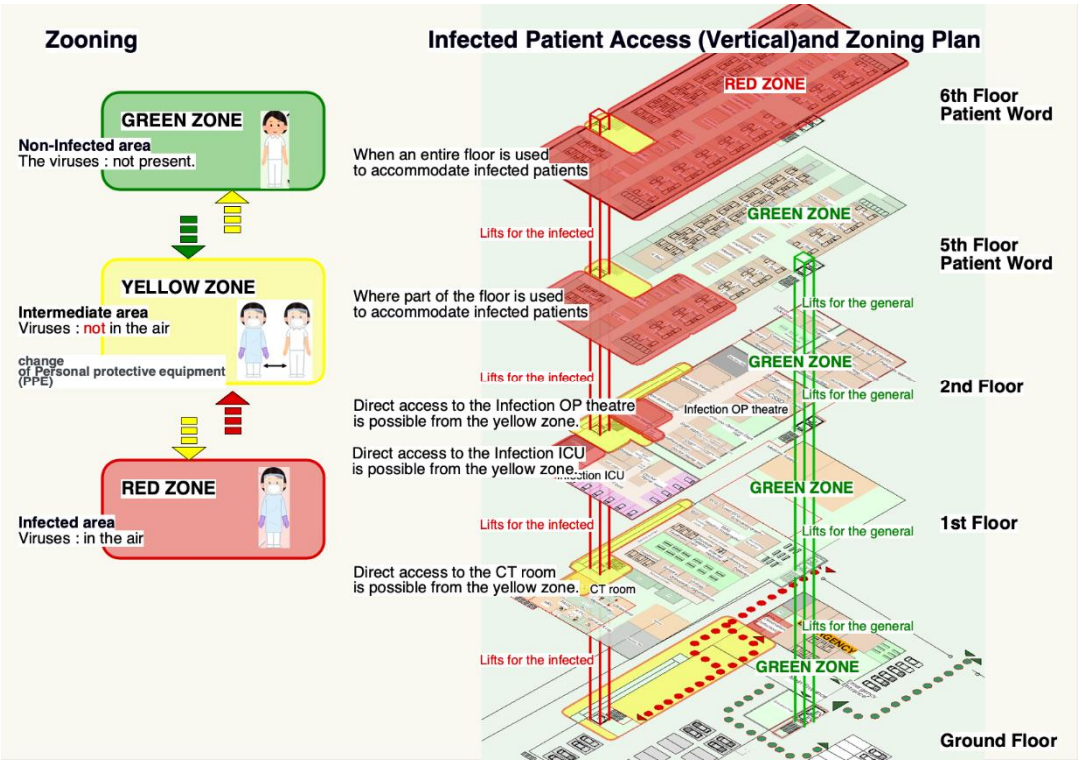



**Figure 4-12: Phnom Penh Municipal Hospital Zoning Plan During a Pandemic**

(4) Equipment Plan

Tables 4-20 and 4-21 show the main medical equipment planned for the seven target hospitals. Typical equipment planned for Type A hospitals (i.e., Siem Reap, Battambang and Kampong Cham) includes angiography used for examination and treatment for cardiovascular diseases. The detailed list of the equipment is attached as Appendix B.

**Table 4-20: Provisional List of Major Medical Equipment for Type A Hospitals**

| Medical Service Department | Major Medical Equipment |
|---|---|
| Out-patient Department | Client PC (PACS), diagnostic set, examination couch, blood pressure meter, weighing scale |
| Chemotherapy Out-patient Department | Client PC (PACS), chemotherapy reclining chair, infusion pump, syringe pump |
| Diagnostic Imaging Department | Client PC (PACS), MRI, CT, general X-ray, fluoroscopy X-ray, mammography, ultrasound |
| Endoscopy Department | Client PC (PACS), upper gastrointestinal fiberscope, upper gastrointestinal fiberscope, bronchoscope |
| Laboratory Department | Client PC (PACS), cryostat microtome, hematology analyzer, biochemistry analyzer |
| Physiological Department | Client PC (PACS), electroencephalograph (EEG), electromyography (EMG), pulmonary function analyzer |

| | | |
|---|---|---|
| Medicine Supply Department | | Client PC (PACS), electrical balance, medicine cabinet, medicine trolley |
| Operation Department | Advanced Medical Service | Client PC (PACS), X-ray C-arm, operating microscope, operating light, pperating table, electrosurgical unit, anesthesia apparatus, vital sign monitor |
| | General Medical Service | Client PC (PACS), operating light, operating table, electrosurgical unit, anesthesia apparatus, vital sign monitor |
| ICU Department | Surgical/Internal Medicine | Client PC (PACS), blood gas analyzer, ventilator, vital sign monitor, infusion pump, syringe pump |
| Angiography Department | | Client PC (PACS), angiography, intra-aortic balloon pump (IABP), blood gas analyzer |
| Physiotherapy Department | | Client PC (PACS), sling therapy bed, parallel bar, ultrasonic therapy machine |
| Patient Ward | | Client PC (PACS), bed, bedside cabinet, overbed table, IV stand, blood pressure monitor |
| Teaching and Training Department | | Laparoscopy simulator, endoscope simulator, bronchoscopy training system |

**Table 4-21: Provisional List of Major Medical Equipment for Type B Hospitals**

| Medical Service Department | Major Medical Equipment |
|---|---|
| Out-patient Department | Client PC (PACS), Diagnostic set, Examination couch, Blood pressure meter, Weighing scale |
| Diagnostic Imaging Department | Client PC (PACS), MRI, CT, General X-ray, Fluoroscopy X-ray, Mammography, Ultrasound |
| Endoscopy Department | Client PC (PACS), Upper gastrointestinal fiberscope, Upper gastrointestinal fiberscope, Bronchoscope |
| Laboratory Department | Client PC (PACS), Cryostat microtome, Hematology analyzer, Biochemistry analyzer |
| Physiological Department | Client PC (PACS), Electroencephalograph (EEG), Electromyography (EMG), Pulmonary function analyzer |
| Medicine Supply Department | Client PC (PACS), Electrical balance, Medicine cabinet, Medicine trolley |
| Operation Department | Client PC (PACS), Operating light, Operating table, Electrosurgical unit, Anesthesia apparatus, Vital sign monitor |
| ICU Department (Surgical/Internal Medicine) | Client PC (PACS), Blood gas analyzer, Ventilator, Vital sign monitor, Infusion pump, Syringe pump |
| Angiography Department | Client PC (PACS), Angiography, Intra-aortic balloon pump (IABP), Blood gas analyzer |
| Physiotherapy Department | Client PC (PACS), Sling therapy bed, Parallel bar, Ultrasonic therapy machine |
| Patient Ward | Client PC (PACS), Bed, Bedside cabinet, Overbed table. IV stand, Blood pressure monitor |
| Teaching and Training Department | Laparoscopy Simulator, Endoscope Simulator, Bronchoscopy training system |

### 4-3-2 Human Resource Requirements

In order to provide advanced and specialized medical care, it is necessary to secure the scope and skills of each practitioner in specialized medical care as well as to satisfy the number of required personnel. In cardiovascular disease, for example, there are various areas that require high levels of expertise. These include an area of cardiac catheterization and PCI for ischemic heart diseases, such as myocardial infarction, and diagnosis and catheter ablation for lethal arrhythmia as well as diagnosis of congenital heart diseases in children. In reality, even in a country with highly advanced medical care services, there is no specialist, e.g., cardiologist, who can cover all these scopes of specialties. Therefore, it is assumed that the specialist doctors proposed for this plan

have the ability to treat the target diseases in each of the clinical fields mentioned in Section 4-2-3 (e.g., for cardiology, angina pectoris and myocardial infarction).

The required number of personnel and the current status of each hospital are shown in Table 4-22.[93] Based on quantitative factors such as the number of beds and patients expected, the minimum numbers of specialist doctors required are presented in the table. In addition, it is also necessary to organize medical teams, which include multiple specialists, depending on the type of specialized medical care. For example, five medical oncologists and 3 surgical oncologists in each of the Type A hospitals are the minimum number required to cover the areas of pulmonology/thoracic surgery, neurology/neurosurgery, gastroenterology (internal and surgical), urology (nephrology) and gynecology. For pathologist and imagery specialists, it is sufficient to have one of each in the central department. Regarding specialized medical care services which require teamed medical care, multiple specialists are required for cardiology, neurology, orthopedics, urology, gastroenterology and pulmonology in Type A hospitals. In addition, since there are specialized areas in advanced medical care that require attention at all times, the number of medical equipment engineers and radiology technicians are proposed to be able to work in shifts. The number of kinetic therapists is estimated to perform rehabilitation, which is essential for the treatment of neurological disorders.

With regard to the Type B hospitals, the suggested number of specialists for oncology is smaller than for Type A hospitals based on the assumption that cancer-related services will be limited to diagnosis and palliative care. For cardiology and neurology, the numbers of personnel necessary for medical diagnosis and treatment are suggested in Table 4-22.

It should be noted that the required number of nurses is not included in the table as the necessary information such as a shift system of nursing by department/hospital could not be obtained in this survey.

[93] As mentioned earlier, there are a few specialists in General Surgery and General Medicine in some hospitals. Although not included in the table, there is a possibility that these personnel are taking roles in some relevant departments. In addition, in the field of ER/ ICU, the surgeons in other departments may be serving concurrently.

**Table 4-22: Required Human Resources and the Current Status in Each Hospital**

| | | Type A | | | | Type B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Department | Category | Required | SR | BB | KC | Required | PP | ST | SV | KP |
| Oncology | Medical Oncologist | **5** | | | | | | | | |
| | Surgical Oncologist | **3** | | | | | | | | |
| | Hematologist | **1** | | | | **1** | | | | |
| | Pathologist | **1** | | | | **1** | | | | |
| | Imagery Specialist | **1** | 2 | 1 | | **1** | | | | |
| | Pharmacist | **2** | 10 | 9 | 7 | **2** | 7 | 3 | 2 | 6 |
| | Lab Technician | **8** | 28(4) | 23(6) | 21 | **8** | 16 | 5 | 7 (3) | 8 |
| Cardiology | Cardiovascular Surgeon | **3** | | | | | | | | |
| | Cardiologist | **3** | 2(1) | 1 | | **3** | | | | |
| | Medical Equipment Engineer | **5** | 1 | | | **5** | 2 | 1 | 1 (1) | 1 |
| | Radiology Technician | **5** | | 1 | 1 | **5** | 3 | 1 | 3 | 2 |
| Neurology | Neurosurgeon | **2** | 1 | | 1 | | | | | |
| | Neurologist | **2** | | | | **2** | | | | |
| | Kinetic Therapist | **8** | 10 | 5 | 7 | **8** | 2 | 1 | 2 | 5 |
| Orthopedics | Orthopedics Specialist | **3** | 3(1) | 3 | 1 | **1** | | | | |
| Urology | Urologist | **3** | 2(2) | 2 | | **1** | 1 | | | |
| Gastroenterology | Gastroenterologist | **2** | 1(1) | | | **2** | | | | 1 |
| | Gastroenterology Surgeon | **2** | | 3 | | **2** | 1 | | | |
| Pulmonology | Pulmonologist | **2** | 2 | | | **2** | 2 | | | |
| | Respiratory Surgeon | **2** | | | | **2** | | | | |
| ER/ICU | ER Specialist | **3** | | | | **3** | | | | |
| | Traumatologist | **1** | | | | **1** | | | | |
| | Anesthesia Specialist | **3** | 4(2) | | 2 | **3** | 3 | | | 1 |
| | Intensive Care Specialist | **2** | | | | **2** | | | | |

* 'Required' indicates the number of Human Resources required for each hospital.

*SR: Siem Reap, BB: Battambang, KC: Kampong Cham, PP: Phnom Penh, ST: Stung Treng, SV: Svay Rieng, KP: Kampot

*Blank parts mean '0'. Also, the numbers in brackets indicate the personnel recruited by the hospitals included in the total numbers.

Source: Prepared by the JICA survey team based on answers to the questionnaires

In the discussions with each target hospital regarding the deployment of required human resources above, many have expressed expectations to MOH to deploy the necessary personnel as hospitals have difficulties recruiting personnel due to the limited budget and shortage of specialists in their regions. Contracting with specialist doctors in private facilities also seems to be challenging for the same reasons.

Under such circumstances, timely deployment of personnel to each target hospital by the Cambodian government is essential for securing the necessary human resources. The details of the number of specialized doctors produced in each field are as described earlier. For example, in the field of oncology, five to six specialist doctors enter the field from UHS every year. In a discussion with DHRD, it was indicated that it would be possible to secure the required number of personnel including specialist doctors and medical equipment engineers within the next ten years, although some graduates may choose to work in the private sector. In a discussion with DP on recruitment and deployment, it was thought feasible to deploy the above necessary human resources within the next ten years. Especially, for specialist doctors, it was thought that the number of recruitments could be increased upon consultation between MOH and the Ministry of Civil Service. In addition, it was shared that there is a possibility of relocating some personnel from Phnom Penh or other provinces to the target hospitals by submitting a letter of recommendation from DP to the Minister of Health.

At the same time, the Cambodian government suggested utilizing the existing personnel at each target hospital as much as possible in order to curb additional costs for human resources. As a practical and sustainable method for this, one option is to train a few personnel from each target hospital and expand the trainings in each hospital by using the personnel as trainers. As mentioned earlier, at national hospitals, including Calmette Hospital and Khmer-Soviet Friendship Hospital, doctors from provincial hospitals are accepted for a certain period of time and OJTs and post-training remote follow-ups are conducted according to necessity. Therefore, such a system can be utilized for the trainings of the trainers (TOT). Moreover, networks among provincial hospitals as well as private hospitals may be utilized for the TOT as well. Training of specialist doctors and medical equipment engineers can be supported by JICA's technical cooperation and training programs, which will be described in detail in the following section.

In order to secure the necessary human resources for the regional hospitals to provide advanced medical services, some of the key actions required by relevant government authorities and the target hospitals include the following:

- ✓ MOH to incorporate human resources needs and measures for regional hospital development in the HSP4, HWDP4 and the infrastructure development plan, which are currently in preparation.
- ✓ MOH and the target hospitals to develop detailed human resource plans as to how many, by when and in which areas of personnel, including specialist doctors, will be trained, recruited, deployed, and/or relocated to the hospitals in line with the implementation schedule.
- ✓ In accordance with the legal status of the regional hospital, the target hospitals to mobilize funds and ensure the sufficient and appropriate allocation of budget to implement the above-mentioned human resource plans in coordination with relevant government authorities (e.g., MEF, MOH) and development partners.
- ✓ MOH and the target hospitals to devise training systems (e.g., TOT, OJT) and programs in

consultation with national hospitals, private hospitals and UHS.

- ✓ MOH to coordinate with the Ministry of Civil Service and increase the number of recruitments to meet the human resource requirements for the regional hospitals as planned above.

### 4-3-3 Implementation Schedule

The following three options are suggested with regard to the implementation schedule of the hospital upgrading.

| Option | Feature |
|---|---|
| 1 | Design and construct all seven hospitals at the same time |
| 2 | Stagger the timing in four lots<br>(Lot 1: SR, Lot 2: ST and KP, Lot 3: BB and KC, Lot 4: PP and SV) |
| 3 | Divide the plan into two phases<br>(2 agreements: Phase 1-SR, ST and KP,<br>Phase 2- BB, KC, PP and SV) |

*SR: Siem Reap, BB: Battambang, KC: Kampong Cham, PP: Phnom Penh, ST: Stung Treng, SV: Svay Rieng, KP: Kampot

The details of each option including the implementation schedule of hospital upgrading, timeframe of allocating required human resources to each hospital, and advantages and disadvantages are explained in the following section.

The blue bars under the implementation schedule for each option indicate the possible timing of the two technical cooperation projects proposed to support the human resource development plan of regional hospitals as explained later in this report (Section 4-7). The implementation period of the technical cooperation projects should work in tandem with the hospital upgrading and the status of human resource allocation.

(1) Option 1

The first option is designing and constructing the seven hospitals at the same time.

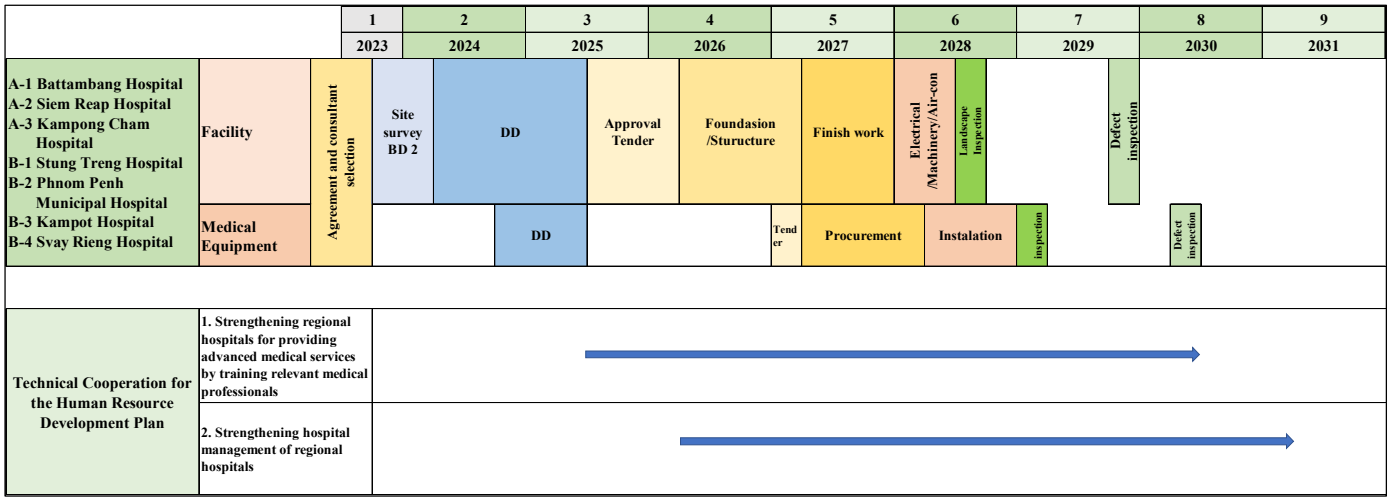



**Figure 4-13: Proposed Implementation Schedule for Option 1**

Source: JICA survey team

In terms of human resources, the figure below shows the required numbers of additional personnel and the timing of allocation of the personnel in light of the schedule. The numbers are calculated based on the total number of required human resources and the current number at each hospital shown in Table 4-22. As mentioned earlier, DHRD and DP indicated a period of ten years as a timeframe for allocating all the necessary human resources, and it is necessary to consider this point when determining the construction period.

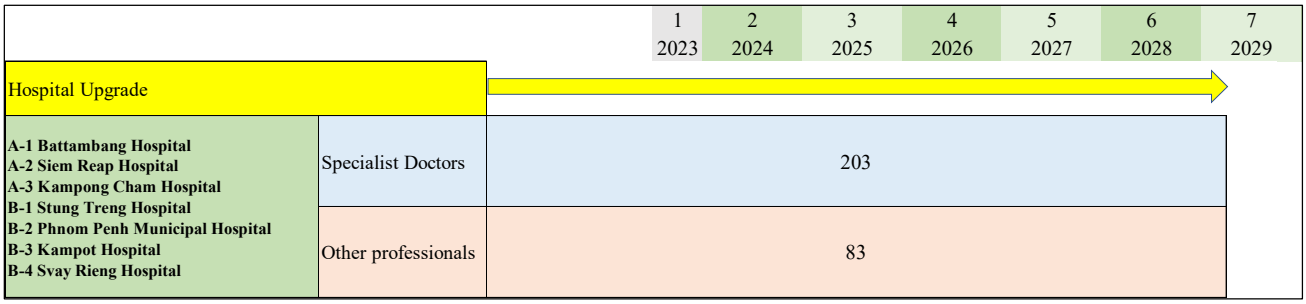



**Figure 4-14: Required Numbers of Additional Human Resources/Timings for Option 1**

Source: JICA survey team

**Table 4-23: Advantages and Disadvantages for Option 1**

| Advantage | Disadvantage |
|---|---|
| • The whole design/construction process may take relatively shorter time | • Difficult to mobilize necessary construction personnel (including 70 international/local engineers) and ensure quality control<br>• Difficult to allocate necessary medical personnel at the same time due to current shortage (203 additional specialist doctors and 83 additional paramedics)<br>• Difficult to support capacity building at the same time |

(2) Option 2

The second option is to stagger the timing of designing and construction in four lots, starting with Siem Reap Provincial Hospital.

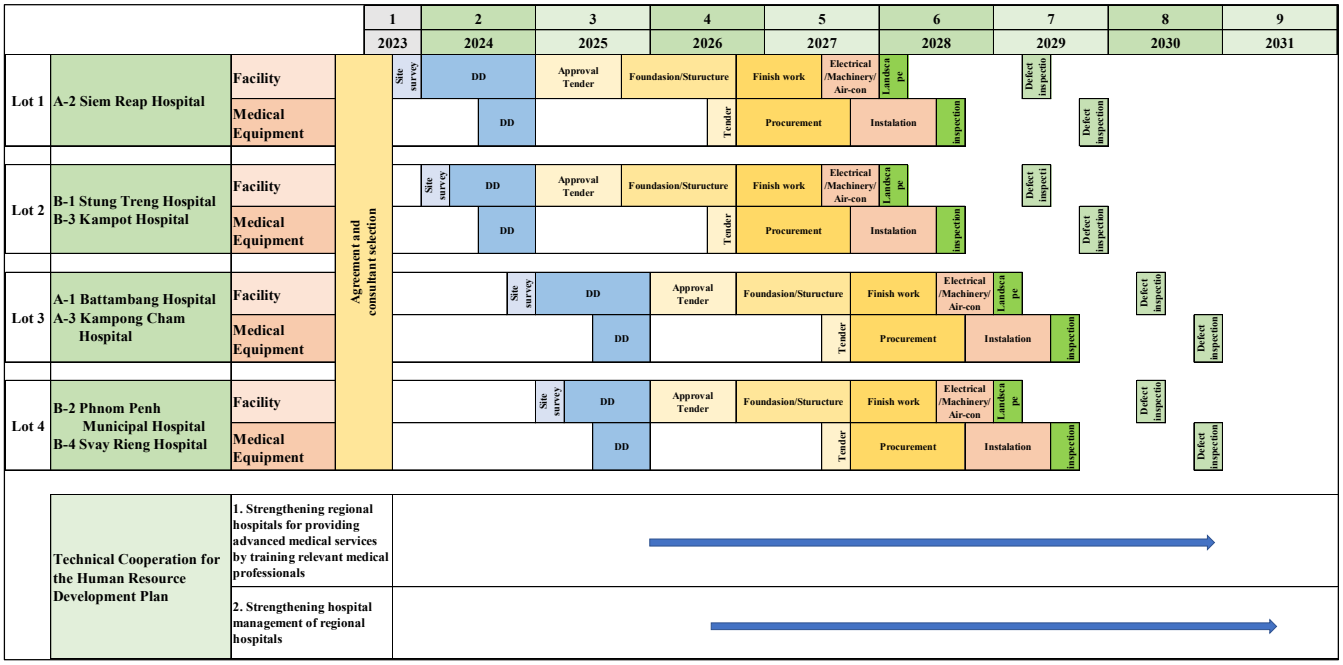



**Figure 4-15: Proposed Implementation Schedule for Option 2**

Source: JICA survey team

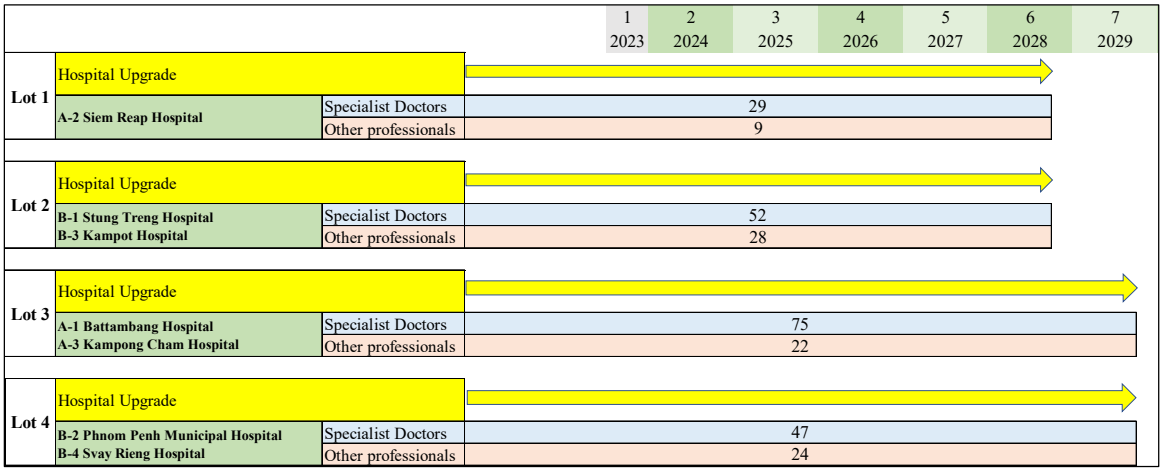



**Figure 4-16: Required Numbers of Additional Human Resources/Timings for Option 2**

Source: JICA survey team

**Table 4-24: Advantages and Disadvantages for Option 2**

| Advantage | Disadvantage |
|---|---|
| • Feasible to mobilize necessary construction personnel and ensure effective implementation process including quality control<br>• Feasible to allocate and train necessary medical personnel<br>• Feasible and effective to focus on staff deployment/training for Siem Reap first as a Type A model hospital due to the existing clinical capacity, so that Siem Reap can support the other hospitals<br>• Can work on Stung Treng and Kampat first among Type B hospitals due to poorer conditions | • Takes longer time to strengthen advanced medical services at provincial level due to the staggered process |

(3) Option 3

The third option is similar to Option 2, but it is divided into two phases with two separate agreements.

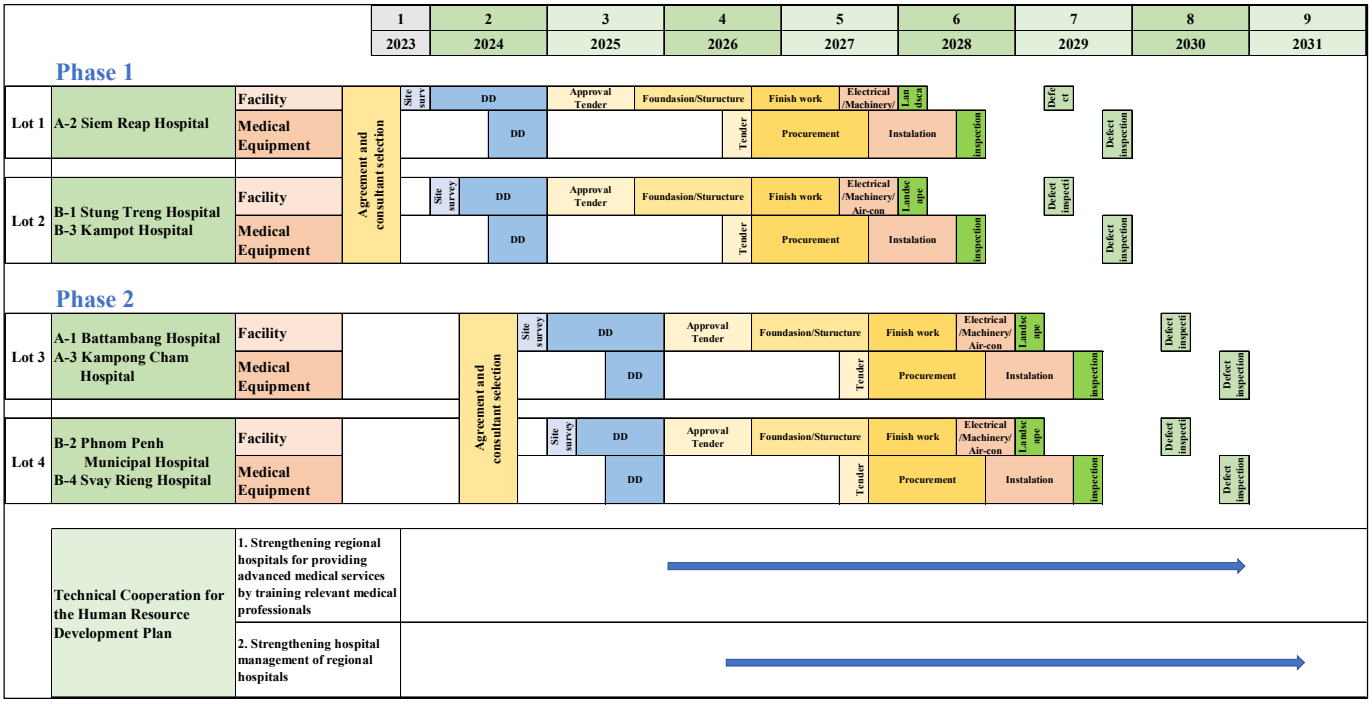



**Figure 4-17: Proposed Implementation Schedule for Option 3**

Source: JICA survey team


**Figure 4-18: Required Numbers of Additional Human Resources/Timings for Option 3**

Source: JICA survey team

**Table 4-25: Advantages and Disadvantages for Option 3**

| Advantage | Disadvantage |
|---|---|
| • Reduction of the initial investment cost as well as Phase 2 cost<br>• Effective planning and implementation of Phase 2 by utilizing the results of Phase 1<br>• Feasible to mobilize necessary construction personnel and ensure effective implementation process including quality control<br>• Feasible and effective to allocate and train necessary medical personnel for Siem Reap first as a Type A model hospital | • Takes longer time to strengthen advanced medical services at provincial level due to the phasing process<br>• Requires to prepare two times of agreement |

Among the three options, Option 2 or 3 is considered more feasible than Option 1 as explained below.

This is a large scale plan involving construction and medical equipment provision for the seven referral hospitals, which are scattered all over the country. It is anticipated that the construction of all hospitals at the same time would be difficult from the viewpoint of mobilizing necessary personnel and ensuring quality control. The expected number of required personnel is approximately 70 including 15 international engineers, 29 local engineers and 21 computer-aided design operators. It would be particularly difficult to mobilize such a number of local engineers who have experience in hospital construction. Therefore, it is advisable to stagger the timing of the detailed design and construction of the seven hospitals.

The plan will also require a number of skilled health personnel as described above. Type A hospitals, in particular, require a greater number of specialist doctors, which tend to be unavailable

in the provincial areas. Among the seven target hospitals, Siem Reap Provincial Hospital is considered to have the highest clinical capacity including the availability of specialist doctors such as cardiologists. Therefore, it could be most appropriate to upgrade Siem Reap Provincial Hospital first with the concentrated efforts to deploy/train the necessary skilled specialist doctors/paramedics for the Type A hospital, and then support the others to be upgraded for both Types A and B.

At the same time, some of the Type B hospital facilities are not in good condition, especially Stung Treng and Kampot Provincial Hospitals, and it is preferable to improve the facilities as soon as possible.

Considering the above points, it would be appropriate to proceed with the design of Siem Reap Provincial Hospital first, followed by Stung Treng and Kampot Provincial Hospitals approximately six months later.

It is expected to conduct further study to consider the standardization of the architectural design of each hospital and the possibility of shortening the design period.

### 4-3-4 Project Cost

Confidential

**Table 4-26: Overall Project Cost Estimate for Option 1**

Confidential

**Table 4-27: Overall Project Cost Estimate for Option 2**

Confidential

**Table 4-28: First Phase Cost Estimate for Option 3**

Confidential

**Table 4-29: Construction Cost of Each Hospital**

Confidential

**Figure 4-19: Blood Bank Floor Plan**

Confidential

**Figure 4-20: MNCU Floor Plan**

Confidential

**Table 4-30: Cost for Equipment Procurement by Hospital (Type A)**

Confidential

**Table 4-31: Cost for Equipment Procurement by Hospital (Type B)**

Confidential

### 4-3-5 Measures to be Taken by the Government of Cambodia

Measures to be taken by the government of Cambodia for the implementation of the plan are listed below.

(1) Finalization of the National Strategy of the Regional Hospital Development including the Legal and Operational Status

See the details in Section 4-1-2.

The assumed process of the transformation of the target hospitals to the PAI and possible pros and cons are summarized below.

While improving the infrastructure of the target hospitals through the proposed plan, the MEF expects these hospitals to become more independent and responsible for hospital financial management. One effective measure to strengthen the autonomy in terms of hospital financing is for the hospitals to be converted to PAIs as some national hospitals have done.

The benefits of the introduction of the PAI for the hospitals are (1) more flexibility to manage hospital assets and liabilities, (2) simpler accounting management with fewer accounting guidelines, and (3) the potential for more diversified means of income, such as parking operations, land/building rentals, and donations.

However, the hospitals that become PAIs will have a board of directors (BOD) whose members will include representatives from the MEF and MOH. The directors of the hospitals will submit hospital management plans and management reports to the BOD and receive approval. The directors of the hospitals, managers, and administrators will be required to have more hospital management, accounting, and financial management skills than ever before and will be responsible for hospital management.

In order for a hospital to become a PAI, a sub-decree must be prepared and enforced by the cabinet. Prior cases of sub-decrees to become PAIs have included representatives of central government ministries as members of the BOD, which may in some respect weaken the attribution of provincial hospitals to the province. Therefore, PAI conversion would need to be approved by the provincial government, and this approval is expected to take a certain amount of time.

It will also require the target hospitals to develop hospital management and accounting/financial skills in order to prepare and submit hospital management plans and management reports to the BOD. In particular, the hospital accounts manage government accounts and revenues such as user fees and HEF separately, but the preparation of hospital financial plans and reports will require analysis that integrates these accounts and management of assets and liabilities through the

preparation of balance sheets.

Therefore, it may not be feasible for all target hospitals to be converted, but the hospitals that have reached a certain level of capacity in hospital operations and accounting and financial management, as well as the intention of the provincial governments, can begin preparing for conversion to PAIs.

(2) Allocation of Required Human Resources and Training of Existing Personnel

See the details in Section 4-3-2.

(3) Operation and Maintenance Cost

1) Medical equipment

Annual operation and maintenance (O&M) cost is estimated to be 10% of the total cost.

**Table 4-32: Annual O&M Cost for Medical Equipment**

Unit: USD

| | Siem Reap | Battambang | Kampong Cham | Svay Rieng | Phnom Penh | Kampot | Stung Treng |
|---|---|---|---|---|---|---|---|
| **OM cost** | 1,712,780 | 1,707,837 | 1,650,148 | 484,235 | 776,875 | 813,617 | 846,362 |

2) Facility

In general, the facility's O&M costs consist of running costs such as electricity and water and building maintenance costs. A detailed estimate should be done at the later stage of designing.

### 4-3-6 Implementation Structures

The detailed implementation structure should be determined when the type and components of the implementation method as well as the legal status of the regional hospital are confirmed.

The provisional implementation structure is described below.

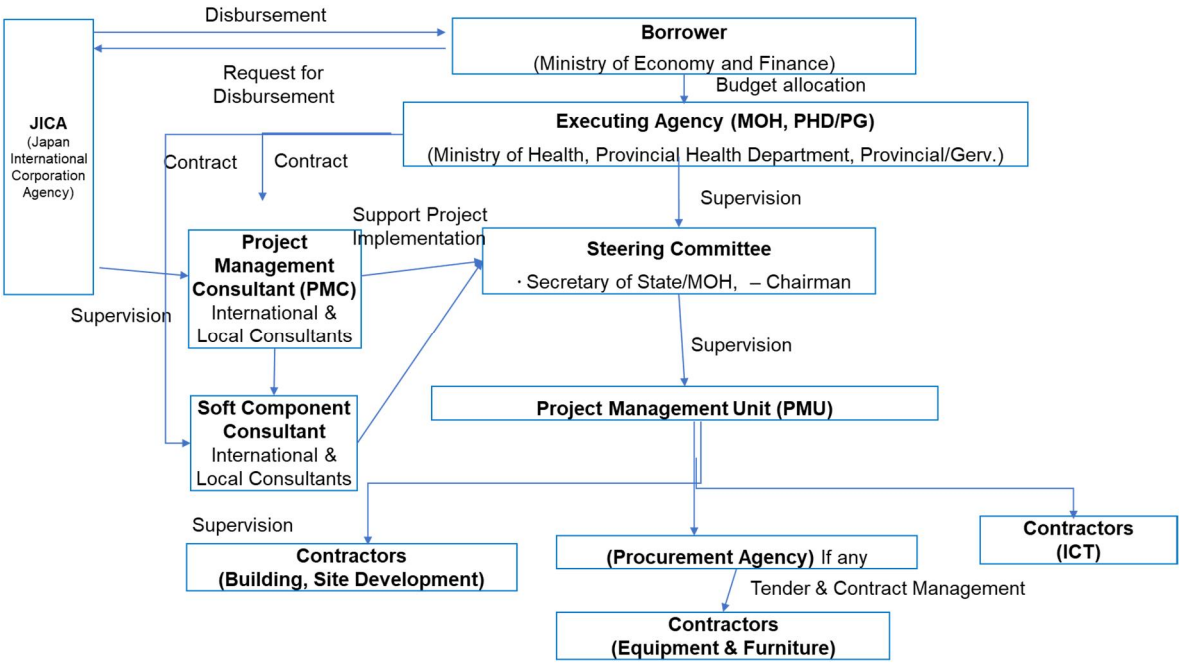



**Figure 4-21: Provisional Implementation Structure**

Source: JICA survey team

(1) Roles and Responsibilities of Major Organizations

Executive Agency

MOH assumes the overall responsibility of the plan. MOH in collaboration with PHDs and provincial governments, if applicable, will establish a project management unit (PMU) within the organization, which takes all necessary measures in a timely and efficient manner and will be fully responsible for the project implementation.

Steering Committee

A steering committee for the project will be formulated for the purpose of supervising the PMU. The mandate of the steering committee includes supervising and guiding the PMU, monitoring funds flow, ensuring inter-ministerial coordination, and facilitating the smooth implementation of the project. Committee members may include the representatives of MOH, MEF and relevant ministries, as well as those from the PHD/provincial governments.

Project Management Unit

The PMU may consist of the Project Management and Monitoring Unit, Administration Unit, Procurement and Engineering Unit, and Financial Management Unit. The PMU will be responsible for the plans and implementation of all the activities under the project.

Project Management Consultants

The PMU will hire consultants for the smooth implementation of the project. Engineering service consultants will support facility design, construction supervision, equipment design, and

equipment installation supervision.

### 4-3-7 Monitoring and Evaluation (M&E) Framework

ODA loan projects have a set of indicators called "operation and effect indicators." The definitions of these indicators are given below:

- Operation Indicators: Quantitative indicators to measure how appropriately the facilities and equipment (outputs) are being utilized after completion.
- Effect Indicators: Quantitative indicators to measure direct effects on the beneficiaries and target areas after completion of the facilities and equipment (outputs).

Based on the definitions, the possible indicators for the plan are listed below. Further discussion is necessary to select the appropriate indicators considering the validity and collectability.

**Table 4-33: Possible Indicators**

| Component*[1] | Category | Indicators |
|---|---|---|
| 1 | Operation | Number of PCI in type A hospitals |
| | | Number of cardiovascular surgeries in type A hospitals |
| | | Number of patients receiving chemotherapy in type A hospitals |
| | | Percentage of cancer patients treated by type A hospitals |
| 1 & 2 | Operation | Number of ICU patients on a ventilator |
| 1 & 2 | Effect | Number of pre-service training for students in specialized doctor programs for advanced medical services at 7 hospitals |
| 1 & 2 | Qualitative indicators | Patient satisfaction |
| | | Retention of specialists |

Note *[1]: Component refers to the number of the project component at Table 4-9

## 4-4 Economic and Financial Analysis

### 4-4-1 Economic Analysis

(1) Preconditions for Economic Analysis

This section explains the results of the economic analysis to evaluate the effectiveness of Option 2 from the viewpoint of Cambodia's national economy. Economic internal rate of return (EIRR) was adopted as an evaluation indicator. The indicator is calculated using annual cash inflow (economic benefit) and cash outflow (economic cost) with the discounted cash flow method.

A. Project period

The project period is set to be a total of 38 years. This includes the construction period starting in 2023. Opening year is assumed to be 2028 for the earliest package (Siem Reap, Stung Treng, and Kampot Provincial Hospitals).

B. Exchange rates

The exchange rates are set as follows.

- 1 USD = 129 JPY (Japanese yen)
- 1 USD = 4,105 KHR (Cambodian riel)

C. With project case and without project case

"With project" is defined as a case in which JICA finances the seven regional hospitals to provide advanced medical services, and "without project" is defined as a case without the project. Economic benefit realized by the implementation of projects is calculated as the difference between "without project" and "with project."

D. Social discount rate

The social discount rate is set to be 12%. This criterion is widely used as the required discount rate in developing countries.

(2) Economic Benefits

The JICA survey team considered reduction of opportunity cost and travel cost for patients and attendants, reduction of NCD-related cost, and the decrease in neonatal and maternal mortality as the economic benefits of the project and tried to monetize each economic benefit. The economic benefit is calculated by taking the difference between "without project" and "with project."

A. Reduction of opportunity cost

The JICA survey team assumed that patients and attendants travel to hospitals in Phnom Penh to receive treatment in advanced medical services where there are no projects ("without project"). If the project is implemented, the patients can receive the treatment at the regional hospitals and save time and costs associated with traveling to Phnom Penh. This is considered as one of the economic benefits. The travel time saved is assumed to correspond to the opportunity cost of working time. In other words, if the implementation of the project results in reducing travel time and the reduced time is used for productive activity such as work, this is considered to be value added to the national economy.

The JICA survey team calculated opportunity cost of working time using GDP data. GDP per capita in 2019 was USD1,713 in Cambodia. Divided by 260 working days per year, the GDP per

day per capita is calculated as USD6.6. The survey team also assumes that the GDP per day increases in accordance with Cambodia's economic development and calculates the increase by referring mid- and long-term GDP growth rate in the "2021 Article IV Consultation Staff Report" by the IMF and population growth in the "World Population Prospects" by the UN Population Division. The table below shows the annual growth rate of GDP per capita and GDP per day in respective years.

**Table 4-34: Growth Rate of GDP Per Capita and GDP Per Day**

| | 2019 | 2025 | 2030 | 2035 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Growth rate of GDP per capita per year | 7.1% | 5.23% | 5.56% | 5.66% | 5.8% | 6.09% | 6.33% |
| GDP per day (USD) | 6.6 | 7.6 | 9.9 | 13.0 | 17.2 | 30.5 | 55.6 |

Source: JICA survey team

The JICA survey team estimated the future number of inpatients and outpatients based on the available HMIS data, population projections and the current data on each provincial hospital. The estimated number of patients in 2031, which represents the increased number of patients with project, is shown in the following table.

**Table 4-35: Estimated Number of Patients in 2031**

| | Siem Reap | Battambang | Kampong Cham | Kampot | Svay Rieng | Stung Treng | Phnom Penh |
|---|---|---|---|---|---|---|---|
| Number of inpatients | 3,616 | 4,737 | 4,620 | 1,908 | 2,192 | 918 | 2,477 |
| Number of outpatients | 8,016 | 16,023 | 4,671 | 2,842 | 4,969 | 1,218 | 6,018 |

Source: JICA survey team

The JICA survey team assumed that on average, 2 persons accompany a patient to receive medical treatment in Phnom Penh. It assumed that hospitalized period is 7 days on average for the inpatients. Therefore, for the attendant persons, working days equivalent to 9 days are assumed to be saved with project. For the outpatients, it is assumed that patients and attendant persons visit Phnom Penh twice a year to receive treatment. When calculating the travel cost saved to visit Phnom Penh, the team used the average bus fees to go to Phnom Penh from each target province. When calculating the accommodation cost saved, the team used the data from the Cambodia Socio-Economic Survey, compared the average living cost between the capital and rural areas and used the difference as the accommodation cost saved with project.

B. Reduction of NCD-related cost

Another economic benefit is the reduction of economic burden coming from NCDs. By introducing the high-quality medical services with project, the project expects to reduce the cost associated with NCDs. In calculating the cost, the team used the information from the WHO's

report.[94] According to it, the total economic burden of NCDs in Cambodia was 5,970 billion riel in 2018. Using this figure, the team estimated the reduction of NCD-related cost with project by applying the coverage ratio of the target provincial hospitals as well as the expected impact that the project has on the active NCDs workers. The estimated economic benefit of the reduction of NCD-related cost is approximately USD65 million in 2030.

C. Decrease in neonatal and maternal mortality

The project plans to improve the maternity wards in three hospitals (Stung Treng and Kampot Provincial Hospitals and Phnom Penh Municipal Hospital). The JICA survey team assumed that neonatal and maternal mortality will improve with project and tried to monetize the impact of the mortality reduction. Neonatal mortality rate was 13 per 1,000 live births in 2020 and MMR was 160 per 100,000 live births in 2017 in Cambodia.[95] With project, the team assumed that these ratios will improve at the same level as Thailand, which is 5 per 1,000 live births for neonatal mortality rate and 37 per 100,000 live births for MMR. Considering the improved number of beds with project, bed occupancy rate, and the above figures, the team estimated the number of babies and pregnant women whose lives can be saved with project. Then, the figure was monetized using the annual GDP per capita.

Table 4-36 shows the economic benefits of the annual reduction of opportunity cost, reduction of NCD-related cost, decrease in neonatal and maternal mortality and the total economic benefit from 2030 to 2060.

**Table 4-36: Economic Benefit of the Project**

Unit: 1,000USD

| Year | Reduction of opportunity cost | Reduction of travel cost | Reduction of accommoda-tion cost | Reduction of NCDs cost | Decrease in neonatal and maternal mortality | Total economic benefit |
|---|---|---|---|---|---|---|
| 2028 | 777 | 760 | 110 | 31,807 | 76 | 33,530 |
| 2029 | 4,278 | 3,737 | 577 | 64,295 | 320 | 73,206 |
| 2030 | 8,016 | 6,701 | 963 | 64,983 | 506 | 81,169 |
| 2031 | 8,531 | 6,750 | 972 | 65,561 | 712 | 82,526 |
| 2032 | 9,079 | 6,800 | 980 | 66,145 | 940 | 83,945 |
| 2033 | 9,663 | 6,851 | 989 | 66,734 | 1,191 | 85,427 |
| 2034 | 10,285 | 6,901 | 997 | 67,327 | 1,466 | 86,977 |
| 2035 | 10,956 | 6,953 | 1,006 | 67,927 | 1,770 | 88,612 |
| 2036 | 11,648 | 6,991 | 1,013 | 68,531 | 2,105 | 90,287 |
| 2037 | 12,383 | 7,030 | 1,019 | 69,141 | 2,471 | 92,044 |

[94] "Prevention and control of noncommunicable diseases in Cambodia, The case for investment"
[95] The World Bank Data

| | | | | | | |
|---|---|---|---|---|---|---|
| 2038 | 13,164 | 7,069 | 1,026 | 69,756 | 2,872 | 93,887 |
| 2039 | 13,995 | 7,108 | 1,032 | 70,377 | 3,310 | 95,823 |
| 2040 | 14,898 | 7,148 | 1,039 | 71,004 | 3,794 | 97,883 |
| 2041 | 15,860 | 7,188 | 1,046 | 71,451 | 4,323 | 99,867 |
| 2042 | 16,883 | 7,228 | 1,053 | 71,901 | 4,900 | 101,965 |
| 2043 | 17,973 | 7,268 | 1,060 | 72,354 | 5,530 | 104,184 |
| 2044 | 19,133 | 7,308 | 1,067 | 72,810 | 6,216 | 106,534 |
| 2045 | 20,394 | 7,349 | 1,074 | 73,269 | 6,973 | 109,059 |
| 2046 | 21,740 | 7,390 | 1,081 | 73,730 | 7,797 | 111,738 |
| 2047 | 23,173 | 7,431 | 1,088 | 74,195 | 8,695 | 114,582 |
| 2048 | 24,702 | 7,473 | 1,095 | 74,662 | 9,672 | 117,604 |
| 2049 | 26,332 | 7,515 | 1,102 | 75,132 | 10,735 | 120,815 |
| 2050 | 28,108 | 7,556 | 1,109 | 75,606 | 11,906 | 124,286 |
| 2051 | 30,005 | 7,599 | 1,117 | 75,870 | 13,181 | 127,771 |
| 2052 | 32,030 | 7,641 | 1,124 | 76,136 | 14,566 | 131,497 |
| 2053 | 34,192 | 7,684 | 1,131 | 76,402 | 16,071 | 135,480 |
| 2054 | 36,499 | 7,727 | 1,139 | 76,670 | 17,706 | 139,740 |
| 2055 | 39,007 | 7,770 | 1,146 | 76,938 | 19,502 | 144,363 |
| 2056 | 41,687 | 7,813 | 1,154 | 77,207 | 21,452 | 149,314 |
| 2057 | 44,551 | 7,857 | 1,161 | 77,477 | 23,570 | 154,617 |
| 2058 | 47,612 | 7,901 | 1,169 | 77,749 | 25,868 | 160,299 |
| 2059 | 50,884 | 7,945 | 1,177 | 78,021 | 28,361 | 166,388 |
| 2060 | 54,442 | 7,990 | 1,185 | 78,294 | 31,099 | 173,009 |

Source: JICA survey team

(3) Economic Cost

A. Investment cost

Investment cost is comprised of construction fees including the procurement of medical equipment, consulting services and administration costs. These costs are estimated in Chapter 4-3-4: Project Cost and are used for this economic analysis. Price escalation, taxes and interest during construction have been eliminated from the investment cost. The JICA survey team used the standard conversion factor of 0.9 when converting the financial prices of goods procured in Cambodia into the economic price.

**Table 4-37: Investment Cost of the Project**

Confidential

B. Operation and maintenance (O&M) cost

O&M costs include medical equipment, particularly CT scans and MRI for all hospitals and angiography for Type A hospitals, personnel cost, and O&M cost for the hospitals. Assuming that the lifespan of the medical equipment is ten years, cost to renew the medical equipment is added in every decade. For the personnel cost, the team calculated the number of special doctors and paramedics including nurses that are required to add with project and multiplied it by their current salary. The team assumed that 1% of the construction cost is used for the O&M cost for hospital operations such as utilities and communication.

**Table 4-38: O&M Cost of the Project**

Confidential

(4) Economic Internal Rate of Return

The EIRR of the project, which is calculated from annual net cash flow from 2023 to 2060 is 18.5%. This exceeds 12%, a benchmark of social discount rate for projects in developing countries which is commonly used. Therefore, the project is feasible from the viewpoint of Cambodia's national economic development.

**Table 4-39: Cashflow of the Project**

Confidential

### 4-4-2 Financial Analysis

(1) Preconditions for the Financial Analysis

This section analyzes the financial feasibility of the project. Specifically, it verifies the financial feasibility of the project's annual cashflow using a financial internal rate of return (FIRR) and analyzes how likely the revenue with project will be able to cover the expenditures.

The project life is set to be same as the economic analysis, which is a total of 38 years. Battambang, Kampong Cham and Svay Rieng Provincial Hospitals and Phnom Penh Municipal Hospital are expected to start operations in 2029. The exchange rate is set the same as in the economic analysis. The concept of without project and with project is also the same as in the economic analysis. The financial analysis is conducted in "real price," which means that future inflation is not considered.

(2) Revenue

The JICA survey team calculated the expected future revenue of each hospital using the estimate of the number of patients and expected user fees. The estimated number of patients is calculated using the same method as in the economic analysis. The number of estimated inpatients and outpatients in 2031 is described in Table 4-35. It assumed that 20% of the total patients are HEF

users. In calculating the revenue, the JICA survey team referred to the existing user fee data from Siem Reap and Battambang Provincial Hospitals because it was difficult for the team to obtain user fee data on the national hospitals that are currently providing high-quality medical services. The team set the representative medical treatment fees for each diagnostic department which is expected to be realized with project by considering the frequency of treatment and the combination of the treatments. The estimation of medical treatment fees in each diagnostic department in Type A and Type B hospitals is shown in the table below.

**Table 4-40: Estimation of Medical Treatment Fees with Project**

Unit: Cambodian Riel

| Diagnostic department | Typical diseases | Type A | | Type B | |
|---|---|---|---|---|---|
| | | outpatient | inpatient | outpatient | inpatient |
| Cardiovascular internal medicine/ Cardiovascular surgery | Angina, cardiac infarct | 381,000 | 2,326,000 | 381,000 | 1,726,000 |
| Respiratory medicine (severe) | Respiratory failure, acute lung edema | 1,476,000 | 2,496,000 | 1,476,000 | 1,946,000 |
| Thoracic surgery (cancer) | Lung cancer, breast cancer | 1,496,000 | 3,422,000 | 1,496,000 | 2,062,000 |
| Neurology (severe) | Brain infarct | 2,340,000 | 3,000,000 | 1,380,000 | 1,890,000 |
| Neurosurgery (cancer, severe) | Brain cancer, head injury | 2,516,000 | 7,900,000 | 1,556,000 | 1,890,000 |
| Gastroenterological medicine | Cholecystitis, hepatitis | 2,492,000 | 2,600,000 | 2,492,000 | 2,600,000 |
| Digestive surgery (severe) | Cholelithiasis, peritonitis | 926,000 | 2,600,000 | 926,000 | 2,600,000 |
| Digestive surgery (cancer) | tumor in the gastrointestinal tract | 2,522,006 | 3,625,000 | 2,522,006 | 2,025,000 |
| Orthopedic (severe) | Femoral fracture, pelvic fracture | 1,050,000 | 9,112,000 | 90,000 | 8,002,000 |
| Urology (severe) | Kidney stone disease | 926,000 | 2,700,000 | 926,000 | 1,950,000 |
| Urology (cancer) | Bladder cancer, prostate cancer | 2,012,000 | 4,710,000 | 1,532,000 | 1,950,000 |
| Gynecology (cancer) | Cervical cancer, uterine body cancer, ovary cancer | 2,012,000 | 4,510,000 | 1,532,000 | 1,950,000 |
| General medicine | Diabetes | 504,000 | | 504,000 | |
| | Hypertension | 402,000 | | 402,000 | |

Source: JICA survey team

Using the data of estimated number of patients and the estimation of medical fees with project, the expected revenue in each hospital with project in 2032 is shown in the table below.

**Table 4-41: Expected Revenue in Each Hospital in 2032 (with Project)**

Unit: 1,000 USD

| | Siem Reap | Battambang | Kampong Cham | Kampot | Svay Rieng | Stung Treng | Phnom Penh |
|---|---|---|---|---|---|---|---|
| Inpatient | 2,853 | 3,535 | 3,375 | 958 | 1,105 | 462 | 1,246 |
| Outpatient | 2,000 | 4,328 | 920 | 653 | 1,106 | 238 | 2,702 |
| Total revenue | 4,853 | 7,863 | 4,295 | 1,612 | 2,211 | 699 | 3,947 |

Source: JICA survey team

(3) Expense

A. Investment expense

Investment expense consists of construction, consulting service, administration costs, and taxes. Price escalation and interest during construction have been eliminated from the investment expense.

**Table 4-42: Investment Expense for Siem Reap Provincial Hospital**

Confidential

**Table 4-43: Investment Expense for Kampot Provincial Hospital**

Confidential

B. O&M expenses

O&M expenses include medical equipment, particularly for CT scans and MRI for all hospitals and angiography for Type A hospitals, personnel costs, and O&M costs for the hospitals. Assumptions about renewal cost of medical equipment, personnel costs, and the hospital operations costs are the same as the economic analysis. In addition, the JICA survey team assumed that 45% and 35% of the total expected revenue would be used for pharmaceuticals for Type A hospitals and Type B hospitals respectively. These figures are assumed based on the financial status of each hospital as described in Chapter 3-3-3 as well as Cambodia's National Health Accounts.

**Table 4-44: O&M Expense for Siem Reap Provincial Hospital**

Confidential

**Table 4-45: O&M Expense for the Kampot Provincial Hospital**

Confidential

(4) Results of the Financial Analysis
Confidential

**Table 4-46: Cashflow of the Project (Siem Reap Provincial Hospital)**
Confidential

**Table 4-47: Cashflow of the Project (Battambang Provincial Hospital)**
Confidential

**Table 4-48: Cashflow of the Project (Kampong Cham Provincial Hospital)**
Confidential

**Table 4-49: Cashflow of the Project (Kampot Provincial Hospital)**
Confidential

**Table 4-50: Cashflow of the Project (Svay Rieng Provincial Hospital)**
Confidential

**Table 4-51: Cashflow of the Project (Stung Treng Provincial Hospital)**
Confidential

**Table 4-52: Cashflow of the Project (Phnom Penh Municipal Hospital)**
Confidential

FIRR for each hospital is -5.8% for Siem Reap, -6.2% for Battambang, -6.0% for Kampong Cham, -10.1% for Kampot, -5.0% for Svay Rieng, -12.4% for Stung Treng and -0.5% for Phnom Penh Hospitals, respectively. The results show that revenue alone cannot cover all the investment and O&M expenses that are necessary with project for all seven hospitals.

**Table 4-53: Summary of Revenue and Expenditure**
Confidential

(5) Impact of the Introduction of PPP on the Results of Financial Analysis

When introducing large medical equipment such as CT scans and MRIs, some provincial hospitals make a PPP contract with private suppliers to hold down initial investment costs and entrust them with the operation and maintenance of the equipment. In this section, the JICA survey team tries to verify the impact of the introduction of PPP for large medical equipment on the overall financial sustainability of each hospital with project. The following is assumed as the conditions for introducing PPP.

- Targeted medical equipment for PPP are CT scans and MRIs for Type A hospitals and CT scans for Type B hospitals.
- Out of the inspection fee, 60% goes to the private supplier, 20% goes to the hospital's revenue and the remaining 20% is allocated to the remuneration for paramedics.
- There is no initial investment cost to introduce PPP to each hospital, provided that the contract period with the private supplier is long-term such as 10-15 years.
- O&M costs for the targeted medical equipment are covered by the supplier.

The JICA survey team conducted financial analysis for introducing PPP under the above conditions. FIRR for each hospital with PPP is described in the following table.

**Table 4-54: FIRRs for Each Hospital with PPP**

| | Siem Reap | Battambang | Kampong Cham | Kampot | Svay Rieng | Stung Treng | Phnom Penh |
|---|---|---|---|---|---|---|---|
| FIRR without PPP (%) | -5.8% | -6.2% | -6.0% | -10.1% | -5.0% | -12.4% | -0.5% |
| FIRR with PPP (%) | -8.2% | -10.3% | -8.0% | -11.3% | -7.9% | -12.3% | -4.0% |

Source: JICA survey team

As the above table indicates, FIRRs for most hospitals become worse when introducing PPP for large medical equipment. This is considered because, in the case of with project, a certain amount of the hospital's revenue is dependent on the medical treatment which uses CT scans and MRIs frequently. Due to the nature of the high-level medical treatment that is going to be provided with project, the equipment should be utilized very frequently, which well exceeds the initial investment cost of the equipment. Because the amount of revenue which is dependent on the usage of CT and MRI is large, the impact of O&M cost getting zero for the equipment on FIRRs turns out to be very small.

## 4-5 Public Private Partnership and Countermeasures for the Financial Burden

### 4-5-1 PPP on Medical Equipment

A model analysis of the financial impact of the PPP on medical equipment is studied in detail below.[96] The table below shows a schematic cash flow when a Type A hospital performs the procurement, operation, and maintenance of large medical equipment, namely CT scans and MRIs, on its own. The model uses the results of interviews with provincial hospitals in the following settings:

- The project period is 12 years, and the discount rate is 8%. The discount rate is set by the survey team based on the loan interest rate published by the Central Bank, etc.
- The investment amount for the large medical equipment is 300. Of the investment amount,

[96] Analyses in this section is a typical example of the PPP on medical equipment. Investment amount is set by the survey team while other conditions such as project period, proportion of operation and maintenance cost to the investment cost, revenue sharing between the hospital and private are based on the interviews with the target hospitals.

50% will be revenue in the first year because the operation period is for six months in the second half of the year. The project will generate revenues equal to the invested amount in the following years.

- The operation of the equipment (salary for technicians, etc.) will cost 7% of the investment, and maintenance of the equipment will cost 10% of the investment.

**Table 4-55: Cash Flow for Large Medical Equipment Projects – Without PPP (regular procurement, operation, and maintenance)**

| Year | Revenue | Expenditure | | | Net cash flow | Weighted net cash flow | Weight with an 8% discount rate |
|---|---|---|---|---|---|---|---|
| | | Investment | Operation | Maintenance | | | |
| 0 | 150 | 300 | 11 | 15 | -176 | -176 | 1.00 |
| 1 | 300 | | 21 | 30 | 249 | 231 | 0.93 |
| 2 | 300 | | 21 | 30 | 249 | 213 | 0.86 |
| 3 | 300 | | 21 | 30 | 249 | 198 | 0.79 |
| 4 | 300 | | 21 | 30 | 249 | 183 | 0.74 |
| 5 | 300 | | 21 | 30 | 249 | 169 | 0.68 |
| 6 | 300 | | 21 | 30 | 249 | 157 | 0.63 |
| 7 | 300 | | 21 | 30 | 249 | 145 | 0.58 |
| 8 | 300 | | 21 | 30 | 249 | 135 | 0.54 |
| 9 | 300 | | 21 | 30 | 249 | 125 | 0.50 |
| 10 | 300 | | 21 | 30 | 249 | 115 | 0.46 |
| 11 | 300 | | 21 | 30 | 249 | 107 | 0.43 |
| | | | | | | **1,602** | |

Source: Developed by the JICA Survey Team based on interviews with regional hospitals.

In this scenario, the total weighted net cash flow for the project period would be 1,602.

However, if the same project is implemented using the PPP method, the cash flow from the hospital side would be as shown in the table below. The hospital would receive 40% of all revenues and would bear the cost of operation but would not incur any investment or maintenance costs. The total net cash flow, in this case, is 756.

**Table 4-56: Cash Flow for Large Medical Equipment Projects – With PPP (procurement, operation, and maintenance with a PPP method)**

| Year | Revenue | Expenditure | | | Net cash flow | Weighted net cash flow | Weight with an 8% discount rate |
|---|---|---|---|---|---|---|---|
| | | Investment | Operation | Maintenance | | | |
| 0 | 60 | 0 | 11 | 0 | 50 | 50 | 1.00 |
| 1 | 120 | | 21 | 0 | 99 | 92 | 0.93 |
| 2 | 120 | | 21 | 0 | 99 | 85 | 0.86 |
| 3 | 120 | | 21 | 0 | 99 | 79 | 0.79 |
| 4 | 120 | | 21 | 0 | 99 | 73 | 0.74 |
| 5 | 120 | | 21 | 0 | 99 | 67 | 0.68 |
| 6 | 120 | | 21 | 0 | 99 | 62 | 0.63 |
| 7 | 120 | | 21 | 0 | 99 | 58 | 0.58 |
| 8 | 120 | | 21 | 0 | 99 | 53 | 0.54 |
| 9 | 120 | | 21 | 0 | 99 | 50 | 0.50 |
| 10 | 120 | | 21 | 0 | 99 | 46 | 0.46 |
| 11 | 120 | | 21 | 0 | 99 | 42 | 0.43 |
| | | | | | | **756** | |

Source: Developed by the JICA survey team based on interviews with target hospitals.

The larger the total weighted net cash flow, the higher the financial performance.

Because the large proportion of revenue compared to investment and the hospital's share of the PPP is less than half, financial performance is higher if the hospital procures, operates, and maintains the equipment itself. Thus, the financial impact of the introduction of the PPP method for medical equipment under this model seems negative.

The other merits and challenges to introducing the PPP methods for medical equipment are described as follows.

**Merits**

- Efficient response in the event of equipment breakdown
  The breakdown of medical equipment is usually unpredictable, and the cost of repair or spare parts tends to be high for larger medical equipment such as CT scans. It is often difficult for hospitals to secure a certain amount of budget for such an unpredictable breakdown. Also, arrangements for the repair may take some time by the hospital. Thus, it could be efficient for the hospitals if the PPP contract agency took care of the repairs.
- Saving the labor cost of maintenance engineers
  The cost may include salaries as well as training. Remarkable technological innovations have been achieved in advanced medical equipment such as CT or MRI, and it is necessary for engineers to make efforts to collect up-to-date technical information on a daily basis. Thus, continuous training costs might be required for the hospital if hiring the

engineers.

**Challenges/considerations**

- The PPP contract partner should be an authorized distributor of the equipment manufacturer or group company to ensure that the equipment operates properly.
- Since the necessary services are provided by the PPP contract agency, the medical skills and techniques required to maintain and operate the medical equipment may not be improved in the hospitals.

Despite the worsening of the FIRR, some of the target hospitals are receiving large medical equipment services through the PPP method, mainly because of the difficulty in obtaining funds for the procurement of medical equipment and/or its maintenance cost at the hospital and, therefore, the merits described above overcome the challenges.

### 4-5-2 Other Types of PPP

PPPs for large medical equipment in provincial hospitals leave little room for the private sector to create efficiencies by devising designs through performance orders. Internationally, there are examples of PPP projects for hospital construction and operation and maintenance, divided into two main types. One is to divide the construction, operation, and maintenance of hospitals into medical services and other services (construction of hospital buildings, installation of medical facilities and equipment, maintenance and management, supply of medical supplies, and services to inpatients), and entrust the former to the government sector and the latter to the private sector. This type of PPP project is seen in countries with a lot of experience in private finance initiatives (PFI)/PPP, such as the UK, Australia, and Japan.

The other main type is where the private sector obtains the project rights to build, operate, and maintain a hospital on government land, and it provides the number of beds and treatment methods contracted with the government at user fee levels set by the government. Beds and services beyond the government contract can be operated at the private hospital's rates and services, with the private sector paying a concession fee to the government or the government paying a subsidy to the private sector for the government contracted portion.

While it is assumed to be premature to introduce this level of PPPs in the development of the provincial/regional hospitals at this moment, the introduction of these PPPs should be studied when considering the improvement of cost effectiveness and Cambodia's overall national health system in the future. In Cambodia, the government is going to replace the existing Law on Concession with the Law on PPP, and it is expected that the related regulations and guidelines including for the health sector will be prepared. In addition, it is necessary for the private sector to participate in PPP projects and accumulate the experience. The construction and operation of a hospital through PPP is a medium- to long-term challenge for Cambodia.

### 4-5-3 Countermeasures for the Financial Burden

The possible measures to reduce the financial burden at the hospital are listed below.

- The medical equipment bidding method:
  When bidding for equipment procurement, it can be proposed to include the maintenance cost for four years as a bidding condition after a one-year warranty period. In total, the maintenance cost is covered by the contract for five years which is a practice in other countries. It can also be requested that the bidders submit an estimated maintenance cost from Year 6 through Year 10 after procurement at the time of the bidding and commit to providing the maintenance services at that cost. The medical equipment life cycle is ten years on average. Therefore, the hospital can be prepared for lifetime maintenance from procurement to disposal of the equipment.
- Medical equipment sharing system with the medical equipment (ME) center concept:
  The concept of the ME center can be introduced as a measure to reduce the cost at the hospital. The hospital equipment management department can be set up as an ME center, which centrally manages the frequently used medical equipment. In this way, the amount of the required equipment can be kept to a minimum, making it easier and more cost effective to maintain the equipment. It is expected to contribute to the efficiency of medical service provision.

The opportunity to increase the hospital revenue can arise if the municipal/provincial hospitals can be transferred to PAI as described above.

## 4-6 Environmental and Social Considerations

In Cambodia, irrespective of the type of individual or association, such as private enterprises, joint ventures, public corporations, or ministries and agencies, all must conduct initial-environmental impact assessment (IEIA) or full EIA on the proposed project to submit the documented reports on the current activities in accordance with the applicable cabinet order in the MOE. It is a mandate to obtain approval from the MOE prior to the commencement of the project by applying for environmental approval.[97]

### 4-6-1 Implementation of Environmental and Social Considerations and EIA

Without exception, it is necessary to carry out the IEIA or full EIA prior to the construction, although the project plans to reconstruct the facility mostly within the existing sites of the hospitals.

The Prakas (Declaration) explains the steps of the EIA by the Cambodian MOE. Detailed steps from the initial contact with the MOE before the submission of EIA report were obtained from the survey team's interview with the person in charge at the EIA in the MOE.

[97] Appendix of the Sub-decree N. 72 ANKR.BK, dated 11 August 1999 on the Process of Environmental Impact Assessment

In this plan, since the details are still under development, it is undetermined whether the initial or full EIA will be implemented (Prakas No. 021 2020). According to the ministerial ordinance, project owners submit a project outline (project plans, project locations, project sizes, implementation schedules, implementation contracts) to the Department of Environmental Impact Assessment (EIA), MOE. After the initial consultation, the EIA department assigns staff to visit the site and review the relevant documents. Whether to conduct IEIA or full EIA will then be determined by the department. The project owner bears the expenses. In the case of full EIA, assessment by companies registered with the MOE is mandatory; however, in IEIA cases, this rule does not apply. Applications are submitted to the Department of EIA with detailed business plans (design drawings, process plans, etc.) in cooperation with the EIA company. In the project, one EIA report could cover the results of seven hospitals (BOX: sub-decree No. 72, 1999). The content should be in accordance with the Environmental Assessment Report and Certificate of Environment License, and 2) Guidelines of the Plan for Relocation of Residents (2000).

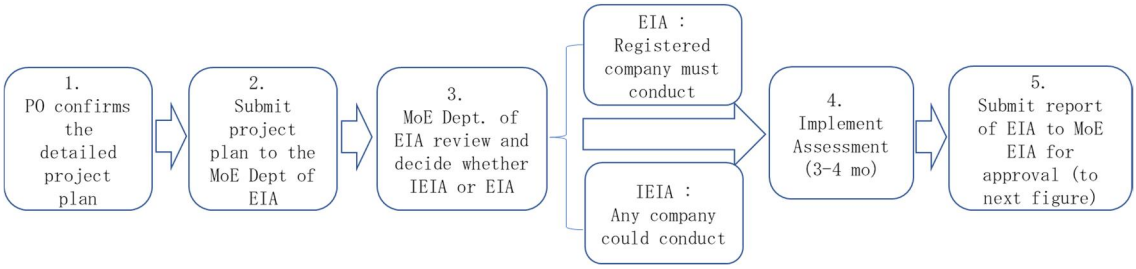



**Figure 4-22: Procedures for Preparing an EIA Report to the Ministry of the Environment after the Details of the Project are Finalized**

Source: Prepared by the JICA survey team

**BOX 4-1: EIA Report Contents**

The EIA report content is designated in sub-decree as following

(the entire process takes approximately $US40-50,000/project)

1. Introduction: background of the project
2. Method of assessment
3. Registration: existing regulation related to the field i.e., health care
4. Project description
5. Description of existing environment condition
6. Public consultation: local authority such as department of health / environment
7. Impact assessment: consultation with stakeholders
8. Environment management plan: method to mitigate the issues
9. Economic analysis: financial and social benefit
10. Conclusion

In addition, since no location of any of the target hospitals are a part of a nature conservation area, an application for environmental approval in this regard is not necessary for this plan. However, in November 2019, with the support of Japan, the Construction Law was enacted as the first construction-related law in Cambodia. As a result, "obtaining prior permission from the competent authorities" is required for almost all buildings. Depending on the type and size of the construction, the application recipients for the license differ. The documents required for the application include a construction agreement with the neighbors, a land management and safety agreement for the construction, and the construction agreement.[98]

As a result of I/EIA, only an agreement on the content of environmental monitoring and response needs to be agreed upon/signed. Since the EIA assessment takes three to four months and two additional months from the submission of the report, the estimated duration of the entire process from initial consultation to approval is approximately six months.

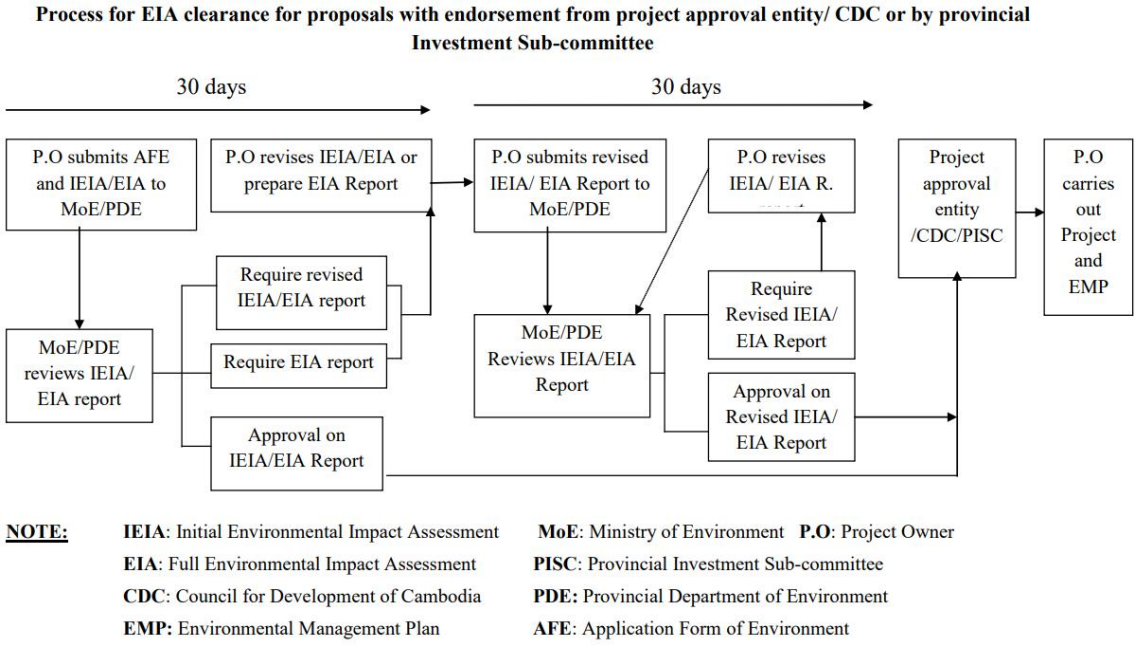



**Figure 4-23: Flow from EIA Report to Approval**

Source: Unofficial translation from MOH, Prakas on General Guidelines for Developing I/EIA Reports

At the stage of detailed plan survey and preparation for cooperation, the business owner decides on the screening by completing the screening form (outline of development area, facility area, production amount, determination of power generation amount). In this case, since all but Stung Treng is a project to construct a new ward within the premises of the existing hospitals, the environmental impact of demolition, construction materials and equipment, and transportation may be considered, but the impact on natural resources to the extent of harm is not considered. There are currently no residents at the proposed site for Stung Treng's new construction. At the

[98] JETRO translation https://www.jetro.go.jp/ext_images/OOA202004_kensetsu.pdf

end of this report (Appendix C), a provisional screening form is prepared as reference material.

### 4-6-2 Construction-related Laws and Regulations

Regarding the management of wastewater and sewage treatment systems, there are laws and regulations concerning sewerage, wastewater treatment system management, and business designs considering water pollution monitoring.[99]

For reference, there has been a trend toward green buildings with reduced environmental impact. In Cambodia, the Green Building Council has been established. The MOE aims to promote the recommendation, monitoring and certification of the construction of green buildings in the draft of the first edition of the Green Building Guidelines that is under preparation.[100]

### 4-6-3 Waste Generated from the Introduction of New Medical Equipment

(1) Import of Medical Devices

Although there are no regulations, the import of medical devices may require permission from the MOH. For this ministerial decision, it is necessary to present the items to be imported to the customs broker and confirm whether permission has been granted on a case-by-case basis. In Cambodia, there is a possibility of importing used products, especially precision medical devices from Europe. Guidelines have been established for the requirements to be complied with for used medical devices ("Technical Guideline for the Acceptance of Second-hand Medical Equipment" /MOH). Broadly speaking, the following conditions are imposed:[101]

- The hospital where the devices are installed after the import has been confirmed and there are ward subjects using the devices.
- The product has not failed and is guaranteed to be of a quality that can withstand the operation.
- Instructions for use and furnishings are attached.
- Maintenance work of the equipment could be carried out in Cambodia.
- Six years have not elapsed since the date of manufacture.

In addition, both sides are required to agree on the transfer of medical devices, technical and maintenance guidance, and to comply with the sender/donor and recipient of used medical devices.

(2) Registration of Medical Devices

In Cambodia, the system for a registration number for medical and dental equipment, whether manufactured or imported domestically, is established to ensure quality, efficacy, and safety. The MOH has the right to withhold and withdraw the registration seal number and is prohibited from manufacturing, importing, exporting and selling medical and dental equipment without such

[99]Sub-decree on the Management of Drainage and Wastewater Treatment System
https://www.mpwt.gov.kh/en/documents/sub-decree/93
[100] Cambodia Green Building Council https://www.camgbc.org/
[101] Technical Guideline for the acceptance of second-hand medical equipment (Ministry of Health, December, 2011)

registration seal number. “Medical devices” include not only medical instruments, appliances, and apparatus), but also medical supply (material), devices for bonding, reproduction, or implantation in the human body (implants), machinery, germicidal components (disinfectant), reagents (in vitro reagents and calibrators), computer programs (software), and other medical devices used in the health field. The application for the registration seal must be written in Khmer, English, or French. Once obtained, the number is valid for three years from the date of issuance, and six months before the expiry, the enterprise should apply for an extension of the period to the MOH.[102]

**BOX 4-2: Labels for Medical Devices and Dental Devices**

Labels for medical devices and dental devices should include the following labels:

- Product name/Address of manufacturing site and name of country of manufacture
- Name and address of the country of the product manager in the market
- Serial number, date of manufacture and expiration date (only once for sterilization and reagents)/storage conditions (for sterilization and reagent components)
- Various other necessary instructions, precautions, prohibitions, and information (if necessary)

(3) Medical Waste Related to Newly Introduced Equipment

Regardless of the newly introduced equipment, it is essential that all equipment in the hospital be carefully classified and appropriately processed so that infection does not spread. It is important to wipe where patients and staff come into contact with an alcohol preparation, or to disinfect using 0.02% sodium hypochlorite solution, etc. and ensure thorough ventilation. Waste is classified into “general waste,” “non-infectious waste for medical purposes,” and “infectious waste.”

This section summarizes the specific points to be noted in the operation of CT/MRI and angiography that are to be newly introduced to provincial hospitals.

CT・MRI

Hand washing before and after photographing (or rubbing hand disinfectant) should be performed. In particular, radiographs of patients with contagious infections should preferably be taken at the end of the day. Gloves, and optionally gowns (disposable aprons) and surgical masks should be worn and disposable sheets placed on the test bench. To prevent airborne infections, N95 masks should be worn. Face shields and surgical masks can prevent droplet infections. Cassettes, squirrels, and aids should be covered with plastic bags. After use, the front side of the plastic bags should be inverted inward and discarded collectively.

After completion of imaging, the equipment and instruments touched by the patient and staff should be cleaned and disinfected with alcohol. If an infectious disease is found after radiography,

[102] Ministerial Ordinance: Prakas on procedure for registration of medical devices: Prakas1258

it should be reported to the Infection Prevention Control Team, superiors, and managers for appropriate measures. Infectious waste should be clearly labeled before taken for treatment.

In a field survey, it was observed that t linens (bed sheets, etc.) were not provided by the hospital and the patients brought these from home or they were not used. It is necessary to thoroughly grasp and dispose of the linen that may have potential infectious contamination.

Angiography

Similar to the above-mentioned CT/MRI and other equipment, washing of hands before and after photographing, protection, separation and treatment of plastics and consumables after use, and cleaning and disinfecting should be thoroughly performed. The unique effluent and consumables of angiography and the equipment and instruments to be reused should be processed as directed by the vendor.

Since angiography is a device with a particularly high risk of contamination with blood, body fluids, etc., it is important to make nurses aware of the risks to prevent accidental exposure to blood and body fluids during the examinations. Education and training must be provided for the connection and injection of tubes to contrast medium injection equipment.

### 4-6-4 Proposals from On-site Inspections

Afterall, the following could be recommended for the target hospitals to consider for improving safe operation of the hospital.

a. Establish an IPC independent waste management team and thoroughly manage the waste after separation to the final disposal.
b. Improvement of information sharing (using images and signs) for outpatients, inpatients, and related parties (separation and treatment of waste, and infection prevention measures), and removal of animals from the premises.
c. Thorough countermeasures against construction defects (wastewater facilities).
d. Disseminating the functions of incineration equipment, preparing, and disseminating common procedures, and proposing appropriate use of incineration equipment for different types of waste.
e. Thorough management of incineration ash (guidelines for collection and storage as general waste).
f. The MOH's intervention in the procurement of waste disposal material (proper plastic bags procurement and distribution).

**BOX 4-3: Examples of the Use of Environmentally Conscious Waste Bags**

Examples of the use of environmentally conscious waste bags in Vietnam[103]

The National Cancer Hospital, based in Hanoi, the capital city of Vietnam, has established bidding plans for purchases of biodegradable waste bags to contribute to reducing plastic waste. In order to reduce the use of plastics, the product will be converted into a biodegradable bag made of cassava powder, and cutlery and dishes have been reused.

The Vietnamese Ministry of Health had formulated a roadmap to stimulate the use of medicines, chemicals, equipment, medical materials, and consumables that use environmentally friendly and reusable materials. Going forward, all medical facilities and health care departments across the country will launch campaigns targeting the health sector, workers, and patients to reduce the use of disposable plastic bags and other products. The move to reduce plastics is part of the health sector's efforts, triggered by the Prime Minister's call to political organizations, ministries, committees, local governments, associations, businesses, and communities.

### 4-7 Human Resource Development Plan for Regional Hospitals

As mentioned in this chapter, particularly Chapter 4-3-2 and 4-3-3, in order for the regional hospitals to fully function through the proposed facility and equipment plans, it is a prerequisite that the Cambodian government allocate necessary human resources to the target hospitals in a timely manner and clarify the legal status of the regional hospitals. The first step, with the leadership of MOH, is to clearly define the role and the types of medical services to be provided by regional hospitals and to incorporate human resources needs and measures in the HSP4 and the infrastructure development plan. In particular, the development of human resources with advanced medical skills requires long-term strategies and efforts by the Cambodian government. It is essential to assess to what extent the required conditions, environment and resources are made available in due course.

As explained so far in this report, the following are the capacity issues that should be addressed to realize the impact of the regional hospital development plan.

(1) Specialist Medical Personnel

It has been pointed out that a shortage of specialist doctors who handle advanced medical care is a major challenge to establishing regional hospitals. In particular, existing specialist doctors are concentrated in national hospitals and urban areas, while there is a large gap in referral hospitals in rural areas. Due to the lack of specialized medical skills, internal medicine and surgery are not properly differentiated in the specialized medical care system of the seven target hospitals. The total number of specialist doctors required for the target hospitals to function as regional hospitals is calculated at 240 in this survey, but the current situation is largely insufficient. As for the areas of specialization, they are all uniformly lacking, including oncology, cardiovascular surgery, neurosurgery, respiratory surgery, gastroenterology and ER.

One of the reasons for the shortage of specialist doctors in Cambodia is the lack of clinical training

[103] Viet Nam News: Hospital to use biodegradable bags to reduce plastic waste
https://vietnamnews.vn/environment/534795/hospital-to-use-biodegradable-bags-to-reduce-plastic-waste.html

sites. For pre-service education, clinical training for students is accepted by a limited number at national hospitals and some provincial hospitals in Cambodia. As for clinical training overseas, as part of the post-graduate specialist program at UHS, only some of the top ranked students are offered the opportunity to study in France in their final year. In-service education has issues with technical training systems and mechanisms, such as the lack of development of CPD programs in the field of specialized medical care and the lack of formal mechanisms for provincial hospital staff to be trained at national hospitals. The target hospitals interviewed, except for Stung Treng Provincial Hospital, explained that in-service education is conducted, but some of them did not have training units, and they were conducting the training in the form of information-sharing.

(2) Medical Equipment Maintenance

Through the interviews conducted by the survey team, it was revealed that the absence and lack of medical equipment engineers (MEEs) are particularly critical among hospital personnel issues. The number of MEEs allocated in the target hospitals was far less than the standard number of MEEs (five to seven per hospital). For this reason, many hospitals rely on private companies for the maintenance and management of medical equipment, which creates the problem of high repair costs. During the observation of the target hospitals by the survey team, since the maintenance (repair and accuracy/performance maintenance) budget was insufficient, the equipment used in the operation room (anesthetic machine/vaporizer, electric scalpel), in the ICU (patient monitors, infusion pumps, ventilators, X-ray machines, ultrasonic devices) and for examinations were found to have been exposed to repairs in hospital workshops for a long period of time. In the past, JICA has helped strengthen medical equipment maintenance at referral hospitals, but some have not found successors after the maintenance staff retired, and some hospitals have struggled to find a budget for repair costs. According to MOH, after the end of the JICA project, staff with sufficient knowledge remain limited, and the training courses developed have been discontinued.

(3) Finance

As explained in the analysis of the survey results, the target hospitals are in various financial situations. It is necessary to ensure that they will have the self-sustaining capacity for financial management and planning if they become PAI as regional hospitals. For example, capacity includes understanding the concept of and preparing income statements and balance sheets. Since the current accounting system consists of two separate components (one for budget requests to MOH and PHD and the other for user fees and insurance), these hospitals do not have the capacity to create a profit and loss statement that integrates both components and grasp the financial situation of the hospital as a whole.

In addition, currently, asset management is at the level of the asset ledger that manages assets at the price at the time of acquisition, but in the case of PAI, it is necessary to introduce the balance sheet with the concept of depreciation and market value and develop systems at the target hospitals to manage their assets and liabilities on their own. At present, all the target hospitals lack the capacity to create and implement hospital financial plans using income statements and balance sheets.

### 4-7-1 Proposed Technical Cooperation Projects for the Human Resource Development Plan

Based on the human resource requirements and development plan, the survey team discussed how to increase the implementation capacity and ensure the optimal impact of the proposed facility and equipment plans with JICA, MOH, MEF and target hospitals. As a result, the following two technical cooperation projects have been proposed. These projects are intended to provide complementary support for the practical capacity building of newly assigned human resources and existing human resources in the target municipal and provincial hospitals, so that they can provide high-quality specialized medical services and become sustainable regional hospitals from a management perspective.

**【Technical Cooperation 1】**
Strengthening regional hospitals for providing advanced medical services by training relevant medical professionals

**【Technical Cooperation 2】**
Strengthening hospital management of regional hospitals

Based on the overall agreement with MOH and MEF on these two potential technical cooperation projects, the following sections explain possible project frameworks and approaches. These are suggested by the JICA survey team based on the survey findings in Cambodia and JICA's similar project experiences in other countries. When the details of the regional hospital development plan are discussed and determined, these suggestions on JICA's technical cooperation should be further explored and modified as necessary.

### 4-7-2 Proposed Technical Cooperation 1

**【Technical Cooperation 1】**
Strengthening regional hospitals for providing advanced medical services by training relevant medical professionals

As mentioned previously, the lack of clinical training sites and opportunities has become a major issue in the training of specialist doctors in Cambodia. Based on the current situation, it would be difficult for the hospitals to perform the specialized care functions as regional hospitals; therefore, there is a particularly high need for the support. Based on the findings, the regional hospital development plan proposes to establish a training center at each Type A hospital and develop training functions related to advanced medical care as a regional hospital. This technical cooperation project is intended to contribute to strengthening the specialized medical care services by supporting the establishment of a training system that utilizes equipment made of advanced technology so that the personnel of regional hospitals can gain advanced medical skills. Assuming the regional hospital development plan will choose to follow the implementation schedule as

suggested (see Options 2 and 3 under Section 4-3-3: Implementation Schedule), Siem Reap Provincial Hospital could be the first Type A hospital to receive the technical support as a model Type A hospital. Subsequently, the project could consider supporting the technical transfer from Siem Reap Provincial Hospital to Battambang and Kampong Cham Provincial Hospitals around the time the latter two will complete their construction work through the facility and equipment plans.

(1) Project Framework

| | |
|---|---|
| **Project Purpose** | Medical services for NCDs using the target advanced medical technologies will be utilized in the regional hospitals. |
| **Target** | Doctors and specialist doctors at Siem Reap Provincial Hospital (Battambang and Kampong Cham Provincial Hospitals will be considered based on the timing of the regional hospital development plan and the allocation of required specialist doctors) |
| **Approach** | • The project will support Siem Reap Provincial Hospital, which is scheduled to complete the construction first. For Battambang and Kampong Cham Provincial Hospitals, the project will plan to support the technical transfer from Siem Reap Provincial Hospital in the latter half of the implementation period.<br>• In addition to dispatching Japanese Experts to Cambodia, the project will consider a combination of training methods and approaches including face-to-face in Japan, remote/online training, and collaboration with national and private hospitals in Cambodia.<br>• In addition to newly assigned specialist doctors, the project will consider training programs and systems that allow existing doctors in the respective hospitals to gain specialized skills to provide specialized medical care.<br>• In order to facilitate the skills development of advanced medical technologies, the equipment to be used for training will be financed by the project.<br>• The project will start by using the existing facilities at Siem Reap Provincial Hospital without waiting for the completion of the construction of the training center based on the facility and equipment plans. |
| **Activity** | 1. Set up a training team at the target hospital, followed by the formulation of training guidelines and strategies and the development of manuals and teaching materials.<br>2. Develop a training plan that includes methods and schedules.<br>3. Procure and set up training equipment at the target hospital and support technical transfer related to maintenance of the equipment.<br>4. Conduct training according to the plan and develop an implementation manual and monitoring and evaluation framework to establish a model of the training implementation system at the target hospital.<br>5. Support technical transfer to Battambang and Kampong Cham Provincial Hospitals using the above manual.<br>6. Share training techniques and the implementation manual with stakeholders through seminars, etc., for promotion of the training system. |
| **Japanese Side Input** | Dispatch of Japanese Experts, provision of materials and equipment, operating expenses for project activities and implementation of training in Japan |

| | |
|---|---|
| **Technical Partner** | • National hospitals (Calmette Hospital, Khmer Soviet Hospital, Kosomak Hospital, etc.)<br>• Private hospitals (Sunrise Japan Hospital, etc.)<br>• Private companies (Terumo, Fujifilm, Canon Medical, etc.) |
| **Implementation Period** | Up to 5 years |

(2) Approaches to Target Advanced Specialized Technologies and Training Methods

A wide variety of advanced medical technologies can be targeted by the project including cardiology, neurosurgery and oncology, where the shortage of human resources is particularly critical. The technology that will be the focus of this project should be determined based on the available resources of JICA and the Cambodian government and the status of allocation of doctors at the hospital. As a training method, it would be most effective to dispatch Japanese specialist doctors in relevant fields (e.g., endoscopic examination and operation, interpretation of MRI results, PCI, etc.) to Cambodia as clinical training instructors. However, since it is not easy to dispatch such personnel for a long period of time, it would be realistic and effective to dispatch them for a short term (e.g., two weeks) for face-to-face training and training visits to the hospitals, combined with training in Japan and remote/online guidance for follow-up. Since specialist doctors who can be tapped as training instructors are also available in Cambodia, including at national hospitals and private hospitals and companies, the project should consider collaborating with these domestic resources in addition to Japanese experts.

(3) Training Equipment

In order to facilitate the strengthening of advanced specialized medical skills, it is proposed to procure the following training equipment for the training center as part of the technical cooperation support.

| Name | Content | Unit/Price |
|---|---|---|
| Functional Patient Simulator | A human body model that learns to change medical findings and vital signs according to the disease, treatment status, and elapsed time. | Confidential |
| Endoscope Insertion Shape Observation Model | A training model for observing the insertion shape of an endoscope. | Confidential |
| Virtual Bronchoscopy Software | A model that reconstructs a virtual image of the bronchial lumen from CT image information to learn biometric information for bronchoscopy insertion. | Confidential |
| Laparoscopic Surgery Training System | A model for learning laparoscopic insertion techniques. | Confidential |

JICA has recently started the Project for Strengthening In-service Training Systems in Cambodia to improve the in-service training system for nurses working in public health facilities in target sites, including Phnom Penh, Kampong Cham, and Battambang. Since nurses are key personnel

at regional hospitals, it is important to coordinate with the project and enhance the synergistic effect of the hospital human resources development.

### 4-7-3 Proposed Technical Cooperation 2

**【Technical Cooperation 2】**
Strengthening hospital management of regional hospitals

As the second technical cooperation project, it is proposed to strengthen the capacity of hospital management, the area in which JICA has a diverse experience of support in different countries. Since regional hospitals will be developed as a new health service delivery system under MOH, it is necessary to strengthen a wide range of operational management capacities such as financial management, medical equipment management and personnel management. The legal status of a regional hospital is directly linked to the management including personnel and budget, and, therefore, the details of support will be examined in line with the Cambodian government's future policy and decision on the legal status. In particular, in the case of PAI, it is indispensable to support the target hospitals in gaining self-sustaining capacity for financial management and planning.

(1) Project Framework

| | |
|---|---|
| **Project Purpose** | Hospital management will be strengthened as a regional hospital. |
| **Target** | Hospital staff at 7 hospitals (Phnom Penh, Stung Treng, Svay Rieng, Kampot, Battambang, Siem Reap, Kampong Cham) |
| **Approach** | • Support target hospitals according to the phased approach as scheduled in the proposed regional hospital development plan.<br>• If the target hospitals become PAI as regional hospitals, the project will incorporate support that strengthens their capacity for independent financial management and developing financial plans. Possible support includes increasing the capacity to understand the concept of and create income statements and balance sheets and the capacity to create and implement hospital financial plans (e.g., hospital financial management based on cost accounting, efficiency of hospital management, asset management), and developing training and systems related to planning and implementation of hospital subsidiary projects (e.g. parking lot operation, café operation, donation operation).<br>• Explore the possibility of working with existing MEEs who received support from the past JICA technical cooperation projects. In addition, it is necessary to take into consideration the lessons learned from the past projects regarding sustainability after the project completion.<br>• Consider strengthening of digital system as part of hospital management of target hospitals in accordance with MOH's digital health policies and systems.<br>• Depending on when and how the legal status of regional hospital will be |

| | |
|---|---|
| | decided, the project can commence before the completion of the hospital construction by the project to support the strengthening of the management system using the existing human resources. |
| **Activity** | 1. Establish hospital management systems, develop manuals and teaching materials and implement training. (training topics include leadership, planning/ reporting, monitoring and evaluation, human resources management, financial management, equipment management, information management, etc.)<br>2. Develop plans by the management team and implement monitoring and evaluation.<br>3. Conduct 5S-KAIZEN-TQM training and its monitoring and evaluation.<br>4. Document the processes and results of the project and share them with MOH so that it can be used as an operation manual for regional hospitals. |
| **Japanese Side Input** | Dispatch of experts, provision of materials and equipment, operating expenses for project activities and implementation of training in Japan |
| **Implementation Period** | Up to 5 years |

The suggested timing of the implementation of the two technical cooperation projects in relation to the regional hospital development plan can be found in the earlier section on the implementation schedule (Section 4-3-3).

In order to complement the above-mentioned technical cooperation, it is proposed to support the following short-term and long-term training in parallel so as to contribute to the long-term development of human resources such as specialist doctors. In particular, it would be effective to address the limited clinical training sites for pre-service education by supporting long-term training for UHS graduate students (specialist majors) at Japanese universities.

| Scheme | Support |
|---|---|
| Short-term training | Issue-specific and country-specific training related to hospital management, medical equipment management and maintenance, etc. |
| Long-term training | Long-term clinical training for MEE and specialist doctors (e.g. radiology, endoscopic diagnosis, pathological diagnosis, emergency, etc.) at Japanese universities |

### 4-8 Conclusion and Considerations for Implementation of the Plan

In order to respond to the high demand for advanced medical services to deal with the increasing burden of NCDs, MOH is proposing to develop regional hospitals by upgrading some of the municipal and provincial hospitals. This survey proposed the regional hospital development plan including the human resource development plan.

The proposed plan aims to support upgrading the seven municipal and provincial hospitals to two

types (Type A and B) with advanced medical services in orthopedics, cardiology, gastroenterology, urology, pulmonology, neurology, and oncology. The difference between the two is that Type A hospitals are strengthened to provide advanced treatment for cancer, cardiology and neurology.

The key components of the facility plan for Type A hospitals are to establish the new advanced medical service department and improve and modernize the facilities for the general medical service department. The facility plan for Type B hospitals aims to strengthen the diagnostic functions of the advanced medical care department and improve and modernize the general medical care department.

From the perspective of effective construction planning and securing the necessary health personnel, it was proposed to disperse the timing of the detailed design and construction of the seven hospitals, starting with the upgrading of Siem Reap Hospital.

An economic analysis of the proposed JICA loan project to materialize the regional hospital development plan was conducted adopting the EIRR as an evaluation indicator. The EIRR was 18.5%, which exceeded the benchmark of the social discount rate of 12%. This indicates that this plan is considered feasible from the viewpoint of Cambodia's national economic development. However, the result of the financial analysis for each hospital was mostly negative. Therefore, it is suggested that a subsidy from the government is needed to maintain the hospital's effective operation and management.

It can be assumed that the PAI status could increase the opportunities to improve the hospital revenue as PAI status is expected to bring more flexibility to manage hospital assets and liabilities and the potential for more diversified means of income, such as parking operations, land/building rentals, and donations.

The PPP method for large medical equipment, currently being implemented in Cambodia, in this plan would have a negative financial impact. The introduction of the PPP approach to hospital construction, operation, and maintenance is proposed to be studied for improving the cost-effectiveness of Cambodia's health services in the future.

It is critical to allocate the necessary human resources for the successful implementation of the plan. While it is the prime responsibility of the government of Cambodia to secure the required human resources, the technical cooperation projects were also proposed to support the government's efforts. The two projects aim to strengthen advanced medical services by training relevant medical professionals and to strengthen hospital management

In order to implement the proposed plan successfully, the key requirements by the relevant government authorities include the following:

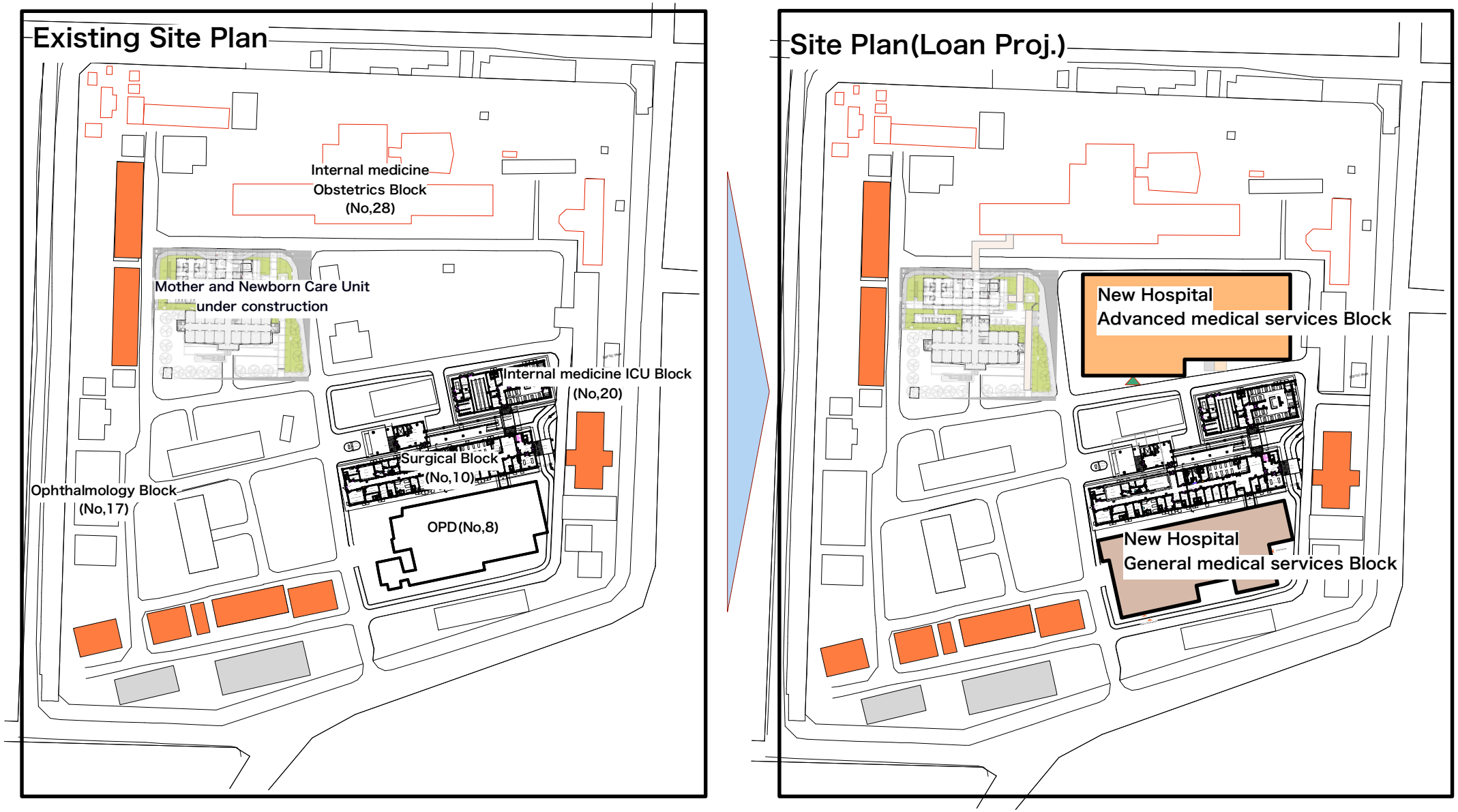
(1) Finalization of the overall national strategy of the regional hospital development
(2) A clear decision on the legal and operational status of the regional hospital and successful transition of the target hospitals as per the decision

(3) Development and implementation of the plan for employment, recruitment and capacity building of medical personnel required for the plan, especially specialists in advanced medical care

END

# Appendix A

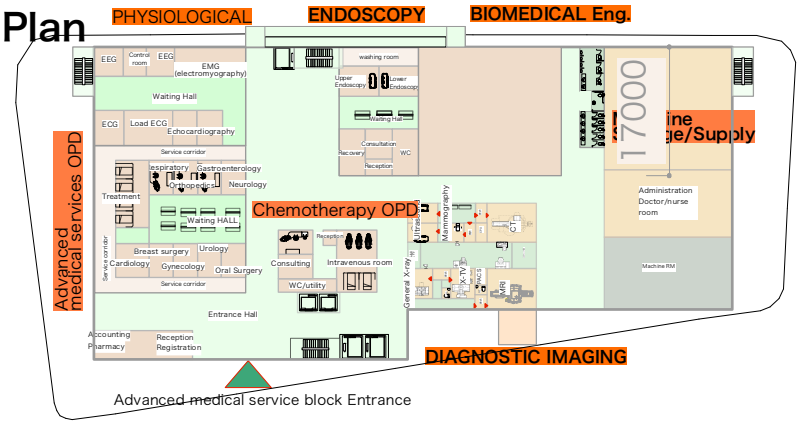
# Regional Hospital TYPE A
# Battambang Hospital



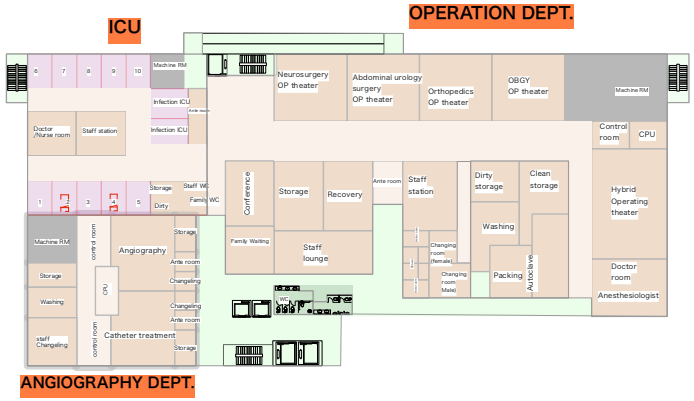
# Battambang Hospital

## Advanced medical services Block

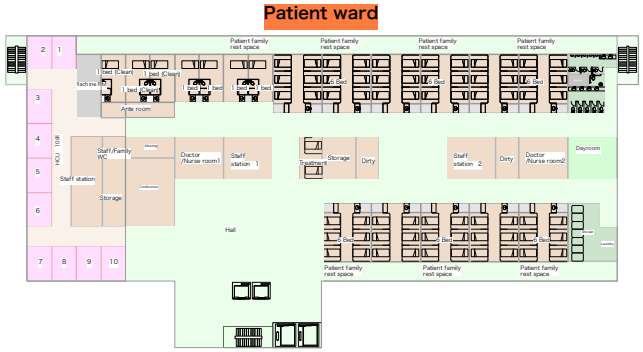
### Ground Floor Plan




### 1st Floor Plan

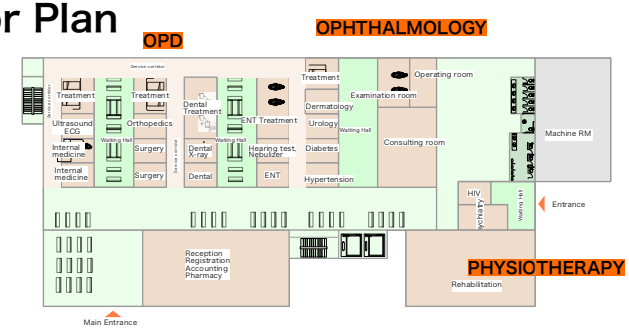



### 2nd Floor Plan

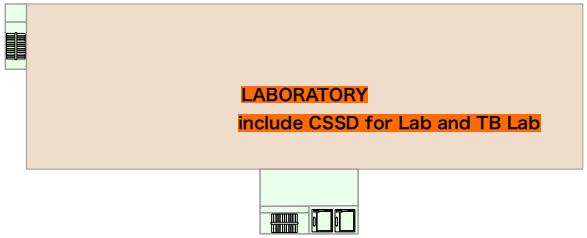



## General medical services Block

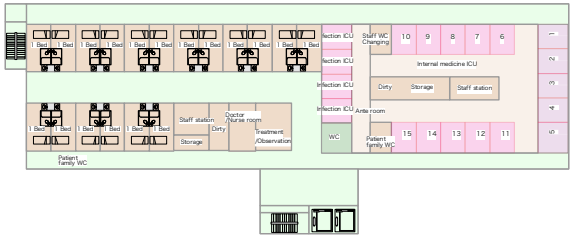
### Ground Floor Plan




### 1st Floor Plan



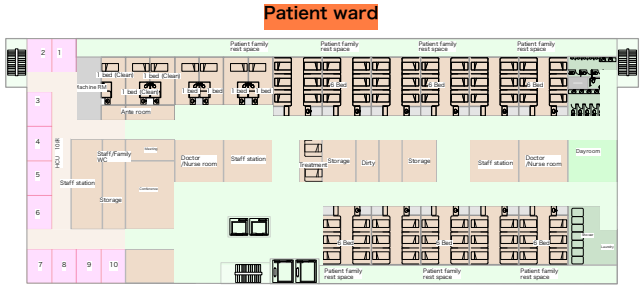

### 2nd Floor Plan



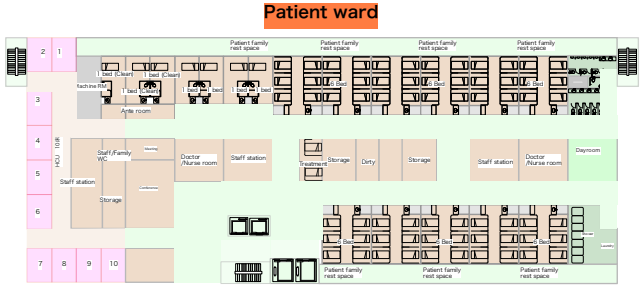
# Battambang Hospital

## Advanced medical services Block

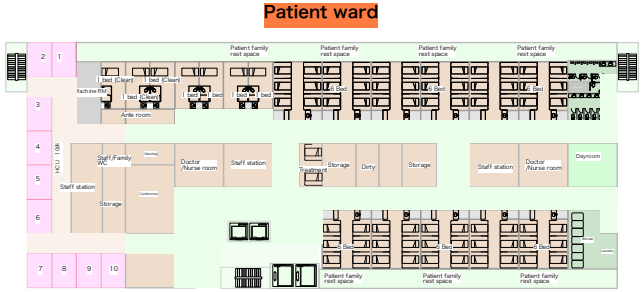
### 3rd Floor Plan



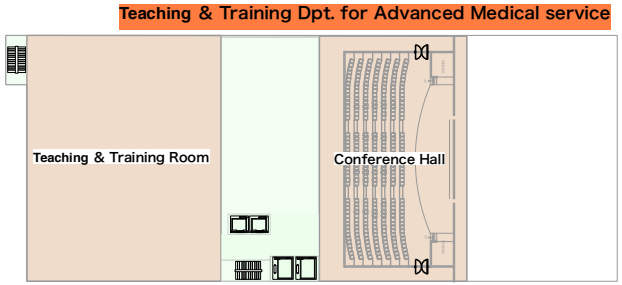

### 4th Floor Plan




### 5th Floor Plan

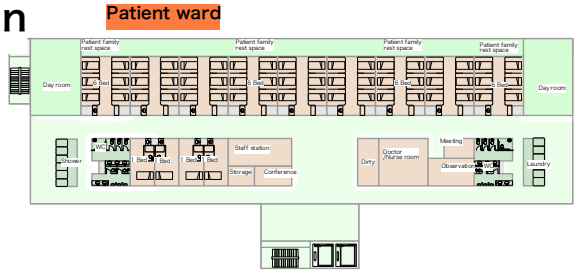



### 6th Floor Plan

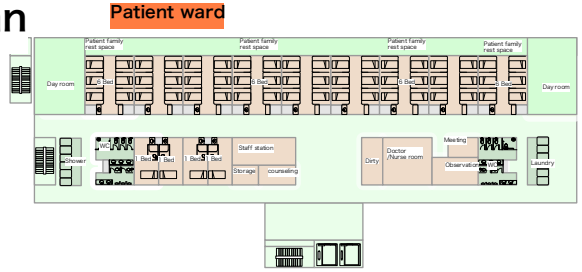



## General medical services Block

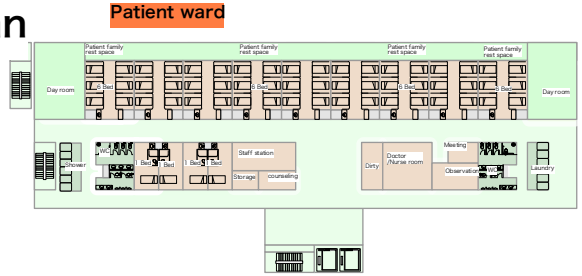
### 3rd Floor Plan



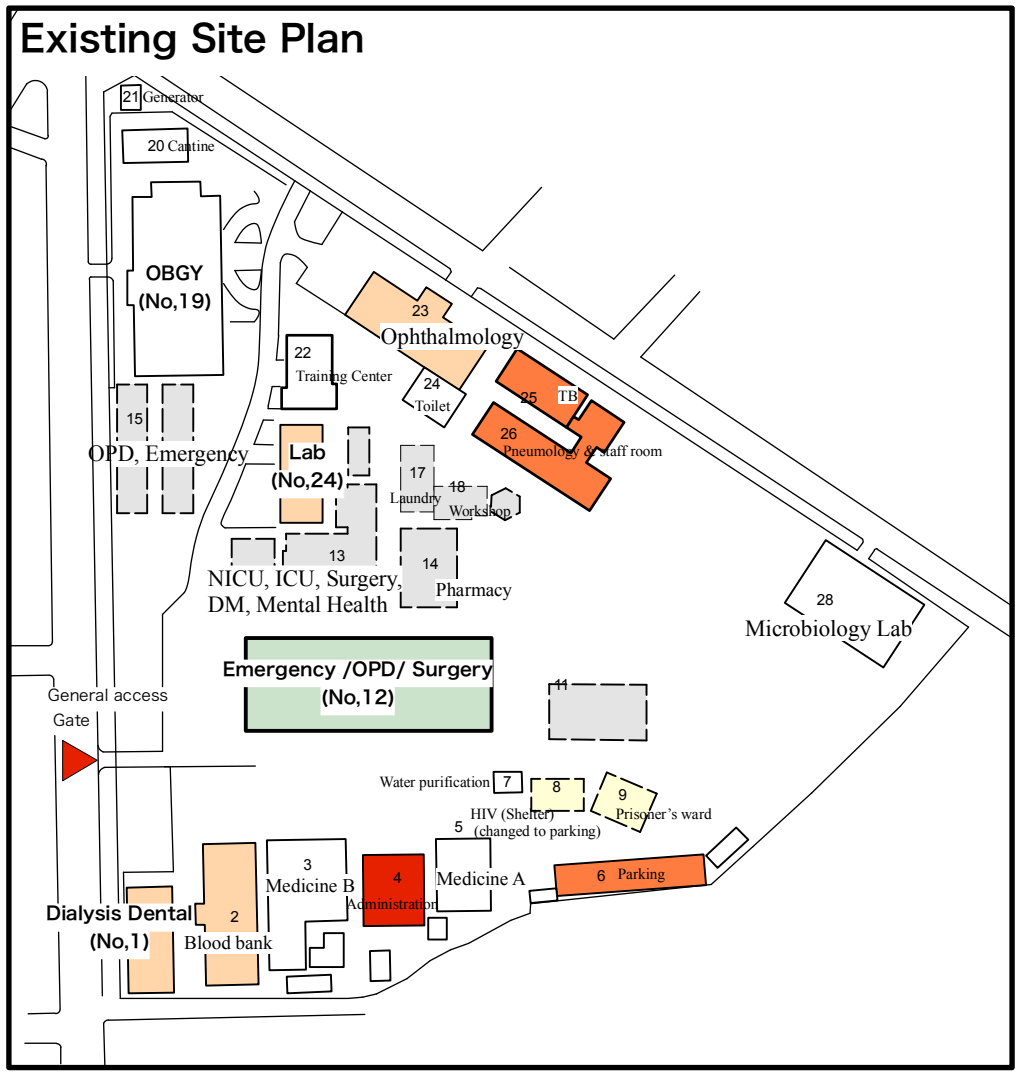

### 4th Floor Plan

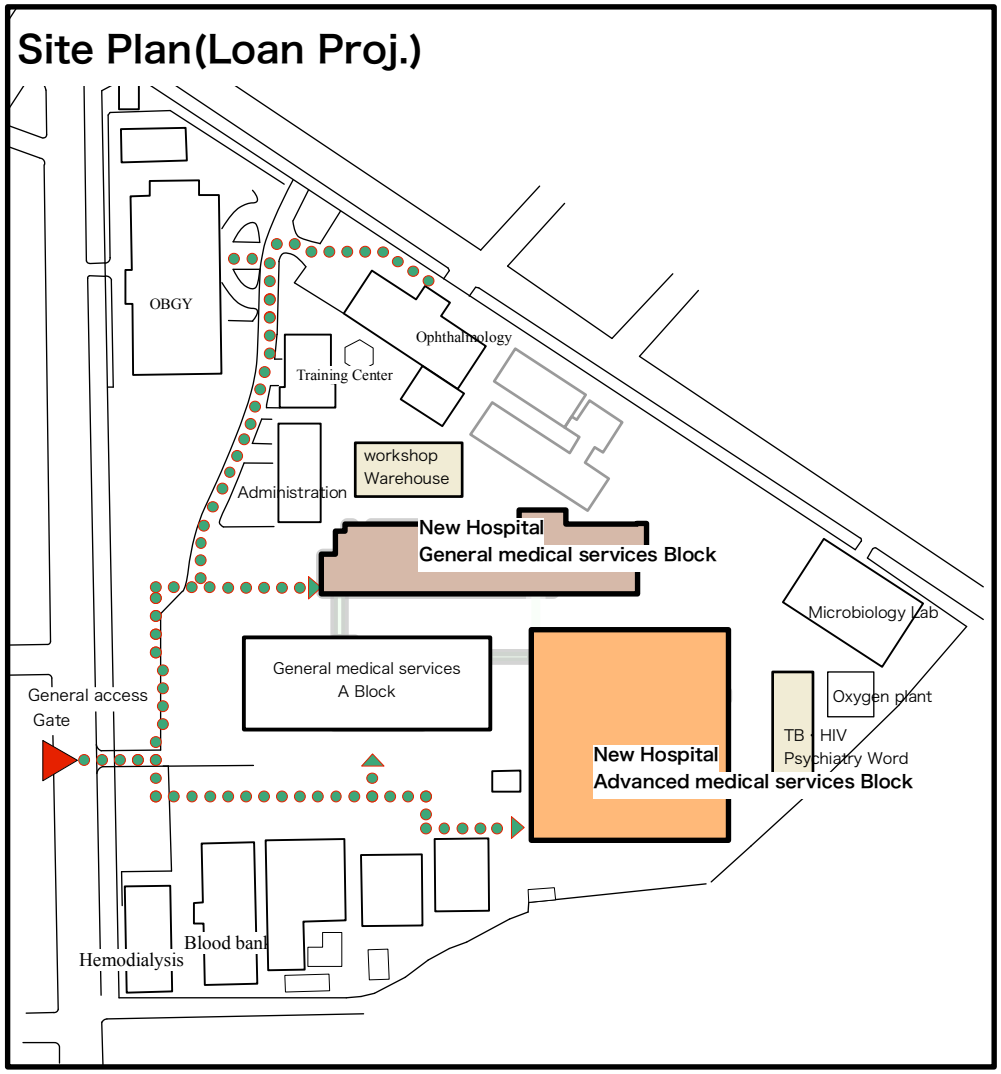



### 5th Floor Plan



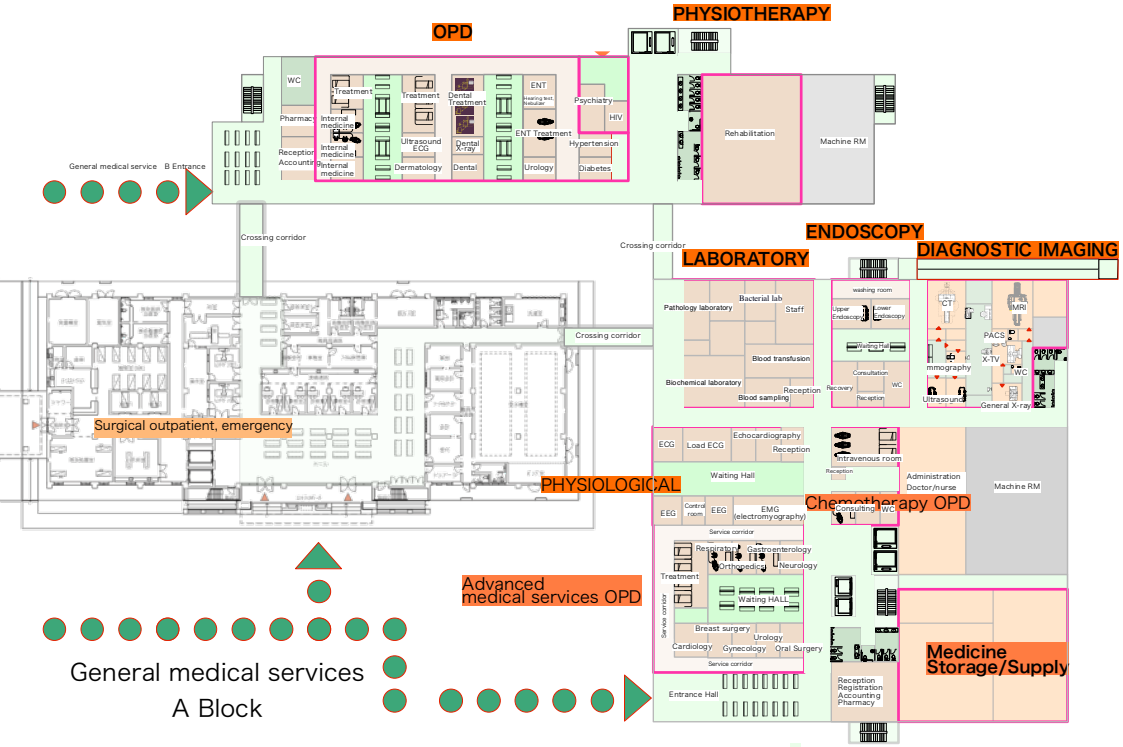
# Regional Hospital TYPE A
# Seim Reap HOSPITAL



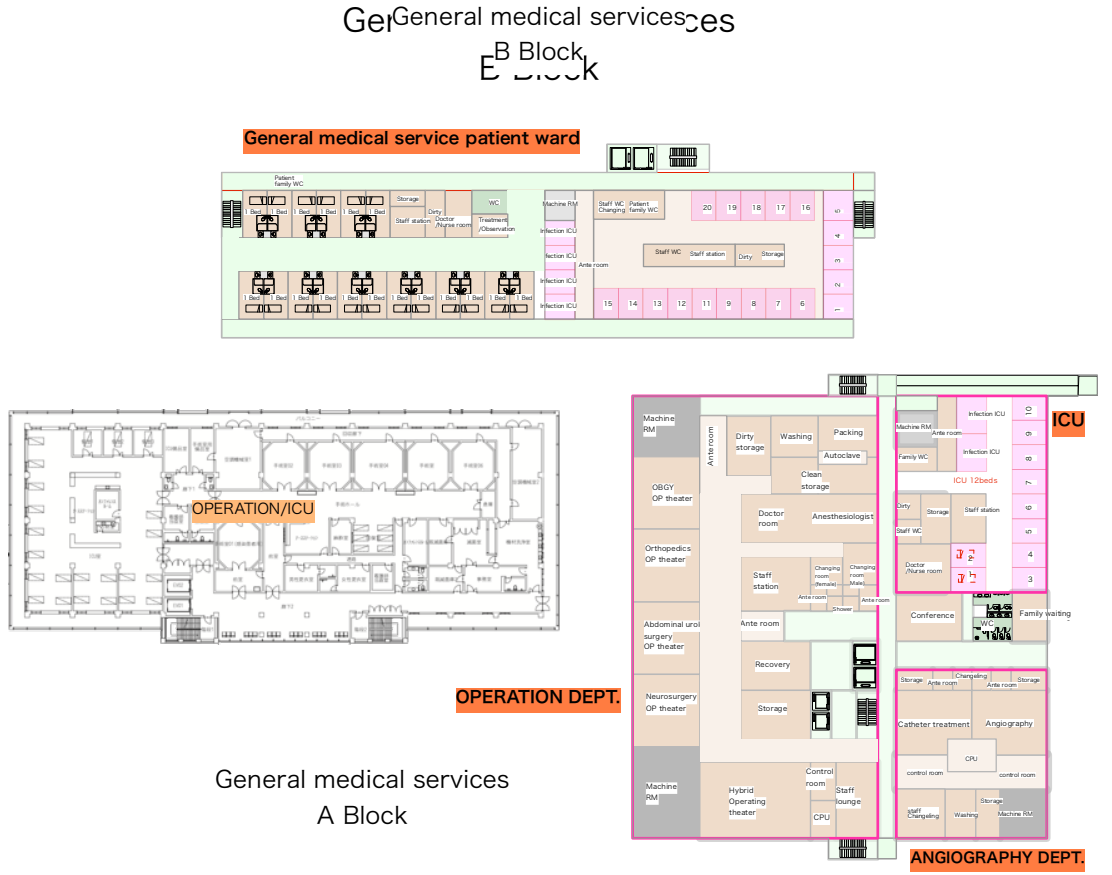



# Seim Reap HOSPITAL

## Ground Floor Plan



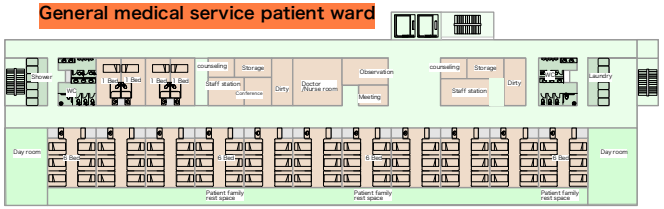

## 1st Floor Plan



# 2nd Floor Plan

General medical services
B Block

General medical service patient ward




General medical services
A Block

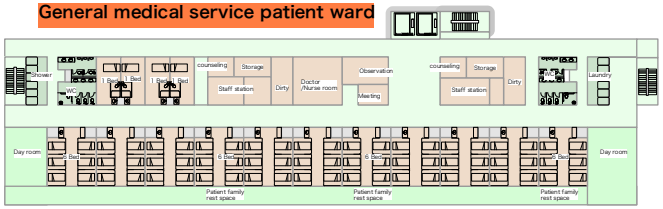
Advanced medical service patient ward

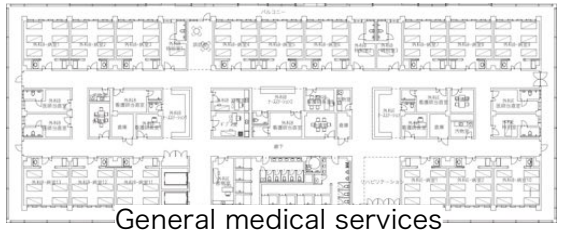
Advanced medical services
Block

# 3rd Floor Plan

General medical services
B Block

General medical service patient ward





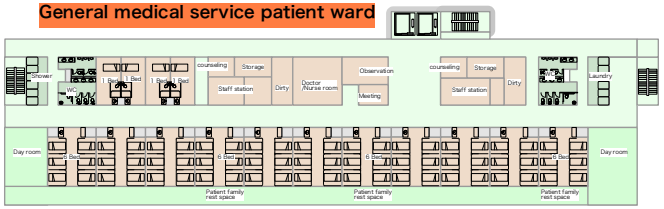
General medical services
A Block

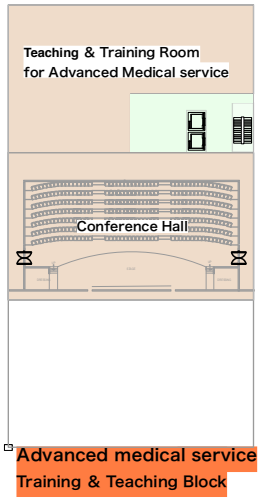
Advanced medical service patient ward

Advanced medical services
Block

## 4th Floor Plan

General medical services
B Block

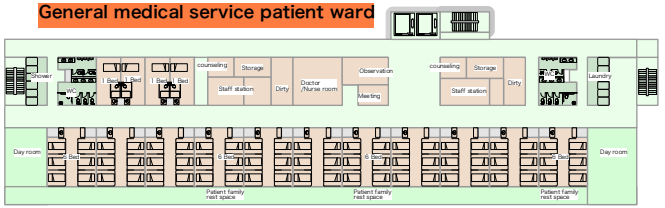



Advanced medical services
Block

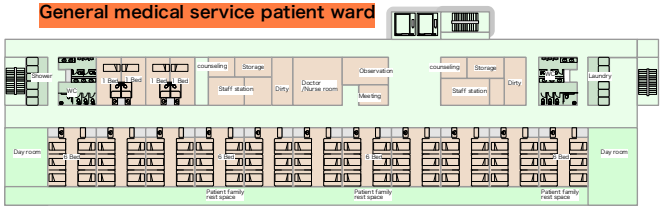
## 5th Floor Plan

General medical services
B Block

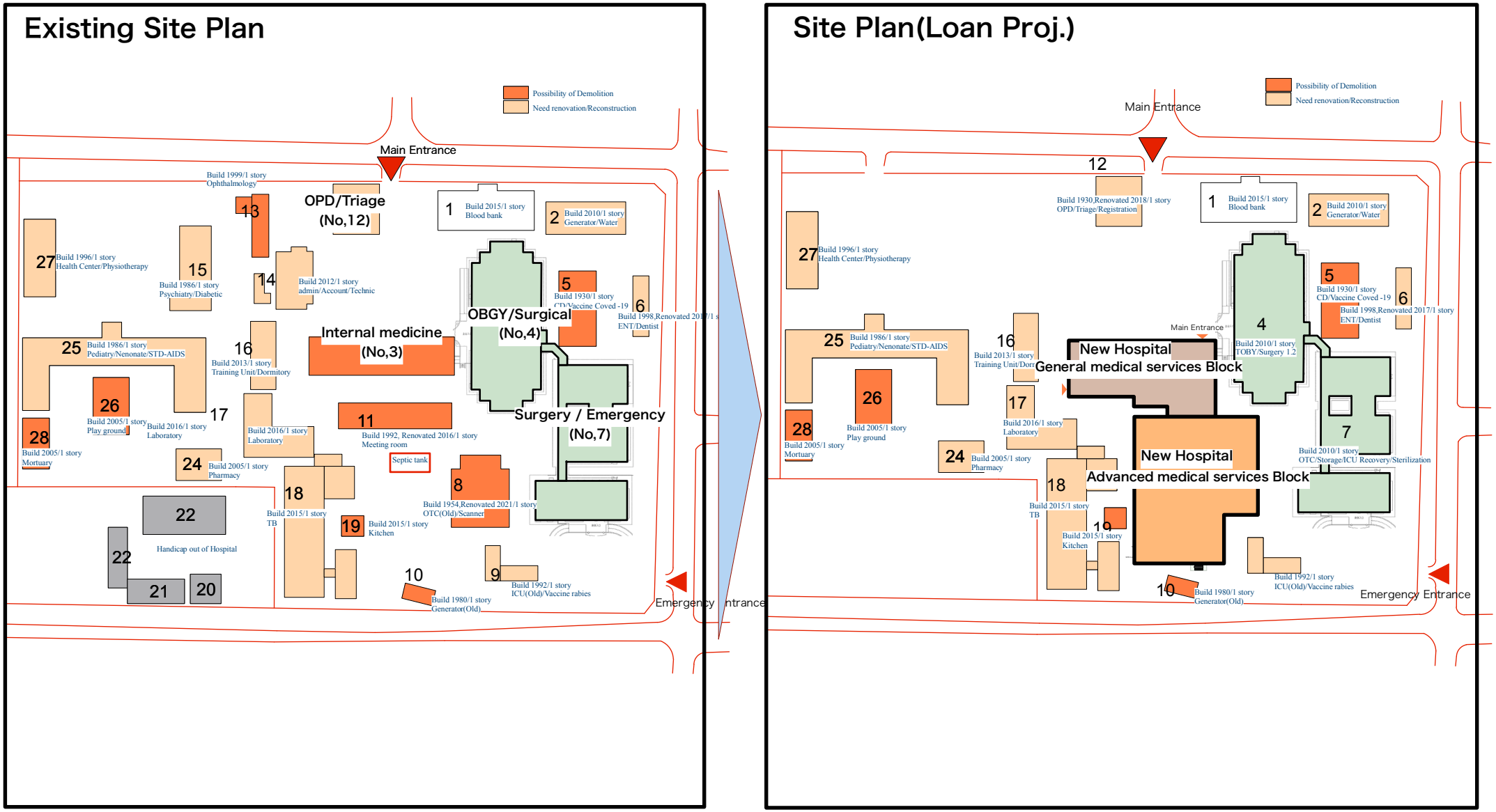



## 6th Floor Plan

General medical services
B Block



# Regional Hospital TYPE A
# Kampong Cham HOSPITAL



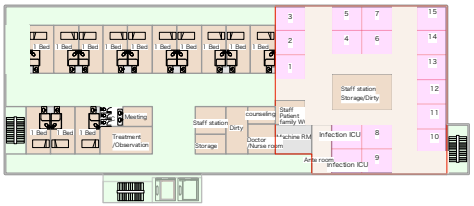
# Kampong Cham HOSPITAL

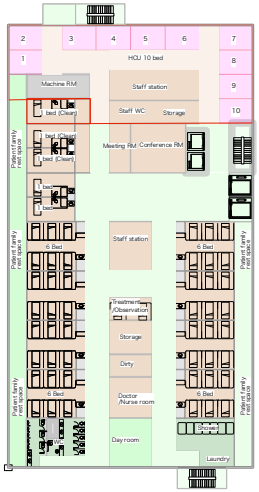
## Ground Floor Plan


## 1st Floor Plan

## 2nd Floor Plan

General medical service patient ward

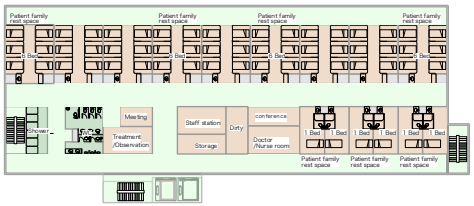


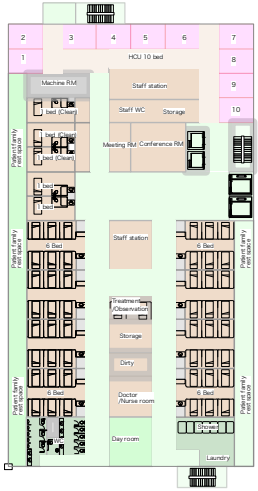


Advanced medical service patient ward

## 3rd Floor Plan

General medical service patient ward

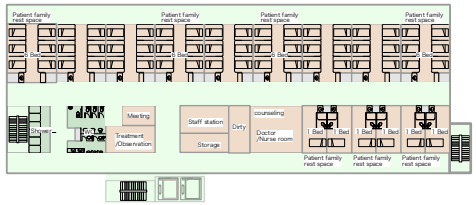


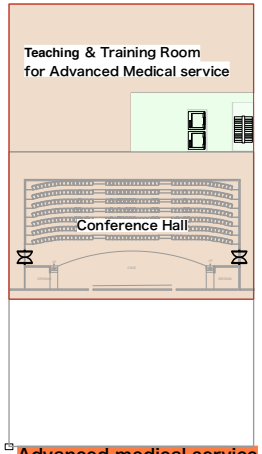


Advanced medical service patient ward

## 4th Floor Plan

General medical service patient ward

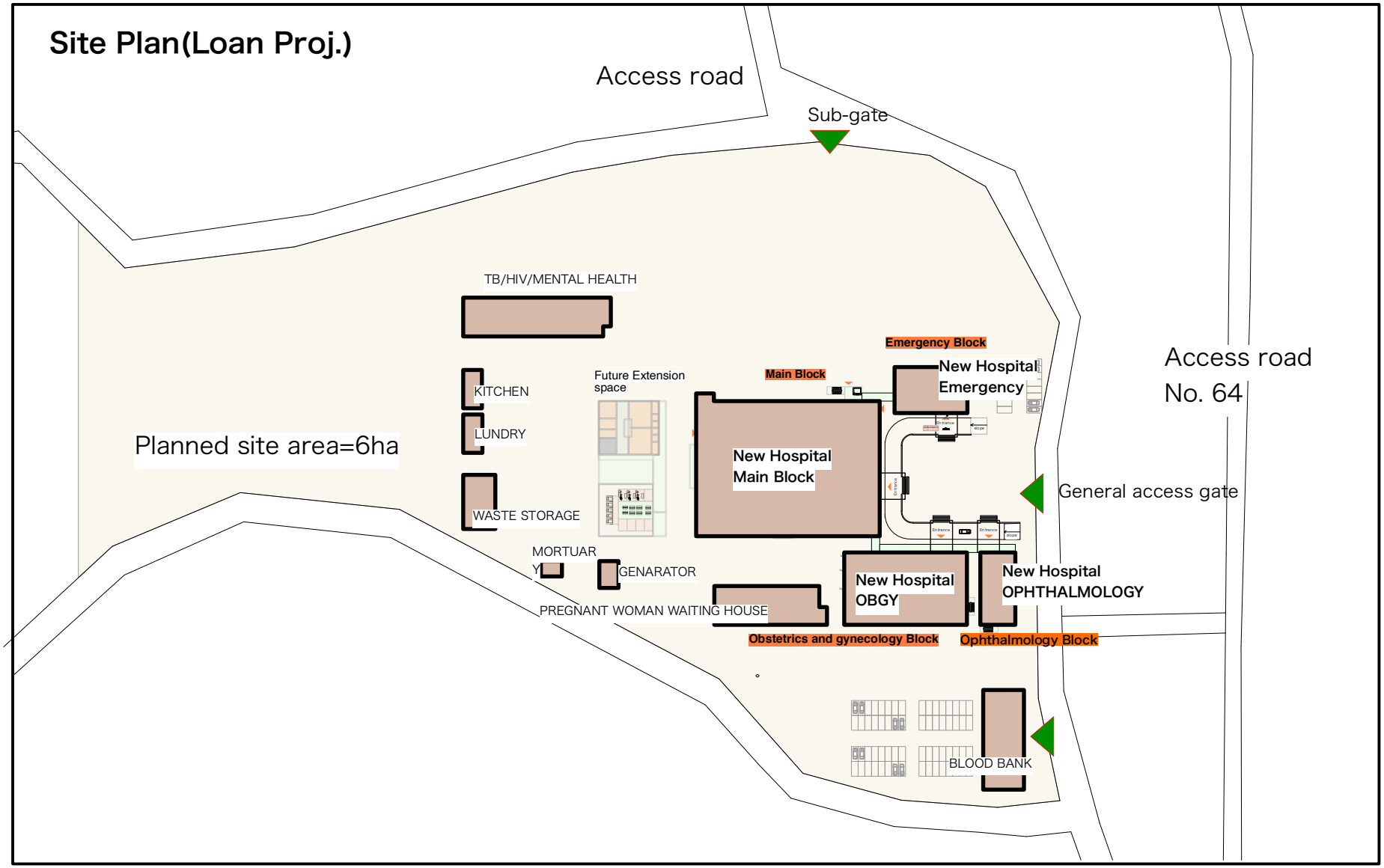




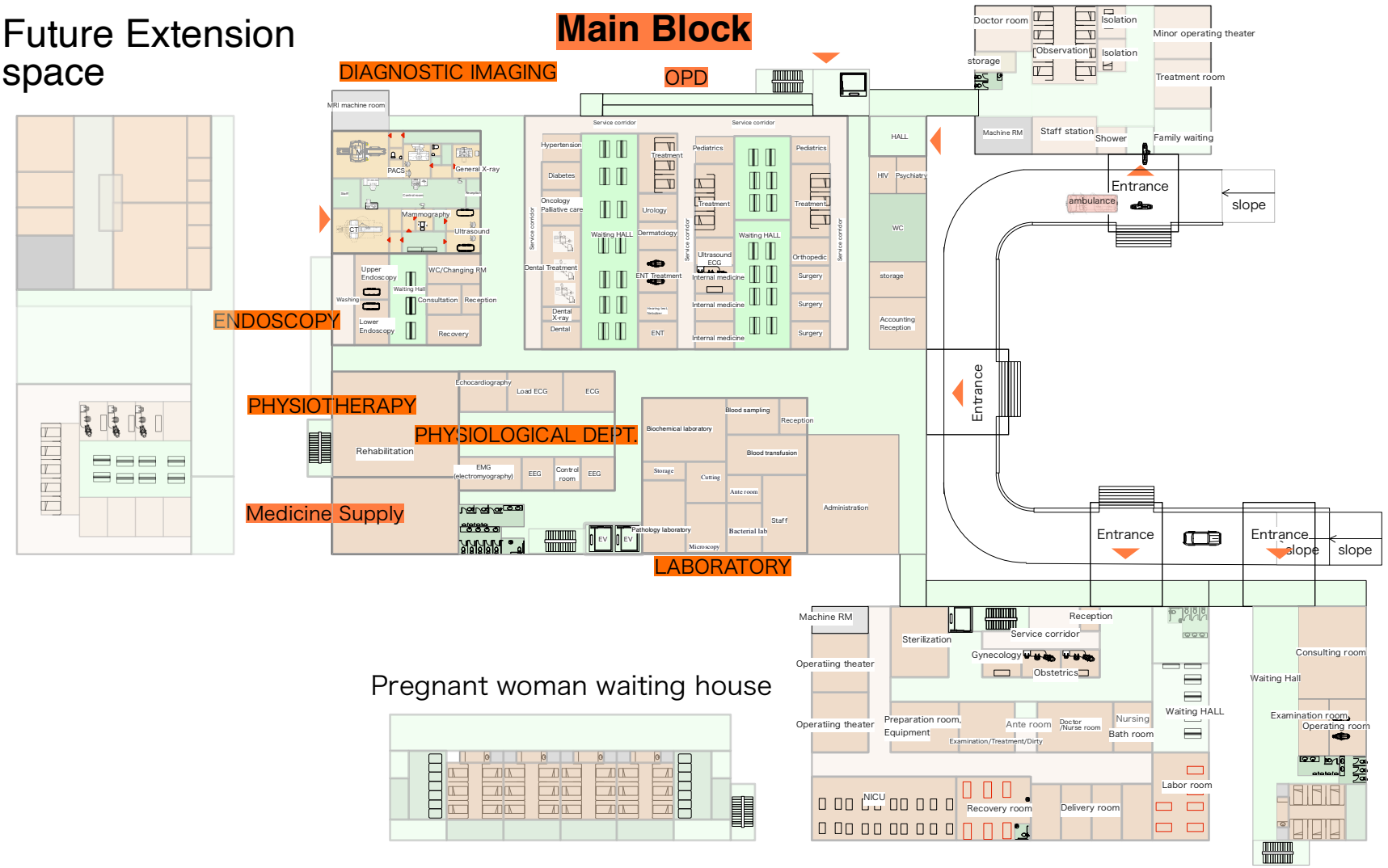

Advanced medical service
Training & Training Block

# Reagional Hospital TYPE B

## Stung Treng Hospital



# Ground Floor Plan

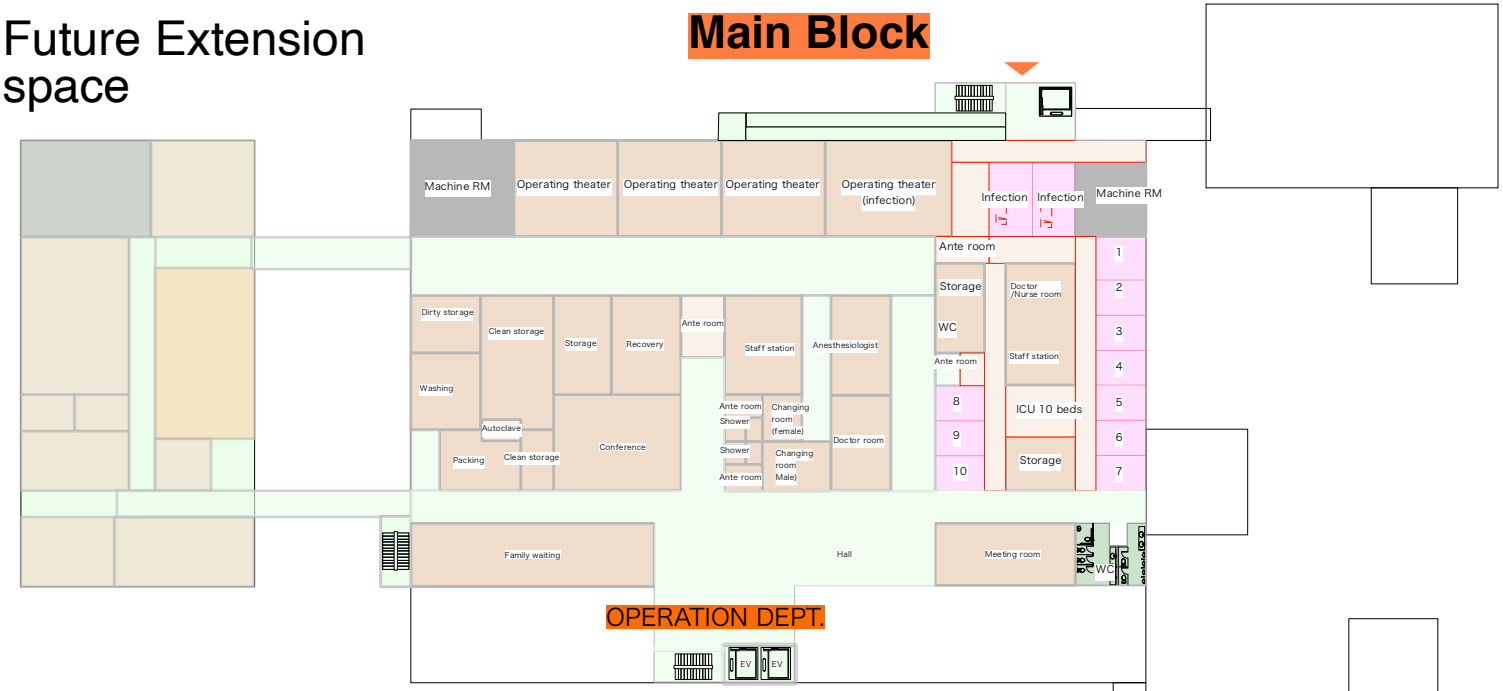


# 1st Floor Plan

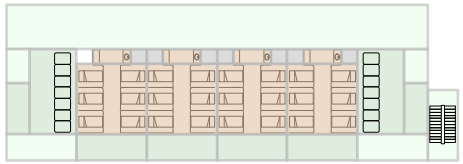
## Emergency Block

Future Extension space

## Main Block




Pregnant woman waiting house




## Obstetrics and gynecology Block

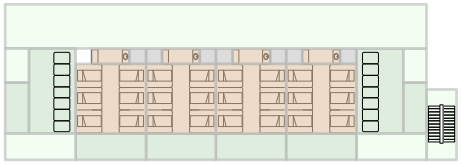
## 2nd Floor Plan

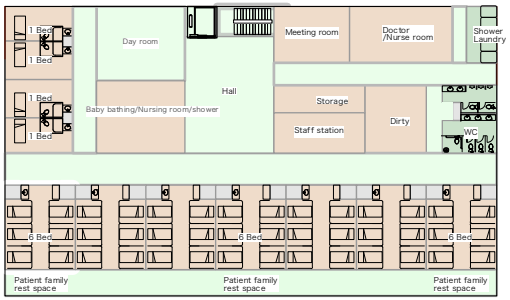
**Main Block**


## 3rd Floor Plan

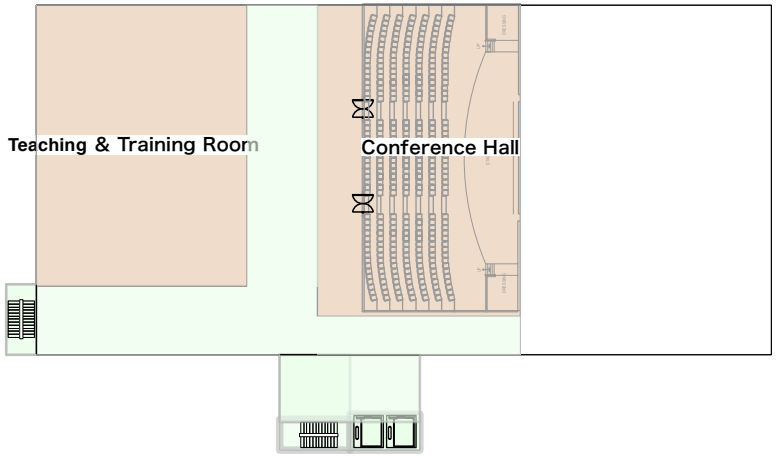
**Main Block**


Pregnant woman waiting house



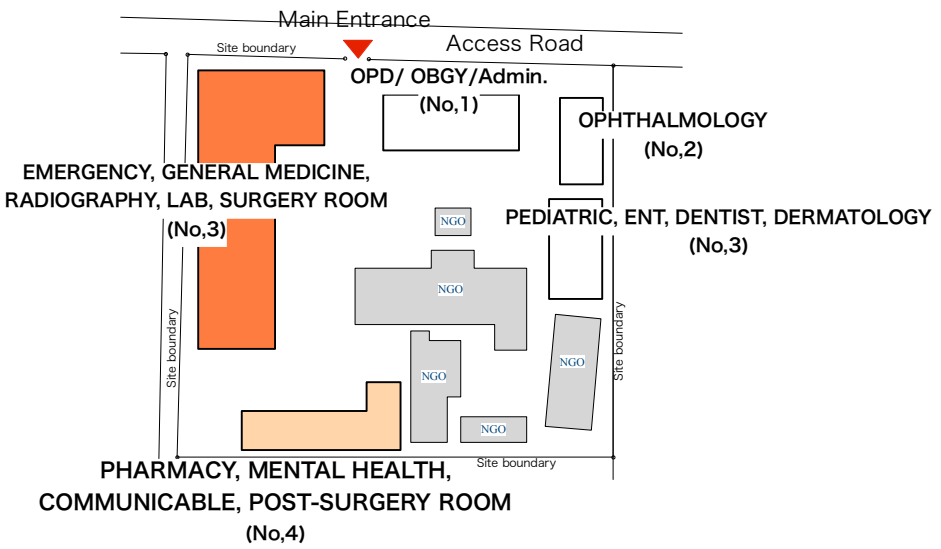



## 4th Floor Plan

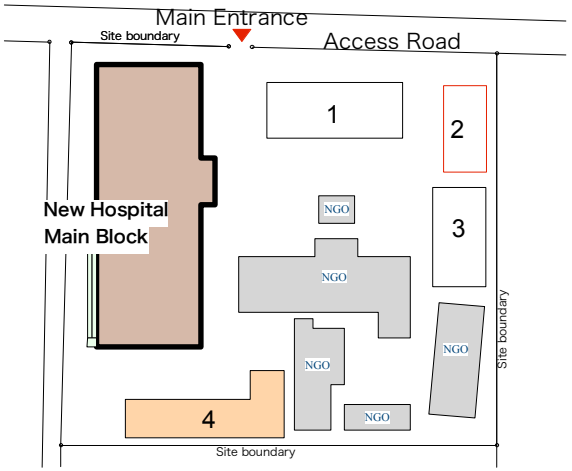


# Regional Hospital TYPE B
# Phnom Penh Municipal Hospital

## Existing Site Plan

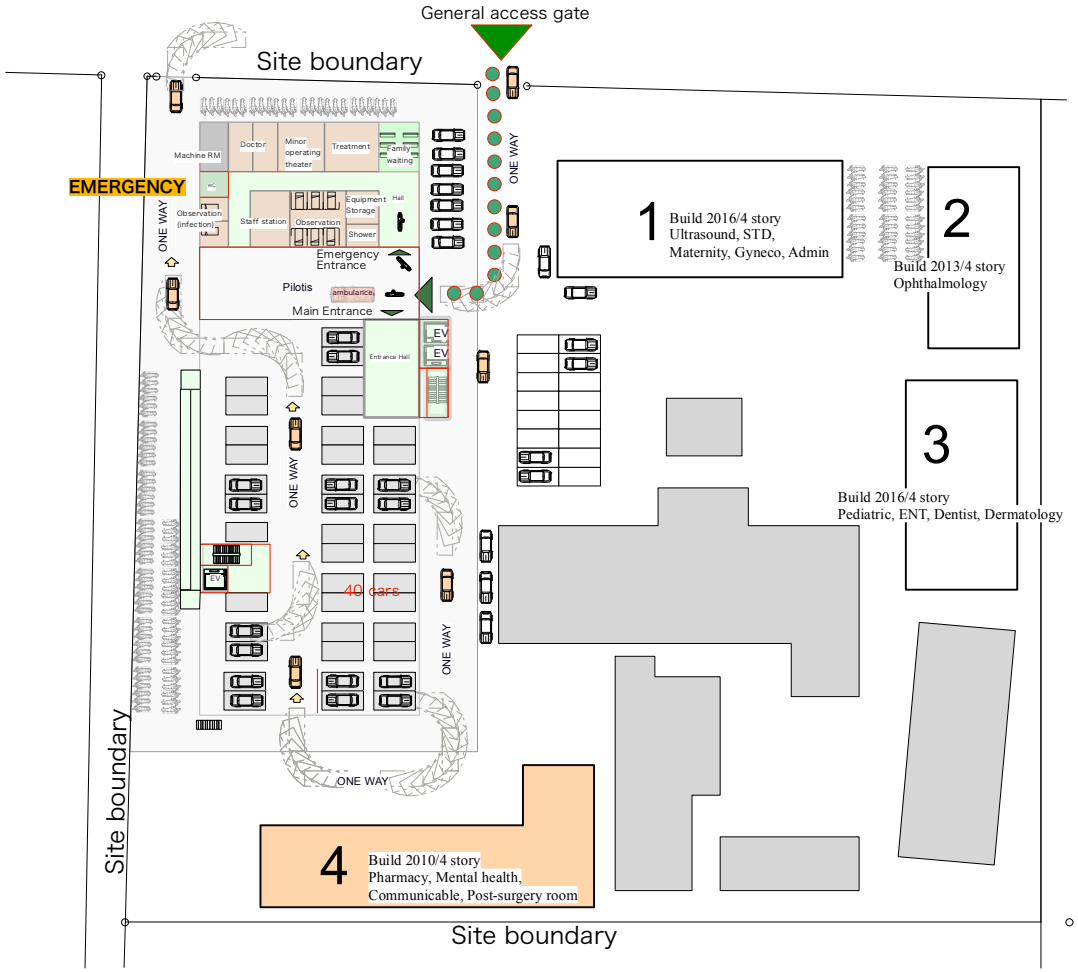



## Site Plan(Loan Proj.)

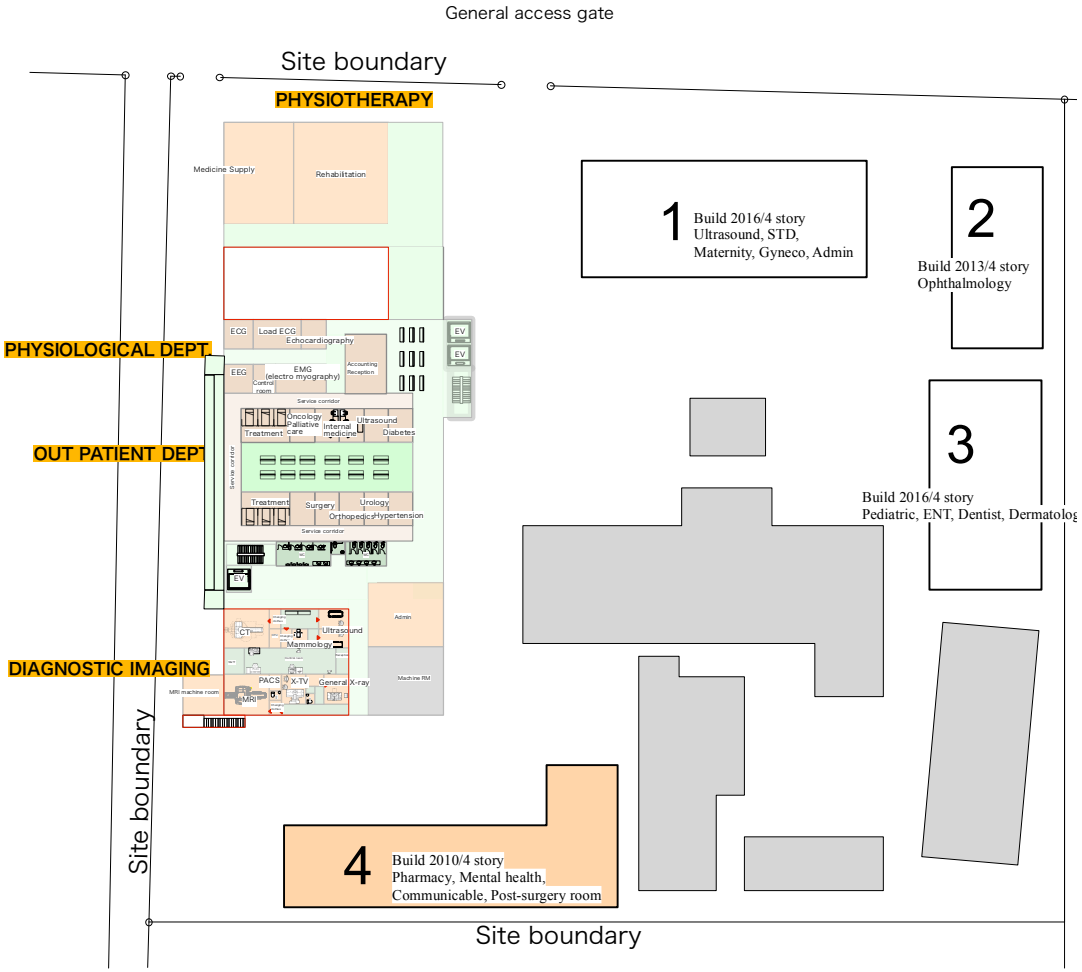


# Phnom Penh Municipal Hospital

## Ground Floor Plan

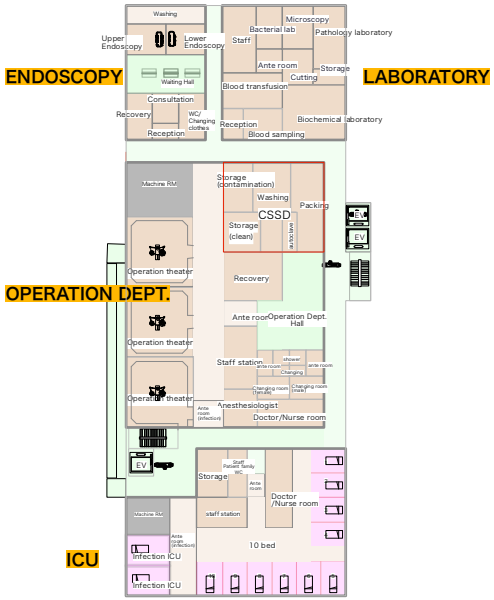



## 1st Floor Plan

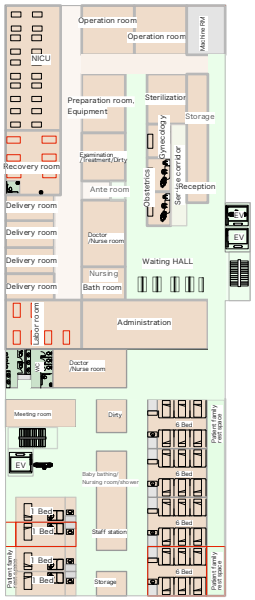


# Phnom Penh Municipal Hospital

## 2nd Floor Plan

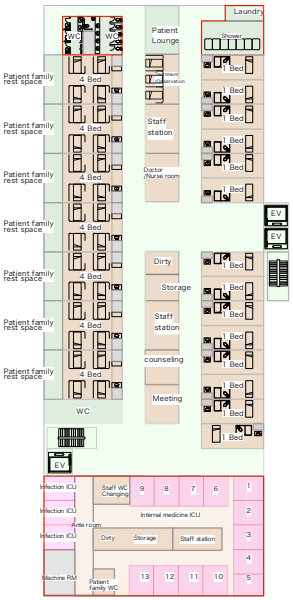



## 3rd Floor Plan



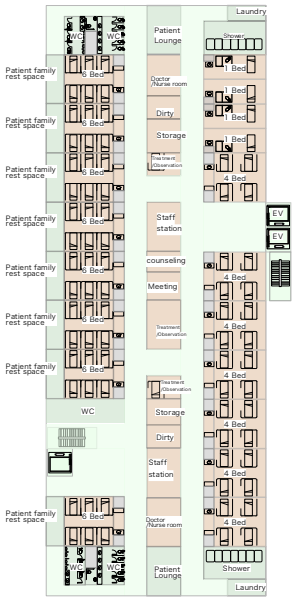

Obstetrics and gynecology

## 4th Floor Plan



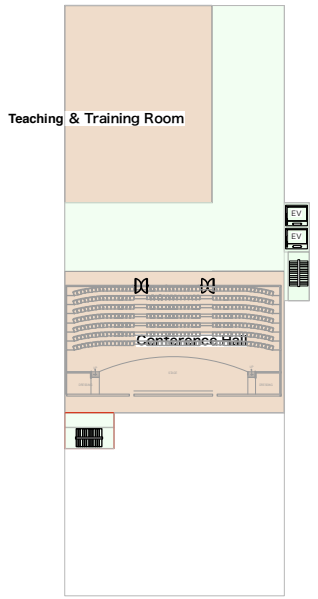

PATIENT WARD

## 5th-6th Floor Plan



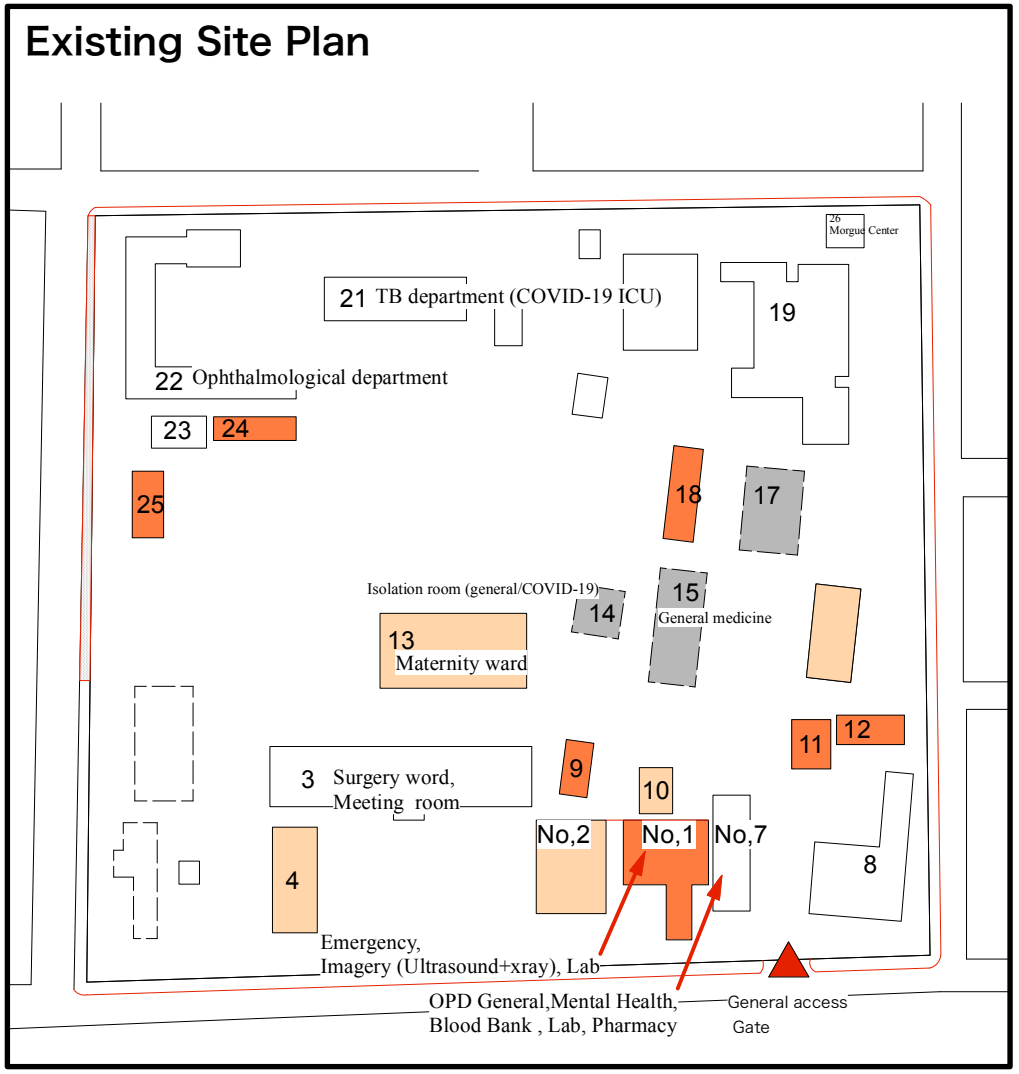

PATIENT WARD

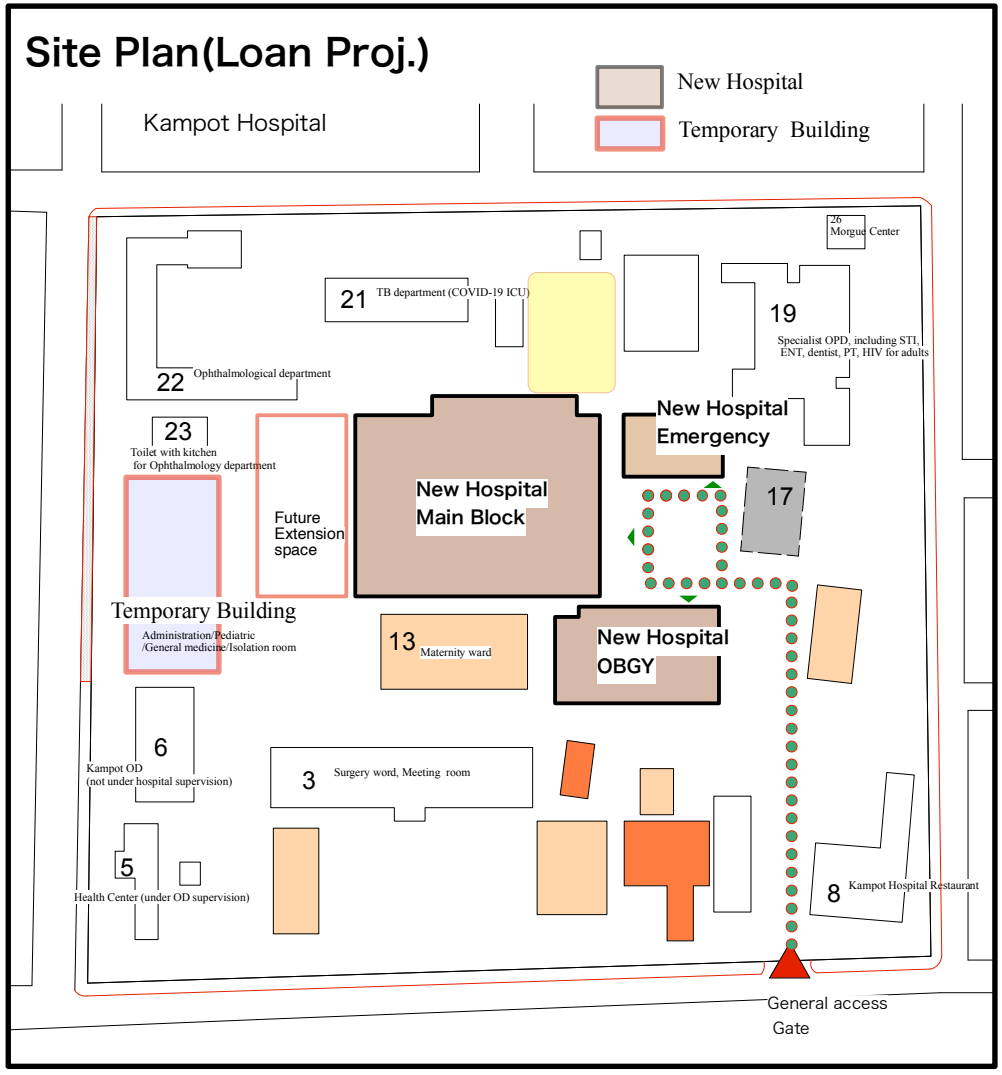
## 7th Floor Plan



# Regional Hospital TYPE B

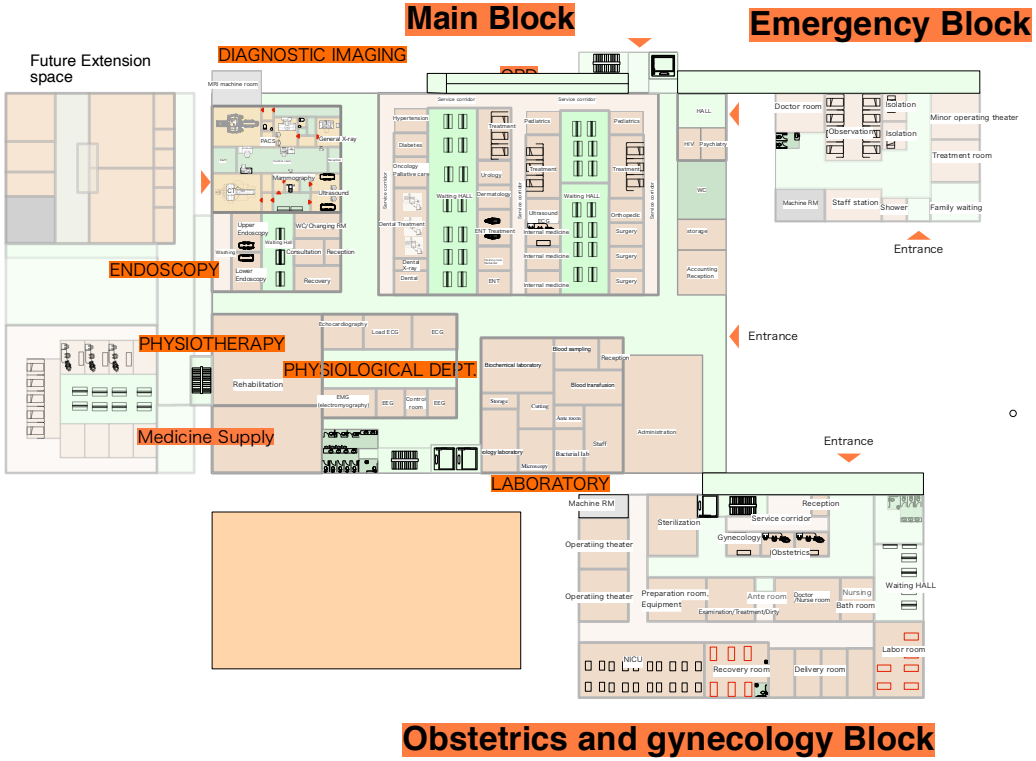
## Kampot Hospital



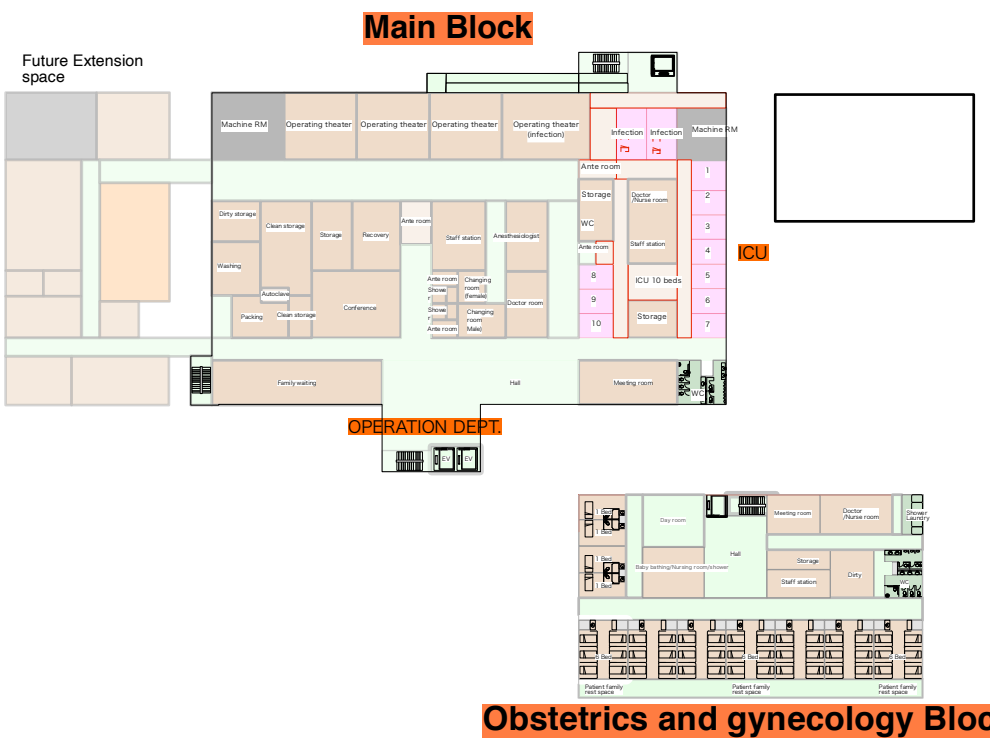



# Kampot Hospital

## Ground Floor Plan




## 1st Floor Plan



# Kampot Hospital

## 2nd Floor Plan

**Main Block**


PATIENT WARD

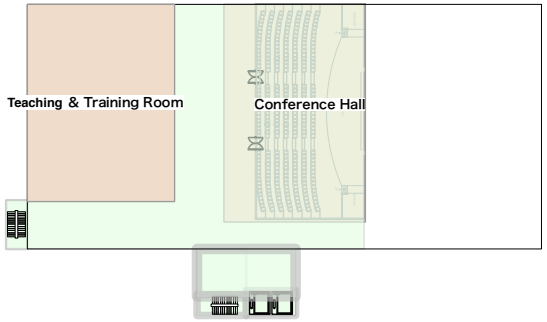
## 3rd-6th Floor Plan

**Main Block**


PATIENT WARD

## 7th Floor Plan

**Main Block**



# Appendix B

**Siem Reap Provincial Hospital**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

**Building for General Medical Services**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Internal medicine, Dermatology, Lifestyle related diseases, Psychiatry, Infectious diseases, ENT, Dental | GF | Diagnostic set | 7 | SMR-G-1 | F |
| | | | | Examination table | 7 | SMR-G-2 | F |
| | | | | Instrument cabinet | 7 | SMR-G-3 | F |
| | | | | Clinent PC (PACS) | 7 | SMR-G-4 | A |
| | | | | Weighing scale | 7 | SMR-G-5 | F |
| | | | | Blood presssure meter | 7 | SMR-G-6 | F |
| | | | | Basket | 7 | SMR-G-7 | F |
| | | | | Desk (Doctor) | 7 | SMR-G-8 | G |
| | | | | Chair (Doctor) | 7 | SMR-G-9 | G |
| | | | | Chair (Patient) | 7 | SMR-G-10 | G |
| | | ENT | | Audiometer | 1 | SMR-G-11 | B |
| | | | | ENT treatment unit and chair | 1 | SMR-G-12 | B |
| | | | | Suction machine | 1 | SMR-G-13 | C |
| | | Dental | | Dental unit and chair | 2 | SMR-G-14 | B |
| | | | | Extraoral vacuum unit | 2 | SMR-G-15 | B |
| | | | | Handpiece set | 2 | SMR-G-16 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 2 | SMR-G-17 | B |
| | | | | Sterilizer | 2 | SMR-G-18 | C |
| | | | | Dental X-ray machine | 1 | SMR-G-19 | A |
| 2 | Rehabilitation | Physiotherapy, Occupational theraphy | GF | Sling therapy bed | 1 | SMR-G-20 | F |
| | | | | Treatment table | 1 | SMR-G-21 | F |
| | | | | Mat | 1 | SMR-G-22 | F |
| | | | | Weight-unloading machine | 1 | SMR-G-23 | F |
| | | | | Parallel bar | 1 | SMR-G-24 | F |
| | | | | Low frequency therapy machine | 1 | SMR-G-25 | F |
| | | | | Infrared therapy machine | 1 | SMR-G-26 | F |
| | | | | Ultrasonic therapy machine | 1 | SMR-G-27 | F |
| | | | | Hot pack humidifier | 1 | SMR-G-28 | F |
| | | | | Traction therapy apparatus | 1 | SMR-G-29 | F |
| 3 | ICU | Internal Medicine (24 Beds) | 1F | ICU bed | 24 | SMR-G-30 | E |
| | | | | Vital sign monitor | 10 | SMR-G-31 | B |
| | | | | Ventilator | 3 | SMR-G-32 | B |
| | | | | Suction machine (mobile) | 5 | SMR-G-33 | C |
| | | | | Infusion pump | 20 | SMR-G-34 | B |
| | | | | Syringe pump | 10 | SMR-G-35 | B |
| | | | | ECG | 1 | SMR-G-36 | B |
| | | | | Blood gas analyzer | 1 | SMR-G-37 | D |
| | | | | X-ray, mobile | 1 | SMR-G-38 | A |
| | | | | Clinent PC (PACS) | 1 | SMR-G-39 | A |
| 3 | Wards | 1 Bed Room (30 Rooms) = 38 Beds<br>6 Bed Room (44 Rooms) = 330 Beds | 1-6F<br>1-6F | Bed | 368 | SMR-G-40 | E |
| | | | | Bedside cabinet | 368 | SMR-G-41 | E |
| | | | | Overbed table | 368 | SMR-G-42 | E |
| | | | | Blood pressure meter | 25 | SMR-G-43 | F |
| | | | | Suction machine (mobile) | 25 | SMR-G-44 | C |
| | | | | ECG | 6 | SMR-G-45 | B |
| | | | | Weight and height scale | 20 | SMR-G-46 | F |
| | | | | Table, nurse station | 20 | SMR-G-47 | G |
| | | | | Chair, nurse station | 120 | SMR-G-48 | G |
| | | | | Instrument trolley | 30 | SMR-G-49 | F |
| | | | | Medicine trolley | 30 | SMR-G-50 | F |
| | | | | Instrument cabinet | 20 | SMR-G-51 | F |
| | | | | medicine cabinet | 20 | SMR-G-52 | F |
| | | | | Filing cabinet | 20 | SMR-G-53 | F |
| | | | | Clinent PC (PACS) | 20 | SMR-G-54 | A |

**Building for Advanced Medical Services**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Respiratory, Neurology, Gastroenterology, Orthopedics, Urology, Gynecology, Breast, Oral surgery, Cardiac surgery | GF | Diagnostic set | 9 | SMR-A-1 | F |
| | | | | Examination couch | 9 | SMR-A-2 | F |
| | | | | Instrument cabinet | 9 | SMR-A-3 | F |
| | | | | Client PC (PACS) | 9 | SMR-A-4 | A |
| | | | | Weighing scale | 9 | SMR-A-5 | F |
| | | | | Blood pressure meter | 9 | SMR-A-6 | F |
| | | | | Basket | 9 | SMR-A-7 | F |
| | | | | Desk (Doctor) | 9 | SMR-A-8 | G |
| | | | | Chair (Doctor) | 9 | SMR-A-9 | G |
| | | | | Chair (Patient) | 9 | SMR-A-10 | G |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | Oncology | Chemotherapy | GF | Bed, chemotherapy | 5 | SMR-A-11 | E |
| | | | | Chair, chemotherapy | 5 | SMR-A-12 | E |
| | | | | IV stand | 10 | SMR-A-13 | F |
| | | | | Stretcher | 2 | SMR-A-14 | F |
| | | | | ECG | 1 | SMR-A-15 | B |
| | | | | Vital sign monitor | 2 | SMR-A-16 | B |
| | | | | Pulse oximeter | 2 | SMR-A-17 | F |
| | | | | Infusion pump | 10 | SMR-A-18 | F |
| | | | | Syringe pump | 5 | SMR-A-19 | F |
| | | | | Oxygen cylinder | 2 | SMR-A-20 | F |
| | | | | Clean bench | 1 | SMR-A-21 | D |
| | | | | Safety cabinet | 1 | SMR-A-22 | D |
| 3 | Physiological Function Testing | Physiological Function Testing | GF | Stress test system, with ECG analyzer | 1 | SMR-A-23 | B |
| | | | | Holter ECG | 1 | SMR-A-24 | B |
| | | | | ECG | 1 | SMR-A-25 | B |
| | | | | Ultrasound scanner (Echo) | 1 | SMR-A-26 | A |
| | | | | Electroencephalograph | 1 | SMR-A-27 | B |
| | | | | Electromyograph | 1 | SMR-A-28 | B |
| | | | | Pulmonary function analyzer | 1 | SMR-A-29 | B |
| | | | | Client PC (PACS) | 3 | SMR-A-30 | A |
| 4 | Endoscope | Endoscopic Examination and Treatment | GF | Upper gastrointestinal fiberscope | 1 | SMR-A-31 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | SMR-A-32 | C |
| | | | | Endoscopic cleeaner | 1 | SMR-A-33 | C |
| | | | | Examinationtable | 2 | SMR-A-34 | F |
| | | | | Client PC (PACS) | 1 | SMR-A-35 | A |
| 5 | Diagnostic Imaging | Diagnostic Imaging | GF | X-ray, general | 1 | SMR-A-36 | A |
| | | | | X-ray, fluoroscopy | 1 | SMR-A-37 | A |
| | | | | CT | 1 | SMR-A-38 | A |
| | | | | MRI | 1 | SMR-A-39 | A |
| | | | | Mammography | 1 | SMR-A-40 | A |
| | | | | PACS station | 1 | SMR-A-41 | A |
| | | | | Client PC (PACS) | 1 | SMR-A-42 | A |
| 6 | Laboratory | Clinical Laboratory<br>Hematology, Biochemistry, Bacteriology, Immunology, Serology, Pathology, Blood Transfusion | GF | Hematology analyzer | 1 | SMR-A-43 | D |
| | | | | Blood coagulation analyzer | 1 | SMR-A-44 | D |
| | | | | Blood sedimentation analyzer | 1 | SMR-A-45 | D |
| | | | | Bilirubin analyzer | 1 | SMR-A-46 | D |
| | | | | Biochemistry analyzer | 1 | SMR-A-47 | D |
| | | | | Electrolyte analyzer | 1 | SMR-A-48 | D |
| | | | | Urine analyzer | 1 | SMR-A-49 | D |
| | | | | Immunoassay analyzer | 1 | SMR-A-50 | D |
| | | | | Bacterial analyzers | 1 | SMR-A-51 | D |
| | | | | Blood culture analyzer | 1 | SMR-A-52 | D |
| | | | | Safety cabinet | 1 | SMR-A-53 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | SMR-A-54 | D |
| | | | | Microtome | 1 | SMR-A-55 | D |
| | | | | Cryostat microtome | 1 | SMR-A-56 | D |
| | | | | Dehydration, dewaxing and paraffin infiltration apparatus | 1 | SMR-A-57 | D |
| | | | | Paraffin inclusion block | 1 | SMR-A-58 | D |
| | | | | Automatic staining machine | 1 | SMR-A-59 | D |
| | | | | Automated pathology specimen encapsulation apparatus | 1 | SMR-A-60 | D |
| | | | | Automated cell collection device | 1 | SMR-A-61 | D |
| | | | | Pathology microscope | 1 | SMR-A-62 | D |
| | | | | Client PC (PACS) | 3 | SMR-A-63 | A |
| 7 | Central Service Department | Surgical Operation<br>Neurology,, Urology, Orthopedics, Obstetrics and Gynecology | 1F | Operating lump | 4 | SMR-A-64 | C |
| | | | | Operating table | 4 | SMR-A-65 | C |
| | | | | Electrosurgical unit | 4 | SMR-A-66 | C |
| | | | | Anesthesia machine | 4 | SMR-A-67 | C |
| | | | | Vital sign monitor | 4 | SMR-A-68 | B |
| | | | | Suction machine | 4 | SMR-A-69 | C |
| | | | | Operating microscope | 3 | SMR-A-70 | C |
| | | | | X-ray, C-arm | 1 | SMR-A-71 | A |
| | | | | Laparpscope | 1 | SMR-A-72 | C |
| | | | | Arthroscope | 1 | SMR-A-73 | C |
| | | Angiography Room | | Operating lump | 3 | SMR-A-74 | C |
| | | | | Operating table | 3 | SMR-A-75 | C |
| | | | | Electrosurgical unit | 1 | SMR-A-76 | C |
| | | | | Anesthesia machine | 1 | SMR-A-77 | C |
| | | | | Vital sign monitor | 3 | SMR-A-78 | B |
| | | | | Suction machine | 3 | SMR-A-79 | C |
| | | | | Angiography, Bi plane | 1 | SMR-A-80 | A |
| | | | | Angiography, Single plane | 2 | SMR-A-81 | A |
| | | | | Contrast media injector | 3 | SMR-A-82 | A |
| | | | | IABP (Intra-aortic balloon pumping system) | 2 | SMR-A-83 | C |
| | | | | Blood gas analyzer | 1 | SMR-A-84 | D |
| | | | | Blood coagulation analyzer | 1 | SMR-A-85 | D |
| | | | | Defibrillator | 1 | SMR-A-86 | C |
| | | | | ECG | 1 | SMR-A-87 | B |
| | | | | Client PC (PACS) | 1 | SMR-A-88 | A |
| | | | | Scrub unit | 5 | SMR-A-89 | C |
| | | Recovery Room | 1F | Recovery bed | 5 | SMR-A-90 | E |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Vital sign monitor | 5 | SMR-A-91 | B |
| 8 | CSSD | CSSD | 1F | Ultrasonic cleaner | 2 | SMR-A-92 | C |
| | | | | High pressure steam sterilizer | 2 | SMR-A-93 | C |
| 9 | ICU | ICU (12 Beds) | 1F | ICU bed | 12 | SMR-A-94 | E |
| | | | | Vital sign monitor, central | 2 | SMR-A-95 | C |
| | | | | Vital sign monitor, bedside | 12 | SMR-A-96 | C |
| | | | | Infusion pump | 20 | SMR-A-97 | B |
| | | | | Syringe pump | 15 | SMR-A-98 | B |
| | | | | Suction machine | 10 | SMR-A-99 | C |
| | | | | X-ray, mobile | 1 | SMR-A-100 | A |
| | | | | Ventilator | 5 | SMR-A-101 | B |
| | | | | Table, nurse station | 2 | SMR-A-102 | G |
| | | | | Chair | 10 | SMR-A-103 | G |
| | | | | Instrument cabinet | 2 | SMR-A-104 | F |
| | | | | Filing cabinet | 2 | SMR-A-105 | F |
| | | | | Instrument trolley | 5 | SMR-A-106 | F |
| | | | | Blood gas analyzer | 1 | SMR-A-107 | D |
| | | | | Client PC (PACS) | 1 | SMR-A-108 | A |
| 10 | HCU | HCU (10 Beds) | 2-3F | HCU bed | 10 | SMR-A-109 | E |
| | | | | Vital sign monitor | 5 | SMR-A-110 | B |
| | | | | Suction machine | 3 | SMR-A-111 | C |
| | | | | Infusion pump | 5 | SMR-A-112 | B |
| | | | | Syringe pump | 5 | SMR-A-113 | B |
| | | | | Client PC (PACS) | 1 | SMR-A-114 | A |
| 11 | Inpatient Admission | 1 Bed Room (10 Rooms) = 10 Beds<br>6 Bed Room (16 Rooms) = 96 Beds | 2-3F | Bed | 106 | SMR-A-115 | E |
| | | | | Bedside cabinet | 106 | SMR-A-116 | E |
| | | | | Overbed table | 106 | SMR-A-117 | E |
| | | | | Blood pressure meter | 6 | SMR-A-118 | F |
| | | | | Suction machine | 6 | SMR-A-119 | C |
| | | | | ECG | 2 | SMR-A-120 | B |
| | | | | Client PC (PACS) | 2 | SMR-A-121 | A |
| 12 | Training Room | Simulator Room | 4F | Laparoscopy Simulator | 1 | SMR-A-122 | H |
| | | | | Endoscope Simulator | 1 | SMR-A-123 | H |
| | | | | Bronchoscopy training system | 1 | SMR-A-124 | H |
| | | | | Mannequin for patient biometric count | 1 | SMR-A-125 | H |

**Batambang Provincial Hospital**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

**Building for General Medical Services**

| No | Service Department | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Internal medicine, Dermatology, ENT, Lifestyle related diseases, Psychiatry, Dental, Infectious diseases, Eye | GF | Diagnostic set | 8 | BTB-G-1 | F |
| | | | | Examination table | 8 | BTB-G-2 | F |
| | | | | Instrument cabinet | 8 | BTB-G-3 | F |
| | | | | Clinent PC (PACS) | 8 | BTB-G-4 | A |
| | | | | Weighing scale | 8 | BTB-G-5 | F |
| | | | | Blood presssure meter | 8 | BTB-G-6 | F |
| | | | | Basket | 8 | BTB-G-7 | F |
| | | | | Desk (Doctor) | 8 | BTB-G-8 | G |
| | | | | Chair (Doctor) | 8 | BTB-G-9 | G |
| | | | | Chair (Patient) | 8 | BTB-G-10 | G |
| | | ENT | | Audiometer | 1 | BTB-G-11 | B |
| | | | | ENT treatment unit and chair | 1 | BTB-G-12 | B |
| | | | | Suction machine | 1 | BTB-G-13 | C |
| | | Dental | | Dental unit and chair | 2 | BTB-G-14 | B |
| | | | | Extraoral vacuum unit | 2 | BTB-G-15 | B |
| | | | | Handpiece set | 2 | BTB-G-16 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 2 | BTB-G-17 | B |
| | | | | Sterilizer | 2 | BTB-G-18 | C |
| | | | | Dental X-ray machine | 1 | BTB-G-19 | A |
| 2 | Rehabilitation | Physiotherapy, Occupational theraphy | GF | Sling therapy bed | 1 | BTB-G-20 | F |
| | | | | Treatment table | 1 | BTB-G-21 | F |
| | | | | Mat | 1 | BTB-G-22 | F |
| | | | | Weight-unloading machine | 1 | BTB-G-23 | F |
| | | | | Parallel bar | 1 | BTB-G-24 | F |
| | | | | Low frequency therapy machine | 1 | BTB-G-25 | F |
| | | | | Infrared therapy machine | 1 | BTB-G-26 | F |
| | | | | Ultrasonic therapy machine | 1 | BTB-G-27 | F |
| | | | | Hot pack humidifier | 1 | BTB-G-28 | F |
| | | | | Traction therapy apparatus | 1 | BTB-G-29 | F |
| 4 | Outpatient | Eye | GF | Ophthalmoscope | 3 | BTB-G-40 | C |
| | | | | Slitlamp | 1 | BTB-G-41 | C |
| | | | | Automatic visual field meter | 1 | BTB-G-42 | C |
| | | | | Ultrasonography | 1 | BTB-G-43 | C |
| | | | | Fundus camera | 1 | BTB-G-44 | C |
| | | | | Laser | 1 | BTB-G-45 | C |
| 5 | Laboratory | Clinical Laboratory<br>Hematology, Biochemistry, Bacteriology, Immunology, Serology, Pathology, Blood Transfusion | 1 F | Hematology analyzer | 1 | BTB-G-46 | D |
| | | | | Blood coagulation analyzer | 1 | BTB-G-47 | D |
| | | | | Blood sedimentation analyzer | 1 | BTB-G-48 | D |
| | | | | Bilirubin analyzer | 1 | BTB-G-49 | D |
| | | | | Biochemistry analyzer | 1 | BTB-G-50 | D |
| | | | | Electrolyte analyzer | 1 | BTB-G-51 | D |
| | | | | Urine analyzer | 1 | BTB-G-52 | D |
| | | | | Immunoassay analyzer | 1 | BTB-G-53 | D |
| | | | | Bacterial analyzers | 1 | BTB-G-54 | D |
| | | | | Blood culture analyzer | 1 | BTB-G-55 | D |
| | | | | Safety cabinet | 1 | BTB-G-56 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | BTB-G-57 | D |
| | | | | Microtome | 1 | BTB-G-58 | D |
| | | | | Cryostat microtome | 1 | BTB-G-59 | D |
| | | | | Dehydration, dewaxing and paraffin infiltrat | 1 | BTB-G-60 | D |
| | | | | Paraffin inclusion block | 1 | BTB-G-61 | D |
| | | | | Automatic staining machine | 1 | BTB-G-62 | D |
| | | | | Automated pathology specimen encapsulatic | 1 | BTB-G-63 | D |
| | | | | Automated cell collection device | 1 | BTB-G-64 | D |
| | | | | Pathology microscope | 1 | BTB-G-65 | D |
| | | | | Client PC (PACS) | 3 | BTB-G-66 | A |
| 6 | Internal Medicine ICU | Internal Medicine ICU (19 Beds) | 2F | ICU bed | 19 | BTB-G-67 | E |
| | | | | Vital sign monitor | 10 | BTB-G-68 | B |
| | | | | Ventilator | 3 | BTB-G-69 | B |
| | | | | Suction machine (mobile) | 5 | BTB-G-70 | C |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Infusion pump | 10 | BTB-G-71 | B |
| | | | | Syringe pump | 8 | BTB-G-72 | B |
| | | | | ECG | 1 | BTB-G-73 | B |
| | | | | Blood gas analyzer | 1 | BTB-G-74 | D |
| | | | | X-ray, mobile | 1 | BTB-G-75 | A |
| | | | | Client PC (PACS) | 1 | BTB-G-76 | A |
| 5 | Inpatient Admission | 1 Bed Room (25 Rooms) = 25 Beds<br>6 Bed Room (18 Rooms) = 108 Beds | 2-4F<br>2-4F | Bed | 133 | BTB-G-77 | E |
| | | | | Bedside cabinet | 133 | BTB-G-78 | E |
| | | | | Overbed table | 133 | BTB-G-79 | E |
| | | | | Blood pressure meter | 13 | BTB-G-80 | F |
| | | | | Suction machine (mobile) | 13 | BTB-G-81 | C |
| | | | | ECG | 3 | BTB-G-82 | B |
| | | | | Weight and height scale | 10 | BTB-G-83 | F |
| | | | | Table, nurse station | 10 | BTB-G-84 | G |
| | | | | Chair, nurse station | 60 | BTB-G-85 | G |
| | | | | Instrument trolley | 10 | BTB-G-86 | F |
| | | | | Medicine trolley | 10 | BTB-G-87 | F |
| | | | | Instrument cabinet | 10 | BTB-G-88 | F |
| | | | | medicine cabinet | 6 | BTB-G-89 | F |
| | | | | Filing cabinet | 6 | BTB-G-90 | F |
| | | | | Clinent PC (PACS) | 6 | BTB-G-91 | A |

**Building for Advanced Medical Services**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Respiratory, Neurology, Gastroenterology, Orthopedics, Urology, Gynecology, Breast, Oral surgery, Cardiac surgery | GF | Diagnostic set | 9 | BTB-A-1 | F |
| | | | | Examination couch | 9 | BTB-A-2 | F |
| | | | | Instrument cabinet | 9 | BTB-A-3 | F |
| | | | | Client PC (PACS) | 9 | BTB-A-4 | A |
| | | | | Weighing scale | 9 | BTB-A-5 | F |
| | | | | Blood pressure meter | 9 | BTB-A-6 | F |
| | | | | Basket | 9 | BTB-A-7 | F |
| | | | | Desk (Doctor) | 9 | BTB-A-8 | G |
| | | | | Chair (Doctor) | 9 | BTB-A-9 | G |
| | | | | Chair (Patient) | 9 | BTB-A-10 | G |
| 2 | Oncology | Chemotherapy | GF | Bed, chemotherapy | 5 | BTB-A-11 | E |
| | | | | Chair, chemotherapy | 5 | BTB-A-12 | E |
| | | | | IV stand | 10 | BTB-A-13 | F |
| | | | | Stretcher | 2 | BTB-A-14 | F |
| | | | | ECG | 1 | BTB-A-15 | B |
| | | | | Vital sign monitor | 2 | BTB-A-16 | B |
| | | | | Pulse oximeter | 2 | BTB-A-17 | F |
| | | | | Infusion pump | 10 | BTB-A-18 | F |
| | | | | Syringe pump | 5 | BTB-A-19 | F |
| | | | | Oxygen cylinder | 2 | BTB-A-20 | F |
| | | | | Clean bench | 1 | BTB-A-21 | D |
| | | | | Safety cabinet | 1 | BTB-A-22 | D |
| 3 | Physiological Function Testing | Physiological Function Testing | GF | Stress test system, with ECG analyzer | 1 | BTB-A-23 | B |
| | | | | Holter ECG | 1 | BTB-A-24 | B |
| | | | | ECG | 1 | BTB-A-25 | B |
| | | | | Ultrasound scanner (Echo) | 1 | BTB-A-26 | A |
| | | | | Electroencephalograph | 1 | BTB-A-27 | B |
| | | | | Electromyograph | 1 | BTB-A-28 | B |
| | | | | Pulmonary function analyzer | 1 | BTB-A-29 | B |
| | | | | Client PC (PACS) | 3 | BTB-A-30 | A |
| 4 | Endoscope | Endoscopic Examination and Treatment | GF | Upper gastrointestinal fiberscope | 1 | BTB-A-31 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | BTB-A-32 | C |
| | | | | Endoscopic cleeaner | 1 | BTB-A-33 | C |
| | | | | Examinationtable | 2 | BTB-A-34 | F |
| | | | | Client PC (PACS) | 1 | BTB-A-35 | A |
| 5 | Diagnostic Imaging | Diagnostic Imaging | GF | X-ray, general | 1 | BTB-A-36 | A |
| | | | | X-ray, fluoroscopy | 1 | BTB-A-37 | A |
| | | | | CT | 1 | BTB-A-38 | A |
| | | | | MRI | 1 | BTB-A-39 | A |
| | | | | Mammography | 1 | BTB-A-40 | A |
| | | | | PACS station | 1 | BTB-A-41 | A |
| | | | | Client PC (PACS) | 1 | BTB-A-42 | A |
| 6 | Central Service Department | Surgical Operation<br>Neurology,, Urology, Orthopedics, Obstetrics and Gynecology | 1F | Operating lump | 4 | BTB-A-43 | C |
| | | | | Operating table | 4 | BTB-A-44 | C |
| | | | | Electrosurgical unit | 4 | BTB-A-45 | C |
| | | | | Anesthesia machine | 4 | BTB-A-46 | C |
| | | | | Vital sign monitor | 4 | BTB-A-47 | B |
| | | | | Suction machine | 4 | BTB-A-48 | C |
| | | | | Operating microscope | 3 | BTB-A-49 | C |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Angiography | | X-ray, C-arm | 1 | BTB-A-50 | A |
| | | | | Laparpscope | 1 | BTB-A-51 | C |
| | | | | Arthroscope | 1 | BTB-A-52 | C |
| | | | | Operating lump | 3 | BTB-A-53 | C |
| | | | | Operating table | 3 | BTB-A-54 | C |
| | | | | Electrosurgical unit | 1 | BTB-A-55 | C |
| | | | | Anesthesia machine | 1 | BTB-A-56 | C |
| | | | | Vital sign monitor | 3 | BTB-A-57 | B |
| | | | | Suction machine | 3 | BTB-A-58 | C |
| | | | | Angiography, Bi plane | 1 | BTB-A-59 | A |
| | | | | Angiography, Single plane | 2 | BTB-A-60 | A |
| | | | | Contrast media injector | 3 | BTB-A-61 | A |
| | | | | IABP (Intra-aortic balloon pumping system) | 2 | BTB-A-62 | C |
| | | | | Blood gas analyzer | 1 | BTB-A-63 | D |
| | | | | Blood coagulation analyzer | 1 | BTB-A-64 | D |
| | | | | Defibrillator | 1 | BTB-A-65 | C |
| | | | | ECG | 1 | BTB-A-66 | B |
| | | | | Client PC (PACS) | 1 | BTB-A-67 | A |
| | | | | Scrub unit | 5 | BTB-A-68 | C |
| | | Recovery Room | 1F | Recovery bed | 5 | BTB-A-69 | E |
| | | | | Vital sign monitor | 5 | BTB-A-70 | B |
| 7 | CSSD | CSSD | 1F | Ultrasonic cleaner | 2 | BTB-A-71 | C |
| | | | | High pressure steam sterilizer | 2 | BTB-A-72 | C |
| 8 | ICU | ICU (12 Beds) | 1F | ICU bed | 12 | BTB-A-73 | E |
| | | | | Vital sign monitor, central | 2 | BTB-A-74 | C |
| | | | | Vital sign monitor, bedside | 12 | BTB-A-75 | C |
| | | | | Infusion pump | 20 | BTB-A-76 | B |
| | | | | Syringe pump | 15 | BTB-A-77 | B |
| | | | | Suction machine | 10 | BTB-A-78 | C |
| | | | | X-ray, mobile | 1 | BTB-A-79 | A |
| | | | | Ventilator | 5 | BTB-A-80 | B |
| | | | | Table, nurse station | 2 | BTB-A-81 | G |
| | | | | Chair | 10 | BTB-A-82 | G |
| | | | | Instrument cabinet | 2 | BTB-A-83 | F |
| | | | | Filing cabinet | 2 | BTB-A-84 | F |
| | | | | Instrument trolley | 5 | BTB-A-85 | F |
| | | | | Blood gas analyzer | 1 | BTB-A-86 | D |
| | | | | Client PC (PACS) | 1 | BTB-A-87 | A |
| 9 | HCU | HUC (10 Beds) x 2,3,4 Floors = 30 Beds | 2-4F | HCU bed | 30 | BTB-A-88 | E |
| | | | | Vital sign monitor | 9 | BTB-A-89 | B |
| | | | | Suction machine | 6 | BTB-A-90 | C |
| | | | | Infusion pump | 15 | BTB-A-91 | B |
| | | | | Syringe pump | 6 | BTB-A-92 | B |
| | | | | Client PC (PACS) | 3 | BTB-A-93 | A |
| 10 | Wards | 1 Bed Room (21 Romms) = 21 Bedss<br>6 Bed rooms (33 Rooms) = 198 Beds | 2-4F | Bed | 219 | BTB-A-94 | E |
| | | | | Bedside cabinet | 219 | BTB-A-95 | E |
| | | | | Overbed table | 219 | BTB-A-96 | E |
| | | | | Blood pressure meter | 9 | BTB-A-97 | F |
| | | | | Suction machine | 6 | BTB-A-98 | C |
| | | | | ECG | 3 | BTB-A-99 | B |
| | | | | Client PC (PACS) | 3 | BTB-A-100 | A |
| 12 | Training Room | Simulator Room | 5F | Laparoscopy Simulator | 1 | BTB-A-101 | H |
| | | | | Endoscope Simulator | 1 | BTB-A-102 | H |
| | | | | Bronchoscopy training system | 1 | BTB-A-103 | H |
| | | | | Mannequin for patient biometric count | 1 | BTB-A-104 | H |

**Kg Cham Provincial Hospital**
**Building for General Medical Services**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Internal medicine, Dermatology, Lifestyle related diseases, Psychiatry, Infectious diseases, ENT, Dental, Surgery | GF | Diagnostic set | 8 | KMC-G-1 | F |
| | | | | Examination table | 8 | KMC-G-2 | F |
| | | | | Instrument cabinet | 8 | KMC-G-3 | F |
| | | | | Clinent PC (PACS) | 8 | KMC-G-4 | A |
| | | | | Weighing scale | 8 | KMC-G-5 | F |
| | | | | Blood presssure meter | 8 | KMC-G-6 | F |
| | | | | Basket | 8 | KMC-G-7 | F |
| | | | | Desk (Doctor) | 8 | KMC-G-8 | G |
| | | | | Chair (Doctor) | 8 | KMC-G-9 | G |
| | | | | Chair (Patient) | 8 | KMC-G-10 | G |
| | | ENT | | Audiometer | 1 | KMC-G-11 | B |
| | | | | ENT treatment unit and chair | 1 | KMC-G-12 | B |
| | | | | Suction machine | 1 | KMC-G-13 | C |
| | | Dental | | Dental unit and chair | 2 | KMC-G-14 | B |
| | | | | Extraoral vacuum unit | 2 | KMC-G-15 | B |
| | | | | Handpiece set | 2 | KMC-G-16 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 2 | KMC-G-17 | B |
| | | | | Sterilizer | 2 | KMC-G-18 | C |
| | | | | Dental X-ray machine | 1 | KMC-G-19 | A |
| 2 | Rehabilitation | Physiotherapy, Occupational theraphy | GF | Sling therapy bed | 1 | KMC-G-20 | F |
| | | | | Treatment table | 1 | KMC-G-21 | F |
| | | | | Mat | 1 | KMC-G-22 | F |
| | | | | Weight-unloading machine | 1 | KMC-G-23 | F |
| | | | | Parallel bar | 1 | KMC-G-24 | F |
| | | | | Low frequency therapy machine | 1 | KMC-G-25 | F |
| | | | | Infrared therapy machine | 1 | KMC-G-26 | F |
| | | | | Ultrasonic therapy machine | 1 | KMC-G-27 | F |
| | | | | Hot pack humidifier | 1 | KMC-G-28 | F |
| | | | | Traction therapy apparatus | 1 | KMC-G-29 | F |
| 3 | Outpatient | Hipertention, Diabets, Dermatology, Urology | 1F | Diagnostic set | 4 | KMC-G-30 | F |
| | | | | Examination table | 4 | KMC-G-31 | F |
| | | | | Instrument cabinet | 4 | KMC-G-32 | F |
| | | | | Clinent PC (PACS) | 4 | KMC-G-33 | A |
| | | | | Weighing scale | 4 | KMC-G-34 | F |
| | | | | Blood presssure meter | 4 | KMC-G-35 | F |
| | | | | Basket | 4 | KMC-G-36 | F |
| | | | | Desk (Doctor) | 4 | KMC-G-37 | G |
| | | | | Chair (Doctor) | 4 | KMC-G-38 | G |
| | | | | Chair (Patient) | 4 | KMC-G-39 | G |
| 4 | Outpatient | Eye | 1F | Ophthalmoscope | 3 | KMC-G-40 | C |
| | | | | Slitlamp | 1 | KMC-G-41 | C |
| | | | | Automatic visual field meter | 1 | KMC-G-42 | C |
| | | | | Ultrasonography | 1 | KMC-G-43 | C |
| | | | | Fundus camera | 1 | KMC-G-44 | C |
| | | | | Laser | 1 | KMC-G-45 | C |
| 5 | Internal Medicine ICU | Internal Medicine ICU (17 Beds) | 2F | ICU bed | 17 | KMC-G-46 | E |
| | | | | Vital sign monitor | 10 | KMC-G-47 | B |
| | | | | Ventilator | 3 | KMC-G-48 | B |
| | | | | Suction machine (mobile) | 5 | KMC-G-49 | C |
| | | | | Infusion pump | 10 | KMC-G-50 | B |
| | | | | Syringe pump | 8 | KMC-G-51 | B |
| | | | | ECG | 1 | KMC-G-52 | B |
| | | | | Blood gas analyzer | 1 | KMC-G-53 | D |
| | | | | X-ray, mobile | 1 | KMC-G-54 | A |
| | | | | Clinent PC (PACS) | 1 | KMC-G-55 | A |
| 5 | Wards | 1 Bed Room (25 Rooms) = 25 Beds<br>6 Bed Room (18 Rooms) = 108 Beds | 2-4F | Bed | 133 | KMC-G-56 | E |
| | | | | Bedside cabinet | 133 | KMC-G-57 | E |
| | | | | Overbed table | 133 | KMC-G-58 | E |
| | | | | Blood pressure meter | 13 | KMC-G-59 | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Suction machine (mobile) | 13 | KMC-G-60 | C |
| | | | | ECG | 3 | KMC-G-61 | B |
| | | | | Weight and height scale | 10 | KMC-G-62 | F |
| | | | | Table, nurse station | 10 | KMC-G-63 | G |
| | | | | Chair, nurse station | 60 | KMC-G-64 | G |
| | | | | Instrument trolley | 10 | KMC-G-65 | F |
| | | | | Medicine trolley | 10 | KMC-G-66 | F |
| | | | | Instrument cabinet | 10 | KMC-G-67 | F |
| | | | | medicine cabinet | 6 | KMC-G-68 | F |
| | | | | Filing cabinet | 6 | KMC-G-69 | F |
| | | | | Clinent PC (PACS) | 6 | KMC-G-70 | A |

**Building for Advanced Medical Services**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Respiratory, Neurology, Gastroenterology, Orthopedics, Urology, Gynecology, Breast, Oral surgery, Cardiac surgery | GF | Diagnostic set | 9 | KMC-A-1 | F |
| | | | | Examination couch | 9 | KMC-A-2 | F |
| | | | | Instrument cabinet | 9 | KMC-A-3 | F |
| | | | | Client PC (PACS) | 9 | KMC-A-4 | A |
| | | | | Weighing scale | 9 | KMC-A-5 | F |
| | | | | Blood pressure meter | 9 | KMC-A-6 | F |
| | | | | Basket | 9 | KMC-A-7 | F |
| | | | | Desk (Doctor) | 9 | KMC-A-8 | G |
| | | | | Chair (Doctor) | 9 | KMC-A-9 | G |
| | | | | Chair (Patient) | 9 | KMC-A-10 | G |
| 2 | Oncology | Chemotherapy | GF | Bed, chemotherapy | 5 | KMC-A-11 | E |
| | | | | Chair, chemotherapy | 5 | KMC-A-12 | E |
| | | | | IV stand | 10 | KMC-A-13 | F |
| | | | | Stretcher | 2 | KMC-A-14 | F |
| | | | | ECG | 1 | KMC-A-15 | B |
| | | | | Vital sign monitor | 2 | KMC-A-16 | B |
| | | | | Pulse oximeter | 2 | KMC-A-17 | F |
| | | | | Infusion pump | 10 | KMC-A-18 | F |
| | | | | Syringe pump | 5 | KMC-A-19 | F |
| | | | | Oxygen cylinder | 2 | KMC-A-20 | F |
| | | | | Clean bench | 1 | KMC-A-21 | D |
| | | | | Safety cabinet | 1 | KMC-A-22 | D |
| 3 | Physiological Function Testing | Physiological Function Testing | GF | Stress test system, with ECG analyzer | 1 | KMC-A-23 | B |
| | | | | Holter ECG | 1 | KMC-A-24 | B |
| | | | | ECG | 1 | KMC-A-25 | B |
| | | | | Ultrasound scanner (Echo) | 1 | KMC-A-26 | A |
| | | | | Electroencephalograph | 1 | KMC-A-27 | B |
| | | | | Electromyograph | 1 | KMC-A-28 | B |
| | | | | Pulmonary function analyzer | 1 | KMC-A-29 | B |
| | | | | Client PC (PACS) | 3 | KMC-A-30 | A |
| 4 | Endoscope | Endoscopic Examination and Treatmen | GF | Upper gastrointestinal fiberscope | 1 | KMC-A-31 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | KMC-A-32 | C |
| | | | | Endoscopic cleeaner | 1 | KMC-A-33 | C |
| | | | | Examinationtable | 2 | KMC-A-34 | F |
| | | | | Client PC (PACS) | 1 | KMC-A-35 | A |
| 5 | Diagnostic Imaging | Diagnostic Imaging | GF | X-ray, general | 1 | KMC-A-36 | A |
| | | | | X-ray, fluoroscopy | 1 | KMC-A-37 | A |
| | | | | CT | 1 | KMC-A-38 | A |
| | | | | MRI | 1 | KMC-A-39 | A |
| | | | | Mammography | 1 | KMC-A-40 | A |
| | | | | PACS station | 1 | KMC-A-41 | A |
| | | | | Client PC (PACS) | 1 | KMC-A-42 | A |
| 6 | Laboratory | Clinical Laboratory Hematology, Biochemistry, Bacteriology, Immunology, Serology, Pathology, Blood Transfusion | GF | Hematology analyzer | 1 | KMC-A-43 | D |
| | | | | Blood coagulation analyzer | 1 | KMC-A-44 | D |
| | | | | Blood sedimentation analyzer | 1 | KMC-A-45 | D |
| | | | | Bilirubin analyzer | 1 | KMC-A-46 | D |
| | | | | Biochemistry analyzer | 1 | KMC-A-47 | D |
| | | | | Electrolyte analyzer | 1 | KMC-A-48 | D |
| | | | | Urine analyzer | 1 | KMC-A-49 | D |
| | | | | Immunoassay analyzer | 1 | KMC-A-50 | D |
| | | | | Bacterial analyzers | 1 | KMC-A-51 | D |
| | | | | Blood culture analyzer | 1 | KMC-A-52 | D |
| | | | | Safety cabinet | 1 | KMC-A-53 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | KMC-A-54 | D |
| | | | | Microtome | 1 | KMC-A-55 | D |
| | | | | Cryostat microtome | 1 | KMC-A-56 | D |
| | | | | Dehydration, dewaxing and paraffin infiltration | 1 | KMC-A-57 | D |
| | | | | Paraffin inclusion block | 1 | KMC-A-58 | D |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Automatic staining machine | 1 | KMC-A-59 | D |
| | | | | Automated pathology specimen encapsulation ap | 1 | KMC-A-60 | D |
| | | | | Automated cell collection device | 1 | KMC-A-61 | D |
| | | | | Pathology microscope | 1 | KMC-A-62 | D |
| | | | | Client PC (PACS) | 3 | KMC-A-63 | A |
| 7 | Central Service Department | Surgical Operation<br>Neurology,, Urology, Orthopedics, Obstetrics and Gynecology | 1F | Operating lump | 4 | KMC-A-64 | C |
| | | | | Operating table | 4 | KMC-A-65 | C |
| | | | | Electrosurgical unit | 4 | KMC-A-66 | C |
| | | | | Anesthesia machine | 4 | KMC-A-67 | C |
| | | | | Vital sign monitor | 4 | KMC-A-68 | B |
| | | | | Suction machine | 4 | KMC-A-69 | C |
| | | | | Operating microscope | 3 | KMC-A-70 | C |
| | | | | X-ray, C-arm | 1 | KMC-A-71 | A |
| | | | | Laparpscope | 1 | KMC-A-72 | C |
| | | | | Arthroscope | 1 | KMC-A-73 | C |
| | | Angiography | | Operating lump | 3 | KMC-A-74 | C |
| | | | | Operating table | 3 | KMC-A-75 | C |
| | | | | Electrosurgical unit | 1 | KMC-A-76 | C |
| | | | | Anesthesia machine | 1 | KMC-A-77 | C |
| | | | | Vital sign monitor | 3 | KMC-A-78 | B |
| | | | | Suction machine | 3 | KMC-A-79 | C |
| | | | | Angiography, Bi plane | 1 | KMC-A-80 | A |
| | | | | Angiography, Single plane | 2 | KMC-A-81 | |
| | | | | Contrast media injector | 3 | KMC-A-82 | A |
| | | | | IABP (Intra-aortic balloon pumping system) | 2 | KMC-A-83 | C |
| | | | | Blood gas analyzer | 1 | KMC-A-84 | D |
| | | | | Blood coagulation analyzer | 1 | KMC-A-85 | D |
| | | | | Defibrillator | 1 | KMC-A-86 | C |
| | | | | ECG | 1 | KMC-A-87 | B |
| | | | | Client PC (PACS) | 1 | KMC-A-88 | A |
| | | | | Scrub unit | 5 | KMC-A-89 | C |
| | | Recovery Room | 1F | Recovery bed | 5 | KMC-A-90 | B |
| | | | | Vital sign monitor | 5 | KMC-A-91 | C |
| 8 | CSSD | CSSD | 1F | Ultrasonic cleaner | 2 | KMC-A-92 | C |
| | | | | High pressure steam sterilizer | 2 | KMC-A-93 | E |
| 9 | ICU | ICU (12 Beds) | 1F | ICU bed | 12 | KMC-A-94 | C |
| | | | | Vital sign monitor, central | 2 | KMC-A-95 | C |
| | | | | Vital sign monitor, bedside | 12 | KMC-A-96 | B |
| | | | | Infusion pump | 20 | KMC-A-97 | B |
| | | | | Syringe pump | 15 | KMC-A-98 | C |
| | | | | Suction machine | 10 | KMC-A-99 | A |
| | | | | X-ray, mobile | 1 | KMC-A-100 | B |
| | | | | Ventilator | 5 | KMC-A-101 | G |
| | | | | Table, nurse station | 2 | KMC-A-102 | G |
| | | | | Chair | 10 | KMC-A-103 | F |
| | | | | Instrument cabinet | 2 | KMC-A-104 | F |
| | | | | Filing cabinet | 2 | KMC-A-105 | F |
| | | | | Instrument trolley | 5 | KMC-A-106 | D |
| | | | | Blood gas analyzer | 1 | KMC-A-107 | A |
| | | | | Client PC (PACS) | 1 | KMC-A-108 | E |
| 10 | HCU | HCU (10 Beds) | 2-3F | HCU bed | 20 | KMC-A-109 | B |
| | | | | Vital sign monitor | 5 | KMC-A-110 | C |
| | | | | Suction machine | 3 | KMC-A-111 | B |
| | | | | Infusion pump | 5 | KMC-A-112 | B |
| | | | | Syringe pump | 5 | KMC-A-113 | A |
| | | | | Client PC (PACS) | 1 | KMC-A-114 | E |
| 11 | Wards | 1 Bed Room (10 Rooms) = 10 Beds<br>6 Bed Room (16 Rooms) = 96 Beds | 2-3F | Bed | 106 | KMC-A-115 | E |
| | | | | Bedside cabinet | 106 | KMC-A-116 | E |
| | | | | Overbed table | 106 | KMC-A-117 | F |
| | | | | Blood pressure meter | 6 | KMC-A-118 | C |
| | | | | Suction machine | 6 | KMC-A-119 | B |
| | | | | ECG | 2 | KMC-A-120 | A |
| | | | | Client PC (PACS) | 2 | KMC-A-121 | H |
| 12 | Training Room | Simulator Room | 4F | Laparoscopy Simulator | 1 | KMC-A-122 | H |
| | | | | Endoscope Simulator | 1 | KMC-A-123 | H |
| | | | | Bronchoscopy training system | 1 | KMC-A-124 | H |
| | | | | Mannequin for patient biometric count | 1 | KMC-A-125 | H |

**Svay Rieng Provincial Hospital**

**Building for General Medical Services**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Internal medicine, Pediatrics, Surgery, Plastic Surgery, ENT, Dermatology, Urology, Dentistry, Oncology Diabetes, Hypertension, Psychiatry, Infectious Diseases | GF | Diagnostic set | 13 | SVR-M-1 | F |
| | | | | Examination table | 13 | SVR-M-2 | F |
| | | | | Instrument cabinet | 13 | SVR-M-3 | F |
| | | | | Clinent PC (PACS) | 13 | SVR-M-4 | A |
| | | | | Weighing scale | 13 | SVR-M-5 | F |
| | | | | Blood presssure meter | 13 | SVR-M-6 | F |
| | | | | Basket | 13 | SVR-M-7 | F |
| | | | | Desk (Doctor) | 13 | SVR-M-8 | G |
| | | | | Chair (Doctor) | 13 | SVR-M-9 | G |
| | | | | Chair (Patient) | 13 | SVR-M-10 | G |
| | | ENT | | Audiometer | 1 | SVR-M-11 | B |
| | | | | ENT treatment unit and chair | 1 | SVR-M-12 | B |
| | | | | Suction machine | 1 | SVR-M-13 | C |
| | | Dental | | Dental unit and chair | 1 | SVR-M-14 | B |
| | | | | Extraoral vacuum unit | 1 | SVR-M-15 | B |
| | | | | Handpiece set | 1 | SVR-M-16 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 1 | SVR-M-17 | B |
| | | | | Sterilizer | 1 | SVR-M-18 | C |
| | | | | Dental X-ray machine | 1 | SVR-M-19 | A |
| 2 | Diagnostic Imaging | Diagnostic Imaging | GF | X-ray, general | 1 | SVR-M-20 | A |
| | | | | X-ray, fluoroscopy | 1 | SVR-M-21 | A |
| | | | | CT | 1 | SVR-M-22 | A |
| | | | | Mammography | 1 | SVR-M-23 | A |
| | | | | PACS station | 1 | SVR-M-24 | A |
| | | | | Clinent PC (PACS) | 1 | SVR-M-25 | A |
| 3 | Endoscope | Endoscopic Examination and Treatment | 1F | Upper gastrointestinal fiberscope | 1 | SVR-M-26 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | SVR-M-27 | C |
| | | | | Endoscopic cleeaner | 1 | SVR-M-28 | C |
| | | | | Examinationtable | 2 | SVR-M-29 | F |
| | | | | Client PC (PACS) | 1 | SVR-M-30 | A |
| 4 | Laboratory | Clinical Laboratory Hematology, Biochemistry, Bacteriology, Immunology, Serology, Pathology, Blood Transfusion | 1F | Hematology analyzer | 1 | SVR-M-31 | D |
| | | | | Blood coagulation analyzer | 1 | SVR-M-32 | D |
| | | | | Blood sedimentation analyzer | 1 | SVR-M-33 | D |
| | | | | Bilirubin analyzer | 1 | SVR-M-34 | D |
| | | | | Biochemistry analyzer | 1 | SVR-M-35 | D |
| | | | | Electrolyte analyzer | 1 | SVR-M-36 | D |
| | | | | Urine analyzer | 1 | SVR-M-37 | D |
| | | | | Immunoassay analyzer | 1 | SVR-M-38 | D |
| | | | | Bacterial analyzers | 1 | SVR-M-39 | D |
| | | | | Blood culture analyzer | 1 | SVR-M-40 | D |
| | | | | Safety cabinet | 1 | SVR-M-41 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | SVR-M-42 | D |
| | | | | Microtome | 1 | SVR-M-43 | D |
| | | | | Cryostat microtome | 1 | SVR-M-44 | D |
| | | | | Dehydration, dewaxing and paraffin infiltration apparatus | 1 | SVR-M-45 | D |
| | | | | Paraffin inclusion block | 1 | SVR-M-46 | D |
| | | | | Automatic staining machine | 1 | SVR-M-47 | D |
| | | | | Automated pathology specimen encapsulation apparatus | 1 | SVR-M-48 | D |
| | | | | Automated cell collection device | 1 | SVR-M-49 | D |
| | | | | Pathology microscope | 1 | SVR-M-50 | D |
| | | | | Client PC (PACS) | 3 | SVR-M-51 | A |
| 5 | Physiological Function Testing | Physiological Function Testing | 1F | Stress test system, with ECG analyzer | 1 | SVR-M-52 | B |
| | | | | Holter ECG | 1 | SVR-M-53 | B |
| | | | | ECG | 1 | SVR-M-54 | B |
| | | | | Ultrasound scanner (Echo) | 1 | SVR-M-55 | A |
| | | | | Electroencephalograph | 1 | SVR-M-56 | B |
| | | | | Electromyograph | 1 | SVR-M-57 | B |
| | | | | Pulmonary function analyzer | 1 | SVR-M-58 | B |
| | | | | Client PC (PACS) | 3 | SVR-M-59 | A |
| 6 | Rehabilitation | Physiotherapy, Occupational theraphy | 1F | Sling therapy bed | 1 | SVR-M-60 | F |
| | | | | Treatment table | 1 | SVR-M-61 | F |
| | | | | Mat | 1 | SVR-M-62 | F |
| | | | | Weight-unloading machine | 1 | SVR-M-63 | F |
| | | | | Parallel bar | 1 | SVR-M-64 | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Low frequency therapy machine | 1 | SVR-M-65 | F |
| | | | | Infrared therapy machine | 1 | SVR-M-66 | F |
| | | | | Ultrasonic therapy machine | 1 | SVR-M-67 | F |
| | | | | Hot pack humidifier | 1 | SVR-M-68 | F |
| | | | | Traction therapy apparatus | 1 | SVR-M-69 | F |
| 7 | ICU | Internal Medicine ICU (16 Beds) | 2F | ICU bed | 16 | SVR-M-70 | E |
| | | | | Vital sign monitor | 8 | SVR-M-71 | B |
| | | | | Suction machine | 6 | SVR-M-72 | C |
| | | | | Infusion pump | 15 | SVR-M-73 | B |
| | | | | Syringe pump | 5 | SVR-M-74 | B |
| | | | | Client PC (PACS) | 1 | SVR-M-75 | A |
| 8 | Wards | 1 Bed Room (11 Rooms) = 11 Beds<br>6 Bed Room (20 Rooms) = 120 Beds | 2-4F | Bed | 131 | SVR-M-76 | E |
| | | | | Bedside cabinet | 131 | SVR-M-77 | E |
| | | | | Overbed table | 131 | SVR-M-78 | E |
| | | | | Blood pressure meter | 12 | SVR-M-79 | F |
| | | | | Suction machine (mobile) | 12 | SVR-M-80 | C |
| | | | | ECG | 3 | SVR-M-81 | B |
| | | | | Weight and height scale | 9 | SVR-M-82 | F |
| | | | | Table, nurse station | 6 | SVR-M-83 | G |
| | | | | Chair, nurse station | 30 | SVR-M-84 | G |
| | | | | Instrument trolley | 9 | SVR-M-85 | F |
| | | | | Medicine trolley | 9 | SVR-M-86 | F |
| | | | | Instrument cabinet | 9 | SVR-M-87 | F |
| | | | | medicine cabinet | 9 | SVR-M-88 | F |
| | | | | Filing cabinet | 9 | SVR-M-89 | F |
| | | | | Clinent PC (PACS) | 6 | SVR-M-90 | A |
| 9 | Training Room | Simulator Room | 5F | Laparoscopy Simulator | 1 | SVR-M-91 | H |
| | | | | Endoscope Simulator | 1 | SVR-M-92 | H |
| | | | | Bronchoscopy training system | 1 | SVR-M-93 | H |
| | | | | Mannequin for patient biometric count | 1 | SVR-M-94 | H |

**Phnom penh Municipal Hospital**

**Building for General Medical Services**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Emergency | Emergency | GF | Stretcher | 3 | PPM-M-1 | F |
| | | | | Examination and treatment table | 5 | PPM-M-2 | F |
| | | | | Vital sign monitor | 3 | PPM-M-3 | F |
| | | | | Defibrillator | 2 | PPM-M-4 | A |
| | | | | Suction machine | 3 | PPM-M-5 | F |
| | | | | ECG | 1 | PPM-M-6 | F |
| | | | | X-ray, mobile | 1 | PPM-M-7 | F |
| | | | | Resuscitator | 2 | PPM-M-8 | F |
| | | | | Ventilator | 1 | PPM-M-9 | B |
| | | | | Observation bed | 3 | PPM-M-10 | E |
| | | Minor Operating Theatre | | Operating table | 1 | PPM-M-11 | C |
| | | | | Operating light | 1 | PPM-M-12 | C |
| | | | | Anesthesia apparatus | 1 | PPM-M-13 | C |
| | | | | Vital sign monitor | 1 | PPM-M-14 | B |
| | | | | Suction machine | 1 | PPM-M-15 | C |
| | | | | Electrosurgical unit | 1 | PPM-M-16 | C |
| | | | | Client PC (PACS) | 5 | PPM-M-17 | A |
| 2 | Outpatient | Internal Medicine, Dermatology, lifestyle disease, Psychiatry, Infectious Diseases, Surgery, Orthopedics | 1F | Diagnostic set | 9 | PPM-M-18 | F |
| | | | | Examination couch | 9 | PPM-M-19 | F |
| | | | | Instrument table | 9 | PPM-M-20 | F |
| | | | | Client PC (PACS) | 9 | PPM-M-21 | A |
| | | | | Weighing scale | 9 | PPM-M-22 | F |
| | | | | Blood pressure meter | 9 | PPM-M-23 | F |
| | | | | Basket | 9 | PPM-M-24 | F |
| | | | | Desk (Doctor) | 9 | PPM-M-25 | G |
| | | | | Chair (Doctor) | 9 | PPM-M-26 | G |
| | | | | Chair (Patient) | 9 | PPM-M-27 | G |
| | | ENT | | Audiometer | 1 | PPM-M-28 | B |
| | | | | ENT treatment unit and chair | 1 | PPM-M-29 | B |
| | | | | Suction machine | 1 | PPM-M-30 | C |
| | | Dental | | Dental unit and chair | 2 | PPM-M-31 | B |
| | | | | Extraoral vacuum unit | 2 | PPM-M-32 | B |
| | | | | Handpiece set | 2 | PPM-M-33 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 2 | PPM-M-34 | B |
| | | | | Sterilizer | 2 | PPM-M-35 | C |
| | | | | Dental X-ray machine | 1 | PPM-M-36 | A |
| 3 | Rehabilitation | Physiotherapy, Occupational theraphy | 1F | Sling therapy bed | 1 | PPM-M-37 | F |
| | | | | Treatment table | 1 | PPM-M-38 | F |
| | | | | Mat | 1 | PPM-M-39 | F |
| | | | | Weight-unloading machine | 1 | PPM-M-40 | F |
| | | | | Parallel bar | 1 | PPM-M-41 | F |
| | | | | Low frequency therapy machine | 1 | PPM-M-42 | F |
| | | | | Infrared therapy machine | 1 | PPM-M-43 | F |
| | | | | Ultrasonic therapy machine | 1 | PPM-M-44 | F |
| | | | | Hot pack humidifier | 1 | PPM-M-45 | F |
| | | | | Traction therapy apparatus | 1 | PPM-M-46 | F |
| 4 | Physiological Function Testing | Physiological Function Testing | 1F | Stress test system, with ECG analyzer | 1 | PPM-M-47 | B |
| | | | | Holter ECG | 1 | PPM-M-48 | B |
| | | | | ECG | 1 | PPM-M-49 | B |
| | | | | Ultrasound scanner (Echo) | 1 | PPM-M-50 | A |
| | | | | Electroencephalograph | 1 | PPM-M-51 | B |
| | | | | Electromyograph | 1 | PPM-M-52 | B |
| | | | | Pulmonary function analyzer | 1 | PPM-M-53 | B |
| | | | | Client PC (PACS) | 3 | PPM-M-54 | A |
| 5 | Diagnostic Imagir | Diagnostic Imaging | 1F | X-ray, general | 1 | PPM-M-55 | A |
| | | | | X-ray, fluoroscopy | 1 | PPM-M-56 | A |
| | | | | CT | 1 | PPM-M-57 | A |
| | | | | Mammography | 1 | PPM-M-58 | A |
| | | | | PACS station | 1 | PPM-M-59 | A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Clinent PC (PACS) | 1 | PPM-M-60 | A |
| 6 | Endoscope | Endoscopic Examination and Treatme | 2F | Upper gastrointestinal fiberscope | 1 | PPM-M-61 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | PPM-M-62 | C |
| | | | | Endoscopic cleeaner | 1 | PPM-M-63 | C |
| | | | | Examinationtable | 2 | PPM-M-64 | F |
| | | | | Client PC (PACS) | 1 | PPM-M-65 | A |
| 7 | Laboratory | Clinical Laboratory<br>Hematology, Biochemistry, Bacteriology, Immunology, Serology, Pathology, Blood Transfusion | 2F | Hematology analyzer | 1 | PPM-M-66 | D |
| | | | | Blood coagulation analyzer | 1 | PPM-M-67 | D |
| | | | | Blood sedimentation analyzer | 1 | PPM-M-68 | D |
| | | | | Bilirubin analyzer | 1 | PPM-M-69 | D |
| | | | | Biochemistry analyzer | 1 | PPM-M-70 | D |
| | | | | Electrolyte analyzer | 1 | PPM-M-71 | D |
| | | | | Urine analyzer | 1 | PPM-M-72 | D |
| | | | | Immunoassay analyzer | 1 | PPM-M-73 | D |
| | | | | Bacterial analyzers | 1 | PPM-M-74 | D |
| | | | | Blood culture analyzer | 1 | PPM-M-75 | D |
| | | | | Safety cabinet | 1 | PPM-M-76 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | PPM-M-77 | D |
| | | | | Microtome | 1 | PPM-M-78 | D |
| | | | | Cryostat microtome | 1 | PPM-M-79 | D |
| | | | | Dehydration, dewaxing and paraffin infi | 1 | PPM-M-80 | D |
| | | | | Paraffin inclusion block | 1 | PPM-M-81 | D |
| | | | | Automatic staining machine | 1 | PPM-M-82 | D |
| | | | | Automated pathology specimen encapsu | 1 | PPM-M-83 | D |
| | | | | Automated cell collection device | 1 | PPM-M-84 | D |
| | | | | Pathology microscope | 1 | PPM-M-85 | D |
| | | | | Client PC (PACS) | 3 | PPM-M-86 | A |
| 8 | Central Service Department | General Operating Room: 2<br>Infectious Operating Room: 1 | 2F | Operating lump | 3 | PPM-M-87 | C |
| | | | | Operating table | 3 | PPM-M-88 | C |
| | | | | Electrosurgical unit | 3 | PPM-M-89 | C |
| | | | | Anesthesia machine | 3 | PPM-M-90 | C |
| | | | | Vital sign monitor | 3 | PPM-M-91 | B |
| | | | | Suction machine | 3 | PPM-M-92 | C |
| | | | | Operating microscope | 2 | PPM-M-93 | C |
| | | | | X-ray, C-arm | 1 | PPM-M-94 | A |
| | | | | Laparpscope | 1 | PPM-M-95 | C |
| | | | | Arthroscope | 1 | PPM-M-96 | C |
| | | Recovery | 2F | Recovery bed | 5 | PPM-M-97 | E |
| | | | | Vital sign monitor | 5 | PPM-M-98 | B |
| 7 | CSSD | CSSD | 2F | Ultrasonic cleaner | 2 | PPM-M-99 | C |
| | | | | High pressure steam sterilizer | 2 | PPM-M-100 | C |
| 8 | ICU | Surgical ICU (12 Beds) | 2F | ICU bed | 12 | PPM-M-101 | E |
| | | | | Vital sign monitor, central | 2 | PPM-M-102 | C |
| | | | | Vital sign monitor, bedside | 12 | PPM-M-103 | C |
| | | | | Infusion pump | 20 | PPM-M-104 | B |
| | | | | Syringe pump | 15 | PPM-M-105 | B |
| | | | | Suction machine | 10 | PPM-M-106 | C |
| | | | | X-ray, mobile | 1 | PPM-M-107 | A |
| | | | | Ventilator | 5 | PPM-M-108 | B |
| | | | | Table, nurse station | 2 | PPM-M-109 | G |
| | | | | Chair | 10 | PPM-M-110 | G |
| | | | | Instrument cabinet | 2 | PPM-M-111 | F |
| | | | | Filing cabinet | 2 | PPM-M-112 | F |
| | | | | Instrument trolley | 5 | PPM-M-113 | F |
| | | | | Blood gas analyzer | 1 | PPM-M-114 | D |
| | | | | Client PC (PACS) | 1 | PPM-M-115 | A |
| 10 | Outpatinet | Obstetrics & Gynecology | 3F | Diagnostic set | 2 | PPM-M-116 | F |
| | | | | Examination table | 2 | PPM-M-117 | F |
| | | | | Instrument cabinet | 2 | PPM-M-118 | F |
| | | | | Client PC (PACS) | 2 | PPM-M-119 | A |
| | | | | Weighing scale | 2 | PPM-M-120 | F |
| | | | | Blood pressure meter | 2 | PPM-M-121 | F |
| | | | | Colposcope | 1 | PPM-M-122 | B |
| | | | | Basket | 2 | PPM-M-123 | F |
| | | | | Desk (Doctor) | 2 | PPM-M-124 | G |
| | | | | Chair (Doctor) | 2 | PPM-M-125 | G |
| | | | | Chair (Patient) | 2 | PPM-M-126 | G |
| 11 | Delivery | Delivery | 3F | Delivery table | 4 | PPM-M-127 | F |
| | | | | Examination lamp | 4 | PPM-M-128 | F |
| | | | | Infant warmer | 4 | PPM-M-129 | B |
| | | | | Vacuum extractor | 2 | PPM-M-130 | C |
| | | | | Fetal doppler | 4 | PPM-M-131 | B |
| 12 | Labor Pain | Labor Pain | 3F | Bed | 5 | PPM-M-132 | E |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | CTG | 3 | PPM-M-133 | B |
| 13 | Post Natal | Post Natal Recovery | 3F | Bed | 5 | PPM-M-134 | E |
| | | | | Cot | 5 | PPM-M-135 | E |
| 14 | NICU | NICU | 3F | Infant incubator | 2 | PPM-M-136 | B |
| | | | | Infant warmer | 2 | PPM-M-137 | B |
| | | | | CPAP | 2 | PPM-M-138 | B |
| | | | | Ventilator, infant | 2 | PPM-M-139 | B |
| 15 | Operating Room | Operating Room for OB & GY | 3F | Operating table | 2 | PPM-M-140 | C |
| | | | | Opetating light | 2 | PPM-M-141 | C |
| | | | | Vital sign monitor | 2 | PPM-M-142 | B |
| | | | | Suction machine | 2 | PPM-M-143 | C |
| | | | | Electrosurgical unit | 2 | PPM-M-144 | C |
| | | | | Anesthesia machine | 2 | PPM-M-145 | C |
| | | | | Autoclave | 2 | PPM-M-146 | C |
| 16 | OB & GY Wards | Wards (OB & GY)<br>1 Bed Room (4 Rooms) = 4 Beds<br>6 Bed Room (4 Rooms) = 24 Beds | 3F | Bed | 28 | PPM-M-147 | E |
| | | | | Bedside cabinet | 28 | PPM-M-148 | E |
| | | | | Overbed table | 28 | PPM-M-149 | E |
| | | | | Blood pressure meter | 3 | PPM-M-150 | F |
| | | | | Suction machine (mobile) | 2 | PPM-M-151 | C |
| | | | | ECG | 1 | PPM-M-152 | B |
| | | | | Weight and height scale | 2 | PPM-M-153 | F |
| | | | | Table, nurse station | 1 | PPM-M-154 | G |
| | | | | Chair, nurse station | 15 | PPM-M-155 | G |
| | | | | Instrument trolley | 3 | PPM-M-156 | F |
| | | | | Medicine trolley | 3 | PPM-M-157 | F |
| | | | | Instrument cabinet | 2 | PPM-M-158 | F |
| | | | | Medicine cabinet | 2 | PPM-M-159 | F |
| | | | | Filing cabinet | 2 | PPM-M-160 | F |
| | | | | Client PC (PACS) | 1 | PPM-M-161 | A |
| 17 | ICU | Internal Medicine ICU (16 Beds) | 4F | ICU bed | 16 | PPM-M-162 | E |
| | | | | Vital sign monitor | 8 | PPM-M-163 | B |
| | | | | Suction machine | 6 | PPM-M-164 | C |
| | | | | Infusion pump | 15 | PPM-M-165 | B |
| | | | | Syringe pump | 5 | PPM-M-166 | B |
| | | | | Clinent PC (PACS) | 1 | PPM-M-167 | A |
| 10 | Wards | 1 Bed Room (17 Rooms) = 17 Beds<br>4 Bed Room (25 Rooms) = 100 Beds | 4-6F | Bed | 117 | PPM-M-168 | E |
| | | | | Bedside cabinet | 117 | PPM-M-169 | E |
| | | | | Overbed table | 117 | PPM-M-170 | E |
| | | | | Blood pressure meter | 15 | PPM-M-171 | F |
| | | | | Suction macine (mobile) | 15 | PPM-M-172 | C |
| | | | | ECG | 3 | PPM-M-173 | B |
| | | | | Weight and height scale | 6 | PPM-M-174 | F |
| | | | | Table, nurse station | 6 | PPM-M-175 | G |
| | | | | Chair, nurse station | 45 | PPM-M-176 | G |
| | | | | Instrument trolley | 9 | PPM-M-177 | F |
| | | | | Medicine trolley | 9 | PPM-M-178 | F |
| | | | | Instrument cabinet | 9 | PPM-M-179 | F |
| | | | | Medicine cabinet | 9 | PPM-M-180 | F |
| | | | | Filing cabinet | 9 | PPM-M-181 | F |
| | | | | Client PC (PACS) | 6 | PPM-M-182 | A |
| 12 | Training Room | Simulator Room | 7F | Laparoscopy Simulator | 1 | PPM-M-183 | H |
| | | | | Endoscope Simulator | 1 | PPM-M-184 | H |
| | | | | Bronchoscopy training system | 1 | PPM-M-185 | H |
| | | | | Mannequin for patient biometric count | 1 | PPM-M-186 | H |

**Kampot Provincial Hospital**

**Building for Emergency**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Emergency | Emergency | GF | Stretcher | 3 | KPT-E-1 | F |
| | | | | Examination and treatment table | 5 | KPT-E-2 | F |
| | | | | Vital sign monitor | 3 | KPT-E-3 | F |
| | | | | Defibrillator | 2 | KPT-E-4 | A |
| | | | | Suction machine | 3 | KPT-E-5 | F |
| | | | | ECG | 1 | KPT-E-6 | F |
| | | | | X-ray, mobile | 1 | KPT-E-7 | F |
| | | | | Resuscitator | 2 | KPT-E-8 | F |
| | | | | Ventilator | 1 | KPT-E-9 | B |
| | | | | Observation bed | 6 | KPT-E-10 | E |
| | | | | Client PC (PACS) | 5 | KPT-E-11 | A |

**Building for General Medical Services**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Internal medicine, Pediatrics, Surgery, Orthopedics ENT, Dermatology, Urology, Dentistry, Diabetes, Hypertension, Psychiatry | GF | Diagnostic set | 11 | KPT-A-1 | F |
| | | | | Examination table | 11 | KPT-A-2 | F |
| | | | | Instrument cabinet | 11 | KPT-A-3 | F |
| | | | | Clinent PC (PACS) | 11 | KPT-A-4 | A |
| | | | | Weighing scale | 11 | KPT-A-5 | F |
| | | | | Blood presssure meter | 11 | KPT-A-6 | F |
| | | | | Basket | 11 | KPT-A-7 | F |
| | | | | Desk (Doctor) | 11 | KPT-A-8 | G |
| | | | | Chair (Doctor) | 11 | KPT-A-9 | G |
| | | | | Chair (Patient) | 11 | KPT-A-10 | G |
| | | ENT | | Audiometer | 1 | KPT-A-11 | B |
| | | | | ENT treatment unit and chair | 1 | KPT-A-12 | B |
| | | | | Suction machine | 1 | KPT-A-13 | C |
| | | Dentistry | | Dental unit and chair | 2 | KPT-A-14 | B |
| | | | | Extraoral vacuum unit | 2 | KPT-A-15 | B |
| | | | | Handpiece set | 2 | KPT-A-16 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 2 | KPT-A-17 | B |
| | | | | Sterilizer | 2 | KPT-A-18 | C |
| | | | | Dental X-ray machine | 1 | KPT-A-19 | A |
| 2 | Diagnostic Imaging | Diagnostic Imaging | GF | X-ray, general | 1 | KPT-A-20 | A |
| | | | | X-ray, fluoroscopy | 1 | KPT-A-21 | A |
| | | | | CT | 1 | KPT-A-22 | A |
| | | | | Mammography | 1 | KPT-A-23 | A |
| | | | | PACS station | 1 | KPT-A-24 | A |
| | | | | Client PC (PACS) | 1 | KPT-A-25 | A |
| 3 | Endoscope | Endoscopic Examination and Treatment | GF | Upper gastrointestinal fiberscope | 1 | KPT-A-26 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | KPT-A-27 | C |
| | | | | Endoscopic cleeaner | 1 | KPT-A-28 | C |
| | | | | Examinationtable | 2 | KPT-A-29 | F |
| | | | | Client PC (PACS) | 1 | KPT-A-30 | A |
| 4 | Laboratory | Clinical Laboratory Hematology, Biochemistry, Bacteriology, Immunology, Serology, Pathology, Blood Transfusion | 1 F | Hematology analyzer | 1 | KPT-A-31 | D |
| | | | | Blood coagulation analyzer | 1 | KPT-A-32 | D |
| | | | | Blood sedimentation analyzer | 1 | KPT-A-33 | D |
| | | | | Bilirubin analyzer | 1 | KPT-A-34 | D |
| | | | | Biochemistry analyzer | 1 | KPT-A-35 | D |
| | | | | Electrolyte analyzer | 1 | KPT-A-36 | D |
| | | | | Urine analyzer | 1 | KPT-A-37 | D |
| | | | | Immunoassay analyzer | 1 | KPT-A-38 | D |
| | | | | Bacterial analyzers | 1 | KPT-A-39 | D |
| | | | | Blood culture analyzer | 1 | KPT-A-40 | D |
| | | | | Safety cabinet | 1 | KPT-A-41 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | KPT-A-42 | D |
| | | | | Microtome | 1 | KPT-A-43 | D |
| | | | | Cryostat microtome | 1 | KPT-A-44 | D |
| | | | | Dehydration, dewaxing and paraffin infi | 1 | KPT-A-45 | D |
| | | | | Paraffin inclusion block | 1 | KPT-A-46 | D |
| | | | | Automatic staining machine | 1 | KPT-A-47 | D |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Automated pathology specimen encapsu | 1 | KPT-A-48 | D |
| | | | | Automated cell collection device | 1 | KPT-A-49 | D |
| | | | | Pathology microscope | 1 | KPT-A-50 | D |
| | | | | Client PC (PACS) | 3 | KPT-A-51 | A |
| 5 | Physiological Function Testing | Physiological Function Testing | GF | Stress test system, with ECG analyzer | 1 | KPT-A-52 | B |
| | | | | Holter ECG | 1 | KPT-A-53 | B |
| | | | | ECG | 1 | KPT-A-54 | B |
| | | | | Ultrasound scanner (Echo) | 1 | KPT-A-55 | A |
| | | | | Electroencephalograph | 1 | KPT-A-56 | B |
| | | | | Electromyograph | 1 | KPT-A-57 | B |
| | | | | Pulmonary function analyzer | 1 | KPT-A-58 | B |
| | | | | Client PC (PACS) | 3 | KPT-A-59 | A |
| 6 | Rehabilitation | Physiotherapy, Occupational theraphy | GF | Sling therapy bed | 1 | KPT-A-60 | F |
| | | | | Treatment table | 1 | KPT-A-61 | F |
| | | | | Mat | 1 | KPT-A-62 | F |
| | | | | Weight-unloading machine | 1 | KPT-A-63 | F |
| | | | | Parallel bar | 1 | KPT-A-64 | F |
| | | | | Low frequency therapy machine | 1 | KPT-A-65 | F |
| | | | | Infrared therapy machine | 1 | KPT-A-66 | F |
| | | | | Ultrasonic therapy machine | 1 | KPT-A-67 | F |
| | | | | Hot pack humidifier | 1 | KPT-A-68 | F |
| | | | | Traction therapy apparatus | 1 | KPT-A-69 | F |
| 6 | Central Service Department | Surgical Operation Neurology,, Urology, Orthopedics, Obstetrics and Gynecology | 1F | Operating lump | 4 | KPT-A-70 | C |
| | | | | Operating table | 4 | KPT-A-71 | C |
| | | | | Electrosurgical unit | 4 | KPT-A-72 | C |
| | | | | Anesthesia machine | 4 | KPT-A-73 | C |
| | | | | Vital sign monitor | 4 | KPT-A-74 | B |
| | | | | Suction machine | 4 | KPT-A-75 | C |
| | | | | Operating microscope | 3 | KPT-A-76 | C |
| | | | | X-ray, C-arm | 1 | KPT-A-77 | A |
| | | | | Laparpscope | 1 | KPT-A-78 | C |
| | | | | Arthroscope | 1 | KPT-A-79 | C |
| | | Recovery Room | 1F | Recovery bed | 5 | KPT-A-80 | E |
| | | | | Vital sign monitor | 5 | KPT-A-81 | B |
| 7 | CSSD | CSSD | 1F | Ultrasonic cleaner | 2 | KPT-A-82 | C |
| | | | | High pressure steam sterilizer | 2 | KPT-A-83 | C |
| 8 | ICU | Surgical ICU (12 Beds) | 1F | ICU bed | 12 | KPT-A-84 | E |
| | | | | Vital sign monitor, central | 2 | KPT-A-85 | C |
| | | | | Vital sign monitor, bedside | 12 | KPT-A-86 | C |
| | | | | Infusion pump | 20 | KPT-A-87 | B |
| | | | | Syringe pump | 15 | KPT-A-88 | B |
| | | | | Suction machine | 10 | KPT-A-89 | C |
| | | | | X-ray, mobile | 1 | KPT-A-90 | A |
| | | | | Ventilator | 5 | KPT-A-91 | B |
| | | | | Table, nurse station | 2 | KPT-A-92 | G |
| | | | | Chair | 10 | KPT-A-93 | G |
| | | | | Instrument cabinet | 2 | KPT-A-94 | F |
| | | | | Filing cabinet | 2 | KPT-A-95 | F |
| | | | | Instrument trolley | 5 | KPT-A-96 | F |
| | | | | Blood gas analyzer | 1 | KPT-A-97 | D |
| | | | | Client PC (PACS) | 1 | KPT-A-98 | A |
| 9 | ICU | Internal Medicine ICU: 16 Beds | 2F | HCU bed | 16 | KPT-A-99 | E |
| | | | | Vital sign monitor | 8 | KPT-A-100 | B |
| | | | | Suction machine | 6 | KPT-A-101 | C |
| | | | | Infusion pump | 15 | KPT-A-102 | B |
| | | | | Syringe pump | 5 | KPT-A-103 | B |
| | | | | Client PC (PACS) | 1 | KPT-A-104 | A |
| 10 | Wards | 1 Bed Room (18 Rooms) = 18 Beds<br>6 Bed Room (56 Rooms) = 336 Beds | 2-6F | Bed | 354 | KPT-A-105 | E |
| | | | | Bedside cabinet | 354 | KPT-A-106 | E |
| | | | | Overbed table | 354 | KPT-A-107 | E |
| | | | | Blood pressure meter | 15 | KPT-A-108 | F |
| | | | | Suction machine (mobile) | 15 | KPT-A-109 | C |
| | | | | ECG | 5 | KPT-A-110 | B |
| | | | | Weight and height scale | 10 | KPT-A-111 | F |
| | | | | Table, nurse station | 8 | KPT-A-112 | G |
| | | | | Chair, nurse station | 60 | KPT-A-113 | G |
| | | | | Instrument trolley | 10 | KPT-A-114 | F |
| | | | | Medicine trolley | 12 | KPT-A-115 | F |
| | | | | Instrument cabinet | 12 | KPT-A-116 | F |
| | | | | Medicine cabinet | 12 | KPT-A-117 | F |
| | | | | Filing cabinet | 12 | KPT-A-118 | F |
| | | | | Client PC (PACS) | 8 | KPT-A-119 | A |
| 12 | Training Room | Simulator Room | 5F | Laparoscopy Simulator | 1 | KPT-A-120 | H |
| | | | | Endoscope Simulator | 1 | KPT-A-121 | H |
| | | | | Bronchoscopy training system | 1 | KPT-A-122 | H |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Mannequin for patient biometric count | 1 | KPT-A-123 | H |

**Building for Obstetrics and Gynecology**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Obstetrics and Gynecology | GF | Diagnostic set | 2 | KPT-M-1 | F |
| | | | | Examination table | 2 | KPT-M-2 | F |
| | | | | Instrument cabinet | 2 | KPT-M-3 | F |
| | | | | Client PC (PACS) | 2 | KPT-M-4 | A |
| | | | | Weighing scale | 2 | KPT-M-5 | F |
| | | | | Blood pressure meter | 2 | KPT-M-6 | F |
| | | | | Colposcope | 1 | KPT-M-7 | B |
| | | | | Basket | 2 | KPT-M-8 | F |
| | | | | Desk (Doctor) | 2 | KPT-M-9 | G |
| | | | | Chair (Doctor) | 2 | KPT-M-10 | G |
| | | | | Chair (Patient) | 2 | KPT-M-11 | G |
| 2 | Delivery | Delivery | GF | Delivery table | 4 | KPT-M-12 | F |
| | | | | Examination lamp | 4 | KPT-M-13 | F |
| | | | | Infant warmer | 4 | KPT-M-14 | B |
| | | | | Vacuum extractor | 2 | KPT-M-15 | C |
| | | | | Fetal doppler | 4 | KPT-M-16 | B |
| 3 | Labor Pain | Labor Pain | GF | Bed | 5 | KPT-M-17 | E |
| | | | | CTG | 3 | KPT-M-18 | B |
| 4 | Post Natal | Post Natal | GF | Bed | 5 | KPT-M-19 | E |
| | | | | Cot | 5 | KPT-M-20 | E |
| 5 | NICU | NICU | GF | Infant incubator | 2 | KPT-M-21 | B |
| | | | | Infant warmer | 2 | KPT-M-22 | B |
| | | | | CPAP | 2 | KPT-M-23 | B |
| | | | | Ventilator, infant | 2 | KPT-M-24 | B |
| 6 | Operating Room | Operating Room | GF | Operating table | 2 | KPT-M-25 | C |
| | | | | Opetating light | 2 | KPT-M-26 | C |
| | | | | Vital sign monitor | 2 | KPT-M-27 | B |
| | | | | Suction machine | 2 | KPT-M-28 | C |
| | | | | Electrosurgical unit | 2 | KPT-M-29 | C |
| | | | | Anesthesia machine | 2 | KPT-M-30 | C |
| | | | | Autoclave | 2 | KPT-M-30 | C |
| 7 | Wards | 1 Bed Room (4 Rooms) = 4 Beds<br>6 Bed Room (7 Rooms) = 42 Beds | 1F | Bed | 46 | KPT-M-30 | E |
| | | | | Bedside cabinet | 46 | KPT-M-30 | E |
| | | | | Overbed table | 46 | BTB-A-95 | E |
| | | | | Blood pressure meter | 2 | BTB-A-96 | F |
| | | | | Suction machine | 2 | BTB-A-97 | C |
| | | | | ECG | 2 | BTB-A-98 | B |
| | | | | Client PC (PACS) | 2 | BTB-A-99 | A |

**Stung Treng Provincial Hospital**

**Building for Emergency**

| | Package Classification |
|---|---|
| A | Imaging Diagnostic |
| B | Physiological functioning monitoring,Treatment |
| C | Surgical operation, Treatment, Endoscopes, Eye |
| D | Clinical laboratory |
| E | Inpatient admission (Wards) |
| F | Common medical equipment, Rehabilitation, Medical furnitures |
| G | General furnitures |
| H | training related equipment |

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Emergency | Emergency | GF | Stretcher | 3 | STT-E-1 | F |
| | | | | Examination and treatment table | 5 | STT-E-2 | F |
| | | | | Vital sign monitor | 3 | STT-E-3 | F |
| | | | | Defibrillator | 2 | STT-E-4 | A |
| | | | | Suction machine | 3 | STT-E-5 | F |
| | | | | ECG | 1 | STT-E-6 | F |
| | | | | X-ray, mobile | 1 | STT-E-7 | F |
| | | | | Resuscitator | 2 | STT-E-8 | F |
| | | | | Ventilator | 1 | STT-E-9 | B |
| | | | | Observation bed | 6 | STT-E-10 | E |
| | | | | Client PC (PACS) | 5 | STT-E-11 | A |

**Building for General Medical Services**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Internal Medicine, Pediatrics,<br>Surgery, Orthopedics,<br>ENT, Dermatology, Urology, Dentistry, Oncology,<br>Oncology, Diabetes, Hypertension, Psychiatry,<br>Infectious Diseases | GF | Diagnostic set | 13 | STT-A-1 | F |
| | | | | Examination table | 13 | STT-A-2 | F |
| | | | | Instrument cabinet | 13 | STT-A-3 | F |
| | | | | Clinent PC (PACS) | 13 | STT-A-4 | A |
| | | | | Weighing scale | 13 | STT-A-5 | F |
| | | | | Blood presssure meter | 13 | STT-A-6 | F |
| | | | | Basket | 13 | STT-A-7 | F |
| | | | | Desk (Doctor) | 13 | STT-A-8 | G |
| | | | | Chair (Doctor) | 13 | STT-A-9 | G |
| | | | | Chair (Patient) | 13 | STT-A-10 | G |
| | | ENT | | Audiometer | 1 | STT-A-11 | B |
| | | | | ENT treatment unit and chair | 1 | STT-A-12 | B |
| | | | | Suction machine | 1 | STT-A-13 | C |
| | | Dentistry | | Dental unit and chair | 2 | STT-A-14 | B |
| | | | | Extraoral vacuum unit | 2 | STT-A-15 | B |
| | | | | Handpiece set | 2 | STT-A-16 | B |
| | | | | Instrument set (mirror, tweezers, etc.) | 2 | STT-A-17 | B |
| | | | | Sterilizer | 2 | STT-A-18 | C |
| | | | | Dental X-ray machine | 1 | STT-A-19 | A |
| 2 | Diagnostic Imaging | Diagnostic Imaging | GF | X-ray, general | 1 | STT-A-20 | A |
| | | | | X-ray, fluoroscopy | 1 | STT-A-21 | A |
| | | | | CT | 1 | STT-A-22 | A |
| | | | | Mammography | 1 | STT-A-23 | A |
| | | | | PACS station | 1 | STT-A-24 | A |
| | | | | Client PC (PACS) | 1 | STT-A-25 | A |
| 3 | Endoscope | Endoscopic Examination and Treatment | GF | Upper gastrointestinal fiberscope | 1 | STT-A-26 | C |
| | | | | Lower gastrointestinal fiberscope | 1 | STT-A-27 | C |
| | | | | Endoscopic cleeaner | 1 | STT-A-28 | C |
| | | | | Examinationtable | 2 | STT-A-29 | F |
| | | | | Client PC (PACS) | 1 | STT-A-30 | A |
| 4 | Laboratory | Clinical Laboratory<br>Hematology, Biochemistry, Bacteriology,<br>Immunology, Serology, Pathology,<br>Blood Transfusion | GF | Hematology analyzer | 1 | STT-A-31 | D |
| | | | | Blood coagulation analyzer | 1 | STT-A-32 | D |
| | | | | Blood sedimentation analyzer | 1 | STT-A-33 | D |
| | | | | Bilirubin analyzer | 1 | STT-A-34 | D |
| | | | | Biochemistry analyzer | 1 | STT-A-35 | D |
| | | | | Electrolyte analyzer | 1 | STT-A-36 | D |
| | | | | Urine analyzer | 1 | STT-A-37 | D |
| | | | | Immunoassay analyzer | 1 | STT-A-38 | D |
| | | | | Bacterial analyzers | 1 | STT-A-39 | D |
| | | | | Blood culture analyzer | 1 | STT-A-40 | D |
| | | | | Safety cabinet | 1 | STT-A-41 | D |
| | | | | Automatic fecal occult blood analyzer | 1 | STT-A-42 | D |
| | | | | Microtome | 1 | STT-A-43 | D |
| | | | | Cryostat microtome | 1 | STT-A-44 | D |
| | | | | Dehydration, dewaxing and paraffin infil | 1 | STT-A-45 | D |
| | | | | Paraffin inclusion block | 1 | STT-A-46 | D |
| | | | | Automatic staining machine | 1 | STT-A-47 | D |
| | | | | Automated pathology specimen encapsu | 1 | STT-A-48 | D |
| | | | | Automated cell collection device | 1 | STT-A-49 | D |
| | | | | Pathology microscope | 1 | STT-A-50 | D |
| | | | | Client PC (PACS) | 3 | STT-A-51 | A |
| 5 | Physiological Function Testing | Physiological Function Testing | GF | Stress test system, with ECG analyzer | 1 | STT-A-52 | B |
| | | | | Holter ECG | 1 | STT-A-53 | B |
| | | | | ECG | 1 | STT-A-54 | B |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Ultrasound scanner (Echo) | 1 | STT-A-55 | A |
| | | | | Electroencephalograph | 1 | STT-A-56 | B |
| | | | | Electromyograph | 1 | STT-A-57 | B |
| | | | | Pulmonary function analyzer | 1 | STT-A-58 | B |
| | | | | Client PC (PACS) | 3 | STT-A-59 | A |
| 6 | Rehabilitation | Physiotherapy,<br>Occupational theraphy | GF | Sling therapy bed | 1 | STT-A-60 | F |
| | | | | Treatment table | 1 | STT-A-61 | F |
| | | | | Mat | 1 | STT-A-62 | F |
| | | | | Weight-unloading machine | 1 | STT-A-63 | F |
| | | | | Parallel bar | 1 | STT-A-64 | F |
| | | | | Low frequency therapy machine | 1 | STT-A-65 | F |
| | | | | Infrared therapy machine | 1 | STT-A-66 | F |
| | | | | Ultrasonic therapy machine | 1 | STT-A-67 | F |
| | | | | Hot pack humidifier | 1 | STT-A-68 | F |
| | | | | Traction therapy apparatus | 1 | STT-A-69 | F |
| 7 | Central Service<br>Department | Surgical Operation<br>Neurology,, Urology, Orthopedics,<br>Obstetrics and Gynecology | 1F | Operating lump | 4 | STT-A-70 | C |
| | | | | Operating table | 4 | STT-A-71 | C |
| | | | | Electrosurgical unit | 4 | STT-A-72 | C |
| | | | | Anesthesia machine | 4 | STT-A-73 | C |
| | | | | Vital sign monitor | 4 | STT-A-74 | B |
| | | | | Suction machine | 4 | STT-A-75 | C |
| | | | | Operating microscope | 3 | STT-A-76 | C |
| | | | | X-ray, C-arm | 1 | STT-A-77 | A |
| | | | | Laparpscope | 1 | STT-A-78 | C |
| | | | | Arthroscope | 1 | STT-A-79 | C |
| | | Recovery Room | 1F | Recovery bed | 5 | STT-A-80 | E |
| | | | | Vital sign monitor | 5 | STT-A-81 | B |
| 8 | CSSD | CSSD | 1F | Ultrasonic cleaner | 2 | STT-A-82 | C |
| | | | | High pressure steam sterilizer | 2 | STT-A-83 | C |
| 9 | ICU | Surgical ICU (12 Beds) | 1F | ICU bed | 12 | STT-A-84 | E |
| | | | | Vital sign monitor, central | 2 | STT-A-85 | C |
| | | | | Vital sign monitor, bedside | 12 | STT-A-86 | C |
| | | | | Infusion pump | 20 | STT-A-87 | B |
| | | | | Syringe pump | 15 | STT-A-88 | B |
| | | | | Suction machine | 10 | STT-A-89 | C |
| | | | | X-ray, mobile | 1 | STT-A-90 | A |
| | | | | Ventilator | 5 | STT-A-91 | B |
| | | | | Table, nurse station | 2 | STT-A-92 | G |
| | | | | Chair | 10 | STT-A-93 | G |
| | | | | Instrument cabinet | 2 | STT-A-94 | F |
| | | | | Filing cabinet | 2 | STT-A-95 | F |
| | | | | Instrument trolley | 5 | STT-A-96 | F |
| | | | | Blood gas analyzer | 1 | STT-A-97 | D |
| | | | | Client PC (PACS) | 1 | STT-A-98 | A |
| 10 | ICU | Internal Medicine ICU = 16 Beds | 2F | HCU bed | 16 | STT-A-99 | E |
| | | | | Vital sign monitor | 8 | STT-A-100 | B |
| | | | | Suction machine | 6 | STT-A-101 | C |
| | | | | Infusion pump | 15 | STT-A-102 | B |
| | | | | Syringe pump | 5 | STT-A-103 | B |
| | | | | Client PC (PACS) | 1 | STT-A-104 | A |
| 11 | Wards | 1 Bed Room (6 Rooms) = 6 Beds<br>6 Bed Room  (20 Rooms) = 120 Beds | 2-3F | Bed | 126 | STT-A-105 | E |
| | | | | Bedside cabinet | 126 | STT-A-106 | E |
| | | | | Overbed table | 126 | STT-A-107 | E |
| | | | | Blood pressure meter | 15 | STT-A-108 | F |
| | | | | Suction machine (mobile) | 15 | STT-A-109 | C |
| | | | | ECG | 3 | STT-A-110 | B |
| | | | | Weight and height scale | 9 | STT-A-111 | F |
| | | | | Table, nurse station | 4 | STT-A-112 | G |
| | | | | Chair, nurse station | 30 | STT-A-113 | G |
| | | | | Instrument trolley | 10 | STT-A-114 | F |
| | | | | Medicine trolley | 10 | STT-A-115 | F |
| | | | | Instrument cabinet | 6 | STT-A-116 | F |
| | | | | Medicine cabinet | 6 | STT-A-117 | F |
| | | | | Filing cabinet | 6 | STT-A-118 | F |
| | | | | Client PC (PACS) | 4 | STT-A-119 | A |
| 12 | Training Room | Simulator Room | 4F | Laparoscopy Simulator | 1 | STT-A-120 | H |
| | | | | Endoscope Simulator | 1 | STT-A-121 | H |
| | | | | Bronchoscopy training system | 1 | STT-A-122 | H |
| | | | | Mannequin for patient biometric count | 1 | STT-A-123 | H |

**Building for Obstetrics and Gynecology**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Obstetrics and Gynecology | GF | Diagnostic set | 2 | STT-M-1 | F |
| | | | | Examination table | 2 | STT-M-2 | F |
| | | | | Instrument cabinet | 2 | STT-M-3 | F |
| | | | | Client PC (PACS) | 2 | STT-M-4 | A |
| | | | | Weighing scale | 2 | STT-M-5 | F |
| | | | | Blood pressure meter | 2 | STT-M-6 | F |
| | | | | Colposcope | 1 | STT-M-7 | B |
| | | | | Basket | 2 | STT-M-8 | F |
| | | | | Desk (Doctor) | 2 | STT-M-9 | G |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Chair (Doctor) | 2 | STT-M-10 | G |
| | | | | Chair (Patient) | 2 | STT-M-11 | G |
| 2 | Delivery | Delivery | GF | Delivery table | 4 | STT-M-12 | F |
| | | | | Examination lamp | 4 | STT-M-13 | F |
| | | | | Infant warmer | 4 | STT-M-14 | B |
| | | | | Vacuum extractor | 2 | STT-M-15 | C |
| | | | | Fetal doppler | 4 | STT-M-16 | B |
| 3 | Labor Pain | Labor Pain | GF | Bed | 5 | STT-M-17 | E |
| | | | | CTG | 3 | STT-M-18 | B |
| 4 | Post Natal | Post Natal | GF | Bed | 5 | STT-M-19 | E |
| | | | | Cot | 5 | STT-M-20 | E |
| 5 | NICU | NICU | GF | Infant incubator | 2 | STT-M-21 | B |
| | | | | Infant warmer | 2 | STT-M-22 | B |
| | | | | CPAP | 2 | STT-M-23 | B |
| | | | | Ventilator, infant | 2 | STT-M-24 | B |
| 6 | Operating Room | Operating Room | GF | Operating table | 2 | STT-M-25 | C |
| | | | | Opetating light | 2 | STT-M-26 | C |
| | | | | Vital sign monitor | 2 | STT-M-27 | B |
| | | | | Suction machine | 2 | STT-M-28 | C |
| | | | | Electrosurgical unit | 2 | STT-M-29 | C |
| | | | | Anesthesia machine | 2 | STT-M-30 | C |
| | | | | Autoclave | 2 | STT-M-31 | C |
| 7 | Wards | 1 Bed Room (8 Rooms) = 8 Beds<br>6 Bed Room (14 Rooms) = 84 Beds | 1-2F | Bed | 92 | STT-M-32 | E |
| | | | | Bedside cabinet | 92 | STT-M-33 | E |
| | | | | Overbed table | 92 | STT-M-34 | E |
| | | | | Blood pressure meter | 4 | STT-M-35 | F |
| | | | | Suction machine | 4 | STT-M-36 | C |
| | | | | ECG | 2 | STT-M-37 | B |
| | | | | Client PC (PACS) | 2 | STT-M-38 | A |

**Building for Eye Clinic**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatinet | Eye clinic | GF | Desk (Doctor) | 1 | STT-E-1 | G |
| | | | | Chair (Doctor) | 1 | STT-E-2 | G |
| | | | | Chair (Patient) | 1 | STT-E-3 | G |
| | | | | Client PC (PACS) | 1 | STT-E-4 | A |
| | | | | Ophthalmoscope | 3 | STT-E-5 | C |
| | | | | Slitlamp | 1 | STT-E-6 | C |
| | | | | Automatic visual field meter | 1 | STT-E-7 | C |
| | | | | Ultrasonography | 1 | STT-E-8 | C |
| | | | | Fundus camera | 1 | STT-E-9 | C |
| | | | | Laser | 1 | STT-E-10 | C |
| 2 | Eye Operating Room | Eye Opeating Room | GF | Operating table | 1 | STT-E-11 | C |
| | | | | Operating light | 1 | STT-E-12 | C |
| | | | | Operating microscope | 1 | STT-E-13 | B |
| 3 | Eye Wards | Eye Wards<br>6 Bed Room (4 Rooms) = 24 Beds | G-1F | Bed | 24 | STT-E-14 | E |
| | | | | Bedside cabinet | 24 | STT-E-15 | E |
| | | | | Overbed table | 24 | STT-E-16 | E |
| | | | | Blood pressure monitor | 3 | STT-E-17 | F |
| | | | | Suction machine (mobile) | 2 | STT-E-18 | C |
| | | | | ECG | 1 | STT-E-19 | B |
| | | | | Client PC (PACS) | 2 | STT-E-20 | A |

**Building for Infectious Diseases Clinic**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | TB Clinic | GF | Diagnostic set | 2 | STT-I-1 | F |
| | | | | Examination couch | 2 | STT-I-2 | F |
| | | | | Instrument cabinet | 2 | STT-I-3 | F |
| | | | | Client PC (PACS) | 2 | STT-I-4 | A |
| | | | | Weighing scale | 2 | STT-I-5 | F |
| | | | | Blood pressure meter | 2 | STT-I-6 | F |
| | | | | Basket | 2 | STT-I-7 | F |
| | | | | Desk (Doctor) | 2 | STT-I-8 | G |
| | | | | Chair (Doctor) | 2 | STT-I-9 | G |
| | | | | Chair (Patient) | 2 | STT-I-10 | G |
| 2 | Wards | TB Wards<br>6床室（6室）= 36 beds | GF | Bed | 24 | STT-I-11 | E |
| | | | | Bedside cabinet | 24 | STT-I-12 | E |
| | | | | Overbed table | 24 | STT-I-13 | E |
| | | | | Blood pressure meter | 3 | STT-I-14 | F |
| | | | | Suction machine (mobile) | 2 | STT-I-15 | C |
| | | | | ECG | 1 | STT-I-16 | B |
| | | | | Client PC (PACS) | 2 | STT-I-17 | A |
| 3 | Outpatient | Infectious Diseases clinic | | Diagnostic set | 2 | STT-I-18 | F |
| | | | | Examination couch | 2 | STT-I-19 | F |
| | | | | Instrument cabinet | 2 | STT-I-20 | F |
| | | | | Client PC (PACS) | 2 | STT-I-21 | A |
| | | | | Weighing scale | 2 | STT-I-22 | F |
| | | | | Blood pressure meter | 2 | STT-I-23 | F |
| | | | | Basket | 2 | STT-I-24 | F |
| | | | | Desk (Doctor) | 2 | STT-I-25 | G |
| | | | | Chair (Doctor) | 2 | STT-I-26 | G |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Chair (Patient) | 2 | STT-I-27 | G |
| 4 | Wards | Infectious Diseases Wards<br>6 Bed Room (7 Rooms) = 42 Beds | GF | Bed | 42 | STT-I-28 | E |
| | | | | Bedside cabinet | 42 | STT-I-29 | E |
| | | | | Overbed table | 42 | STT-I-30 | E |
| | | | | Blood pressure meter | 4 | STT-I-31 | F |
| | | | | Suction machine (mobile) | 2 | STT-I-32 | C |
| | | | | ECG | 1 | STT-I-33 | B |
| | | | | Client PC (PACS) | 2 | STT-I-34 | A |

**Building for Blood Bank**

| No | Service Departments | | FP | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | | Blood Collection | GF | Donor bed | 3 | KPT-M-9 | G |
| | | | | Simple blood analyzer | 1 | KPT-M-10 | G |
| | | | | Component blood collection device | 1 | KPT-M-11 | G |
| 2 | | Blood Examination | GF | Blood Type Analyzers | 1 | KPT-M-4 | A |
| | | | | Centrifuges | 2 | KMC-G-40 | C |
| | | | | Refrigerated centrifuges | 2 | KMC-G-41 | C |
| | | | | Blood storage refrigerators | 2 | KMC-G-42 | C |
| | | | | Blood storage freezers | 2 | KMC-G-43 | C |

# Appendix C

## Appendix C: Environmental Social Consideration

### C-1 Roles of Infection Prevention Control (IPC) Team

(Example from Kampot provincial referral hospital)

1. Focal person for the IPC control
2. Ensure appropriate implementation of the guideline of IPC
3. Receiving new information on IPC from the province (Provincial health department) and Central government (Ministry of Health)
4. Prepare annual IPC plan with the budget request to PHD in annual operation plan (AOP) including improvement of infrastructure, equipment, and training to personnel.
5. Evaluate the implementation of work and status of IPC in the hospital including quarterly report and submit it to the director of the hospital.
6. Supervise and monitor the implantation of daily care (nursing) for the IPC.
7. Identify issues in the implementation of IPC needed to address and report to the IPC committee of the hospital.
8. Routinely observe any inappropriate IPC practice in the hospital and report to IPC committee in PHD to request support if needed.
9. Provide echo training to health care staff of IPC at least once a year.
10. Ensure the supply of material and equipment with the appropriate amount for ICP including syringe needle safety boxes, sample cleaning material, plastic bag containers, running tap water, electricity etc.
11. Ensure availability of needed infrastructure for effective IPC in the hospital including tap water and appropriate toilet. Appropriate drainage and electricity.
12. Provide technical support in purchasing and monitoring of materials and equipment and monitor the effectiveness of sterilization.
13. Ensure availability of appropriate operation and process of handwashing place with soap in each room.
14. Ensure the surrounding environment and surface have been cleaned and washed appropriately.
15. Ensure that staff who are newly recruited have been informed on IPC before start working in any ward.
16. Ensure that the waste has been separated based on Prakas (ministerial order) on health care waste management
17. Ensure that guideline on safe injection and treatment after exposure to the source of infection has been implemented

## C-2 Screening Format (DRAFT)

Name of Proposed Project: TBC

Project Executing Organization, Project Proponent or Investment Company: TBC

Name, Address, Organization, and Contact Point of a Responsible Officer: TBC

**Check Items**

Please write “to be advised (TBA)” when the details of a project are yet to be determined.

Question 1: Address of project site

Municipal Hospitals: Phnom Penh

Provincial Hospitals: Battambang, Siem Reap, Stung Treng, Kompong Cham, Kampot, Svay Rieng

Question 2: Scale and contents of the project (approximate area, facilities area, production, electricity generated, etc.)

2-1. Project profile (scale and contents)

2-2. How was the necessity of the project confirmed?

Is the project consistent with the higher program/policy?

■YES: Please describe the higher program/policy.

(The Ministry of Health of Cambodia has formulated the Health Strategic Plan, and the fourth revision is currently being formulated. (As of April 2022) The reduction of regional disparities compared to Phnom Penh, the strengthening of responses to lifestyle-related diseases that have been increasing in recent years, and the development of facilities for that purpose are in line with the higher-level plans. )

☐NO

2-3. Did the proponent consider alternatives before this request? N/A

☐YES: Please describe outline of the alternatives

( )

☐NO

2-4. Did the proponent implement meetings with the related stakeholders before this request? Not yet organized.

☐Implemented ■Not implemented

If implemented, please mark the following stakeholders.

☐Administrative body

☐Local residents

☐NGO

☐Others

(1) ☐ The local residents above include socially vulnerable individuals/groups

(Please specify: )

(2) ☐ The proponent gave appropriate consideration to ensure participation of the socially vulnerable individuals/groups

2-5 Does the project include any of the following items?

☐Yes ■No

If yes, please mark the items included in the project.

☐Involuntary resettlement (scale: households, persons)

☐Groundwater pumping (scale: m3/year)

☐Land reclamation, land development, and/or land-clearing (scale: hectors)

☐Logging (scale: hectors)

Question 3:

Is the project a new one or an ongoing one? In the case of an ongoing project, have you received strong complaints or other comments from local residents?

■New ☐Ongoing (with complaints) ☐Ongoing (without complaints)

☐Other ( )

Question 4:

Is an Environmental Impact Assessment (EIA), including an Initial Environmental Examination (IEE) required for the project according to a law or guidelines of a host country? If yes, is an EIA implemented or planned? If necessary, please fill in the reason why an EIA is required.

■Necessary (☐Implemented ☐Ongoing/planning) To be implemented during detailed planning survey.

(Reason why EIA is required: All projects are subject to EIA. )

☐Not necessary

☐Other (please explain: )

Question 5:

In the case that steps were taken for an EIA, was the EIA approved by the relevant laws of the host country? If yes, please note the date of approval and the competent authority.

☐Approved without a supplementary condition (Date of approval: Competent authority: )

☐Approved with a supplementary condition (Date of approval: Competent authority: )

☐Under appraisal

☐Under implementation

☐Appraisal process not yet started

☐Other ( )

Question 6:

If the project requires a certificate regarding the environment and society other than an EIA, please indicate the title of said certificate. Was it approved?

☐Already certified

Title of the certificate: ( “obtaining prior permission from the competent authorities”)

☐Requires a certificate but not yet approved

☐Not required

■Others ( )

Question 7:

Are any of the following areas present either inside or surrounding the project site?

☐Yes ■No

If yes, please mark the corresponding items.

☐National parks, nationally-designated protected areas (coastal areas, wetlands, areas for ethnic minorities or indigenous peoples and cultural heritage, etc. designated by national governments)

☐Primary forests, natural forests in tropical areas

☐Habitats with important ecological value (coral reefs, mangrove wetlands, tidal flats, etc.)

☐Habitats of rare species that require protection under domestic legislation, international treaties, etc. Areas in danger of large-scale salt accumulation or soil erosion

☐Areas with a remarkable tendency of desertification

☐Areas with unique archeological, historical, or cultural values

☐Areas inhabited by ethnic minorities, indigenous peoples, or nomadic peoples with traditional ways of life, and other areas with special social values

Question 8:

Does the project include any of the following items?

☐Yes ■No

If yes, please mark the appropriate items.

☐Involuntary resettlement (scale: households, persons)
☐Groundwater pumping (scale: m3/year)
☐Land reclamation, land development, and/or land-clearing (scale: hectors)
☐Logging (scale: hectors)

Question 9:

Please mark related environmental and social impacts, and describe their outlines.

Possible impacts during the construction of facilities.

| | |
|---|---|
| ☐Air pollution | ☐Involuntary resettlement |
| ☐Water pollution<br>☐Soil pollution | ☐Local economies, such as employment, livelihood, etc. |
| ■Waste<br>■Noise and vibration | ☐Land use and utilization of local resources |
| ☐Ground subsidence<br>☐Offensive odor<br>☐Geographical features | ☐Social institutions such as social infrastructure and local decision-making institutions |
| ☐Bottom sediment<br>☐Biodiversity and ecosystems | ☐Existing social infrastructures and services |
| ☐Water usage<br>☐Accidents<br>☐Climate change<br>☐Limitation of accessibility to information, meetings, etc. on a specific person or group | ☐Socially vulnerable people (Indigenous people, ethnic minorities)<br>☐Socially vulnerable people (People in poverty, persons with disabilities, refugees, internally displaced persons, and minorities) |
| ☐Gender | ☐Misdistribution of benefits and damages |
| ☐Children's rights | ☐Local conflicts of interest |
| ☐Cultural heritage | ☐Others ( ) |
| ☐Infectious diseases such as HIV/AIDS | Outline of related impact: |

Question 10:

In the case of a project such as a two-step loan or a sector loan, can sub-projects be specified at the present time? TBC

☐Yes ☐No

Question 11:

Regarding information disclosure and meetings with stakeholders, if JICA's environmental and social considerations are required, does the proponent agree to information disclosure and meetings with stakeholders through these guidelines? N/A

☐Yes ☐No

END of FORM

# Appendix D

## Attachments under Appendix D

D-1: Review of Facility Plan

D-2: Project Cost

D-3 List of Equipment

D-4: Major Technical Specifications of the Advanced Medical Equipment

D-5: Economic and Financial Analysis

D-6: Additional Survey Conducted on Environmental and Social Considerations

D-7: Operation and Effect Indicators

## Review of Facility Plan

## 1. Existing Facilities and Proposed Construction Site

### 1.1 Siem Reap Hospital

### a. Existing Facility Situation and Proposed Construction Site

The existing facilities that can be removed and areas that can be constructed for this Project are shown in the figure below.

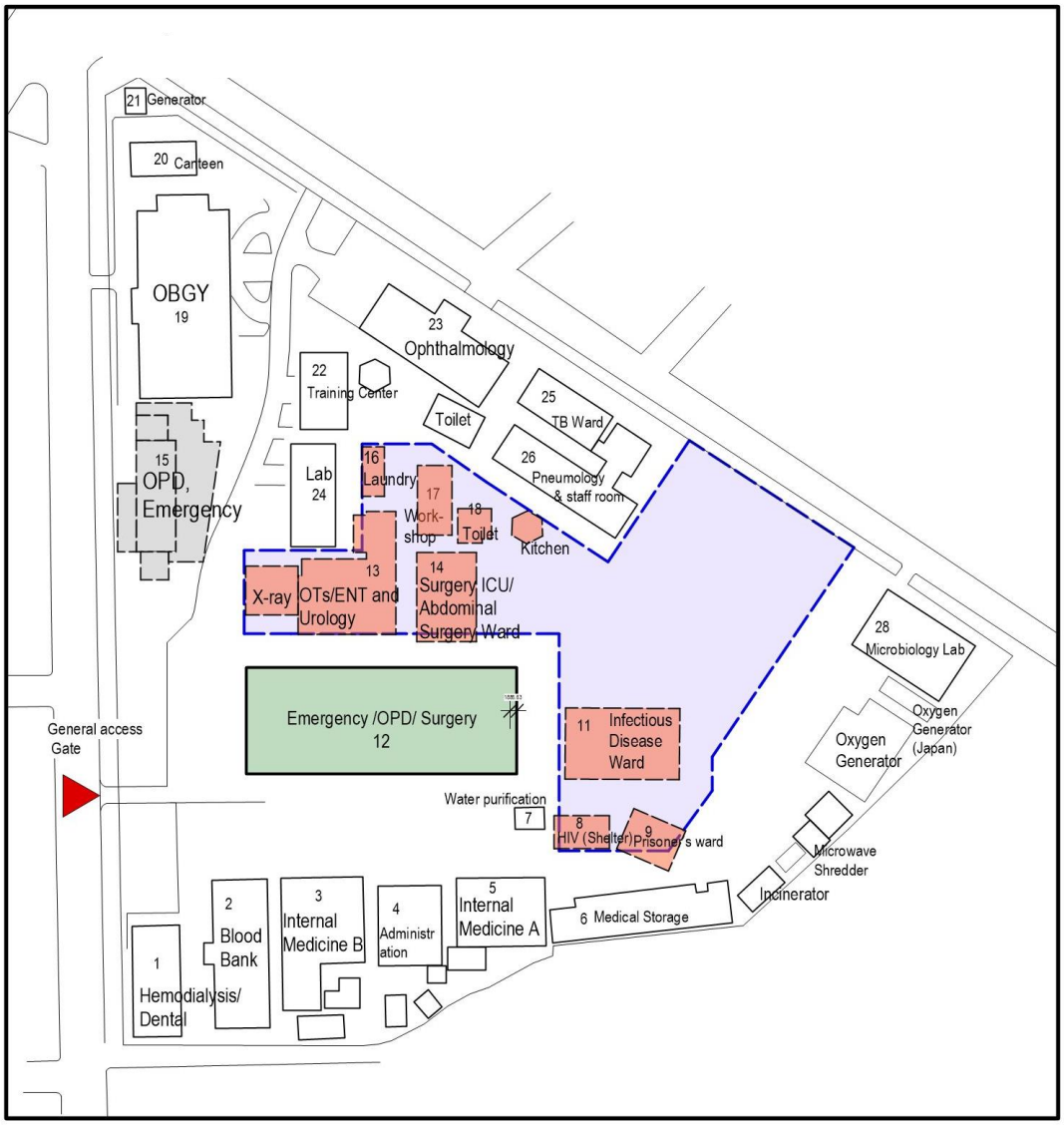



**Fig. 1.1 Layout Map of Siem Reap Hospital**

The surgical departments such as No.13 Surgical Operation Room/Urology & ENT Ward, No.14 Surgical ICU, and No.5 2nd Floor Trauma Unit in Figure 1.1 above will be relocated to No.12 New Surgery Building scheduled to be completed in October 2023 (by the Japanese grant project).

For medical services being provided at the existing facilities which need to be demolished, alternative locations for the continuity of service provision during the construction of the Project are planned as follows.

- No. 11 Infectious disease ward →1st floor of No.5 Internal Medicine A
- No. 8 HIV OPD →No.15 ER& OPD
- No. 16 Laundry → No.20 Canteen (out of use currently)
- No. 18 Toilet →Use other existing toilets
- No. 17 Workshop →To be decided on relocation place

## b. Current Status of Existing Facilities and Possibility of Continued Use

The following table shows the use of each existing facility at Siem Reap Hospital including the number of existing beds, the number of patients, the utilization policy (removal or continued use) when the Loan Project is implemented, the medical services to be transferred to the new Surgery Building, and the medical services currently provided (CPA3) that will be accommodated in the Loan Project facilities.

# Table 1.1 Existing Facility Use and Number of Beds at Siem Reap Hospital

| No. | Clinical department | No. of Inpatient 2022 (HIS) | No. of Beds (Official) | Bld.-No. (in Fig 1.1) | Existing Building Name | Stories | | **No. of beds (Actual)** | to be demolished | to be move to the New Surgery building | to be utilized continuously | to be accommodated into the Loan Buildings. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **No. of beds into the Loan Project** | | | | | | | | | | | | **153** |
| | **Total** | **24,455** | **370** | | | | | **432** | | | | | |
| 1 | **General Medicine** | 6,158 | 110 | 5 | Internal Medicine A | 2 | GF | 40 | | | ✓ | ✓ | 40 |
| | | | | 3 | Internal Medicine B | 2 | 1F | 45 | | | | ✓ | 45 |
| | | | | 11 | Infectious disease Ward | 1 | | 25 | ✓ | | | ✓ | 25 |
| | | | | 26 | Pneumology & Staff room | 1 | | 11 | | | ✓ | ✓ | 11 |
| 2 | **Surgery** | 5,110 | 115 | 13 | Operation Theater/ ENT and Urology | 2 | GF | 0 | ✓ | ✓ | | | |
| | | | | | | | 1F | 42 | ✓ | ✓ | | | |
| | | | | 13b | X-ray | 1 | | | ✓ | ✓ | | | |
| | | | | 14a | Surgery Ward | 2 | 1F | 36 | ✓ | ✓ | | | |
| | | | | 5 | Internal Medicine A | 2 | 1F | 50 | | ✓ | | | |
| 3 | **Pediatric** | 305 | 10 | 19 | OBGY | 3 | GF | 0 | | | ✓ | | |
| 4 | **Obstetric** | 2,360 | 25 | | | | 1F | 20 | | | ✓ | | |
| 5 | **Gynecology** | 1,533 | 25 | | | | 1F | 50 | | | ✓ | | |
| 6 | **Ophthalmology** | 967 | 10 | 23 | Ophthalmology | 3 | GF | 0 | | | ✓ | | |
| | | | | | | | 1F | 15 | | | ✓ | | |
| | | | | | | | 2F | 0 | | | ✓ | | |
| 7 | **ENT** | 149 | 5 | 13 | 1F of No.13 | | | | ✓ | ✓ | | | |
| 8 | **Emergency and General OPD** | 815 | 10 | 15 | OPD, Emergency, Triage | 1 | | 15 | | ✓ | | | |
| 9 | **Medical ICU** | 1,617 | 20 | 3 | Internal Medicine B | 2 | GF | 25 | | | ✓ | ✓ | 25 |
| | | | | 14b | Pneumology ICU | | GF | 7 | ✓ | | | ✓ | 7 |
| 10 | **Surgical ICU** | 847 | 20 | 14a | Abdominal Surgery ICU | 2 | GF | 14 | ✓ | ✓ | | | |
| 11 | **Tuberculosis** | 371 | 10 | 25 | TB Ward | 1 | | 24 | | | ✓ | | |
| 12 | **Hemodialysis** | 4,223 | 10 | 1 | Hemodialysis + Dental | 1 | | 11 | | | ✓ | | |
| 13 | **Dental Clinic** | OPD only | OPD only | 1 | Hemodialysis + Dental | | | | | | ✓ | | |
| 14 | **Mental Health** | | | 19 | GF of No. 19 OBGY | | | | | | | ✓ | |
| 15 | **Diabetes** | | | 19 | GF of No. 19 OBGY | | | | | | | ✓ | |
| 16 | **Infectious Disease** | | | 8 | HIV shelter | 1 | | 0 | ✓ | | | ✓ | |
| 17 | **Physiotherapy** | | | 19 | GF of No. 19 OBGY | | | | | | | ✓ | |
| | | | | 2 | Blood Bank | | | | | | | | |
| | | | | 4 | Administration | 1 | | 0 | | | ✓ | ✓ | |
| | | | | 6 | Pharmacy (Medical Store) | 1 | | | | | ✓ | ✓ | |
| | | | | 7 | Water purification | | | | | | ✓ | | |
| | | | | 9 | Prisoner's ward | 1 | | 2 | ✓ | | | | |
| | | | | 10 | Equipment Storage | | | | | | | ✓ | |
| | | | | 16 | Laboratory | 1 | | | | | ✓ | | |
| | | | | 17 | Workshop | 1 | | | ✓ | | | ✓ | |
| | | | | 18 | Toilet | 1 | | | ✓ | | | ✓ | |
| | | | | 20 | Canteen | 1 | | | | | ✓ | ✓ | |
| | | | | 21 | Generator house | 1 | | | | | ✓ | ✓ | |
| | | | | 22 | Training Centre | 2 | | | | | ✓ | ✓ | |
| | | | | 28 | Microbiology Laboratory | 1 | | | | | ✓ | | |
| | | | | 29 | Incinerator | 1 | | | | | ✓ | | |
| | | | | 30 | Crusher | 1 | | | | | ✓ | | |
| | | | | 31 | Oxygen generator | 1 | | | | | ✓ | | |

## 1.2 Kampong Cham Hospital

### a. Existing Facility Situation and Proposed Construction Site

The existing facilities that can be removed and areas that can be constructed for this Project are shown in the figure below.

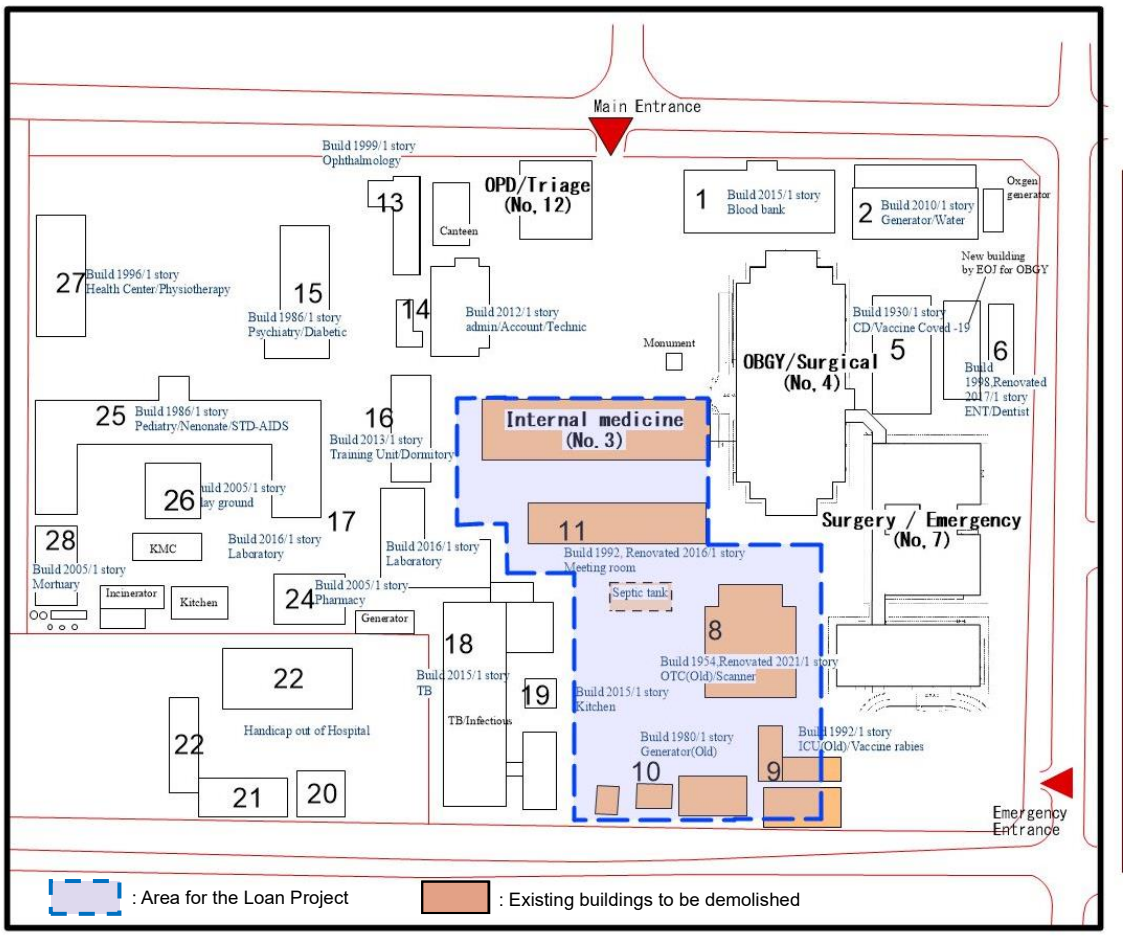



**Fig. 1.2 Layout Map of Kampong Cham Hospital**

For medical services being provided at the existing facilities which need to be demolished, alternative locations for the continuity of service provision during the construction of the Project are planned as follows.

- No.3 Internal Medicine →No.18 TB/Infectious disease department building
- No.8 OT (old)/Scanner →No.7 Surgery/Emergency
- No. 9 ICU (old)/Vaccine rabies (currently Hemodialysis)
  →Hemodialysis machines will be moved to other building.
- No.10 Generator (old) →Disposal (no continued use)
- No.11 Meeting room →No.14 Administration/Account/Technic building
- Septic Tank for No.4 & No.7 (Japanese grant building)
  →Replaced at the south part of the hospital premises.

- No. 4 OBGY is short of beds and compensated by placing temporary beds in the corridor. Even so, OBGY is at full capacity. To accommodate this high need, the entire Surgery Department on the second floor will be housed in the planned facility, and the vacant area will be reused as a ward for OBGY. No. 7 Surgery OT will also be used as a dedicated operation room and recovery room for OBGY.
- The No. 4 OBGY wing and No. 25 Pediatric Ward (including NICU) are located far apart, making travel distance for neonates a serious problem. To solve this problem, the NICU will be located as close as possible to the delivery rooms in the OBGY department to secure easy access.
- The Buddha statue in front of the No. 3 Internal Medicine building cannot be moved and demolished. The No.3 building is facing the main entrance of the OBGY building, so the proposed facility needs to be set back at least 3m from the facade of the current No.3 facility as its most frontal plane.

### b. Current Status of Existing Facilities and Possibility of Continued Use

The following table shows the use of each existing facilities at Kampong Cham Hospital including the number of existing beds, the number of patients, the utilization policy (removal or continued use) when the Loan Project is implemented, and the medical services currently provided (CPA3) that will be accommodated in the Loan Project facilities.

## Table 1.2 Existing Facility Use and Number of Beds at Kampong Cham Hospital

| No. | Clinical department | No. of Inpatient 2022 (HIS) | No. of beds (Official) | Bld.-No. (in Fig. 1.2) | Existing Building Name | Stories | | **No. of beds (Actual)** | to be demolished | to be utilized continuously | to be accommodated into the New loan Buildings. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **No. of beds into the Loan Project** | | | | | | | | | | | | **211** |
| | Total | **19,498** | **280** | | | | | **369** | | | | |
| 1 | **General Emergency** | 2,831 | 20 | 3 | Internal medicine-**ICU**(+Emergency) | 2 | GF | 28 | ✓ | | ✓ | 28 |
| 2 | **General Medicine** | 2,475 | 42 | | Internal medicine-General ward | | 1F | 53 | ✓ | | ✓ | 53 |
| 3 | **ICU (=included in General Emergency)** | | | | | | | | | | | |
| 4 | **Surgery** | 4,196 | | 4 | | | | | | | | |
| | **Surgery -1** | 1,031 | 25 | | OBGY/Surgery -**Surgery 1(JICA)** | 2 | 1F | 29 | | | ✓ | 29 |
| | **Surgery -2** | 2,015 | 58 | | OBGY/Surgery -**Surgery 2** | | 1F | 63 | | | ✓ | 63 |
| | **ICU (Emergency Surgery)** | 1,150 | 12 | 7 | Surgery OT / Emergency, **ICU** (JICA) | 1 | | 12 | | | ✓ | 12 |
| 5 | **Pediatric** | 3,530 | 30 | 25 | Pediatric/Neonatal/STD-AIDS | 2 | G-1 | 60 | | ✓ | | |
| | | | | | Pediatric - **NICU** | | GF | 6 | | | ✓ | 6 |
| | | | | | Pediatric - **KMC** | | | 5 | | | ✓ | 5 |
| 6 | **OBGY** | 5,873 | 66 | 4 | OBGY/Surgery -**OBGY** | | GF | 89 | | ✓ | | |
| 7 | **ENT** | 0 | 0 | 6 | **ENT**/Dental | 1 | | 1 | | | ✓ | 0 |
| 8 | **Dental** | 52 | 2 | | ENT/**Dental** | | | | | | ✓ | 2 |
| 9 | **OPH** | 154 | 4 | 13 | Ophthalmology | 1 | | 9 | | | ✓ | 9 |
| 10 | **Infectious Disease** | 81 | 8 | | | | | 4 | | | ✓ | 4 |
| 11 | **Leprosy** | | 3 | | Leprosy | | | 0 | | ✓ | | |
| 12 | **TB** | 306 | 10 | | TB | 1 | | 10 | | ✓ | | |
| 13 | | | | 1 | Blood bank | 1 | | | | ✓ | | |
| 14 | | | | 2 | Generator/Water(JICA) | 1 | | | | ✓ | | |
| 15 | | | | 5 | Infectious disease ward | 1 | | | | ✓ | | |
| 16 | | | | 8 | OT(old)/Scanner | 1 | | | ✓ | | | |
| 17 | | | | 9 | Shockwave/Hemodialysis | 1 | | | | ✓ | | |
| 18 | | | | 10 | Generator(old) | 1 | | | ✓ | | | |
| 19 | | | | 11 | Meeting room | 1 | | | ✓ | | | |
| 20 | | | | 12 | OPD/ Triage/ Registration | 1 | | | | ✓ | | |
| 21 | | | | 14 | Administration/Account/Technic | 1 | | | | ✓ | ✓ | |
| 22 | Psychiatry | | | 15 | Psychiatry/ Diabetic | 1 | | | | ✓ | ✓ | |
| 23 | Diabetes | | | | | | | | | | | |
| 24 | | | | 16 | Training Unit / Dormitory | 1 | | | | ✓ | | |
| 25 | | | | 17 | Laboratory | 1 | | | | ✓ | ✓ | |
| 26 | | | | 19 | Kitchen | 1 | | | | | | |
| 27 | | | | 24 | Pharmacy | 1 | | | | ✓ | | |
| 28 | | | | 26 | Play ground | 1 | | | | ✓ | | |
| 29 | | | | 27 | Health Centre | 1 | | | | ✓ | | |
| 30 | Physiotherapy | | | | / Physiotherapy | | | | | | ✓ | |
| 31 | | | | 28 | Mortuary | 1 | | | | ✓ | ✓ | |
| 32 | | | | 29 | Incinerator | | | | | ✓ | | |
| 33 | | | | 30 | Microwave | | | | | ✓ | | |
| 34 | | | | 31 | Kitchen for patient's family | | | | | ✓ | | |
| 35 | | | | 32 | Generator shed | | | | | ✓ | | |

## 2. Planned Number of Beds

The planned numbers of beds for both targeted hospitals are shown below.

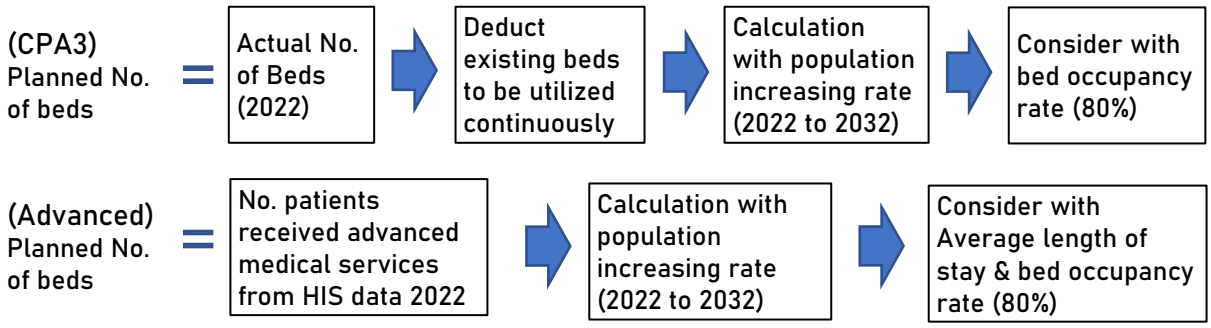
**Table 2.1 Planned Numbers of Beds for Siem Reap Hospital**

| Number of Beds | Total (CPA + Advanced) | CPA3 | | | Advanced Medical Service | | |
|---|---|---|---|---|---|---|---|
| | | Total | ICU | General | Total | ICU | General |
| Total Number of beds (2032) | 698 | 573 | 72 | 501 | 125 | 22 | 103 |
| Number of existing beds to be used continuously | 135 | 135 | 0 | 135 | | | |
| Number of beds in the Japnese grant aid project building | 212 | 212 | 23 | 189 | | | |
| **Number of planned beds in the loan project** | **351** | **226** | **49** | **177** | **125** | **22** | **103** |

**Table 2.2 Planned Numbers of Beds for Kampong Cham Hospital**

| Number of Beds | Total (CPA + Advanced) | CPA3 | | | Advanced Medical Service | | |
|---|---|---|---|---|---|---|---|
| | | Total | ICU | General | Total | ICU | General |
| Total Number of beds (2032) | 612 | 500 | 58 | 442 | 112 | 19 | 93 |
| Number of existing beds to be used continuously | 75 | 75 | 0 | 75 | | | |
| Number of beds in the Japnese grant aid project buildings (to be used for OBGY) | 161 | 161 | 0 | 161 | | | |
| **Number of planned beds in the loan project** | **376** | **264** | **58** | **206** | **112** | **19** | **93** |

The numbers of planned beds above were obtained according to the calculation flow shown below.




## 3. Contents of Proposed Facilities

The Project will cover the targeted areas below in the hospital's functional blocks.

I. Medical Treatment (for CPA3 & Advanced)
II. Examination/ Diagnosis
III. Education/Training
IV. Medical Support/Supply
V. Administration

## 3.1 Targeted Areas in Hospital Functional Blocks for Siem Reap Hospital

### I. Medical Treatment (for CPA3 & Advanced)

| | |
|---|---|
| **I-1. General Medical Service (CPA3)** | |
| Clinical department | |
| Triage | |
| Internal Medicine | |
| Mental Health | |
| Diabetes | |
| Infectious Disease | |
| Physiotherapy | |
| *ER* | *To be allocated in the new Surgery Building by Japanese grant aid.* |
| *Surgery* | |
| *Pediatric* | *Existing buildings will be used continuously.* |
| *Obstetric* | |
| *Gynecology* | |
| *Ophthalmology* | |
| *ENT* | |
| *Tuberculosis* | |
| *Hemodialysis* | |
| *Dental Clinic* | |
| *Prisoner's ward* | *Alternative facilities will be maintained by the hospital.* |
| *Surgery OTs* | *To be allocated in the new Surgery Building.* |
| **I-2. Advanced Medical Service** | |
| Cardiology intervention | |
| Cardiovascular surgery | |
| Respiratory medicine | |
| Thoracic surgery（Cancer） | |
| Neurology (critical illness) | |
| Neurosurgery（Cancer） | |
| Gastroenterological surgery (critical illness) | |
| Gastrointestinal surgery（Cancer） | |
| Orthopedic surgery (critical illness) | |
| Urology（Advanced） | |
| Urology（Cancer） | |
| Gynecology（Cancer） | |
| Cervical and oral surgery（Cancer） | |
| Hematology | |
| | |
| Operation Theater | a Hybrid OT and 2 Ots |
| Catheter Lab | 2 x Catheter Lab. |

*Gray colored cells mean out of the target on the Loan Project.

### II. Examination/ Diagnosis

| | |
|---|---|
| **II-1. Imaging Diagnosis** | |
| X-ray(General/Fluoroscopy/Mobile) | |
| CT | |
| MRI | |
| Mammography | |
| Endoscopy | |
| Bronchoscopy | |
| **II-2. Physiological Examination** | |
| Ultra Sound | |
| ECG | |
| EEG | |
| EMG | |
| **II-3. Laboratory** | Existing buildings will be used continuously. |
| Pathology Lab. | |

### III. Education/Training

| | |
|---|---|
| Seminar/Practice Room | |
| Conference room | |
| Conference Hall | To be emergency ward in case of pandemic. |
| Library | |

### IV. Medical Support/ Supply

| | |
|---|---|
| Pharmacy/Medicine Store | |
| *Blood bank* | *Existing buildings will be used continuously.* |
| *Food Service* | *Hospital will care in the future.* |
| Procurement | Storages |
| Medical Gas | Piping from existing Oxygen generators |
| Sterile supply | Washing/sterilization/stock |
| Waste/garbage management | Garbage stock |
| Mortuary | |
| Laundry | |
| Workshop | Equipment/ utility maintenance |
| Generator house | |

*Gray colored cells mean out of the target on the Loan Project.

### V. Administration

| | |
|---|---|
| Office | management, medical affairs |
| Security | |
| Canteen/Cafeteria | for staffs |
| Storage | |
| Public Toilet | |

## 3.2 Targeted Areas in Hospital Functional Blocks for Kampong Cham Hospital

### I. Medical Treatment (for CPA3 & Advanced)

| | |
|---|---|
| **I-1. General Medical Service (CPA3)** | |
| *Triage* | *Existing building will be used continuously.* |
| ER | |
| Internal Medicine | |
| Surgery | To be moved into the new Loan Building from Japanese grant aid building. |
| *Pediatric* | *Existing buildings will be used continuously.* |
| NICU | To be moved into Japan grant aid building. |
| KMC | |
| *Obstetric* | *To be expanded in Japan grant aid building (former Surgery department).* |
| *Gynecology* | |
| Ophthalmology | |
| ENT | |
| *Tuberculosis* | *Existing buildings will be used continuously.* |
| *Hemodialysis* | |
| Dental | |
| Mental Health | Only OPD |
| Diabetes | Only OPD |
| Infectious Disease | |
| Physiotherapy | |
| | |
| Surgery OTs | |
| | |
| **I-2. Advanced Medical Service** | |
| Cardiology intervention | |
| Cardiovascular surgery | |
| Respiratory medicine | |
| Thoracic surgery（Cancer） | |

| | |
|---|---|
| Neurology (critical illness) | |
| Neurosurgery（Cancer） | |
| Gastroenterological surgery (critical illness) | |
| Gastrointestinal surgery（Cancer） | |
| Orthopedic surgery (critical illness) | |
| Urology （Advanced） | |
| Urology （Cancer） | |
| Gynecology（Cancer） | |
| Cervical and oral surgery（Cancer） | |
| Hematology | |
| | |
| Operation Theater | (1 Hybrid OT and 4 OTs) |
| Catheter Lab | (2 x Catheter Lab.) |

*Gray colored cells mean out of the target on the Loan Project.

## II. Examination/ Diagnosis

| | |
|---|---|
| **II-1. Image Diagnosis** | |
| X-ray(General/Fluoroscopy/Mobile) | |
| CT | |
| MRI | |
| Mammography | |
| Endoscopy | |
| Bronchoscopy | |
| **II-2. Physiological Examination** | |
| Ultra Sound | |
| ECG | |
| EEG | |
| EMG | |
| **II-3. Laboratory** | |
| Laboratory | Including Pathology Lab. |

## III. Education/Training

| | |
|---|---|
| Seminar/Practice Room | |
| Conference room | |
| Conference Hall | To be emergency ward in case of pandemic. |
| Library | |

## IV. Medical Support/ Supply

| | |
|---|---|
| Pharmacy/Medicine Store | Dispensary only. Existing will be used continuously. |
| *Blood bank* | *Existing buildings will be used continuously.* |
| *Food Service* | *Hospital will care in the future.* |
| Procurement | Storages |
| Medical Gas | Piping from existing Oxygen generators |
| Sterile supply | Washing/sterilization/stock |
| Waste/garbage management | Garbage stock |
| Mortuary | |
| Laundry | |
| Workshop | Equipment/ utility maintenance |
| Generator house | |

*Gray colored cells mean out of the target on the Loan Project.

## V. Administration

| | |
|---|---|
| Office | management, medical affairs |
| Security | |
| Canteen/Cafeteria | for staffs |
| Storage | |
| Public Toilet | |

## 3.3 Floor Areas of Planned Facilities

[Siem Reap Hospital]

**I. General Medical Service Building**

| | Floor | Floor Are (㎡) |
|---|---|---|
| 1 | GF | 2,352.0 |
| 2 | 1F | 1,969.1 |
| 3 | 2F | 1,969.1 |
| 4 | 3F | 1,969.1 |
| 5 | 4F | 1,969.1 |
| 6 | 5F | 1,963.7 |
| 7 | 6F | 1,963.7 |
| 8 | 7F | 1,298.2 |
| 9 | RF | 100.0 |
| | total | **15,554.1** |

**II. Advanced Medical Service Building**

| | Floor | Floor Are (㎡) |
|---|---|---|
| 1 | GF | 2,643.5 |
| 2 | 1F | 2,764.8 |
| 3 | 2F | 1,743.3 |
| 4 | 3F | 1,743.3 |
| 5 | 4F | 1,729.4 |
| 6 | RF | 100.0 |
| | total | **10,724.3** |

**Sub Total (I + II)** **26,278.4 M²**

| | | |
|---|---|---|
| **III.** | **Pharmacy** | 567.0 |
| **IV.** | **Laundry/Workshop/Toilet** | 246.0 |
| **V.** | **Mortuary** | 144.0 |
| **Ground Total (I + II + III + IV)** | | **27,235.4 M²** |

[Kampong Cham Hospital]

**I. General Medical Service Building**

| | Floor | Floor Are (㎡) |
|---|---|---|
| 1 | GF | 1,561.1 |
| 2 | 1F | 1,561.1 |
| 3 | 2F | 1,561.1 |
| 4 | 3F | 1,404.2 |
| 5 | 4F | 1,404.2 |
| 6 | 5F | 1,404.2 |
| 7 | 6F | 1,404.2 |
| 8 | 7F | 1,428.6 |
| 9 | RF | 100 |
| | total | **11,828.6** |

**II. Advanced Medical Service Building**

| | Floor | Floor Are (㎡) |
|---|---|---|
| 1 | GF | 2,750.2 |
| 2 | 1F | 2,674.4 |
| 3 | 2F | 2,674.4 |
| 4 | 3F | 1,802.6 |
| 5 | 4F | 1,802.6 |
| 6 | 5F | 1,802.6 |
| 7 | 6F | 1,802.6 |
| 8 | 7F | 1,238.9 |
| 9 | RF | 100.0 |
| | total | **16,648.1** |

**Sub Total (I + II)** **28,476.7 M²**

| | | |
|---|---|---|
| **III.** | **Mortua** | 111.7 |
| **IV.** | **Laundr** | 77.0 |
| **V.** | **NICU incld. Stepdown**(Renovation) | 245.0 |
| **Ground Total (I + II + III + IV+V)** | | **28,910.35 M²** |

## 4. Design Concept of Targeted Hospitals

The Project will plan new hospital facilities to upgrade two provincial hospitals, namely Siem Reap Hospital and Kampong Cham Hospital, to regional hospitals capable of providing advanced medical services. Each design proposal is positioned as a schematic proposal to study the size and budget of the facility to accommodate the medical service functions required for a regional hospital. In the detailed design stage, the schematic plans will be reviewed, and the detailed design will be implemented.

The planned facility is expected to be undertaken by a local construction company. The main structure will be reinforced concrete, and the foundation will be cast-in-place concrete piles.

### I. Siem Reap Hospital

#### ① Contents of the Proposed Hospital Facility

The new Project hospital consists of two main buildings, General and Advanced Medical Service Blocks, in addition to a pharmacy and workshop/laundry/public toilet. While the Mortuary is also included in the Project, it does not appear in the plan drawings because of no secure proper construction site on the hospital premises.

The following functions/departments will be accommodated in the main hospital buildings.

**[General Medical Service Building]**

Triage, General OPD (internal medicine), Special OPD (physiotherapy, psychiatry), Advanced OPD, ICU (CPA3), Ward, Administration, Cafeteria, Educational/Training Department, Conference Hall

**[Advanced Medical Service Building]**

Examination/Diagnosis (incl. MRI, CT, X-ray, Mammography), Chemotherapy, Operation Theater, Catheter Labo, ICU (Advanced), Ward (Advanced)

#### ② Layout Plan

The 39,596.5 $m^2$ hospital site is filled with numerous facilities, and the existing surgery wing, surgical wing, infectious disease ward, and HIV outpatient wing will need to be demolished to make space for the new facility. The new hospital facility will be divided into two main buildings: the General Medical Service Building will be located to the north of the new surgery building, which will be completed by the end of October 2023, and the Advanced Medical Service Building will be located to the north of the new surgery building. They are connected to each other by corridors.

The current main gate on the west side of the hospital site will be used for the entrance of ambulances. Ambulances will first approach the ER on the ground floor of the new surgery building, while emergency patients with cardiac problems will go straight through the gate to directly access the Advanced Medical Services Building with Catheter Labo. On the west side of the hospital site, there will be a new gate for walk-in patients, separate from the emergency gate, and they are expected to go straight to approach the

triage in the General Medical Service Building.

In case of a pandemic, infectious patients will enter the hospital site from Gate B1 on the north side and enter the facility through the entrance at the back of the General Medical Services Building to prevent the spread of infection within the hospital.

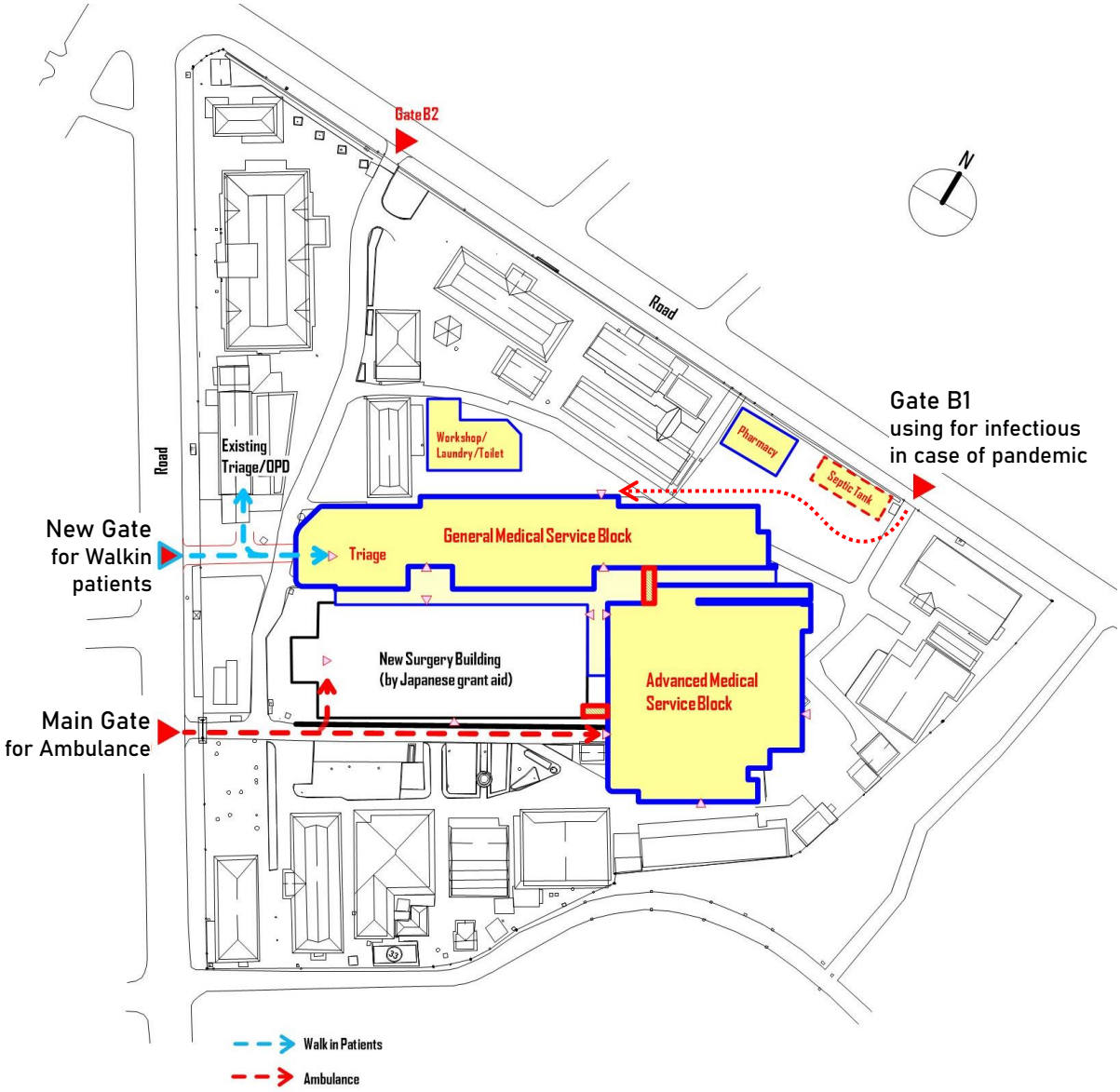



**Fig. 4.1 Proposed Building Layout of SRH**

### ③ Floor Plan

**[Ground Floor]**

The ground floor has the outpatient department that receives the most frequent patient traffic and is considered easy patient access.

The triage area where outpatients should first visit is located directly after the pedestrian gate. Patients with a fever should move to the existing OPD to be screened for infectious diseases. Patients without fever or other symptoms of infection are interviewed at the triage and then moved on to receive their

respective medical services. The internal medicine OPD is adjacent to the triage and is located on the ground floor of the General Medical Service Building. The waiting area, reception desk, insurance desk, accounting, and pharmacy are all located in this area to allow patients to efficiently go through the process from reception to consultation and payment. In addition, specialty clinics for Physiotherapy and Psychiatry are located on the ground floor. Patients receiving surgical consultations go to the surgical OPD through the door facing the triage of the new surgery building, which was constructed by the Japanese grant aid.

In case of a pandemic, infected patients will enter through the gate on the north side of the site and enter the General Medical Service Building through the entrance on the north side. The infectious patients can access the isolated area through the service elevator to separate them from clean users and their flow lines.

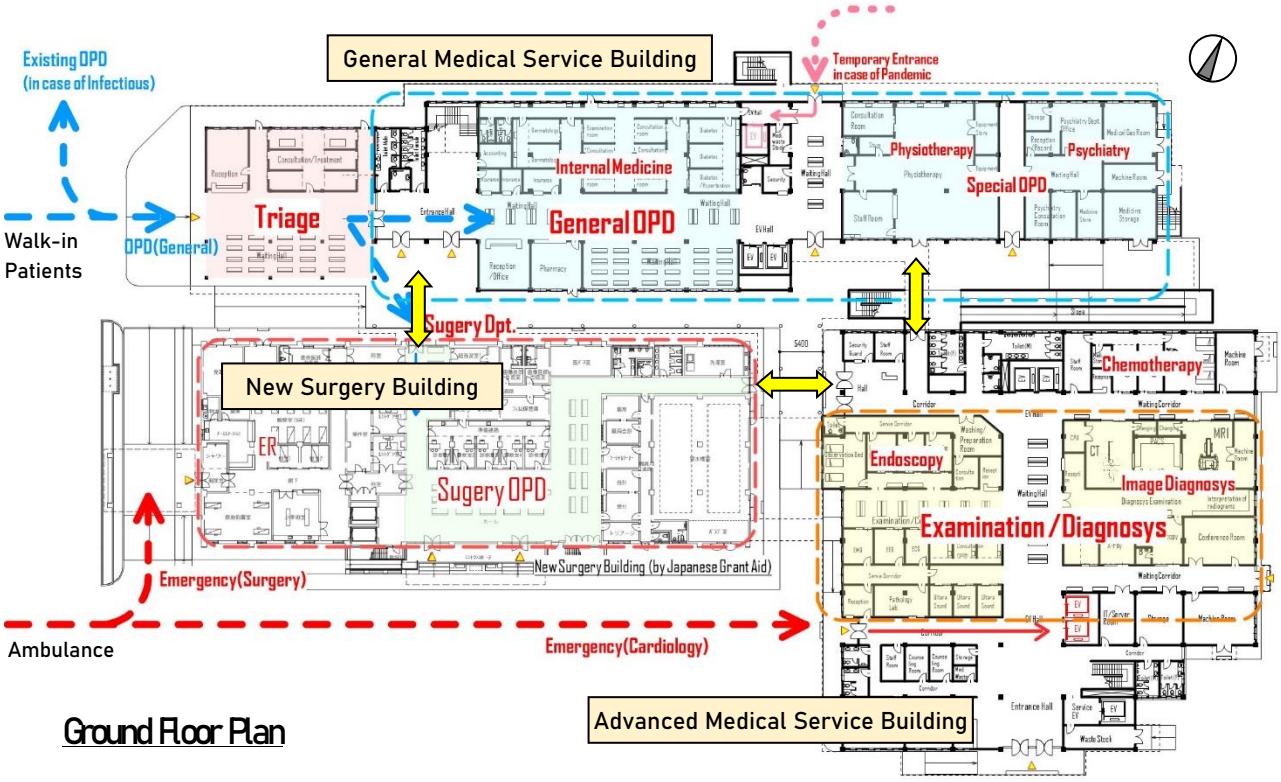



**Fig. 4.2 Ground Floor Plan of SRH**

The Advanced Building has the examination/diagnosis department, which is connected not only to the operation department on the above floor, but also to the new surgery building and the General Building via a cross corridor. Across the corridor, there is a block for physiological examination (Endoscopy, ECG, Ultrasound, etc.) on the west side and diagnostic imaging on the east side which has MRI, CT, X-ray and mammography with PACS system. The chemotherapy department is located in the northern part of the ground floor. Each of these departments has a reception desk and waiting area attached to it.

The Advanced Building has a direct entrance from the ambulance gate, which accesses an elevator that leads directly to the Catheter Lab on the first floor above.

Both General and Advanced Buildings have their own staff elevators, which are separate from the patient elevators.

**[First Floor]**

On the first floor of the General Medical Service Building, the Advanced OPD will be located on the west side of the elevator hall, connected to the ground floor by stairs and elevators, and the isolation ICU will be located on the east side. The isolation ICU will be capable of isolating entire blocks to accommodate patients with severe infectious diseases in case of a pandemic.

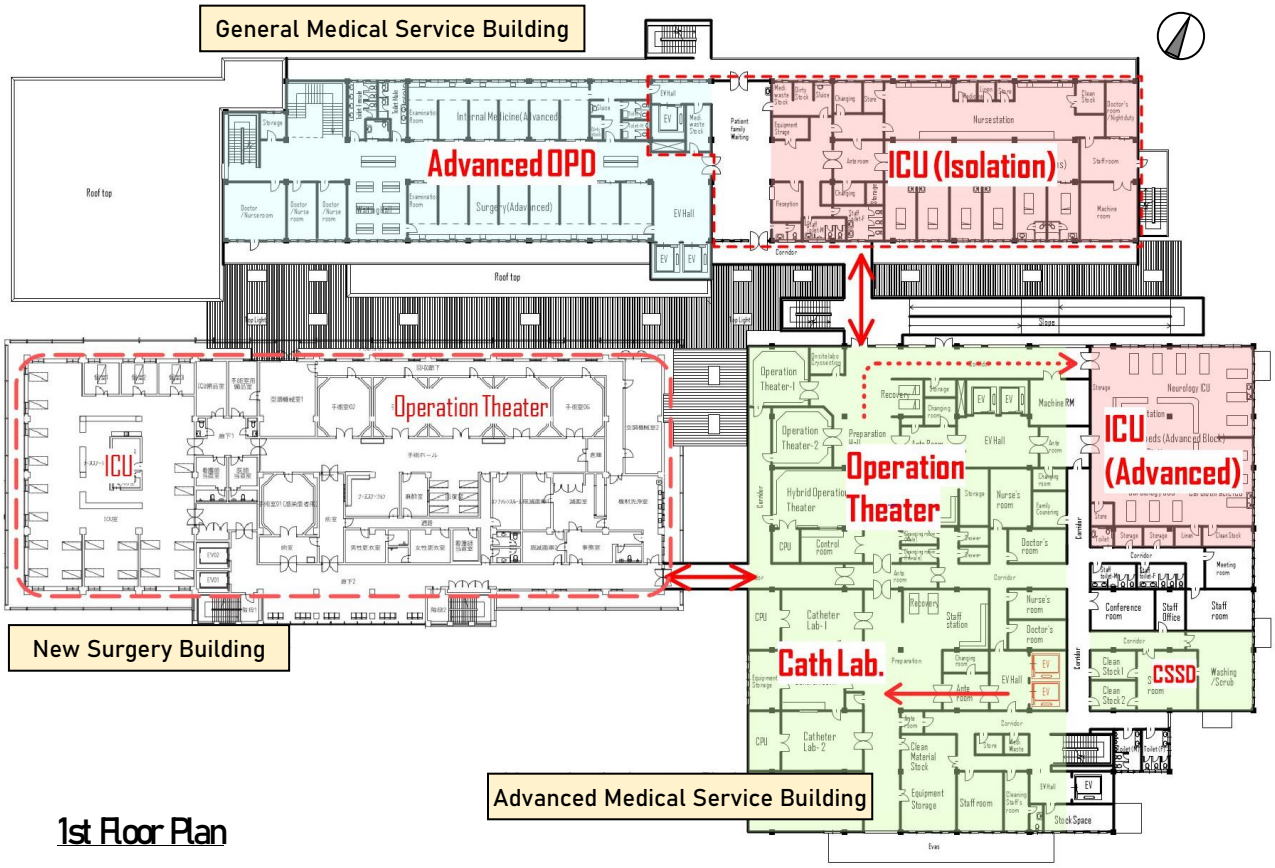



**Fig. 4.3 1st Floor Plan of SRH**

The Advanced Medical Service Building will have the Catheter Lab directly accessible from a dedicated elevator hall for cardiac emergencies. The operating theater area will be located on the north side of the building, across a corridor that crosses the Catheter Lab area located on the south side. The ICU will be close to the operating theater area, connected by a dedicated corridor from the operating theater area. The corridor crossing the Catheter Lab area and operating room area will be connected to the first floor of the new surgery building (surgical operation rooms and ICU) by a cross corridor to allow easy movement of medical staff.

**[2nd-5th Floor Plan]**

The wards are located from the second to the fifth floor. In the General Medical Service Building, there

is an ICU on the second floor (the level of nursing care is somehow higher than general beds, which is different from ICUs in developed countries). General wards are located on the 3rd to 5th floors. On the other hand, the Advanced Medical Service Building has ICUs and general wards on the 2nd and 3rd floors, and only general wards are located on the 4th floor. However, in consideration of efficient nursing care with a small number of medical staff, it is conceivable that they could be consolidated in one location, which could be easily arranged by swapping the positions of the beds during the detailed design stage.

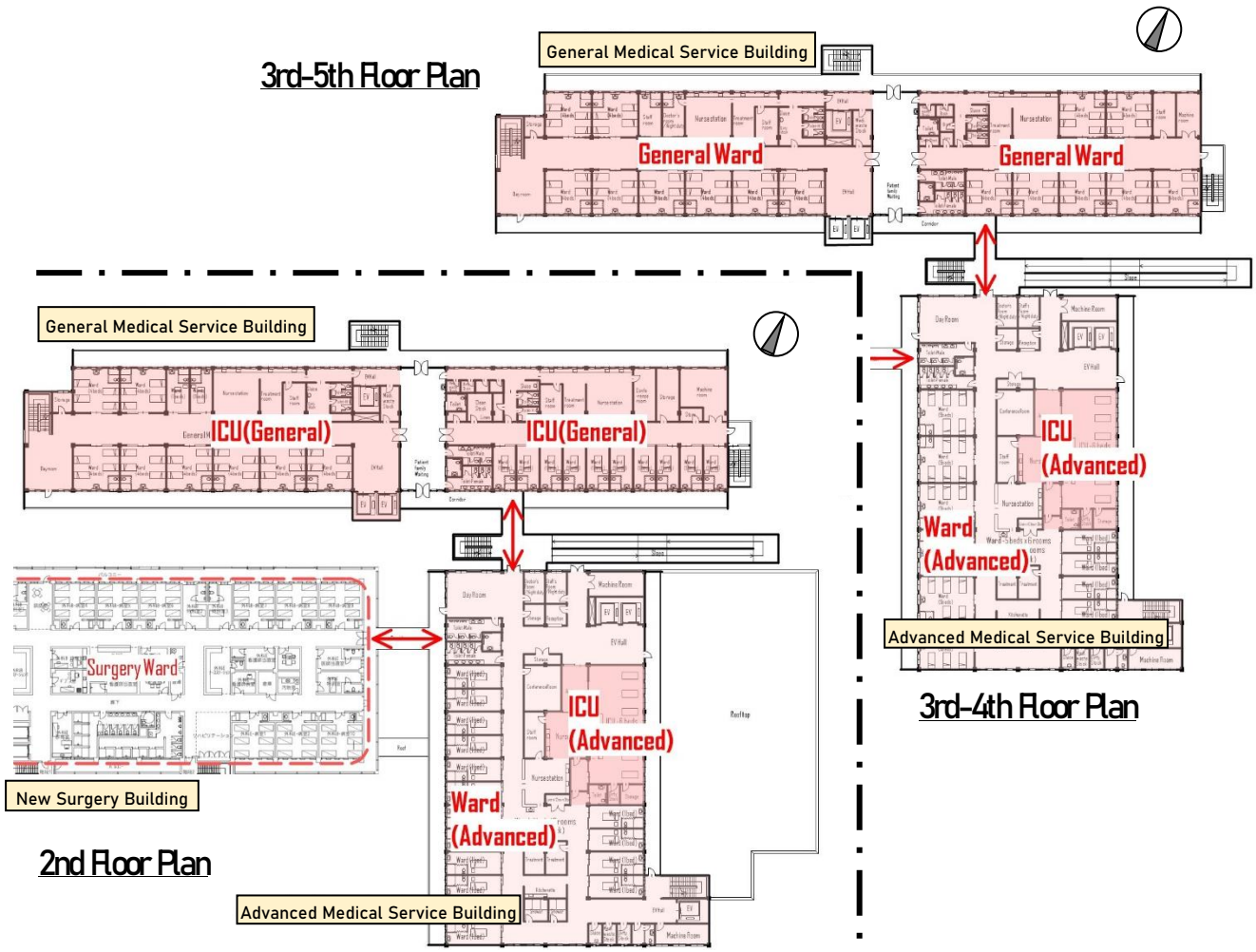



**Fig. 4.4 2nd -5th Floor Plan of SRH**

All the patients' rooms have their own attached toilet/shower for patients. From the perspective of hygiene management, the attached toilet/shower should be located facing the outside wall. Each ward consists of private rooms and 4 to 5 patients' rooms. The number of beds accommodated and the location of the toilet in each room will be reviewed again at the time of the detailed design.

**[6th -7th Floor]**

The 6th floor has the Administration Department including the room of the Director, medical affairs,

meeting rooms and doctor's and nurse's offices in the eastern part. In the western part, there will be the education/training department with some seminar/training rooms, library and meeting room. A cafeteria with a kitchen to provide refreshments to staff will be located in front of the elevator hall.

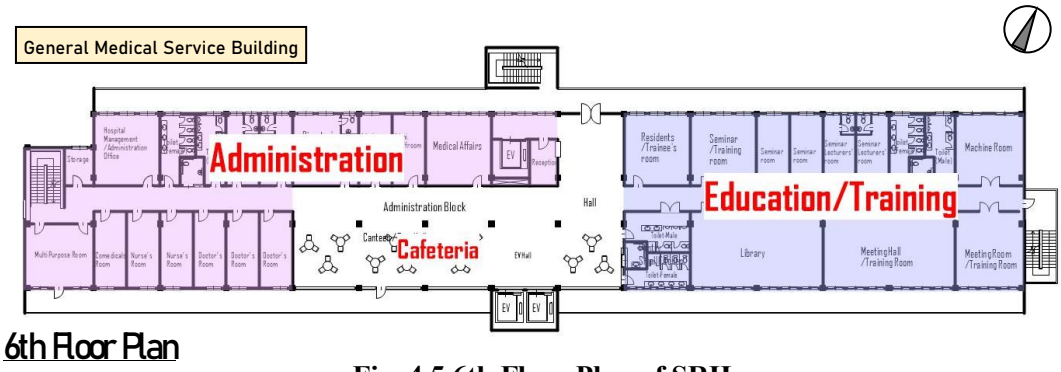



**Fig. 4.5 6th Floor Plan of SRH**

On the 7th floor, the conference hall with big storage and a preparation room will be located for larger seminars and events.

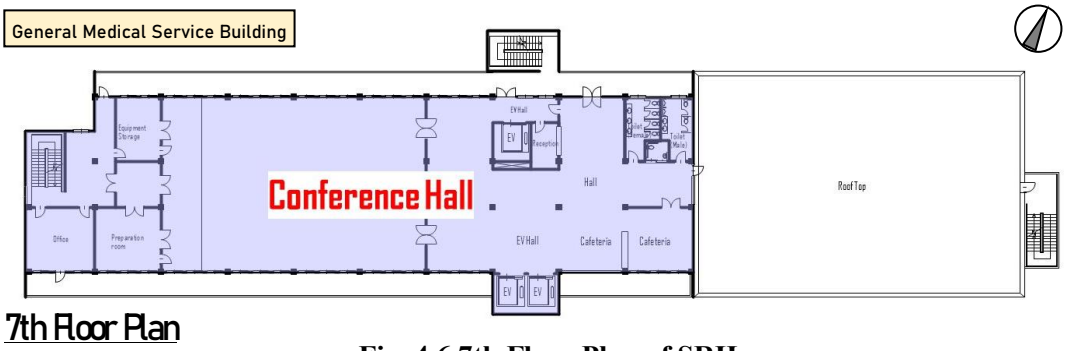



**Fig. 4.6 7th Floor Plan of SRH**

### ④ Section Plan

Both buildings will be RC (reinforced concrete) ledged frame structures with RC pile foundations. However, the actual pile design will be determined according to international structural design standards after a geotechnical investigation during the detailed design.

The ground floor level will be raised 0.6m above the ground level, and the height of each floor is 4.5 m. These elevations were matched to the adjacent surgical building to be connected by a connecting crosswalk.

| | General Medical Service Building | | Advanced Medical Service Building | | Surgery Building by JP's grant aid |
|---|---|---|---|---|---|
| ▽7F | Canference hall, Equip. strage, Preparation room, cafeteria | | | | |
| ▽6F | Administration, Education/Traininig | | | | |
| ▽5F | Genral Ward (CPA3) | | | | |
| ▽4F | Genral Ward (CPA3) | Connecting | General Ward (Advanced) | | |
| ▽3F | Genral Ward (CPA3) | Connecting | ICU and General Ward (Advanced ) | Connecting | Sugery Ward |
| ▽2F | ICU Ward (CPA3) | Connecting | ICU and General Ward (Advanced) | Connecting | Sugery Ward |
| ▽1F | Advanced Medical Service OPD, Isolation ICU Ward (CPA3) | Connecting | Operation Theater, Cath Labo. , ICU (Advanced medical service) | Connecting | Operation Theaters, ICU (Surgery) |
| ▽GF | Triage, Main entrance, General OPD, Physiothearapy, Psychiatry, | Connecting | Diagnostic Imaging, Examinations, Endoscopy, Chemotherapy, Pathology Lab. | Connecting | ER, OPD surgery |

**Fig. 4.7 Section of SRH**

## II. Kampong Cham Hospital

### ① Contents of the Proposed Hospital Facility

The new Project hospital consists of two main blocks, General and Advanced Medical Service Blocks, in addition to a laundry building. NICU, stepdown and KMC (Kangaroo Mother Care) will be transferred from the existing pediatric building to the OBGY building (by the Japanese grant aid) with renovation work.

The following functions/departments will be accommodated in the main hospital blocks.

**[General Medical Service Block]**

General OPD (internal medicine, surgery, ENT, ophthalmology, dermatology, dental, diabetes etc.), Advanced OPD, ICU (CPA3), Ward, Administration, Cafeteria, Educational/Training Department

**[Advanced Medical Service Block]**

ER, Examination/Diagnosis (incl. MRI, CT, X-ray, Mammography), Laboratory, Special OPD (physiotherapy, psychiatry), Chemotherapy, Operation Theater, Catheter Lab, ICU (Advanced), Ward (Advanced & CPA3), Conference Hall

### ② Layout Plan

The hospital site 38,197.3 $m^2$ is filled with numerous facilities, and the existing General Medicine Building, old operation theater, meeting room, and septic tank will need to be demolished to make space for the new facility. The new hospital facility will consist of two main blocks, the General Medical Service Block and the Advanced Medical Service Block.

The two blocks are connected by a deck on each floor to facilitate horizontal movement of medical staff. The General Medical Service Block provides CPA3 services that have been provided essentially as a provincial hospital, whereas the Advanced Medical Service Block provides newly invited advanced medical services as the regional hospital.

The main gate located on the north side of the hospital site will be used as an entrance and exit to the hospital site for both walk-in patients and emergency vehicles, while emergency vehicles will go straight through the gate and then turn right soon after, passing through the piloti of the General Medical Service Block and entering the ER located in the Advanced Medical Service Block. Pedestrians will go straight to the General Medical Service Block entrance after being checked in and taking their vitals at the existing triage beside of the gate.

During a pandemic, patients with suspected infection will enter the hospital not through the main gate but bypassing the outside of the hospital grounds to the gate on the south side of the compound. They will then be cared for in the existing TB/Infectious Disease Department to prevent contamination of the hospital.

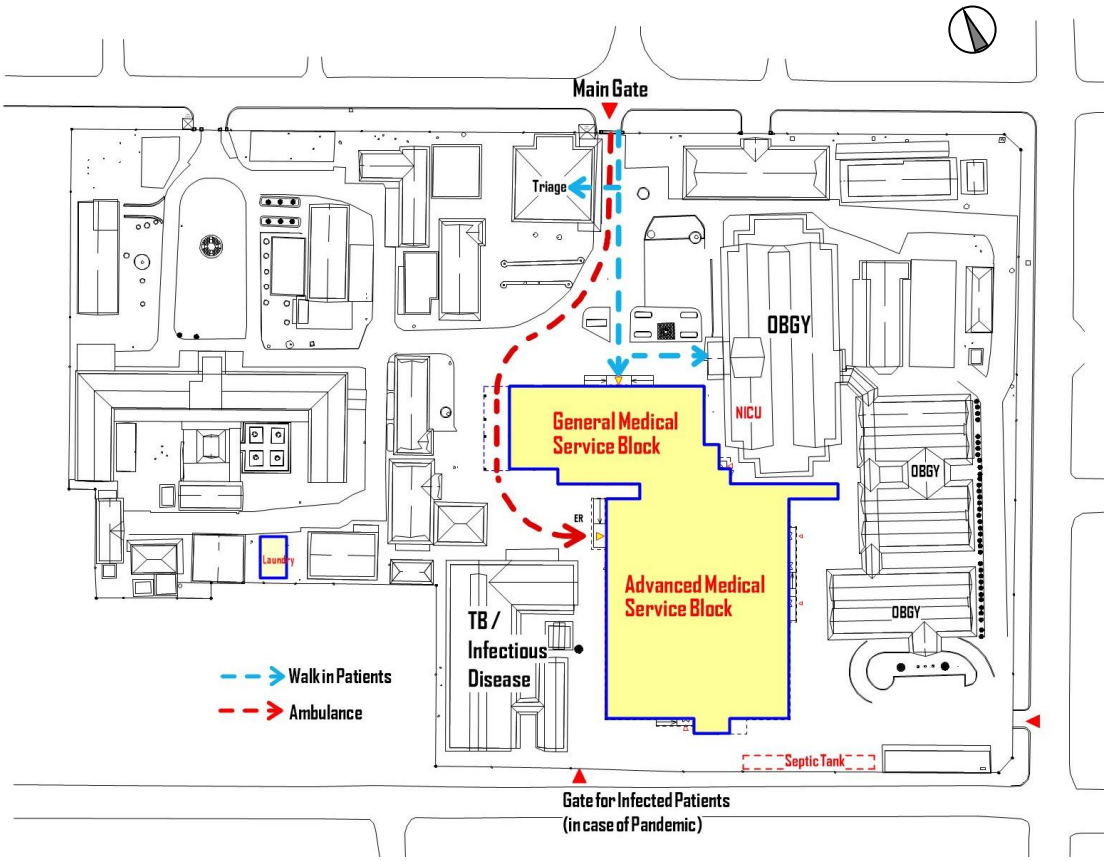



**Fig. 4.8 Proposed Building Layout of KCH**

### ③ Floor Plan

**[Ground Floor]**

The General Medical Service Block will be located directly in front of the main gate of the hospital compound and will serve as the main entrance for patients. The General Medical Service Block will be constructed on the site of the existing two-story General Medicine Building, which will be demolished prior to construction. It is expected that the OPD functions scattered throughout the site will be consolidated in this building, allowing the hospital staff to operate more efficiently (except for maternal

and child health related functions).

Patients in the Advanced Medical Service Block as well as those undergoing testing will approach their respective destinations via the OPD's entrance hall. A single entrance at the beginning of the visit will provide a clear and easy-to-understand flow line to control the actions of the users. However, the ER is located just behind the General Medical Service Block, and emergency vehicles approach through the pilotis. After emergency triage, surgical and cardiac emergencies are transported by elevators in the ER to the operating rooms or Catheter Labs on the upper floors. The diagnostic imaging department is adjacent to the ER and is followed by additional laboratories to provide rapid examination of emergency patients.

The NICU and its step-down will be renovated on the ground floor of the OBGY building, which was built by the Japanese grand aid.

The NICU will be renovated to be accessible within a short distance from the delivery room to reduce the risk of premature neonates deteriorating and will be located closer to the existing pediatric wing to minimize the travel burden on the medical staff.


**Fig. 4.9 Ground Floor Plan of KCH**

The Mortuary will be located at the south-east corner of the Advanced Medical Service Block. The designing of the Mortuary should be carried out at the detail design stage.

**[First Floor]**

The OPD of CPA3 will be located on the first floor of the General Medical Service Block. The examination rooms are arranged in a U-shape around the waiting area, with a service corridor connecting the back of each examination room to allow staff easy access. The Advanced Medical Service Block includes a group of operating rooms accessed by an elevator in the ER directly below and connected to the ICU by a dedicated corridor. The CSSD is located adjacent to the operating rooms and is responsible for sterilization on the same floor.

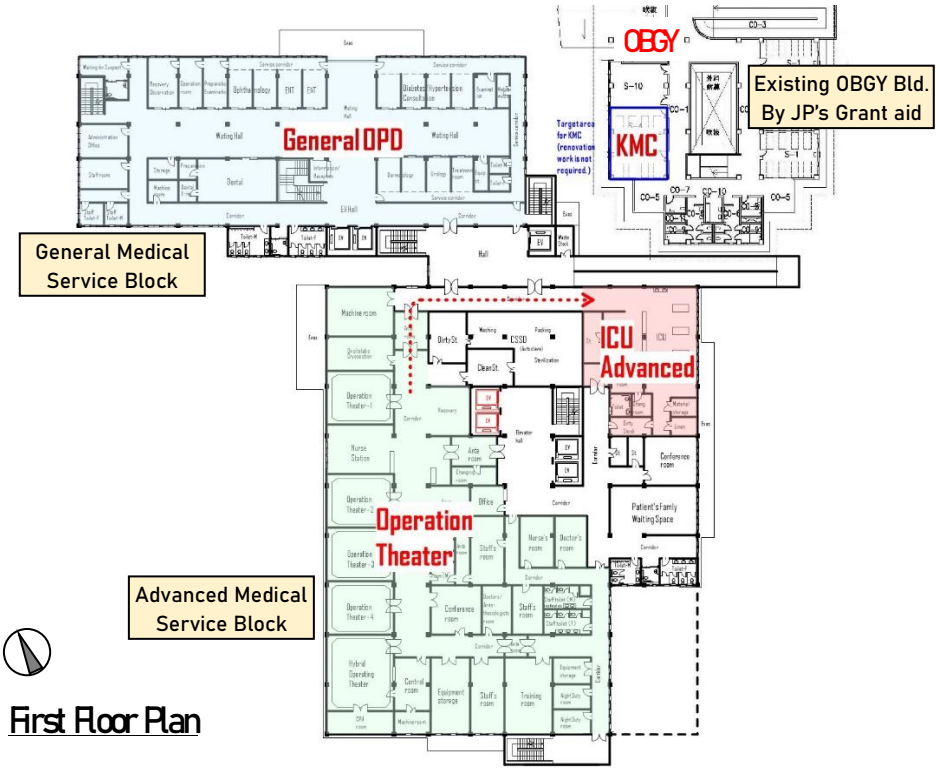



**Fig. 4.10 1st Floor Plan of KCH**

**[Second Floor]**

The General Medical Service Block contains the Advanced OPD. In the Advanced Medical Service Block, Catheter Labs are located side by side as same as the operation theaters on the first floor. The ICUs are located in order to accommodate post-operative patients in the Catheter Lab and post-operative patients from the first floor OTs department and may be integrated to make effective use of limited medical personnel. It will be considered in the detailed design stage if necessary.

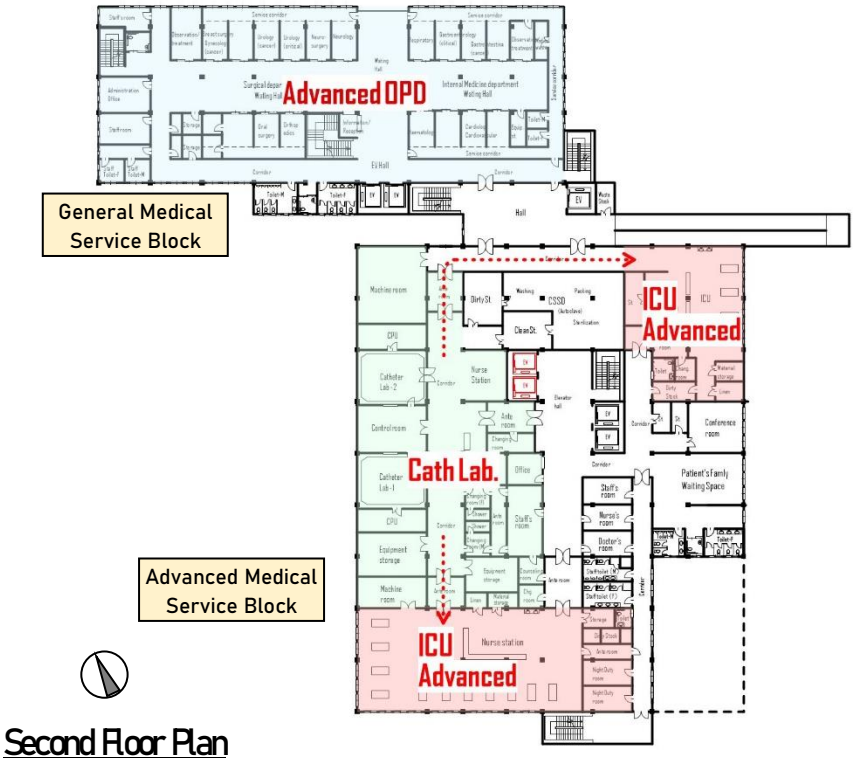



**Fig. 4.11 2nd Floor Plan of KCH**

**[3rd - 6th Floor]**

The required inpatient beds are arranged on the 3rd through 6th floors in both blocks. The beds for CPA3 and advanced services will be sectioned and managed on each floor of each block. ICU (CPA3) wards are accommodated in the General Medical Service Block on the 3rd-4th floors, and General Wards (Advanced) are located in the Advanced Medical Service Block on the 3rd – 4th floors. Due to the large number of General Wards (CPA3), they will be located on the 5th – 6$^{th}$ floors of both blocks.

All the patients' rooms have their own attached toilet/shower for patients. From the perspective of hygiene management, the attached toilet/shower should be located facing the outside wall. Each ward consists of private rooms and 4- to 5 patients' rooms. The number of beds accommodated and the location of toilets in each room will be reviewed again at the time of the detailed design. Each floor is connected to the General and Advanced Blocks by a deck for efficient staff moving flow. Each block and floor can be divided from each other with partition walls if necessary for infectious disease control.


**Fig. 4.12 3rd-4th and 5th-6th Floor Plan of KCH**

**[7th Floor]**

The 7th floor is the highest floor of both the General and Advanced Medical Service Blocks. The General Medical Service Block has a central corridor across the building in an east-west direction, with the administrative section including the medical offices on the north side of the corridor and the education and training section on the south side. A cafeteria providing refreshments for staff is located adjacent to the elevator hall. On the 7th floor of the Advanced Medical Service Block, a large conference hall is located with a foyer and cafeteria, and the two buildings are connected by a deck.


**Fig. 4.13 7th Floor Plan of KCH**

### ④ Section Plan

Both buildings will be RC (reinforced concrete) ledged frame structures with RC pile foundation. However, the actual pile design will be determined according to international structural design standards after a geotechnical investigation during detailed design.

The ground floor level will be raised 0.6m above the ground level, and the height of each floor is 4.5 m.

To avoid making the General Medical Service Block too tall when viewed from the front gate of the hospital, two floors of the Ward were moved to the Advanced Medical Service Block, and both buildings were adjusted to be eight stories high.

| | General Medical Service Block | | AdvancedMedical Service Block |
|---|---|---|---|
| ▽7F | Administration, Education/Traininig | Connecting | Canference hall, Equip. strage, Preparation room, cafeteria |
| ▽6F | Geenral Ward (CPA3) | Connecting | Geenral Ward (CPA3) |
| ▽5F | Geenral Ward (CPA3) | Connecting | Geenral Ward (CPA3) |
| ▽4F | ICU Ward (CPA3) | Connecting | General Ward (Advanced medical service) |
| ▽3F | ICU Ward (CPA3) | Connecting | General Ward (Advanced medical service) |
| ▽2F | Advanced OPD | Connecting | Cath Labo. , ICU (Advanced medical service) |
| ▽1F | General OPD | Connecting | Operation Theater, ICU (Advanced medical service) |
| ▽GF | Main entrance, General OPD | Connecting | ER, Diagnostic Imaging, Laboratory, Examinations, Endoscopy, Chemotherapy, Physiothearapy, Psychiatry |

**Fig. 4.14 Section of KCH**

## 5. Temporary Construction Plan

### 5.1 Temporary Construction Plan of Siem Reap Hospital

The construction plan will be considered with the safety of the hospital in operation fully taken into consideration. Since the site is very narrow, construction of small and short-lived facilities such as laundry and pharmacy will be started in the latter half of the construction period, and the location of such facilities will be considered for use as a temporary yard until then. In addition, a temporary yard will be secured at another location outside the hospital.

The entire construction site will be completely enclosed by a temporary fence to keep it away from hospital activities. The main construction gate will be located on the north side of the site where it will not interfere with hospital activities. A temporary gate will also be installed near the front gate of the hospital on the east side, and a temporary road will be provided between the General and Advanced Medical Service Buildings to serve as the main line of construction traffic.


**Fig. 5.1 Temporary Construction Plan of SRH**

### 5.2 Temporary Construction Plan of Kampong Cham Hospital

The construction site will be surrounded by a temporary fence to separate it from the hospital activities. The existing emergency services gate on the southeast side of the hospital site will be used as the main gate for construction vehicles and as a temporary yard from the emergency services roundabout to the south site boundary. The existing emergency gate is currently rarely used, but a replacement gate will

be set up on the same road surface.

The use of large cranes and concrete pump trucks is essential for this construction, and when they are used, the extent of the temporary fencing will need to be moved to provide space for large construction equipment.

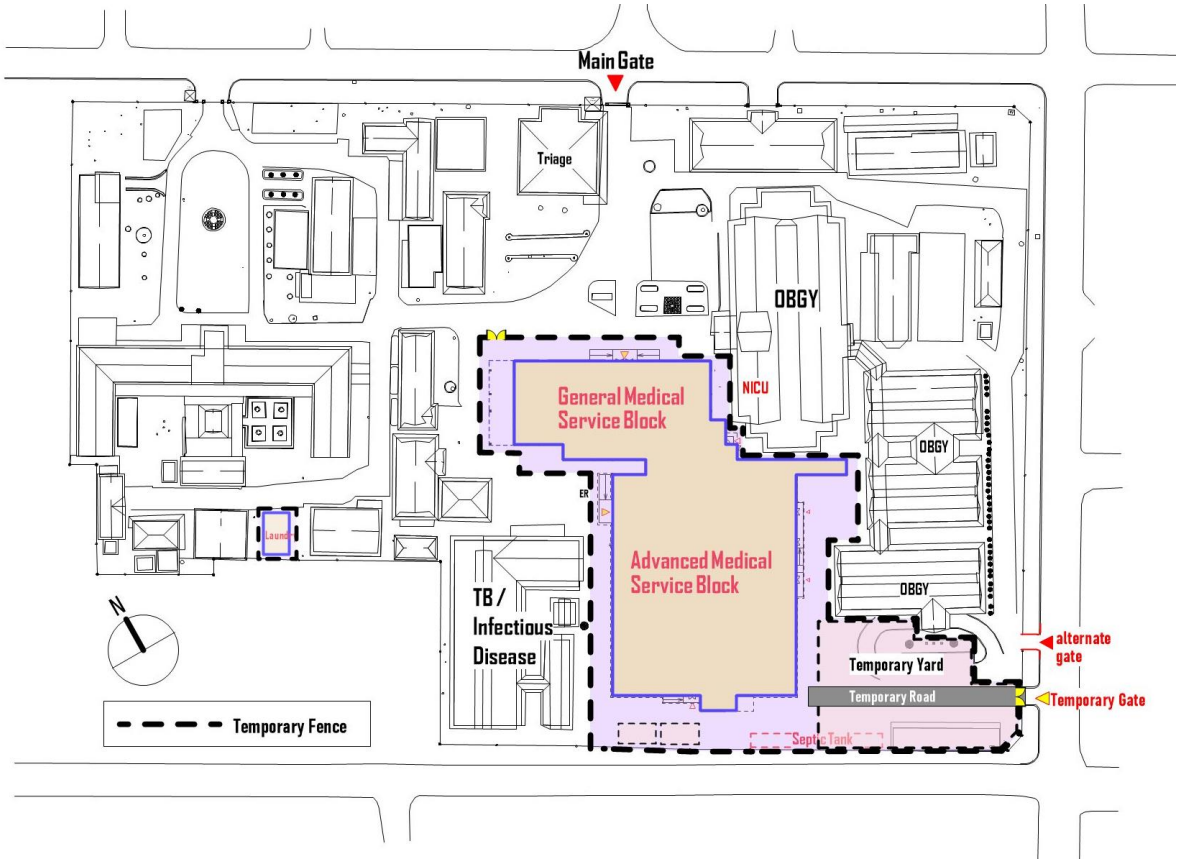
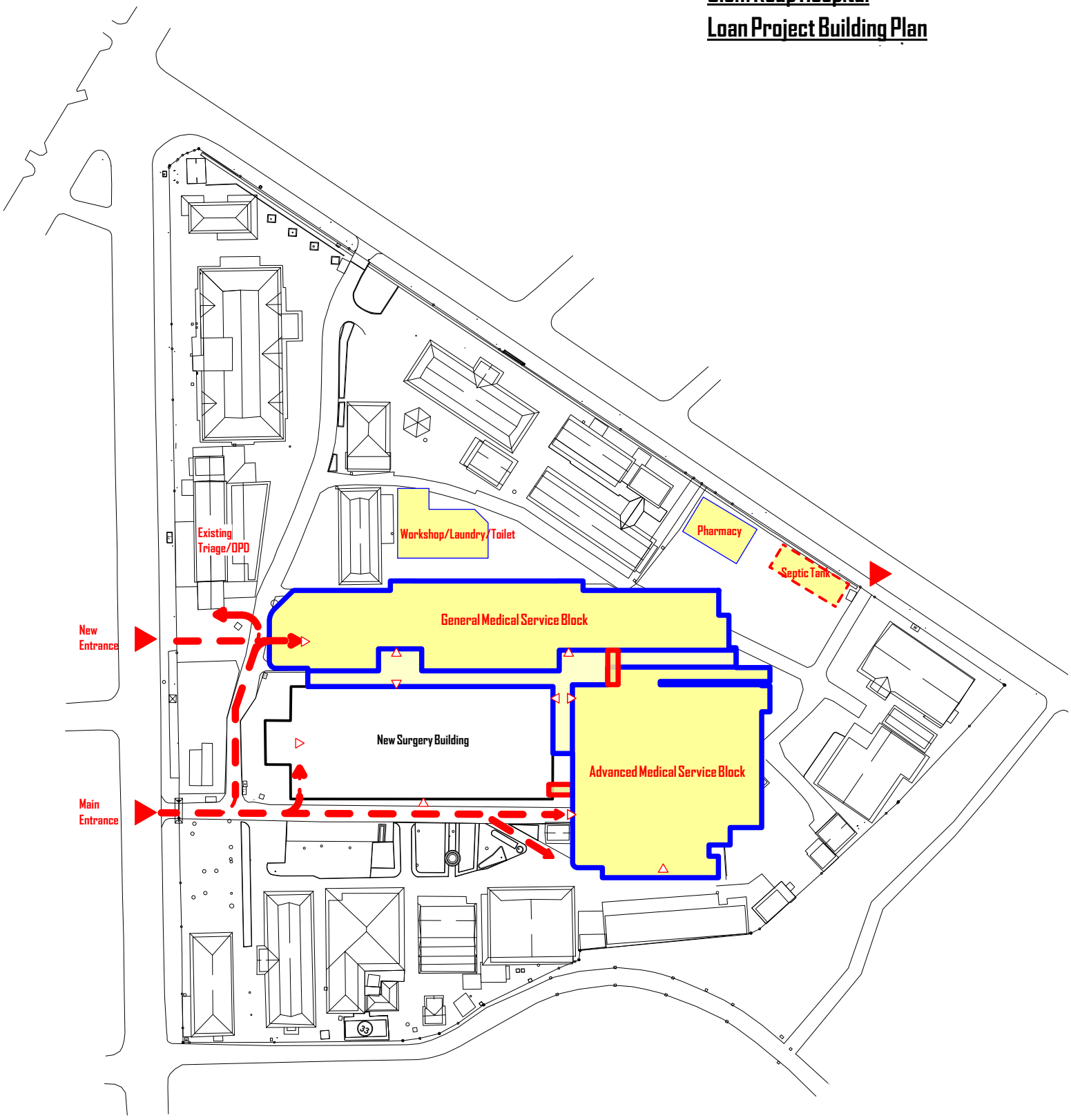



**Fig. 5.2 Temporary Construction Plan of KCH**

## 6. Drawings of Facility Plan

Proposed plans of the new hospital buildings for Siem Reap Hospital and Kampong Cham Hospital are shown in the following sections.

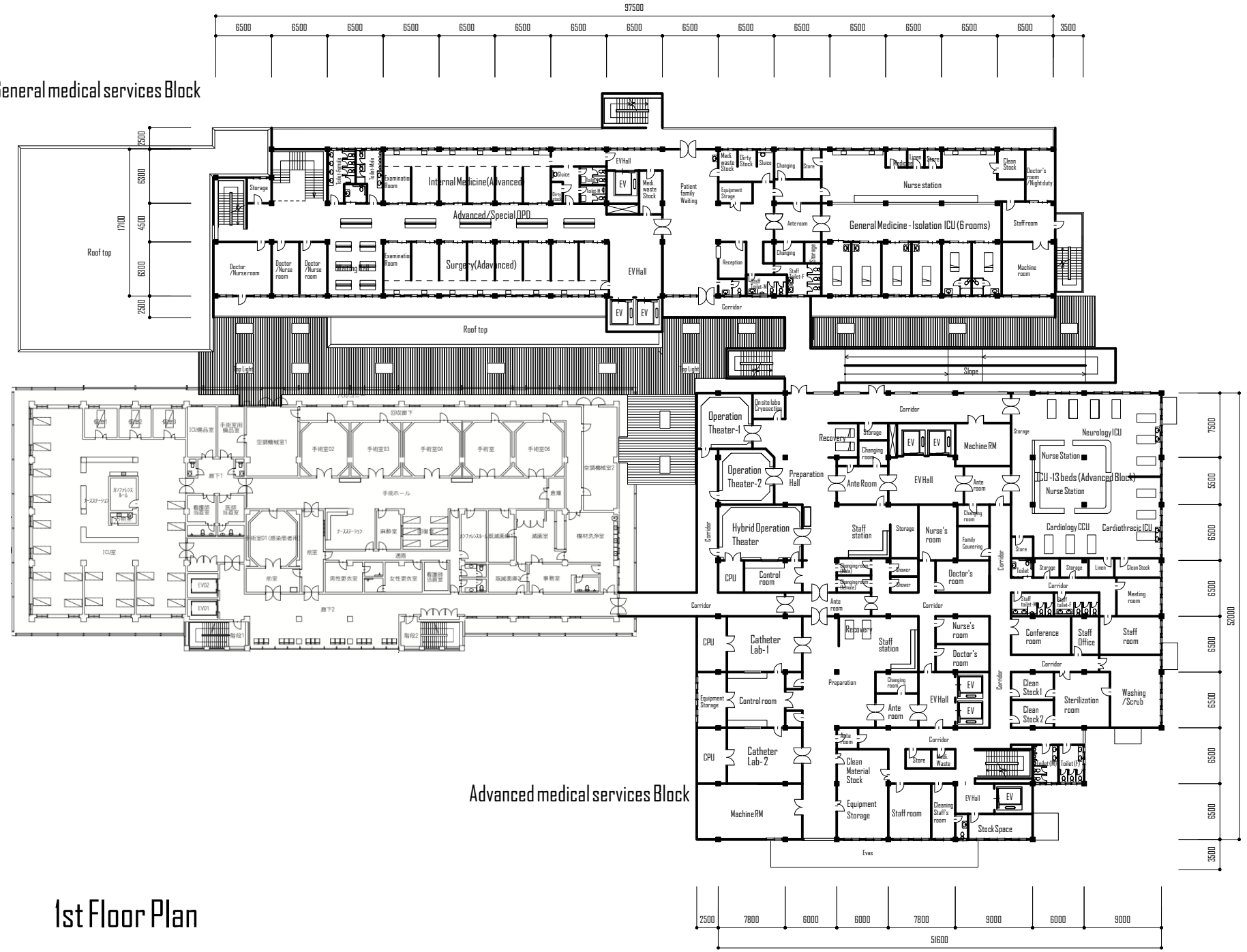
# Siem Reap Hospital
# Loan Project Building Plan

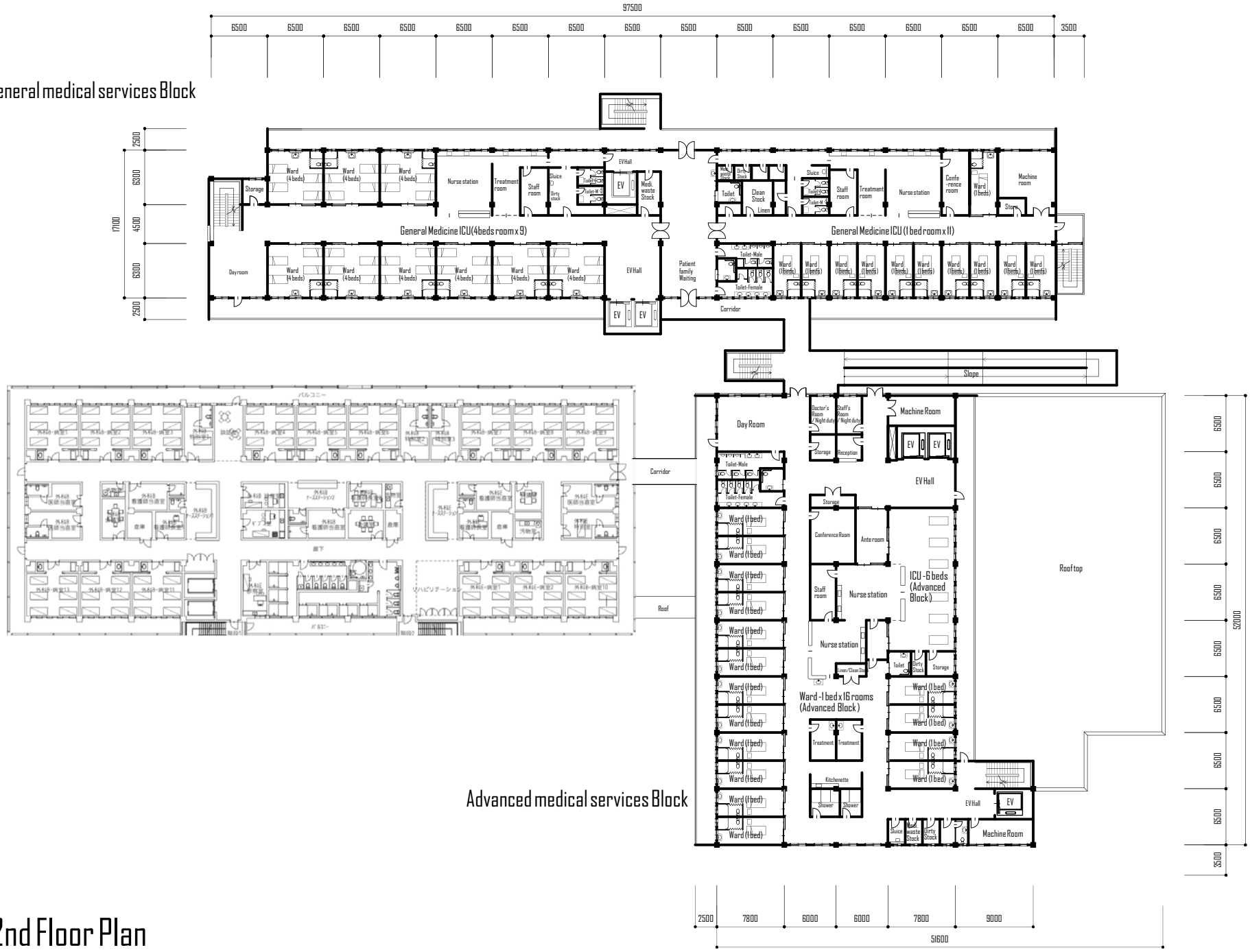



## Site Layout PLan

S=1/1500


Existing OPD
(in case of Infectious)
General medical services Block
OPD(General)
Triage
Reception
Consultation/Treatment
Waiting Hall
Entrance Hall
Reception /Office
Pharmacy
General OPD
Accounting
Dermatology
General Medicine
Diabetes
Diabetes /Hypertention
Security
EV Hall
Consultation Room
Physiotherapy
Staff Room
Psychiatry Dept. Office
Medical Gas Room
Machine Room
Psychiatry Consultation Room
Medicine Store
Medicine Storage
Slope
New Surgery Building (by Japanese Grant Aid)
Emergency(Surgery)
Emergency(Cardiology)
Hall
Corridor
Security Guard
Staff Room
Toilet (M)
Toilet (F)
Chemotherapy
Intravenous room
Machine Room
Waiting Corridor
Service Corridor
Observation Bed
Lower Endoscopy
Upper Endoscopy
Broncho scopy
Washing/ Preparation Room
Consultation
Reception
Examination/Consultation
EMG
EEG
ECG
Examination/ Consultation room
Pathology Lab.
Ultara Sound
CPU
CT
PACS
Changing
MRI
Control Room /Office
Diagnosys Examination
Interpretation of radiograms
Mammography
General X-ray
Fluoroscopy
Conference Room
IT/Server Room
Storage
Counseling Room
Med. Waste
Administration Office
Entrance Hall
Service EV
Waste Stock
EV Hall
Waiting Hall
Advanced medical services Block
Ground Floor Plan


97500
6500 6500 6500 6500 6500 6500 6500 6500 6500 6500 6500 6500 6500 6500 6500 3500
General medical services Block
Roof top
Storage
Internal Medicine(Advanced)
Advanced/Special OPD
Surgery(Advanced)
Examination Room
Waiting area
Doctor /Nurse room
Doctor /Nurse room
Doctor /Nurse room
EV Hall
Patient family Waiting
Medi. waste Stock
Dirty Stock
Sluice
Changing
Store
Equipment Storage
Nurse station
Clean Stock
Doctor's room /Night duty
Ante room
General Medicine - Isolation ICU (6 rooms)
Staff room
Reception
Staff Toilet-M
Staff Toilet-F
Machine room
Corridor
Roof top
Top Light
Slope
Operation Theater-1
Operation Theater-2
Onsite labo Cryosection
Preparation Hall
Recovery
Ante Room
EV Hall
Machine RM
Neurology ICU
Nurse Station
ICU -13 beds (Advanced Block)
Hybrid Operation Theater
CPU
Control room
Staff station
Nurse's room
Doctor's room
Cardiology CCU
Cardiothracic ICU
Conference room
Staff Office
Meeting room
Catheter Lab-1
Catheter Lab-2
Equipment Storage
Clean Material Stock
Clean Stock 1
Clean Stock 2
Sterilization room
Washing /Scrub
Staff room
Cleaning Staff's room
Stock Space
Evas
Advanced medical services Block
2500 7800 6000 6000 7800 9000 6000 9000
51600
7500 5500 6500 6500 6500 6500 6500 6500 3500
52000
1st Floor Plan

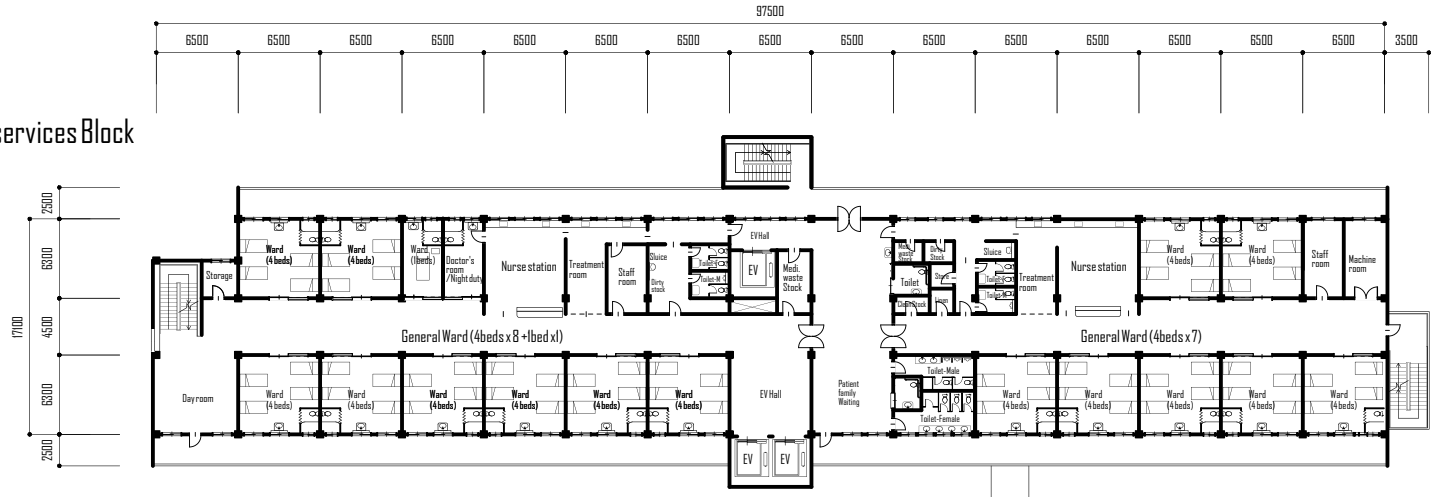



# 2nd Floor Plan

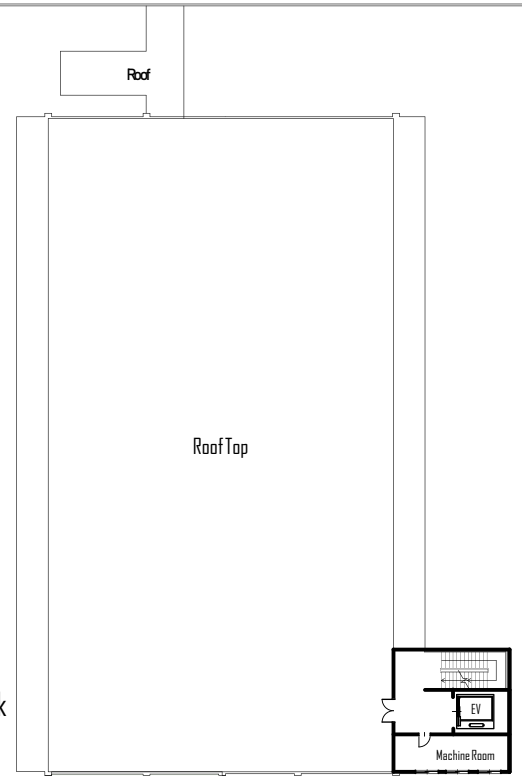

# 3rd Floor Plan


# 4th Floor Plan

General medical services Block

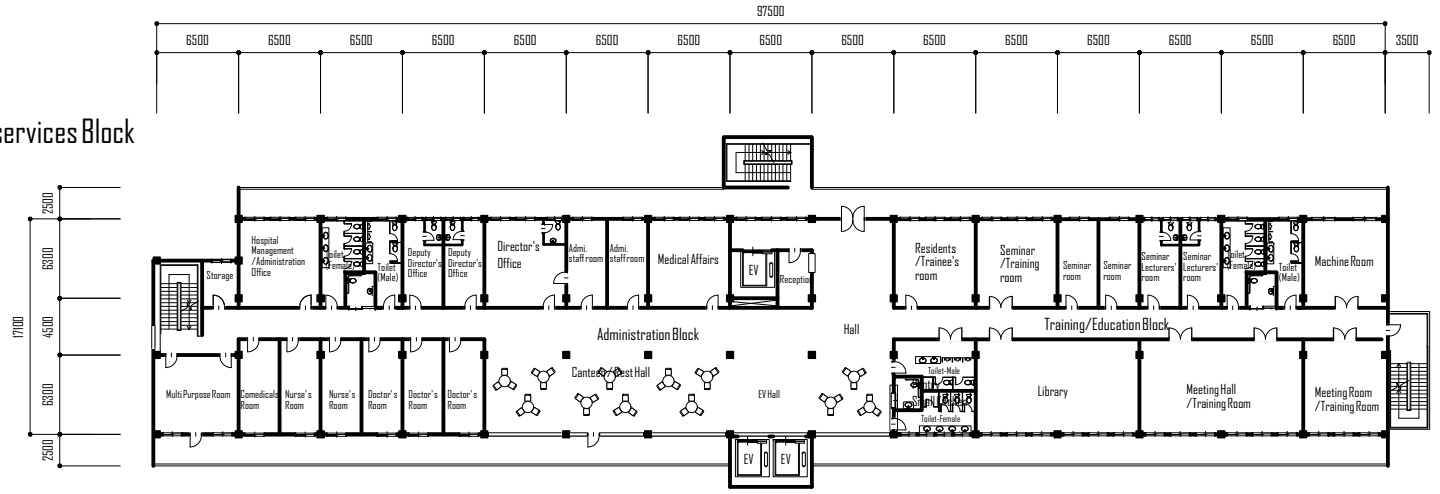



# 5th Floor Plan



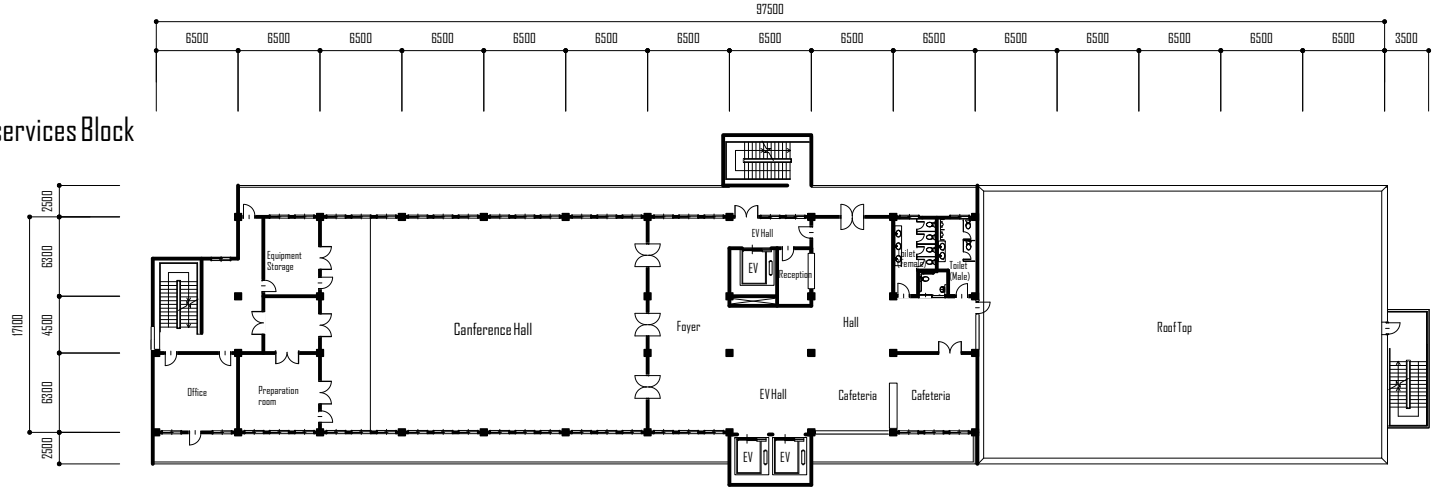

Advanced medical services Block

General medical services Block



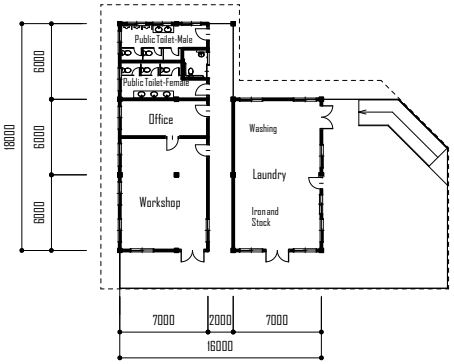

# 6th Floor Plan

General medical services Block

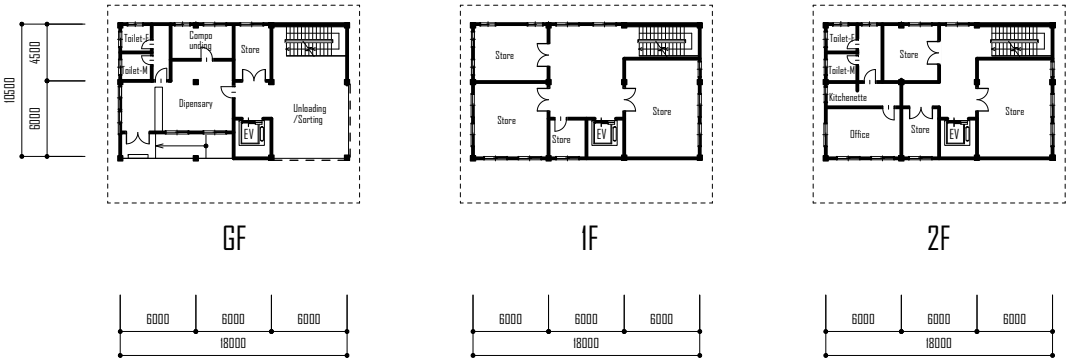



# 7th Floor Plan

---

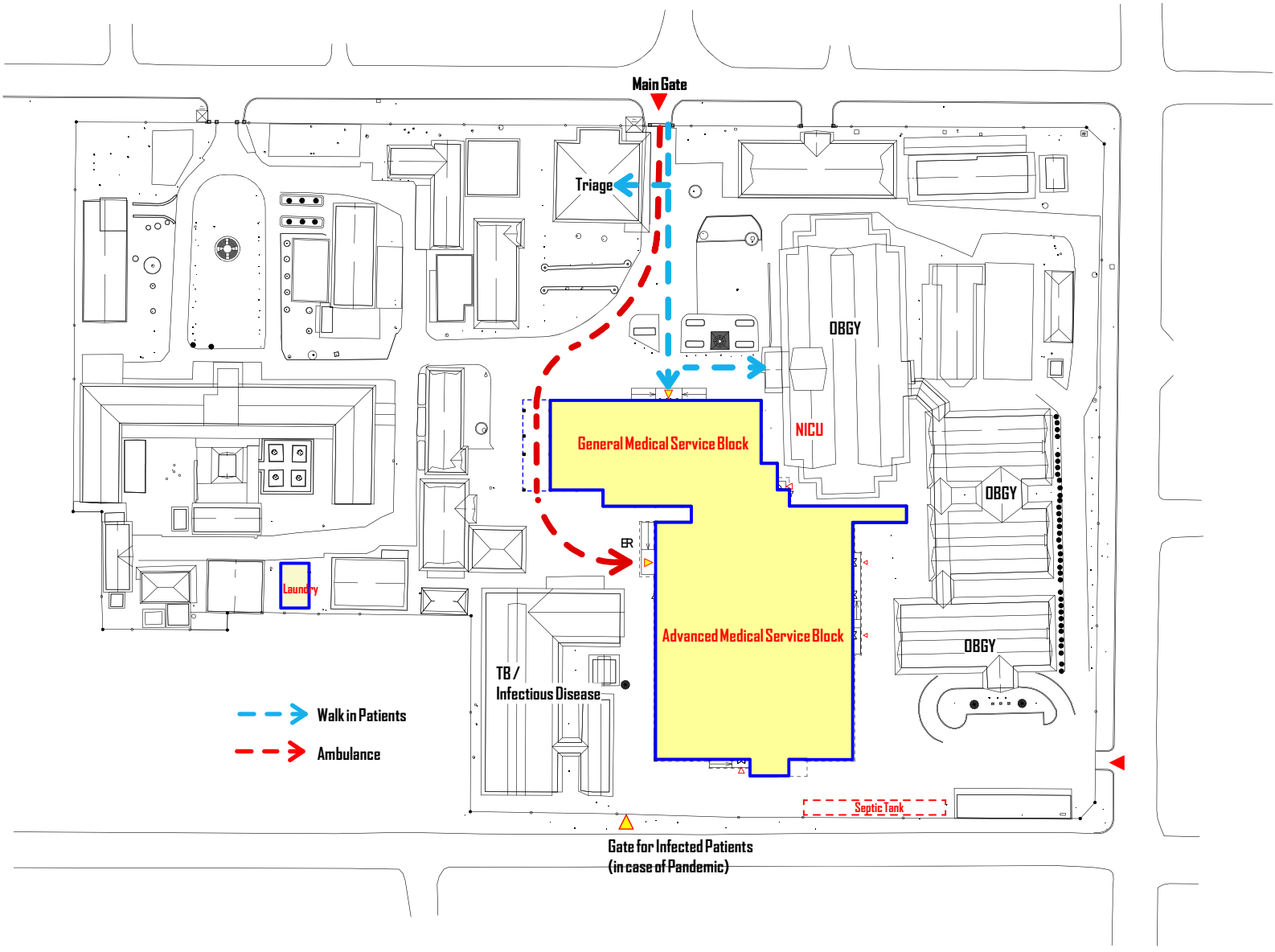



Workshop / Laundry / Toilet




Pharmacy

# Kampong Cham Hospital
# Loan Project Building Plan

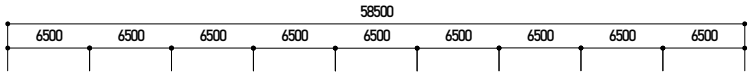



## Site Layout PLan

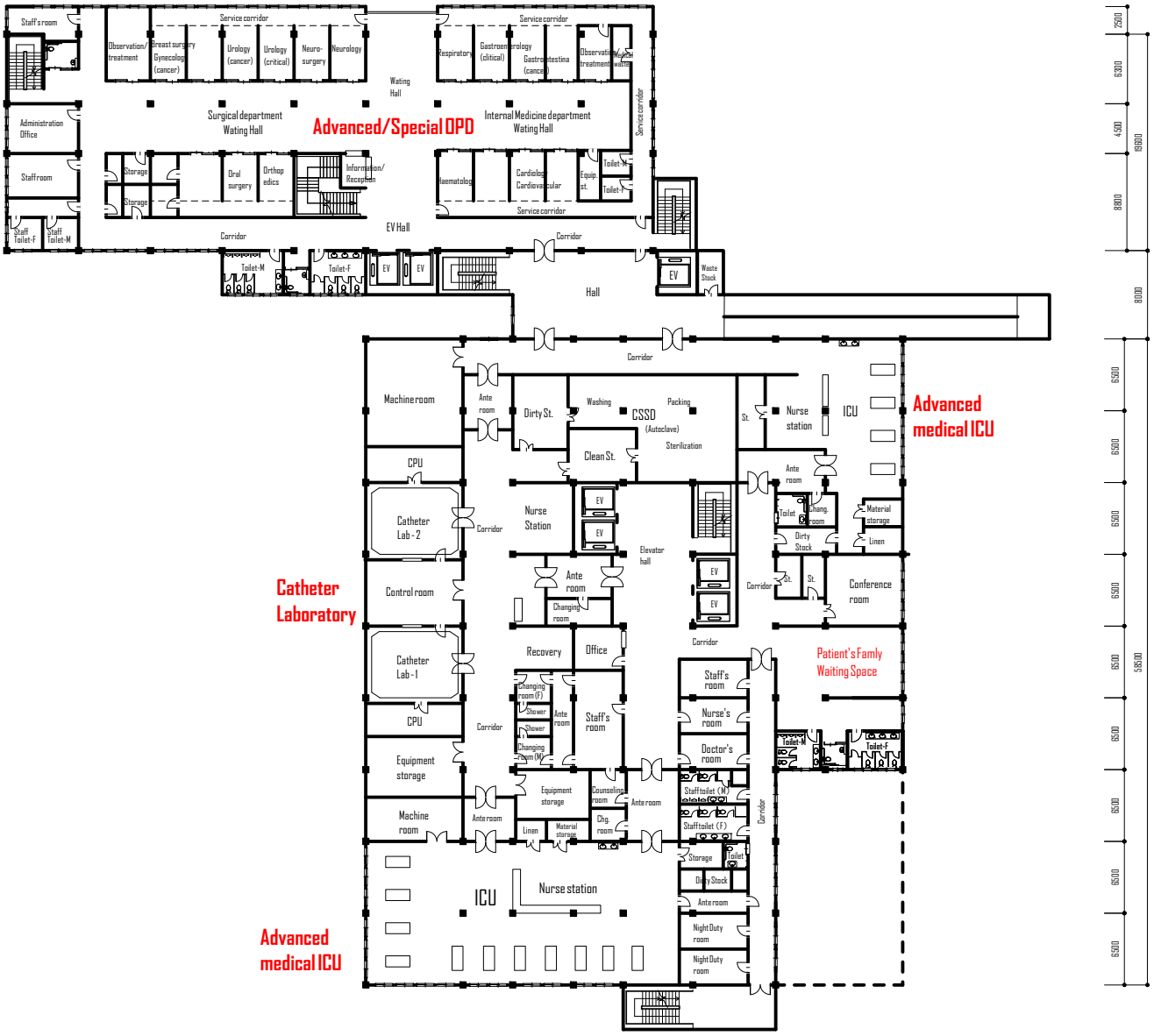
S=1/1500


58500
6500 6500 6500 6500 6500 6500 6500 6500 6500
General medical service block
Main Entrance
OBGY NICU
Target area for renovation work of NICU
NICU
NICU Stepdown
General OPD
Waiting for Suspect
Staff room
Insurance/Accounting
Reception Registration
Entrance Hall
Service corridor
Internal Medicine Consultation
Examination
Toilet
Office
Office
Waiting Hall
Waiting Hall
Pharmacy
Compound
Surgery consultation
Staff Toilet-F
Staff Toilet-M
Corridor
EV Hall
Toilet-M
Toilet-F
EV
Hall
Waste Material St.
Emergency Treatment room
Nurse Station
ER Observation Bed room
Reception
ER Entrance Hall
ER
Equip.
Machine
Minor Surgery OT
EV Hall
Corridor
Echo
Echo
CT
MRI
Machine
Machine
Toilet
Reception
Diagnostic Imaging
Staff's room
Server room
Control room
Furuoroscopy
Toilet
Chg.
General X-ray
Mammography
Bilchemical lab.
Laboratory
Microscopy room
Haema-tology lab.
Blood sampling
Reception
Ante room
Toilet-F
Toilet-M
Bacterial lab.
Corridor
Pathology lab.
Cutting room
Staff Room
Medicine Store
Reception
Chemotherapy
Intravenous room
Chemotherapy
Waiting
Consultation room
Physiotherapy
Equip. storage
EV Hall
Corridor
Waiting
Reception
Psychiatry Consultation room
Psychiatry Consultation room
Psychiatry
Storage
Medicine
Staff's room
Toilet-F
Toilet-M
Consult. room
Broncho scopy
Upper Endoscopy
Lower Endoscopy
Washing
Endoscopy
Waiting
Recovery room
Toilet
Toilet-F
Toilet-M
Reception
ECG
EMG
EEG
Examination
Waiting
Exami. room
Exami. room
Exami. room
Mortuary
8800 4500 5500 4500 6300 7500 4500 7000
48600
Advanced medical services block
Ground Floor Plan


58500
6500 6500 6500 6500 6500 6500 6500 6500 6500
General medical service block
Waiting for Suspect
Recovery Observation
Operation room
Preparation Examination
Ophthalmology
ENT
ENT
Service corridor
Wating Hall
Diabetes Consultation
Hypertension
Examination
Medical waste
Administration Office
Staff room
Storage
Preparation
Machine room
Dental
Dental X-ray
Information/ Reception
Dermatology
Urology
Treatment room
Equip. st.
Toilet-M
Toilet-F
Staff Toilet-F
Staff Toilet-M
General OPD
EV Hall
Corridor
Toilet-M
Toilet-F
EV
Waste Stock
Hall
Evas
Target area for KMC (renovation work is not required.)
KMC
Advanced medical ICU
Machine room
Ante room
Dirty St.
Washing
CSSD (Autoclave)
Packing
Sterilization
Clean St.
St.
Nurse station
ICU
Onsite labo Cryosection
Operation Theater - 1
Recovery
Elevator hall
Toilet
Chang. room
Material storage
Dirty Stock
Linen
Nurse Station
Operation Theater
Operation Theater - 2
Changing
Conference room
Equip.
Office
Patient's Famly Waiting Space
Operation Theater - 3
Changing room (F)
Shower
Changing room (M)
Staff's room
Nurse's room
Doctor's room
Operation Theater - 4
Doctors/ Anes-thesiologists room
Staff toilet (M)
Staff toilet (F)
Hybrid Operating Theater
Control room
Equipment storage
Training room
Night Duty room
CPU room
Machine room
8800 4500 5500 4500 6300 7500 4500 7000
48600
Advanced medical services block
Bed Number
Ward: 0
ICU: 4
1st Floor Plan



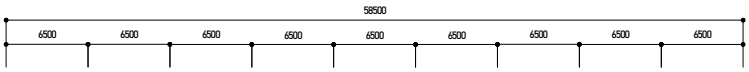

General medical service block




Advanced medical services block

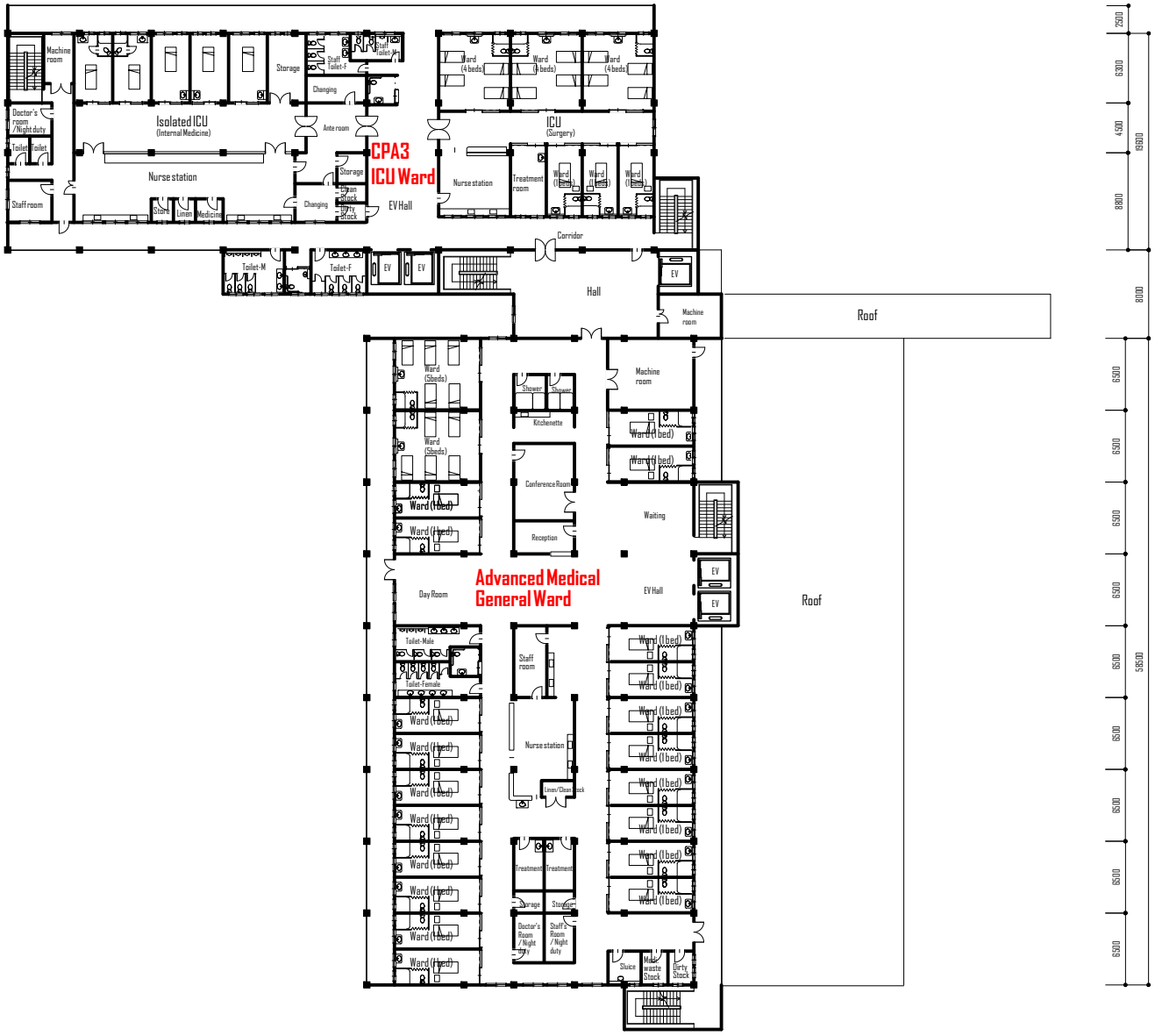
Bed Number
Ward: 0
ICU: 15

# 2nd Floor Plan



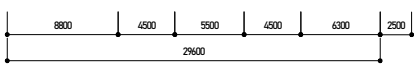

## General medical service block

Bed Number
Ward: 0
ICU: 20

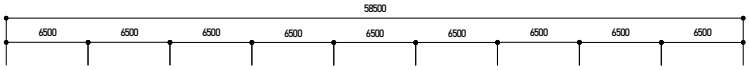



## Advanced medical services block

Bed Number
Ward: 30
ICU: 0

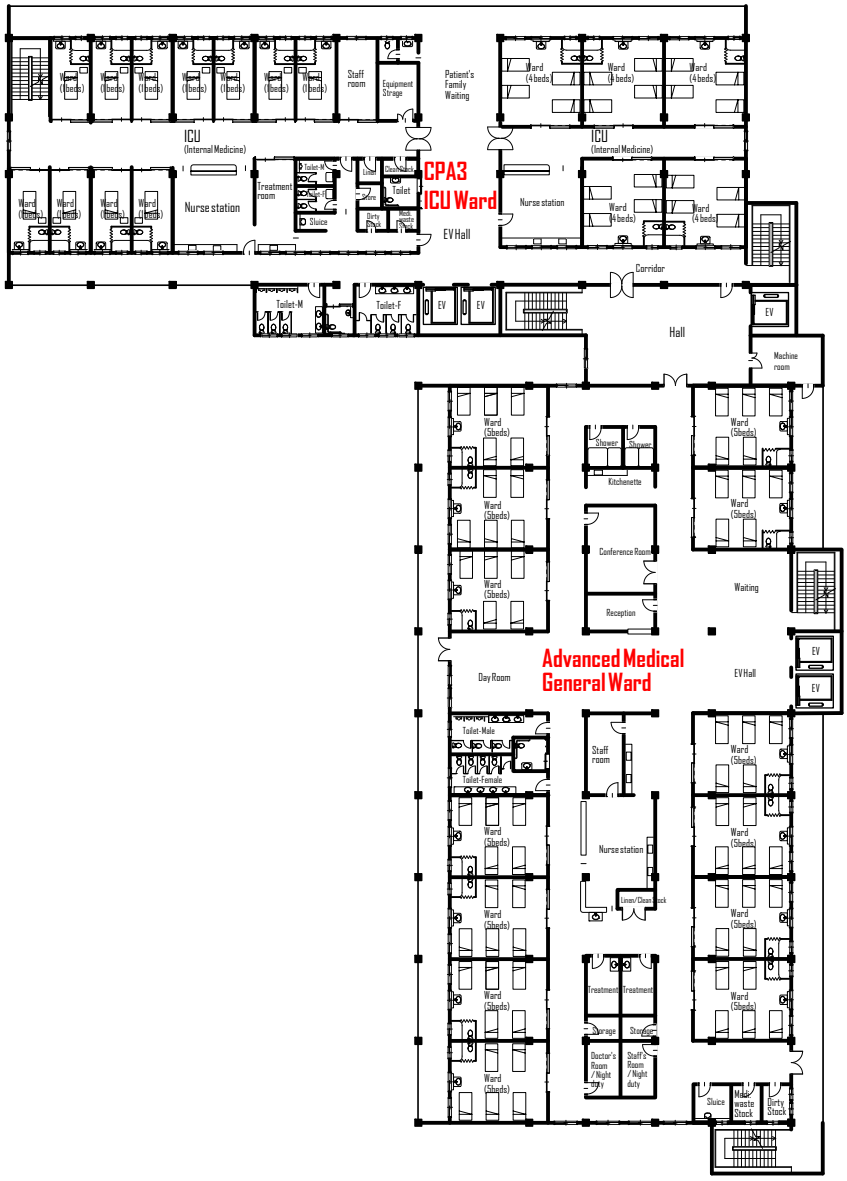


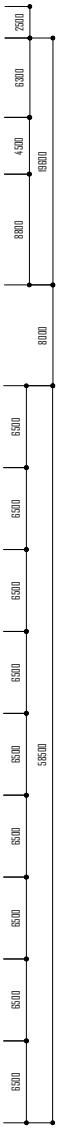

# 3rd Floor Plan




## General medical service block

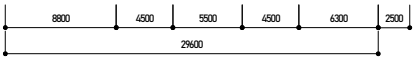
Bed Number
Ward: 0
ICU: 30



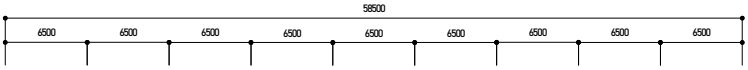




## Advanced medical services block

Bed Number
Ward: 65
ICU: 0

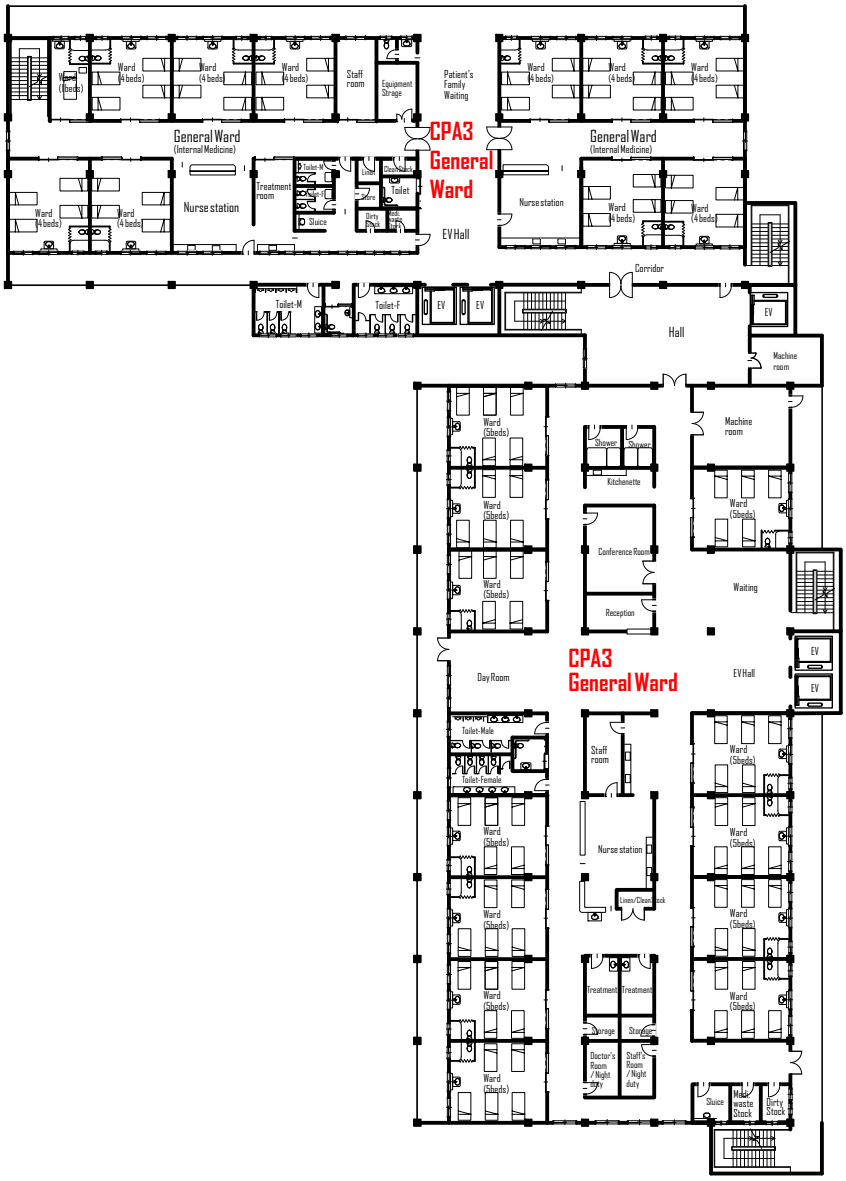


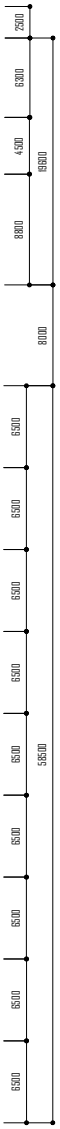

# 4th Floor Plan




## General medical service block

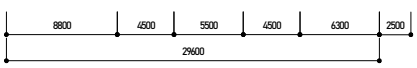
Bed Number
Ward: 41
ICU: 0



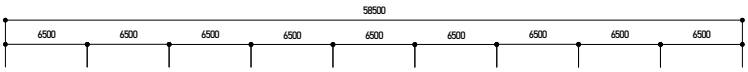




## Advanced medical services block

Bed Number
Ward: 60
ICU: 0

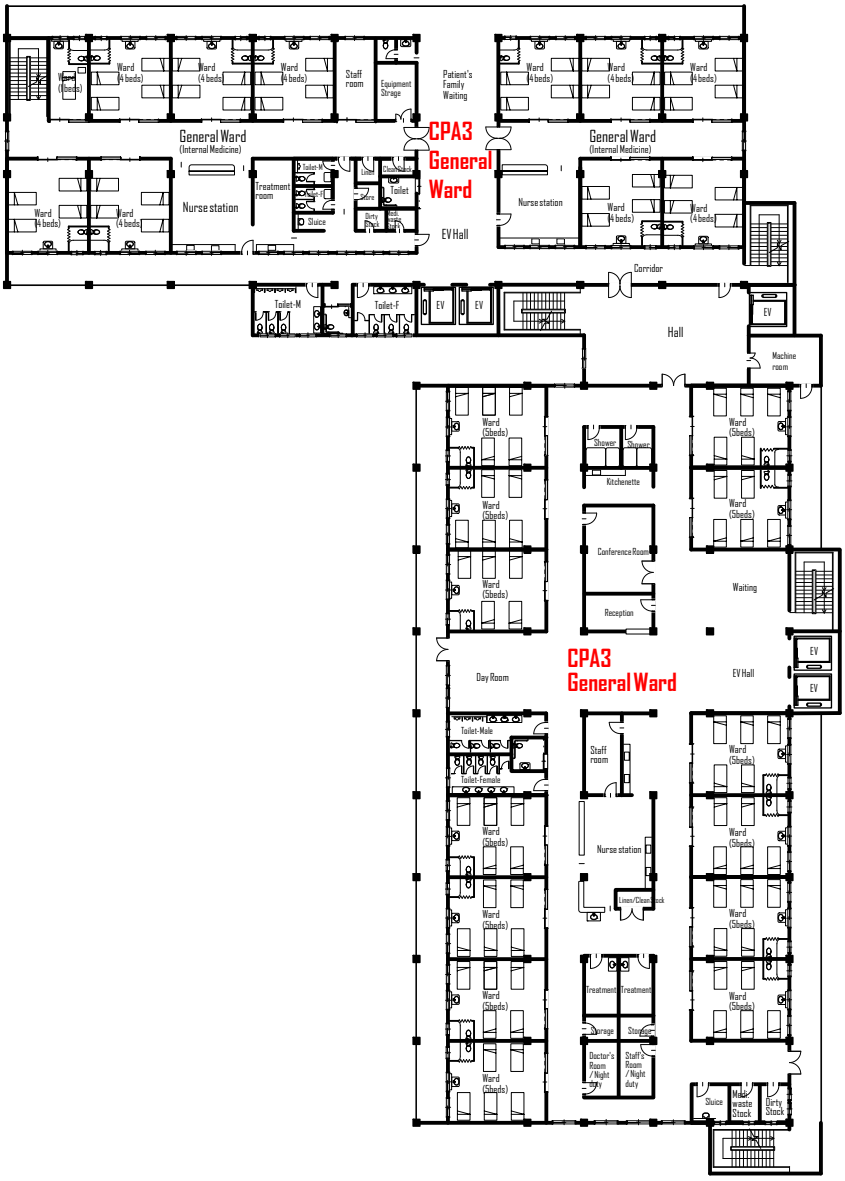


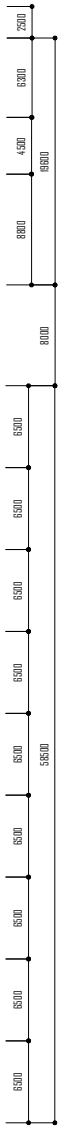

# 5th Floor Plan



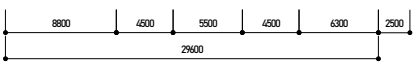

## General medical service block

Bed Number
Ward: 41
ICU: 0



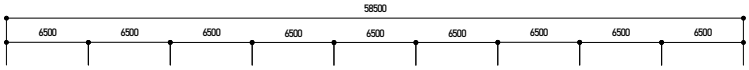




## Advanced medical services block



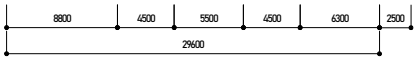

Bed Number
Ward: 85
ICU: 0

# 6th Floor Plan

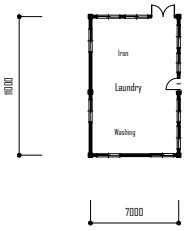



## General medical service block

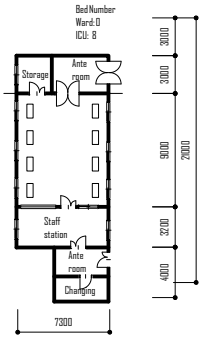

## Advanced medical services block




# 7th Floor Plan




# Laundry




# Renovation for NICU in JICA ObGy bldg

## 7. Catchment Area of 7 Regional Hospitals and Access Population within 2 and 3 Hours of the 2 Targeted Hospitals (as Regional Hospitals)

The estimated future population of catchment areas for the seven regional hospitals was calculated as follows using the data from the Provisional Population Census 2019.

**Table 7.1 Estimated Population Covered by Each Regional Hospital**

| Regional Hospital | Covered population |
|---|---|
| **Siem Reap Hospital** | **1,933,122** |
| **Kampong Cham Hospital** | **2,020,789** |
| Streng Treng Hospital | 464,004 |
| Battambang Hospital | 2,470,520 |
| Kampot Hospital | 972,353 |
| Svay Rieng Hospital | 1,145,295 |
| Phnom Penh National Hospitals | 6,185,933 |

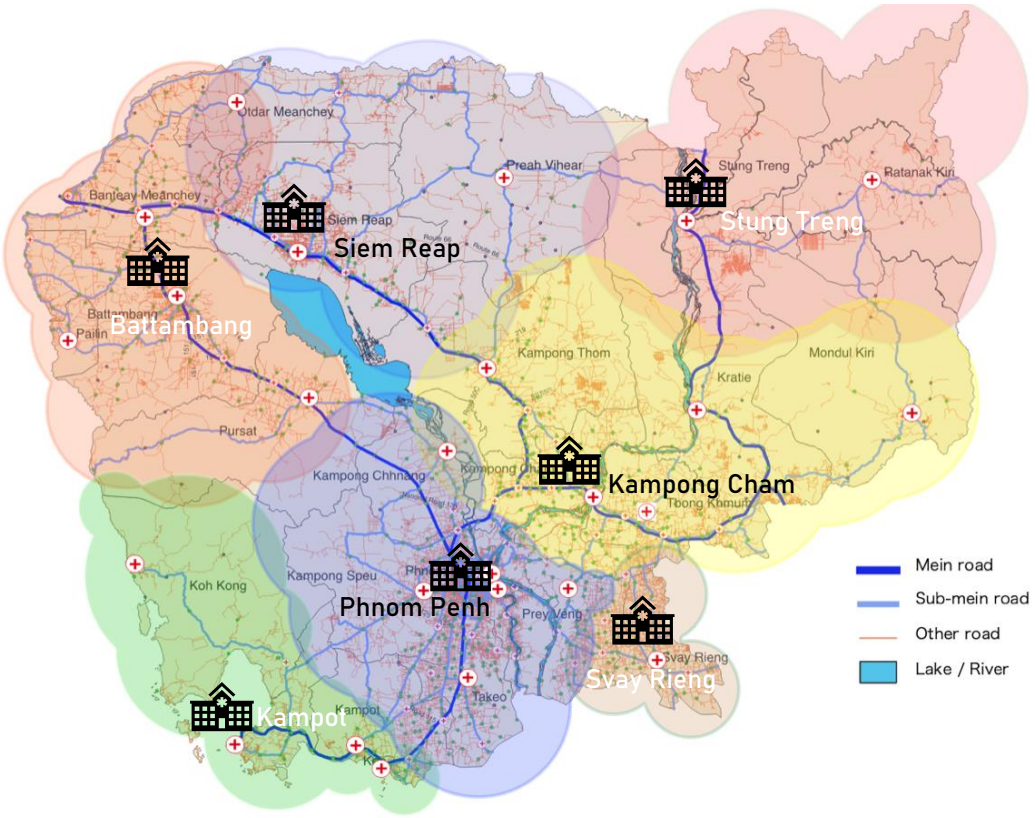



**Fig. 7.1 Coverage Area of Each Regional Hospital**

The table below shows the estimated population with access to each of the targeted regional hospitals and the national hospital in Phnom Penh within 3 hours by vehicle.

**Table 7.2 Estimated Population Accessed within 3 Hours of the Two Target Hospitals**

| Regional Hospital | Covered population |
|---|---|
| **Siem Reap Hospital** | **3,047,027** |
| **Kampong Cham Hospital** | **4,051,917** |
| Phnom Penh National Hospitals | 6,539,019 |

(The population data for each area was taken from the Provisional Population Census 2019.)

The access areas to the two targeted hospitals and the Phnom Penh National Hospital by vehicle within 2 and 3 hours are shown in the figure below. The blue lines indicate 2-hour access and the red lines indicate 3-hour access.

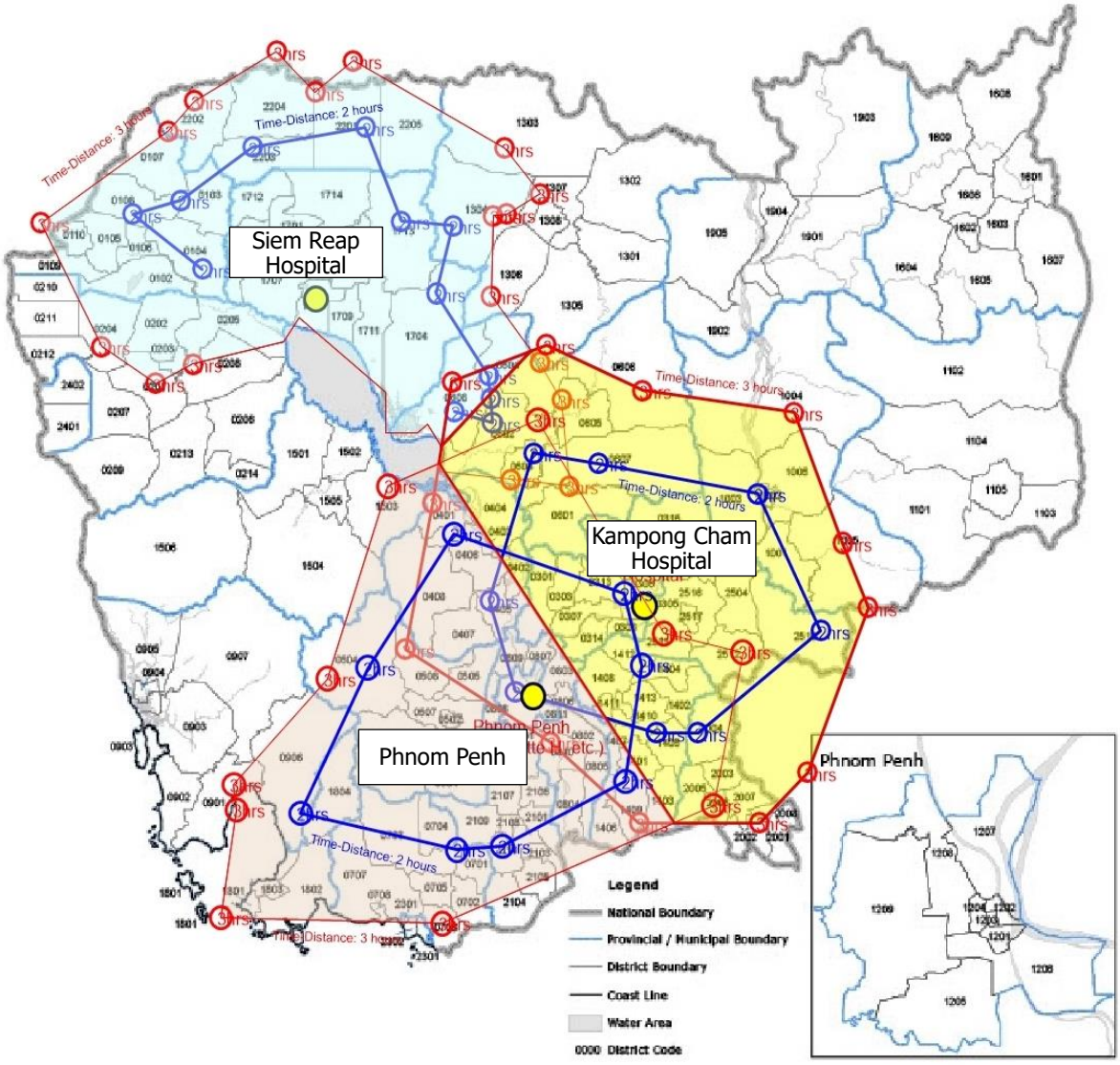



**Fig. 7.2 Access Area within 2 and 3 Hours of the Two Targeted Hospitals (as Regional Hospitals)**

**Appendix D-2: Project Cost**

Confidential

## Appendix D-3: List of Equipment

Siem Reap

| Package | |
|---|---|
| 1 | General Medical Equipment |
| 2 | Ward Equipment and Furniture |
| 3 | Diagnostic Imaging |

General Medical Services Building

| No | Clinical Departments / Section | | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|
| 1 | Reception | Insurance Premium, etc. | Desk, Reception | 3 | SMR-G-1 | 2 |
| | | | Chair, Staff | 9 | SMR-G-2 | 2 |
| | | | Filing Cabinet, Document | 9 | SMR-G-3 | 2 |
| 2 | Pharmacy | | Cabinet, Medicine | 3 | SMR-G-4 | 2 |
| | | | Work Table, Pharmacy | 2 | SMR-G-5 | 2 |
| | | | Chair, Staff | 10 | SMR-G-6 | 2 |
| | | | Electric Balance | 3 | SMR-G-7 | 2 |
| | | | Medicine Refrigerator | 2 | SMR-G-8 | 2 |
| | | | Cabinet, Medicine 2 | 20 | SMR-G-67 | 2 |
| | | | Pharmaceutical Shelf | 20 | SMR-G-68 | 2 |
| | | | Medicine Refrigerator | 4 | SMR-G-69 | 2 |
| | | | Work Table, Pharmacy | 3 | SMR-G-70 | 2 |
| | | | Chair | 10 | SMR-G-71 | 2 |
| | | | Medication Cart | 4 | SMR-G-72 | 2 |
| | | | Desk and Chair | 6 | SMR-G-73 | 2 |
| 3 | Outpatient | Triage, Dermatology, Diabetes, and Psychiatry,<br>Internal Medicine, Surgery (Advanced) | Diagnostic Set | 7 | SMR-G-9 | 1 |
| | | | Examination Table | 7 | SMR-G-10 | 2 |
| | | | Instrument Cabinet | 7 | SMR-G-11 | 2 |
| | | | Client PC (PACS) | 7 | SMR-G-12 | 1 |
| | | | Weighing Scale | 7 | SMR-G-13 | 1 |
| | | | Blood Pressure Meter, Electric | 7 | SMR-G-14 | 1 |
| | | | Basket | 7 | SMR-G-15 | 2 |
| | | | Desk, Doctor | 7 | SMR-G-16 | 2 |
| | | | Chair, Doctor | 7 | SMR-G-17 | 2 |
| | | | Chair, Patient | 7 | SMR-G-18 | 2 |
| | | ENT | Audiometer | 1 | SMR-G-19 | 1 |
| | | | ENT Treatment Unit with Chair | 1 | SMR-G-20 | 1 |
| | | | Suction Machine | 1 | SMR-G-21 | 1 |
| | | Dental Clinic | Dental Unit with Chair | 2 | SMR-G-22 | 1 |
| | | | Extraoral Vacuum Unit | 2 | SMR-G-23 | 1 |
| | | | Handpiece Set | 2 | SMR-G-24 | 1 |
| | | | Instrument Set (mirror, tweezers, etc.) | 2 | SMR-G-25 | 1 |
| | | | Sterilizer, Dental | 2 | SMR-G-26 | 1 |
| | | | Dental X-ray | 1 | SMR-G-27 | 3 |
| 4 | Rehabilitation | Physictherapy, occupational Therapy | Sling therapy bed | 1 | SMR-G-28 | 1 |
| | | | Treatment Table | 1 | SMR-G-29 | 1 |
| | | | Mat | 1 | SMR-G-30 | 1 |
| | | | Weight-unloading Machine | 1 | SMR-G-31 | 1 |
| | | | Parallel Bar | 1 | SMR-G-32 | 1 |
| | | | Low Frequency Therapy Machine | 1 | SMR-G-33 | 1 |
| | | | Infrared Therapy Machine | 1 | SMR-G-34 | 1 |
| | | | Ultrasonic Therapy Machine | 1 | SMR-G-35 | 1 |
| | | | Hot Pack Humidifier | 1 | SMR-G-36 | 1 |
| | | | Traction Therapy Apparatus | 1 | SMR-G-37 | 1 |
| 5 | ICU | 47 Beds (Total No. of Beds) | ICU bed | 47 | SMR-G-38 | 2 |
| | | | Vital Sign Monitor | 47 | SMR-G-39 | 1 |
| | | | Ventilator | 3 | SMR-G-40 | 1 |
| | | | Suction Machine | 5 | SMR-G-41 | 1 |
| | | | Infusion Pump | 47 | SMR-G-42 | 1 |
| | | | Syringe Pump | 20 | SMR-G-43 | 1 |
| | | | ECG | 1 | SMR-G-44 | 1 |
| | | | Blood Gas Analyzer | 2 | SMR-G-45 | 1 |
| | | | X-ray, Mobile | 1 | SMR-G-46 | 3 |
| | | | Client PC (PACS) | 1 | SMR-G-47 | 1 |
| 6 | Patient Ward | 181 Beds (total No. of Beds) | Bed | 181 | SMR-G-48 | 2 |
| | | | Bedside Cabinet | 181 | SMR-G-49 | 2 |
| | | | Overbed Table | 181 | SMR-G-50 | 2 |
| | | | Blood Pressure Meter | 15 | SMR-G-51 | 1 |
| | | | Suction Machine | 15 | SMR-G-52 | 1 |
| | | | ECG | 6 | SMR-G-53 | 1 |
| | | | Weight and Height Scale | 15 | SMR-G-54 | 1 |
| | | | Table, Nurse Station | 15 | SMR-G-55 | 2 |
| | | | Chair, Nurse Station | 120 | SMR-G-56 | 2 |
| | | | Instrument Trolley | 15 | SMR-G-57 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Medicine Trolley | 15 | SMR-G-58 | 2 |
| | | | | Instrument Cabinet | 10 | SMR-G-59 | 2 |
| | | | | Medicine Cabinet | 10 | SMR-G-60 | 2 |
| | | | | Filing Cabinet | 10 | SMR-G-61 | 2 |
| | | | | X-ray, Mobile | 2 | SMR-G-62 | 3 |
| | | | | Client PC (PACS) | 10 | SMR-G-63 | 1 |
| 7 | Mini Kitchen | | | Refrigerator | 2 | SMR-G-64 | 2 |
| | | | | Gas Stove for Cooking | 2 | SMR-G-65 | 2 |
| | | | | Microwave Oven | 2 | SMR-G-66 | 2 |

Advanced Medical Services Building

| No | Clinical Departments / Section | | | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpetient | | | Diagnostic Set | 9 | SMR-A-1 | 1 |
| | | | | Examination Table | 9 | SMR-A-2 | 2 |
| | | | | Instrument Cabinet | 9 | SMR-A-3 | 2 |
| | | | | Client PC (PACS) | 9 | SMR-A-4 | 1 |
| | | | | Weighing Scale | 9 | SMR-A-5 | 1 |
| | | | | Blood Pressure Meter | 9 | SMR-A-6 | 1 |
| | | | | Basket | 9 | SMR-A-7 | 2 |
| | | | | Desk, Doctor | 9 | SMR-A-8 | 2 |
| | | | | Chair, Doctor | 9 | SMR-A-9 | 2 |
| | | | | Chair, Patient | 9 | SMR-A-10 | 2 |
| 2 | Oncology | Chemotherapy | | Bed, Chemotherapy | 3 | SMR-A-11 | 2 |
| | | | | Reclining Chair, Chemotherapy | 3 | SMR-A-12 | 2 |
| | | | | IV Stand | 9 | SMR-A-13 | 1 |
| | | | | Stretcher | 2 | SMR-A-14 | 1 |
| | | | | ECG | 1 | SMR-A-15 | 1 |
| | | | | Vital Sign Monitor | 2 | SMR-A-16 | 1 |
| | | | | Pulse Oximeter | 2 | SMR-A-17 | 1 |
| | | | | Infusion Pump | 10 | SMR-A-18 | 1 |
| | | | | Syringe Pump | 5 | SMR-A-19 | 1 |
| | | | | Oxygen Cylinder | 2 | SMR-A-20 | 1 |
| | | | | Clean Bench | 1 | SMR-A-21 | 1 |
| | | | | Safety Cabinet | 1 | SMR-A-22 | 1 |
| 3 | Physiological Function Testing | Physiological Function Testing | | Stress Test System with ECG Analyzer | 1 | SMR-A-23 | 1 |
| | | | | Holter ECG | 1 | SMR-A-24 | 1 |
| | | | | ECG | 1 | SMR-A-25 | 1 |
| | | | | Ultrasound (Echo) | 1 | SMR-A-26 | 1 |
| | | | | Electroencephalograph | 1 | SMR-A-27 | 1 |
| | | | | Electromyograph | 1 | SMR-A-28 | 1 |
| | | | | Pulmonary Function Analyzer | 1 | SMR-A-29 | 1 |
| | | | | Client PC (PACS) | 3 | SMR-A-30 | 1 |
| 4 | Video Endoscope | Endoscopic Examination and Treatment | | Upper Gastrointestinal Video Fiberscope | 1 | SMR-A-31 | 1 |
| | | | | Lower Gastrointestinal Video Fiberscope | 1 | SMR-A-32 | 1 |
| | | | | Video Bronchoscope | 1 | SMR-A-33 | 1 |
| | | | | Endoscopic Cleaner | 1 | SMR-A-34 | 1 |
| | | | | Examination Table | 2 | SMR-A-35 | 1 |
| | | | | Client PC (PACS) | 1 | SMR-A-36 | 1 |
| 5 | Diagnostic Imaging | | | X-ray, General | 1 | SMR-A-37 | 3 |
| | | | | X-ray, Fluoroscopy | 1 | SMR-A-38 | 3 |
| | | | | CT | 1 | SMR-A-39 | 3 |
| | | | | MRI | 1 | SMR-A-40 | 3 |
| | | | | Mammography | 1 | SMR-A-41 | 3 |
| | | | | PACS Station | 1 | SMR-A-42 | 1 |
| | | | | Ultrasound | 1 | SMR-A-43 | 3 |
| | | | | Ultrasound (Echo) | 1 | SMR-A-44 | 3 |
| | | | | Client PC (PACS) | 1 | SMR-A-45 | 1 |
| 6 | Specimen Testing | Specimen Testing<br>Hematology, Biochemistry, Microbiology, Immunology and Serology, Pathology, Blood Transfusion | | Hematology Analyzer | 1 | SMR-A-46 | 1 |
| | | | | Blood Coagulation Analyzer | 1 | SMR-A-47 | 1 |
| | | | | Blood Sedimentation Analyzer | 1 | SMR-A-48 | 1 |
| | | | | Bilirubin Analyzer | 1 | SMR-A-49 | 1 |
| | | | | Biochemistry Analyzer | 1 | SMR-A-50 | 1 |
| | | | | Electrolyte Analyzer | 1 | SMR-A-51 | 1 |
| | | | | Urine Analyzer | 1 | SMR-A-52 | 1 |
| | | | | Immunoassay Analyzer | 1 | SMR-A-53 | 1 |
| | | | | Bacterial Analyzers | 1 | SMR-A-54 | 1 |
| | | | | Blood Culture Analyzer | 1 | SMR-A-55 | 1 |
| | | | | Safety Cabinet | 1 | SMR-A-56 | 1 |
| | | | | Automatic Fecal Occult Blood Analyzer | 1 | SMR-A-57 | 1 |
| | | | | Microtome | 1 | SMR-A-58 | 1 |
| | | | | Cryostat Microtome | 1 | SMR-A-59 | 1 |
| | | | | Dehydration, Dewaxing and Paraffin Infiltration | 1 | SMR-A-60 | 1 |
| | | | | Paraffin Inclusion Block | 1 | SMR-A-61 | 1 |
| | | | | Automatic Staining Machine | 1 | SMR-A-62 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Automated Pathology Specimen Encapsulation A | 1 | SMR-A-63 | 1 |
| | | | | Automated Cell Collection Device | 1 | SMR-A-64 | 1 |
| | | | | Pathology Microscope | 1 | SMR-A-65 | 1 |
| | | | | Client PC (PACS) | 3 | SMR-A-66 | 1 |
| 7 | Operation Theatre | 2 Operating Rooms | | Operating Light | 2 | SMR-A-67 | 1 |
| | | | | Operating Table | 2 | SMR-A-68 | 1 |
| | | | | Electrosurgical Unit | 2 | SMR-A-69 | 1 |
| | | | | Anesthesia Machine | 2 | SMR-A-70 | 1 |
| | | | | Vital Sign Monitor | 2 | SMR-A-71 | 1 |
| | | | | Suction Machine | 2 | SMR-A-72 | 1 |
| | | | | Operating Microscope | 2 | SMR-A-73 | 1 |
| | | | | X-ray, C-arm | 1 | SMR-A-74 | 3 |
| | | | | Laparpscope Set | 1 | SMR-A-75 | 1 |
| | | | | Arthroscope | 1 | SMR-A-76 | 1 |
| | | Cath Lab | | Operating Light | 2 | SMR-A-77 | 1 |
| | | | | Operating Table | 2 | SMR-A-78 | 1 |
| | | | | Electrosurgical Unit | 1 | SMR-A-79 | 1 |
| | | | | Anesthesia Machine | 1 | SMR-A-80 | 1 |
| | | | | Vital Sign Monitor | 2 | SMR-A-81 | 1 |
| | | | | Suction Machine | 2 | SMR-A-82 | 1 |
| | | | | Angiography, Bi-plane | 1 | SMR-A-83 | 3 |
| | | | | Angiography, Single-plane | 1 | SMR-A-84 | 3 |
| | | | | Contrast Media Injector | 2 | SMR-A-85 | 1 |
| | | | | IABP (Intra-aortic balloon pumping system) | 1 | SMR-A-86 | 1 |
| | | | | Blood Gas Analyzer | 1 | SMR-A-87 | 1 |
| | | | | Blood Coagulation Analyzer | 1 | SMR-A-88 | 1 |
| | | | | Defibrillator | 1 | SMR-A-89 | 1 |
| | | | | ECG | 1 | SMR-A-90 | 1 |
| | | | | Client PC (PACS) | 1 | SMR-A-91 | 1 |
| | | | | Scrub Station | 4 | SMR-A-92 | 1 |
| | | | | High Pressure Steam Sterilizer | 1 | SMR-A-93 | 1 |
| | | | | Instrument Cabinet | 2 | SMR-A-94 | 2 |
| | | Recovery | | Recovery Bed | 5 | SMR-A-95 | 2 |
| | | | | Vital Sign Monitor | 5 | SMR-A-96 | 1 |
| 8 | CSSD | CSSD | | Ultrasonic Cleaner | 2 | SMR-A-95 | 1 |
| | | | | High Pressure Steam Sterilizer | 2 | SMR-A-96 | 1 |
| | | | | Instrument Cabinet | 5 | SMR-A-97 | 2 |
| | | | | Linen Rack | 5 | SMR-A-98 | 2 |
| | | | | Instment Trolley | 2 | SMR-A-99 | 2 |
| | | | | Laundry Cart | 2 | SMR-A-100 | 2 |
| | | | | Work Table | 2 | SMR-A-101 | 2 |
| 9 | ICU | 22 Beds | | ICU bed | 22 | SMR-A-102 | 2 |
| | | | | Vital Sign Monitor, Central | 3 | SMR-A-103 | 1 |
| | | | | Vital Sign Monitor, Bedside | 22 | SMR-A-104 | 1 |
| | | | | Infusion Pump | 22 | SMR-A-105 | 1 |
| | | | | Syringe Pump | 22 | SMR-A-106 | 1 |
| | | | | Suction Machine | 8 | SMR-A-107 | 1 |
| | | | | X-ray, Mobile | 1 | SMR-A-108 | 3 |
| | | | | Ventilator | 12 | SMR-A-115 | 2 |
| | | | | Table, Nurse Station | 3 | SMR-A-116 | 2 |
| | | | | Chair | 22 | SMR-A-117 | 2 |
| | | | | Instrument Cabinet | 2 | SMR-A-118 | 2 |
| | | | | Filing Cabinet | 2 | SMR-A-119 | 2 |
| | | | | Instrument Trolley | 5 | SMR-A-120 | 2 |
| | | | | Blood Gas Analyzer | 1 | SMR-A-121 | 1 |
| | | | | Client PC (PACS) | 3 | SMR-A-122 | 2 |
| 10 | Patient Ward | 100 Beds | | Bed | 100 | SMR-A-123 | 2 |
| | | | | Bedside Cabinet | 100 | SMR-A-124 | 2 |
| | | | | Overbed Table | 100 | SMR-A-125 | 1 |
| | | | | Blood Pressure Meter | 6 | SMR-A-121 | 1 |
| | | | | Suction Machine | 6 | SMR-A-122 | 1 |
| | | | | ECG | 2 | SMR-A-123 | 1 |
| | | | | X-ray, Mobile | 1 | SMR-A-124 | 3 |
| | | | | Client PC (PACS) | 2 | SMR-A-125 | 1 |
| | | | | Table, Nurse Station | 3 | SMR-A-126 | 2 |
| | | | | Chair, Nurse Station | 30 | SMR-A-127 | 2 |
| | | | | Instrument Trolley | 6 | SMR-A-128 | 2 |
| | | | | Medicine Trolley | 6 | SMR-A-129 | 2 |
| | | | | Instrument Cabinet | 3 | SMR-A-130 | 2 |
| | | | | Medicien Cabinet | 3 | SMR-A-131 | 2 |
| | | | | Filing Cabinet | 3 | SMR-A-132 | 2 |
| | | | | Round Pails (for waste disposal) | 30 | SMR-A-133 | 2 |
| 11 | Training | Simulator Room | | Laparoscopy Simulator | 1 | SMR-A-134 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Endoscope Simulator | 1 | SMR-A-135 | 1 |
| | | | | Bronchoscopy Training System | 1 | SMR-A-136 | 1 |
| | | | | Mannequin for Patient Biometric Count | 1 | SMR-A-137 | 1 |
| 12 | Mortuary | Mortuary / Autopsy | | Mortuary Refrigerator (2 bodies) | 3 | SMR-A-143 | 1 |
| | | | | Mortuary Table | 2 | SMR-A-143 | 1 |
| | | | | Autopsy Table | 2 | SMR-A-143 | 1 |
| | | | | Autopsy Instrument Set | 2 | SMR-A-143 | 1 |

Laundry

| No | Clinical Departments / Section | | | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Laundry | | | Laundry Machine | 2 | SMR-A-144 | 2 |
| | | | | Drying Machine | 2 | SMR-A-145 | 2 |
| | | | | Linen Cart | 5 | SMR-A-146 | 2 |
| | | | | Linen Rack | 10 | SMR-A-147 | 2 |
| | | | | Work Table | 3 | SMR-A-148 | 2 |

Kampong Cham

| Package | |
|---|---|
| 1 | General Medical Equipment |
| 2 | Ward Equipment and Furniture |
| 3 | Diagnostic Imaging |

General Medical Services Building

| No | Clinical Departments / Section | | | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Reception | Insurance Premium, etc. | | Desk, Reception | 3 | KMC-G-1 | 2 |
| | | | | Chair, Staff | 9 | KMC-G-2 | 2 |
| | | | | Filing Cabinet, Document | 9 | KMC-G-3 | 2 |
| 2 | Pharmacy | | | Cabinet, Medicine | 3 | KMC-G-4 | 2 |
| | | | | Work Table, Pharmacy | 2 | KMC-G-5 | 2 |
| | | | | Chair, Staff | 10 | KMC-G-6 | 2 |
| | | | | Electric Balance | 3 | KMC-G-7 | 2 |
| | | | | Medicine Refrigerator | 2 | KMC-G-8 | 2 |
| 3 | Outpatient | Internal Medicine, Surgery, Diabetes, Dermatology | | Diagnostic Set | 8 | KMC-G-9 | 1 |
| | | | | Examination Table | 8 | KMC-G-10 | 2 |
| | | | | Instrument Cabinet | 8 | KMC-G-11 | 2 |
| | | | | Client PC (PACS) | 8 | KMC-G-12 | 1 |
| | | | | Weighing Scale | 8 | KMC-G-13 | 1 |
| | | | | Blood Pressure Meter, Electric | 8 | KMC-G-14 | 1 |
| | | | | Basket | 8 | KMC-G-15 | 2 |
| | | | | Desk, Doctor | 8 | KMC-G-16 | 2 |
| | | | | Chair, Doctor | 8 | KMC-G-17 | 2 |
| | | | | Chair, Patient | 8 | KMC-G-18 | 2 |
| | | ENT | | Audiometer | 1 | KMC-G-19 | 1 |
| | | | | ENT Treatment Unit with Chair | 1 | KMC-G-20 | 1 |
| | | | | Suction Machine | 1 | KMC-G-21 | 1 |
| | | Dental Clinic | | Dental Unit with Chair | 2 | KMC-G-22 | 1 |
| | | | | Extraoral Vacuum Unit | 2 | KMC-G-23 | 1 |
| | | | | Handpiece Set | 2 | KMC-G-24 | 1 |
| | | | | Instrument Set (mirror, tweezers, etc.) | 2 | KMC-G-25 | 1 |
| | | | | Sterilizer, Dental | 2 | KMC-G-26 | 1 |
| | | | | Dental X-ray | 1 | KMC-G-27 | 3 |
| | | Eye | | Ophthalmoscope | 3 | KMC-G-28 | 1 |
| | | | | Slitlamp | 1 | KMC-G-29 | 1 |
| | | | | Automatic Visual Field Meter | 1 | KMC-G-30 | 1 |
| | | | | Ultrasonography | 1 | KMC-G-31 | 3 |
| | | | | Fundus Cmera | 1 | KMC-G-32 | 1 |
| | | | | Laser Unit | 1 | KMC-G-33 | 1 |
| 4 | Rehabilitation | Physiotherapy Occupational Theraphy | | Sling Therapy Bed | 1 | KMC-G-34 | 1 |
| | | | | Treatment Table | 1 | KMC-G-35 | 1 |
| | | | | Mat | 1 | KMC-G-36 | 1 |
| | | | | Weight-unloading Machine | 1 | KMC-G-37 | 1 |
| | | | | Parallel Bar | 1 | KMC-G-38 | 1 |
| | | | | Low Frequency Therapy Machine | 1 | KMC-G-39 | 1 |
| | | | | Infrared Therapy Machine | 1 | KMC-G-40 | 1 |
| | | | | Ultrasonic Therapy Machine | 1 | KMC-G-41 | 1 |
| | | | | Hot Pack Humidifier | 1 | KMC-G-42 | 1 |
| | | | | Traction Therapy Apparatus | 1 | KMC-G-43 | 1 |
| 5 | ICU | 49 Beds | | ICU Bed | 49 | KMC-G-44 | 2 |
| | | | | Vital Sign Monitor | 49 | KMC-G-45 | 1 |
| | | | | Ventilator | 10 | KMC-G-46 | 1 |
| | | | | Suction Machine (Mobile) | 10 | KMC-G-47 | 1 |
| | | | | Infusion Pump | 70 | KMC-G-48 | 1 |
| | | | | Syringe Pump | 20 | KMC-G-49 | 1 |
| | | | | ECG | 3 | KMC-G-50 | 1 |
| | | | | Blood Gas Analyzer | 2 | KMC-G-51 | 1 |
| | | | | X-ray, Mobile | 1 | KMC-G-52 | 3 |
| | | | | Clinent PC (PACS) | 1 | KMC-G-53 | 1 |
| 6 | Patient Ward | 205 Beds | | Bed | 205 | KMC-G-54 | 2 |
| | | | | Bedside Cabinet | 205 | KMC-G-55 | 2 |
| | | | | Overbed Table | 205 | KMC-G-56 | 2 |
| | | | | Blood Pressure Meter | 15 | KMC-G-57 | 1 |
| | | | | Suction Machine | 15 | KMC-G-58 | 1 |
| | | | | ECG | 3 | KMC-G-59 | 1 |
| | | | | Weight and Height Scale | 10 | KMC-G-60 | 1 |
| | | | | Table, Nurse Station | 10 | KMC-G-61 | 2 |
| | | | | Chair, Nurse Station | 60 | KMC-G-62 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Instrument Trolley | 10 | KMC-G-63 | 2 |
| | | | | Medicine Trolley | 10 | KMC-G-64 | 2 |
| | | | | Instrument Cabinet | 10 | KMC-G-65 | 2 |
| | | | | Medicine Cabinet | 6 | KMC-G-66 | 2 |
| | | | | Filing Cabinet | 6 | KMC-G-67 | 2 |
| | | | | X-ray, Mobile | 1 | KMC-G-68 | 3 |
| | | | | Client PC (PACS) | 6 | KMC-G-69 | 1 |
| 7 | Mini Kitchen | | | Refrigerator | 2 | KMC-G-70 | 1 |
| | | | | Gas Stove for Cooking | 2 | KMC-G-71 | 1 |
| | | | | Microwave Oven | 2 | KMC-G-72 | 1 |

Advanced Medical Services Building

| No | Clinical Departments / Section | | | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Outpatient | Emergency, Psychiatry | | Diagnostic Set | 9 | KMC-A-1 | 1 |
| | | | | Examination Table | 9 | KMC-A-2 | 2 |
| | | | | Instrument Cabinet | 9 | KMC-A-3 | 2 |
| | | | | Client PC (PACS) | 9 | KMC-A-4 | 1 |
| | | | | Weighing Scale | 9 | KMC-A-5 | 1 |
| | | | | Blood Pressure Meter | 9 | KMC-A-6 | 1 |
| | | | | Basket | 9 | KMC-A-7 | 2 |
| | | | | Desk, Doctor | 9 | KMC-A-8 | 2 |
| | | | | Chair, Doctor | 9 | KMC-A-9 | 2 |
| | | | | Chair, Patient | 9 | KMC-A-10 | 2 |
| 2 | Oncology | Chemotherapy | | Bed, Chemotherapy | 3 | KMC-A-11 | 1 |
| | | | | Rclining Chair, Chemotherapy | 3 | KMC-A-12 | 1 |
| | | | | IV Stand | 9 | KMC-A-13 | 1 |
| | | | | Stretcher | 2 | KMC-A-14 | 1 |
| | | | | ECG | 1 | KMC-A-15 | 1 |
| | | | | Vital Sign Monitor | 2 | KMC-A-16 | 1 |
| | | | | Pulse Oximeter | 2 | KMC-A-17 | 1 |
| | | | | Infusion Pump | 10 | KMC-A-18 | 1 |
| | | | | Syringe Pump | 5 | KMC-A-19 | 1 |
| | | | | Oxygen Cylinder | 2 | KMC-A-20 | 1 |
| | | | | Clean Bench | 1 | KMC-A-21 | 1 |
| | | | | Safety Cabinet | 1 | KMC-A-22 | 1 |
| 3 | Physiological Function Testing | Physiological Function Testing | | Stress test system, with ECG analyzer | 1 | KMC-A-23 | 1 |
| | | | | Holter ECG | 1 | KMC-A-24 | 1 |
| | | | | ECG | 1 | KMC-A-25 | 1 |
| | | | | Ultrasound (Echo) | 1 | KMC-A-26 | 3 |
| | | | | Electroencephalograph | 1 | KMC-A-27 | 1 |
| | | | | Electromyograph | 1 | KMC-A-28 | 1 |
| | | | | Pulmonary Function Analyzer | 1 | KMC-A-29 | 1 |
| | | | | Client PC (PACS) | 3 | KMC-A-30 | 1 |
| 4 | Endoscope | Endoscopic Examination and Treatment | | Upper Gastrointestinal Video Fiberscope | 1 | KMC-A-31 | 1 |
| | | | | Lower Gastrointestinal Video Fiberscope | 1 | KMC-A-32 | 1 |
| | | | | Video Bronchoscope | 1 | KMC-A-33 | 1 |
| | | | | Endoscopic Cleaner | 1 | KMC-A-34 | 1 |
| | | | | Examination Table | 2 | KMC-A-35 | 1 |
| | | | | Client PC (PACS) | 1 | KMC-A-36 | 1 |
| 5 | Diagnostic Imaging | | | X-ray, General | 1 | KMC-A-37 | 3 |
| | | | | X-ray, Fluoroscopy | 1 | KMC-A-38 | 3 |
| | | | | CT | 1 | KMC-A-39 | 3 |
| | | | | MRI | 1 | KMC-A-40 | 3 |
| | | | | Mammography | 1 | KMC-A-41 | 3 |
| | | | | PACS Station | 1 | KMC-A-42 | 1 |
| | | | | Ultrasound | 1 | KMC-A-43 | 3 |
| | | | | Ultraound (Echo) | 1 | KMC-A-43 | 3 |
| | | | | Client PC (PACS) | 1 | KMC-A-44 | 1 |
| 6 | Specimen Testing | Specimen Testing | | Hematology Analyzer | 1 | KMC-A-45 | 1 |
| | | Hematology, Biochemistry, Microbiology, | | Blood Coagulation Analyzer | 1 | KMC-A-46 | 1 |
| | | Immunology and Serology, Pathology, | | Blood Sedimentation Analyzer | 1 | KMC-A-47 | 1 |
| | | Blood Transfusion | | Bilirubin Analyzer | 1 | KMC-A-48 | 1 |
| | | | | Biochemistry Analyzer | 1 | KMC-A-49 | 1 |
| | | | | Electrolyte Analyzer | 1 | KMC-A-50 | 1 |
| | | | | Urine Analyzer | 1 | KMC-A-51 | 1 |
| | | | | Immunoassay Analyzer | 1 | KMC-A-52 | 1 |
| | | | | Bacterial Analyzers | 1 | KMC-A-53 | 1 |
| | | | | Blood Culture Analyzer | 1 | KMC-A-54 | 1 |
| | | | | Safety Cabinet | 1 | KMC-A-55 | 1 |
| | | | | Automatic Fecal Occult Blood Analyzer | 1 | KMC-A-56 | 1 |
| | | | | Microtome | 1 | KMC-A-57 | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Cryostat Microtome | 1 | KMC-A-58 | 1 |
| | | | | Dehydration, Dwaxing and Paraffin Infiltration | 1 | KMC-A-59 | 1 |
| | | | | Paraffin Inclusion Block | 1 | KMC-A-60 | 1 |
| | | | | Automatic Staining Machine | 1 | KMC-A-61 | 1 |
| | | | | Automated Pathology Specimen Encapsulation | 1 | KMC-A-62 | 1 |
| | | | | Automated Cell Collection Device | 1 | KMC-A-63 | 1 |
| | | | | Pathology Microscope | 1 | KMC-A-64 | 1 |
| | | | | Client PC (PACS) | 3 | KMC-A-65 | 1 |
| 7 | Operation Theatre | 4 Operating Rooms | | Operating Light | 4 | KMC-A-66 | 1 |
| | | | | Operating Table | 4 | KMC-A-67 | 1 |
| | | | | Electrosurgical Unit | 4 | KMC-A-68 | 1 |
| | | | | Anesthesia Machine | 4 | KMC-A-69 | 1 |
| | | | | Vital Sign Monitor | 4 | KMC-A-70 | 1 |
| | | | | Suction Machine | 4 | KMC-A-71 | 1 |
| | | | | Operating Microscope | 3 | KMC-A-72 | 1 |
| | | | | X-ray, C-arm | 1 | KMC-A-73 | 1 |
| | | | | Laparpscope Set | 1 | KMC-A-74 | 1 |
| | | | | Arthroscope | 1 | KMC-A-75 | 1 |
| | | Cath Lab | | Operating Light | 2 | KMC-A-76 | 1 |
| | | | | Operating Table | 2 | KMC-A-77 | 1 |
| | | | | Electrosurgical Unit | 1 | KMC-A-78 | 1 |
| | | | | Anesthesia Machine | 2 | KMC-A-79 | 1 |
| | | | | Vital Sign Monitor | 2 | KMC-A-80 | 1 |
| | | | | Suction Machine | 2 | KMC-A-81 | 1 |
| | | | | Angiography, Bi-plane | 1 | KMC-A-82 | 3 |
| | | | | Angiography, Single-plane | 1 | KMC-A-83 | 3 |
| | | | | Contrast Media Injector | 2 | KMC-A-84 | 3 |
| | | | | IABP (Intra-aortic balloon pumping system) | 1 | KMC-A-85 | 1 |
| | | | | Blood Gas Analyzer | 1 | KMC-A-86 | 1 |
| | | | | Blood Coagulation Analyzer | 1 | KMC-A-87 | 1 |
| | | | | Defibrillator | 1 | KMC-A-88 | 1 |
| | | | | ECG | 1 | KMC-A-89 | 1 |
| | | | | Client PC (PACS) | 1 | KMC-A-90 | 1 |
| | | | | Scrub Station | 5 | KMC-A-91 | 1 |
| | | | | High Pressure Steam Sterilizer | 1 | KMC-A-92 | 1 |
| | | | | Instrument Cabinet | 2 | KMC-A-93 | 2 |
| | | Recovery | | Recovery Bed | 5 | KMC-A-94 | 2 |
| | | | | Vital Sign Monitor | 5 | KMC-A-95 | 1 |
| 8 | CSSD | CSSD | | Ultrasonic Cleaner | 2 | KMC-A-96 | 1 |
| | | | | High Pressure Steam Sterilizer | 2 | KMC-A-97 | 1 |
| | | | | Instrument Cabinet | 5 | KMC-A-98 | 2 |
| | | | | Linen Rack | 5 | KMC-A-99 | 2 |
| | | | | Instment Trolley | 2 | KMC-A-100 | 2 |
| | | | | Laundry Cart | 2 | KMC-A-101 | 2 |
| | | | | Work Table | 2 | KMC-A-102 | 2 |
| 9 | ICU | 19 Beds | | ICU bed | 19 | KMC-A-103 | 2 |
| | | | | Vital Sign Monitor, central | 2 | KMC-A-104 | 1 |
| | | | | Vital isgn Monitor, Bedside | 19 | KMC-A-105 | 1 |
| | | | | Infusion Pump | 19 | KMC-A-106 | 1 |
| | | | | Syringe Pump | 15 | KMC-A-107 | 1 |
| | | | | Suction Machine | 10 | KMC-A-108 | 1 |
| | | | | X-ray, Mobile | 1 | KMC-A-110 | 3 |
| | | | | Ventilator | 5 | KMC-A-111 | 1 |
| | | | | Table, Nurse Station | 2 | KMC-A-112 | 2 |
| | | | | Chair, Nurse Station | 10 | KMC-A-113 | 2 |
| | | | | Instrument Cabinet | 2 | KMC-A-114 | 2 |
| | | | | Filing Cabinet | 2 | KMC-A-115 | 2 |
| | | | | Instrument Trolley | 5 | KMC-A-116 | 1 |
| | | | | Blood Gas Analyzer | 1 | KMC-A-117 | 1 |
| | | | | Client PC (PACS) | 1 | KMC-A-118 | 1 |
| 10 | NICU | 8 Incubators | | Infant Incubator | 8 | KMC-A-119 | 1 |
| | | | | Infant Warmer | 2 | KMC-A-120 | 1 |
| | | | | Phototherapy Unit | 3 | KMC-A-121 | 1 |
| | | | | Ventilator, Infant | 2 | KMC-A-122 | 1 |
| | | | | Infusion Pump | 8 | KMC-A-123 | 1 |
| | | | | Syringe Pump | 5 | KMC-A-124 | 1 |
| | | | | Neonatal Monitor | 5 | KMC-A-125 | 1 |
| | | | | Suction Machine | 3 | KMC-A-126 | 1 |
| | | | | Baby Cot | 25 | KMC-A-146 | 1 |
| 11 | Patient Ward | 91 Beds | | Bed | 91 | KMC-A-127 | 2 |
| | | | | Bedside Cabinet | 91 | KMC-A-128 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Overbed Table | 91 | KMC-A-129 | 2 |
| | | | | Blood Pressure Meter | 6 | KMC-A-130 | 1 |
| | | | | Suction Machine | 6 | KMC-A-131 | 1 |
| | | | | ECG | 2 | KMC-A-132 | 1 |
| | | | | Client PC (PACS) | 2 | KMC-A-133 | 1 |
| | | | | Table, Nurse Station | 4 | KMC-A-134 | 2 |
| | | | | Chair, Nurse Station | 24 | KMC-A-135 | 2 |
| | | | | Instrument Trolley | 6 | KMC-A-136 | 2 |
| | | | | Medicine Trolley | 6 | KMC-A-137 | 2 |
| | | | | Instrument Cabinet | 3 | KMC-A-138 | 2 |
| | | | | Medicien Cabinet | 3 | KMC-A-139 | 2 |
| | | | | Filing Cabinet | 3 | KMC-A-140 | 2 |
| | | | | Round Pails (for waste disposal) | 30 | KMC-A-141 | 2 |
| 12 | Training | Simulator Room | | Laparoscopy Simulator | 1 | KMC-A-142 | 1 |
| | | | | Endoscope Simulator | 1 | KMC-A-143 | 1 |
| | | | | Bronchoscopy Training System | 1 | KMC-A-144 | 1 |
| | | | | Mannequin for Patient Biometric Count | 1 | KMC-A-145 | 1 |

Laoundry Building

| No | Clinical Departments / Section | | | Equipment | Q'ty | Equip. No. | Package |
|---|---|---|---|---|---|---|---|
| 1 | Laundry | | | Laundry Machine | 2 | KMC-A-146 | 2 |
| | | | | Drying Machine | 2 | KMC-A-147 | 2 |
| | | | | Linen Cart | 5 | KMC-A-148 | 2 |
| | | | | Linen Rack | 10 | KMC-A-149 | 2 |
| | | | | Work Table | 3 | KMC-A-150 | 2 |

**Appendix D-4:**
**Major Technical Specifications of the Advanced Medical Equipment**

| Equipment | Photo | Major Specifications | Remarks |
|---|---|---|---|
| MRI, 1.5T |  | 1) 1.5T Magnet<br>2) Having a Signal to Noise Ratio (SNR) images by AI technology<br>3) 1.4m self-shielded superconducting magnet<br>4) Gradient max/Slew Rate: 33mT/m, 125mT/m<br>5) Bore size: Approx. 630 mm or more<br>6) Height of patient table: Approx. 450 mm or less<br>7) Field of View (FOV): 550 x 550 x 550 mm or equivalent<br>8) Maximum receiving channels: 64 channels or more | 1) Following components would be included for standards configuration:<br>UPS, Chiller, Dehumidifier, Injector, Workstation, Distribution Board, Laser Imager, Shield Cage, Exhaust Fan, Interior Decoration, Quench Pipe, etc. |
| CT |  | 1) 320 detector rows with 0.5 mm wide, yielding a maximum of 16-cm z-axis coverage. Available 3D and 4D image processing<br>2) Gantry aperture: Approx. 780 mm in diameter<br>3) 360 degree continuous rotation<br>4) Rotation Speed: 0.35s min. or less<br>5) X-ray generator: Max power. 72kW or equivalent<br>6) X-ray tube: Heat capacity 7.5MHU, Cooling rage Max. 1,386kHU/min.<br>7) Patient couch: Height adjustable 332 to 900mm or equivalent | 1) Following components would be included for standards configuration:<br>UPS, Injector, Workstation, Distribution Board, Laser Imager, ECG trigger monitor, etc. |
| Single-Plane Angiography Machine |  | 1) Crossover angiography system, with 8” x 8” FPD<br>2) Floor-mounted C-arm support, C-arm rotation angle: RAO 120 degrees to LAO 120 degree, C-arm sliding CRA 50 degree to CAU 90 degree<br>3) X-ray high-voltage generator: Inverter method, max. power 100kW | 1) Following components would be included for standards configuration: UPS, Injector, etc. |

| | | | |
|---|---|---|---|
| Bi-Plane Angiography Machine |  | 1) Crossover angiography system, with 8” x 8” FPD<br>2) Lateral Movement: fluoroscopy / radiography range: 1,800 mm +/- 900 mm (Floor-Mounted), 490 mm (Ceiling-Suspended)<br>3) FPD near/away movement: 300 mm and 350 mm (depend on type of FPD)<br>4) X-ray High voltage generator: Inverter type<br>5) Radiology setting range: Tube voltage, 50 to 125kV<br>6) Fluoroscopy setting range: Tube voltage, 50 to 125kV<br>7) Digital fluoroscopy system: Available<br>8) Patient monitoring system: Bedside monitor multi-link interface with angiography system | 1) Following components would be included for standards configuration: UPS, Injector, etc. |
| X-ray Fluoroscopy |  | 1) Multi-purpose digital x-ray fluoroscopy system with FPD<br>2) C-arm moves in the RAO/LAO and CRA/CAU directions with longitudinal, tabletop lateral, and table elevator movement. Both AP and PA projections can be changed by easy operation.<br>3) High-frequency inverter generator, 80 kW | 1) Following components would be included for standards configuration: UPS, etc. |
| Digital General Fixed X-ray (Ceiling Mounted) |  | 1) Ceiling mounted Radiography System<br>2) High-voltage generation inverter method, Nominal electrical power 50kW, Short-term rating max. 630mA<br>3) Tube voltage setting range: 40kV to 150kV<br>4) Tube support: Longitudinal movement 4,400 mm, Lateral movement 2,000 mm, Vertical movement 1,700 mm | 1) Following components would be included for standards configuration: UPS, FPD, etc. |

| | | | |
|---|---|---|---|
| Digital Mammography |  | 1) Full Field Digital Detector<br>2) Minimum FPD size is 50 to 80 μm pixel<br>3) C-arm angulation from -135° to +180 °<br>4) 3D acquisition workstation<br>5) High precision tomosynthesis images, more than 15 projection images<br>6) Available automatic breast compression decompression control | 1) Following components would be included for standards configuration: UPS, etc. |
| Ultrasound<br>Probe: Linear, Convex |  | 1) Available of cardiac testing<br>2) LCD monitor: 23 inch wide or bigger<br>3) DVD/CD drive, Precision Imaging, D-THI, ApliPure+, Tissue Specific Optimization, Trapezoid Scan, Quick Scan, ADF (Advanced Dynamic Flow)<br>4) DICOM, Smart 3D, Software full keyboard, Vascularity Index, BEAM, SMI (Superb Micro-vascular Imaging), Intelligent Dynamic Micro Slice<br>5) Full Focus, AppLocker Security Management, Transducer connector holder and electric lifting of the operation panel are included. | 1) Following components would be included for standards configuration: UPS, Gel, Printer, Paper, etc. |
| Ultrasound<br>Probe: Linear,Sector, Convex |  | 1) Available for doppler<br>2) LCD monitor: 21.5-inch wide or bigger<br>3) DVD/CD drive, Precision Imaging, D-THI, ApliPure+, Tissue Specific Optimization, Trapezoid Scan, Quick Scan, Advanced Dynamic Flow (ADF)<br>4) DICOM, Smart 3D, Software full keyboard, Vascularity Index, BEAM, Probe connect holder are included. | 1) Following components would be included for standards configuration: UPS, Gel, Printer, Paper, etc. |

| | | | |
|---|---|---|---|
| Upper Gastrointestinal Videoscope |  | 1. Components<br>Videoscope system, LCD monitor (over 26 inches), High frequency electrosurgical unit, Ultrasonic coagulation, Carbon dioxide insufflator, Trolley, etc.<br>2. Specifications<br>Viewing angle: 140° or over<br>Depth of view: 3 to 100mm or more<br>Outer diameter: 8.9mm or less<br>Control unit: Shall have four scope switches to enable freeze, release, remote operation of peripheral devices<br>Narrow-band light observation (NBI) using the optical digital method shall be possible. | |
| Lower Gastrointestinal Videoscope |  | 1. Components<br>Videoscope system, LCD monitor (over 26 inches), High frequency electrosurgical unit, Ultrasonic coagulation, Carbon dioxide insufflator, Trolley, etc.<br>2. Specifications<br>Viewing angle: 170° during normal observation<br>Observation depth: 5 to 100mm or more<br>Outer diameter: 12.2 mm or less<br>Channel inner diameter:3.2 mm or less<br>Control unit: Four scope switches to enable freeze, release, remote operation of peripheral devices | |
| Video Bronchoscope |  <br>  | 1. Components<br>Bronchoscope set, Video scope, Image output monitor, Laryngoscope blade, Laryngoscope connecting cable piece, Laryngoscope, Storage stand, etc.<br>2. Specifications<br>Outer diameter: 3.5mm or less<br>Outer diameter: 3.0mm or less<br>Outer diameter of flexible part: 3.0mm or less<br>At least 4 scope switches shall be equipped on the control unit | |

**Appendix D-5: Economic and Financial Analysis**

## 1. Economic Analysis

### 1.1 Preconditions for Economic Analysis

This section explains the results of the economic analysis to evaluate the effectiveness of the Siem Reap Provincial Hospital and Kampong Cham Provincial Hospital from the viewpoint of Cambodia's national economy. Economic internal rate of return (EIRR) was adopted as an evaluation indicator. The indicator is calculated using annual cash inflow (economic benefit) and cash outflow (economic cost) with the discounted cash flow method.

#### A. Project period

The project period is set to be a total of 37 years. This includes the construction period starting in 2024. The starting year of the advanced medical services in both hospitals is assumed to be 2030.

#### B. Exchange rates

The exchange rates are set as follows.

- 1 USD = 145 JPY (Japanese yen)
- 1 USD = 4,102 KHR (Cambodian riel)

#### C. With project case and without project case

"With project" is a case in which JICA finances the two regional hospitals to provide advanced medical services, and "without project" is defined as a case without the project. Economic benefit realized by implementing projects is calculated as the difference between "without project" and "with project."

#### D. Social discount rate

The social discount rate is set to be 10%. This criterion is widely used as the required discount rate in developing countries.

### 1.2 Economic Benefits

The JICA survey team considered a reduction of opportunity cost and travel cost for patients and attendants, a reduction of NCD-related cost, a decrease in neonatal and maternal mortality, and a generation of value added by the medical human resources as the economic benefits of the project and tried to monetize each economic benefit. The economic benefit is calculated by taking the difference between "without project" and "with project."

#### A. Reduction of opportunity cost

The JICA survey team assumed that patients and attendants travel to hospitals in Phnom Penh to receive treatment in advanced medical services where there are no projects ("without project"). If the project is implemented, the patients can receive the treatment at the regional hospitals and save time and costs associated with traveling to Phnom Penh. This is considered as one of the economic benefits. The travel time saved is assumed to correspond to the opportunity cost of working time. In other words, if the

implementation of the project results in reducing travel time and the reduced time is used for productive activity such as work, this is considered to be value added to the national economy.

The JICA survey team calculated the opportunity cost of working time using GDP data. GDP per capita in 2019 was USD 1,713 in Cambodia. Divided by 260 working days per year, the GDP per day per capita is USD 6.6. The survey team also assumes that the GDP per day increases in accordance with Cambodia's economic development and calculates the increase by referring to mid- and long-term GDP growth rate in the "2021 Article IV Consultation Staff Report" by the IMF and population growth in the "World Population Prospects" by the UN Population Division. The table below shows the annual growth rate of GDP per capita and GDP per day in respective years.

**Table 1-1: Growth Rate of GDP Per Capita and GDP Per Day**

| | 2019 | 2025 | 2030 | 2035 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Growth rate of GDP per capita per year | 7.1% | 5.23% | 5.56% | 5.66% | 5.8% | 6.09% | 6.33% |
| GDP per day (USD) | 6.6 | 7.6 | 9.9 | 13.0 | 17.2 | 30.5 | 55.6 |

Source: JICA survey team

The JICA survey team estimated the future number of inpatients and outpatients based on the available HMIS data, population projections, and the current data on each provincial hospital. The estimated number of patients in 2032, which represents the increased number of patients with the project, is shown in the following table.

**Table 1-2: Estimated Number of Patients in 2032**

| | Siem Reap | Kampong Cham |
|---|---|---|
| Number of inpatients | 3,972 | 3,471 |
| Number of outpatients | 7,537 | 3,863 |

Source: JICA survey team

The JICA survey team assumed that, on average, 2 persons accompany a patient to receive medical treatment in Phnom Penh. It assumes that the hospitalized period is 7 days on average for the inpatients. Therefore, for the attendant persons, working days equivalent to 9 days are assumed to be saved with the project. For the outpatients, it is assumed that patients and attendant persons visit Phnom Penh twice a year to receive treatment. When calculating the travel cost saved to visit Phnom Penh, the team used the average bus fees to go to Phnom Penh from each target province. When calculating the accommodation cost saved, the team used the data from the Cambodia Socio-Economic Survey, compared the average living cost between the capital and rural areas, and used the difference as the accommodation cost saved with the project.

B. Reduction of NCD-related cost

Another economic benefit is the reduction of economic burden coming from NCDs. By introducing the high-quality medical services with project, the project expects to reduce the cost associated with NCDs. In calculating the cost, the team used the information from the WHO's report.[1] According to it, the total economic burden of NCDs in Cambodia was 5,970 billion riel in 2018. Using this figure, the team

[1] "Prevention and control of noncommunicable diseases in Cambodia, The case for investment"

estimated the reduction of NCD-related cost with project by applying the coverage ratio of the target provincial hospitals as well as the expected impact that the project has on the active NCDs workers. The estimated economic benefit of the reduction of NCD-related cost is approximately USD 6.9 million in 2030.

C. Decrease in neonatal and maternal mortality

The project plans to develop NICU facility in Kampong Cham Provincial Hospital. The JICA survey team assumed that neonatal and maternal mortality will improve with the project and tried to monetize the impact of the mortality reduction. Neonatal mortality rate was 13 per 1,000 live births in 2020 and MMR was 160 per 100,000 live births in 2017 in Cambodia.[2] With the project, the team assumed that these ratios will improve at the same level as Thailand, which is 5 per 1,000 live births for neonatal mortality rate and 37 per 100,000 live births for MMR. Considering the improved number of beds with the project, bed occupancy rate, and the above figures, the team estimated the number of babies and pregnant women whose lives can be saved with the project. Then, the figure was monetized using the annual GDP per capita.

D. Generation of value added by medical human resources

In this project, new medical income is generated by the provision of advanced medical services. A portion of this new medical income can be viewed as added value created by the provincial hospitals' regular and non-regular employees (medical human resources). From this perspective, the portion of the medical care revenue used for regular employees' bonuses and employment of non-regular employees is considered added value.

Table 1-3 shows the economic benefits of the annual reduction of opportunity cost, reduction of NCD-related cost, decrease in neonatal and maternal mortality, and the total economic benefit from 2030 to 2060.

**Table 1-3: Economic Benefit of the Project**

Unit: 1,000USD

| Year | Reduction of opportunity cost | Reduction of NCDs cost | Decrease in neonatal and maternal mortality | Generation of value added by medical human resources | Total economic benefit |
|---|---|---|---|---|---|
| 2030 | 896 | 6,881 | 9 | 207 | 7,993 |
| 2031 | 1,863 | 6,959 | 13 | 415 | 9,250 |
| 2032 | 1,642 | 7,039 | 17 | 415 | 9,113 |
| 2033 | 3,499 | 14,239 | 22 | 830 | 18,588 |
| 2034 | 3,734 | 14,402 | 26 | 830 | 18,991 |
| 2035 | 4,014 | 14,566 | 32 | 830 | 19,442 |
| 2036 | 6,830 | 24,554 | 38 | 1,383 | 32,805 |
| 2037 | 7,165 | 24,835 | 45 | 1,383 | 33,427 |
| 2038 | 7,521 | 25,119 | 52 | 1,383 | 34,075 |

[2] The World Bank Data

| Year | Reduction of opportunity cost | Reduction of NCDs cost | Decrease in neonatal and maternal mortality | Generation of value added by medical human resources | Total economic benefit |
|---|---|---|---|---|---|
| 2039 | 7,900 | 25,406 | 60 | 1,383 | 34,749 |
| 2040 | 8,312 | 25,696 | 69 | 1,383 | 35,459 |
| 2041 | 8,750 | 25,858 | 78 | 1,383 | 36,069 |
| 2042 | 9,218 | 26,021 | 89 | 1,383 | 36,710 |
| 2043 | 9,716 | 26,185 | 100 | 1,383 | 37,384 |
| 2044 | 10,247 | 26,350 | 112 | 1,383 | 38,092 |
| 2045 | 10,825 | 26,516 | 126 | 1,383 | 38,850 |
| 2046 | 11,443 | 26,683 | 141 | 1,383 | 39,649 |
| 2047 | 12,102 | 26,851 | 157 | 1,383 | 40,493 |
| 2048 | 12,807 | 27,020 | 175 | 1,383 | 41,385 |
| 2049 | 13,560 | 27,190 | 194 | 1,383 | 42,328 |
| 2050 | 14,382 | 27,362 | 215 | 1,383 | 43,342 |
| 2051 | 15,262 | 27,458 | 238 | 1,383 | 44,340 |
| 2052 | 16,203 | 27,554 | 263 | 1,383 | 45,403 |
| 2053 | 17,212 | 27,650 | 290 | 1,383 | 46,535 |
| 2054 | 18,292 | 27,747 | 320 | 1,383 | 47,741 |
| 2055 | 19,467 | 27,844 | 352 | 1,383 | 49,046 |
| 2056 | 20,728 | 27,941 | 388 | 1,383 | 50,439 |
| 2057 | 22,079 | 28,039 | 426 | 1,383 | 51,927 |
| 2058 | 23,529 | 28,137 | 468 | 1,383 | 53,517 |
| 2059 | 25,085 | 28,236 | 513 | 1,383 | 55,216 |
| 2060 | 26,780 | 28,335 | 562 | 1,383 | 57,059 |

Source: JICA survey team

## 1.3 Economic Cost

### A. Investment cost

The investment cost is comprised of construction fees, including the procurement of medical equipment, consulting services, and administration costs. These costs are estimated in Chapter 4-3-4: Project Cost and are used for this economic analysis. Price escalation, taxes, and interest during construction have been eliminated from the investment cost. The JICA survey team used the standard conversion factor of 0.9 when converting the financial prices of goods procured in Cambodia into the economic price.

Assuming that the life span of medical equipment is 10 years, the cost of renewal of such equipment is set at every 10 years. In addition, major building repairs (8% of construction costs) were also set to be made every 10 years.

**Table 1-4: Investment Cost of the Project**

B. Operation and maintenance (O&M) cost

O&M costs include medical equipment, particularly CT scans and MRI for all hospitals and angiography, personnel cost, and O&M cost. Assuming that the lifespan of the medical equipment is ten years, the cost to renew the medical equipment is added every decade. For the personnel cost, the team calculated the number of special doctors and paramedics, including nurses, that are required to add with project and multiplied it by their current salary. In addition, the personnel cost of non-regular staff, 60% of the regular staff, was also set as part of the maintenance cost. The team assumed that 1% of the construction cost is used for the O&M cost for hospital operations such as utilities and communication.

**Table 1-5: O&M Cost of the Project**

Confidential

1.4 Economic Internal Rate of Return

The EIRR of the project, which is calculated from annual net cash flow from 2024 to 2060 is 10.9%. This exceeds 10%, a benchmark of social discount rate for projects in developing countries which is commonly used. Therefore, the project is feasible from the viewpoint of Cambodia's national economic development.

**Table 1-6: Cashflow of the Project**

Confidential

## 2. Financial Analysis

2.1 Preconditions for the Financial Analysis

This section analyzes the financial feasibility of the project. Specifically, it verifies the financial feasibility of the project's annual cashflow using a financial internal rate of return (FIRR) and analyzes how likely the revenue with project will be able to cover the expenditures.

The project life is set to be same as the economic analysis, which is a total of 37 years. Both hospitals are expected to start operations of the advanced medical services in 2030. The exchange rate is set the same as in the economic analysis. The concept of without project and with project is also the same as in the economic analysis. The financial analysis is conducted in "real price," which means that future inflation is not considered.

2.2 Revenue

The JICA survey team calculated the expected future revenue of each hospital using the estimate of the number of patients and expected user fees. The estimated number of patients is calculated using the same method as in the economic analysis. The number of estimated inpatients and outpatients in 2030 is described in Table 1-2. It assumes that 20% of the total patients are HEF users. In calculating the revenue, the JICA survey team referred to the existing user fee data from Siem Reap and Battambang Provincial Hospitals and Khmer-Soviet Hospitals because it was difficult for the team to obtain user fee data on the national hospitals currently providing high-quality medical services. The team set the representative medical treatment fees for each diagnostic department which is expected to be realized with the project by considering the frequency of treatment and the combination of the treatments. The

estimation of medical treatment fees in each diagnostic department is shown in the table below.

**Table 2-1: Estimation of Medical Treatment Fees with Project**

Unit: Cambodian Riel

| Diagnostic department | Typical diseases | Outpatient | Inpatient |
|---|---|---|---|
| Cardiovascular internal medicine/ Cardiovascular surgery | Angina, cardiac infarct | 381,000 | 6,326,000 |
| Respiratory medicine (severe) | Respiratory failure, acute lung edema | 1,476.000 | 2,496,000 |
| Thoracic surgery (cancer) | Lung cancer, breast cancer | 1,496,000 | 8,278,000 |
| Neurology (severe) | Brain infarct | 2,340,000 | 3,000,000 |
| Neurosurgery (cancer, severe) | Brain cancer, head injury | 2,516,000 | 12,728,000 |
| Gastroenterological medicine | Cholecystitis, hepatitis | 2,492,000 | 2,600,000 |
| Digestive surgery (severe) | Cholelithiasis, peritonitis | 926,000 | 2,600,000 |
| Digestive surgery (cancer) | tumor in the gastrointestinal tract | 2,522,000 | 8,481,000 |
| Orthopedic (severe) | Femoral fracture, pelvic fracture | 1,050,000 | 9,112,000 |
| Urology (severe) | Kidney stone disease | 926,000 | 2,700,000 |
| Urology (cancer) | Bladder cancer, prostate cancer | 2,012,000 | 9,566,000 |
| Gynecology (cancer) | Cervical cancer, uterine body cancer, ovary cancer | 2,012,000 | 9,336,000 |
| General medicine | Diabetes | 504,000 | - |
| | Hypertension | 402,000 | - |
| | Dialysis | 44,240,000 | - |

Source: JICA survey team

Using the data of the estimated number of patients and the estimation of medical fees with the project, the expected revenue in each hospital with the project in 2032 is shown in the table below. The advanced medical services will begin in 2030, but the services are expected to be gradually expanded over a six-year period, with the planned services beginning in 2036, the seventh year after the services begin. The table below shows the projected revenues for both hospitals in 2036.

**Table 2-2: Expected Revenue in Each Hospital in 2036 (with Project)**

Unit: 1,000 USD

| Revenue items | Total |
|---|---|
| Human resource payment from the government | 2,304 |
| Revenue from inpatient | 9,513 |
| Revenue from outpatient | 2,897 |
| Total revenue | 14,714 |

Source: JICA survey team

2.3 Expense

A. Investment expense

Investment expense consists of construction, consulting service, administration costs, and taxes which are based on the estimates in Appendix D-3 Project Cost and used for this financial analysis. Price escalation and interest during construction have been eliminated from the investment expense.

**Table 2-3: Investment Expenses for Both Hospitals**
Confidential

B. O&M expenses

O&M expenses include utility cost, medical equipment cost, personnel cost, and pharmaceutical cost. The setting of personnel costs for regular staff, bonuses for regular staff, and human resource cost for non-regular staff, and utility cost are the same as in the economic analysis. In addition, the JICA survey team assumed that 45% of the total expected revenue would be used for pharmaceuticals. These figures are assumed based on the financial status of each hospital, as described in Chapter 3-3-3, as well as Cambodia's National Health Accounts.

**Table 2-4: O&M Expense for Both Hospitals**
Confidential

2.4 Results of the Financial Analysis

During the first six years after the introduction of advanced medical services, revenues will not cover maintenance costs. If the government spends $510,000 in subsidies each year from 2030 to 2025, revenues will also be able to cover maintenance and management costs during this period. Thereafter, revenues will be able to cover maintenance costs except in 2040 and 2050, when the government will invest in major building repairs and medical equipment updates. FIRR will be -5.9%.

**Table 2-5: Cashflow of the Project**
Confidential

The revenues, investment costs, maintenance costs, government subsidies from 2030 to 2025, and FIRR for both Siam Reap and Kampong Cham hospitals are shown in the table below.

**Table 2-6: Revenue, Expenditure, and Subsidy from the Government (accumulated total from 2024 to 2060)**
Confidential

2.5 Impact of the Introduction of PPP on the Results of Financial Analysis

When introducing large medical equipment such as CT scans and MRIs, some provincial hospitals make a PPP contract with private suppliers to hold down initial investment costs and entrust them with the operation and maintenance of the equipment. In this section, the JICA survey team tries to verify the impact of the introduction of PPP for large medical equipment on the overall financial sustainability of each hospital with the project. The following is assumed as the conditions for introducing PPP.

- Targeted medical equipment for PPP are CT scans and MRIs.
- Out of the inspection fee, 60% goes to the private supplier, 20% goes to the hospital's revenue and the remaining 20% is allocated to the remuneration for paramedics.

- There is no initial investment cost to introduce PPP to each hospital, provided that the contract period with the private supplier is long-term such as 10-15 years.
- O&M costs for the targeted medical equipment are covered by the supplier.

The JICA survey team conducted the financial analysis for introducing PPP under the above conditions. FIRR for each hospital with PPP is described in the following table.

**Table 2-7: FIRRs for Each Hospital with PPP**

| Hospitals | | Without PPP | With PPP |
|---|---|---|---|
| Both hospitals | FIRR (%) | -5.8 | -8.3 |
| | Annual subsidy amount (1,000 USD) | 510 (from 2030 to 2035) | 1,510 (from 2030 to 2060) |
| Siem Reap | FIRR (%) | -5.8 | -8.6 |
| | Annual subsidy amount (1,000 USD) | 130 (from 2030 to 2035) | 950 (from 2030 to 2060) |
| Kampong Cham | FIRR (%) | -6.0 | -8.1 |
| | Annual subsidy amount (1,000 USD) | 390 (from 2030 to 2035) | 560 (from 2030 to 2060) |

Source: JICA survey team

As the above table indicates, FIRRs for most hospitals become worse when introducing PPP for large medical equipment. This is considered because, in the case of with project, a certain amount of the hospital's revenue depends on the medical treatment that frequently uses CT scans and MRIs. Due to the nature of the high-level medical treatment that will be provided with the project, the equipment should be utilized frequently, which well exceeds the initial investment cost of the equipment. Because the amount of revenue dependent on the usage of CT and MRI is large, the impact of O&M cost getting zero for the equipment on FIRRs turns out to be very small.

## Appendix D-6: Additional Survey Conducted on Environmental and Social Considerations

Based on the initial study results of the data collection survey conducted from 2021 to 2022, two hospitals, namely Siem Reap Provincial[1] and Kampong Cham Provincial Hospital, were selected in January 2023 to be upgraded as regional hospitals. To implement these two hospital improvement projects successfully and to be in accordance with the Cambodian laws, it was decided that environmental approval would be obtained. It abides by both the JICA Guidelines for Environmental and Social Considerations (2022: hereinafter referred to as JICA Guideline) and the relevant Cambodian Environmental Impact Assessment (EIA) legal framework.

The JICA survey team supported the preparation of the "JICA environmental screening format" for both hospital improvement projects. With the relevant information provided by the MOH, the MOE had concluded that IEIA (Initial EIA) study was sufficient for the application for the environmental approval of both hospital improvement projects. It was noted that the Department of Preventive Medicine (DoPM) of MoH is the official governmental body responsible for this IEIA study.

To conduct these two IEIA studies effectively and smoothly, the environmental assessment, stakeholder analysis, and report preparation were consigned to a local environmental consulting firm. Figure 1 shows the study schedule outline of this IEIA study.

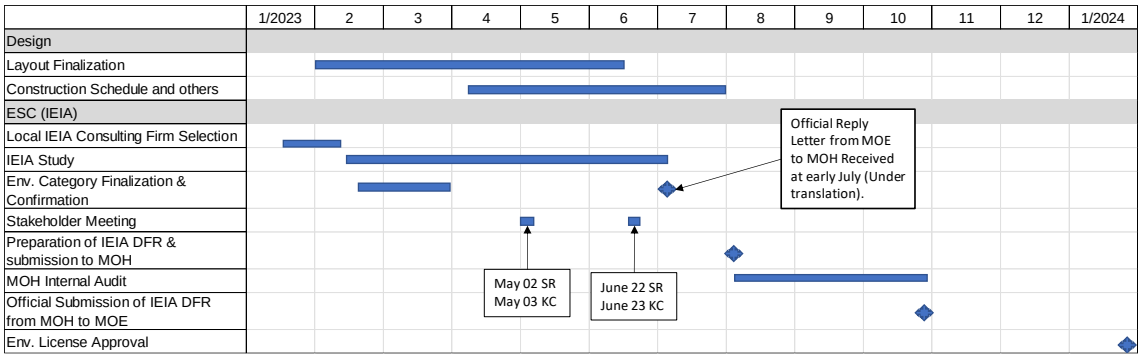



**Figure 1 Outline of IEIA Implementation Study**

(Source: JICA Study Team, 2023)

As shown in this figure, there are four (4) public consultations held within this IEIA study. There was a general election in Cambodia on 23 July 2023 to elect members of the National Assembly. The election campaign started on 1 July 2023. Consequently, the new Minister of MOH was

[1] There are hospital gate signs written as both "Provincial" and "Provincial Referral" at Siem Reap Hospital.

inaugurated in August 2023.

As shown in this figure, an IEIA draft final report (DFR) was developed and submitted to the MOH for their internal audit in early August of Year 2023. After the completion of the MOH internal audit process, the IEIA DFR was officially sent from the MOH to the MOE in October 2023 for their IEIA examination and approval. The IEIA report examination and approval usually takes a maximum of 3 months.

## Appendix D-7: Operation and Effect Indicators

The proposed indicators and their baseline and target values are shown in the table below. These indicators are set based on the project design mentioned in the appendixes of this report.

| No | Indicators | Baseline (2022)*1 | | Target (2032) [Two years after the Project completion] | |
|---|---|---|---|---|---|
| | | Siem Reap | Kampong Cham | Siem Reap | Kampong Cham |
| 1 | Number of Inpatients (per year) | 24,455 | 19,508 | 31,333 | 23,469 |
| 2 | Number of Outpatients (per year) | 90,883 | 29,857 | 112,533 | 38,684 |
| 3 | Number of CT scans performed (per year) | 4,320 | 1,042 | 5,389 | 1,312 |
| 4 | Number of MRI performed (per year) | 0 | 0 | 2,567 | 625 |
| 5 | Number of catheter surgeries performed (per year) | 0 | 0 | 360 | 360 |
| 6 | Number of cancer operations performed (per year) | 108 | 0 | 392 | 371 |
| 7 | Number of neurosurgeries performed (per year) | 91 | 0 | 114 | 107 |
| 8 | Number of cardiac surgeries performed (per year) | 0 | 0 | 86 | 81 |
| 9 | Number of OP new cases referred from health centers (per year) | 7,156 | 3,355 | 8,861 | 4,347 |

*1: baseline data in 2022 are based on HIS 2022 except No. 4 of Kampong Cham and No.9 of both hospitals which are collected from each hospital.

<Estimation methods for target in 2032>

| | |
|---|---|
| 1 | Based on the baseline data of inpatients in 2022, the target number is calculated by the population growth rate of each regional hospital catchment area from 2022 to 2030 and the national population growth rate from 2030 to 2032.<br>As per the number of advanced medical care inpatients who will be newly treated by upgrading the hospital, the number in 2022 is estimated based on the total number of advanced care patients nationwide and the population ratio of the seven regional hospital catchment areas. Then, the target value is calculated using the abovementioned population growth rates. |

| | |
|---|---|
| 2 | The target value of outpatients is estimated by calculating the patient increase rate from 2022 to 2032 using an approximate formula based on the trends in the number of outpatients over the past few years. The number of advanced medical care outpatients is estimated using the ratio of numbers of new outpatients and total inpatients for each hospital. |
| 3 | The target value is estimated based on the patient increase rate from 2022 to 2032. |
| 4 | The target value is estimated by multiplying the number of CT scans by the ratio of CT and MRI in 34 OECD countries, which is 47.63%. |
| 5 | The target value is set, taking into account the number of cardiologists to be assigned to each hospital in 2032 (1 full-time and 1 part-time). |
| 6 | The target value of Siem Reap is calculated by multiplying the baseline data in 2022 by the inpatient increase rate. The value for Kampong Cham is set as 30% of the figure estimated from the catchment area population ratio with Seim Reap, taking into account the number of health personnel as of 2032. |
| 7 | The target value of Siem Reap is calculated by multiplying the baseline data by the inpatient increase rate. The value for Kampong Cham is calculated based on the catchment area population ratio with Siem Reap. |
| 8: | The target value is estimated by the number of surgeries required for inpatients with angina pectoris and myocardial infarction (estimated under No 1). |
| 9 | The target value is estimated by multiplying the baseline data by the outpatient increase rate (used in No 2). |