

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT
OF
DISTRICT HOSPITALS
IN THE WESTERN PART OF KENYA
IN
THE REPUBLIC OF KENYA**

November 2006

JAPAN INTERNATIONAL COOPERATION AGENCY

The Consortium of Nihon Sekkei, Inc. and EARL Consultants, Inc.

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PREFACE

In response to a request from the Government of the Republic of Kenya, the Government of Japan decided to conduct a basic design study on the Project for Improvement of District Hospitals in the Western Part of Kenya and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Kenya a study team from January 16th to February 9th, 2006.

The team held discussions with the officials concerned of the Government of Kenya, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Kenya in order to discuss a draft basic design, and as this result, the present report was finalized.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Kenya for their close cooperation extended to the teams.

November 2006

Masafumi Kuroki
Vice President
Japan International Cooperation Agency

November 2006

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of District Hospitals in the Western Part of Kenya in the Republic of Kenya.

This study was conducted by the Consortium of Nihon Sekkei, Inc. and EARL Consultants, Inc. under a contract to JICA, during the period from January to November 2006. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Kenya and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Masahiro Ikawa
Project Manager

Basic Design Study Team on
the Project for Improvement of District Hospitals
in the Western Part of Kenya

The Consortium of Nihon Sekkei, Inc. and EARL Consultants, Inc.

Summary

The Republic of Kenya (hereinafter referred to as “Kenya”) is situated in East Africa, surrounded by Somalia, Uganda, Tanzania, Ethiopia and Sudan. Kenya became an independent country from British rule in 1963. Kenya has an area of 583 thousand square kilometers (about 1.5 times that of Japan), and its population is about 32.40 million (2004). Its Gross National Income (GNI) per capita is US Dollars 460 (2004).

The state of healthcare sector of Kenya, as is indicated by the maternal mortality rate being 1,000 for every 100 thousand births (2002) and the infant mortality rate being 78 for every 1,000 births (2002), ranks the lowest in the world, so do the surrounding countries in East Africa. The western part of the country sharing borders with Uganda and Tanzania (five districts in Nyanza and Rift Valley Provinces (with a population of 2.7 million)), in particular, suffer extensively from such infectious diseases as malaria, tuberculosis, measles, HIV / AIDS. Particularly the Province of Nyanza has the infantile mortality of 133 per 1,000 births (in 2003), which is the highest in Kenya. Similarly, the western part of Kenya is poor in social infrastructure in spite of their significant population, and many of their medical institutions at various levels were equipped as far back as from the 1940s to 1970s. Naturally, these medical institutions are suffering from such problems as obsolescence, failures of medical facilities and equipment. Although the government of Kenya is not necessarily conducting precise analysis of the indicators of medical and healthcare quality by region, it would be right to assume that the state of medical and healthcare service in the western part of the country is worse than the rest of the country from a lower rate of labor by hospitalization of 36.0 percent (2003) against Kenya’s national average of 40.1 percent (2003).

To improve such a situation, the Government of Kenya formulated in 1999 the “National Health Sector Strategic Plan (1999 - 2004)” which set forth delegation of authority to local governments, proper allocation of manpower, etc. in the healthcare sector, as priority themes. The government has promoted under this plan establishment of referral system of patients at district and lower levels, and various improvements of local medical and healthcare services, with cooperation of the World Bank, the United State, Japan and other donors.

The Government is now in the process of formulating the “National Health Sector Strategic Plan (2005 - 2010) to follow the “National Health Sector Strategic Plan (1999 - 2004).” Also, the Government has formulated the “Interim Operation Plan (2004 - 2005)” as the interim measure for the transit period whereby the Government promotes new measures including preparation of healthcare infrastructure as a priority measure.

The Government of Japan has established a development theme aimed at “economic and social development benefiting poor strata” in the Country Assistance Plan for Kenya, and placed “medical and healthcare service” as a high-priority area in the country plan, and thereby promoted various measures for strengthening functions of higher medical institutions at the central level and those for improving local medical and healthcare services.

For the western part in particular, JICA implemented a development study in 1998 “Study on Enhancement of District Health System,” and in this study JICA and the Kenyan side developed a master plan for strengthening the system for local medical and healthcare services. Based on the master plan, JICA implemented in 2001 a grant aid program, “Project for Improvement of Health Centers in the Western Part of Kenya,” and a Technical Cooperation project, “Project for Improvement of Health Service with a Focus on Safe Motherhood in Kisii and Kericho Districts,” since 2005, thereby promoting various activities intended to strengthen the management and operation of healthcare centers and improvement of maternity care services.

Such endeavors have achieved a certain degree of improvement in the primary medical and healthcare services in the primary level medical institutions. By contrast, district hospitals, which are secondary medical institutions, are left behind with obsolescent facilities and equipment, insufficiently functioning as district level referral institutions.

Under such a circumstance, the Government of Kenya filed in 2004 a request with the Government of Japan for a grant aid program intended to intensify the functions of Kisii District Hospital (classified as a quasi-province hospital) in Nyanza Province and Kericho District Hospital in Rift Valley Province, both being core hospitals for district level medical and healthcare services in the western part of Kenya, through provision of facilities and equipment, and thereby to improve the medical and healthcare services provided by these hospitals.

In response to this request, the government of Japan decided to conduct a basic design study, and the Japan International Cooperation Agency (JICA) dispatched a basic design study team in January 2005. The basic design study team had discussions with the concerned officials of the Kenyan side, investigated the concerned facilities, collected necessary materials, and surveyed the proposed construction site. After having conducted necessary studies in Japan, the basic design study team presented the draft report of basic design study in August 2006, and has finally completed this basic design study report.

The result of the basic design study confirms the necessity of improvement of the Kisii and Kericho District Hospitals. To achieve this purpose a conclusion was reached that it was necessary to construct the Outpatient Diagnosis and Treatment Building of the Kisii District Hospital and the Emergency Diagnosis and Treatment Building of the Kericho District Hospital, in Kisii City and Kericho City, respectively, and to implement provision and installation of equipment concerned with these two buildings.

The following is the outline of “The Project for Improvement of District Hospitals in the Western Part of Kenya”.

- Responsible Agency: The Ministry of Health, the Government of Kenya
- Implementing Agency: Kisii District Hospital and Kericho District Hospital
- Entire project period: Approximately 20 months, including the detailed design and tender period
- Planned construction site: sites in Kisii and Kericho Cities
- Building structure: Reinforced concrete structure (New construction)

Content of the Project:

Outline of the Cooperation Project for the Kisii District Hospital

| Major project breakdown (Number of stories / total floor area) | | Facility and equipment |
|--|--|---|
| Outpatient Department Building (Two-storied building / 3,704.00m ²) | | 1 st Floor Outpatient Department: General outpatient, Casualty, Special Clinic (internal medicine, surgery, pediatrics, E.N.T, eye clinic, dental clinic and obstetrics/gynaecology) X-ray Division: X-ray examination and Physiological examination Examination Division: Blood, physiological and pathological examinations Clerical and Administrative Division 2 nd Floor Operation Division: Operation room (3 rooms), sterilization and assembly HDU (high dependency unit) Division: H.D.U room, H.D.U. isolated room Delivery Division: Delivery room (5 rooms) |
| Ancillary facility (each one-storied building / 435.20m ²) | Machine Room Building (309.01m ²) | High Voltage Electric Room, Low Voltage Switchboard Room, Pump Room, Raw water Reservoir, Elevated cistern, Generator Room |
| | Toiler Building(65.04m ²) | Toilet for outpatients |
| | Incinerator furnace (57.42m ²) | Sorted waste storage space, incinerator furnace |
| | Others (3.73m ²) | Gate house |
| Medical equipment | | Procured for the Outpatient Department Building and some existing facilities |

Outline of the Cooperation Project for the Kericho District Hospital

| Major project breakdown | | Facility and equipment |
|--|---|--|
| Casualty (one-storied building / 425.10m ²) | | Casualty Emergency Physiological / Pathological Examination Room |
| Ancillary facility (each one-storied building / 77.00m ²) | Machine Room Building-1 (46.10m ²) | Low Voltage Switchboard Room, Generator Room |
| | Machine Room Building-2 (30.98m ²) | Elevated cistern, pump room |
| | Others (16.92m ²) | Raw water reservoir, Elevated water tank |
| Medical equipment | | Procured for the Casualty and some existing facilities |

The total expense required for this project is estimated at 1,350 million Yen (1,312 million Yen from the Japanese side and 38 million Yen from the Kenyan side).

The total budget for operation of the Kisii District Hospital in 2004/2005 was approximately 46 million KShs (about 71.3 million yen). It is estimated that the project will entail an increment of 13 million KShs (about 20.15 million yen) in management and maintenance expenses. (from the second year onward after the implementation of the project) This increase makes up 28% of the total operation budget of the Kisii District Hospital. On the other hand, the total budget for operation of the Kericho District Hospital was approximately 22.9 million KShs (about 35.5 million yen) in the fiscal year of 2004/2005. An increase in management and maintenance expenses incurred in this project (from the second year onward after the implementation of the project) is estimated at 2.92 million KShs (about 4.52 million yen), which makes up 13% of the total operation budget of the Kericho District Hospital.

The second year after the implementation of this project falls on the fiscal year of 2009/2010 of Kenya. Supposing that the budget for operation shows an annual increase of 6% (or an increment from 13 million KShs to 15.6 million KShs in 2009/2010) and 3% (or an increment from 2.92 million yen to 3.6 million KShs in 2009/2010) over that of 2004/2005 in the Kisii District Hospital and in the Kericho District Hospital respectively, both hospitals can afford the incremental amounts in their management and maintenance expenses. The Ministry of Health has made a commitment to meet the increased amount in the management and maintenance expenses of both hospitals.

The Kisii District Hospital is currently staffed with 453 employees and its staff cost amounts to approximately 55 million KShs (about 86 million yen). Upon the completion of the cooperation project, it will be required to increase the size of the staff by 82 persons. The staff cost thereof is estimated at approximately 11 million KShs (roughly 18 million yen), which accounts for about 21% of the current staff costs. On the other hand, the Kericho District Hospital is currently staffed with 294 employees and its staff cost amounts to roughly 36 million KShs (about 55 million yen). The necessity of hiring an additional staff of 34 persons will arise together with the completion of the cooperation project. The staff cost thereof is estimated at approximately 4 million KShs (about 6 million yen), which represents some 11% of the current staff costs. In Kenya the staff costs of every district hospital are commonly paid by the Ministry of Health. That is, the staff costs of the Kisii and Kericho District Hospitals are also paid by the Ministry. Under such circumstances, the Ministry of Health made a commitment, under its responsibility and authority, to pay the increases in the staff costs.

It is expected that the project will produce the following direct effect:

Kisii District Hospital

- 1) To improve the medical service function of the Hospital through bringing together the outpatient division and the central diagnosis and treatment division in the same building
The project will bring together the outpatient division and the central diagnosis and treatment division, which are separately located in the precincts of the Hospital at present as antiquated facilities, in the Outpatient Department Building. Thus, the rearrangement of the facilities at the optimum size will enable the Hospital to provide medical service efficiently and restore the normal service of diagnosis and treatment. After the optimization of facilities the numbers of operations and ultrasonographies will increase from 2,166 per year (in 2005) and 2,453 per year (in 2005) respectively.
- 2) To upgrade the quality of secondary medical service provided by the Kisii District Hospital
In addition to Japan's grant aid, the facilities improvement program has been under way with aid from the World Bank and others. The aid will improve the function of the Kisii District Hospital as secondary medical organization which has been one of the original purposes of the Hospital. That is, the Kisii District Hospital is classified also as a quasi-province hospital that is expected to accept patients from other district hospitals in the surrounding region. Hence, it will become possible for the Kisii District Hospital to provide appropriate secondary medical service to residents living in a wider area (i.e. to strengthen the referral system).
- 3) To achieve efficient hospital management
Through technical training offered under the soft component system, each of the Ministry of Health (including the office in the District of Kisii), Kisii District Hospital and Kericho District Hospital will have a growing awareness of the importance of facility maintenance from its own standpoint and build an appropriate system of management and maintenance based upon such awareness. Thus, each hospital will enhance the efficiency of its management. Likewise, the hospital will establish a medical waste treatment system, thereby contributing not only to the prevention of nosocomial infections but also to the establishment of management in full consideration for the issue of ensuring safety outside the hospital.
- 4) Model hospital of secondary medical level
The Kisii District Hospital will function pertinently as a secondary medical organization through the implementation of the JICA's cooperation project and also through improvements in the hospital wards at the expense of Kenya. As a result, from a long- and medium-ranged perspective it is expected that the referral system be strengthened in the target region. In addition, the Kisii District Hospital will play the role of a model hospital for developing secondary medical facilities in other regions in the future.

Kericho District Hospital

- 1) To improve the emergency diagnosis and treatment function
The Kericho District Hospital currently provides its emergency medical service in the General Outpatient Department, thereby lowering the medical service capacity of the Outpatient Department in general. When a new emergency diagnosis and treatment building is constructed at the Kericho District Hospital under this project, it will be able to provide speedy and efficient medical service to seriously ill or wounded emergency patients. One of its results will be seen as an increase in the number of outpatients from 86,374 cases per year (in 2005).

2) To upgrade the quality of secondary medical service

The construction of the emergency diagnosis and treatment building and the installation of necessary equipment will enhance the functions of the Hospital as a secondary medical organization. In particular, the function of its referral system for emergency patients will be strengthened.

It is expected that this project will produce the following indirect effect.

1) To enhance the function as an education hospital

The Kisii District Hospital is the implementing agency for training activities of lower level health workers as well as being the only secondary level health facility in Kisii District. Furthermore, it is the education hospital of the neighbouring Kenya Medical Training College Kisii Branch. Therefore, the provision of training rooms in Kisii District Hospital will enable the secure provision of rooms for training activities, enhancing the functions as an educational hospital and contribute to the improvement of medical services in the District.

2) Smooth implementation of technical cooperation activities

The Kisii District Hospital will be equipped with a training room, thus making it possible to implement technical cooperation activities more smoothly. As a result, it is expected that the project will contribute to achieving the objectives of technical cooperation (such as strengthening of the management and maintenance function of the primary medical institution and improvements in healthcare service to pregnant women).

3) Improvement of financial independence

It is possible for the Hospital to provide speedy and correct emergency medical service, thereby increasing its revenue from treatment fees in parallel with its efficient management. Hence, it is expected to enhance the financial independence of the Hospital.

From what mentioned above, implementation of this project as Japan's grant aid program will help the Kisii District Hospital and the Kericho District Hospital become able to properly function as secondary medical institutions in the western part of the country, thereby making direct contribution to general upgrading the level of medical care in the entire Kisii and Kericho District, with ultimate beneficial effect on the five million population of the western part of the country. It follows then that implementation of this project as Japan's grant aid program is very meaningful, and also very high degree of relevance and necessity may be found between the cause of Japan's grant aid program and implementation of this project.

It is essential that the works of Kenyan portion have been timely done before the cooperation project is commenced. It is also recommended that the following improvements or arrangements be made so that the two district hospitals, which will be improved by this project, may be smoothly and effectively managed, and that the above-mentioned direct and indirect effects may be realized.

- (1) The Kisii District Hospital suffers from an extremely poor supply of water. In fact, the water supply program for the entire city of Kisii has been reviewed, and it is planned to construct water pipes used exclusively by the Kisii District Hospital. For smooth management of the Hospital vitally necessary is that it receives a stable supply of water. Therefore, it is of importance that the Kenya side complete piping works with its own budget in coordination with the schedule of the hospital building's construction and the time of its completion.
- (2) It is essential that the facilities and equipment which will be provided under this cooperation project be maintained in good conditions for continuous use through budgeting for their maintenance and offering training to a medical staff in charge of their maintenance. The office of the Ministry for Roads and Public Works in each District shall be also responsible for the maintenance of the facilities together with the Hospital. Hence, it will be imperative to build a system in which necessary information (a maintenance manual and etc.) is accessible to all

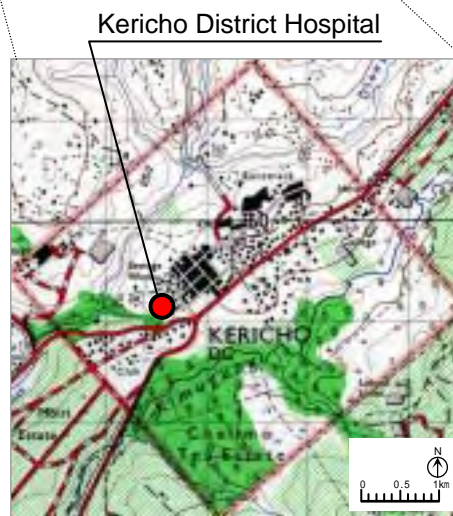
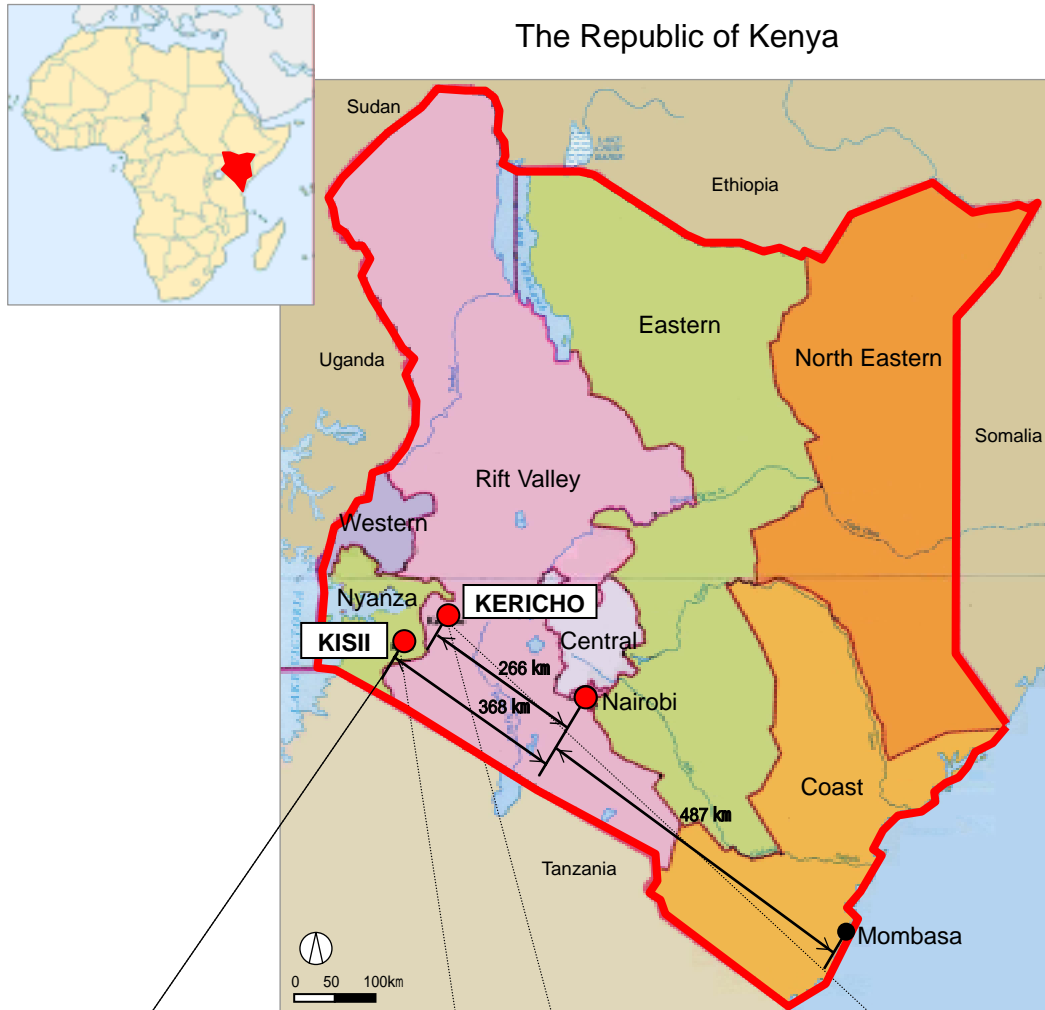
people concerned.

- (3) In order to deal with an unexpected problem of any equipment promptly, a budget should be regularly allocated as repair expenses for medical equipment. This will enable the hospital to control the deterioration of medical service to its minimum. In the future, it is recommended that the hospital set aside a reserve fund for the purchase of equipment which has expired its service year for smooth renewal.
- (4) It is essential to design an appropriate financial and funding program and constantly hold an accurate grip on its revenue and expenditure so as to reflect its financial situation in improving the hospital management. This practice will be useful also for sustainable development through sound management of the hospital.
- (5) Persons employed by each District Office of the Ministry for Roads and Public Works, as well as people working for the Ministry of Health and hospitals, assume the responsibility of maintaining facilities and equipment. Hence, it is necessary to make preparations and coordinate training schedules for providing the technical training under the soft component system also to those persons.

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Location Map



Project Site



Perspective (Kisii District Hospital)



Perspective (Kericho District Hospital)

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ABBREVIATIONS

| | |
|---------------|---|
| A/P | Authorization to Pay |
| B/A | Banking Arrangement |
| AIDS | Acquired Immunodeficiency Syndrome |
| BS | British Standard |
| E/N | Exchange of Notes |
| GTZ | German Technical Cooperation Agency |
| GDP | Gross Domestic Product |
| GNI | Gross National Income |
| HIV | Human Immunodeficiency Virus |
| HDU | High Dependence Unit |
| IMF | International Monetary Fund |
| JASS | Japanese Architectural Standard Specification |
| JICA | Japan International Cooperation Agency |
| JIS | Japan Industrial Standard |
| MDF | Main Distribution Frame |
| MOF | Ministry of Finance |
| MOH | Ministry of Health |
| MTC | Medical Training Collage |
| OPD | Out-patient Department |
| PABX | Private Automatic Branch Exchange |
| PEPFAR | Presidents Emergency Plan for AIDS Relief |
| PRGF | Poverty Reduction and Growth Facility |
| KPLC | Kenya Power & Lighting Co., Ltd. |
| KShs | Kenyan Shillings |
| WHO | World Health Organization |

Chapter 1. Background of the Project

CHAPTER 1. BACKGROUND OF THE PROJECT

The Republic of Kenya (hereinafter referred to as “Kenya”) is situated in East Africa, surrounded by Somalia, Uganda, Tanzania, Ethiopia and Sudan. Kenya became an independent country from British rule in 1963. Kenya has an area of 583 thousand square kilometers (about 1.5 times that of Japan), and its population is about 32.40 million (2004). Its Gross National Income (GNI) per capita is US Dollars 460 (2004).

The state of healthcare sector of Kenya, as is indicated by the maternal mortality rate being 1,000 for every 100 thousand births (2002) and the infant mortality rate being 78 for every 1,000 births (2002), ranks the lowest in the world, so do the surrounding countries in East Africa. The western part of the country sharing borders with Uganda and Tanzania (five districts in Nyanza and Rift Valley Provinces (with a population of 2.7 million)), in particular, suffer extensively from such infectious diseases as malaria, tuberculosis, measles, HIV / AIDS. Particularly the Province of Nyanza has the infantile mortality of 133 per 1,000 births (in 2003), which is the highest in Kenya. Similarly, the western part of Kenya is poor in social infrastructure in spite of their significant population, and many of their medical institutions at various levels were equipped as far back as from the 1940s to 1970s. Naturally, these medical institutions are suffering from such problems as obsolescence, failures of medical facilities and equipment. Although the government of Kenya is not necessarily conducting precise analysis of the indicators of medical and healthcare quality by region, it would be right to assume that the state of medical and healthcare service in the western part of the country is worse than the rest of the country from a lower rate of labor by hospitalization of 36.0 percent (2003) against Kenya’s national average of 40.1 percent (2003).

To improve such a situation, the Government of Kenya formulated in 1999 the “National Health Sector Strategic Plan (1999 - 2004)” which set forth delegation of authority to local governments, proper allocation of manpower, etc. in the healthcare sector, as priority themes. The government has promoted under this plan establishment of referral system of patients at district and lower levels, and various improvements of local medical and healthcare services, with cooperation of the World Bank, the United State, Japan and other donors.

The Government is now in the process of formulating the “National Health Sector Strategic Plan (2005 - 2010) to follow the “National Health Sector Strategic Plan (1999 - 2004).” Also, the Government has formulated the “Interim Operation Plan (2004 - 2005)” as the interim measure for the transit period whereby the Government promotes new measures including preparation of healthcare infrastructure as a priority measure.

The Government of Japan has established a development theme aimed at “economic and social development benefiting poor strata” in the Country Assistance Plan for Kenya, and placed “medical and healthcare service” as a high-priority area in the country plan, and thereby promoted various measures for strengthening functions of higher medical institutions at the central level and those for improving local medical and healthcare services.

For the western part in particular, JICA implemented a development study in 1998 “Study on Enhancement of District Health System,” and in this study JICA and the Kenyan side developed a master plan for strengthening the system for local medical and healthcare services. Based on the master plan, JICA implemented in 2001 a grant aid program, “Project for Improvement of Health Centers in the Western Part of Kenya,” and a Technical Cooperation project, “Project for Improvement of Health Service with a Focus on Safe Motherhood in Kisii and Kericho Districts,” since 2005, thereby promoting various activities intended to strengthen the management and operation of healthcare centers and improvement of maternity care services.

Such endeavors have achieved a certain degree of improvement in the primary medical and healthcare services in the primary level medical institutions. By contrast, district hospitals, which are secondary medical institutions, are left behind with obsolescent facilities and equipment, insufficiently functioning as district level referral institutions.

Under such a circumstance, the Government of Kenya filed in 2004 a request with the Government of Japan for a grant aid program intended to intensify the functions of Kisii District Hospital (classified as a quasi-province hospital) in Nyanza Province and Kericho District Hospital in Rift Valley Province, both being core hospitals for district level medical and healthcare services in the western part of Kenya, through provision of facilities and equipment, and thereby to improve the medical and healthcare services provided by these hospitals.

Chapter 2. Contents of the Project

CHAPTER 2. CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

Since the state of medical and healthcare service in the western part of the country was deteriorating compared with the rest of the country, the government of Kenya has promoted various measures to strengthen of functions of higher medical institutions at the central level and those for improving local medical and healthcare services, according to the Master Plan Study on the Improvement of Local Healthcare and Medical Service in the Republic of Kenya developed jointly by the Japanese and Kenyan experts by the 1998 development study, “Study on Enhancement of District Health System in the Republic of Kenya.” Also, Japan’s grant aid program for 2001, “Project for Improvement of Health Centers in the Western Part of Kenya” and the PROTECO, “Project for Improvement of Health Service with a Focus on Safe Motherhood in Kisii and Kericho Districts” underway since 2005 have achieved a certain degree of improvement in the medical and healthcare service in the primary level medical institutions, in various activities toward strengthening management and operations of healthcare centers and improvement of maternity care services. Under such a circumstance, this project intends to restore the functions of top referral medical institution of the district hospital now suffering from obsolescence of facilities and equipment.

Implementation of this project as Japan’s grant aid program will directly help the Kisii District Hospital and the Kericho District Hospital become able to properly function as secondary medical institution, and thereby upgrade the medical and healthcare service in these two districts, with beneficial effects on the five million population of the western part of Kenya.

Tables 2-1 and 2-2 show the outlines of the cooperation projects for the Kisii and Kericho District Hospitals

Table 2-1 Outline of the Cooperation Project for the Kisii District Hospital

| Major project breakdown (Number of stories / total floor area) | | Facility and equipment |
|--|--|---|
| Outpatient Department Building (Two-storied building / 3,704.00m ²) | | 1 st Floor Outpatient Department: General outpatient, Casualty, Special Clinic (internal medicine, surgery, pediatrics, E.N.T, eye clinic, dental clinic and obstetrics/gynaecology) X-ray Division: X-ray examination and Physiological examination Examination Division: Blood, physiological and pathological examinations Clerical and Administrative Division 2 nd Floor Operation Division: Operation room (3 rooms), sterilization and assembly HDU (high dependency unit) Division: H.D.U room, H.D.U. isolated room Delivery Division: Delivery room (5 rooms) |
| Ancillary facility (each one-storied building / 435.20m ²) | Machine Room Building (309.01m ²) | High Voltage Electric Room, Low Voltage Switchboard Room, Pump Room, Raw water Reservoir, Elevated cistern, Generator Room |
| | Toiler Building(65.04m ²) | Toilet for outpatients |
| | Incinerator furnace (57.42m ²) | Sorted waste storage space, incinerator furnace |
| | Others (3.73m ²) | Gate house |
| Medical equipment | | Procured for the Outpatient Department Building and some existing facilities |

Table 2-2 Outline of the Cooperation Project for the Kericho District Hospital

| Major project breakdown | | Facility and equipment |
|--|---|--|
| Casualty (one-storied building / 425.10m ²) | | Casualty Emergency Physiological / Pathological Examination Room |
| Ancillary facility (each one-storied building / 77.00m ²) | Machine Room Building-1 (46.10m ²) | Low Voltage Switchboard Room, Generator Room |
| | Machine Room Building-2 (13.98m ²) | Elevated cistern, pump room |
| | Others (16.92m ²) | Raw water reservoir, Elevated water tank |
| Medical equipment | | Procured for the Casualty and some existing facilities |

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

The Government of Kenya places special emphasis upon upgrading the level of local healthcare and medical service. To that end, it intends to develop a referral system, thereby building an efficient healthcare and medical service network. Based upon this policy of Kenya, the Project has been planned to strengthen the intrinsic functions of the two district hospitals as secondary medical organizations in order to improve the referral system further.

The facility improvement plans for both hospitals shall include a zoning plan by hospital function (facility master plan) as a future vision of each hospital, based upon which the facilities shall be remodelled or expanded.

The scale of the planned facilities of each hospital shall be based upon the present and past performance of diagnosis and treatment. At the same time, it will be decided in consideration for other factors such as an estimated population increase in the service area and the occupancy rate of each hospital.

The project shall adopt floor planning and select equipment and materials which will potentially prevent or alleviate nosocomial infections so that the hospital's medical activities will not be disturbed in emergencies including an outbreak of malaria and other epidemics.

The purpose of the equipment/materials plan lies, in principle, in supplying the equipment and materials that are outmoded or undersupplied in number. The equipment and materials that are indispensable in providing secondary medical service will be also included.

The project's plan shall fully consider the prevention of environmental pollution which may be inflicted upon the hospital and its surrounding area.

The Kisii District Hospital is the educational hospital of the Kisii School of the Kenya Medical Training College (MTC). It also functions as an institution to provide technical training activities to medical and healthcare professionals of primary medical organizations in the western part of Kenya. Therefore, the possibility of building a training room shall be studied.

The soft component system will be used to provide technical training in order to build a sustainable management and maintenance system.

(2) Policy toward natural conditions

1) Temperature and humidity

The monthly mean temperature in Kisii City and Kericho City varies little between 23°C and 28°C. The highest and lowest temperatures can exceed 30°C and reach 10°C, respectively, in the hottest and coldest months. The mean humidity varies from 50 to more than 70 percent. The characteristic temperature and humidity pattern in this area is that temperature soars from January to March and humidity rises from March to June, the rainy season. This area is relatively cool except for the January to March period; therefore, the design does not call for air conditioning for ordinary rooms. However, good natural draft will be provided to secure sufficient ventilation for rooms without air conditioning or mechanical ventilation.

2) Precipitation

Precipitation is extremely scarce in the western part of Kenya during the period from December to February. Almost 80 percent of annual precipitation falls during the two rainy seasons, one from March to June and the other from August to November. The area has

annual precipitation of about 2,000 mm, and downpours with a maximum precipitation per hour of 100 mm. Therefore, the design will take into consideration such conditions in setting drainage of stormwater from the roofs and capacities of the exterior gutters.

3) Wind direction and wind speed

Observatory data indicate that mean wind speed is about 3m/sec. for both cities. In Kisii City northwest wind prevails almost throughout the year. Detailed data on wind is not available for Kericho City; however, judging from the shapes of trees rising in the surrounding of the site, northeast and northwest winds presumably prevail throughout the year. The architectural planning will lay out facilities of this project and their openings to effectively take advantage of these wind characteristics for natural draft and natural ventilation.

4) Sunshine and ultraviolet rays

This area is just on the Equator; therefore, the Sun's angle of elevation is high. Buildings are exposed to intense sunlight radiating from just above; therefore, relatively long eaves will be provided to shield the sunlight to windows and due consideration will be given to thermal insulation of the roof. Since the area is 1,500 to 2,000 meters high above sea level, radiation of ultraviolet rays is naturally intense. Accordingly, the exterior finishing materials of high deterioration resistance will be used for portions exposed to the direct sunlight.

5) Disaster records, etc.

The western part of Kenya has not been hit by such disasters as earthquake, flood of devastating magnitude. The structural design calculation of buildings will be based on the architectural design standards of Kenya regarding seismic force and wind pressure.

(3) Policy toward socioeconomic conditions

Kenya's GDP has grown at 2.8, 4.3 and estimated value of 5.0 percent in 2003, 2004, and 2005, respectively. A growth rate similar to that of 2005 is forecast for 2006. The consumer price index rose by 8.3, 16.3, 7.6 in December 2003, 2004, and 2005, respectively, against the same period of the preceding year. The consumer price index rose by two-digit from the latter half of 2004 to the first half of 2005, but the rate subsided to one-digit in the latter half of 2005.

The data issued by the Central Bureau of Statistics do not indicate data for individual substances, including construction and related materials; therefore, detailed data on prices are not available. Notwithstanding, judging from the fact that Kenya depends almost entirely on import for crude oil, a slight rising trend is naturally anticipated for consumer prices.

Further, Kenya is experiencing water and electric power shortages for the past several years, due mainly to irregular weather. Formulation of the construction schedule for construction work will consider such factors.

(4) Policy toward construction business conditions, procurement conditions or particular business conditions, trade practices

Business conditions of the construction sector improved from 2003 to 2004, according to the bulletins of the KENYA ASSOCIATION OF BUILDING AND CIVIL ENGINEERING CONTRACTOR. Construction works are done mostly by private investments. In Nairobi, the capital city, a number of new buildings under construction are rising. By contrast, buildings under construction are rarely seen in Kisii City and Kericho City. In Nairobi some buildings are taller than 20-storied; however, common residences are one-storied and shops are four-storied at the tallest in Kisii and Kericho Cities.

Here, buildings with RC pillars and beams, with Nairobi stone masonries filling the spaces in the frames formed by the pillars and beams, are common. Generally, with the Nairobi stones, the external walls are piled with pointed joints, the interior walls are finished with cement mortar and paints, the roofs are covered with roof tiles or metal sheets. The existing buildings of the Kisii District Hospital and the Kericho District Hospital are one-storied buildings.

Kenya may be classified as an agricultural country, with such agricultural crops as coffee, tea being the mainstay of the country's economy. Manufactured industrial products (construction materials) are almost none and imported from South Africa, Turkey, European countries, Southeast Asian countries, etc., except for cement, bricks, piling materials, roof tiles, ceramic tiles, deformed bars which are domestically produced. Under such as situation, construction materials including imported materials for small-scale construction works are relatively easily procurable from the domestic market. Large-scale construction works as this project require formulation of detailed schedules, taking into account of expected periods from order to delivery of purchases, because of the limited availabilities of kinds and stocks of construction materials in the domestic market.

The construction business of Kenya is under strong British influence, and the Building Code Republic of Kenya or the General Specification for Building Works Republic of Kenya are based on the British Standards. Therefore, the designs will be developed conforming to the British Standard.

Regarding the labour conditions, the total labour population exceeds the demand. As a matter of fact, unskilled labours are in excess supply; however, skilled workers are much in short supply in terms of both quality and quantity. Even these skilled labours are much inferior to their counterparts in developed countries in performance. Their daily productivity is considered to be around 1/3 to 1/4 of those of their Japanese counterparts.

In Kenya felling down of trees has been prohibited in principle. This regulation was intensified in 2003, and since then timber is in short supply. Wood products are now almost imported. The level of wood processing skill is not up to the standards; therefore, care must be exercised to selection of locally manufactured fittings.

Automobiles run on the left side of the road like Japan. Trucks, trailers, one-box cars, public transportation vehicles such as buses are legally obliged to be equipped with a speed governor which limits the maximum running speed to 80km/hour. Such conditions must be remembered when figuring out transportation time of materials, etc.

The business hours of government offices are 8:00 to 13:00 and 14:00 to 17:00 from Monday to Friday, and Saturday and Sunday are holidays. The business hours of private enterprises are almost the same.

The Kenya Standard Time is six hours behind the Japan Standard Time. Kenya does not adopt the daylight saving time. Kenya's currency is Kenya Shilling (KShs).

(5) Policy toward employing local contractors

Registration with the Ministry of Road and Public Works is necessary in order to conduct a construction business in Kenya. The applicants for registration are classified according to their trades such as architecture, civil works, and also classified into eight ranks, A to H, according to their experiences and construction ability, and registered in the "REGISTER OF APPROVED BUILDING CONTRACTORS." The data for 2005 indicate that 66 contractors out of 1,346 registered companies fall under A class, 31 contractors fall under B class. The REGISTER indicates the registration number, company name, company's location, trade, category for each registered company, but does not indicate other necessary information such as scale of business. Each company's "REGISTRATION OF CONTRACTORS" bears its trade and category.

According to a 2005 material published by the KENYA ASSOCIATION OF BUILDING AND CIVIL ENGINEERING CONTRACTORS, 138 companies are registered as member companies, most of which are referred to as a large construction company. Bulletins of the ASSOCIATION do not indicate data on these companies' capitals, assets, numbers of employees, past performances, amounts of orders received, etc.

Some local construction companies have experienced construction works related to Japan's ODA. These companies are all regarded as large companies in the KENYA ASSOCIATION OF BUILDING AND CIVIL ENGINEERING CONTRACTORS.

The project installs hospital facilities, and the degree of difficulty of the construction works is relatively high. The selected Japanese contractor, a juridical person registered in Japan, is to use local contractors as subcontractors. In such a case, it is desirable to commission relatively large and capable contractors falling under A or B class, with a plenty of past performances of similar projects.

(6) Policy toward implementing agency's managing and maintenance ability

1) Facility plan

More than 60 years have passed since commissioning of both the Kisii District Hospital and the Kericho District Hospital. During this period, hospital facilities have been modified or added one after another. Either of them consists of 30 to 40 buildings. Sporadically, there are some which are noticeably deteriorated despite relatively recent years in which they were constructed, presumably because of the effects of severe climatic conditions; namely, downpours, high temperatures and high humidities.

The Kisii District Hospital and the Kericho District Hospital have respectively ten and six specialists to manage and maintain their facilities. Among hospital facilities and equipment, such machines as boilers, washing machines, electric water heaters are left unrepaired, indicative of the management and maintenance systems insufficiently functioning. Naturally, their manpowers and technical capabilities need reinforcement.

In formulating this project, easiness of management and maintenance and reduction of running cost represent the most important themes; therefore, facilities and equipment of appropriate qualities will be selected. Besides, locally procurable items will be adopted to the extent possible.

2) Equipment plan

The targeted district hospitals have assigned to their maintenance units one technologist as a leader and around five technicians to conduct equipment and facility maintenance. The said unit is called an HMU (hospital maintenance unit), which conducts scheduled check-ups and deals with malfunctions of medical equipment. The MOH has established a maintenance contract with local agents for the most sophisticated equipment to receive repair services. The operation and maintenance cost is covered by revenue of the hospitals, which consists of budget from MOH and consultation/treatment fees collected from the local community. The average of the expenditures of the past five years is KShs 2,413,000 for Kisii hospital and that of Kericho hospital is KShs 410,000, which are mainly spent for the purchase of equipment and spare parts. As Kisii HMU makes modification of equipment, such as adding stands to desk-top sphygmomanometers and changing autoclave heat sources, the job range of Kisii HMU is wider than that of Kericho HMU. Therefore, it seems that Kisii hospital has spent more in maintenance cost than Kericho hospital. Both hospitals understand that the execution of the project increases maintenance cost and they plan to secure the necessary budget by expected increase of treatment fees through the execution of this project.

The function of the medical equipment is designed to comply with the contents of the services provided at each department of the hospitals at the moment. In conceiving

specifications of the equipment, it should be taken into consideration that the models be prioritized in which hospital staffers can prepare consumables by themselves, such as reagents or obtain spare parts easily in the local markets, to minimize the increase of operation and maintenance cost.

(7) Policy toward determination of grade for facility, equipment, etc.

1) Facility plan

The design of hospital buildings will be done conforming to the “Hospital Facility, etc.” of the below-mentioned standards effective in Kenya. In addition, the design will also give particular attentions to the environmental consideration, prevention of nosocomial infections, supports to the disabled, hospital functions that enable measures to cope with disasters.

- Building Code Republic of Kenya
- Firefighting Act, Republic of Kenya
- Effluent Water Standard, Republic of Kenya (draft stage)

Also, secondary medical institutions in Kenya similar to these two hospitals will be referred to for their organizational structures and levels of functions, to set the grades for each division and each room meeting the performances requirements of them so that the facility plan may be developed to realize the maximum cost benefit ratio.

2) Equipment plan

The improvement of the medical service is planned by replacement of superannuated equipment that cannot function properly, and by supplementing equipment that fell short in numbers that cannot fulfil the service demand, in diagnosis and treatment services that the targeted hospitals provide.

The equipment grade should be set to conform to the content of services in each section and medical personnel's technical level, and limited to the extent in which the operation and maintenance budget of each hospital is not greatly increased.

(8) Policy toward method of construction and procurement

1) Policy toward method of construction

The construction methods common locally will be adopted in principle for foundations and skeleton works. However, the kinds of construction works that are liable to cause unsatisfactory performances, sashes for example that may cause unsatisfactory performance in durability and sealing, Japanese methods will be considered.

2) Policy toward method of procurement

Major materials, facilities and equipment, mainly products of Japan, European countries, South Africa, are available in the Kenyan market, with few exceptions. These products may be procurable from agents dealing in such product in Nairobi. Locally procured products will be used to the extent possible to facilitate maintenance. In such cases, however, their qualities and availabilities will be confirmed to avoid any adverse effect on the construction schedule.

The materials, facilities, and equipment imported from Japan and third countries will be transported by sea to the Port of Mombasa, Kenya. From Mombasa the goods will be transported by vehicle on land to the sites in Kericho District and Kisii District. The pavements on the trunk roads are noticeably deteriorated, and the goods will be subjected to significant vibrations. Therefore, some of the goods will be well packed to be able to withstand shocks, high humidities, high temperatures, etc.

3) Policy toward construction schedule

Regarding the implementation schedule, this project should desirably be done as a national

bond project, judging from the nature, scale, etc. of this cooperation project.

Both project sites are situated in the existing hospital premises, and various kinds of infrastructure facilities will be provided or improved as Kenyan side work. It is therefore important that construction schedules be well confirmed by the concerned persons of both the Kenyan and Japanese sides, to avoid any trouble to smooth implementation of the construction work of this project. It is no less important that the construction work be well planned not to hinder routine medical services of the hospitals, even during the construction period.

2-2-2 Basic Plan

2-2-2-1 Overall Project Description (Study of the Request)

(1) Revision of the request

1) Initial request

The request made on July 28, 2005 for the Kisii District Hospital and that on July 15, 2005 for the Kericho District Hospital concerned almost all functions of the hospital facilities as shown on the columns of “Initial request” of Tables 2-1 and 2-2, respectively.

2) Major revisions confirmed by the field survey

This cooperation project is in a position to attach particular importance to the “Master Plan Study on the Improvement of Local Healthcare and Medical Service in the Republic of Kenya” proposed by a Japan’s development study “Study on Enhancement of District Health System in the Republic of Kenya” done from 1997.

In the process of agreeing on the contents of the final requests, discussions were made from broad viewpoints; namely, the roles and results of surveys on the existing facilities of both hospitals indicated by the development study, and of “facilities that have direct effects on improvement of the medical service,” and high levels of construction technologies required for “the ‘Outpatient Building’ and the ‘Central Diagnosis and Treatment Building.’” Consequently, it was agreed that for the Kisii District Hospital, the Diagnosis and Treatment Divisions (the General Outpatient Division, the Emergency Outpatient Division, theatres) and utility facilities such as water supply, and for the Kericho District Hospital, the Casualty should have the top priority. It was also agreed that the Obstetrics Division of the Kisii District Hospital should follow them in priority. The items agreed on by both parties during the field survey are shown on the columns of “Final request” of Table 2-3 and 2-4.

3) Final request

The contents of the final request agreed in the discussions between the Kenyan side the field survey team during the basic design field survey from January 15 to February 10, 2006 are as shown in the tables below.

Table 2-3 Initial and Final Requests (for Facility) for the Kisii District Hospital

| Initial request | | | Final request (Minutes) | | |
|-----------------|-------------------------------|----------|-------------------------|-------------------------------|--|
| Priority | Division | Facility | Priority | Division | Facility |
| A | CASUALTY | | A | CASUALTY | -Filter clinic -Minor Theatre -Treatment -Observation |
| A | OUT-PATIENT DEPARTMENT | | A | OUT-PATIENT DEPARTMENT | -Consultation -Eye clinic -Treatment -E.N.T. -Internal medicine -Dental clinic -Surgery -X-ray -Paediatric -Ultrasound -Obst./Gyne. -Laboratory -Psychiatry -Accounts office |
| A | THEATRE and ICU UNIT | | A | THEATRE and ICU UNIT | -Theatre (incl. caesarian section) -High Dependence Unit (incl. infections) -C.S.S.D |

| Initial request | | | Final request (Minutes) | | |
|-----------------|---------------------------------------|---|-------------------------|------------------------------|--|
| Priority | Division | Facility | Priority | Division | Facility |
| A | INFRASTRUCTURE | -Water supply system (Borehole) -Sewerage system -Incinerator -Oxygen plant & Piping | A | INFRASTRUCTURE | -High tension power receiving -Water reservoir -Medical gas -Neutralization & sterilization treatment -Incinerator |
| A | COMPREHENSIVE MATERNITY UNIT | | B | Delivery Section | -Delivery -Labour ward -Newborn unit |
| | | | C | Antenatal and Postnatal ward | -Antenatal ward -Postnatal ward |
| A | GENERAL WARDS for total 96beds | -Medical ward - Surgical ward | | | |
| A | BLOOD TRANSFUSION CENTRE | | | | |
| A/B | LAUNDRY | | | | |
| A/B | KITCHEN | | | | |
| B | ADMINISTRATION BLOCK | | | | |
| B | HOSPITAL STORE | | | | |
| B | RESOURCE CENTRE | | | | |
| B / C | MORTUARY | | | | |
| B / C | PERIMETER WALL | | | | |

Table 2-4 Initial and Final Requests (for Facility) for the Kericho District Hospital

| Initial request | | | Final request (Minutes) | | |
|-----------------|---|--|-------------------------|-----------------|--|
| Priority | Division | Facility | Priority | Division | Facility |
| A | CASUALTY | | A | CASUALTY | -Filter clinic -Minor Theatre -Treatment -Observation |
| B | OUT-PATIENT DEPARTMENT | -General Consultation -V.C.T. -Orthopaedic -Nutrition -Physiotherapy -X-Ray -Occupational -Laboratory Therapy -Pharmacy -Eye clinic -Records -Dental -Administration -E.N.T. office -S.T.I. -Library | | | |
| B | THEATRE, ICU, HDU and BURNS UNIT | Theatre | | | |
| A | | Intensive Care Unit | | | |
| A | | High Dependence Unit | | | |
| B | | Burns Unit | | | |

| Initial request | | |
|-----------------|----------|--|
| Priority | Division | Facility |
| | | MATERNAL CHILD COMPLEX |
| A | | Labour ward |
| A | | Maternity Unit |
| A | | New born Unite |
| A | | Gynaecology ward |
| - | | Theatre |
| - | | Paediatric unit |
| - | | Mother hostel |
| | | GENERAL WARDS for total 280beds |
| B | | 2 General wards (Female) for 80 beds |
| B | | 2 General wards (Male) for 80 beds |
| B | | Eye ward for 40 beds |
| B | | Amenity ward (Female) for 40 beds |
| B | | Amenity ward (Male) for 40 beds |
| | | LAUNDRY |
| A | | Modern Laundry |
| | | KITCHEN |
| C | | Modern Kitchen |
| | | MORTUARY |
| B | | Modern mortuary |
| | | MAINTENANCE |
| B | | Maintenance work shop |
| | | STORES |
| A | | Non-pharmaceuticals store |
| A | | Drugs store |
| A | | General store |
| A | | Equipment store |
| | | STAFF HOUSING |
| C | | Staff housing |

4) Medical equipment

Kenyan side requested to the government of Japan 400 items of medical equipment for Kisii hospital and 700 items for Kericho hospital in July 2005. The request included many consumable items for dental treatment and equipment of higher grade, considering that the targeted hospitals are ranked as the secondary level institutions. The summary of requested medical equipment is shown in Table 2-5.

Table 2-5 Summary of requested equipment

[Kisii district hospital]

| No | Location | Function of departments | Requested equipment |
|----|--|---|--|
| 1 | Operation theatre | To carry out surgeries under general anaesthesia for general surgeries and Ob/Gy with 3 operating rooms | Basic diagnostic equipment (stethoscopes, sphygmomanometers, laryngoscope/otoscope/ophthalmoscope set) |
| 2 | HDU | 8 beds, observation and care for highly dependent patients | MCH equipment (Stethoscope, sphygmomanometer, examination table, weighing machine, height scale and so on) |
| 3 | Physiotherapy | Rehabilitation for physical dysfunctions | Physiotherapy equipment (Infra-red lamp, ultraviolet lamp, low frequency wave therapy unit etc.) |
| 4 | OPD (internal medicine, surgical, Ob/Gy, paediatrics, ENT) | Treatment for out-patients | Examination tables for Ob/Gy, paediatrics, and delivery forceps, incubators and resuscitators |
| 5 | Internal medicine | Examination of patients | Height scales, weighing machines, examination tables, sphygmomanometers |
| 6 | Renal, surgical, orthopaedic department | Diagnosis and operations for urology | Examination equipment (cyst scope, cystectomy sets, lithotomy sets and so on) |
| 7 | Laboratory | Clinical examination | Binocular microscopes, blood cell counters, distillation units, electrophoresis units, and so on |
| 8 | Radiology | X-ray and ultrasound imaging diagnosis | X-ray diagnostic unit, mobile x-ray unit, automatic film developers |
| 9 | Pharmacy | dispensing of drugs | Distillation units, electric-balance, and so on |
| 10 | CSSD | Washing, sterilization, and supply of surgical material, and linens, so on | Autoclaves, washing machines, dryers and so on |
| 11 | Dental clinic | Dental examination and treatment | Dental chairs, dental forceps, and orthopantomograph and so on |
| 12 | ENT | ENT diagnosis and treatment | ENT chairs, laryngoscopes, audiometers |
| 13 | HMU | Maintenance of hospital facilities and equipment | Electric / mechanic / carpenter tool boxes |
| 14 | Wards (male, female and paediatrics) | Care for in-patients | Sphygmomanometers, weighing machines |
| 15 | Others(mortuary, public health, MCH/Family planning, office) | Keeping remains, public health education, perinatal examination, office work and so on | Mortuary refrigerators, ambulances, office equipment and furniture and so on |
| 16 | Kitchen | Preparation of food for in-patients | Cookers, mashers, mixers and so on |
| 17 | Ophthalmology | Eye surgeries, accommodation and examination for in-patients | Cataract/glaucoma surgical sets, operating microscopes, laser unit and so on |
| 18 | Casualty | Minor operations | Laryngoscopes, sphygmomanometers, anaesthesia machine, operating beds for minor surgeries |
| 19 | Surgical ward | Care of in-patients | Orthopaedic beds, resuscitators |
| 20 | Office furniture and equipment for new administration block | Accounting, procurement, registration, telephone exchange | Office furniture (desks and chairs) and equipment, computers |

[Kericho district hospital]

| N _o | Departments | Functions | Requested equipment |
|----------------|---|--|---|
| 1 | Casualty/OPD/Recovery block | 1) Treatment for emergency cases, and 2) Observation of patients after treatment | 1) O ₂ masks, resuscitation bags, defibrillators, laryngoscopes 2) I/V stands, suction machines and so on |
| 2 | Minor operating room | Minor operations such as suturing injuries and abscess incision | Diagnostic set, suturing set, forceps, stretchers and so on |
| 3 | OPD | Consultation and treatment by specialist doctors (internal medicine, surgical, Ob/Gy, Paediatrics, TB clinic, Dental, ENT and so on) | Diagnostic equipment(diagnostic set, sphygmomanometer, examination table, examination light and so on) |
| 4 | Work therapy | Recovery of patients functions by work therapy | Parallel bar, bicycle exerciser, pooley, and so on |
| 5 | Ophthalmic diagnosis and surgical equipment | To diagnose and surgeries of cataract and so on | Ophthalmic coagulators, cryosurgery unit, slit lamp microscope and so on |
| 6 | Radiology | Provision of image information for diagnosis | Ultrasound machine with Doppler, auto developer, mobile X-ray unit |
| 7 | ICU laboratory | Examination of ICU patients | Biochemistry analyzers, electrolytes analyzers, blood gas analyzers, centrifuges and so on |
| 8 | Laboratory | Examination for haematology, biochemistry, bacteriology and so on | Centrifuge, microscope, bacteria culturing instruments and so on |
| 9 | Physiotherapy/electrotherapy | Therapy for functions recovery of patients | Short wave diathermy, micro-wave diathermy, infra-red light |
| 10 | Dental laboratory | Preparation of artificial tooth | Row material, consumable items and so on |
| 11 | ICU | Intensive care for grave patients | Respirators, ECG monitors, suction machines, defibrillators |
| 12 | Operation theatre | Surgical operations for orthopaedic, Ob/Gy under general anaesthesia | Surgical instruments (operating tables, anaesthesia machine, operating light, surgical forceps, patients monitors, autoclaves and so on) |
| 13 | Burns unit | Care for burns | Resuscitation bags, I/V stands, ECG machines and so on |
| 14 | Labour room | Observation and waiting room for pregnant women before delivery | Suction machine, fetal heart detectors, delivery tables and so on |
| 15 | Nursery | Care for new born | Phototherapy unit, incubators, I/V stand and so on |
| 16 | MCH/Family planning | Examination of pregnant women and instruction of family planning | Sphygmomanometer, fetal heart detector, artery forceps and so on |
| 17 | Surgical/internal medicine/Ob/Gy wards | Care for in-patients | Suction machine, sphygmomanometer |
| 18 | Amenity ward | Paying beds | Suction machine, sphygmomanometer |
| 19 | Paediatrics ward | Care for in-patients | Suction machine. Sphygmomanometer |
| 20 | TB clinic | Treatment for TB | Sphygmomanometer, weighing machine |
| 21 | Drugs list | List for surgical instruments and material | Surgical instruments and plates set for tonsillectomy, thyroidectomy and so on |
| 22 | Laundry | Washing linens for in-patients | Washing machines, squeezers, dryers |
| 23 | Kitchen | Preparation of food for in-patients | Electric/gas cookers, refrigerators and so on |
| 24 | Mortuary | To keep remains by refrigeration | Mortuary refrigerators |
| 25 | HMU | To maintain facilities and medical equipment | Electric/electronic/plumbing tool boxes, multimeters and so on |
| 26 | EPI storage | Storing vaccines | Deep freezers, refrigerators, vaccine carriers and so on |

During the discussions in the field survey, from the originally requested items of medical equipment, consumable items were deleted, such as items that do not meet the functions of the targeted hospitals. Ninety-eight items are recommended for Kisii hospital and 67 items for Kericho hospital and the list was attached as the final requested equipment list, which was attached to M/D.

(2) Study of the request

The results of the study during the field survey and the home office analysis on the contents of final requests from the Kenyan side are as follows.

1) Facility plan

Background and reason, etc. for selecting the Kisii District Hospital and the Kericho District Hospital as subject of cooperation

One of the five priority programs of the “Study on Strengthening the District Health System in the Western Part of Kenya” (December 1998) done by Japan is “2. Rehabilitation of District Hospital.” The program includes both the Kisii District Hospital and the Kericho District Hospital. The idea is to strengthen the facility and equipment of the Kisii District Hospital and the Kericho District Hospital, both being the core hospitals of medical and healthcare service at district level in the western part of Kenya, thereby strengthening the functions of secondary medical institutions of both districts, and upgrading the medical and healthcare services provided by these hospitals

Further, the Kisii District Hospital is a medical training college for medical and healthcare professionals. In this context, promotion of another one of the five programs mentioned above “5. Re-training for Medical Staff” may be expected.

The relations among this project and the “Project for Improvement of Health Centres in the Western Part of Kenya” done by Japan and ongoing “Project for Improvement of Health Service with a Focus on Safe Motherhood in Kisii and Kericho Districts” and relations with the preceding project of Kenya’s healthcare sector are as per shown in Figure 2-1.

Delay in modernization of facilities over the long period of medical service activities (Kisii District Hospital)

The Kisii District Hospital takes various managerial measures, such as special price premium wards different from general wards, to become financially self-reliant. Despite such efforts, the facilities and equipment are generally and noticeably deteriorated, as may be indicated by the General Outpatient Building and Diagnosis and Treatment Building which have been in use without modification since 1916, the year in which the hospital was inaugurated. The number of patients far exceeds the number that may be coped with by the capacities of the present facilities.

Such a situation hinders the hospital from satisfactorily performing a number of functions the hospital ought to perform well, as listed below. And, measures to resolve such a situation are urgently needed.

- Lowering of the quality of medical services due to separated layouts of the Outpatient Department and the Central Diagnosis and Treatment Division
- Risks of nosocomial infections and medical accidents because of crossings of traffic lines of patients, hospital staff, materials in the hospital facilities
- Contamination of the environments of the hospital surroundings caused by discharging, etc. of untreated sewage and wastewater
- Physical and mental loads on the patients resulting from the insufficient waiting spaces, floor areas of diagnosis and treatment rooms, wards (prolonged outdoor waiting or insufficient beds)

- Deteriorated environment of rooms due to insufficient ventilation, lighting, protection of privacy attributable to narrow spacings between buildings and their obsolescence (most buildings being older than 30 years)

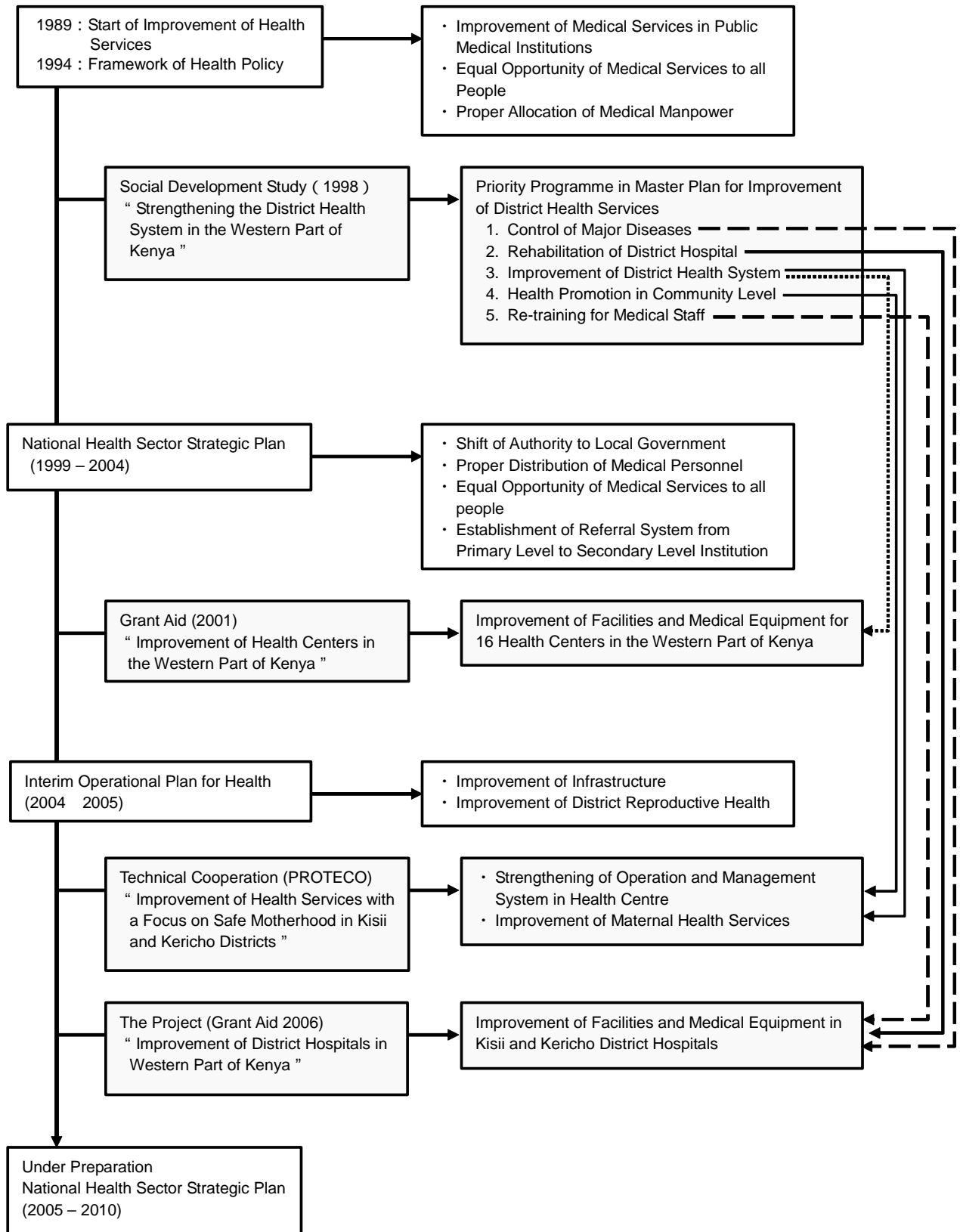


Figure 2-1 State of Healthcare System in the Western Part of Kenya

Role of core hospital covering neighbouring districts (the Kisii District Hospital)

Being located in Kisii Central District, The Kisii District Hospital is the secondary hospital of the Kisii Central District. However, the result of an interview survey indicates that the hospital accepts about three million patients from the eight districts shown in the figure below. In other words, the works performed by the hospital far exceed the role of a district hospital. In this western part, there are district hospitals in North Kisii District and South Kisii District; however, these hospitals are generally not providing enough secondary medical services. And, the Kisii District Hospital is playing the important roles of core hospital in this region. Prompted by such a situation, the Ministry of Health has recently upgraded the four district hospitals to provincial hospitals in addition to the existing eight provincial hospitals. These four district hospitals are the Kisii District Hospital in Nyanza Province, the Machakos District Hospital in Eastern Province, the Thika District Hospital in Central Province, and the Meru District Hospital in North Eastern Province.

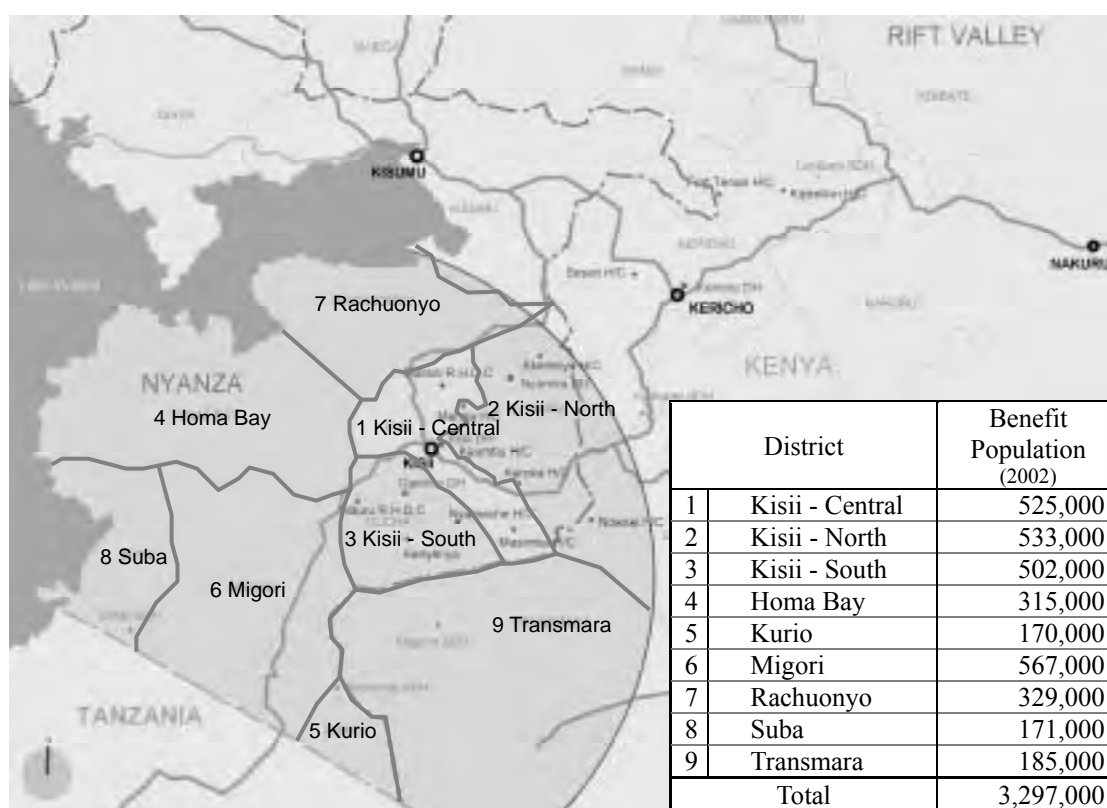


Figure 2-2 Beneficial Area of the Kisii District Hospital

Role as an educational hospital (the Kisii District Hospital)

In the premises of the Kisii District Hospital there is a detached school of the Kenya Medical Training College (MTC) to develop clinical doctors. The Kisii District Hospital accepts about 100 students from MTC, meaning that the Kisii District Hospital plays an important role as an educational organ of the medical and healthcare professionals and contributes greatly to the development of healthcare and medical service network in Kenya.

Improvement of the Obstetrics Division (Kisii District Hospital)

Regarding the Obstetrics Division, there are such themes as cooperation with the PROTECO project ongoing in Kisii and Kericho Districts, and “improvement of reproductive healthcare and child health” as a priority program of a development study

previously done. Considering that the Kisii District Hospital handles the second greatest number of deliveries in Kenya, coordinated operation of the Caesarean operation and the theatres is important, regarding various rooms related to delivery in the Obstetrics Division. If the facility for obstetrics is built by the Kenyan government budget, the facility will be built probably apart from the theatres of this project, and the result would be a very inefficient layout. It may be judged therefore that the necessity of this project planned to include various obstetrics-related rooms is very high.

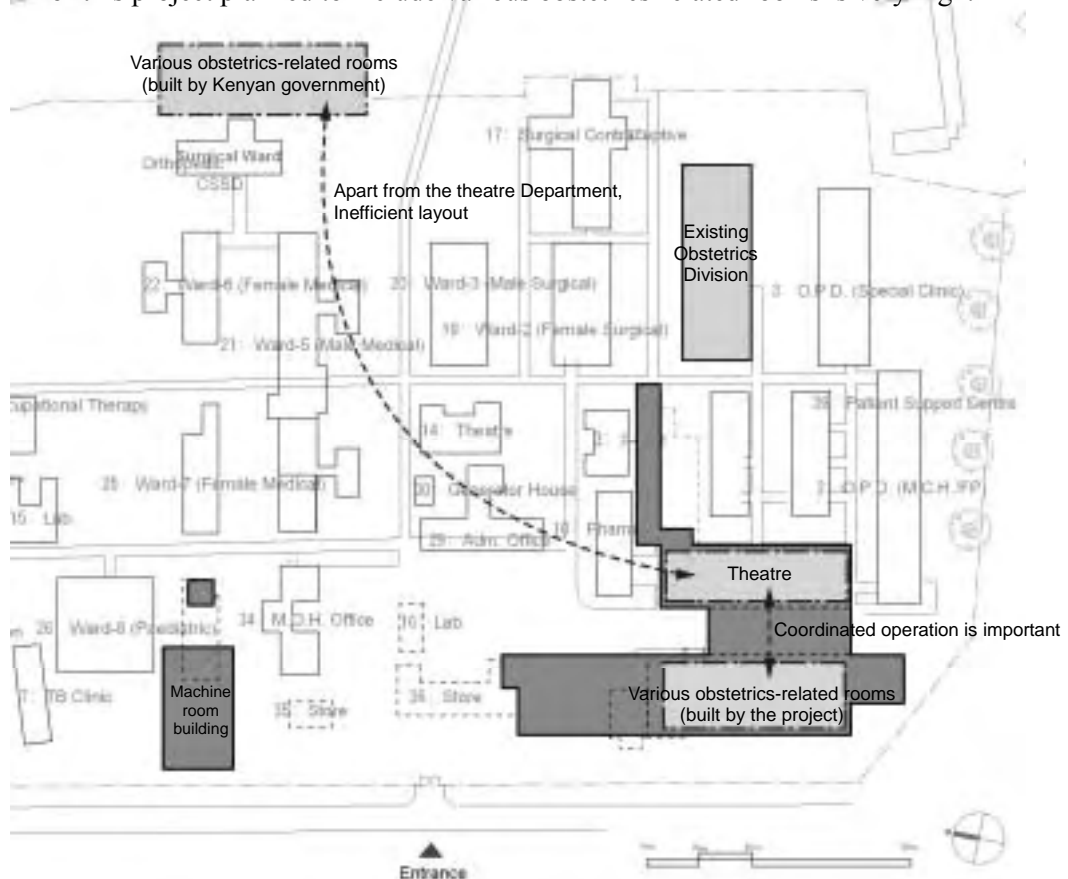


Figure 2-3 Study on Proper Layout of the Theatre Department and Various Obstetrics-related Rooms in the Kisii District Hospital

Installation of emergency diagnosis and treatment services to cope with increasing traffic accidents (Kericho District Hospital)

The Kericho District Hospital has been generally improved in facility and equipment since 2000 (the year in which the Basic Design Study for the Project for Improvement of Health Centres in the Western Part of Kenya was implemented). The number of outpatients and inpatients is considered to be within the capacity of the present facility, excluding the emergency diagnosis and treatment services.

As shown in Figure 2-4, there is no Casualty in neighbouring districts. Hospitals equipped with Casualty facilities near Kericho District are one in Nakuru (110km away) and the other in Kisumu (80km away). Therefore, patients are brought to the Kericho District Hospital, being relatively well equipped with facilities like theatres, from neighbouring districts. Also, being situated along the trunk road from Mombasa, an important port city of the Indian Ocean, to Kisumu, a core city in the western part of Kenya, through Nairobi, the capital city, the General Outpatient Division of the Kericho District Hospital accepts victims of traffic accidents that occur frequently near Kericho on the trunk road. However, the Kericho District Hospital lacks the Casualty and is therefore unable to administer sufficient treatments.

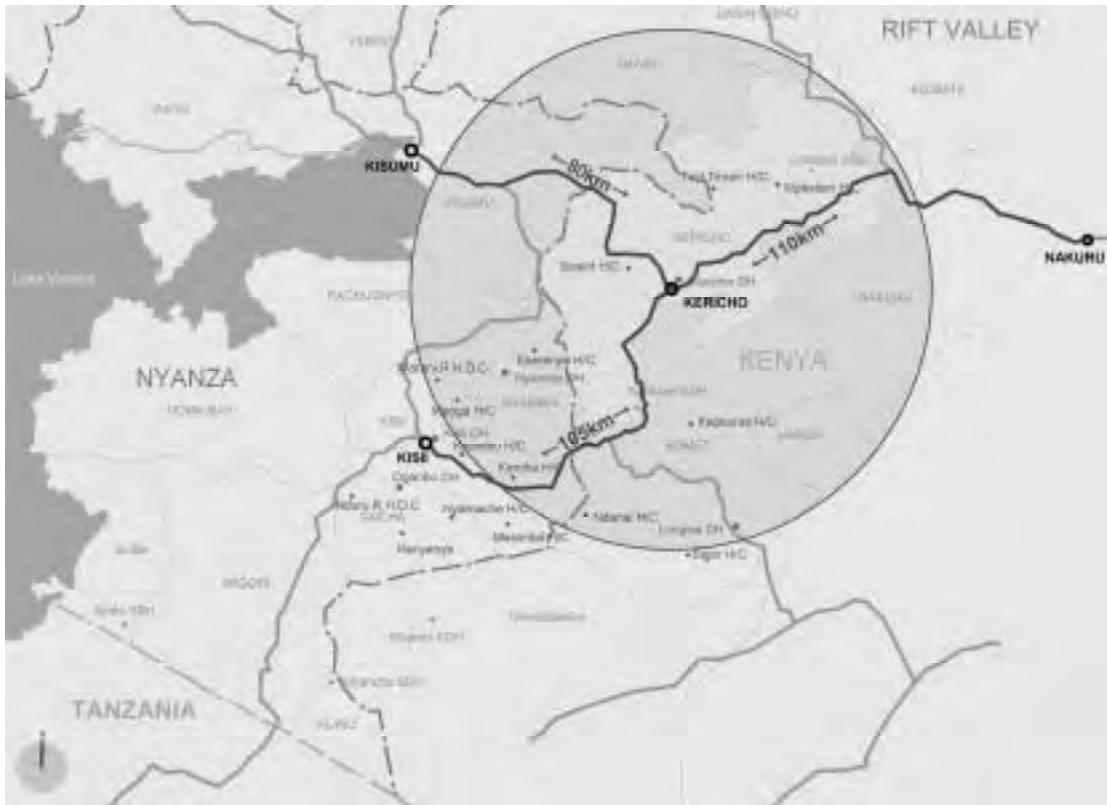


Figure 2-4 Beneficial Area of the Kericho District Hospital

Cooperation with Japan's technical cooperation project

Both hospitals are sites of training activities for medical and healthcare professionals of the primary medical institutions in the western part of the country being implemented by the "Project for Improvement of Health Service with a Focus on Safe Motherhood in Kisii and Kericho Districts (March 2005 to February 2008)," a PROTECO project aimed at improving the services of health centres with community people's participation.

Cooperation with other development partners

A World Bank's project, "Ward Building Construction Project," is underway in the premises of the Kisii District Hospital. Four buildings are under construction. The Walter Reed, a US assistant organization, is conducting a facility design for "Facility for HIV / AIDS-related Researches" for the Kericho District Hospital. There is no duplication between these projects and this project.

Scope of work for cooperation

a) Kisii District Hospital

For the reasons cited above, although it must be admitted that the hospital generally needs repairs and renewal of its facilities, judgment of necessity and relevance of the grant aid program is made from the viewpoints of "facilities that have direct effects on improvement of the medical service," "facilities that require relatively high levels of technologies that are difficult for the locally available technologies to meet," "contribution to the development of regional healthcare and medical service network." It is right to include in the scope of work for cooperation the Diagnosis and Treatment Division (General Outpatient Diagnosis and Treatment, Special clinic, Casualty, theatres, delivery rooms), and training rooms.

b) Kericho District Hospital

For the reason mentioned above, the Casualty is included in the scope of work for cooperation.

Hospital facilities that can continue medical activities in case of disasters

Of natural disasters, the Building Code Republic of Kenya provides standards against the earthquake and the wind. The code provides earthquake resisting design standard by regions with the active fault map of Kenya attached, and also provides a similar standard for the wind. This project will apply these standards to the design, and adopt roof structures that do not permit leaks, thereby planning hospitals that can serve as a base for emergency support activities.

Self-reliant technological and financial development

In selecting construction materials, durable, maintenance-free, and locally available and easy-to-maintain ones are preferred. This will enable reliable provision of medical services, and help reduce financial burden of maintenance of medical facilities.

Measure to prevent nosocomial and community infections (environmental consideration)

To avoid possibility of nosocomial infections, the traffic lines in the hospitals will be designed to avoid crossings between those of patients and those of medical and healthcare professionals. The treatment method of medical wastes and the treating facilities of supplied water and wastewaters will be designed to prevent nosocomial and community infections.

Construction plan enabling provision of sustainable medical services

It is desirable to secure the sites of construction close to the entrance portions, distinctively visible and easy to access, for both cooperation project facilities, the Kisii District Hospital and the Kericho District Hospital, because of the project being of the nature of improvement of the Diagnosis and Treatment Division. Therefore, it is necessary for the Kenyan side to demolish the buildings of both hospitals shown in the tables below before the start of construction in order to secure the construction sites. Since the medical service functions of these buildings to be demolished need to be provided during the construction period, it is planned to move these functions to other buildings, including those under construction shown in the figure below.

a) Kisii District Hospital

Table 2-6 Facilities to be Demolished and Facilities to Which the Functions of the Subject Facilities Move, Kisii District Hospital

| Facility to be demolished | | Facilities to which the functions are moved | | |
|---------------------------|--------------------------------|---|---|--|
| Building No. | Building name | Building No. | Building name | Note |
| NO. 1 | O.P.D. | NO. 11 | Record: to be completed in December 2006 | Tentatively used during the construction period only |
| NO. 8 | District Health / HANDS Office | NO. 12 | O.P.D.(M.C.H): to be completed in December 2006 | Permanently moved as District Health / HANDS Office |
| NO.35 | Store | NO.2 | O.P.D. (M.C.H / FP) | Permanently moved |
| NO. 9 | VCT | | | |
| NO.16 | Lab. | | | |
| NO.28 | Ward-1 (Gynaecology) | NO. 25 | Ward-7 (Female Medical) | Jointly used during the construction period only |
| NO.36 | Store | NO.10 | Pharmacy: to be completed in December 2006 | Tentatively used during the construction period only |
| NO.37 | Store | | | |

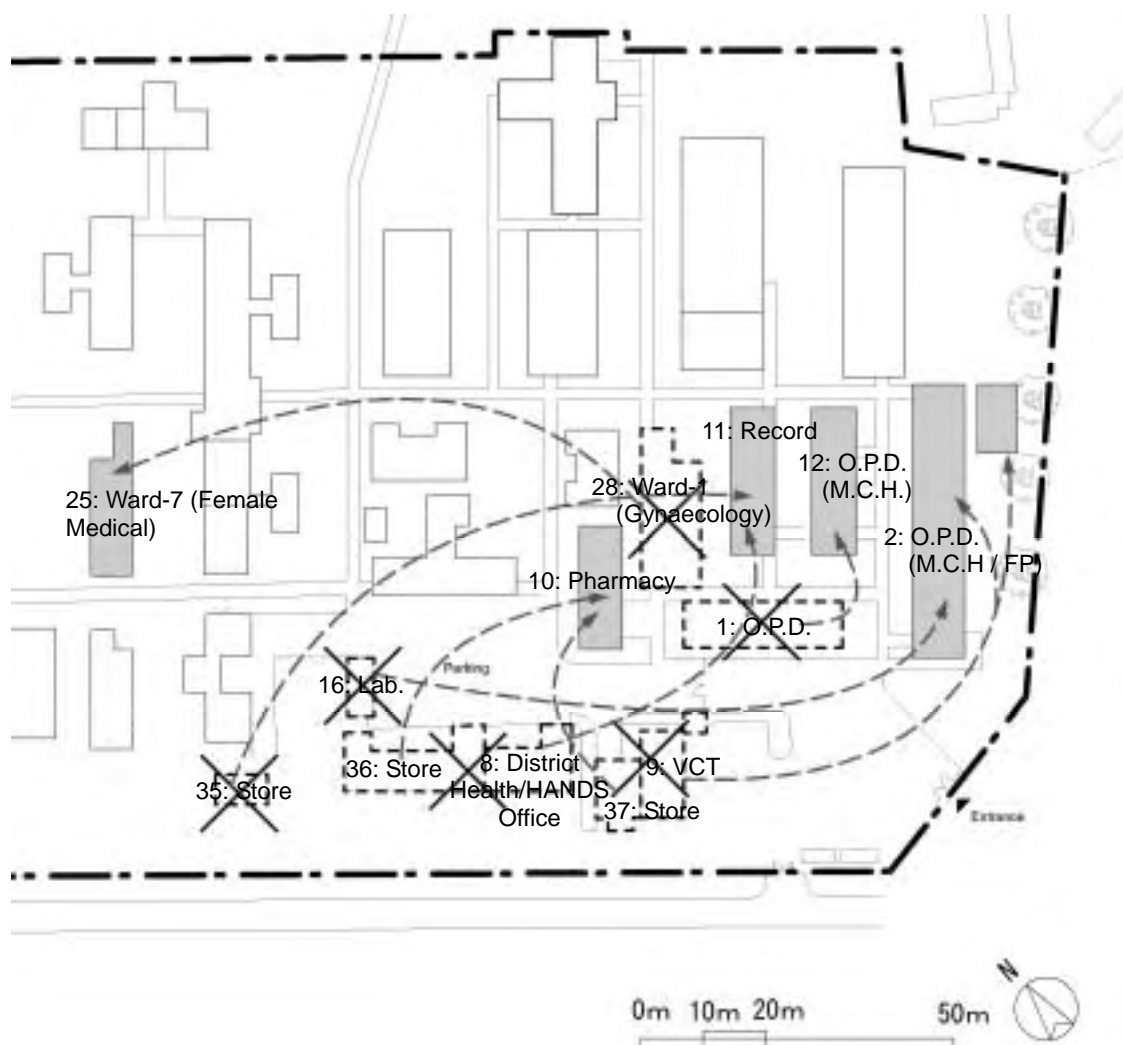


Figure 2-5 Facilities to be Demolished and Facilities to Which the Functions of the Subject Facilities Move, Kisii District Hospital

b) Kericho District Hospital

Table 2-7 Facilities to be Demolished and Facilities to Which the Functions of the Subject Facilities Move, Kericho District Hospital

| Facilities to be demolished | | Facilities to which the functions are moved | | | |
|-----------------------------|-------------------------|---|---------------|--|-------------------|
| Building No. | Building name | Building No. | Building name | Note | |
| NO.3 | O.P.D. (Special Clinic) | TB Clinic | NO. 6 | TB Clinic: Construction completed, functions are being moved. | Permanently moved |
| | | Public Health Office | NO.20 | Administration Office | Permanently moved |
| | | HIV Clinic | - | Walter Reed Building: The construction started in April 2006, to be completed in January 2007. | Permanently moved |

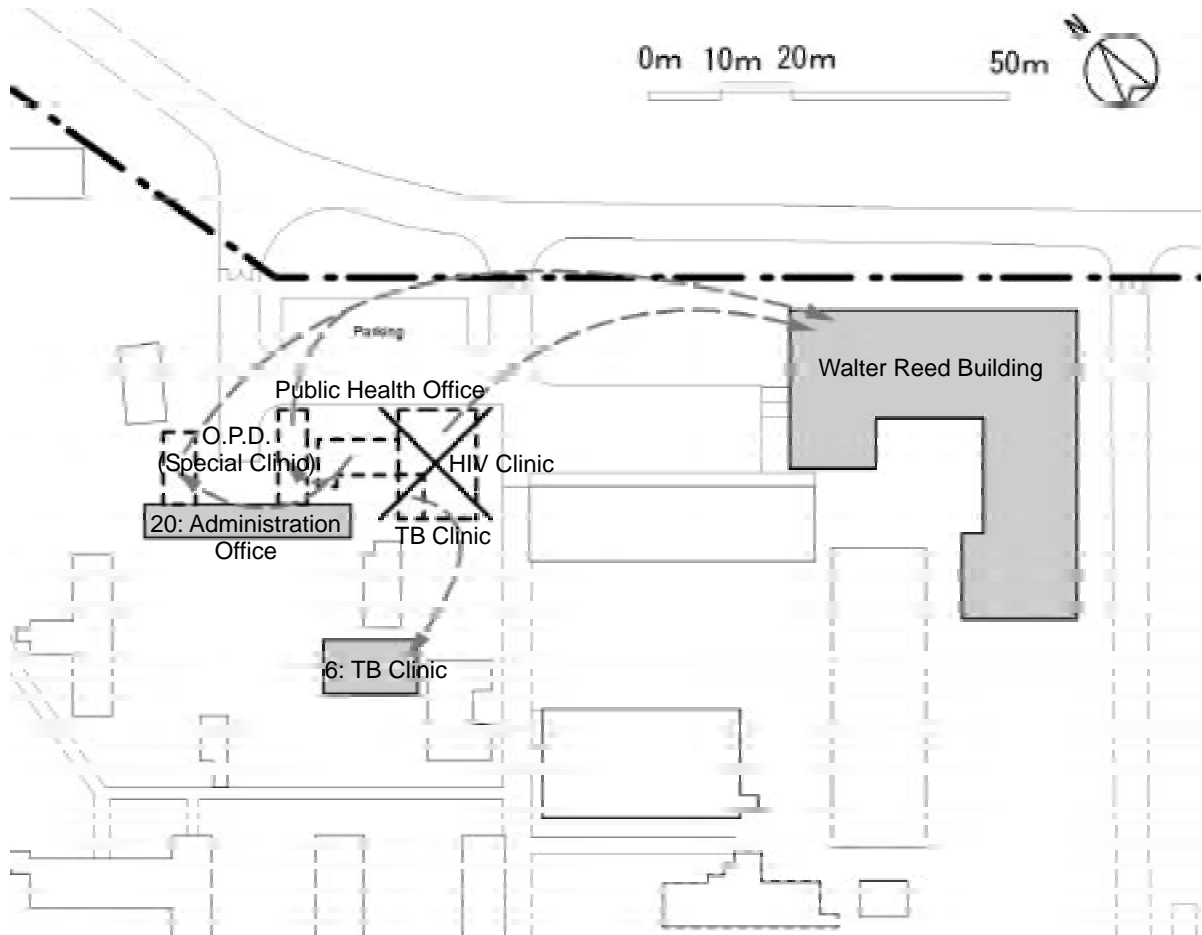


Figure 2-6 Facilities to be Demolished and Facilities to Which the Functions of the Subject Facilities Move, Kericho District Hospital

2) Equipment plan

Range of assistance for medical equipment procurement

Kenyan side agreed to the equipment to be procured for new and existing buildings as the result of the field survey. The plan is shown in Table 2-8.

Table 2-8 Summary of the equipment plan

| [Kisii district hospital] | |
|--|---|
| New building | Existing building |
| 1. Casualty 1-1 Treatment room 1-2 Minor operating room 1-3 Recovery room 2. Out-patient department (OPD) 2-1 Psychiatry/Internal medicine/Paediatrics/Surgery 2-2 Otolinolaringology (ENT) 2-3 Ophthalmology 2-4 Dental 2-5 Obstetrics and Gynaecology 2-6 Radiology 2-7 Laboratory 2-8 Treatment room-2 2-9 Laboratory 3. Theatre department 3-1 Theatres 3-2 Recovery room 3-3 Highly Dependence Unit (HDU) 3-4 Central sterilization supply department (CSSD) 4. Maternity 4-1 Delivery room 4-2 Labour room 4-3 Nursery 4-3 Treatment room | 5. Physiotherapy/Occupational therapy 6. Hospital maintenance unit (HMU) 7. Ophthalmology |

| [Kericho district hospital] | |
|---|---|
| New building | Existing building |
| 1. Casualty 1-1 Filter clinic 1-2 Treatment room 1-3 Minor operating room 1-4 Recovery room | 2. Theatre 3. Out-patient department (OPD) 3-1 Internal medicine, Surgery, Psychiatry 3-2 Obstetrics and Gynaecology 3-3 Paediatrics 3-4 Dental clinic 3-5 ENT 3-6 Ophthalmology 3-7 Tuberculosis clinic 4. Radiology 5. Laboratory 6. Physiotherapy/ 7. Maternity unit 8. Nursery 9. MCH/Family plan 10. Hospital maintenance unit(HMU) |

Examination of additional request

Kenyan side requested additionally dialysis units to treat cases for renal insufficiency, poisoning and so on during discussions in the field survey. The said items require filters (US\$ 40/pc), expensive consumables as a prerequisite, which might contribute to the welfare of only those who can afford it and the units require a well-trained personnel to operate them. Therefore, the basic design study team explained to the Kenyan side that the team cannot accept the additional request, since the procurement of the said items deviates the principle of Japan's grant. The Kenyan side agreed to the explanation of the Japanese side.

Design policy for equipment selection

The field survey showed that most of departments cannot function sufficiently. Though the causes vary, it is very clear that destabilization and shortage of equipment in numbers affect supply of the medical services. It is considered to be effective to equip the targeted hospitals in order to improve such situations. Therefore, in the equipment plan prioritized are items which are essential for targeted departments to function properly, and items of which existing ones are deteriorating, or falling short in numbers in the light of the work load.

The quantity of each item is determined considering frequency of use and dispositions of existing equipment. Since ambulances have already been procured and maternity related items, including delivery forceps, will be procured through MCH project (PROTECO) under Japanese assistance, such items are deleted from the plan.

The points on infrastructures of the sites are that hardness of water available at Kisii hospital is relatively high ($> \text{Ca } 250 \text{ mgs}$) and its pressure is too low ($< 0.5 \text{ kgf/cm}^2$); in addition, power fluctuations of both hospitals are quite large and power surge sometimes occurs. Considering these circumstances, procurement of AVR's should be considered for the items of equipment, which power fluctuation affects, such as ultrasound diagnostic unit and spectrophotometers. Since low water pressures and pure water quality significantly affect the running of high pressure steam sterilizers, booster pumps and water softeners should be considered to attach to the said units.

Summary of equipment planning

The result of equipment planning for each department of the targeted hospitals is shown as follows:

[Kisii hospital]

a) Casualty department (new building)

The new casualty department is designed to house a minor operating room, treatment rooms, and observation rooms with this project. The minor operating room will be equipped with an operating table, an operating light, a suction unit and so on, to conduct such treatment as suturing to stop bleeding and abscess incision. The department would often receive emergency cases that would contract a cardiac arrest. In the minor operating room, it is planned to procure an operating table, an operating light, and a suction unit, which are necessary for such treatment as suturing injuries, to stop bleeding and for abscess incision. And also considered is to procure a defibrillator in case that a patient goes into heart arrest. For the observation room, planned is to dispose beds for passage observation of patients and administration of intravenous drip.

b) Out-patient department (new building)

In OPD, consultation rooms for Psychiatry, Internal medicine, Surgery, and Paediatrics are planned to procure X-ray film illuminators, examination lights, and examination tables to expand the capacity of basic medical care. In other specialist

OPD rooms (ENT, Eye, Dentistry and Ob/Gyn) it is planned to dispose of such items as ENT treatment units, slit lamp microscopes, dental treatment units, and ultrasonic diagnostic units corresponding to the specialty of each department to improve medical services. In examination, a satellite laboratory and radiology will be newly set up to enable the casualty department urgent examinations for Haematology, Biochemistry, and Parasitology (Malaria), and Immunology besides the central laboratory

As the inspection section of the casualty department, the satellite laboratory and the radiology section will be established in the department besides the central laboratory, so that haematology, biochemistry, and X-rays, etc. can be urgently inspected. For radiology, function of the present department is shifted to the new building; thus existing items, such as a general X-ray unit, an X-ray fluoroscopy unit and an automatic X-ray film processor, can continue to be used and will be moved to the new building. In the satellite laboratory, planned are to conduct examinations for biochemistry, Parasitology and haematology. For the items necessary for the laboratory, existing equipment will be shifted from the present laboratory.

For the satellite laboratory, existing items of equipment will be transferred for biochemistry, Parasitology (malaria), immunology, and haematology inspections. However, it is being considered to renew obsolete existing spectrophotometers and microscopes.

It is planned to dispose of teaching microscopes, since this hospital has a teaching function for students.

c) Operation theatre, O/T (new building)

The O/T consists of three theatres, HDU (highly dependence units) with 10 beds, and CSSD (central sterilization supply department). Though there are presently two theatres, the department is not in a position to meet with increasing numbers of operation cases, such as obstetric emergency cases, e.g., caesarean sections, orthopaedic surgeries; i.e., fractures reduction due to RTA, road traffic accidents and celiotomy cases.

In the building plan design the two theatres will be expanded to three based upon analysis of services demand.

Regarding the equipment plan for the new operation theatre, it is planned to replace and supplement such essential items as operating tables, operating lights, aesthetic ventilators, and electrosurgical units, which are deteriorating or fall short in numbers. For the HDU, a neighbouring room to the O/T, it is planned to procure ECG monitors, Gatch beds and so on since the HDU receives patients who need relative intensive care. For CSSD, it is planned to install high pressure steam sterilizers.

For the Burns unit, which was requested to be set up in the original project request form, the unit is integrated into HDU, since the function is overlapping with that of HDU.

d) Maternity unit (new building)

For the new maternity unit, it is planned to procure the necessary expansion of the present unit, increasing to five beds in the delivery room, eight beds in the labour room, and 12 beds in the recovery room, to ease congestion of the present unit. It is planned to procure fetal heart detectors to monitor fetal status and labour beds for the labour room, delivery beds, suction units and so on for the delivery room and recovery beds after delivery for the recovery room. The nursery is designed to be divided into two sections: septic and aseptic rooms. For the equipment plan, baby cots, incubators, and infant warmers for care, and phototherapy units to treat icterus neonatorum will be procured.

e) Physiotherapy (existing building)

In Physiotherapy, the number of patients getting hurt in physical functions due to RTAs has been rapidly increasing in recent years. For the department, it is planned to procure a UV lamp, an infra-red therapy unit, and a stimulator, which are deteriorating, to satisfy this increasing number of patients.

f) Hospital maintenance unit (HMU)

HMU is the department that is responsible for facilities and medical equipment maintenance. The HMU has two technologists and four technicians, and some staff members have been to Japan to receive medical equipment maintenance training. In addition to these staff members, some artisans, (one carpenter, one painter, and one mason) take care of facilities maintenance. The contents of current activities are a scheduled check-up as preventive maintenance and repair works for medical equipment, which fall out-of-order in addition to producing simple items of equipment such as stands for the sphygmomanometers and instrument carts. In this project planned are to procure basic electric and mechanical tools, which are insufficient in numbers, and also are aimed at enhancement of the maintenance ability of facilities equipment as well as medical equipment.

g) Ambulances

The Kenyan side explained that the procurement purpose is transportation of grave patients who need intensive care to such higher level institutions as Kisumu provincial hospital and Kenyatta national hospital. Since most of the existing ambulances are deteriorating, the hospital cannot meet the demand of transport services. Therefore it is expected that procurement of a new ambulance will increase the number of referral cases. However, it seems difficult for the targeted hospital to maintain ambulances properly, looking at the present status of the present ones, which are not maintained in good condition and some deteriorating ones are kept as they are. Moreover, multipurpose vehicles that can be used as an ambulance have been recently procured for each district health office by on-going safety motherhood projects in Kisii and Kericho, under the Japanese assistance (so called PROTECO). Therefore, it is judged appropriate that ambulances are excluded from this project.

h) Eye operating room (existing building)

In the Eye department, one ophthalmologist, and three clinical eye doctors conduct eye operations. Since operations are carried out for more than 30 cases of cataract and glaucoma a day, the demand of services is quite high. Though an ophthalmologist (hospital director), and three clinical doctors are already posted, an operating table, ophthalmoscope, and an operating microscope became obsolete or not equipped yet. The operating room is in such a busy situation that the room is fully booked three weeks ahead. In this equipment plan, an operating table, a supplement operating microscope, and operating lights to enhance operation capacity and secure its effectiveness are planned.

[Kericho district hospital]

a) Casualty department (new building)

The new casualty department consists of a filter clinic, a minor operating room, a recovery room, a laboratory and so on. In the filter clinic it is planned to add an X-ray film illuminator to show X-ray images and an examination light to secure brightness necessary for diagnostics, since each patient is interviewed and palpitated at the filter clinic and is instructed which department to visit depending upon symptoms.

In the treatment room it is planned to procure laryngoscopes and resuscitators to carry out Cardio-Pulmonary Resuscitation (CPR) and stretchers and examination tables, an operating bed, a suction unit to carry out minor operations in the minor operating room, and recovery beds for observation of patients treated in the recovery room.

b) Operation theatre (existing building)

The existing operation theatre has two operating rooms. The operation theatre has nine staff: one general surgeon, one orthopaedician, one obstetrician/gynaecologist, two clinical doctors (orthopaedics), and four anaesthetists. The demands of emergency operation services have been rapidly increasing in a way that the number of orthopaedic cases and caesarean sections has reached half of the total operations in recent years. This project is planned to equip two operating rooms (one existing operating room and one room to be renovated for operating) with operating tables, operating lights, electrosurgical units, anesthetic ventilators, ECG monitors and so forth to meet the demand of general and orthopaedic operation services. For one existing operating room it is planned to procure an Obstetrics/Gynaecology operating table to carry out obstetric emergency operations such as caesarean sections. As certain items of existing equipment are usable among such items as surgical instruments sets and anesthetic ventilators, which were procured through the Spanish government's assistance, it is considered to be appropriate to continue to use them.

c) Specialist OPD (existing building)

Since each clinic of the OPD receives 20 patients a day and is over-crowded, all of the patients may not receive treatment. It is planned to renew obsolete items of equipment and to supplement items which fell short in numbers, in order to improve the situation in this project. It is also considered to procure basic items of equipment considering the specialty of each clinic, provided that a specialist doctor is assigned. Introducing major items of equipment, it is considered to procure or supplement examination tables, X-ray film illuminators and diagnostic sets, which are worn-out or are short in numbers, for Internal medicine, Surgery, and Psychiatry clinics, an ultrasound diagnostic unit for an Obstetrician/Gynaecologist and a diagnostic set for a paediatrician, two dental units and so forth for two dentists, two ENT units for two ENT doctors, and two ENT clinical doctors, such items as slit lamp microscopes for an Ophthalmologist and three clinical doctors.

d) Radiology (existing building)

The mobile X-ray unit is planned to replace the existing old and deteriorating unit, since the number of X-ray examinations is quite high for emergency cases. However, it may be carried to other sections to use if necessary. As for a requested automatic X-ray film processor, the unit is excluded from this project since the existing one is still usable.

- e) Laboratory (existing building)
 Walter Reed, United States NGO, assisted in procuring equipment for this laboratory, which has enabled the laboratory to carry out examinations sufficiently. In this project it is planned to procure binocular microscopes and centrifuges to supplement existing ones, which are short in number, to carry out malaria examinations. As the hospital receives trainees as a teaching hospital, teaching microscopes are also planned to be procured.
- f) Physiotherapy/occupational therapy (existing building)
 Around 10 patients a day visit this department to recover their physical functional disorders. It is planned in this project to renew an old microwave therapy unit, a wax therapy unit, and so on, which are worn-out.
- g) Maternity unit (existing building)
 With Spanish assistance, the hospital procured for this department such items as delivery tables, suction units and so on, in addition to China-made infant warmers. However, since the number of patients is too high, it cannot adequately satisfy the demands of medical care. Therefore, it is planned to supplement delivery tables, suction units and fetal heart detectors, which fell short in number.
- h) Nursery
 Four of the existing incubators are not working and are used as baby cots as power fluctuations damaged parts, such as PCBs. These damaged items are to be replaced by this project, and, at the same time, basic items such as suction units and resuscitators are to be considered to be procured. Phototherapy units, which are very effective to treat new born jaundice, are also planned.
- i) MCH/FP (existing building)
 Midwives provide pregnant women with examination, care and health education in this section. Fetal heart detectors are planned to monitor fetal growth in perinatal examinations.
- j) Hospital Maintenance Unit (HMU)
 One technologist and five technicians conduct maintenance work for facilities-related equipment, as well as medical equipment. The current activities consist of making equipment such as stretcher modification, repair work for equipment falling out-of-order, and repair services to lower level institutions located in the district. In this project, basic equipment such as tool boxes for electricians and mechanics are planned to enhance the maintenance ability not only for medical equipment but also facilities-related equipment. In this project, basic equipment such as tool boxes for electricians and mechanics are planned to enhance the maintenance ability not only for medical equipment but also facilities-related equipment.
- k) Ambulances
 Kericho hospital is transferring emergency cases to Nakul provincial hospital, Eldred teaching hospital, and Kenyatta national hospital three times a week, since the hospital has no facility or ICU to treat such cases.
 As existing ambulances are obsolete, they should be replaced with a new one. However, as a multi-purpose vehicle, which is usable as an ambulance, is procured for Kericho and Kisii district health offices, it is judged to be appropriate to exclude the requested ambulance from this project.

Review in domestic study

The basic design study team conducted a thorough examination of the data collected during the field survey. The following points that were reviewed and changed as the result of the examination are:

[Kisii hospital]

| Departments | Item no. And description in equipment inspection table | Contents of change | Justification |
|---|--|---|---|
| 1 . Casualty 2-7 Treatment room | A2-23 examination table | Deleted | Integration of 3 consultation rooms into 4 filter clinic rooms |
| 3 . Operation theatre 3-1 Theatres 3-4 Burns unit | A3-3 Operating light with battery A3-9 Instruments sterilizer A3-11 Defibrillator A3-22 Patient beds A3-23 Examination light | Deleted Deleted Deleted Deleted | No need as emergency power source is secured. Integration into 3-18 existing equipment is working Burns unit is integrated into 3-2 HDU |
| 4 . Maternity Consultation room | A4-14 Ultrasound diagnostic unit - | Deleted Added to the plan A4-16 examination couch | Integration to OPD Change of building plan, or addition of consultation rooms |
| 7.Other | A7-1 Ambulance | Deleted | To be procured through another scheme |

[Kericho hospital]

| Departments | Item no. And description in equipment inspection table | Contents of change | Justification |
|--------------------------------|--|---|--|
| Casualty 1-2 treatment room | B1-7 stretchers | B1-7-1 stretchers (2) B1-7-2 examination couches (2) | Of 4 stretchers, 2 are planned for patient's transportation and the rest are changed to be 2 examination couches for consultation. |
| 2.Theatre | B2-7 Defibrillators | Deleted | Existing equipment is working. |
| 4 . Radiology Dark room | B4-1 Automatic film developers | Deleted | Existing equipment is working |
| 11.Ambulance | B11-1 Ambulance | deleted | Procured through another scheme |

Equipment determination

Equipment selection is conducted based upon equipment selection criteria shown in Table 2-9. The criteria satisfied are marked with "1". When all the criteria are satisfied, this specific item is marked with "1". However, if all the criteria are not satisfied, then the item is marked with "0".

Table 2-9 Equipment selection criteria

| |
|--|
| Maintenance 1: items that are sufficiently maintainable by the Kenyan side in technical and financial aspects; 0: items that Kenyan side cannot meet the above; |
| Present status of exiting equipment 1: items to replace the existing old items of medical equipment, and are supplementation to the existing equipment to alleviate the present shortage; 0: items that existing one is working well or this time will be procured by other donors' assistance or Kenyan side; |
| Man power disposition 1: items that can be operated by present hospital staff easily; 0: items that the said staffer are not assigned |
| Function and activities 1: items that meet functions and activities of targeted hospital 0: items that do not so |
| Principles of Japan's grant in aid 1: items that contribute to improvement of medical services directly and that are not consumables 0: items that do not contribute to the services, are of low cost, consumables and that can be easily procured in local markets |
| Other reasons to delete 0: items that should be deleted due to other reasons than described above |

Table 2-10 Equipment determination

[Kisii hospital]

< Judgment 1 : passed, 0 : failed >

| NO. | Description | Existing no. | Requested no. | Criteria | | | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|-----|-------------|--------------|---------------|----------|--|--|--|--|--|--|--|----------|----------|----------|---------|------------|-------|-------------|
| | | | | | | | | | | | | | | | Replace | Supplement | Newly | |

1 . Casualty

1-1 Treatment room-1

| | | | | | | | | | | | | | | | | | |
|-------|-------------------|---|---|---|---|---|---|---|---|---|---|---|--------------|---|---|---|---|
| A1- 1 | Examination couch | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Treatment rm | 0 | 0 | 2 | 2 |
| A1- 2 | Suction unit | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Treatment rm | 0 | 0 | 2 | 2 |
| A1- 3 | Resuscitator | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | Treatment rm | 0 | 0 | 1 | 1 |

1-2 Minor operating room

| | | | | | | | | | | | | | | | | | |
|-------|------------------------|---|---|---|---|---|---|---|---|---|---|---|-----------|---|---|---|---|
| A1- 4 | Defibrillator | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | Minor O/T | 0 | 0 | 1 | 1 |
| A1- 5 | Operating table | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 0 | 0 | 1 | 1 |
| A1- 6 | Operating light | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 0 | 0 | 1 | 1 |
| A1- 7 | Instruments sterilizer | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 0 | 0 | 1 | 1 |

1-3 Recovery room

| | | | | | | | | | | | | | | | | | |
|-------|---------------|---|---|---|---|---|---|---|---|---|---|---|-------------|---|---|---|---|
| A1- 8 | Recovery beds | 0 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Recovery rm | 0 | 0 | 5 | 5 |
|-------|---------------|---|---|---|---|---|---|---|---|---|---|---|-------------|---|---|---|---|

| NO. | Description | Existing no. | Requested no. | Criteria | | | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|-----|-------------|--------------|---------------|----------|--|--|--|--|--|--|--|----------|----------|----------|---------|------------|-------|-------------|
| | | | | | | | | | | | | | | | Replace | Supplement | Newly | |

2 . Out-patient department

2-1 Psychiatry/Internal medicine/Paediatrics/Surgery

| | | | | | | | | | | | | | | | | | |
|-------|-------------------|---|---|---|---|---|---|---|---|---|---|---|---------------|---|---|---|---|
| A2- 1 | Film viewer | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Consulting rm | 0 | 0 | 3 | 3 |
| A2- 2 | Examination light | 0 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 4 | 4 |
| A2- 3 | Examination couch | 0 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 4 | 4 |

2-2 ENT clinic

| | | | | | | | | | | | | | | | | | |
|-------|--------------|---|---|---|---|---|---|---|---|---|---|---|------|---|---|---|---|
| A2- 4 | ENT units | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | ENT | 0 | 0 | 2 | 2 |
| A2- 5 | ENT chairs | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 2 | 2 |
| A2- 6 | Laryngoscope | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| A2- 7 | Nebulae | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |

2-3 Eye clinic

| | | | | | | | | | | | | | | | | | |
|--------|----------------|---|---|---|---|---|---|---|---|---|---|---|------------|---|---|---|---|
| A2- 8 | Perimeter | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Eye clinic | 0 | 0 | 1 | 1 |
| A2- 9 | Lens meter | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| A2- 10 | Slit lamp | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| A2- 11 | Refract meter | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A2- 12 | Dry sterilizer | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |

2-4 Dental clinic

| | | | | | | | | | | | | | | | | | |
|--------|-------------------|---|---|---|---|---|---|---|---|---|---|---|---------------|---|---|---|---|
| A2- 13 | Dental unit | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Dental clinic | 1 | 1 | 0 | 2 |
| A2- 14 | Autoclave | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 1 | 0 | 0 | 1 |
| A2- 15 | Ultrasonic scalar | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 1 | 1 | 0 | 2 |

2-5 Ob/Gy

| | | | | | | | | | | | | | | | | | |
|--------|-------------------------------|---|---|---|---|---|---|---|---|---|---|---|-------|---|---|---|---|
| A2- 16 | Examining table for Ob/Gy | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | Ob/Gy | 0 | 0 | 1 | 1 |
| A2- 17 | Examination light | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| A2- 18 | Ultrasonic diagnostic machine | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 1 | 0 | 0 | 1 |
| A2- 19 | Examination table | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 0 | 0 | 1 | 1 |

2-6 Radiology

| | | | | | | | | | | | | | | | | | |
|--------|-------------------------|---|---|---|---|---|---|---|---|---|---|---|-------------------|---|---|---|---|
| A2- 20 | Mobile X-ray unit | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Casualty X-ray rm | 1 | 0 | 0 | 1 |
| A2- 21 | Dental X-ray unit | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Radiology | 1 | 0 | 0 | 1 |
| A2- 22 | X-ray film illuminators | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

2-7 Treatment room

| | | | | | | | | | | | | | | | | | |
|--------|-------------------|---|---|---|---|---|---|---|---|---|---|---|--------------|---|---|---|---|
| A2- 23 | Examination couch | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | B | Treatment rm | 0 | 0 | 0 | 0 |
|--------|-------------------|---|---|---|---|---|---|---|---|---|---|---|--------------|---|---|---|---|

2-8 Laboratory

| | | | | | | | | | | | | | | | | | |
|--------|--------------------------------|---|---|---|---|---|---|---|---|---|---|---|------------|---|---|---|---|
| A2- 24 | Binocular microscopes | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Laboratory | 2 | 0 | 0 | 2 |
| A2- 25 | Teaching binocular microscopes | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 2 | 2 |
| A2- 26 | Sterilizers | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A2- 27 | Distillation units | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A2- 28 | Centrifuge | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

| NO. | Description | Existing no. | Requested no. | Criteria | | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|--------|-------------------|--------------|---------------|----------|---|---|---|---|---|---|----------|----------|----------|---------|------------|-------|-------------|
| | | | | | | | | | | | | | | Replace | Supplement | Newly | |
| A2- 29 | Spectrophotometer | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

2-9 Treatment room - 2• 3

| | | | | | | | | | | | | | | | | | |
|--------|--------------------|---|---|---|---|---|---|---|---|---|---|---|----------------------------------|---|---|---|---|
| A2- 30 | Examination table | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Treatment rm-2 • 3 • delivery rm | 2 | 0 | 0 | 2 |
| A2- 31 | Suction unit | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Treatment rm-3 | 0 | 0 | 1 | 1 |
| A2- 32 | Examination lights | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Treatment rm-2• 3 | 0 | 0 | 2 | 2 |

2-10 Consultation room

| | | | | | | | | | | | | | | | | | |
|--------|--------------------|---|---|---|---|---|---|---|---|---|---|---|----------------------|---|---|---|---|
| A2- 33 | Examination lights | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Consultation rms (4) | 0 | 0 | 4 | 4 |
|--------|--------------------|---|---|---|---|---|---|---|---|---|---|---|----------------------|---|---|---|---|

3 . Operation theatre (O/T)

3-1 Operation theatre

| | | | | | | | | | | | | | | | | | |
|--------|------------------------------|---|---|---|---|---|---|---|---|---|---|---|-------------|---|---|---|---|
| A3- 1 | Operating table | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | O/T | 2 | 1 | 0 | 3 |
| A3- 2 | Operating lights | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 2 | 1 | 0 | 3 |
| A3- 3 | Operating light with battery | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| A3- 4 | Suction unit | 2 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 2 | 1 | 0 | 3 |
| A3- 5 | Anesthetic ventilators | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 2 | 0 | 0 | 2 |
| A3- 6 | Electrosurgical units | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 2 | 1 | 0 | 3 |
| A3- 7 | ECG monitors | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A3- 8 | Pulse oxymeters | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 3 | 3 |
| A3- 9 | Instrument sterilizer | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | | 0 | 0 | 0 | 0 |
| A3- 10 | General surgical sets | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | O/T | 2 | 1 | 0 | 3 |
| A3- 11 | Defibrillator | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| A3- 12 | Dermatome | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| A3- 13 | Recovery beds | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Recovery rm | 0 | 0 | 3 | 3 |
| A3- 14 | Respirator | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 2 | 2 |
| A3- 15 | Table-top autoclave | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | O/T | 0 | 0 | 1 | 1 |

3-2 Highly dependence unit (HDU)

| | | | | | | | | | | | | | | | | | |
|--------|----------------|---|----|---|---|---|---|---|---|---|---|---|-------------------------------------|---|---|----|----|
| A3- 16 | Gatch beds | 0 | 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | septic rm (2) aseptic rm (8) | 0 | 0 | 10 | 10 |
| A3- 17 | ECG monitors | 0 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | septic rm (2) aseptic rm (2) | 0 | 0 | 4 | 4 |
| A3- 18 | Nebulizers | 0 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | septic rm (2) aseptic rm (4) | 0 | 0 | 6 | 6 |
| A3- 19 | Defibrillators | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | HDU | 0 | 0 | 1 | 1 |

3-3 Central sterilization supply department (CSSD)

| | | | | | | | | | | | | | | | | | |
|--------|---------------------------------|---|---|---|---|---|---|---|---|---|---|---|------|---|---|---|---|
| A3- 20 | High pressure steam sterilizers | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | B | CSSD | 1 | 1 | 0 | 2 |
| A3- 21 | Instrument sterilizer | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | B | -do- | 1 | 0 | 0 | 1 |

3-4 Burns unit

| NO. | Description | Existing no. | Requested no. | Criteria | | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|--------|--------------------|--------------|---------------|----------|---|---|---|---|---|---|----------|----------|----------|---------|------------|-------|-------------|
| | | | | | | | | | | | | | | Replace | Supplement | Newly | |
| A3- 22 | Patient beds | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | B | | 0 | 0 | 0 | 0 | |
| A3- 23 | Examination lights | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | B | | 0 | 0 | 0 | 0 | |

4 . Maternity unit

| | | | | | | | | | | | | | | | | |
|--------|----------------------------|---|----|---|---|---|---|---|---|---|---|--|---|---|---|----|
| A4- 1 | Delivery tables | 4 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Delivery rm | 4 | 1 | 0 | 5 |
| A4- 2 | Suction units | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| A4- 3 | Fetal heart detectors | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Labour rm | 0 | 0 | 3 | 3 |
| A4- 4 | Labour beds | 6 | 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 6 | 6 | 0 | 12 |
| A4- 5 | Recovery beds | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Recovery rm | 0 | 0 | 8 | 8 |
| A4- 6 | Incubators | 8 | 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Nursery | 4 | 0 | 0 | 4 |
| A4- 7 | Infant warmers | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | septic rm (1) Aseptic rm(1) | 0 | 0 | 2 | 2 |
| A4- 8 | Phototherapy units | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Septic rm (1) Aseptic rm(1) | 1 | 1 | 0 | 2 |
| A4- 9 | Bilirubinmeters | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Nursery | 0 | 0 | 1 | 1 |
| A4- 10 | Nebulizers | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Septic rm (1) non septic rm (2) | 0 | 0 | 3 | 3 |
| A4- 11 | Delivery lights | 0 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Delivery rm | 0 | 0 | 5 | 5 |
| A4- 12 | Resuscitators | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Nursery | 0 | 0 | 1 | 1 |
| A4- 13 | Instruments Autoclaves | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Delivery rm | 1 | 0 | 0 | 1 |
| A4- 14 | Ultrasound diagnostic unit | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 0 | 0 |
| A4- 15 | Baby cots | 6 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Septic rm (1) Aseptic rm(5) | 6 | 0 | 0 | 6 |
| A4- 16 | Vacuum extractors | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Delivery rm | 1 | 0 | 0 | 1 |
| A4- 17 | Examination couches | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Maternity treatment rm | 0 | 1 | 0 | 1 |

5 . Physiotherapy/occupational therapy

| | | | | | | | | | | | | | | | | |
|-------|---------------------|---|---|---|---|---|---|---|---|---|---|---------------|---|---|---|---|
| A5- 1 | UV apparatus | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Physiotherapy | 1 | 0 | 0 | 1 |
| A5- 2 | Shortwave diathermy | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A5- 3 | Infrared lamp | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A5- 4 | Stimulators | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

6 . HMU

| | | | | | | | | | | | | | | | | |
|-------|-------------------------|---|---|---|---|---|---|---|---|---|---|------|---|---|---|---|
| A6- 1 | Tool for electric | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | HMU | 1 | 0 | 0 | 1 |
| A6- 2 | Tool for mechanic | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A6- 3 | Oscilloscope | 1 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| A6- 4 | IC & transistor testers | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| A6- 5 | Multimeters | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| A6- 6 | current meters | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| A6- 7 | Soldering stations | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | B | -do- | 0 | 0 | 0 | 0 |

7 . Other

| | | | | | | | | | | | | | | | | |
|-------|------------|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|
| A7- 1 | Ambulances | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | C | | 0 | 0 | 0 | 0 |
|-------|------------|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|

| NO. | Description | Existing no. | Requested no. | Criteria | | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|-----|-------------|--------------|---------------|----------|--|--|--|--|--|--|----------|----------|----------|---------|---------|------------|-------------|
| | | | | | | | | | | | | | | | Replace | Supplement | |

8. Ophthalmic operation theatre

| | | | | | | | | | | | | | | | | |
|-------|-------------------------|---|---|---|---|---|---|---|---|---|---|----------------|---|---|---|---|
| A8- 1 | Operation table | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | B | Ophthalmic O/T | 1 | 0 | 0 | 1 |
| A8- 2 | Operating microscopes | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| A8- 3 | Operating lights | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 1 | 0 | 1 |
| A8- 4 | Autoclaves | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | C | -do- | 0 | 1 | 0 | 1 |
| A8- 5 | Indirect ophthalmoscope | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | C | -do- | 0 | 0 | 1 | 1 |
| A8- 6 | Direct ophthalmoscope | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | C | -do- | 0 | 0 | 1 | 1 |

[Kericho district hospital]

< Judgment 1 : passed, 0 : failed >

| No. | Description | Existing no. | Requested no. | Criteria | | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|-----|-------------|--------------|---------------|----------|--|--|--|--|--|--|----------|----------|----------|---------|-----|-------|-------------|
| | | | | | | | | | | | | | | Replace | Add | Newly | |

1 . Casualty department

1-1 Consultation rm (Filter clinic)

| | | | | | | | | | | | | | | | | |
|-------|--------------------|---|---|---|---|---|---|---|---|---|---|---------------|---|---|---|---|
| B1- 1 | Examination lights | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Filter clinic | 0 | 0 | 2 | 2 |
| B1- 2 | Film viewers | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 2 | 2 |

1-2 Treatment room

| | | | | | | | | | | | | | | | | |
|-------|-------------------|---|---|---|---|---|---|---|---|---|---|--------------|---|---|---|---|
| B1- 3 | Laryngoscope | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Treatment rm | 0 | 0 | 2 | 2 |
| B1- 4 | Resuscitation bag | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 2 | 2 |
| B1- 5 | Suction machine | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| B1- 6 | Autoclave | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B1- 7 | Stretcher | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 3 | 0 | 4 |

1-3 Minor operating room

| | | | | | | | | | | | | | | | | |
|--------|-----------------|---|---|---|---|---|---|---|---|---|---|--------------------|---|---|---|---|
| B1- 8 | Operating table | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Minor operating rm | 0 | 0 | 1 | 1 |
| B1- 9 | Operating light | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| B1- 10 | Defibrillator | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

1-4 Recovery room

| | | | | | | | | | | | | | | | | |
|--------|---------------|---|---|---|---|---|---|---|---|---|---|-------------|---|---|---|---|
| B1- 11 | Recovery beds | 0 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Recovery rm | 0 | 0 | 5 | 5 |
|--------|---------------|---|---|---|---|---|---|---|---|---|---|-------------|---|---|---|---|

2 . Operation theatre (O/T)

| | | | | | | | | | | | | | | | | |
|-------|-----------------------------|---|---|---|---|---|---|---|---|---|---|------|---|---|---|---|
| B2- 1 | Laryngoscope | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | O/T | 0 | 0 | 1 | 1 |
| B2- 2 | Pulseoximeter | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 1 | 0 | 1 |
| B2- 3 | Electrosurgical unit | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 2 | 0 | 2 |
| B2- 4 | Orthopaedic operating table | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B2- 5 | Operating microscope | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 1 | 0 | 1 |
| B2- 6 | ECG monitor | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| B2- 7 | Defibrillators | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | B | -do- | 0 | 0 | 0 | 0 |
| B2- 8 | Operating lights | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 2 | 1 | 0 | 3 |
| B2- 9 | Operating table | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

| No. | Description | Existing no. | Requested no. | Criteria | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|--------|------------------------|--------------|---------------|----------|---|---|---|---|---|----------|----------|----------|---------|-----|-------|-------------|
| | | | | | | | | | | | | | Replace | Add | Newly | |
| B2- 10 | Dermatome | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| B2- 11 | Ob/Gy operating table | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| B2- 12 | Anesthetic ventilators | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| B2- 13 | Suction machine | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 2 | 0 | 0 | 2 |

3 . Out-patient department (OPD)

3-1 Internal medicine/Surgical/Psychiatry clinics

| | | | | | | | | | | | | | | | | |
|-------|-------------------------|---|---|---|---|---|---|---|---|---|---|----------------------------------|---|---|---|---|
| B3- 1 | X-ray film illuminators | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Surgery(1) | 2 | 0 | 0 | 2 |
| B3- 2 | Examination couches | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Surgery(1),Ps ychiatry (1) | 3 | 0 | 0 | 3 |
| B3- 3 | Diagnostic sets | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Surgery(1) | 2 | 0 | 0 | 2 |

3-2 Ob/Gy clinic

| | | | | | | | | | | | | | | | | |
|-------|----------------------------|---|---|---|---|---|---|---|---|---|---|--------------|---|---|---|---|
| B3- 4 | Ultrasound diagnostic unit | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | Ob/Gy clinic | 0 | 0 | 1 | 1 |
| B3- 5 | Ob/Gy examining table | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 0 | 0 | 1 | 1 |
| B3- 6 | Examination light | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 1 | 0 | 0 | 1 |

3-3 Paediatric clinic

| | | | | | | | | | | | | | | | | |
|-------|------------------------|---|---|---|---|---|---|---|---|---|---|-------------------|---|---|---|---|
| B3- 7 | X-ray film illuminator | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Paediatric clinic | 0 | 0 | 1 | 1 |
| B3- 8 | Examination couch | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

3-5 Dental clinic

| | | | | | | | | | | | | | | | | |
|--------|----------------------|---|---|---|---|---|---|---|---|---|---|---------------|---|---|---|---|
| B3- 9 | Dental unit | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Dental clinic | 2 | 0 | 0 | 2 |
| B3- 10 | X-ray film processor | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| B3- 11 | Ultrasonic scaler | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 2 | 2 |

3-6 ENT clinic

| | | | | | | | | | | | | | | | | |
|--------|----------------------|---|---|---|---|---|---|---|---|---|---|------------|---|---|---|---|
| B3- 12 | ENT treatment units | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | ENT clinic | 0 | 0 | 1 | 1 |
| B3- 13 | ENT treatment chairs | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | ENT clinic | 0 | 0 | 1 | 1 |
| B3- 14 | Laryngoscope | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| B3- 15 | Nebulizers | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |

3-7 Eye clinic

| | | | | | | | | | | | | | | | | |
|--------|-------------------|---|---|---|---|---|---|---|---|---|---|------------|---|---|---|---|
| B3- 16 | Examination light | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Eye clinic | 1 | 0 | 0 | 1 |
| B3- 17 | Ophthalmoscope | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |
| B3- 18 | Slit lamp | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 0 | 0 | 1 | 1 |

3-8 TB clinic

| | | | | | | | | | | | | | | | | |
|--------|-------------|---|---|---|---|---|---|---|---|---|---|-----------|---|---|---|---|
| B3- 19 | Film viewer | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | TB clinic | 0 | 1 | 0 | 1 |
|--------|-------------|---|---|---|---|---|---|---|---|---|---|-----------|---|---|---|---|

4 . X-ray

| | | | | | | | | | | | | | | | | |
|-------|--------------------------|---|---|---|---|---|---|---|---|---|---|---------------------------|---|---|---|---|
| B4- 1 | Automatic film processor | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Dark room | 1 | 0 | 0 | 1 |
| B4- 2 | Mobile X-ray unit | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Casualty X-ray unit rm | 1 | 0 | 0 | 1 |

5 . Laboratory

| | | | | | | | | | | | | | | | | |
|-------|------------|---|---|---|---|---|---|---|---|---|---|------------|---|---|---|---|
| B5- 1 | Centrifuge | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Laboratory | 1 | 0 | 0 | 1 |
| B5- 2 | Microscope | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Laboratory | 1 | 0 | 0 | 1 |

6 . Physiotherapy department

| | | | | | | | | | | | | | | | | |
|-------|----------------------|---|---|---|---|---|---|---|---|---|---|---------------|---|---|---|---|
| B6- 1 | Short wave diathermy | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | Physiotherapy | 0 | 0 | 1 | 1 |
| B6- 2 | Microwave diathermy | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B6- 3 | Infra-red lamp | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |

| No. | Description | Existing no. | Requested no. | Criteria | | | | | | Judgment | Priority | Location | Purpose | | | Planned qty |
|-------|---------------------|--------------|---------------|----------|---|---|---|---|---|----------|----------|----------|---------|-----|-------|-------------|
| | | | | | | | | | | | | | Replace | Add | Newly | |
| B6- 4 | Ultrasound machine | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B6- 5 | Nerve stimulator | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B6- 6 | Wax therapy machine | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B6- 7 | Plaster cutter | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | A | -do- | 0 | 1 | 0 | 1 |

7 . Maternity unit

| | | | | | | | | | | | | | | | | |
|-------|-----------------------|---|---|---|---|---|--|---|---|---|---|-------------|---|---|---|---|
| B7- 1 | Suction machine | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | B | Delivery rm | 0 | 1 | 0 | 1 |
| B7- 2 | Fetal heart detectors | 1 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | B | Labour rm | 1 | 1 | 0 | 2 |
| B7- 3 | Delivery tables | 2 | 3 | 1 | 1 | 1 | | 1 | 1 | 1 | A | Delivery rm | 2 | 0 | 0 | 2 |

8 . Nursery

| | | | | | | | | | | | | | | | | |
|-------|--------------------|---|---|---|---|---|--|---|---|---|---|---------|---|---|---|---|
| B8- 1 | Baby cots | 4 | 6 | 1 | 1 | 1 | | 1 | 1 | 1 | B | Nursery | 4 | 2 | 0 | 6 |
| B8- 2 | Phototherapy units | 0 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | A | -do- | 0 | 0 | 2 | 2 |
| B8- 3 | Incubators | 4 | 4 | 1 | 1 | 1 | | 1 | 1 | 1 | A | -do- | 4 | 0 | 0 | 4 |
| B8- 4 | Suction machines | 1 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |
| B8- 5 | Resuscitators | 1 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | B | -do- | 1 | 1 | 0 | 2 |

9 . MCH/Family planning

| | | | | | | | | | | | | | | | | |
|-------|----------------------|---|---|---|---|---|--|---|---|---|---|--------|---|---|---|---|
| B9- 1 | Fetal heart detector | 1 | 2 | 1 | 1 | 1 | | 1 | 1 | 1 | B | MCH/FP | 0 | 1 | 0 | 1 |
|-------|----------------------|---|---|---|---|---|--|---|---|---|---|--------|---|---|---|---|

10. Hospital maintenance unit (HMU)

| | | | | | | | | | | | | | | | | |
|--------|--------------------|---|---|---|---|---|---|---|---|---|---|------|---|---|---|---|
| B10- 1 | Tool for electric | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | HMU | 1 | 0 | 0 | 1 |
| B10- 2 | Tool for mechanic | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | B | -do- | 1 | 0 | 0 | 1 |
| B10- 3 | Multimeters | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | B | -do- | 0 | 0 | 0 | 0 |
| B10- 4 | Soldering stations | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | B | -do- | 0 | 0 | 0 | 0 |

11. Ambulance

| | | | | | | | | | | | | | | | | |
|--------|-----------|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|
| B11- 1 | Ambulance | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | C | | 0 | 0 | 0 | 0 |
|--------|-----------|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|

2-2-2-2 Site Plan

(1) Kisii District Hospital

1) Shape of the site and ground

The site with an area of about 4.1 hectares face on the south and west very busy roads. The site is a slope of a very gentle downward gradient from the south to the north, with a difference of elevation of about seven meters.

The boring test results indicate that a cohesive soil (weathered basalt) layer lies to a depth of about GL-20m, indicating a good rigidity with an N value of 19 to 50.

2) Surrounding environment and state of infrastructure

The Kisii District Hospital is situated in the central part of Kisii City. The crossing (runabout) which the main entrance of the hospital faces is very busy with traffics of vehicles and people, and is dangerous.

Bus stops for the matatsu (public mini bus), parking lots, public toilets are provided in the present entrance space to the hospital. It is also a community road routinely used by the students of the Kisii Detached School of the Kenya Medical Training College (MTC) situated adjacent to the hospital, and also by the community people. The area near the entrance to the hospital is always filled with the community people, patients, hospital staff, and the hospital guards frequently find it difficult dealing with them.

The social infrastructure is insufficiently provided in Kisii. Power failure, for example, occurs several times a day. The Kenya Power and Lighting Company (KPL) supplies hydroelectric power to Kisii City, the supply is too short of the demand.

The water purification plant in the eastern part of the city supplied water to the city. Although a plenty of water is available throughout the year at the water intake point of the Gucha River, the water supply to the city is very unstable due to the decline of the pumping capacity of the water purification plant. Now, they plan to install a new pump; nevertheless, there remain some problems about supply capacity, a problem of insufficient capacity of the water supply tank to supply water to the entire city area, for example.

Regarding wastewater, a stormwater drainage plan and a sewerage system plan are underway. The Kisii Water and Sanitation Company operates a wastewater treatment plant at a place 10 kilometres apart from the city area.

Collection of the municipal wastes and medical wastes is not done in Kisii City.

The city gas network is not established. Most people burn LPG (propane), kerosene or firewood for cooking.

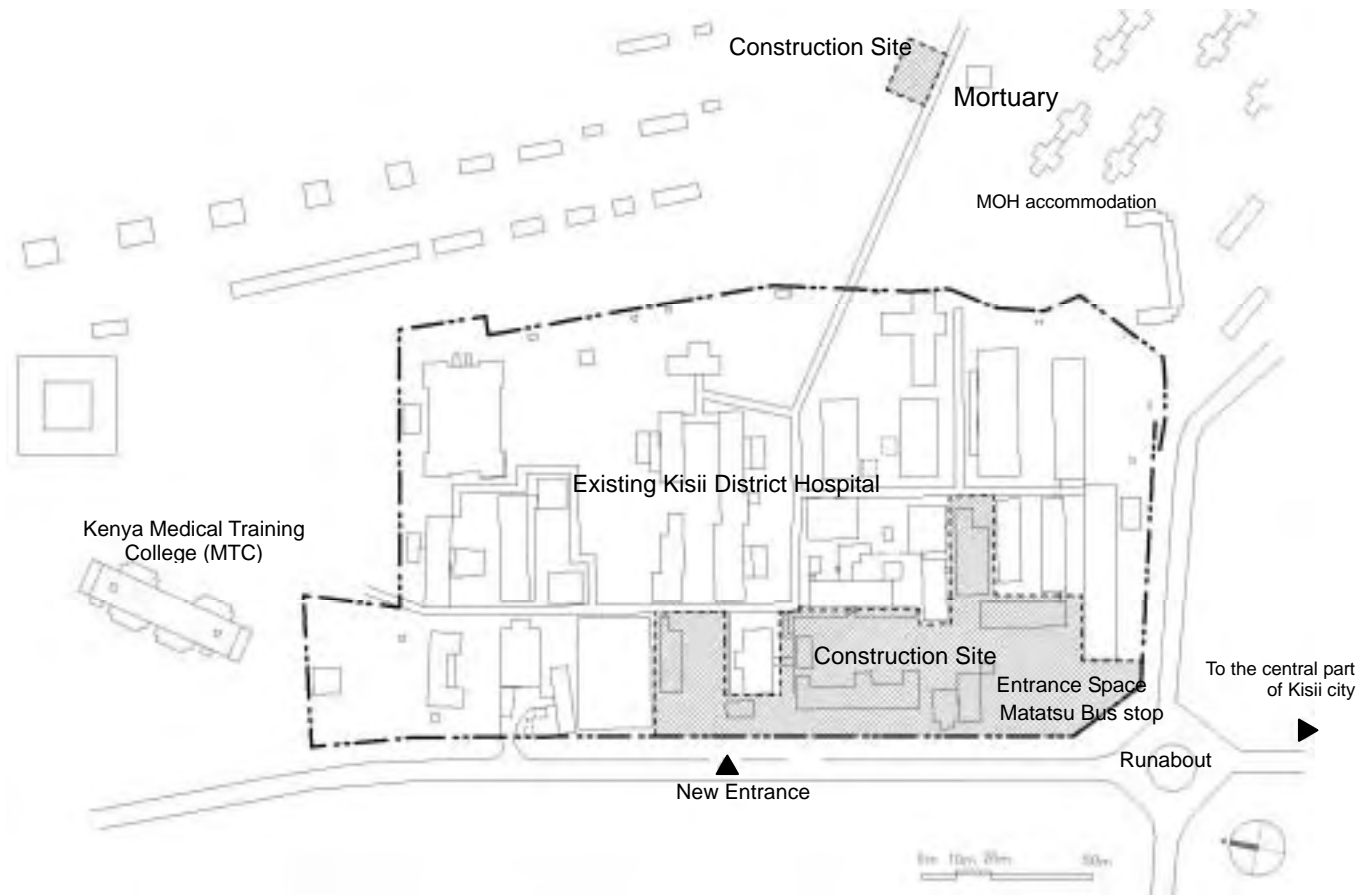


Figure 2-7 Kisii District Hospital Neighbourhood Including the Construction Site

3) Land use plan

A master plan for rehabilitation of the Kisii District Hospital will be developed referring to the previously mentioned present state of the existing facilities and the result of analysis of the draft request for this project. The layout plan of this project will be made based on such entire improvement plan. Major considerations to the layout planning are as follows.

Improvement of traffic lines, effectiveness improvement of medical services

→ Integration of the Outpatient Building Division and the Central Diagnosis and Treatment Building Division

Provision of uninterrupted medical services

→ Proposition of a facility rebuilding plan that does not interrupt medical services during the construction period of the project facilities

Securing of proper facility capacity

→ Calculation of number of sickrooms from the present number of patients

The existing facilities that will become vacant as a result of relocation after completion of this project are buildings indicated in bold lines. The government of Kenya intends to repair the existing facilities of the divisions that are excluded from the final request based on the government's master plan.

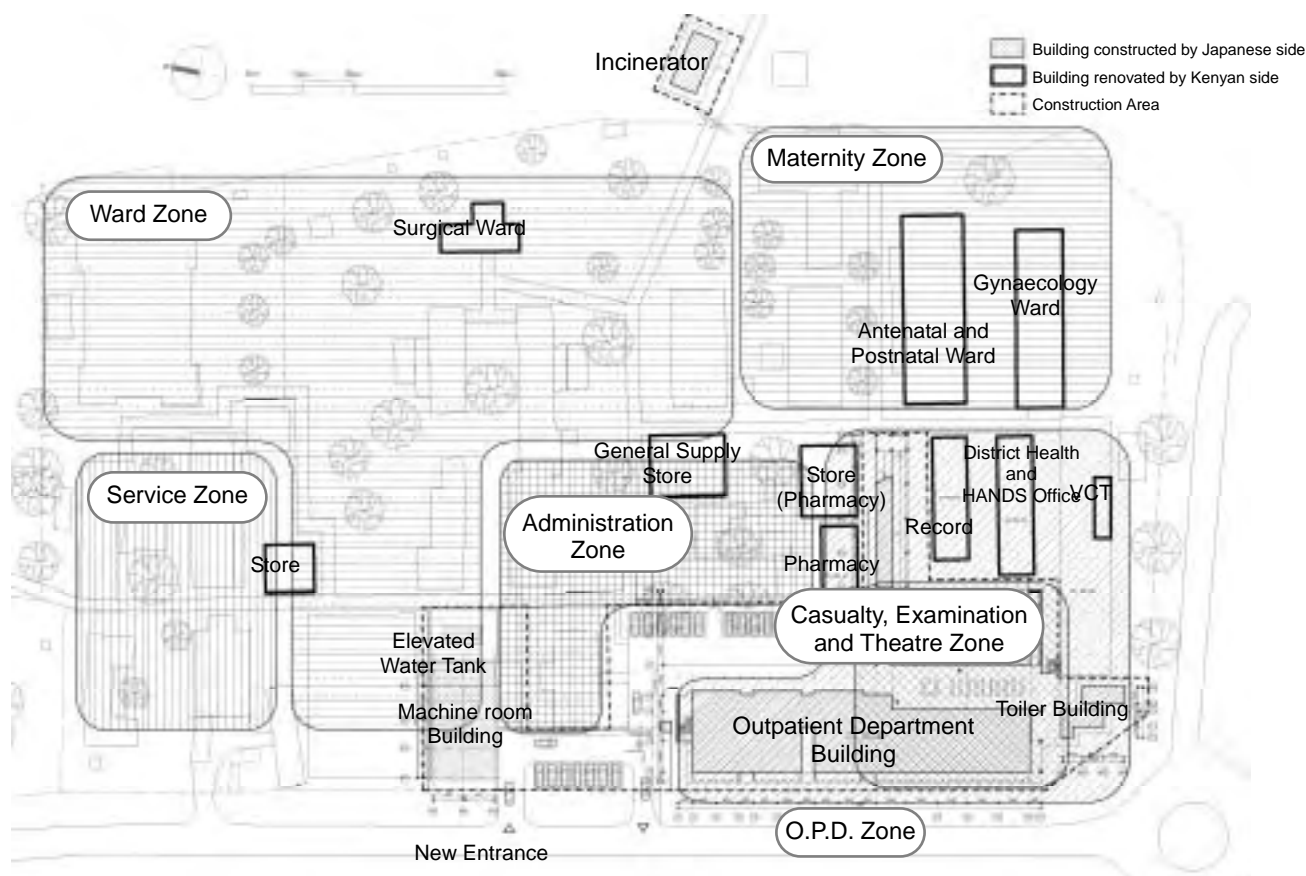


Figure 2-8 Relation between the Master Plan for Rehabilitation of the Kisii District Hospital and the Present Cooperation Project

4) Existing facilities and layout plan of the project facilities

The divisions subject to this project are the Outpatient Department (General Outpatient Diagnosis and Treatment, the Special Clinic, the Casualty), the Central Diagnosis and Treatment Division, and the Delivery Division. These facilities will be installed in the space to be made available by demolishing the obsolete General Outpatient Building, warehouse, parking lots. In formulating the layout plant, the office building, symbolic of this Hospital build in 1916, the year in which this hospital was inaugurated, will remain. The layout plan will consider relocation of the present entrance to the hospital facing a busy and dangerous road crossing to a safer place.

The above mentioned divisions will be housed in the Outpatient Department Building to be located to the southwestern part of the site. Traffic, communications and cooperation with the Outpatient Building will be facilitated by placing a piloti on the ground floor.

A security gate will be placed at the entrance, moved from the road crossing to the west side of the site, to control all entrances and exits of the medical and healthcare professionals, patients and their concerned persons, ambulances, vehicles for the staff and for services. A porch will be provided to the gate, and patients' private passenger cars, taxis are restricted from passing the gate.

A vacant space will be provided adjacent to the porch, and the Machine Building, which houses the emergency generator, will be located close to this vacant space to facilitate the Machine Building to receive fuel from vehicles. Regarding the water-supply related Machine Building, a new road is laid to the existing elevated cistern to the southeast of the

site.

The incinerator is planned for a place now used for waste stockpiling near the mortuary on the east side of the site.

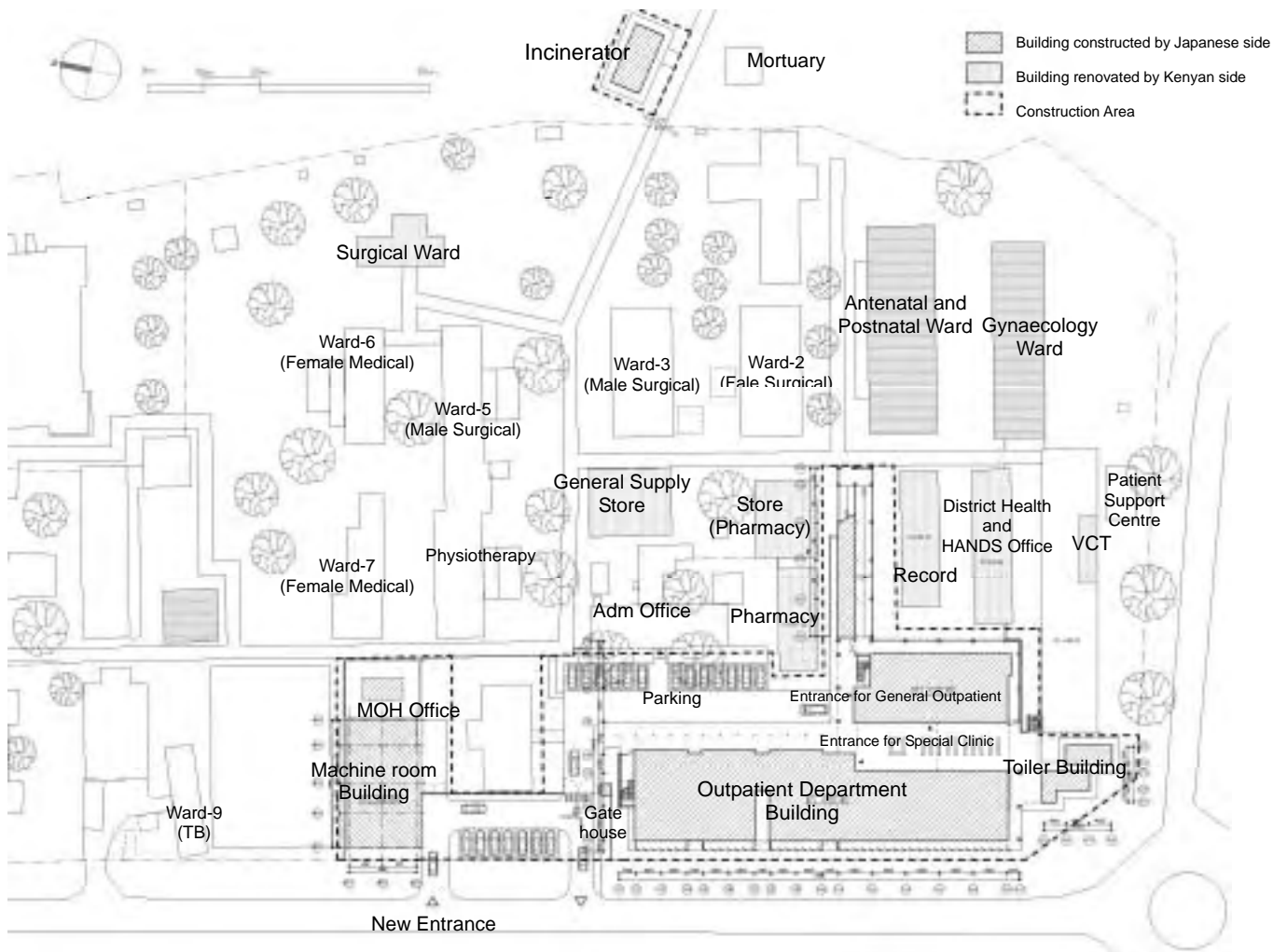


Figure 2-9 Existing Facilities and Layout Plan of the Project Facilities of the Kisii District Hospital

(2) Kericho District Hospital

1) Shape of the site and ground

The site with an area of about eight hectares, with its northeastern side facing a busy road, has a gentle downward gradient from the northeast side to the southwest side, with a difference of elevation of about 12 meters.

2) Surrounding environment and state of infrastructure

The Kericho District Hospital is situated in the southwestern part of Kericho City, and is close to a bus terminal and a commercial area. The road in front of the hospital is relatively busy in traffic.

The Kenya Power and Lighting Company supplies a sufficient amount of electric power for the entire demand of the Kericho City. Notwithstanding, power failure occurs five to six times a month.

The water supply is stable and meets the demand. Water sources are several deep wells, rivers and dams. A new water purification plant has been installed at a place five kilometres to the northeast of the hospital. Water is abundantly available, a new water purification plant is in operation, new water pipes are laid. Water supply failures are rare except for unexpected accidents, etc. Water failure occurs about three times during the dry season, or January and February. Water pressure of the waterworks system is maintained high enough to feed directly to the water supply tank.

Kericho Water and Sanitation Company installed a wastewater treatment plant at a site to northwest corner of the hospital site five years ago. A trickling filter wastewater treatment plant with a capacity of 4,000m³/day operates in a very wide site. The sludge is recovered and composted for reuse.

There is a waste collection facility in a site between the wastewater treatment plant and the hospital. They incinerate the wastes, but the way they treat the wastes is not good enough to be perfect, though they use incineration.

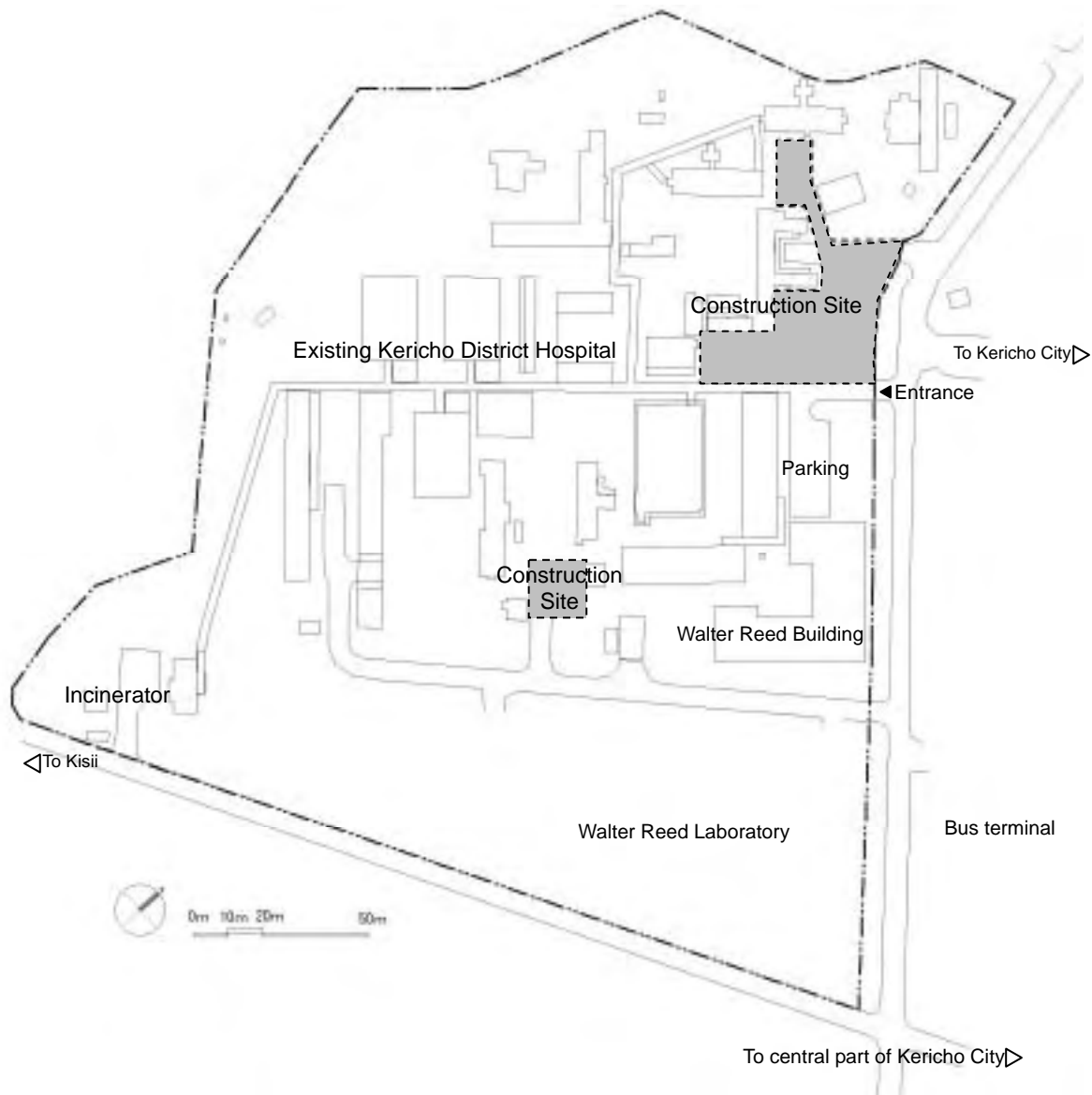


Figure 2-10 Kericho District Hospital Neighbourhood Including the Construction Site

3) Land use plan

A clear zoning plan for the entire Kericho District Hospital has been developed which calls for continuous layout from the main entrance at northeast roadside through the Outpatient Department, Examination and Theatre Department, Obstetrics Division, to the Ward Division. The study team confirmed the contents of the master plan shown below with the Kenyan side through the discussions. The Emergency Division of this project is planned based on this master plan.

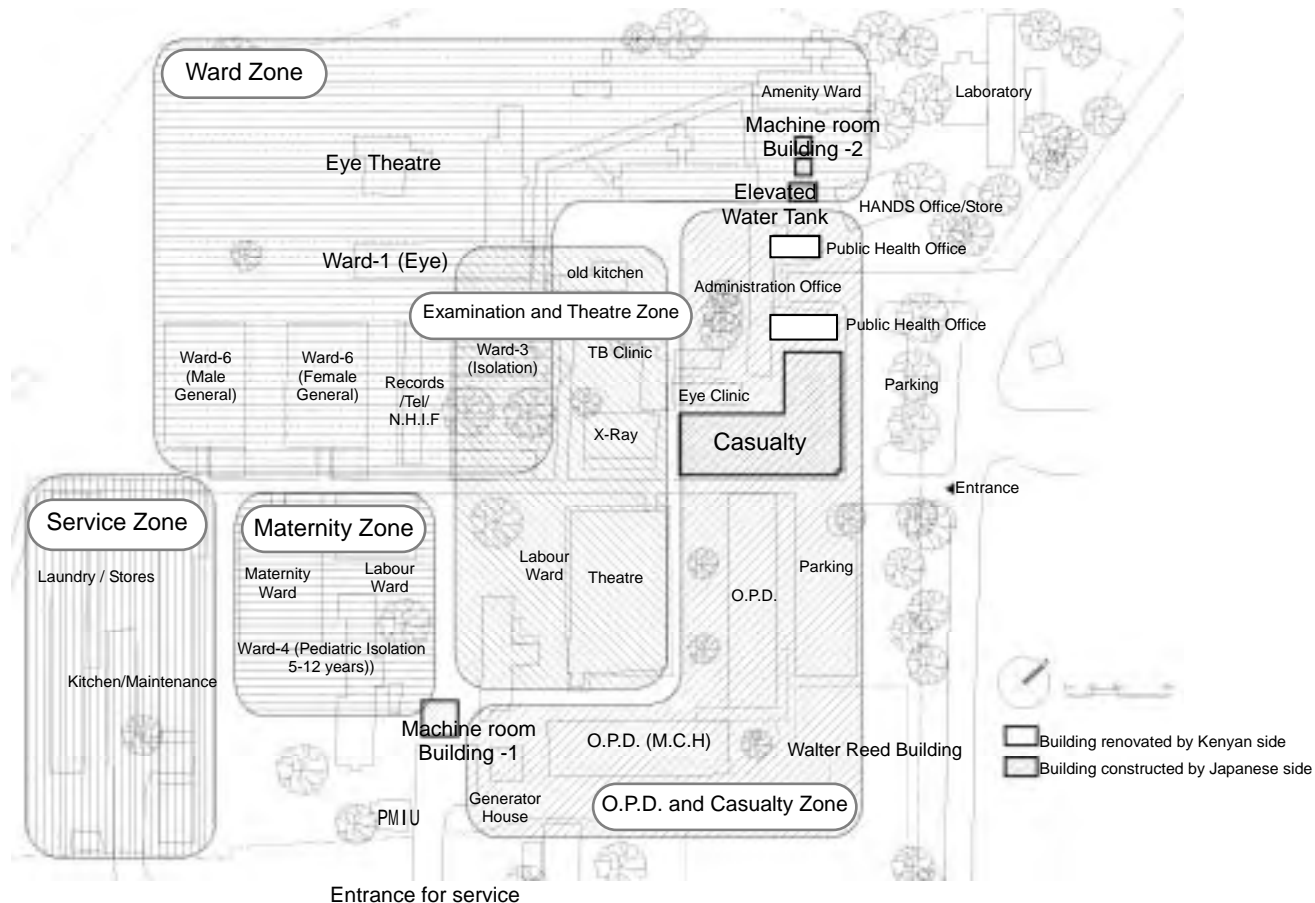


Figure 2-11 Master Plan for Rehabilitation of the Kericho District Hospital

4) Facility layout plan

The Emergency Division is the subject of this project. The Emergency Division will be constructed on the site left after demolition of the obsolete building housing the HIV Clinic which is to be relocated to the Walter Reed Building scheduled for completion in January 2007.

The Machine Building to house such facilities as the emergency generator will be built on a lot near the existing generator room facing the service entrance on the southeast side of the site.

The water-supply related Machine Building and the elevated cistern will be placed on a vacant lot on the north side of the existing facility, considering such factors as the difference of elevation with the project facilities and convenience of maintenance.

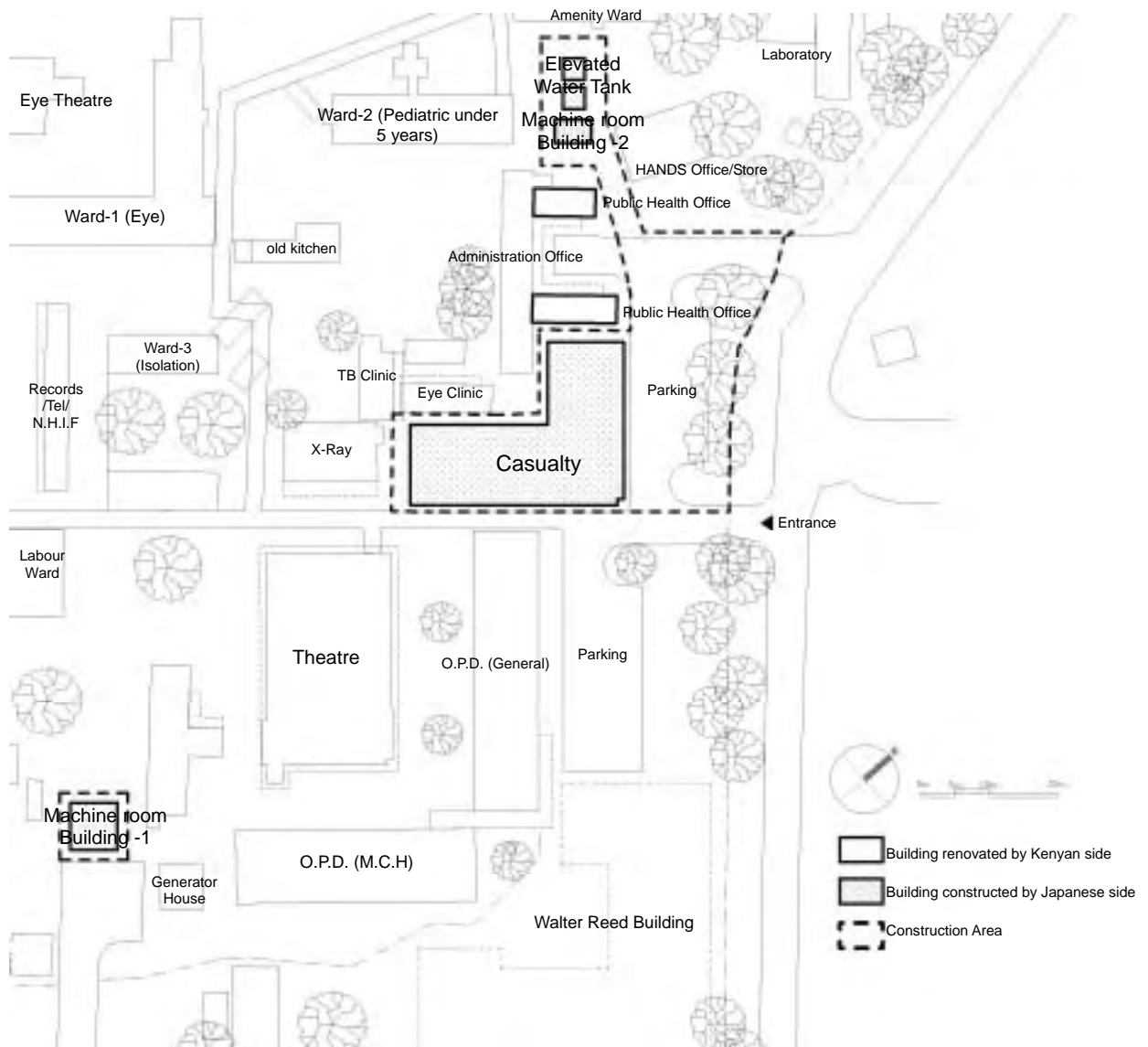


Figure 2-12 Facility Plan of this Project for the Kericho District Hospital

2-2-2-3 Architectural Plan

(1) Conditions of the facility capacity

The number of rooms of each division subject to design of this project is calculated using the conditions given below based on the forecast number of patients for 2014, five years after completion and start of commissioning of the services. The forecast numbers of patients for 2014 are obtained from the past data (numbers of patients and cases of operations) of both hospitals and rates of population increase of Kisii Central District and Kericho District, both being direct beneficial districts.

1) Forecast of population and number of patients for Kisii Central District and Kericho District

The number of patients may be considered to increase in proportion to the population. At first, the population for 2014 is forecast for both districts, and their rates of increase of population are calculated. The rates of population increase determined by the government of Kenya from the 2002 census are 1.04% and 1.05% for Kisii Central District and Kericho District, respectively. From these the forecast population for 2014 will be as shown in the table below. The rate of population increase from 2006 onward is 1.17 and 1.21 times larger for Kisii Central District and Kericho District, respectively. These figures are also used for forecasting the numbers of patients.

Table 2-11 Forecast Population of Kisii Central District

| | 1999 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 | 2014 |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Male | 234,448 | 248,945 | 259,105 | 269,679 | 280,685 | | | |
| Female | 257,338 | 273,252 | 284,404 | 296,010 | 308,091 | | | |
| Total | 491,786 | 522,197 | 543,509 | 565,689 | 588,776 | 612,327 | 636,820 | 662,293 |
| Increasing rate per year | | 1.06 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 |
| Increasing rate based on 2006 | | | | | 1.04 | 1.08 | 1.13 | 1.17 |

(Source: Kisii Central District Development Plan for 2002 - 2008)

Table 2-12 Forecast Population of Kericho District

| | 1999 | 2002 | 2004 | 2006 | 2008 | 2010 | 2012 | 2014 |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Male | 237,821 | 255,576 | 268,142 | 281,327 | 295,160 | | | |
| Female | 230,672 | 247,893 | 260,082 | 272,870 | 286,288 | | | |
| Total | 468,493 | 503,469 | 528,224 | 554,197 | 581,448 | 610,520 | 641,046 | 673,099 |
| Increasing rate per year | | 1.07 | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 |
| Increasing rate based on 2006 | | | | | 1.05 | 1.10 | 1.16 | 1.21 |

(Source: Kericho District Development Plan for 2002 - 2008)

2) Presumption for medical activities for both districts

Annual working day

The Outpatient Department, except for the Casualty and the Delivery Division, and The Central Diagnosis and Treatment Division are open for services except of Saturdays and Sundays.

The average annual working days for each division are presumed as follows.

[Outpatient Department]

| | |
|--------------------|----------|
| General Outpatient | 260 days |
| Special clinic | 260 days |
| Casualty | 365 days |

[Central Diagnosis and Treatment Division]

| | |
|---|----------|
| X-ray Examination Division | 260 days |
| Physiological / Pathological Examination Division | 260 days |
| Delivery Division | 365 days |
| Theatre / D.H.U. Division | |
| Scheduled operations | 260 days |
| Emergency operations | 365 days |
| Obstetrics operations | 365 days |

Opening hours of the Outpatient Department and the Central Diagnosis and Treatment Division

On working days these divisions are open from 8:00 to 12:30 in the morning and 13:30 to 17:00 in the afternoon, or a total of eight hours.

Clinical hour of each diagnosis and treatment division

The clinical hour, treatment hour, recuperation hours after operation or delivery, etc. are shown in the scale calculation table for each diagnosis and treatment division.

(2) Facility plan of the Kisii District Hospital

1) Study by division

Number of patients

The numbers of outpatients for five years from 2001 to 2005 are as per shown in Table 2-13.

• Outpatient Department

There was an outbreak of malaria in 2001, and the number of outpatients increased to 140 thousand.

The rate of increase during the three years from 2003 to 2005 is 105%, nearly equal to the rate of population increase of the Kisii Central District. Therefore, the number of outpatients used for scale calculation is the average value for the three years from 2003 to 2005.

Table 2-13 Number of Patients for the Outpatient Department

| | Occupancy rate of Out-patient | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|---------------------------|-------------------------------|---------|---------|---------|---------|---------|----------------------|
| Total No. of Out-patients | 100% | 139,087 | 112,568 | 114,262 | 125,508 | 126,072 | 121,947 |
| Rate of increase | | | 81% | 102% | 110% | 100% | 105% |
| 1 Casualty | 15% | 20,863 | 16,885 | 17,139 | 18,826 | 18,911 | 18,292 |
| High injured | 20% | 4,173 | 3,377 | 3,428 | 3,765 | 3,782 | 3,658 |
| Low injured | 80% | 16,690 | 13,508 | 13,711 | 15,061 | 15,129 | 14,634 |
| 2 General consultation | 10% | 13,909 | 11,257 | 11,426 | 12,551 | 12,607 | 12,195 |
| 3 M.C.H | 25% | 34,772 | 28,142 | 28,566 | 31,377 | 31,518 | 30,487 |
| 4 Special Clinic | 50% | 69,544 | 56,284 | 57,131 | 62,754 | 63,036 | 60,974 |

(Source: interview survey)

Table 2-14 Number of Patients for the Special Clinic

| Out-patients (Special Clinic) | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|---|--------------|--------|--------|--------|--------|--------|----------------------|
| 1 Internal medicine | 1 | 13,953 | 11,376 | 13,226 | 14,881 | 15,413 | 14,507 |
| 2 Paediatric | | | | | | | |
| 3 Surgery | | | | | | | |
| 4 Obstetric/Gynaecology | | | | | | | |
| 5 Psychiatry | 0 | - | - | 1,644 | 1,322 | 1,545 | 1,504 |
| 6 Dental clinic | 1 | 4,532 | 4,967 | 7,340 | 7,058 | 6,563 | 6,987 |
| 7 E.N.T. | 1 | 4,234 | 3,348 | 5,006 | 5,794 | 5,164 | 5,321 |
| 8 Eye clinic | 1 | 6,273 | 4,877 | 5,405 | 6,605 | 6,058 | 6,023 |
| Sub-Total No. of Special Clinic Out-patient | | 28,992 | 24,568 | 32,621 | 35,660 | 34,743 | 34,341 |
| Rate of increase | | | 85% | 133% | 109% | 97% | 103% |
| 9 T.B clinic | 2 | - | - | 7,994 | 9,351 | 5,304 | 7,550 |
| 10 Physiotherapy | 1 | 10,839 | 7,320 | 7,730 | 9,158 | 9,505 | 8,798 |
| 11 Occupational Therapy | 1 | 10,405 | 8,268 | 7,677 | 6,430 | 10,870 | 8,326 |
| 12 HIV clinic | 1 | - | - | - | - | 1,385 | 1,385 |
| 13 VCT | 1 | - | - | - | 1,881 | 2,687 | 2,284 |
| Total No. of Special Clinic Out-patient | | 79,228 | 64,725 | 88,644 | 98,141 | 99,238 | 95,341 |

(Source: interview survey)

- X-ray Examination Division

The number of X-ray examinations a year to be used for the scale calculation is the average number for the three years from 2003 to 2005, as is the case with the Outpatient Department.

Until 2002, the ultrasonography was done in the radiographic examination rooms alternately. The ultrasound room newly installed in 2003 is bad in the room environment, and the number of patients decreased by about 30%. In 2003 the technician in charge was absent for six months for training, during this period the number of patients further decreased. The number of patients a year for scale calculation is the average for two years from 2001 to 2002, the years in which the effects of rooms and manning were small.

Table 2-15 Number of X-ray Examinations

| X-ray Examination | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|---------------------|--------------|--------|--------|--------|--------|--------|----------------------|
| X-ray (General) | 2 | 11,252 | 10,921 | 12,970 | 11,783 | 13,289 | 12,681 |
| X-ray (Fluoroscopy) | | 400 | 378 | 445 | 520 | 518 | 494 |
| Total | | 11,652 | 11,299 | 13,415 | 12,303 | 13,807 | 13,175 |
| Rate of increase | | | 97% | 119% | 92% | 112% | 108% |

(Source: interview survey)

Table 2-16 Number of Ultrasonographic Examinations

| Physiological Examination | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | 2 years Average |
|---------------------------|--------------|-------|-------|-------|-------|-------|-----------------|
| Ultrasound | 1 | 4,801 | 4,265 | 3,253 | 3,051 | 2,453 | 4,533 |
| Rate of increase | | | 89% | 76% | 94% | 80% | |

(Source: interview survey)

- Physiological / Pathological Examination Division

The number of physiological / pathological examinations used for the scale calculation is the average for the three years from 2003 to 2005, as is the case with the Outpatient Department.

Table 2-17 Number of Physiological / Pathological Examinations

| Laboratory Examination | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|------------------------|--------------|--------|--------|--------|--------|---------|----------------------|
| 1 Biochemistry | 1 | 7,491 | 7,702 | 12,315 | 17,941 | 21,257 | 17,171 |
| 2 Hematology | 1 | 9,037 | 20,526 | 24,149 | 12,404 | 31,076 | 22,543 |
| 3 Parasitology | 1 | 25,507 | 31,032 | 46,082 | 45,404 | 56,942 | 49,476 |
| 4 Immunology | 1 | 27,322 | 15,251 | 16,883 | 33,099 | 108,769 | 52,917 |
| 5 Micro-Biology | 1 | 6,942 | 5,902 | 8,775 | 8,212 | 43,232 | 20,073 |
| Bacteriology (TB) | | 6,325 | 5,582 | 8,076 | 7,351 | 8,815 | |
| Bacteriology (Culture) | | 617 | 320 | 699 | 861 | 34,417 | |
| 6 Blood Transfusion | | 2,615 | 4,247 | 3,760 | 3,083 | 2,631 | 3,158 |

(Source: interview survey)

- Delivery Division

The number of deliveries used for scale calculation is the average for the three years from 2003 to 2005, as is the case with the Outpatient Department.

The hospitalization data used for scale calculation of the nursery is the average for 2004 and 2005, because the data for 2003 and before are not kept.

Table 2-18 Number of Deliveries

| Delivery | No. of Delivery beds | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|--------------------------|----------------------|-------|-------|-------|-------|-------|----------------------|
| 1 Normal delivery | 4 | 7,299 | 7,307 | 7,020 | 6,483 | 6,520 | 6,674 |
| 2 Vacuum extracted | | 27 | 23 | 6 | 20 | 0 | 9 |
| 3 Low birth weight | | 694 | 701 | 577 | 689 | 723 | 663 |
| 4 Stillbirth | | 327 | 307 | 345 | 323 | 380 | 349 |
| 5 Others | | 1,240 | 1,190 | 1,120 | 1,250 | 1,270 | 1,213 |
| Total No. of Out-patient | | 9,587 | 9,528 | 9,068 | 8,765 | 8,893 | 8,909 |
| Rate of increase | | | 99% | 95% | 97% | 101% | 99% |

(Source: interview survey)

Table 2-19 Hospitalization Days of Newborn Babies

| Newborn | 2001 | 2002 | 2003 | 2004 | 2005 | Last 2 years Average |
|-------------------------------|------|------|------|-------|-------|----------------------|
| Available beds | - | - | - | 10 | 10 | 10 |
| -Incubator | | | | 2 | 2 | |
| -Cot (using broken incubator) | | | | 6 | 6 | |
| -Cot | | | | 2 | 2 | |
| Available bed days | | | | 3,650 | 3,650 | |
| Total No. of Admission days | - | - | - | 3,738 | 4,116 | 3,927 |
| Bed occupancy rate | - | - | - | 102% | 113% | 108% |

(Source: interview survey)

- Theatre / D.H.U. (ward for serious patients) Division

One of the two theatres is not available for use because of a facility failure. Therefore, the number of operations that can be done by the Kisii District Hospital may be considered to be about 1,500.

As may be noted from Table 2-20, emergency operations and obstetrics operations are increasing in the Kisii District Hospital. Therefore, more than half the scheduled operations are cancelled. And, the rate of cancellation is increasing.

Therefore, the number of operations used for scale calculation includes the number of scheduled operations that were cancelled. The latest 2005 data is used.

Table 2-20 Number of Operations

| Operation | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | Last years Average |
|------------------------|--------------|-------|-------|-------|-------|-------|--------------------|
| Scheduled Operation | 1 | 199 | 539 | 570 | 636 | 662 | 662 |
| -Done | | 128 | 311 | 309 | 276 | 222 | |
| -not Done | | 71 | 228 | 261 | 360 | 440 | |
| Emergency Operation | | 198 | 251 | 392 | 300 | 702 | 702 |
| Caesarian section | | 712 | 823 | 709 | 907 | 1,242 | 1,242 |
| Total No. of Operation | | 1,038 | 1,385 | 1,410 | 1,483 | 2,166 | 2,166 |
| Rate of increase | | | 133% | 102% | 105% | 146% | 126% |

(Source: interview survey)

The D.H.U. is used for postoperative patients and diagnosis and treatment of traffic accident, food poisoning and burn injury victims. Therefore, numbers of operations of Table 2-21 and victims of traffic accidents, food poisoning, and burn injuries are used. However, the data for victims of traffic accidents, food poisoning and burn injuries are not available from 2004 onward. Therefore, the average for the three years from 2001 to 2003 is used.

Table 2-21 Traffic Accident, Food Poisoning, Burn Injury Victim Patients

| | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | 3 years Average |
|------------------------|--------------|------|------|------|------|------|-----------------|
| RTA'S | 0 | 249 | 331 | 220 | - | - | 267 |
| Poisoning | | 81 | 99 | 82 | - | - | 87 |
| Burn's and Corrosion | | 89 | 90 | 67 | - | - | 82 |
| Total No. of Operation | | 419 | 520 | 369 | | | 123 |
| Rate of increase | | | 124% | 71% | | | |

(Source: interview survey)

Scale calculation

Based on the above design conditions, scales of various rooms of the divisions of the Kisii District Hospital within the scope of this project are calculated.

- Outpatient Department

Table 2-22 Required Number of Various Rooms for the General Outpatient / Casualty

| | | Annual No. of Casualty-patients | | | | | | Consultation room | | | Casualty room | | | Observation room | | | | | |
|----------|---------------------------|--|-------------------------------|------------------------|---------------------------------------|-------------------------------|--|------------------------------|--|------------------------------------|---------------|-------------------------------------|--|-----------------------------------|--------------|-------------------------------------|--|-----------------------------------|--------------|
| | | Annual No. of Casualty-patients (p/year) | Annual working day (day/year) | Opening hour (min/day) | Average No. of daily patients (p/day) | Rate of increasing population | Expected No. of daily patients on 2014 (p/day) | Average of Consultation time | maximum No. of daily patients per room | Required No. of consultation rooms | No. of rooms | Average of Observation time (min/p) | maximum No. of daily patients per room | Required No. of Observation rooms | No. of rooms | Average of Observation time (min/p) | maximum No. of daily patients per room | Required No. of Observation rooms | No. of rooms |
| | | A | B | C | D=A/B | E | F=D*E | G | H=C/G | I=F/H | J | K=C/J | L=F/K | M | N=C/M | O=F/N | | | |
| Casualty | High injured | 3,658 | 365 | 1,440 | 10.02 | 1.17 | 11.73 | - | - | - | 180 | 8 | 1.47 | 2 | 600 | 2 | 4.89 | 5 | |
| | Low injured | 14,634 | 365 | 540 | 40.09 | 1.17 | 46.94 | 20 | 27 | 1.74 | - | - | - | - | - | - | - | - | |
| O.P.D | First medical examination | 12,195 | 260 | 480 | 46.90 | 1.17 | 54.91 | 20 | 24 | 2.29 | - | - | - | - | - | - | - | - | |
| | total | | | | | | | | | 4.03 | 4 | | | | | | | | |

Table 2-23 Required Number of Various Rooms for the Special Clinic by Medical Care

| | | Annual No. of Out-patients | | | | | | consultation room | | | | |
|----------------|----|-------------------------------------|-------------------------------|------------------------|---------------------------------------|-------------------------------|--|--------------------------------------|---|------------------------------------|--------------|----------------|
| | | Annual No. of Out-patients (p/year) | Annual working day (day/year) | Opening hour (min/day) | Average No. of daily patients (p/day) | Rate of increasing population | Expected No. of daily patients on 2014 (p/day) | Average of consultation time (min/p) | maximum No. of daily patients per room (p/day * room) | Required No. of consultation rooms | No. of rooms | |
| | | A | B | C | D=A/B | E | F=D*E | G | H=C/G | I=F/H | | |
| Special clinic | 1 | Internal medicine | 4,352 | 260 | 480 | 16.74 | 1.17 | 19.60 | 20 | 24 | 0.82 | 1 |
| | 2 | Pediatric | 3,627 | 260 | 480 | 13.95 | 1.17 | 16.33 | 20 | 24 | 0.68 | 1 |
| | 3 | Surgery | 3,627 | 260 | 480 | 13.95 | 1.17 | 16.33 | 20 | 24 | 0.68 | 1 |
| | 4 | Obstetric/Gynecology | 2,901 | 260 | 480 | 11.16 | 1.17 | 13.06 | 20 | 24 | 0.54 | 1 |
| | 5 | Psychiatry | 1,504 | 260 | 480 | 5.78 | 1.17 | 6.77 | 45 | 11 | 0.63 | 1 |
| | 6 | Dental clinic | 6,987 | 260 | 480 | 26.87 | 1.17 | 31.46 | 25 | 19 | 1.64 | 2 |
| | 7 | E.N.T. | 5,321 | 260 | 480 | 20.47 | 1.17 | 23.96 | 25 | 19 | 1.25 | 2 |
| | 8 | Eye clinic | 6,023 | 260 | 480 | 23.16 | 1.17 | 27.12 | 25 | 19 | 1.41 | 2 |
| | 9 | T.B clinic | 7,550 | 260 | 480 | 29.04 | 1.17 | 34.00 | 20 | 24 | 1.42 | Using Existing |
| | 10 | Physiotherapy | 8,798 | 260 | 480 | 33.84 | 1.17 | 39.62 | 20 | 24 | 1.65 | Using Existing |
| | 11 | Occupational Therapy | 8,326 | 260 | 480 | 32.02 | 1.17 | 37.49 | 20 | 24 | 1.56 | Using Existing |
| | 12 | HIV clinic | 1,385 | 260 | 480 | 5.33 | 1.17 | 6.24 | 20 | 24 | 0.26 | Using Existing |
| | 13 | VCT | 2,284 | 260 | 480 | 8.78 | 1.17 | 10.28 | 20 | 24 | 0.43 | Using Existing |

• X-ray Examination Division

Table 2-24 Required Number of Various Rooms for the X-ray Examination Division

| | Annual No. of Examinations (p/year) | Annual working day (day/year) | Opening hour (min/day) | Average No. of daily Examinations (p/day) | Rate of increasing population | Expected No. of daily Examinations on 2014 (p/day) | Examination room | | | No. of room |
|---------------------|--|------------------------------------|-----------------------------|---|-------------------------------|--|--|--|--------------------------------------|-------------|
| | | | | | | | Average of Examination time (min/p) | maximum No. of daily Examinations in a room (p/day * room) | Required No. of Examination rooms | |
| | | | | | | | G | H=C/G | I=F/H | |
| 1 X-ray | | | | | | | | | | |
| X-ray (General) | 12,681 | 260 | 480 | 48.77 | 1.17 | 57.10 | 10 | 48 | 1.19 | |
| X-ray (Fluoroscopy) | 494 | 260 | 480 | 1.90 | 1.17 | 2.23 | 30 | 16 | 0.14 | |
| 2 Ultrasound | 4,533 | 260 | 480 | 17.43 | 1.17 | 20.41 | 20 | 24 | 0.85 | 1 |

• Delivery Division

This project covers mainly rooms of the Obstetrics Division which concern delivery; namely, the labour room, delivery room and recovery room. The numbers of necessary antenatal rooms and postpartum rooms are also calculated; however, the Kenyan side plans to cope with these requirements by rehabilitating the existing Obstetrics Building.

Table 2-25 Required Number of Various Rooms for the Delivery Division

| Item Medical care | Annual No. of Deliveries (p/year) | Annual working day (day/year) | Deliveries (p/day) | Rate of increasing population | Antenatal | | | Labour | | | Delivery | | | Recovery | | | Postnatal | | | |
|--------------------------|--|------------------------------------|-------------------------|-------------------------------|---|-------------------------------------|--|-------------|-------------------------------------|--|-------------|--|----------------------------------|-------------|---------------------------------------|--|-------------|---------------------------------------|--|-------------|
| | | | | | Expected No. of daily patients on 2014 (p/day) | Average of Labour time (day/p) | Required No. of Labour beds (p/day) | No. of beds | Average of Labour time (day/p) | Required No. of Labour beds (p/day) | No. of beds | Maximum No. of daily Deliveries (p/day) | Required No. of Delivery beds | No. of beds | Average of Recovery time (day/p) | Required No. of Recovery beds (p/day) | No. of beds | Average of Recovery time (day/p) | Required No. of Recovery beds (p/day) | No. of beds |
| | | | | | E=C* D | F | G=E* F | F | G=E* F | H | I=E/H | J | K=E* J | J | K=E* J | J | K=E* J | J | K=E* J | J |
| Delivery | 8,909 | 365 | 24.41 | 1.17 | 28.58 | 0.75 | 21.43 | 22 | 0.4 | 11.43 | 12 | 6 | 4.76 | 5 | 0.25 | 7.14 | 8 | 0.75 | 21.43 | 22 |
| Caesarian section | 1,386 | 365 | 3.80 | 1.17 | 4.45 | | | | | | | | | | | | | 4 | 17.78 | 18 |

Table 2-26 Required Number of Beds in the Nursery

| | Annual No. of Admission days | Rate of increasing population | Expected No. of daily patients on 2014 | Annual working day (day/year) | Average No. of daily Admission (p/day) | Bed occupancy rate | Required No. of beds (p/day) | No. of beds |
|--------------|------------------------------|-------------------------------|--|-------------------------------|--|--------------------|------------------------------|-------------|
| | A | B | C=A*B | D | E=C/D | F | G=E*F | |
| Newborn unit | 3,927 | 1.17 | 4,598 | 365 | 12.60 | 80% | 15.75 | 16 |
| Incubator | | | | | | | | 6 |
| Infantwarmer | | | | | | | | 1 |
| Cot | | | | | | | | 5 |
| (isolation) | | | | | | | | |
| Incubator | | | | | | | | 2 |
| Infantwarmer | | | | | | | | 1 |
| Cot | | | | | | | | 1 |

• Theatre / H.D.U. (wards for serious patients) Division

Table 2-27 Required Number of Various Rooms for the Theatre / H.D.U. (wards for serious patients) Division

| | Annual No. of Operations / Patients (p/year) | | Annual working day (day/year) | | Average No. of daily Operations / Patients (n/day) | | Rate of increasing population | | Expected No. of daily Operations / Patients on 2014 (p/day) | | Maximum No. of daily Operations (p/day) | | Theatre | | Recovery | | High Dependant Unit | | | H.D.U. (Infection) | | |
|---------------------|--|-----------------|----------------------------------|---------------------------------------|--|--|--|---------------------------------------|---|--|---|-------------|--|---------------------------------------|-------------|---|---------------------|---|---|--------------------|------|---|
| | A | B | C=A/B | D | E=C*D | F | G=E*F | H | I=E*H | J=E*0.3 | K | L=J*K | M | N=F*M | O | P | Q | R | S | T | U | |
| | Required No. of Theatre | No. of Theatres | Average of Recovery time (day/p) | Required No. of Recovery beds (p/day) | No. of beds | Average No. of daily H.D.U. patients (p/day) | Average of H.D.U. treatment time (day/p) | Required No. of Recovery beds (p/day) | No. of beds | Average of H.D.U. treatment time (day/p) | Required No. of Recovery beds (p/day) | No. of beds | Average of H.D.U. treatment time (day/p) | Required No. of Recovery beds (p/day) | No. of beds | | | | | | | |
| Scheduled Operation | 662 | 260 | 2.55 | 1.17 | 2.98 | 3 | 0.99 | 0.25 | 0.75 | 0.89 | 3.5 | 3.13 | | | | | | | | | | |
| Emergency Operatio | 702 | 365 | 1.92 | 1.17 | 2.25 | 3 | 0.75 | 0.25 | 0.56 | 0.68 | 3.5 | 2.36 | | | | | | | | | | |
| Caesarian Section | 1,242 | 365 | 3.40 | 1.17 | 3.98 | 5 | 0.80 | 0.25 | 1.00 | | | | | | | | | | | | | |
| total | 2,606 | | 7.87 | | 9.22 | | 2.54 | 3 | 2.30 | 3 | | 5.49 | 6 | | | | | | | | | |
| Poisoning | 87 | 365 | 0.24 | 1.17 | 0.28 | | | | | 0.28 | 4 | 1.12 | 2 | | | | | | | | | |
| Burns and Corrosion | 82 | 365 | 0.22 | 1.17 | 0.26 | | | | | | | | | | | | | | | 6 | 1.58 | 2 |

2) Required floor area

The total floor area for architectural planning is calculated from the required numbers of rooms, etc. calculated above. The area of a given room of this cooperation project is determined referring to the Standards for Medical Facilities in use in Kenya and the Standards for Floor Area of Medical Facilities of Japan (design materials, etc. of the Architectural Institute of Japan), while considering the present state of the concerned existing facilities.

Further, determination of floor area is a comprehensive approach, taking into account the layout of the medical facilities and equipment to be installed in the subject room, numbers of patients and medical staff to work in the room.

Table 2-28 Floor Area of Each Room of the Subject Facility

| Outpatient Department Building (Ground floor) | | | | | Outpatient Department Building (First floor) | | | | | |
|---|--|---|-------|---|--|--------------------------------|---|----------|---|-------|
| [Division] | Room | Floor area (m ²), Dimension (m) | | | [Division] | Room | Floor area (m ²), Dimension (m) | | | |
| [Casualty] | | | | | [Theatre Department] | | | | | |
| | Filter clinic-1 | 13.25 | 3.17 | x | 4.18 | Theatre-1 | 38.10 | 6.00 | x | 6.35 |
| | Filter clinic-2 | 13.25 | 3.17 | x | 4.18 | Theatre-2 | 37.63 | 6.17 | x | 6.10 |
| | Filter clinic-3 | 11.78 | 2.82 | x | 4.18 | Theatre-3 | 38.10 | 6.35 | x | 6.00 |
| | Filter clinic-4 | 13.25 | 3.17 | x | 4.18 | Recovery room-1 | 17.62 | 5.56 | x | 3.17 |
| | Observation room | 69.00 | 11.50 | x | 6.00 | Nurse station-1 | 10.33 | 3.26 | x | 3.17 |
| | Waiting bay-1 | 32.94 | 15.25 | x | 2.16 | Conference room | 9.51 | 3.00 | x | 3.17 |
| | Staff toilet-1, -2 | 4.30 | 2.05 | x | 2.10 | Doctor room | 10.04 | 3.17 | x | 3.17 |
| | Staff room-1 | 9.41 | 2.97 | x | 3.17 | Transfer hall | 13.11 | 4.65 | x | 2.82 |
| | Plaster room | 10.68 | 3.37 | x | 3.17 | Changing room-1 (women) | 14.89 | 3.17 | x | 4.70 |
| | Store-1 | 6.87 | 2.17 | x | 3.17 | Changing room-1 (men) | 14.89 | 3.17 | x | 4.70 |
| | Minor theatre | 33.72 | 6.00 | x | 5.62 | Shower room (women) | 2.13 | 1.30 | x | 1.64 |
| | Nurse station-1 | 11.76 | 2.80 | x | 4.20 | Shower room (men) | 2.13 | 1.30 | x | 1.64 |
| | Sterilization room | 4.66 | 2.43 | x | 1.92 | Staff toilet-1 | 2.14 | 1.30 | x | 1.65 |
| | Sluice room | 3.68 | 1.92 | x | 1.92 | Store-2 | 9.19 | 3.17 | x | 2.90 |
| | Treatment room-1 | 24.64 | 6.01 | x | 4.10 | Corridor-1 | 77.63 | 22.70 | x | 3.42 |
| | Treatment room-2 | 12.91 | 3.15 | x | 4.10 | Machine room (air conditioner) | 38.99 | 6.70 | x | 5.82 |
| | Corridor-1 | 31.49 | 12.35 | x | 2.55 | Sluice room-1 | 13.77 | 2.17 | x | 6.35 |
| | Shower room | 19.05 | 3.00 | x | 6.35 | Sluice room-2 | 6.87 | 2.17 | x | 3.17 |
| Sub total | | 326.64 | | | | Sterilization packing room | 33.02 | 5.20 | x | 6.35 |
| [Examination, Office Division] | | | | | [Delivery Division] | | | | | |
| | Lab-1 | 13.95 | 3.00 | x | 4.65 | Delivery room-1 | 15.43 | 3.17 | x | 4.87 |
| | Lab-2 | 13.95 | 3.00 | x | 4.65 | Delivery room-2 | 14.61 | 3.00 | x | 4.87 |
| | Lab-3 | 13.95 | 3.00 | x | 4.65 | Delivery room-3 | 18.54 | 6.35 | x | 2.92 |
| | Lab-4 | 31.57 | 6.79 | x | 4.65 | Delivery room-4 | 19.49 | 6.35 | x | 3.07 |
| | Blood collection room | 8.36 | 2.20 | x | 3.80 | Delivery room-5 | 19.68 | 6.35 | x | 3.10 |
| | Toilet-1, -2 | 4.40 | 2.20 | x | 2.00 | Sluice room-3 | 6.50 | 3.16 | x | 2.06 |
| | Corridor-4 | 21.82 | 16.17 | x | 1.35 | Treatment room | 11.40 | 2.85 | x | 4.00 |
| | X-ray room-1 | 24.25 | 3.82 | x | 6.35 | Recovery room-2 | 56.57 | 9.17 | x | 6.17 |
| | X-ray room-2 | 26.41 | 4.16 | x | 6.35 | Labour room | 76.19 | 12.35 | x | 6.17 |
| | X-ray office | 40.70 | 10.00 | x | 4.07 | Toilet-1 | 5.78 | 2.82 | x | 2.05 |
| | Ultrasound room | 8.97 | 2.83 | x | 3.17 | Toilet-2 | 6.11 | 2.82 | x | 2.17 |
| | Dark room | 6.91 | 2.18 | x | 3.17 | Staff room-2 | 9.98 | 3.17 | x | 3.15 |
| | Toilet/changing room | 3.05 | 2.26 | x | 1.35 | Nurse station-3 | 19.05 | 3.17 | x | 6.01 |
| | Accounts office room | 27.90 | 6.00 | x | 4.65 | Waiting bay | 39.53 | 3.88 | x | 10.19 |
| | Staff room-2 | 36.00 | 6.00 | x | 6.00 | Store-6 | 6.06 | 2.82 | x | 2.15 |
| | Store-2 | 6.87 | 2.17 | x | 3.17 | Store-7 | 6.34 | 3.17 | x | 2.00 |
| | Staff toilet-3, -4 | 3.54 | 2.00 | x | 1.77 | Store-8 | 6.15 | 3.00 | x | 2.05 |
| Sub total | | 292.60 | | | | Corridor-3 | 55.00 | 5.50 | x | 10.00 |
| [Outpatient Department] | | | | | [Newborn Division] | | | | | |
| | Nurse station-2 | 21.27 | 3.35 | x | 6.35 | Milk room | 27.30 | 6.50 | x | 4.20 |
| | Psychiatry | 13.96 | 3.35 | x | 4.17 | Nursery | 37.02 | 6.17 | x | 6.00 |
| | Ante room | 6.09 | 3.35 | x | 1.82 | Nursery (Isolated) | 19.02 | 3.17 | x | 6.00 |
| | Waiting bay-2 | 108.80 | 8.81 | x | 12.35 | Changing room | 6.81 | 3.17 | x | 2.15 |
| | Waiting bay-3 | 106.82 | 8.65 | x | 12.35 | Staff room-1 | 11.97 | 2.85 | x | 4.20 |
| | Internal medicine | 13.21 | 4.17 | x | 3.17 | Store-5 | 6.81 | 3.17 | x | 2.15 |
| | Surgery | 11.75 | 4.17 | x | 2.82 | Sub total | | 108.93 | | |
| | Paediatrics | 13.21 | 4.17 | x | 3.17 | [H.D.U. Division] | | | | |
| | Treatment room-3 | 20.12 | 6.35 | x | 3.17 | H.D.U. ward | 79.04 | 6.40 | x | 12.35 |
| | E.N.T. | 39.17 | 6.35 | x | 6.17 | H.D.U. ward (isolation) | 17.70 | 2.95 | x | 6.00 |
| | Eye clinic | 39.17 | 6.35 | x | 6.17 | Nurse station-2 | 9.14 | 2.95 | x | 3.10 |
| | Dental office | 11.94 | 3.00 | x | 3.98 | Store-4 | 3.24 | 2.95 | x | 1.10 |
| | Dental lab | 12.61 | 3.17 | x | 3.98 | Sub total | | 109.12 | | |
| | Dental clinic | 37.01 | 6.18 | x | 5.99 | [Training Division] | | | | |
| | Obstetrics and gynaecology | 37.08 | 6.18 | x | 6.00 | Meeting room-1 | 29.65 | 4.67 | x | 6.35 |
| | Corridor-2 | 120.78 | 33.00 | x | 3.66 | Meeting room-2 | 29.65 | 4.67 | x | 6.35 |
| | Corridor-3 | 19.89 | 2.17 | x | 9.17 | Hall | 31.80 | 5.30 | x | 6.00 |
| Sub total | | 632.88 | | | | Store-3 | 11.39 | 4.04 | x | 2.82 |
| [Others] | | | | | [Others] | | | | | |
| | Security office | 6.36 | 3.00 | x | 2.12 | Pantry | 5.29 | 1.67 | x | 3.17 |
| | Medical gas room-1 | 10.50 | 3.00 | x | 3.50 | Sub total | | 107.78 | | |
| | Medical gas room-2 | 14.91 | 3.00 | x | 4.97 | [Others] | | | | |
| | Medical gas room-3 | 13.50 | 3.00 | x | 4.50 | Corridor-2 | 118.80 | 36.00 | x | 3.30 |
| | Store-3 | 36.06 | 3.00 | x | 12.02 | Staff toilet-2 | 12.90 | 6.00 | x | 2.15 |
| | Exterior corridor, balcony | 390.84 | 3.00 | x | 73.00 | Toilet-1 | 10.04 | 3.17 | x | 3.17 |
| | Exterior waiting bay | 252.00 | 9.00 | x | 28.00 | Exterior corridor, balcony | 455.22 | 3.00 | x | 72.57 |
| Sub total | | 724.17 | | | | Sub total | | 596.96 | | |
| Ground floor total | | 1976.29 | | | | First floor total | | 1,727.71 | | |
| | | | | | | Total floor area | | 3,704.00 | | |
| Ancillary facility | | | | | | | | | | |
| [Division] | Room | Floor area (m ²), Dimension (m) | | | | | | | | |
| | Toilet building | 65.04 | 12.00 | x | 5.42 | | | | | |
| | Machine Room Building, Raw water reservoir | 279.00 | 22.50 | x | 12.40 | | | | | |
| | Incinerator | 57.42 | 5.15 | x | 11.15 | | | | | |
| | Gate house | 3.73 | 1.78 | x | 2.10 | | | | | |
| | Elevated water tank | 30.01 | 4.10 | x | 7.32 | | | | | |
| Total floor area | | 435.20 | | | | | | | | |

3) Facility configuration (function)

The facility configuration of this project is explained below.

Table 2-29 Facility Configurations of the Divisions within the Scope of this Project

| Building / floor | | Configuration |
|--------------------------------|--------------|---|
| Outpatient Department Building | Ground floor | Outpatient Department (general outpatient, special clinic, casualty), X-ray Division, Laboratory Division, Clerical and Administrative Division |
| | First floor | Theatre Department, Delivery Division, H.D.U. Division |
| Ancillary facility | | Toilet Building, Incinerator, Machine Building, Gate House |

4) Floor planning

The two-storied system which does not incur such maintenance and operation cost as elevators, etc. and still does not adversely affect the medical service is adopted.

A piloti is provided on the ground floor to facilitate cooperation with the existing Outpatient Building. In addition, this piloti will serve as a common waiting bay for the Casualty, the General Outpatient Division to be located to the east, and the Special Clinic or the X-ray Division to be located to the west; and as a provision for accommodating significantly varying numbers of patients that may come depending upon climatic conditions, as is the case with an outbreak of malaria. The Theatre Department, Obstetrics Division, the H.D.U. Division are placed on the first floor. A wheelchair slope is provided on the east side of the building to facilitate transfer of patients from the Existing Ward Division.

The exterior corridor and balconies are planned exterior side of the building, in consideration of facilitating the service traffic lines, evacuation routes, maintenance of facilities and equipment, etc.

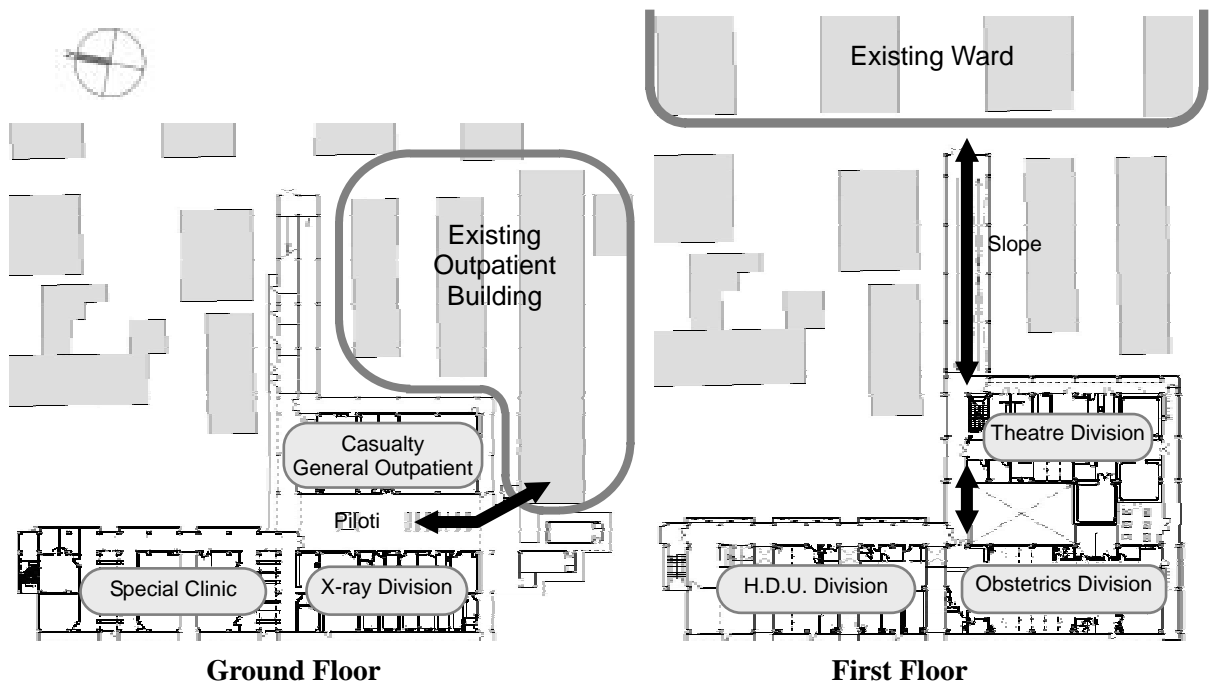
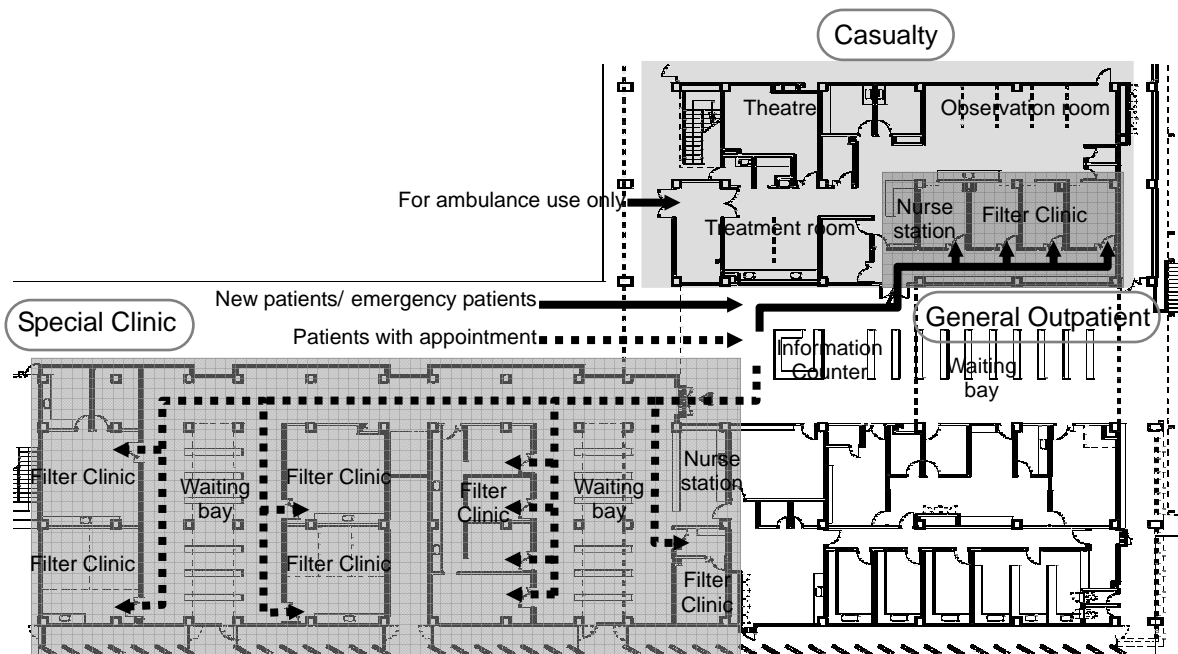


Figure 2-13 Outpatient Department Building , Floor Planning

- Design concept for the Outpatient Department (general outpatient, special clinic, casualty)

In Kenya first-visit patients generally come to the hospital without appointment. These first-visit patients receive diagnosis at the General Outpatient Division. In the adopted system, patients with appointments and who have previously received diagnosis receive diagnosis at the Special Clinic. The entrance to each division is a nurse station which controls entrance of patients. A reception counter will be provided in the piloti so that patients may be advised where they should go.

The filter clinic of the General Outpatient Division also serve as those of the Casualty (filter clinic) which accept patients 24 hours a day. Therefore, treatment rooms, small theatres, observation rooms are placed just behind the diagnosis and laboratories to cope with serious patients. An entrance exclusively for directly receiving serious patients brought by ambulance is planned.



**Figure 2-14 Outpatient Department Building , Ground Floor
(Outpatient Department)**

- Design concept for the X-ray Division, Laboratory Division

The general-purpose radiography room, radioscopy room and ultrasonography room are planned for the X-ray Division. The X-ray Division is placed facing the exterior waiting bay, considering the relatively large number of patients to this division. The existing facilities and equipment are used for the general-purpose radiography and radioscopy; these will be placed in spaces to be prepared by the Kenyan side. The Laboratory Division is divided into four subdivisions, and placed with the blood collection counter and the toilet for urine collection on the southwestern side.

The traffic lines of the staff are designed to be sided by both divisions, thereby the traffic lines may not cross those of patients which will improve the working efficiency of the staff.

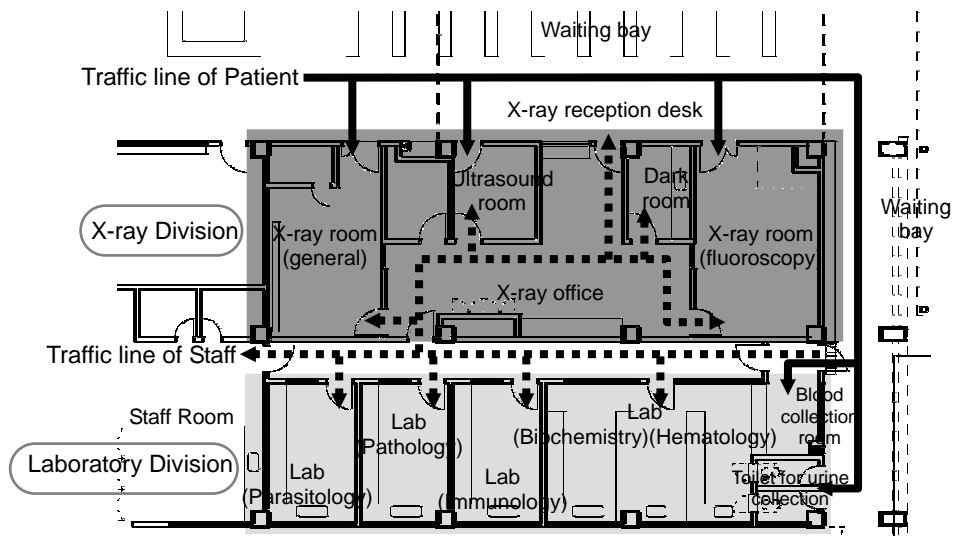


Figure 2-15 Outpatient Department Building , Ground Floor (X-ray Division, Outpatient Department)

- Design concept for the Theatre Department, the H.D.U. Division
 The Theatre Department will have three operation rooms, one recovery room, one sterilization room and staff rooms. In this project, for thorough enforcement of measures to prevent infections to the Theatre Department, the traffic lines of the post operative contaminated equipment and materials and those of medical staff and patients are distinctively separated. The recovery room is planned at a place easily visible from the nurses' station and can accommodate the patients for a maximum of six hours to allow them to come out from anesthesia. The recovered patient will be transferred either to the H.D.U Division or to the ward depending upon the conditions of the patient.

The H.D.U. Division's rooms are all designed to be fully visible from the nurse station.

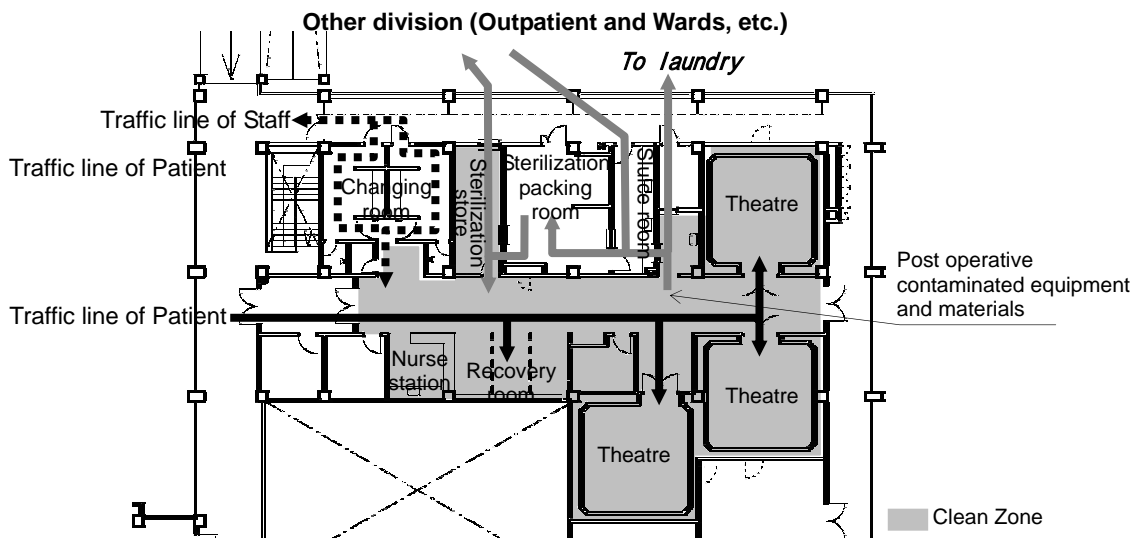


Figure 2-16 Outpatient Department Building , First Floor (Theatre Department)

- Design concept for the Obstetrics Division

In Kenya pregnant women may stay in the hospital two or three days before and after delivery because of the unsatisfactory transportation conditions. In Kenya, therefore, the obstetrics divisions normally have their wards in addition to rooms directly related to delivery. In this project, of the facilities of the Obstetrics Division, the labour room, delivery rooms, recovery room, nursery are planned. The Kenyan side will rehabilitate the existing Obstetrics Building and install the antenatal wards and postpartum wards in it.

These rooms will be arranged to permit smooth movements from the labour, delivery to the recovery. The parturient women who need obstetrical operations are transferred to the neighbouring Operation Division. The nursery is planned to permit entry only after changing clothes to prevent infections.

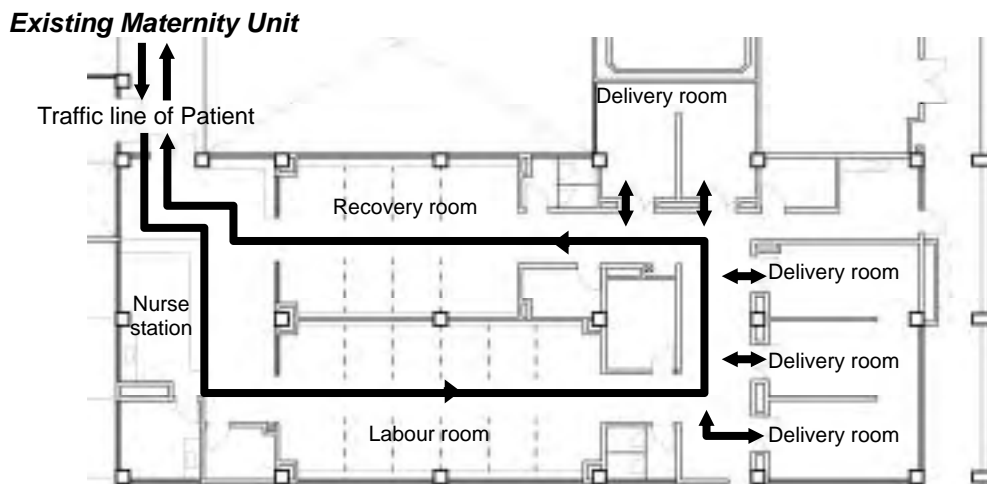


Figure 2-17 Outpatient Department Building , First Floor (Obstetrics Division)

5) Elevation planning (shape, exterior surfacing material)

The structure of buildings will be of concrete rigid frame structure, the structure commonly used locally. The external wall portions will be of masonry structure of Kisii stones. The pillars and beams will be mortared with cement and paint finished.

The roof will be a sloped roof of concrete slabs with asphalt roofing to ensure long-range water-proofing functions. On top of that, the roof will be thatched with folded plates to protect the asphalt roofing from deterioration caused by exposure to the ultraviolet rays and any solid objects that may fall on the roof.

The window frames will be aluminium fittings of high weatherability in consideration of intense solar radiation. In addition, exterior louvers will be placed on the west-side walls to reduce air-conditioning loads, and to give a unique appearance. The spacings between the window frames and exterior louvers will be used as space for piping or air-conditioners' outdoor machines.

6) Section planning

Such common use spaces as corridor and patients' waiting bay will be of structures with plenty of openings to generously permit natural ventilation.

The story height will be 4.0 and 3.8 meters for the ground floor and first floor, respectively, considering ceiling heights necessary for various rooms and spaces for air-conditioning, water supply and drainage pipes, etc.

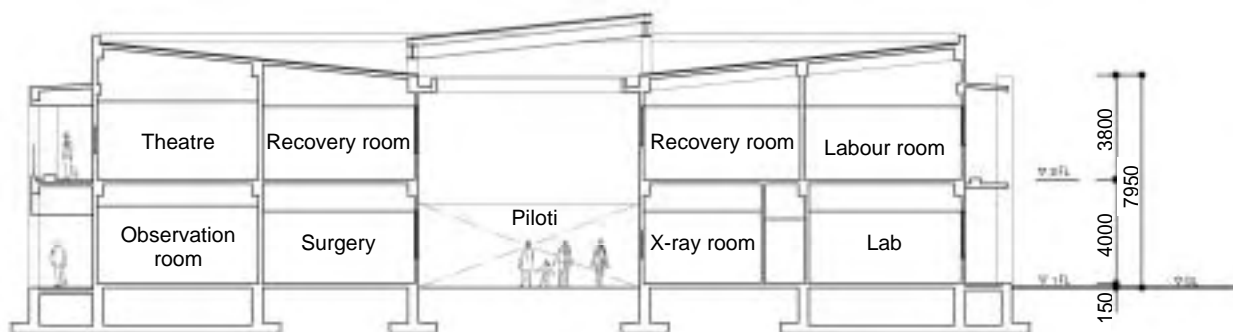


Figure 2-18 Cross Sectional View of the Outpatient Department Building

(3) Facility plan of the Kericho District Hospital

1) Study by division

Number of patients

The numbers of outpatients for five years from 2001 to 2005 and various examinations are as given below.

• Outpatient Department

The trend in the number of outpatients shows an average rate of increase of 105% for three years from 2003 to 2005, the rate nearly equal to that of population increase of Kericho District, though there was an irregular rise exceeding 90 thousand in 2002. Therefore, the number of outpatients used for scale calculation is the average value for the three years from 2003 to 2005.

Table 2-30 Number of Patients for the Outpatient Department

| | Occupancy rate of Out-patient | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|---------------------------|-------------------------------|--------|--------|--------|--------|--------|----------------------|
| Total No. of Out-patients | 100% | 77,867 | 95,030 | 78,312 | 76,292 | 86,374 | 80,326 |
| Rate of increase | | | 122% | 82% | 97% | 113% | 105% |
| 1 Casualty | 20% | 15,573 | 19,006 | 15,662 | 15,258 | 17,275 | 16,065 |
| High injured | 20% | 3,115 | 3,801 | 3,132 | 3,052 | 3,455 | 3,213 |
| Low injured | 80% | 12,459 | 15,205 | 12,530 | 12,207 | 13,820 | 12,852 |
| 2 General consultation | 20% | 15,573 | 19,006 | 15,662 | 15,258 | 17,275 | 16,065 |
| 3 M.C.H | 35% | 27,253 | 33,261 | 27,409 | 26,702 | 30,231 | 28,114 |
| 4 Special Clinic | 25% | 19,467 | 23,758 | 19,578 | 19,073 | 21,594 | 20,082 |

(Source: interview survey)

Table 2-31 Number of Traffic Accident Victim Patients

| | No. of rooms | 2001 | 2002 | 2003 | 2004 | 2005 | Last 3 years Average |
|------------------|--------------|------|------|------|------|------|----------------------|
| RTAS | 0 | 77 | 26 | 86 | 111 | 143 | 113 |
| Rate of increase | | | 34% | 331% | 129% | 129% | |

(Source: interview survey)

Scale calculation

Based on the performances shown above, scales of various rooms of the divisions within the scope of this project are calculated.

- Casualty

Table 2-32 Required Number of Various Rooms of the Casualty

| Casualty | Annual No. of Casualty-patients (p/year) | Annual working days (day/year) | Opening hours (min/day) | Average No. of daily patients (p/day) | Rate of increase | Average No. of daily patients in future (p/day) | Filter room | | | | Casualty room | | | | Observation room | | | |
|-------------|--|--------------------------------|-------------------------|---------------------------------------|------------------|---|--------------------------------------|---|------------------------------------|----------------------|-------------------------------------|---|-----------------------------------|----------------------|-------------------------------------|---|-----------------------------------|----------------------|
| | | | | | | | Average of Consultation time (min/p) | maximum No. of daily patients in a room | Required No. of consultation rooms | No. of planned rooms | Average of Observation time (min/p) | maximum No. of daily patients in a room | Required No. of Observation rooms | No. of planned rooms | Average of Observation time (min/p) | maximum No. of daily patients in a room | Required No. of Observation rooms | No. of planned rooms |
| | A | B | C | D=A/B | E | F=D*E | G | H=C/G | I=F/H | | J | K=C/J | L=F/K | | M | N=C/M | O=F/N | |
| High injure | 3,213 | 365 | 1,440 | 8.80 | 1.21 | 10.69 | - | - | - | | 180 | 8 | 1.34 | 2 | 600 | 2 | 4.45 | 5 |
| Low injure | 12,852 | 365 | 540 | 35.21 | 1.21 | 42.77 | 20 | 27 | 1.58 | 2 | - | - | - | - | - | - | - | - |

2) Required floor area

The total floor area for architectural planning is calculated from the required numbers of rooms, etc. calculated above. The area of a given room of this project is determined referring to the Standards for Medical Facilities in use in Kenya and the Standards for Floor Area of Medical Facilities of Japan (design materials, etc. of the Architectural Institute of Japan), while considering the present state of the concerned existing facilities.

Further, determination of floor area is a comprehensive approach, taking into account the layout of the medical facilities and equipment to be installed in the subject room, number of patients and medical staff to work in the room.

Table 2-33 Floor Area of Each Room of the Subject Facility

Casualty (Ground floor)

| { Division } Room | Floor area (m ²), Dimension (m) | | | |
|--------------------|---|------|---|-------|
| { Casualty } | | | | |
| Lab | 21.82 | 4.85 | × | 4.50 |
| Store-1 | 15.37 | 4.85 | × | 3.17 |
| Staff room | 14.55 | 4.85 | × | 3.00 |
| Nurse station-1 | 6.87 | 2.17 | × | 3.17 |
| Office room | 8.46 | 2.67 | × | 3.17 |
| Corridor-2*2 | 18.28 | 1.32 | × | 13.85 |
| Toilet-1 (women) | 14.26 | 3.17 | × | 4.50 |
| Treatment room-1 | 9.25 | 3.17 | × | 2.92 |
| Filter clinic-1 | 9.25 | 3.17 | × | 2.92 |
| Filter clinic-2 | 11.09 | 3.17 | × | 3.50 |
| Waiting room | 26.22 | 6.32 | × | 4.15 |
| Shower room-1 | 20.12 | 4.15 | × | 4.85 |
| Store-2 | 9.35 | 2.95 | × | 3.17 |
| Sterilization room | 6.08 | 1.92 | × | 3.17 |
| Sluice room | 6.56 | 2.07 | × | 3.17 |

| { Division } Room | Floor area (m ²), Dimension (m) | | | |
|--|---|-------|---|-------|
| Corridor-1*2 | 9.13 | 6.92 | × | 1.32 |
| Observation room | 64.89 | 14.42 | × | 4.50 |
| Treatment room-2 | 43.65 | 9.00 | × | 4.85 |
| Minor theatre | 21.82 | 4.50 | × | 4.85 |
| Nurse station-2 | 6.87 | 3.17 | × | 2.17 |
| Toilet-2 | 3.62 | 1.67 | × | 2.17 |
| Shower room-2 | 1.87 | 1.37 | × | 1.37 |
| Night duty room | 11.08 | 4.15 | × | 2.67 |
| Medical gas room-1 | 5.91 | 3.00 | × | 1.97 |
| Medical gas room-2 | 8.61 | 3.00 | × | 2.87 |
| Parking lot | 28.00 | 5.60 | × | 5.00 |
| Space for air-conditioners' outdoor machines, etc. | 22.12 | 1.40 | × | 15.80 |
| Total floor area | 425.10 | | | |

Ancillary facility

| { Division } Room | Floor area (m ²), Dimension (m) | | | |
|---------------------|---|------|---|------|
| Machine Building-1 | 46.10 | 6.80 | × | 6.78 |
| Machine Building-2 | 13.98 | 4.45 | × | 3.14 |
| Raw water reservoir | 12.92 | 3.40 | × | 3.80 |
| Elevated water tank | 4.00 | 2.00 | × | 2.00 |
| Total floor area | 77.00 | | | |

3) Facility configuration (function)

The facility configurations of the facilities of the divisions within the scope of this project are as follows.

Table 2-34 Facility Configurations of the Divisions within the Scope of this Project

| Building / floor | Configuration |
|---------------------------------|------------------------------------|
| Casualty Ground floor | Casualty |
| Ancillary facility Ground floor | Machine Building, Elevated Hydrant |

4) Floor planning

• Design concept for the Casualty

On the one side of the building are placed the filter clinics, laboratories; on the other side are placed treatment rooms and minor theatres for simple operations and the observation room, with the main entrance on the centre.

In addition, an entrance exclusively for serious patients brought by ambulance is planned so that such patients may be smoothly accepted and properly treated. Another exclusive entrance for serious patients is installed on the southern side of the building close to the existing radiographic examination rooms and theatres for those patients who need immediate radiographic examinations or major operations.

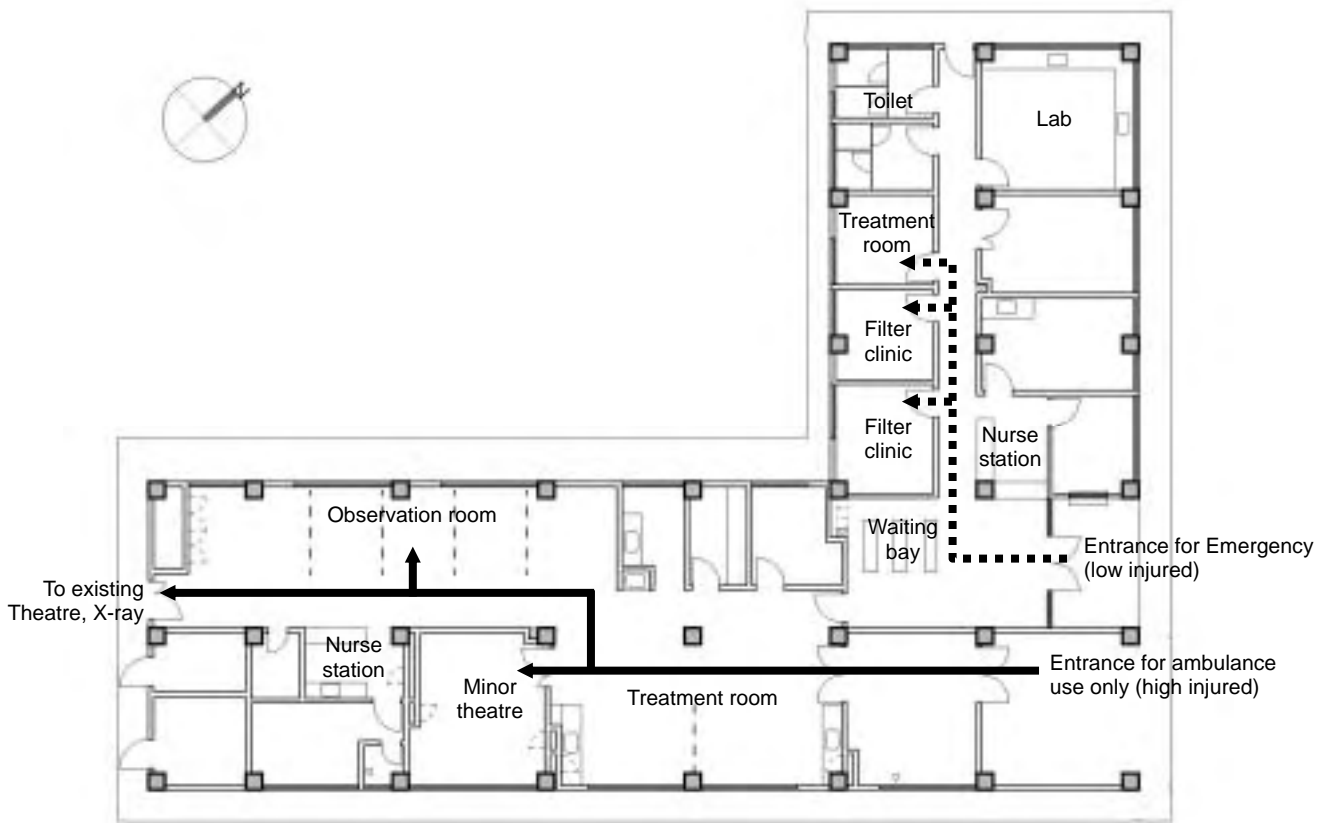


Figure 2-19 Casualty Planned for the Kericho District Hospital

5) Elevation planning (shape, exterior surfacing material)

The elevation planning similar to the above-mentioned elevation planning of the Kisii District Hospital is adopted.

6) Section planning

Such common use spaces as corridor and patients' waiting bay will be of structures with plenty of openings to generously permit natural ventilation. The story height will be 3.8 meters, considering ceiling heights necessary for various rooms and spaces for air-conditioning, water supply and drainage pipes, etc.

Also, high sidelights (high windows) are installed in consideration of the environments of the centre corridor that would otherwise tend to be dark and humid, and the treating rooms and the observation room that should avoid direct strong sunlight.

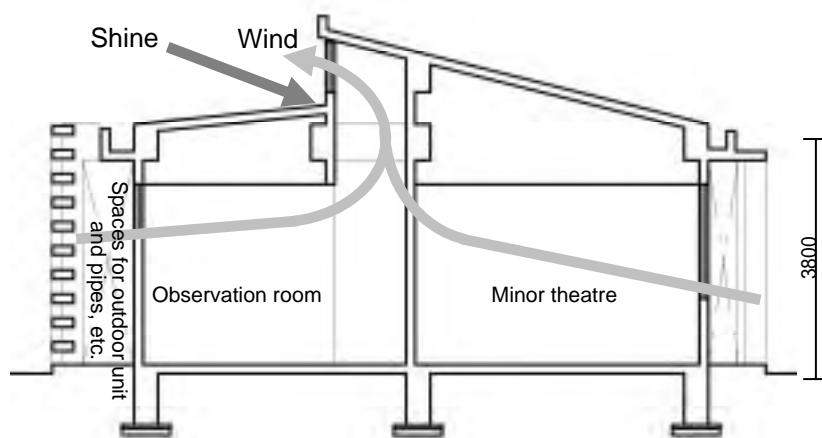


Figure 2-20 Cross Sectional View of the Casualty