BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE EXPANSION
OF
TRIBHUVAN UNIVERSITY, INSTITUTE OF MEDICINE
AND THE TEACHING HOSPITAL
IN
THE KINGDOM OF NEPAL

MARCH, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of His Majesty's Government of Nepal, the Government of Japan has decided to conduct a Basic Design Study on the Project for the Expansion of Tribhuvan University, Institute of Medicine and the Teaching Hospital and entrusted the study to the Japan International Cooperation Agency (JICA).

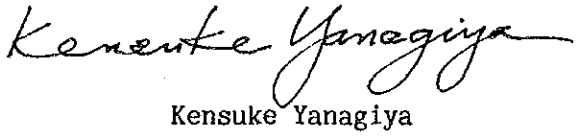
JICA sent to the Kingdom of Nepal a survey team headed by Dr. Yoshitaka Mori, professor of Hyogo College of Medicine, from November 7 to December 3, 1989.

The team exchanged views with the officials concerned of His Majesty's Government of Nepal and conducted a field survey in the project site. After the team returned to Japan, further studies were made. Then, a mission was sent to the Kingdom of Nepal in order to discuss the draft report and the present report was prepared.

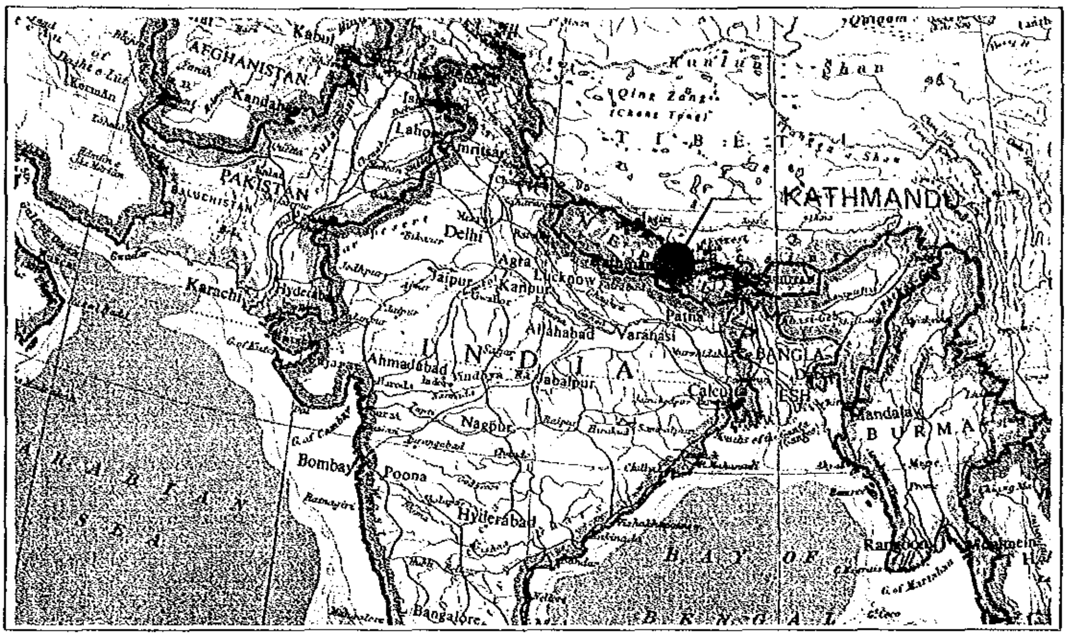
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of His Majesty's Government of Nepal for their close cooperation extended to the team.

March, 1990



Kensuke Yanagiya
President
Japan International Cooperation Agency


AFGHANISTAN
Kabul
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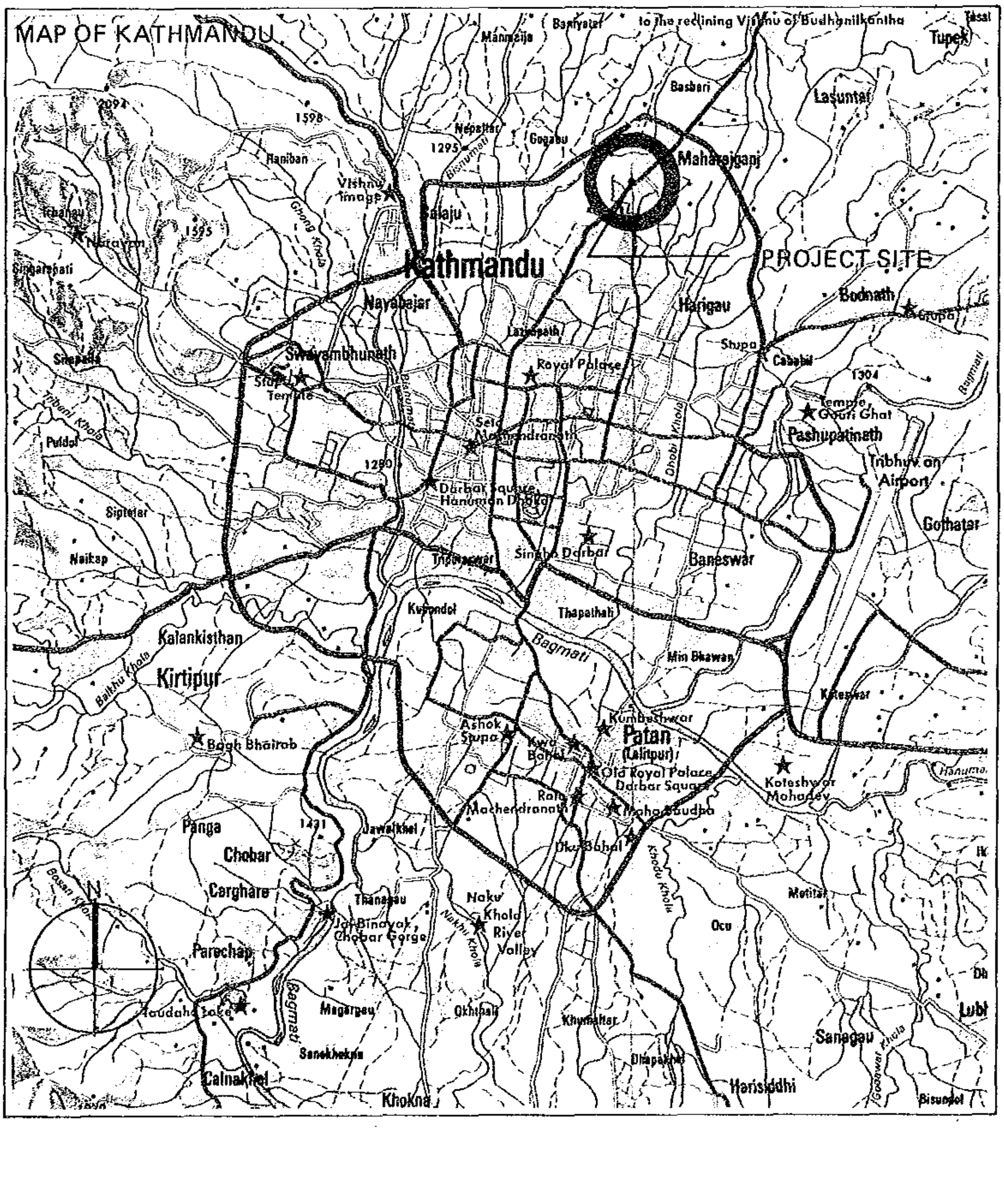
MAP OF KATHMANDU
PROJECT SITE
Kathmandu
Maharajganj
Balaju
Nayabajar
Swayambhunath
Royal Palace
Darbar Square
Hanuman Dhoka
Singha Darbar
Baneswar
Thapathali
Bagmati
Min Bhawan
Harigau
Bodnath
Pashupatinath
Tribhuvan Airport
Gothatar
Kalankisthan
Kirtipur
Bagh Bhairab
Patan
(Lalitpur)
Old Royal Palace
Darbar Square
Ashok Stupa
Kumbeshwar
Koteshwar Mahadev
Panga
Chobar
Carghare
Parechap
Jal Binayak Chobar Gorge
Nakhu Khola River Valley
Magargau
Okhthali
Khumaltar
Sanagau
Harisiddhi
Khokna
Calnakhel
Basbari
Lasuntar
Tupek
Manmaiju
Nepaltar
Gongabu
Hapiban
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Jawalakhel
Mahabaudha
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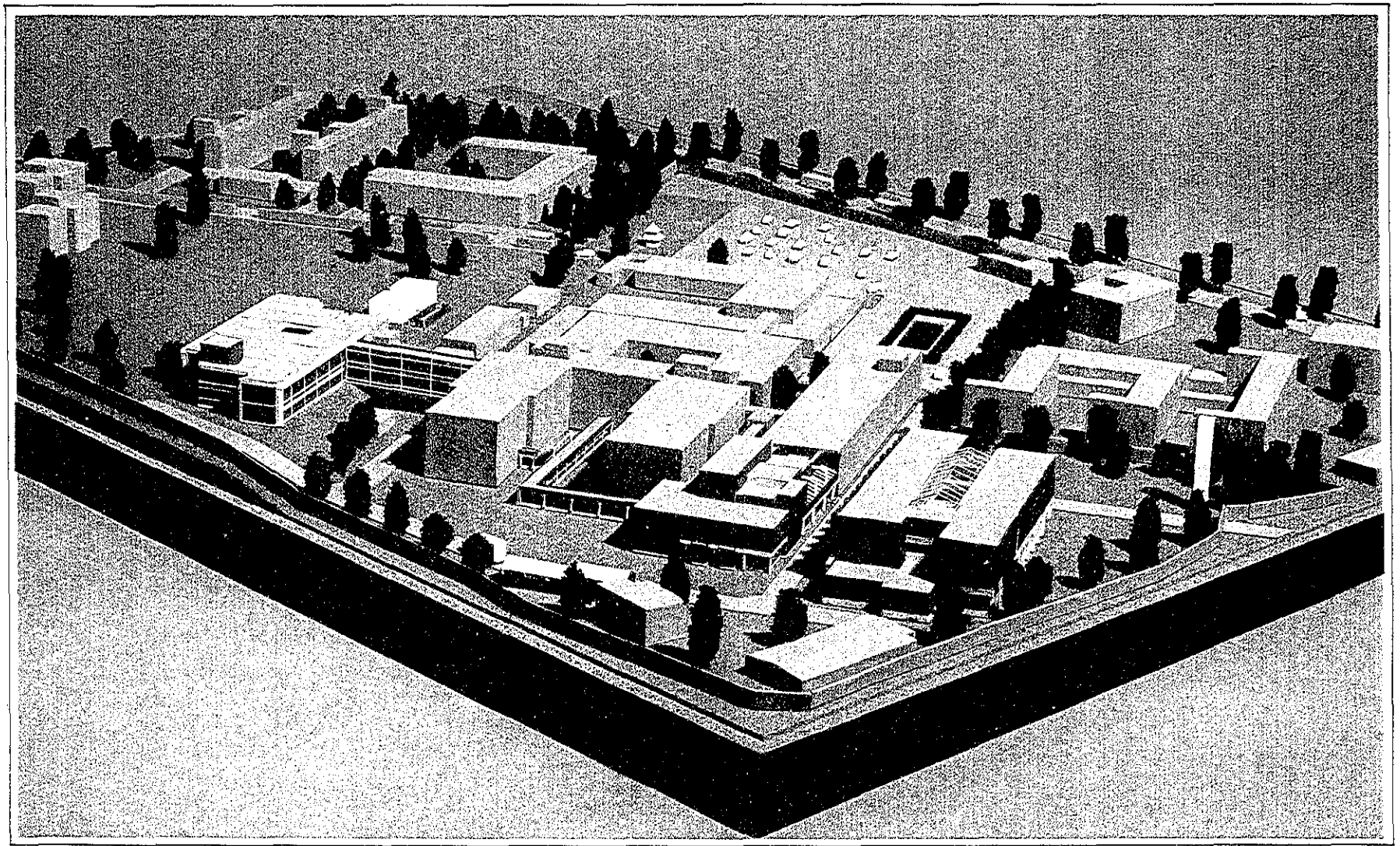
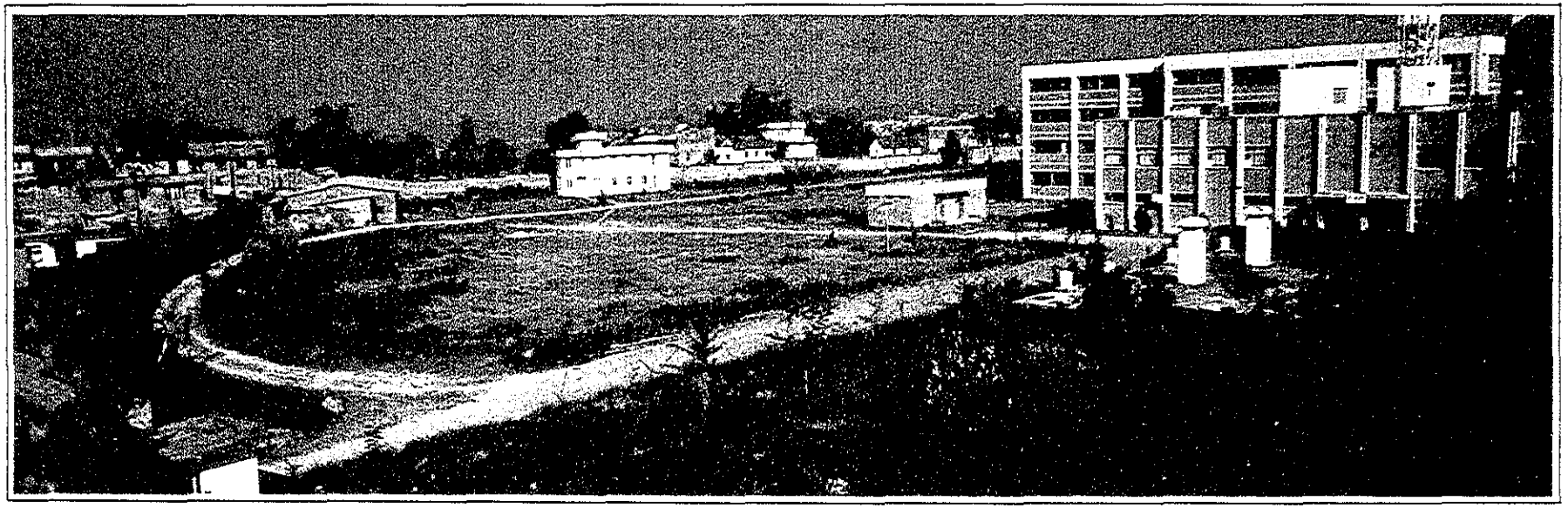
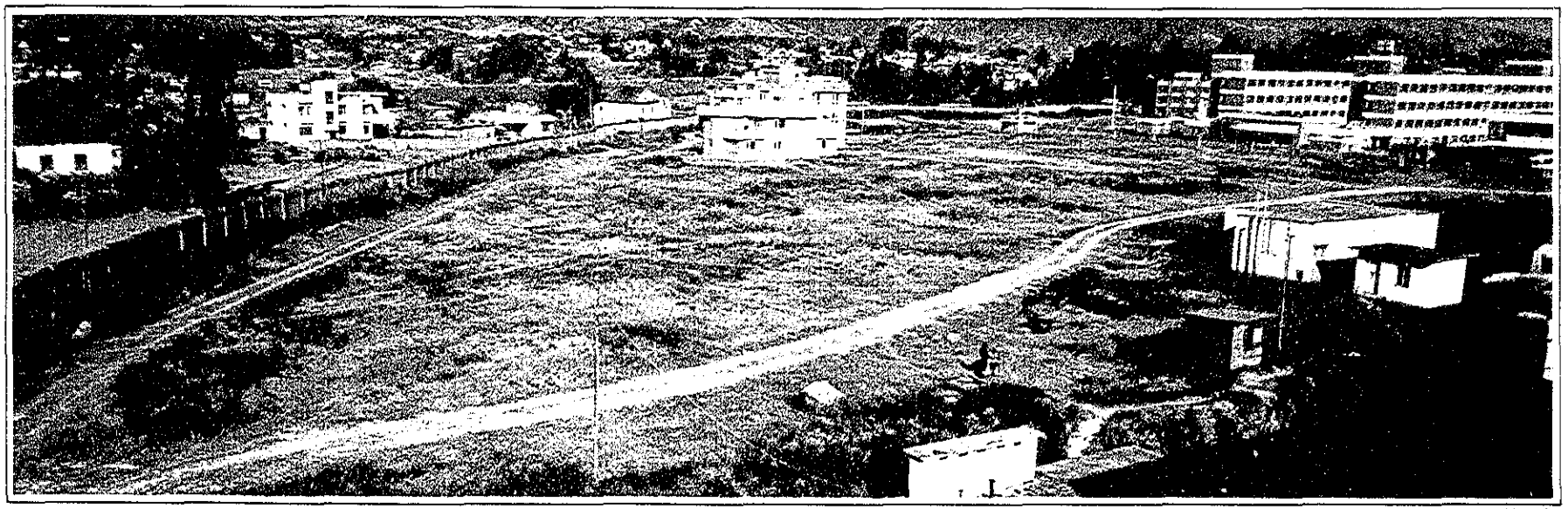
Budhanilkantha



Tribhuvan University Institute of Medicine and The Teaching Hospital



Project Site for Basic Medical Science Building and Operating Building



Project Site for Wards

SUMMARY

SUMMARY

The Kingdom of Nepal is an inland country lying between China and India. It has a land area of approximately 147,000km^2 and is situated between lat. 26°N. and lat. 30°N. Approximately 17,970,000 (estimated value for 1989) Nepalese live in areas which range in height from approximately 60 meters above sea level to more than 8,000 meters above sea level. The southern lowlands bordering on India ascend toward the mountainous areas.

The country's health and medical care administration falls under the jurisdiction of the Ministry of Health, and with some exceptions, education and training of medical manpower -- such as medical officers, nurses and medical technologists -- is carried out at Tribhuvan University's Institute of Medicine (IOM) under the control of the Ministry of Education and Culture. Tribhuvan University, which was established in 1959, is the country's only institution of higher education. In 1972, an institute of medicine was added to the university. As a result, the university currently has ten departments in total. The history of education and training of medical officers at IOM is still relatively short. In 1977, the medical officer (MBBS) training course was started with an annual student intake of 30, and in 1984 the first medical students completed the course. In 1980, Japanese technical cooperation for the Tribhuvan University Medical Education Project was launched; in March 1984, Tribhuvan University Teaching Hospital (TUTH) was established, and in March 1986, the nurses' school attached to IOM was established, both with a grant aid from the government of Japan.

The government of Nepal has been promoting the construction and expansion of health posts, health centers, hospitals and other medical facilities with a view to supplying basic health services to all by the year 2000. Due to the country's fiscal problems and the absolute shortage of medical

manpower, particularly medical officers, the central government has not completely met the people's ever growing demand for health services.

The groundwork for medical care and education in clinical medicine at the university's medical department was laid through the establishment of Tribhuvan University Teaching Hospital and the government of Japan's technical cooperation project. Remarkable improvements have been made in medical care techniques and TUTH's workload has increased more rapidly than was initially expected. As a result of the rapid increase in the number of outpatients coming to the hospital, its outpatient, operation and ward divisions have been operating at capacity. In the case of the radiography, medical technology and emergency divisions, it is necessary to take measures to cope with this increase in workload. On the other hand, the facilities and equipment for use in medical education at the IOM are of poor quality, far below the minimum required for medical education. Furthermore, medical schools in some foreign countries do not authorize the credits Nepalese students obtained at IOM. For these reasons, it is impossible for IOM to increase the annual intake for the medical officer training course.

To resolve this situation, the government of Nepal worked out a project to expand the facilities of IOM and TUTH, and requested that the government of Japan provide grant aid for this project. In response to this request, the government of Japan decided to conduct a survey in connection with the grant aid requested, and the Japan International Cooperation Agency sent a basic design study team to Nepal from November 7 to December 3, 1989. The team exchanged views with the Nepalese government officials concerned, and conducted a field survey at the same time. After returning to Japan, the team made further studies, then conducted a briefing on the final draft report in Nepal from February 23 to March 4, 1990.

Tribhuvan University Institute of Medicine is the Nepalese organization responsible for the implementation of this project. The facilities

constructed under this project will be integrated into the existing facilities of IOM and TUTH.

The facilities of IOM are scattered around the university's central campus in Maharajiganj and its eleven other campuses. However, most of the important facilities, including the Dean's office building, the "old academic building", TUTH and the nurses' campus, are located within the central campus. By 1989, IOM had opened a total of 24 training courses, ranging from those for training paramedical staff to those for training medical specialists, and in that year accepted 762 students. TUTH consists of the outpatient division (internal, surgical, orthopedic, ophthalmic, otorhinolaryngologic, obstetric and gynecologic, dermatologic, dental and psychiatric departments), the emergency division, the operation/anesthesiologic division (3 clean operating room, 2 non-clean operating rooms, 1 infectious disease operating room, 6 ICUs), the medical technology division, the radiography division, and the ward division (300 sickbeds for internal, surgical, orthopedic, ophthalmic, otorhinolaryngologic, obstetric and gynecologic, dermatologic, dental, psychiatric, postoperative, burn and tropical disease patients).

As of October 1989, IOM had a staff of 410 -- 19 professors, 35 assistant professors, 57 lecturers, 59 assistant lecturers 81 other teaching staff and 159 others. There were 796 staff is TUTH --- 88 medical officers, 119 nurses, 36 auxiliary nurse midwives and 553 others. Of the 88 medical officers working at TUTH, 50 are also teaching at IOM.

Comprehensive analysis of the present condition of medical care at these facilities and operation and management of the facilities, the project site, the infrastructure, the local construction industry, etc. accounted for the present condition of IOM and TUTH as well as the contents of the government of Nepal's request. The most appropriate contents and the scale of the prospective facilities were determined as follows:

- Project site:
  Central Campus of Tribhuvan University Institute of Medicine (Maharaji Gandhi, Kathmandu)

- Total floor area : approximately 11,295 m^2
  New facilities : approximately 10,641 m^2
  Remodeling : approximately 654 m^2

- Structure/no. of stories:
  Reinforced concrete structure / 3 stories, 2 stories, 1 story

- Facilities:
  1. IOM

  (1) Basic medical science building
  New facilities : 4,567 m^2
  Lecture rooms, training rooms (anatomy, physiology, biochemistry, pharmacology, pathology, forensic medicine, microbiology, community medicine)

  2. TUTH

  (1) Wards (100 beds)
  New facilities : 2,528 m^2
  Sickrooms, nurse stations, treatment rooms, etc.

  (2) Operating building
  New facilities : 2,380 m^2
  Remodeling : 446 m^2
  Operating rooms, ICU, CCU, CSSD, doctors' and nurses' locker rooms, etc.

  (3) Clinical laboratories
  Remodeling : 174 m^2
  Microbiology laboratory, virology laboratory

(4) Hospital engineering workshop
New facilities : 203 m^2
workshop, equipment store room

(5) Oxygen gas production building
New facilities : 130 m^2

(6) Water treatment plant
New facilities : 68 m^2

3. Other necessary facilities

(1) Septic tanks, etc.
New facilities : 765 m^2
Remodeling : 34 m^2

- Equipment

1. Equipment for use at IOM

(1) Basic medical science building
Autopsy table, flame photometer, fume hood, etc.

2. Equipment for use at TUTH

(1) Wards
Beds, suction pump, etc.

(2) Operating building
Operating tables, operating light, anesthesia apparatus, etc.

(3) Remodeling of the Clinical laboratories
Laboratory table

(4) Hospital engineering workshop
tool set, etc.

(5) Oxygen gas production building
Oxygen gas plant

(6) Replacement and addition of existing equipment in TUTH
Blood gas analyzer

When this project is to be implemented with grant aid from Japan, it is reasonable to divide the entire project into three phases in light of the many restrictions, including the scheduled time for completion. In Phase 1, 3.5 months will be required to complete the design of the facilities, and 12 months will be necessary for the construction of these facilities. In Phase 2, 2.5 months are needed for the design of the facilities and 12 months for the construction of these facilities. In phase 3, 1.5 months are allotted for the design of the facilities, and 6 months for the construction.

The major results expected of the project include the resolution of the absolute shortage of medical officers, which is one of the most urgent challenges facing the country, and enhancement of the general standard of medical manpower training in the country. This project is expected to help improve and expand the country's educational system for basic medicine and remedy the increase in IOM's annual intake (from 30 to 60). The improvement and expansion of the country's medical officer training programme will make it easier for the graduates of IOM to take medical specialist training courses offered in foreign countries.

With respect to clinical medicine, the number of hospital sickbeds will be increased by 100 to 400 and two large-size operating rooms will be added to improve operation division functions. The ICU/CCU and CSSD will also be expanded. The project aims to expand and improve the facilities of TUTH's wards, operation division and clinical laboratories. A sufficient number of cases for clinical education may be dealt with to cope with the rapidly increasing number of outpatients, operations, clinical examinations and X-ray examinations. Furthermore, construction of the

equipment maintenance workshop, the oxygen gas plant and the water treatment plant will help the teaching hospital establish a minimum health service base. The improvement of the information system, which includes fire alarm and emergency public-address systems, will allow for safer operation of the facilities.

The maintenance and operation costs, including personnel expenses, which will be created by the facilities expansion, will be covered by income from hospital sickbed rental and increased operation/examination charges, which are expected as a result of this project.

As mentioned above, the project aims to enhance the Nepalese people's welfare by raising the general level of health services in Nepal. The project is very significant because it will help the government of Nepal meet its people's basic minimum health service needs and establish a base for health and medical care. These government efforts are among the major national goals. In this context, Japan's grant aid for the implementation of this project is judged to be appropriate and reasonable.

Of the measures considered necessary (after the on-site investigation of TUTH), selections were made on the basis of due urgency and Nepal's ability to effectively utilize and manage the facilities.

It is impossible to resolve all the problems facing IOM and TUTH through implementation of this project. In the case of the facilities of TUTH, in particular, there are many items which need to be resolved through continued efforts. Of these, the expansion of the facilities of the outpatient and emergency divisions, the expansion and improvement of the functions of the physiological examination facilities and X-ray diagnostic facilities should be given top priority. When the hospital's beds total 500 after the addition of more 100, it will be necessary to increase the capacity of the laundry as well as the kitchen and dining facilities.

CONTENTS

APPENDIX – 1

APPENDIX – 2

CHAPTER 1 INTRODUCTION

INTRODUCTION

In Nepal, the central government's health service policy measures are being implemented with emphasis on the expansion of primary health care services. For instance, the number of the health posts increased by about 88% from 433 in 1976/77 to 814 in 1986/87. During the six-year period from 1980/81 to 1986/87, the number of ayurvedic service centres increased by 70% from 85 to 145. The number of hospital sickbeds increased by 22 percent during the 5th five-year plan (1970 - 75), by 33 percent during the 6th five-year plan (1975 - 80). In the 7th five-year plan (1985 - 90), by 1989, the number of hospital beds increased by 27 percent. As a result, the total number of hospital beds is now 4,329. However, the number of hospital beds per 10,000 persons is still 2.4 (1988), which compares with 2.9 in Bangladesh, 6.1 in Bhutan, 6.1 in Maldives and 6.9 in India.

With respect to the training of health service manpower, an institute of medicine was established within Tribhuvan University in 1972, with the aim of training middle- and low-level health service manpower.
Nevertheless the country was still dependent on foreign countries for education and training in advanced medicine.
As a result, the country was short of high-level health service manpower by 142 persons, middle-level health service manpower by 260 persons and low-level health service manpower by 1,252 persons during the 4th five-year plan.

The Institute of Medicine (IOM) started a medical doctor training programme in 1977, with 30 students participating in it. In 1984 the first trainees completed the course. But even this was not sufficient to cope with the ever increasing demand for health services. While the country now has 879 medical doctors, 380 staff nurses and 1,808 auxiliary nurse midwives, it is estimated that the country will need 2,400 medical

officers, 1,202 staff nurses and 5,000 auxiliary nurse midwives by the year 2000.

Such being the case, the Tribhuvan University Medical Education Project was launched in 1980. The main objectives of this project are:

(1) To train medical officers and paramedicals

(2) To enhance the technical level of teaching hospitals so that they may fulfill their functions as national referral centres.

(3) To contribute to the improvement of national health services by conducting surveys and studies in the areas of medical education, diagnosis, treatment and community health.

With grants from the Japanese government, the Tribhuvan University Teaching Hospital (TUTH) and a training school for nurses were established in March of 1984 and in March of 1986 respectively.
The main objectives of the TUTH plan are:

(1) To train health service manpower
(2) To provide national referral health services
(3) To conduct health service-related surveys and studies
(4) to provide advanced health services

Although six years have passed since TUTH was established, medical data relating to TUTH still indicates the necessity of further improving conditions in the institution. An analysis of trends regarding the total number of medical officers indicates that it is necessary to train an average of 126 medical officers yearly beginning in 1988 in order to increase the total number of medical officers from 879 in 1988 to 2,400 in the year 2000. Actually, an average of 70.6 medical officers, including those trained overseas, was trained annually from 1984 to 1988.

On the other hand, there have been marked increases in the number of outpatients and inpatients at TUTH. During 1988/89, the number of outpatients was 182,639 (or about 640 a day given 285 consultation and treatment days a year) and the number of inpatients was 8,590 (at sickbed occupancy rate of 77.23 percent). It is therefore necessary to expand TUTH's existing facilities.

To resolve the above-mentioned situation of the country's health services, the Nepalese government formulated a project to expand the existing facilities of Tribhuvan University, Institute of Medicine and the Teaching Hospital, and requested that the Japanese government provide grant aid for the implementation of the project.

In response to the request, the Japanese government decided to conduct a survey concerning the project. The Japan International Cooperation Agency dispatched to Nepal a basic design study team headed by Dr. Yoshitaka Mori, Professor of Hyogo College of Medicine from November 7 to December 3, 1989. While in Nepal, the team reviewed the contents of the request for the grant aid, the background of the project, etc., and also conducted the following investigations to evaluate the feasibility of the requested grant aid.

(1) Analysis of the background and the appropriateness of the project.

(2) Present conditions of health services, education and training of health service manpower in Nepal.

(3) Positioning of the project within the framework of the nation's overall health programme.

(4) Consultation on the contents and scale of the project with representatives of the Nepalese government.

(5) Confirmation of systems for implementing the project, for operating and managing the projected facilities, for work to be implemented by the Nepalese and for budgeting.

(6) Investigation of the project site.

(7) Investigation of the existing facilities and equipment of IOM and TUTH.

(8) Investigation of actual operations of IOM and TUTH.

(9) Investigation of the construction industry in Nepal

The purpose of this report is to summarize analyses conducted in Japan based on findings of the above-mentioned investigations and the briefings on the draft final report conducted by the team in Nepal from February 23 to March 4, 1990. A copy of the minutes of discussion, the list of members of the basic design study team, the basic design study schedule, etc. are included at the end of this report.

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Background of the Project

Nepal is confronted with a multitude of health problems. In 1981, a census year, 42 percent of the nation's population was 15 years old or younger. While there is a strong demand for health services and education, the geographical constraints in mountainous Nepal have delayed the establishment of road networks as well as the spread of health services. Furthermore, the shortage of health service manpower, their concentration in urban areas and the shortage of medical equipment and drugs have been major obstacles to the expansion of health services in the country.

Improving environmental sanitation is also a matter of urgency. The nation's water supply and sewerage systems are underdeveloped; the national average diffusion rate for water supply being about 15 percent (1987). Poor sanitary conditions in rural areas where many people live together with farm animals have been a major cause of infectious diseases, worms and skin diseases.

The birth rate and the death rate are both high, the former being 42/1000 and the latter being 16/1000. While the average life expectancy is short (53 years for males and 50 years for females), the annual population growth rate is high (2.6 percent). The ubiquitous poverty is attributable mainly to the large infantile population which exceeds the working population as well as the poor food situation, which causes malnutrition and contributes to the high disease incidence rates.

In addition to the high birth rate, the death rate for infants is also high (111/1000). The slow advance of health services for mothers and children has resulted in a rise in the death rate. The rate of incidence

is high for diphtheria, whooping cough, tetanus, rubeola, polio and tuberculosis, which can be prevented through vaccination.

Malnutrition is a problem common to almost all infants and children. In addition to these problems, the nation's high illiteracy rate, estimated at about 80 percent, has resulted in the loss of opportunities to acquire a proper knowledge of sanitation. Judging from the present school attendance rate, it appears that the illiteracy rate is far higher for females than for males.
Major infectious diseases include dysentery, malaria, tuberculosis, leprosy, rubeola, polio and rabies.

In 1977, smallpox was declared extinct following a survey conducted by an international organization. In recent years, incidence of malaria, believed to have been controlled in the 1970s, has resurged.

Under these circumstances, the Nepalese government has been implementing a nationwide disease prevention campaign, which includes preventive medicine projects to prevent malaria, leprosy and tuberculosis, as well as vaccination projects (including inoculation of BCG) against diphteria, polio and other infant diseases. Apart from this, in many rural areas, illness was believed to represent a sort of spiritual phenomenon and traditional religious services were performed to cure them. This custom is not yet completely extinct. Since 1974, strenuous efforts have been made to promote the concept of emergency treatment and spread a basic knowledge of sanitation in an attempt to change rural residents' perception of illness.

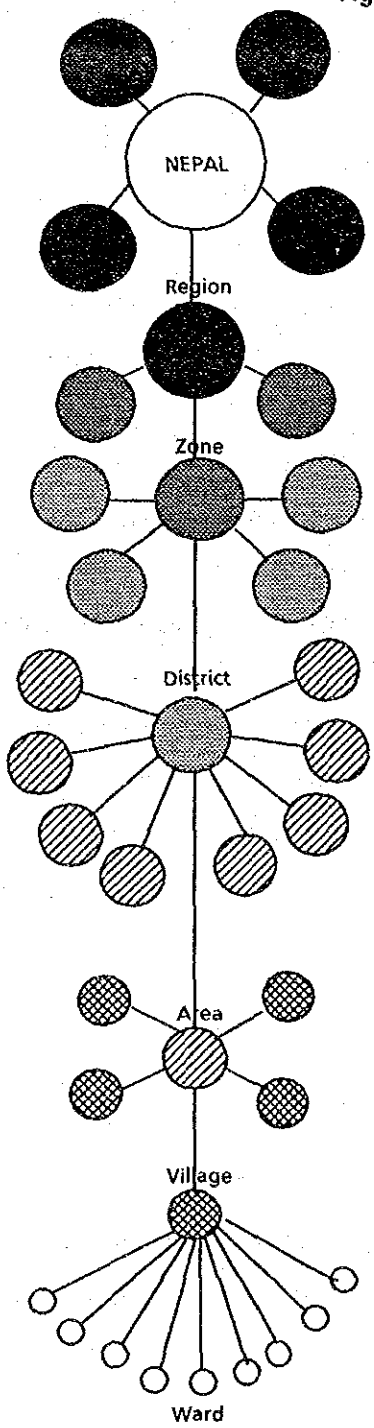
To promote public health, continuous efforts have been made to construct more hospitals and health posts, as well as to train health service manpower to work at these facilities. The country is gradually paving the way for implementing education and training of high-level health service personnel, for which the country has thus far been dependent on other countries.

2-1-1 General Situation of Health Services in Nepal

(1) Health Service System

As shown in the following figure, the present situation of health services in Nepal is characterized by a pyramid of medical services and facilities.

Fig. 2-1 Nationwide Health Service Organization in Nepal



NEPAL	• National Hospital
	Bir Hospital 300 beds
	(TUTH) 300 beds
	• Central Hospitals
	1 Maternity Hospital 200 beds
	2 Kanti children Hospital 150 beds
	3 Teku Hospital 100 beds
	4 Ayurved Hospital 50 beds
5 REGIONS	• Regional Hospital
	Pokhara Regional Hospital 150 beds
14 ZONES	• Zone Hospitals
	1 Mechi Hospital 50 beds
	2 Koshi Hospital 130 beds
	3 Sagarmatha Hospital 50 beds
	4 Janakpur Hospital 50 beds
	5 Narayani Hospital 50 beds
	6 Lumbini Hospital 50 beds
	7 Bheri Hospital 62 beds
	8 Seti Hospital 50 beds
	9 Mahakali Hospital 50 beds
75 DISTRICTS	• District Hospitals
	56 District Hospitals
	District Total 1,058 beds
AREAS	• Health Posts
	816 Health Posts
VILLAGE	• Sub Health Posts

(2) Primary Health Care

The Nepalese government worked out a plan to establish a health service network aimed at providing BHN to all citizens, and in 1950 a project to construct health centres was launched. Each health centre is required to have at least one medical officer and health service staff to provide basic health services. In 1975, 31 health centers were established. However, due to the shortage of health service manpower, it was impossible to further increase the number of health centres.

Consequently, the central government modified the project to establish health posts staffed with paramedical personnel (Health Assistants or HAS and Senior Auxiliary Health Workers or SAHWS) across the country. In 1988, the total number of health posts reached 816, and health centres were reorganized into 15-bed district hospitals.
Of the total number of health posts, 675 are integrated health posts, which offer health guidance for mothers and children, vaccination services, nutrition guidance and health education programmes, in addition to general health services. They also carry out campaigns against local epidemics. The remaining 141 health posts are static health posts providing basic health services. Furthermore, in recent years sub-health posts have been established to provide basic health services to residents in remote areas. Each sub-health post has an AHW and an MCH. The costs for operating and managing the sub-health post in a village are defrayed by the village Panchayat.

(3) Hospital Health Services

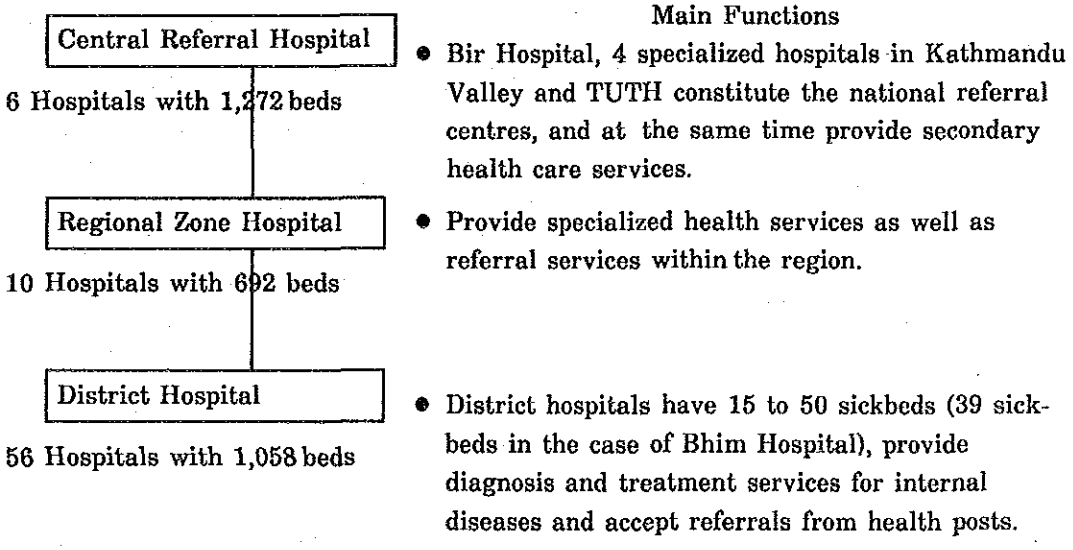
In Nepal, a full-fledged system for providing modern hospital health services came into being in 1949 when Bir Hospital was established. However, the system did not work at first because few other medical facilities were constructed. In 1956 when the Ministry of Health was

established, the total number of hospitals was 34 and sickbeds numbered only 625.

Later on, modern hospital health services were introduced with the cooperation of other countries, international organizations and missions. In 1974/75, the total number of hospitals was 62, and the total number of sickbeds reached 2,174. In 1988/89, the total number of hospitals was 101, with the total number of sickbeds increasing to 4,329. Between 1974/75 and 1988/89, the number of sickbeds per 10,000 population increased from 1.7 to 2.4. In comparison with 2.9 for Bangladesh, 6.1 for Bhutan, 6.1 for Maldives and 6.9 for India, however, the figure for Nepal is still very small.

As shown in Fig.2-1, Nepal's hospital health service network is based on an organizational structure centered around Bir Hospital, in which specialized hospitals serve as central referral hospitals.

Fig.2-2 Health Service Pyramid in Nepal



In addition to the above hospitals, there are 8 hospitals (combined total number of sickbeds: 454) operated by missions, 11 hospitals run by NGOs, police hospitals, military hospitals and a private hospital. In 1988/89, the total number of hospitals was 101 and the total number of sickbeds was 4,329.

The following table shows trends in the number of hospitals and sickbeds from 1975 to 1989 in Nepal.

Table 2-1 Trends in Number of Hospitals and Hospital Sickbeds (1975-1988)

YEAR / REGIONS	1975	1980	1985	1986	1987	1988	1989
	No. of Hospitals	No. of Hospitals	No. of Hospitals	No. of Hospitals	No. of Hospitals	No. of Hospitals	No. of Hospitals
	No. of Beds	No. of Beds	No. of Beds	No. of Beds	No. of Beds	No. of Beds	No. of Beds
EASTERN	13	17	20	22	22	23	23
	356	455	494	524	524	697	697
CENTRAL	25	28	29	30	32	34	34
	1273	1498	2111	2161	2211	2294	2364
WESTERN	13	15	15	17	17	17	19
	305	421	486	616	616	616	670
MID-WESTERN	5	6	6	8	8	10	13
	110	116	116	141	181	211	263
FAR-WESTERN	4	6	9	12	12	12	12
	80	110	265	310	310	335	335
NEPAL Total	60	72	79	89	91	96	101
	2124	2600	3472	3752	3842	4153	4329

Note) Includes TUTH, Mission Hospitals, Police Hospitals, a Private Hospital and NGO's Hospitals

Source: Health Information Bulletin MOH 1989

(4) National Hospital Health Service Plan

In advance of the start of the 8th five-year plan, possible ways to develop a national health service network were discussed. As a result, the following national hospital health service plan was worked out.

Table 2-2 Table giving Outline of National Hospital Health Service Plan

Categories	Hospital Name	No. of Beds (Proposed additional)	Main Functions
National Hospitals	1 TUTH	300 (200)	• Teaching hospital • National referral hospital
	2 Bir Hospital	300 (500)	
	National Total	600 (700)	
Central Hospitals	1 Kanti Hospital	150 (150)	• Provide specialized clinical services and referral services
	2 Teku Hospital	100 (200)	
	3 Maternity Hospital	200 (100)	
	4 Patan Hospital	138 (62) *1	
	5 Ayurved Hospital	50 (100)	
	6 Ananda Ban Leprosy Hospital	100 ( ) *1	
	7 Homeopathy Hospital	25 (25) *2	
	Central Total	763 (637)	
Regional Hospitals	1 Dipayal	- (50)	• Provide following services with 150 beds 1. General medicine 2. General surgery 3. Gyn. / Obs 4. Dental 5. Paediatric 6. Ayurved 7. Orthopedic/trauma 8. ENT 9. Psychiatric 10.TB 11.Dermatology • Conduct clinical in-service training
	2 Surkhet	15 (85)	
	3 Dharan	75 (175)	
	4 Pokhara	150 (100)	
	5 Pokhara(Ayurved)	- (25)	
	6 Biratnagar(Ayurved)	- (25)	
	Regional Total	240 (460)	
Zone Hospitals	1 Lumbini Butwal	50 (75)	• Divided into three categories 50 beds, 100 beds and 150 beds. Positioned 1. Medical Superintendent 2. Physician 3. Surgeon 4. Ob/gynecologist 5. Dentist 6. Ayurved in 150-beds zone Hospital • Provide referral services to the zone
	2 Koshi Morang	100 (25)	
	3 Bheri Nepalgunj	62 (88)	
	4 Narayani Birgunj	50 (100)	
	5 Janakpur Dhanusha	50 (75)	
	6 Seti Bajhang	15 (35)	
	7 Rapti Dang	15 (35)	
	8 Karnali Jumla	15 (35)	
	9 Sagarmatha Rajbiraj	15 (35)	
	10 Seti Dhangadi	50 (100)	
	11 Mahakali Mahendranagar	50 (50)	
	12 Mechi Jhapa	50 (50)	
	Zone Total	522 (703)	
District Hospitals	62 Hospitals *3		• Divided into three categories 15 beds, 25 beds and 35 beds. • Provide general medical care.
	District Total	1,058 (817)	

Source: Report on Country Health Resources and Priorities 1990-1995

*1 Mission hospital
*2 District Hospital (Present)
*3 The following exceptions are planed for district hospital beds.
Bhaktapur 150 beds Lagankhel 150 beds Bharatpur 100 beds+25 beds(Trauma)
Hetauda 50 beds Ayurved 150 beds

(5) Ministry of Health's Budget (expenditures)

Table 2-3 Trends in Expenditures in State Budget and Ministry of Health Budget

(Rs in Million)

		1983/84	1984/85	1985/86	1986/87	1987/88	1988/89 Estimate	1989/90 Estimate
Ministry of Health	Regular Expenditure	117.8	139.2	150.0	182.5	204.1	275.0	318.6
	Development Expenditure	199.8	254.8	255.9	309.2	385.2	562.1	614.9
	Total	317.6	394.0	405.9	491.7	589.3	837.1	933.5
	Foreign Aids & Loan	99.7	141.5	137.5	148.4	139.7		
Nepal	Regular Expenditure	2,273.5	2,906.2	3,583.9	4,135.1	4,677.0	5,765.1	6,651.2
	Development Expenditure	5,163.8	5,488.6	6,213.3	7,378.0	9,428.0	9,495.5	13,590.8
	Total (index)	7,437.3 (100)	8,394.8 (113)	9,797.1 (137)	11,513.2 (155)	14,105.0 (189)	15,266.6 (205)	20,242.0 (272)
	Foreign Aids & Loan (index)	2,547.5 (100)	2,676.5 (109)	3,491.6 (137)	3,990.9 (157)	5,269.3 (207)	8,890.2 (349)	

Source: Economic Survey 1989
Budget Speech of 1989/90

In the case of the state budget for fiscal 1987/88, 589.3 million Rs, accounting for about 4.2 percent of the total expenditures of 14,051.1 million Rs, went to health services, of which 385.2 million Rs or 65.4 percent were for development. In the state budget, expenditures exceed revenues every year, and the deficits are covered with foreign grants and foreign and domestic loans. The proportion of foreign grants to the government's development budget is on the increase. In fiscal 1988/89, the proportion was 63 percent, but in fiscal 1989/90 it increased to 73.5 percent.

2-1-2 Medical Education and Training of Health Service Manpower

(1) Medical Education and Training System

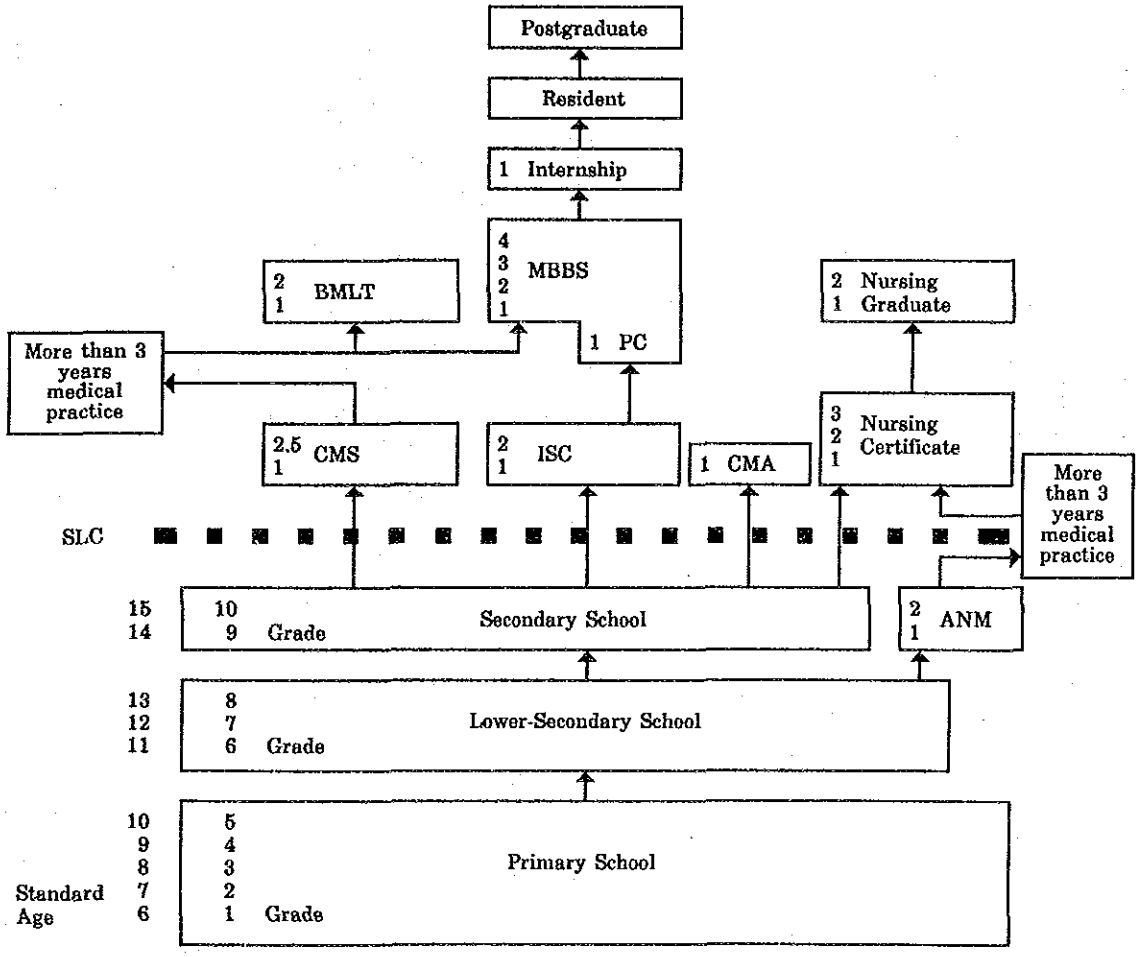
Medical education and training of health service manpower are conducted at Tribhuvan University Institute of Medicine with a view to training the necessary number of health service personnel to participate in the

government's long-term health service plan and each five-year plan based on it.

Tribhuvan University is the nation's only institution of higher education and was established in 1959. The university operates under the direct control of the Ministry of Education and Culture and currently has 10 faculties.

Shown in the following figures is the conceptual schema of the medical education system in Nepal.

Fig. 2-3 Conceptual Schema of Medical Education System in Nepal



MBBS : Bachelor of Medicine and Bachelor of Surgery
BMLT : Bachelor of Medical Laboratory Technicians
CMS : Certificate in Medical Science
ISC : Intermediate Science Course
PC : Premedical Course
SLC : School Leaving Certificate
ANM : Auxiliary Nurse Midwives
CMA : Community Medicine Auxiliaries

(2) Curriculum and Courses Offered at IOM

At IOM, the following programmes and courses are offered. The total number of students newly enrolled at IOM was 726 in 1989.

Table 2-4 Programmes and Courses Offered at IOM

Training Programme	Prerequisite	Duration Years	Post	Course (Location)	Annual Intake
ANM	Grade 8	2	ANM	(Bharatpur) (Tansen)	32 22
CMA	SLC	1	AHW	(Surkhet) (Tansen) (Dhankuta)	80 40 60
Certificate Level CMS	SLC	2.5		(Maharajiganj) Health Assistant Lab Technician Radiography Physiotherapy Pharmacy Health Education & Sanitation	 30 15 15 7 15 10
Ayurved Programme	SLC	3	Kaviraj	Vaidhya Ayurved Certificate	40 40
Nursing Certificate	SLC or ANM · SLC	3	Staff Nurse	(Kathmandu) (Birgunj) (Pokhara) (Biratnagar) (Nepalgunj)	120 30 40 30 30
Nursing Graduate	Certificate in Nursing	2	Sister / Senior PHN	Community Nursing Hospital Nursing	9 21
Graduate Programme	Certificate in Medical Science or Intermediate Science Course	4+1/5+1	Medical Officer	MBBS Bachelor in Public Health	30 15
		2	Medical Technologist	BMLT	4
Post Graduate				Diploma Child Health Anaesthesia G & O ENT Radiography Master in Public Health Doctorate General practice Eye	 3 4 4 4 3 2 4 3

(3) Present Condition of Education and Manpower Development

In Nepal, 1,734 ANMs and 1,121 AHWs (ANMs and AHWs are both basic-level health service personnel) were trained from 1972 to 1989 in keeping with the expansion of the nation's primary health care services. Now that the nationwide establishment of the minimum number of health posts and other primary health care service facilities has been completed, the prospects for meeting the minimum basic-level health manpower requirements look brighter.

On the other hand, the need to secure the necessary number of medium- and high-level health service personnel in keeping with the continuing expansion of medical facilities is becoming stronger. It is an urgent necessity for the country to train medical officers, whose education and training has thus far been greatly dependent on foreign countries.

Table 2-5 Cumulative Total Number of Health Service Personnel Trained in Nepal

Basic Level	ANM	1,734
	CMA/AHW	1,121
	Baidya	90
Middle Level	Health Assistant	907
	Ayurved Assistant	125
	Nurse (certificate)	568
	Lab. Technician	91
	Radiography Assistant	58
	Pharmacy Assistant	64
	Physiotherapy Assistant	7
Bachelor Level	Doctor (MBBS)	80
	Nurse (BN)	112
	Public Health (BPH)	10
	Laboratory Technologist (BMLT)	6
Post Graduate		
• Diploma	Gyn./Obs. (DGO)	18
	Anaesthesia (DA)	15
	ENT(DLO)	8
	Child Health (DCH)	6
• Degree	General Practice	6

Source: Report on Country Health Resources and Priorities 1990~1995 MOH

The following are descriptions of education and training of the country's health service manpower by type of job.

- Education and Training of Medical Officers (MBBS Course)

  Qualification
  1. Completion of Intermediate Science Course and Premedical Course
  2. CMS Course plus more than three years of medical practice.

  Training institution: IOM (annual intake: 30)

The 7th five-year plan requires that 1,352 medical officers be trained by 1990, the final year of the 7th five-year plan. As of 1988, the total number of medical officers was 879, which means a serious shortage of medical officers. While the MBBS Course accepts 30 trainees every year, about 45 other Nepalese trainees are qualified as medical officers in foreign countries every year. Thus it will be possible to employ about 75 medical officers yearly on average. The breakdown by type of employer of the necessary number of medical officers is as shown below.

Ministry of Health	1,105
IOM	148
Others	99
Total	1,352

- Education and Training of Staff Nurses (certificate level)

  Qualifications
  1. SLC. Female aged 16 to 25.

  Training schools:

IOM Kathmandu Nurses' School	annual intake:	120
IOM Biratnagar Nurses' School	annual intake:	30
IOM Pokhara Nurses' School	annual intake:	40
Birgunj Nurses' School	annual intake:	30
Nepalgunj Nurses' School	annual intake:	30

Those who have completed the certificate level course work as staff nurse at hospitals or serve as assistant instructor.

As of 1987/88 there were a total of 601 nurses at work and by the year 2000 it will be necessary to secure an additional 1,202 nurses.

Since the present combined total number of trainees accepted for the certificate level course is 250, it will be possible to secure the necessary number of nurses in the not so distant future. At this time, however, there is a considerable shortage of nurses.

According to Health Manpower Planning Exercise 1986, 693 staff nurses are required for implementing 24-hour nursing care at 70 hospitals controlled by the Ministry of Health. This clearly explains the degree of the current shortage of staff nurses.

- Education and Training of ANMs

Qualification:	Grade 8. Female aged 16 to 25.	
Training schools:	Baratopur School	annual intake: 32
	Tansen School	annual intake: 22

ANMs are basic-level health service personnel who work at health posts in principle. Around 1985 they were engaged mainly in providing primary health care services at health posts or health centres. Due to the shortage of nurses, however, most ANMs are presently working at hospitals. Any ANM who has more than three years of nursing practice and who has passed the SLC qualification examination can enter a nurses' school. After graduation, she can work as a staff nurse. An ANM without SLM qualification can earn wages at the same level as those paid to staff nurses if she is promoted to the position of senior ANM. For this reason, few ANMs wish to work at provincial medical facilities. As a result of the central government's decision to transfer health posts' health services to AHWs, the scale of the ANM training course is being gradually reduced.

- Education and Training of Pharmacists

There are four classes of pharmacists, namely, Gaz (gazetted) III, Gaz II and Gaz I for those who have completed the bachelor level course and NG (non gazetted) I for those who have completed the certificate level course. It is estimated that the country will be short 123 Gaz III pharmacists and 54 NG I pharmacists at the end of the 7th five-year plan (at the end of 1990).

Table 2-6 Necessary Number of Pharmacists

Class		No. of Filled Posts in 1986	At the end of 7th Five-Year Plan		
			Total Supply	Requirement	Mismatch
Gaz (gazetted)	I	3	6	10	-4
Gaz	II	15	15	32	-17
Gaz	III	31	58	181	-123
NG(non. gazetted)	I	56	96	146	-54

Source: Report on Health Manpower Planning 1986

As IOM offers no gazetted pharmacist training course, the country is totally dependent on foreign countries for education and training of this type of pharmacist. On the other hand, the CMS Programme offers a pharmacy course for the education and training of pharmacy assistants (PAs or NG I). However, many of those who have completed this pharmacy course find work at pharmaceutical companies and retail pharmacies. It should also be noted that the separation rate is high in the case of such pharmacists.

- Education and Training of Medical Technicians

Medical technicians are classified as follows.

Medical Technologists	(1) Gaz (gazette) I
	(2) Gaz II
	(3) Gaz III
Laboratory Technicians	(4) NG (non gazetted) I
Laboratory Assistants	(5) NG II

Gaz III class medical technologists are trained through the medical technologist course (BMLT), a graduate programme. To date, 6 trainees have completed the course. Gaz II and Gaz I class medical technologists are those who have been promoted to their present ranks from lower ranks. NG I class laboratory technicians are trained through the CMS Programme's laboratory technician course. Since 1972, 91 trainees have completed the course. NG II class laboratory assistants are trained at Central Health Laboratory which operates under the control of the Ministry of Health.

- Education and Training of Radiographers

There are four classes of radiographers, namely Gaz III and Gaz II for those who have completed the bachelor level course, NG I for those who have completed the certificate level course and NG II for those who have acquired necessary techniques through on-the-job training at medical facilities. It is estimated that the country will be short 12 Gaz III class radiographers and 29 NG I and NG II class radiographers at the end of the 7th five-year plan (at the end of 1990).

Table 2-7 Necessary Number of Radiographers

Class	No. of Filled Posts in 1986	At the end of 7th Five-Year Plan		
		Total Supply	Requirement	Mismatch
GazII	1	1	2	-1
GazIII	3	4	16	-12
NG I , NGII	71	97	126	-29

As IOM offers no Gaz III or Gaz II course, radiographers of these classes are trained mainly in India. NG I class radiographers are trained in the CMS Programme's radiography course as are pharmacy assistants. Those who have completed the course have great difficulty finding employment because hospitals offer only a limited number of positions for them. Many NG I class radiographers take the MBBS course after working as radiographers for more than three years.

- Education and Training of HAs

Qualifications:	SLC	
Training course:	CMS Programme's general medicine course (training period: two and a half years)	

HAs are those who have completed a course on administration of health posts, and thus, most of them work at health posts. However, some of them teach at IOM or work for missions and other organizations. Since there has been no increase in the number of health posts in recent years, the necessary number of HAs in 1990 is set at 1,039.

This means that 100 HAs are to be trained during a period of five years. As it is expected that about 65 HAs will quit by the end of 1990, the actual total number of HAs will be 1,036. Thus it will be possible to balance supply and demand.

Many of those who quit as HAs take the MBBS course to become medical officers. There are some cases where those with AHW qualification take a 3 month course to become senior AHWs and work as heads of health posts.

- Education and Training of AHWs (CMA course)

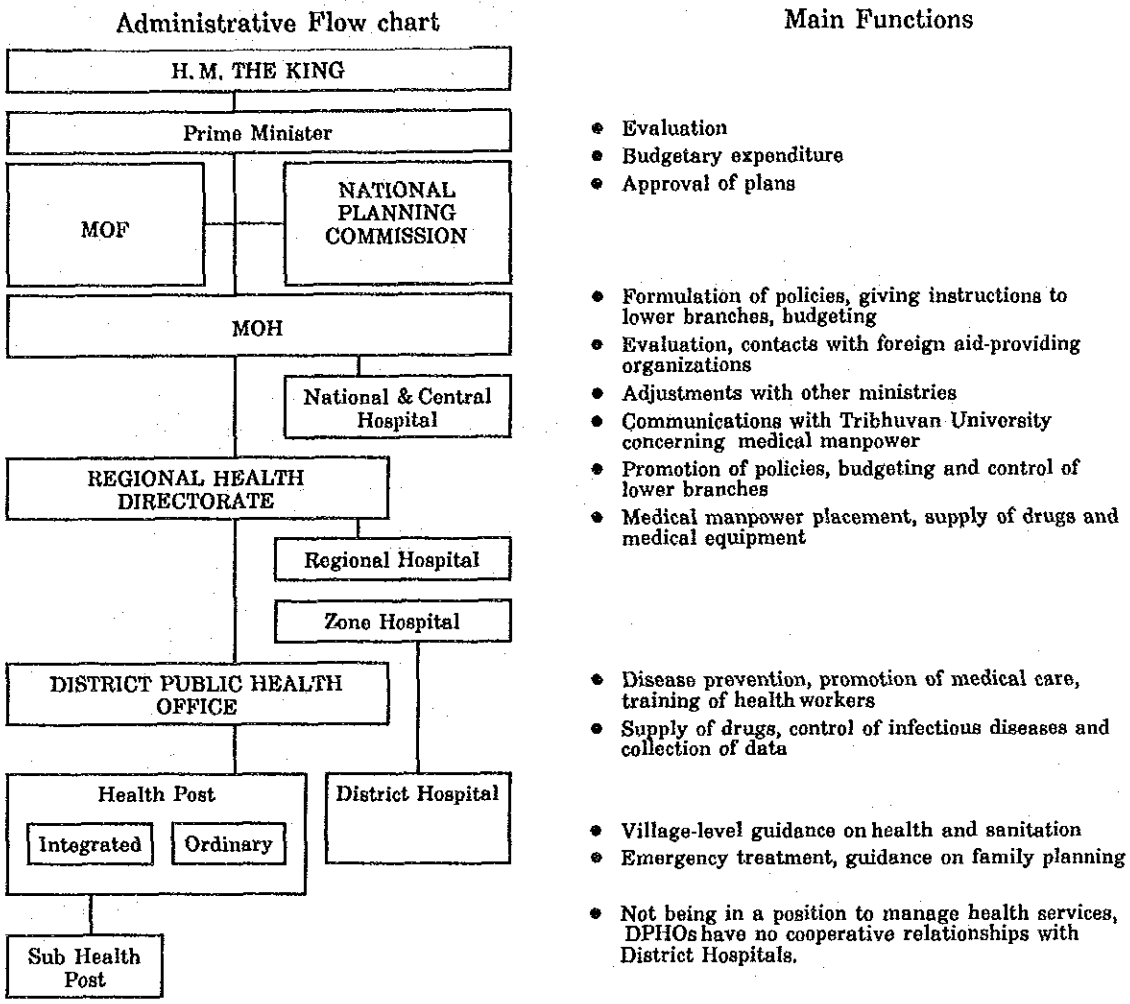
Qualifications:	SLC	
Training Schools:	Surukhet School	annual intake: 80
	Tansen School	annual intake: 40
	Dhankuta School	annual intake: 60

AHWs engage in disease prevention activities and promotion of various primary health care activities, as well as health service activities at NGOs and missions. Under the 7th five-year plan, about 1,000 AHWs are to be trained, but the necessary number of AHWs at the end of 1990 is 1,592 whereas the total supply will be 2,036. Thus, it is likely that the country will have a surplus of about 500 AHWs.

2-1-3 Present Condition of Health Service Administration in Nepal

The following diagram outlines the health service administration in Nepal.

Fig. 2-4 Health Services Organization Diagram



(Note) The above diagram shows the administrative organization as of December 1989. A review of the organization is being carried out in advance of the formulation of the next five-year plan (1990-95).

2-1-4 Diseases and Present Condition of Health Services

Diseases in Nepal can be classified as follows:

1. Infectious diseases
2. Infectious diseases common to humans and farm animals
3. Tropical diseases
4. Malnutrition
5. Insufficient absorption
6. Occupational diseases attributable to hard labor in farming and mountain villages
7. Other diseases

Table 2-8 shows a comparison of the number of patients suffering main diseases in 1974 and that for 1983/84. As stated in the notes to the table, the figures are from a limited number of medical facilities. However, it is possible to grasp nationwide trends through these figures. As is seen from the table, if "delivery-related diseases and childbirths" and "diseases impossible to diagnose" are excluded, there were no significant changes in the rate of incidence of each disease during the period of about ten years, with "infectious diseases and worms" and "injuries and poisoning" ranking first and second respectively in both years.

Table 2-8 Comparison of Number of Patients Suffering Major Diseases in 1974 and that for 1983/84

Types of Diseases	Morbidity pattern from Country Health Programme Nepal 1974		*3 Morbidity pattern in 1983/84 No. of Cases	
	*1 No. of Inpatients	*2 No. of Outpatients		
Infective and parasitic diseases	[1] 6,989	2,030	[3]	6,687
Accidents, poisoning and violence	[2] 1,838	441	[4]	4,845
Diseases of the digestive system	[3] 1,555	831	[7]	2,742
Diseases of the genito-urinary system	[4] 1,423	583	[6]	2,889
Complications of pregnancy, childbirth and puerperium	[5] 1,404	-	[1]	31,904
Diseases of the respiratory system	[6] 1,322	1,024	[5]	3,825
Diseases of the nervous system and sense organs	[7] 824	748	[8]	1,335
Diseases of the circulatory system	[8] 797	-	[9]	1,263
Neoplasms	[9] 467	-	[13]	441
Diseases of the skin and subcutaneous tissue	[10] 437	1,049	[11]	755
Diseases of the masculoskeletal system & connective tissue	-	-	[14]	377
Endocrine, Nutritional metabolic disease & Immunity	-	221	[12]	448
Diseases of blood & blood-forming organs	-	196	[10]	652
Symptoms, Signs & Ill-defined Conditions	-	-	[2]	7,456
Total	17,056	7,123		65,619

*1 Data from 24 out of 58 hospitals
*2 Data from 8 hospitals and some health posts in Bara district
*3 Data from 4 Development Region except Far-Western

Source: Country Monograph Series No.6
Population of NEPAL
Country Health Profile
NEPAL 1988

Table 2-9 also shows the top twenty diseases in Nepal today. Except for childbirth-related diseases and those impossible to diagnose, infectious diseases, injuries, fractures, poisoning and skin burns are predominant. It should also be noted that the death rate is particularly high for bacterially caused diseases, mental diseases and tuberculosis.

Main endemic diseases include malaria, filariasis, bacterially caused diseases, rabies, tuberculosis, leprosy and bacterially caused gastroenteritis. Cases of goitre caused by iodine deficiency are reported in various parts of the country. Smallpox has since been almost eradicated. In recent years, however, influenza has been rampant in mountainous areas, claiming lives of many elderly people and infants. It appears that there are many cases of polio, too. The Nepalese government is giving top priority to eradicate the following diseases in the country.

1. Malaria

Sixty-two percent of the country's population live in malaria-infested areas. In 1958, the Nepal Malaria Eradication Organization was established. As a result, the number of cases of malaria, which amounted to two million in 1959, was reduced to 2,518 by 1970. In recent years, however, there has been marked increase in the number of cases of malaria. In 1988, it amounted to 42,221. If efforts to eradicate malaria end in failure, it may lead to increase in the number of cases of encephalistis, dengue fever and kala azar. In this context, it is essential to step up preventive measures against this disease.

2. Tuberculosis

In 1965, a project to fight tuberculosis was launched. But this project has not yet generated sufficient effect. It is expected that preventive measures against tuberculosis will have been taken in 50 districts by the end of 1989. It is also expected that the project will cover 78.5 percent

of the country's population, with a total of 500,000 medical examinations conducted, by the end of the 7th five-year plan.

3. Leprosy

At present, diagnosis and treatment of leprosy is being conducted in 57 districts, with 25,361 leprosy patients being treated.

4. Hepatitis

According to the results of a survey conducted in five areas of the country, 99 percent of the combined total number of the residents in these areas showed an HAV positive reaction, and 59 percent showed a HBV positive reaction to the hepatitis test. This means that hepatitis is spreading widely in the country. It should be added that in 91 percent of the cases, acute hepatitis was of the NANB type.

5. Typhoid fever

The number of cases of typhoid fever increases during the dry season.

6. Gastroenteritis

Cases of gastroenteritis are reported throughout the year in Nepal. The rate of incidence of this disease is particularly high for children.

7. Japanese encephalitis and meningitis

Cases of Japanese encephalitis and meningitis are reported every year in 23 districts in the Terai area. In these districts, the number of cases of these diseases amounted to 1,195 (including 314 deaths) in 1986 and 502 (including 140 deaths) in 1987. The death rate ranged from 26 to 28 percent. On the other hand, there has been an alarming increase in the number of cases of meningitis in the past ten years.

8. Non-infectious diseases

As many cases of such non-infectious diseases as cardiovascular diseases, cardiovascular rheumatio diseases, neophlasms and diabetes are reported, the central government is in the process of working out plans to improve the quality of medical facilities for treating these diseases.

Table 2-9 Top Twenty Diseases in Nepal (no. of cases, no. of mortality and mortality rate)(1984/85)

	Types of Diseases	A: No. of Cases	B: No. of Mortality	Mortality rate B/A×100
1	Normal delivery	18,698	19	0.1%
2	Intestinal infection disease	8,052	254	3.2%
3	Other disease of the respiratory system	6,678	355	3.5%
4	Symptoms, Signs & ill-defined condition	5,439	184	3.4%
5	Direct obstetric causes	4,747	53	1.1%
6	Disease of other parts of the digestive system	3,653	138	3.8%
7	Tuberculosis	2,696	195	7.2%
8	Abortion	2,307	5	-
9	Disease of females genital organs	2,069	3	-
10	Other injuries	1,978	68	3.4%
11	Disease of the nervous system	1,637	161	9.8%
12	Disease of urinary system	1,502	32	2.1%
13	Disorder of eye and adenexa	1,395	4	-
14	Fractures	1,290	18	1.4%
15	Disease of skin and subcutaneous tissue	1,064	20	1.9%
16	Disease of blood & blood forming organs	870	43	4.9%
17	Viral disease	833	45	5.4%
18	Other Bacterial disease	822	152	18.5%
19	Disease of the upper respiratory system	808	22	2.7%
20	Burns	784	37	4.7%
	Others	5,957	266	-
	Total	73,279	2,074	2.8%

Source: Country Health Profile NEPAL 1988

(2) Present Condition of Health Services

1) Medical Facilities

The country's health services can be divided broadly into primary health care services and hospital health services. At present, 816 health posts and 16 health centres provide primary health care services under the control and direction of the district public health offices.

The national hospital (Bir Hospital) and central hospitals (which include maternity hospitals, Kanti Pediatric Hospital, Teku Hospital of Infectious Diseases and Manasiku Hospital) in and around Kathmandu are responsible for secondary health care services and national referral service. Regional hospitals, zone hospitals and district hospitals, all of which are under the control of the regional health directorates, provide regional- and local-level hospital health services. These medical facilities form the base of the country's hospital health service pyramid. Table 2-10 shows a breakdown by region of the total number of hospitals, health posts and health centres as of 1989.

Table 2-10 Breakdown by Economic Development Region of Total Number of Hospitals, Health Posts and Health Centres

Medical Facilities / Regions Population	No. of Hospital							No. of Health Posts			No. of Health Centres
	Teaching National	Central	Regional Zone	District	Mission NGO	Others	Total	Integrated	Ordinary	Total	
Eastern E.D.R. 4,496,814			3	14	4	2	23	141	27	171	4
Central E.D.R. 5,791,897	2	4	2	14	8	4	34	171	46	217	6
Western E.D.R. 3,701,412			2	12	4	1	19	144	33	177	3
Mid-Western E.D.R. 2,344,955			1	9	2	1	13	135	16	151	2
Far Western E.D.R. 1,640,432			2	7	2	1	12	81	19	100	1
NEPAL 17,975,510	2	4	10	52	20	9	101	675	141	816	16

Source: Health Information Bulletin vol.5 1989

2) Health Services

In Nepal, the lowest-level health services are provided through the community health volunteer (CHVs) activities and the female community health volunteer (FCHVs) activities. The CHV stationed at each ward is given a monthly allowance of 100 Rs and is responsible for promotion of health-related activities, health education, first aid and referral of serious cases to the VHW (responsible for operation and management of the sub health post under the supervision of the intermediate supervisor (IS)). Concerning technical matters, the VHW comes under the supervision of the MCHW and the ANM. Traditional health services are frequently utilized by many people across the country. There is a total of 155 traditional health service facilities (Ayurvedic Ausadhalaya) in the country. These facilities rank below health posts and hospitals.

The lowest-level hospital health services are provided by district hospitals which accept referrals from health posts and have medical officers provide basic hospital health services to community residents. With the exception of Bir Hospital and TUTH at which patients are required to pay for some of the health services provided, consultation and prescription services are provided free of charge. However, the central government is studying the possibility of changing all the country's medical facilities into fee-charging ones.

3) Medicines

A national list of essential drugs was prepared during the 7th five-year plan. Presently, 80 types of drugs are manufactured, of which 42 are manufactured using only domestically available ingredients. There are more than 10,000 specifications for imported drugs, and 35 percent of the imported drugs are included in the national list of essential drugs. All drugs are tested by the Department of Drug Administration (DDA) in accordance with the Nepal Drugs Act.

2-2 Outline of Health Service-Related Plans

In Nepal, the central government's efforts to formulate modern national health services policies were triggered by the establishment of Bir Hospital in 1948. The 1st five-year plan (1956-61) was launched in 1956. And the Ministry of Health, established in the same year, set about developing a full-scale health service system. During the period between the 1st and 3rd five-year plan (1956-70), extreme emphasis was placed on prevention of malaria and smallpox as well as family planning through educational activities conducted by health consultants; health posts were set up as medical facilities for their use. During the period of the 4th five-year plan (1970-75), the concept of an overall public health service was introduced, and efforts to construct health posts throughout the country helped improve the disease prevention services. Also, Tribhuvan University Institution of Medicine (IOM) was established to expedite the central government's medical manpower development effort through education and on-the-job training of paramedical manpower. During the period of the 5th five-year plan (1975-80), the overall public health policy became one of the central government's top-priority national policies, and national public health policy measures were implemented. In 1975, the Long-Term Health Plan 1975 was formulated through the combined efforts of the King of Nepal, the National Commission on Population, the National Planning Commission, the Ministry of Finance and the Ministry of Education and Culture. The 6th five-year plan (1980-85) stipulated the continuation of the overall public health policy adopted under the 5th five-year plan, and aimed at providing basic health services to the people, checking population growth and improving the nutritional and environmental conditions in the country.

2-2-1 7th Five-Year Plan

The Nepalese government is now in the process of implementing the 7th five-year plan (1985-90), which has the following three items as its main goals:

1. To increase production.
2. To expand employment
3. To ensure that all the Nepalese people are guaranteed basic living conditions.

In order to attain these goals, the central government is promoting policy measures to realize an average life span of 55.4 years, an infant mortality rate of 98.3/1000 and a population growth rate of 1.9 percent by increasing the country's medical manpower, expanding the primary health care facilities and thereby expanding primary health care services for the people.

The main goals of the central government's health service policy under the 7th five-year plan are as follows:

1. To promote overall primary health care services.
2. To establish a citizen-level social base for health and promote citizens' participation in the country's health related programmes.
3. To improve the quality of hospital facilities and management capabilities.
4. To set up efforts to control the population.
5. To extend loans to private medical facilities.
6. To educate and train health service specialists.

The following programmes have been worked out as concrete policy measures to attain these goals:

1. To promote and improve primary health care services in provincial areas as overall services directed by the Ministry of Health.

2. To establish a sub-health post in each ilaka constructed under the 6th five-year plan to meet the people's basic health needs.

3. To continue policy measures to construct a 15-bed hospital in each district as a medical facility to which serious cases can be referred.

4. To promote decentralization of health service functions.

5. To promote improvements in drug distribution, the health environment, equipment sanitation and family planning requiring the cooperation of more than one government agency.

The health-related targets and the present degree of achievement of the goal under the 7th five-year plan are as shown in the following table.

Table 2-11 Targeted Values under 7th Five-Year Plan

Indicator	Unit	Base values	Targets	Achievement
Crude Mortality Rate	per 1,000 population	16.57	12.00	14.85
Crude Birth Rate	per 1,000 population	42	40	41.56
Infant Mortality Rate	per 1,000 population	111.5	98.3	105.3
Average Life Span	years	51.43	55.4	52.8
Fertility Rate	%	6.3	4.0	5.8
Population Growth Rate	%	2.2	1.9	2.62

Source: National Commission on Population
Country Health Profile
Mid-term Review Report N.P.C. 1988
Nepal in Figures CBS 1988

2-2-2 The Long Term Health Plan 1975-1990

In 1975, the Ministry of Health formulated the Long Term Health Plan, and the 5th, 6th and 7th five-year plans were implemented in accordance with the objectives of this long term plan.

The long term plan is aimed at reducing the country's mortality rate, increasing the country's average life span, enhancing the health

standards, educating and training medical manpower, and expanding medical facilities. The main goals of this plan are as follows:

1. To develop basic medical care facilities for residents of provincial areas who account for 96 percent of the country's population.

2. To control population growth which is an obstacle to the promotion of national development and to promote the concept and practice of family planning.

3. To construct hospitals with 15 sickbeds or more in 75 districts.

4. To integrate various projects to provide basic health services.

5. To conduct research on the effectiveness of traditional drugs and methods of treatment and expand production of herbs.

6. To educate and train medical manpower and make effective use of existing medical manpower.

7. To reform the country's health administration to provide health services more effectively.

8. To promote cooperation with the existing private hospitals and medical offices and put these medical facilities under central government supervision (by the end of 1990, if possible).

9. To encourage community residents to participate in community health programmes.

10. To improve the quality of environmental sanitation and educate the general public on the quality of drugs.

12. To promote a gradual shift from non-revenue providing health service system to revenue providing health service system.

More specifically, emphasis is placed on the following:

1. To provide basic health services to residents of provincial areas.

2. To improve the quality of family planning and child and maternal health.

3. To promote education and training of medical manpower within the country.

4. To prevent and eradicate infectious diseases.

5. To spread educational programmes on health, nutrition and environmental sanitation.

6. To expand and improve hospital health services.

2-2-3 Health for All by the Year 2000 (HFA/2000)

The government of Nepal is in the process of promoting one of the most important national goals: To meet the people's Basic Minimum Needs (BMN) and establish a viable health care base Health for All (HFA) by the year 2000.

Main goals of HFA/2000:

1. To provide overall primary health care services to provincial residents through health posts and realize a basic health service system for treatment and prevention of diseases and improvement of health.

2. To continue the nationwide implementation of public health volunteer activities.

3. To integrate various activities of the medical facilities in order to provide more effective health services.

4. To integrate traditional medical facilities into the health posts at the regional level.

Main goals to be attained by the year 2000 through HFA/2000 and BMN:

1. To reduce the infant mortality rate (per 1,000 infants) to 45.

2. To reduce the population growth rate to 2 percent or less.

3. To increase the average life span to 65 years.

4. To increase the ratio of domestically made drugs used to 60 percent.

Furthermore, the following targeted values are set in order to attain these goals:

1. To ensure a ratio of 1 skilled medical care worker (including doctors) to 3,000 residents.

2. To ensure a ratio of 1 nurse (Staff nurse & ANM) to 600 residents.

3. To ensure a ratio of 1 health volunteer to 500 residents.

4. To reduce the distance from patients to the nearest medical facility.

2-3 Background and Contents of the Request

2-3-1 Background of the Request

The government of Nepal intends to be able to provide basic health services to all its people by the year 2000.

Since 1950, the government of Nepal has been actively promoting the construction of basic medical facilities such as health posts, health centres and hospitals. Due to fiscal problems and the absolute shortage of medical manpower, however, it has been unable to meet the people's ever increasing demand for health services.

In 1972, Tribhuvan University Institute of Medicine (IOM) was established as an institution for educating and training medical care specialists, including medical officers. In 1984, Tribhuvan University Teaching Hospital (TUTH) was established and in 1986, a nurses' school attached to the university was established, both with grant aid from the government of Japan. Since then, the government of Japan has continued its technical cooperation with the government of Nepal in the areas of clinical medicine and medical education in the country.

As a result, a base for medical care and education in clinical medicine was established at IOM. Furthermore, technical cooperation has contributed to remarkable improvements in medical care techniques, which in turn has led to a greater expansion of health services than was initially predicted.

As a result of the rapid increase in the number of outpatients, in particular the hospital's outpatients, the operating and ward divisions are forced to accept outpatients and inpatients to capacity. Moreover, it is now necessary to cope with the need for expansion of services in the radiography, clinical examination and emergency divisions.

On the other hand, IOM facilities and equipment are of low quality, far from the standard required of a medical education institution, (although Japan's technical cooperation is under way for basic medical education at IOM). For this reason, the government of Nepal worked out a project to expand the facilities of Tribhuvan University Institute of Medicine and the Teaching Hospital to improve basic medical education in the country, and to improve and expand health services provided by TUTH. The government of Nepal also requested the government of Japan to provide grant aid for the implementation of the project.

2-3-2 Contents of the Request

Contents of the request for grant aid from the Japanese government, was finalized based on results of the basic design study team's consultation with the Nepalese side, as summarized below:

1. Facilities

    1. Basic medical science building
    2. Provision of 100 additional beds
    3. Expansion of operation room, ICU and CCU
    4. Oxygen gas plant and water treatment plant
    5. Minor remodeling of existing clinical laboratories, X-ray facilities, etc.
    6. Hospital engineering workshop

2. Equipment

    Equipment necessary for operation of the above facilities

CHAPTER 3 CONTENTS OF THE PROJECT

CONTENTS OF THE PROJECT

3-1 Objective of the Project

Since its establishment in 1972, The Tribhuvan University Institute of Medicine (IOM), the only national university, has been training medical officers and other health care manpower. Despite the ever increasing social demand for health services, the facilities and equipment of IOM, which are essential for medical education, have been of poor quality, far from the technical level required for medical education. The IOM has been unable to educate and train the necessary number of medical students. In 1985, The Tribhuvan University Teaching Hospital (TUTH) was established with a grant aid project from Japan, as a place for education in clinical medicine. In the area of basic medicine, however, students taking the paramedical courses are forced to share outdated, meager facilities with those taking the MBBS (Bachelor of Medicine and Bachelor of Surgery) course. The shortage of classrooms has also made it difficult to regularly prepare satisfactory timetables.

On the other hand, the TUTH has operated very smoothly for the first five years since opening. However, the workload at its outpatient, ward/operation and central clinical divisions has increased faster than initially anticipated due to the rapid increase in the number of outpatients. Therefore it is also necessary to improve the facilities required for raising the technical level of basic health services. This is preparatory step toward the implementation of an advanced medical care, including diagnosis and treatment of circulatory ailments, malignant tumors, etc. Furthermore, some of the equipment used at the TUTH are damaged or out of order due to poor maintenance, and must be replaced.

Thus, the objectives of this project are to expand education in basic medicine by providing facilities and equipment for lectures and practical

training in MBBS, and to improve TUTH's functions by extending or remodeling some existing facilities, and replacing outdated equipment.

As part of Japan's technical cooperation with the IOM, the IOM medical education project was launched in June of 1980, and it has steadily produced good results. Furthermore, both the Nepalese and Japanese sides have agreed that a five-year technical cooperation programme will be started in 1989 in the areas of clinical medical examination and hospital management. Therefore, this project is also aimed at supporting these technical cooperation programmes by providing necessary facilities and equipment.

3-2 Examination of the Contents of the Request

3-2-1 Examination of the Contents of the Project

The main functions of the Tribhuvan University Institute of Medicine (IOM), the only national university medical department, can be divided into the following four categories:

(1) Education and training of health care manpower
(2) National referral service
(3) Health service-related research and survey
(4) Advanced health services

The IOM is currently offering a total of 21 training courses at the paramedical, bachelor and post-graduate levels. Lectures are given at the old academic building, health learning material building, Mohego building, lecture rooms of TUTH and the nurse campus (see Appendix 2 "Outline of IOM"). The total number of students enrolled at the IOM exceeds 1,100. The IOM wants to increase the annual intake in light of the present shortage of medical manpower, particularly of medical officers. However, it is unable to implement all its present curricula, let alone increase the annual intake, due to the very poor quality of its present educational facilities. All of their educational facilities are used to capacity for the 21 training courses. As a consequence, unexpected cancellations of lectures (including those due to student union's meetings) make it difficult to reorganize the teaching schedules. Often, the time required for completion of a course extends beyond the end of the term.

Furthermore, it is impossible for MBBS students to obtain an internationally authorized degree by taking IOM's medical courses alone. For this reason, it has been strongly demanded that the facilities of the IOM be expanded and improved so that it may acquire the ability to completely fulfill the functions required of a national university medical department.

In 1983 and 1984 the government of Japan provided grant aid for the improvement of the IOM's facilities. As a result, a place for MBBS education in clinical medicine was secured within the hospital.

However, in the area of basic medicine, the minimum requirements for the facilities and equipment for education, research and development have not yet been achieved. Therefore, it is necessary for the IOM to secure sufficient MBBS facilities particularly those in basic medicine.

After construction of facilities for use in MBBS under this project, it will become easier to cope with the shortage of facilities at the IOM because the existing buildings will be used for its paramedical courses.

As mentioned in "3-1 Objective of the Project", the present shortage of facilities has resulted from the marked increase in the workload at TUTH. Generally a rapid increase in the number of patients greatly affects the hospital, particularly the ward, operation and X-ray divisions. Like many other countries, Nepal needs to enhance health service standards. Therefore, it is time for TUTH to satisfy all the necessary conditions for efficient and effective operation as a teaching hospital.

Furthermore, it should be noted that some of the equipment supplied under the grant aid project in 1985 are frequently used and are therefore likely to break down, causing medical examinations and diagnoses to be suspended. Therefore, it is necessary to take advantage of this project to secure an extra backup unit for each important piece of equipment.

In light of the above, this project, is aimed at expanding the facilities of IOM so that the IOM may completely fulfill its functions. Therefore, it is appropriate and reasonable to implement this project with a grant aid from the government of Japan.

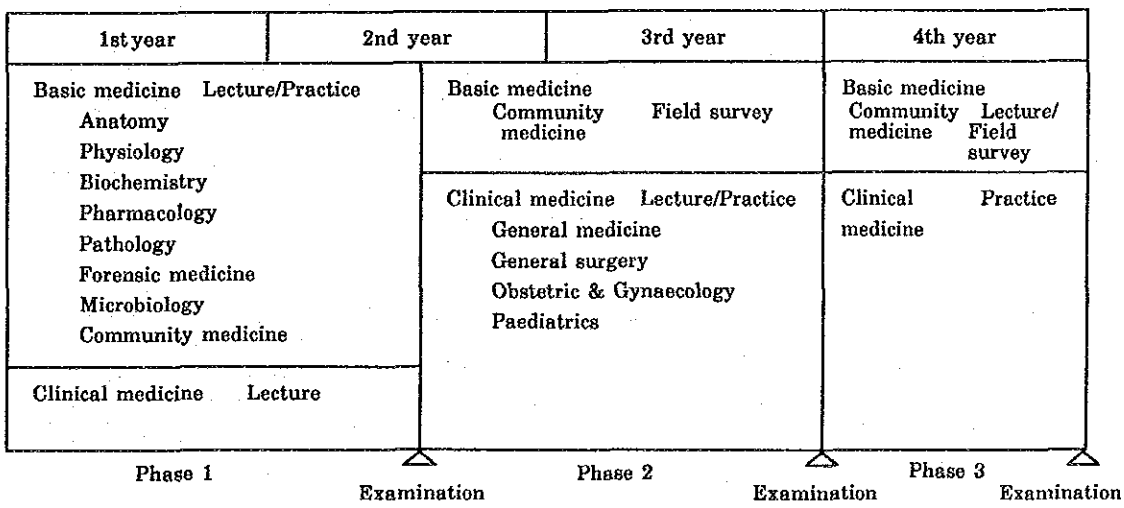
3-2-2 Examination of the Facilities and Equipment Requested

Efforts to assess the contents of the request made by the government of Nepal were made through consultation with the Nepalese side which followed the basic design study. As a result, the final request was made for the following 6 headings of facilities and equipment, as described in Chapter 2, 2-3-2 "Contents of the Request". The contents of the final request were examined after completion of a field survey. The results of this examination are as described below:

(1) Basic Medical Science Building

MBBS of IOM is to be completed in four years in principle. The four-year period is divided into three phases. Lectures and practical training classes are given on subjects in two fields - basic medicine and clinical medicine. The completion of TUTH practical training in clinical medicine has been carried out within the hospital, lectures and practice on basic medicine and lectures on clinical medicine are still carried out at IOM's outdated facilities and the hospital's four classrooms, both of which are used also for education and training of paramedical staff.

Fig. 3-1 Four Year MBBS Programme



Regarding the subjects on basic medicine, the IOM has its own facilities in the Mohego building for lectures and practical demonstration on anatomy, physiology and pharmacology. Although the building itself is not old, its facilities are of such poor quality, they are not suited for practical training.

The lecture and demonstration rooms of the old academic building and part of the clinical examination room within TUTH are used for lectures on biochemistry, pathology and microbiology. Lectures on biochemistry and and microbiology are part of the lectures on pathology. The equipment for use in pathology lectures and practice is well maintained and therefore meets basic technical requirements. However, these facilities are also used for lectures and practice in the paramedical courses, which makes it impossible to regularly work out satisfactory timetables for each course. In order to fully implement the IOM's curricula, it is necessary to separate the lectures and practice classes on biochemistry and microbiology from pathology and expand and improve them to include their clinical aspects.

Lectures and practice on forensic medicine are currently carried out by TUTH's clinical laboratory division, and are therefore not treated as organizationally independent. As no dissection room is available for dissection demonstration, a facility of the nearby military hospital is used for this purpose. If forensic medicine is to be treated as an independent branch of basic medicine, it is necessary to establish new facilities for lectures and practice on the subjects.

Lectures and practice on community medicine are centred around field research and are carried out at one of the demonstration rooms on the second floor of the old academic building. But no facility is available for sorting out statistics data collected in field work. The facilities available for lectures and practice on this subject are generally of poor quality.

Professors and other instructors teaching the above eight subjects are utilizing part of the old academic building, the Mohego building and TUTH as their study rooms/offices, creating poor communications between them. The IOM does not have regular research facilities which an educational institution is supposed to have. Part of TUTH's clinical laboratory rooms are used by the instructors for research. The IOM offers post-graduate courses, but it has no facilities for their research activities.

There is no particular problem with practical training in general medicine (including internal medicine, dermatology and psychiatry), general surgery (including surgery, ophthalmology, ENT, orthopedics, dentistry and anaesthesiology) and obstetrics/gynaecology carried out at TUTH and in paediatrics at Kanti Children's Hospital with which TUTH has close working relations. Lectures are given at TUTH's lecture rooms or the small seminar rooms within the ward, which are also used for MBBS and paramedical lectures. This creates a shortage of classrooms and as is the case with basic medicine, makes it impossible to work out satisfactory timetables.

Under such circumstances, there is a strong need to integrate the facilities for lectures and practice in basic medicine, establish rooms for professors and other instructors and lecture rooms for clinical medicine, expand and improve facilities and equipment for MBBS, and thereby dramatically improve the standard of the country's medical education. If and when sufficient facilities and equipment are available for lectures and practice in MBBS, the Ministry of Education and Culture will immediately increase IOM's annual intake from 30 to 60. This planned measure is aimed at expanding the opportunity for Nepalese medical students to become qualified to practice medicine within the country. This measure is also necessary in resolving the present serious shortage of medical officers.

(2) Ward (Addition of 100 sickbeds)

From the beginning, the project to construct TUTH included among others, the addition of 200 sickbeds to cope with the future increase in the number of inpatients. In the five-year period immediately after its opening, the number of inpatients has increased steadily (see "Appendix-2 Fig.2"). At present, the outpatient division is forced to reject a few patients every day, and is making every effort to maximize the sickbed utilization rate by reducing the length of hospitalization for many inpatients (at the hospital, the average length of hospitalization for 1988/89 was 9.17 days, compared with 15 to 28 days at Japanese hospitals of the same scale).
Furthermore, the sudden increase in the number of patients suffering infectious diseases during the rainy season has caused a shortage of sickbeds in the past few years (the average sickbed utilization rate for May through August is 100%). Thus, it is an urgent necessity for TUTH to increase the number of sickbeds.

In Japan, the time required to complete medical education at medical schools is six years, of which one year is exclusively for practical training on clinical medicine. In this case, 400 sickbeds are required for 80 medical students, or five beds for every student. Upon construction of the basic medical science building, on the other hand, IOM's annual intake will be increased to 60. The increase by 30 of the annual intake will result in a more serious shortage of sickbeds for practice. For the two-year practical training in clinical medicine at TUTH, the necessary number of sickbeds calculated on this assumption is 600 (60 students × 2 years × 5 beds/student).

However, it is unrealistic to drastically increase the number of sickbeds, (300 at present), without considering such resulting problems as a need to increase the number of nurses and an increase in facilities operation

costs. Rather, it is more reasonable to attain a final goal of 500 sickbeds by a more gradual increase in their number.

(3) Operating Building (extension of the operation division and ICU/CCU)

At present, TUTH's operating building has 3 general clean operating rooms, 2 emergency/non-clean operating rooms, 1 infectious disease operating room and a central sterilizing supply room for the exclusive use of the operation division. The combined annual total number of operations performed at these six operating rooms since the hospital's opening is as shown in the following table.

Table 3-1 Annual in Number of Operations in TUTH

Item \ year	1984/85	1985/86	1986/87	1987/1988	1988/1989
Operation	264	1,006	2,234	2,307	2,350
Minor operation	178	644	1,085	1,413	1,870
Total	442	1,650	3,319	3,720	4,220

Source: TUTH statistics

In the emergency/non-clean operation rooms, two to three operations are conducted a day. The infectious disease operating room (for minor operations) is seldom used. Other operations are performed at the other 3 operating rooms (for 1988/89, the average daily number of operations per room was 3.9 to 4.3 (4220 - 2 to 3 operations/day × 285 hospital days) × 285 ÷ 3 rooms). Although minor operations account for 45 percent of the annual total number of operations, the average daily number of operations per room exceeds that for Japanese hospitals (2 to 3 operations/room) by a large margin. This means that these operating rooms are functioning at capacity. As it is expected that there will be an increases in the number of operations in line with an increase in number of sickbeds and the country's increased population, there is a strong need to expand the operation division's facilities.

As matters now stand, however, it is impossible to perform large-scale operations on serious cases in these operating rooms. Both the pre-operative and post-operative techniques as well as facilities remain at a low level. Operations on serious cases are performed in India and other foreign countries. Although not so many cases of circulatory ailment and malignant tumors, are reported in Nepal, it actually appears that there are a considerable number of such cases judging from examples of cases at TUTH. At Bir Hospital, for example, as many as 60 cases of cardiotomy were reported in 1989 (see Appendix-2 Table 16). It is obvious that these diseases will require major steps in the area of medical care in the near future. It is time for TUTH to cope with this problem in stages to educate and train medical officers, as well as to realize ways to thoroughly treat serious cases. The largest clean operating room of the hospital has a floor space of only $34m^2$. It is too small for large-scale operations for the above-mentioned diseases. It is also necessary to establish a large operating room with observation space for students and exemplary operations by foreign surgeons.

For these reasons, it is necessary to establish large operating rooms (48 to 56 m^2/room) and at the same time expand and improve the existing ICU and CCU.

(4) Oxygen Gas Plant and Water Treatment Plant

a. Oxygen Gas Plant

At TUTH, the operating rooms, the ICU and the postoperative ward required, in the aggregate, 35 to $36m^3$ of oxygen a day. This quantity of oxygen gas has been supplied from liquefied oxygen purchased from Indian Oxygen Co., Ltd. The liquefied oxygen is changed into compressed oxygen at Parwanipur near the border of Nepal. However, the imported volume of liquefied oxygen has declined sharply since the lapse of the Nepal-India Trade Transit Treaty in March 1989. For this reason, in November 1989 only $14m^3$

of oxygen was supplied a day on average, which is insufficient to support operations on a daily basis. As for oxygen production in Nepal, top priority is given to production for industrial use. So stable supply of oxygen will remain a problem, even if the trade transit relations between Nepal and India are resumed. Priority should be given to domestic production and supply of oxygen. Thus, there is a strong need to install an oxygen gas plant in TUTH.

It should be noted that an oxygen gas plant was installed in Kanti Children's Hospital adjacent to TUTH in 1985 with a grant aid project from Japan. At first, the plant did not operate smoothly, but later it came to operate regularly because both Japanese and Nepalese started providing maintenance service. At present, the plant operates eight hours a day, supplying about $30m^3$ of oxygen a day to the Kanti Children's Hospital. When oxygen production exceeds the hospital's daily requirement, the surplus is sold to TUTH. There is no technical problem involved in installing an oxygen gas production plant similar to that provided to the Kanti Children's Hospital. If such a plant is installed in TUTH, it will contribute a more stable supply of oxygen gas and become a new source of income for TUTH.

b. Water Treatment Plant

The results of the examination of the quality of well water and tap water conducted as part of the basic design study are as shown in "Appendix-2 Table 1". Judging from the results of this examination and similar water analyses, the well water has large iron and ammonia contents, and is muddy because of floatage. Iron and floatage stick to the plumbing, wash stands, sinks, scales of medical equipment and cause yellowing of the washing. They also cause equipment deterioration. There is no problem with the

quality of city water, but a sufficient quantity of city water is not supplied to TUTH. In addition, there is presently no plan to increase the number of water mains. As a result, the hospital has no choice but to use well water. Thus, there is a strong need to install a water treatment facility in the hospital. However, removal of ammonia is not included in this project since that would require sizable large-scale facility installation costs. It would also require supply of chemicals for removing ammonia. While ammonia-containing water is not suited for drinking, it can be used safely for washing. However, distilled water should be used for preparation of reagent solutions and dilution in experiments.

(5) Minor Remodeling of the Existing Clinical Laboratories, X-ray Facilities

a. Clinical Laboratory Division

The number of clinical examinations has been increasing in proportion to the increase in the number of outpatients and inpatients (see "Appendix-2 Table 9'". The clinical laboratory department is coping with the increase in workload by remodeling the store room in the existing building and using the remodeled store room as an additional facility for clinical laboratories. However, the additional facility is located by the side of the X-ray department facilities on the ground floor, far away from the main clinical laboratory division facility (on the first floor). In addition, the division is suffering from an absolute shortage of examination tables. Thus, the division is not functioning sufficiently. The division previously accepted, requests for histopathological examination from hospitals in and around Kathmandu, but the volume of this extra examination work has exceeded capacity. At present, clinical examinations are limited

to those requested by other divisions of TUTH. Under such circumstances, there is a strong need to expand the facilities of the clinical laboratory division.

b. X-ray Division

TUTH has a total of four X-ray rooms, and five machines, for general X-ray, tomography, fluoroscopy, blood vessel radiography and IVP radiography with bucky stand, respectively. Trends in the annual number of X-ray examinations since TUTH's opening are as shown in the following table:

Table 3-2 Annual Number of X-ray Examinations in TUTH

year / numbers	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
Patient	1,935	5,067	12,475	21,933	24,988	32,286
Films	4,900	11,000	26,100	40,000	37,400	46,450

Source: TUTH Statistics

The X-ray division is conducting X-ray examinations for 113 patients a day on average (32,286 patients ÷ 285 hospital days), and general radiography accounts for 97 percent of the total number of examinations (see "Appendix-2 Table 9"). In order to complete examinations for all patients with whom general radiography is required in time, the time required for the examination of each patient must be 6 minutes (6 hours/day × 2 unit × 60 minutes ÷ 113 patients × 0.97). In actuality, the staff can only handle such an over-crowded examination schedule by working overtime.

In light of such a situation, a bucky stand and a movable X-ray machine will be provided by Japanese technical cooperation in 1990. Furthermore, TUTH is planning to shift the existing X-ray machine located at health learning material building to TUTH building. this X-ray machine is West Germany-made and is not working at present. However, at Kathmandu, there is an agent for

the X-ray machine. TUTH considers that they can maintain that equipment by themselves. When the bucky stand is installed in the fluoroscopy room, and existing X-ray machine is shifted to TUTH, it is expected to ease the current problematic congestion. For this reason, remodeling of the existing X-ray department in TUTH for installing that X-ray machine will be included, but the addition of a general X-ray machine is not included in this project.

Computerized axial tomography (CAT) is a method for tracking the position and spread of a disease through images of cross sections of the body, including the head. In Nepal, a West German-made CAT unit was installed in Bir Hospital in 1987. Presently CAT examinations are carried out for 10 to 15 patients a day at the hospital. 1 to 3 cases are referred to the hospital from TUTH for their CAT examination.

At Bir Hospital, an Indian technician is stationed as the technician in charge of maintenance and operation of the CAT unit. Judging from the present condition of TUTH, however, it is difficult for the hospital to employ a technician in charge of maintenance and operation of a CAT unit. In addition, the cost for maintaining and operating a CAT unit will be considerable. As installation of a CAT unit will bring pressure to bear on TUTH's budget, it is not included in this project.

(6) Hospital Engineering Workshop

At TUTH, many pieces of equipment provided as part of Japan's technical cooperation are operating in addition to those provided under Japan's grant aid project. These pieces of equipment are inspected regularly by the staff of the maintenance and operation division of the hospital. But neither the space for equipment maintenance nor the number of machines and tools needed for maintenance is sufficient for the present quantity of

equipment in operation at TUTH. It is necessary to establish an equipment maintenance workshop responsible for centralized control of equipment operation as well as maintenance of buildings. A workshop for maintenance and repair of medical equipment and storage of backup equipment in TUTH is also needed. Such a new division and workshop will help the Nepalese improve their ability to operate and manage their own facilities and equipment.

(7) Medical Equipment

The equipment requested at the stage of the preliminary survey and the basic design stage will be reviewed, and equipment will be decided in conjunction with the content of the equipment whose supply under the technical cooperation programmes for 1989 and 1990.

As for the equipment for basic medicine, only the basic equipment for use in practical training will be selected. As for the equipment for advanced research work, only spaces for its installation in the future will be secured. There are some overlapping requests for equipment of the same type, some of the more expensive equipment will be installed in the laboratory for common use as a measure to minimize the number of units.

As for the equipment to be installed in TUTH, their specifications should be identical with those provided in the past. The existing equipment which can be used after they are moved to the new extension of the existing facility will be made on the assumption that they will be used after their move.

Of the items requested at the time of the preliminary survey, expansion of outpatient division facilities and installation of a nitrous oxide gas production plant were excluded from this project after consultation between both sides at the basic design study.

The Nepalese side's request for extension and remodeling of outpatient division facilities is excluded from this project because this follows the Nepalese request for extension and remodeling of other division facilities, and because problems due to crowded schedules can be resolved by extending consultation hours and limiting reservations of returning patients. There is a strong possibility, however, that the number of the outpatient division's examination rooms (particularly those of the dental, internal and obstetric/gynaecological departments) and the patients' waiting rooms (of all departments) will be too few for the increased number of outpatients in the near future. Therefore, this situation must be dealt with in the future.

A nitrous oxide gas production facility requires importation from India of such raw materials as ammonium nitrate, sodium hydroxide, sulfuric acid, and potassium permanganate which are additive refining agents. This does not result in efficient production of nitrous oxide in Nepal. Also, it is very difficult to control the process of nitrous oxide production. Failure to properly control the process may result in generation of impure and dangerous gases such as NO and NO_2. In light of these negative factors, installation of a nitrous oxide production plant is not included in this project.

3-2-3 Basic Policy of Implementation of the Project

The considerations above affirm that the project is necessary and that the Nepalese are able to implement it. The expected effects of the project are in line with the objectives of Japan's grant aid project, and it is judged appropriate and reasonable to implement this project with grant aid from Japan. Therefore, the outline of this project will be examined, and its basic design will be worked out, on the assumption that this project is to be implemented with such grant aid.

3-3 Outline of the Project

3-3-1 The Executing Agency of the Project and the Project Management System

(1) The Executing Agency of the Project

Tribhuvan University Institute of Medicine (IOM) under the jurisdiction of the Ministry of Education and Culture is the Nepalese executing agency for this project's implementation. As shown in "Appendix-2 Fig. 1", the IOM's central campus and Tribhuvan University Teaching Hospital (TUTH) are under the control of the dean of the IOM.

(2) Project Management System

The facilities to be expanded and improved in this project are, the basic medical science building belongs to IOM's central campus, and all the other facilities to be extended or remodeled to TUTH. After completion of this project, these facilities will be integrated into the facilities of the IOM and TUTH. The basic medical science building will be operated by the staff of the IOM, and the extended and remodeled facilities of the hospital by the staff of TUTH.

a. Basic Medical Science Building

MBBS's annual intake is to be increased from 30 to 60. The institute's present staff will be able to cope with an increase of 30 in its annual intake, but some additional assistant instructors will be newly recruited. IOM should intend to expand its staff by the year 2000.

Table 3-3 Tribhuvan University Institute of Medicine's Teaching Staff

( )1989

Subject	Professor	Reader	Lecturer	Asst. Lecturer	Instructor	Deputy Instructor	Asst. Instructor	Total
Anatomy	1 (1)	2 (1)	2 (2)	4 (2)	2 (1)	1 (0)	2 (2)	14 (9)
Physiology	1 (1)	2 (1)	2 (1)	4 (1)	-	-	-	9 (4)
Pharmacology	1 (1)	2 (1)	2 (2)	4 (1)	-	-	-	9 (5)
Pathology	1 (1)	2 (2)	4 (3)	8 (5)	2 (2)	2 (2)	8 (8)	27 (23)
Microbiology	1 (0)	2 (1)	1 (0)	1 (1)	-	-	-	5 (2)
Biochemistry	1 (0)	2 (1)	2 (2)	2 (2)	-	-	-	7 (5)
Forensic Medicine	1 (1)	2 (1)	1 (0)	1 (1)	-	-	-	5 (3)
Community Medicine	3 (2)	4 (2)	8 (8)	8 (8)	3 (3)	3 (3)	1 (1)	30 (27)
Internal Medicine	1 (1)	3 (3)	3 (1)	3 (0)	-	-	-	8 (5)
Surgery	1 (1)	3 (3)	2 (1)	2 (0)	-	-	-	8 (5)
Obs/Gnae	1 (1)	3 (2)	2 (0)	2 (2)	-	-	-	8 (5)
Paediatrics	1 (1)	3 (2)	2 (0)	2 (1)	-	-	-	8 (4)
Ophthalmology	1 (1)	2 (2)	2 (1)	2 (1)	-	-	-	7 (5)
ENT	1 (1)	1 (1)	1 (0)	1 (1)	-	-	-	4 (3)
Dentistry	0 (0)	2 (1)	2 (2)	2 (2)	-	-	-	6 (5)
Dermatology	0 (0)	1 (1)	1 (0)	1 (0)	-	-	-	3 (1)
Orthopedics	0 (0)	1 (1)	1 (0)	1 (0)	-	-	-	3 (1)
Anaesthesiology	1 (1)	2 (2)	2 (2)	2 (2)	-	-	-	7 (7)
Radiology	1 (1)	2 (1)	2 (0)	2 (1)	1 (1)	-	-	8 (4)
Cardiology	0 (0)	0 (0)	1 (1)	0 (0)	-	-	-	1 (1)
Psychiatry	1 (1)	2 (1)	1 (0)	1 (0)	-	-	-	5 (2)
Total	19 (16)	43 (30)	43 (26)	53 (31)	8 (7)	6 (5)	11 (11)	183(126)

b. Staff Required at the Extended and Remodeled Facilities of TUTH

TUTH has no concrete plans to expand its staff to match the extension and remodeling of its facilities, but it is at least necessary to increase the number of staff according to Table 3-4.

Table 3-4 Minimum required in Number of TUTH Staff in Conjunction with Extension and Remodeling of TUTH Facilities

Staff for ward extension (100 beds)	Senior nurse	2
	Nurse	14
	ANM	10
	Peon	30
Staff for Oxygen Plant	Engineer	2
Staff for extension of clinical laboratories	Engineer	2
Total		60

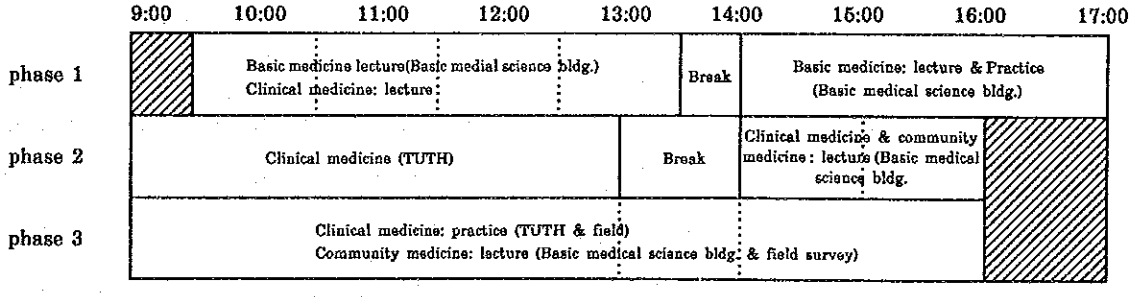
3-3-2 Activity Plan

IOM and TUTH are to operate and manage the expanded, improved facilities based on the present facility operation and management system (with some increase in staff). Shown below are the activity plans for the expanded or improved facilities of IOM (MBBS) and TUTH.

(1) Basic Medical Science Building (MBBS)

Outline of the annual training schedule for MBBS is as shown in the following figure. Under this schedule, lectures and practical training in eight subjects of basic medicine are to be carried out at the basic medical science building.

Fig 3-2 Outline of Annual Schedule for Medical Officer Training Course



1) Anatomy

By studying this subject, the student will acquire a basic knowledge of and attitude towards clinical medicine, and will understand the structure and functions of the human body through lectures and practical training. Scientific thinking and a basic stance required of the medical officer will be acquired.

2) Physiology

By studying this subject, the student will acquire a basic knowledge of the energy metabolism and human sensory, kinetic and respiratory functions through lectures and practical training. How the human body puts each of its varied functions in action to keep itself in order will be studied.

3) Pharmacology

The student will obtain a basic knowledge of the origin, chemical and physical properties, pharmacological functions, sequence of functioning, adverse effects and clinical applications of major drugs through lectures and practical training. The drugs' effects on the functions of the human body will be studied.

4) Pathology

The student will acquire the ability to analyze diseases by understanding the human body's defensive reactions, observating with the naked eye, and by analyzing necropsy specimens with a microscope and observating histopathological specimens through lectures and practical training. The relationships between good health and illness, and form and function, will be analyzed. Various diseases will be morphologically analyzed, clarifying their relationships with abnormal organs functioning.

5) Biochemistry

The student will understand the chemistry, functions and metabolism of amino acids, protein, fat, sugar, nucleic acid and vitamins through lectures and practical training for the purpose of understanding the chemistry of substances constituting the human body and the metabolism of these substances within the human body.

6) Microbiology

The student will study characteristics of various microorganisms, particularly those which cause infectious diseases, and the relationship between preventive medicine and the method of controlling microorganisms that cause infectious diseases through lectures and practical training for the purpose of understanding the effects of microorganisms on the human body.

7) Forensic Medicine

The student will study the medico-legal method of conducting necropsy, provisions of necropsy-related laws and the method of determining the cause of death through lectures and demonstration by lecturers for the purpose of acquiring a basic knowledge of medico-legal science.

8) Community Medicine

The student will recognize health-related problems in groups and the trends of these problems through lectures, practical training and field research for the purpose of understanding the significance of practicing medicine as a social function in relation to public health and nutritional science.

9) Other Subjects of Clinical Medicine

Lectures and practical training will be carried out for giving the

students a basic knowledge of general internal medicine (internal medicine, dermatology and psychiatry), general surgery (surgery, orthopedics, ophthalmology, ENT, dental surgery and anaesthesiology), obstetrics/gynaecology and paediatrics. As the practical training will be carried out at the outpatient, X-ray, Operation, ICU/CCU and ward divisions of TUTH, the lecture room of the basic medical science building will be used for lectures only.

(2) Wards (addition of 100 sickbeds)

In the case of the 300 sickbeds installed in the existing wards, there is a total of 12 nursing care units, 12 to 45 sickbeds assigned to each unit. In the case of the additional 100 sickbeds to be installed under this project, however, the nursing manpower requirement is to be kept at a minimum. Accordingly, in this project the number of nursing care units should be two, 50 sickbeds assigned to each unit.

"Appendix-2 Table 9" " shows the distribution of the 300 sickbeds installed in the existing wards. Except for the number of inpatients (including expectant mothers) accepted as the obstetric/gynaecologic department, the large number of patients accepted at the internal and surgical departments is particularly prominent. Only 66 sickbeds are assigned to each of the internal and the surgical departments.

	No. of patients/year		Average length of hospitalization		No. of hospital days/year		No. of Beds		Bed utilization rate
Internal ward	2,133	×	9.17	÷	285	÷	66 × 100	=	103.9%
Surgical ward	2,040	×	9.17	÷	285	÷	66 × 100	=	99.5%

The sickbed utilization rate is by far higher than the ideal rate of 85 percent in both departments. Thus, the existing wards are operating at full capacity, and are not available to all patients who want to be hospitalized. For this reason, of the additional 100 sickbeds, 50 should be assigned to the internal department, and the remaining 50 to the surgical department.

At the internal and surgical wards, a team consisting of a professor (or the like), a lecturer and 2 to 3 interns (plus a few medical students if necessary) will make the rounds of their patients, just as is the case with the existing wards. After the ordinary consultation hours, doctors on call will be in charge. As for the nursing care system, a team of a chief nurse, seven staff nurses and five practical nurses will work in three shifts (from 8:00 a.m. to 4:00 p.m., noon to 8:00 p.m. and 8:00 p.m. to 8:30 a.m.).

In the case of the internal ward, the sickbeds should be made available to general patients and to narcotics addicts. In the surgical ward, top priority should be given to general patients. All postoperative patients who require more careful nursing care than general patients should be given nursing care at the existing ward.

(3) Operating Building (extension of the operation division and ICU/CCU)

As stated in "3-3-2 Contents of the Request," the extension of the facilities of the operating building will be planned and implemented to improve the very crowded operating schedule and to realize an operating system to perform operations on patients suffering from circulatory diseases. Also, a room for the students to observe actual operations will be established to improve the operation division's function as part of a teaching hospital.

(4) Oxygen Gas Plant and Water Treatment Plant

a. Oxygen Gas Plant

In principle, the prospective oxygen gas plant will be operating for eight hours a day to produce a quantity of oxygen gas to meet the hospital's daily oxygen gas requirement. Although it is not so difficult to operate the prospective plant, it is desirable that one of the staff be assigned to take charge of its

maintenance and operation. When the maintenance and operation of the plant is established, the plant will start operating for 24 hours a day. The surplus gas can be supplied to other hospitals in Kathmandu, which will bring an additional source of income to the hospital.

b. Water Treatment Plant

In this project, water will be supplied to part of the facilities of the outpatient division such as ENT, dental and clinical laboratory divisions, the existing operation division and the washing division, as well as the kitchen, and the facilities newly established, extended or remodeled. Water supply to the other divisions is not included in this project as these are not in urgent need of a new water supply source.

(5) Hospital Engineering Workshop

This workshop will serve as a new department where the Nepalese engineers will take charge of maintenance and management of the medical equipment installed in TUTH. This workshop will also be responsible for management of equipment/facility maintenance manuals and storage of repair parts. Furthermore, this workshop will function as the hospital's central observation facility.

(6) Clinical Laboratory Division

As stated in "Chapter 3 3-2-2 Contents of the Request", the expansion of the facilities of this division is aimed at enhancing the ability to cope with the increase in the number of examinations. The equipment will be moved to the new facility from the existing laboratory by the side of X-ray division.

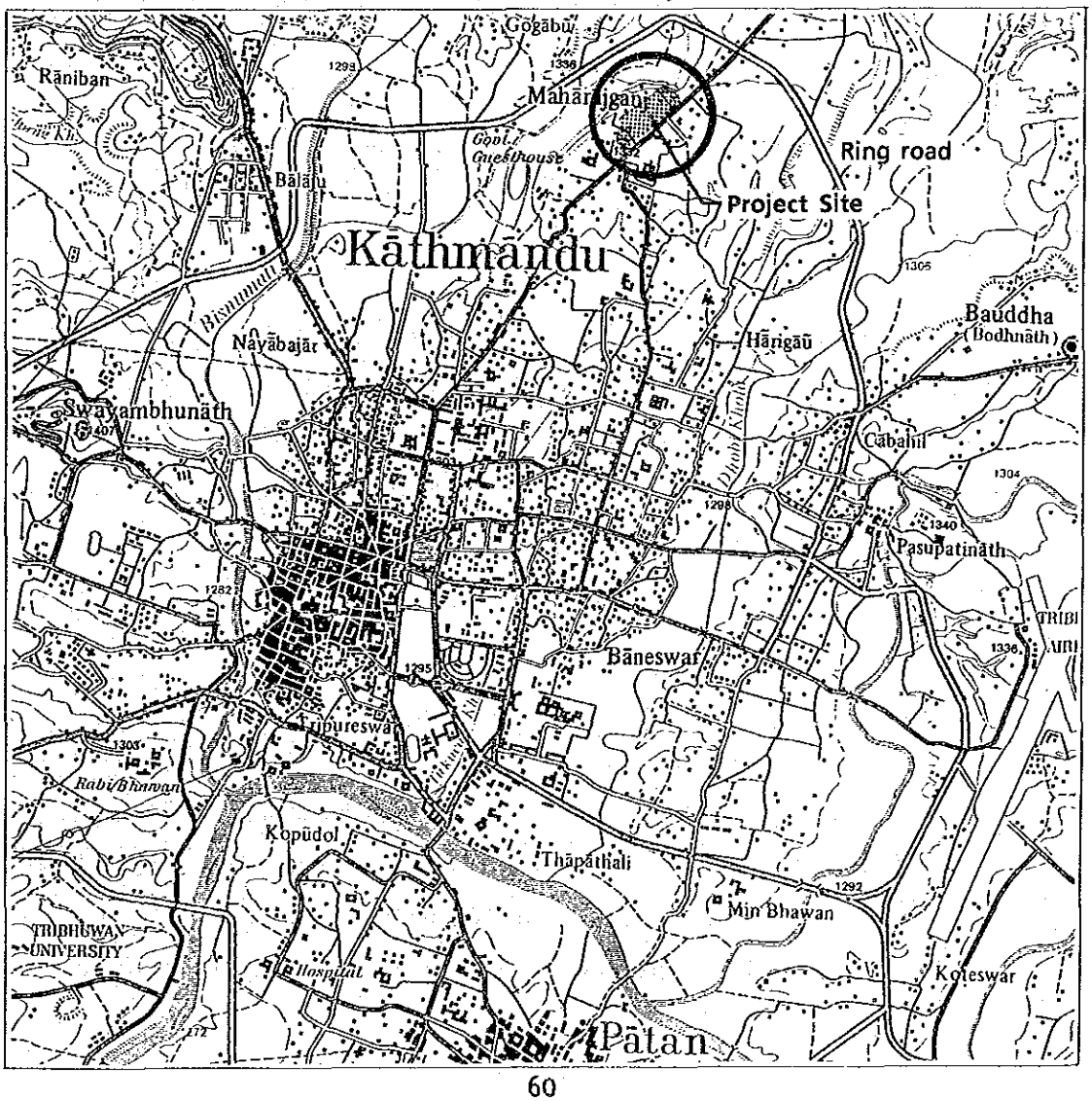
3-3-3 Outline of the Project Site

(1) Location

The project site is located on the premises of Tribhuvan University Institute of Medicine (IOM), Maharajganj District, which is about 3km north of the center of Kathmandu. The Project site is easily accessible because the nearest bus stop on the bus line leading to central Kathmandu is about 50 meters away from it.

Around the project site are the private residence of the King' brother, a police school and embassies. This means that this district has a reliable infrastructure.

Fig. 3-3 Location of the Project Site



(2) Project Site

1) Infrastructure

a. Electricity

Nepal Electricity Authority's (NEA) overhead 11kV power cables are installed along the eastern side of the project site and along its western boundary. Electricity is supplied to the facilities of TUTH and the nurses' campus via service wires connecting with the overhead 11kV power cable installed on the eastern side of the project site. In this project, electricity will be supplied to the facilities of the basic medical science building via service lines connected to the overhead power cable on the western side of the project site, and to the wards and the operating building via service lines connected to the overhead power cable on the eastern side.

•Voltage

Primary voltage	11kV 3-phase, 3-wire 50Hz
Secondary voltage	400V/230V 3-phase, 4-wire 50Hz

b. Telephone

Telephone COL trunk lines are installed on NEA's utility poles. The Nepal Telecom Corporation (NTC) also pays close attention to the stable supply of telephone services to this district.
At present, three telephone trunk lines are provided to TUTH, moreover, providing of five COL trunk lines is planned.

c. Water Supply

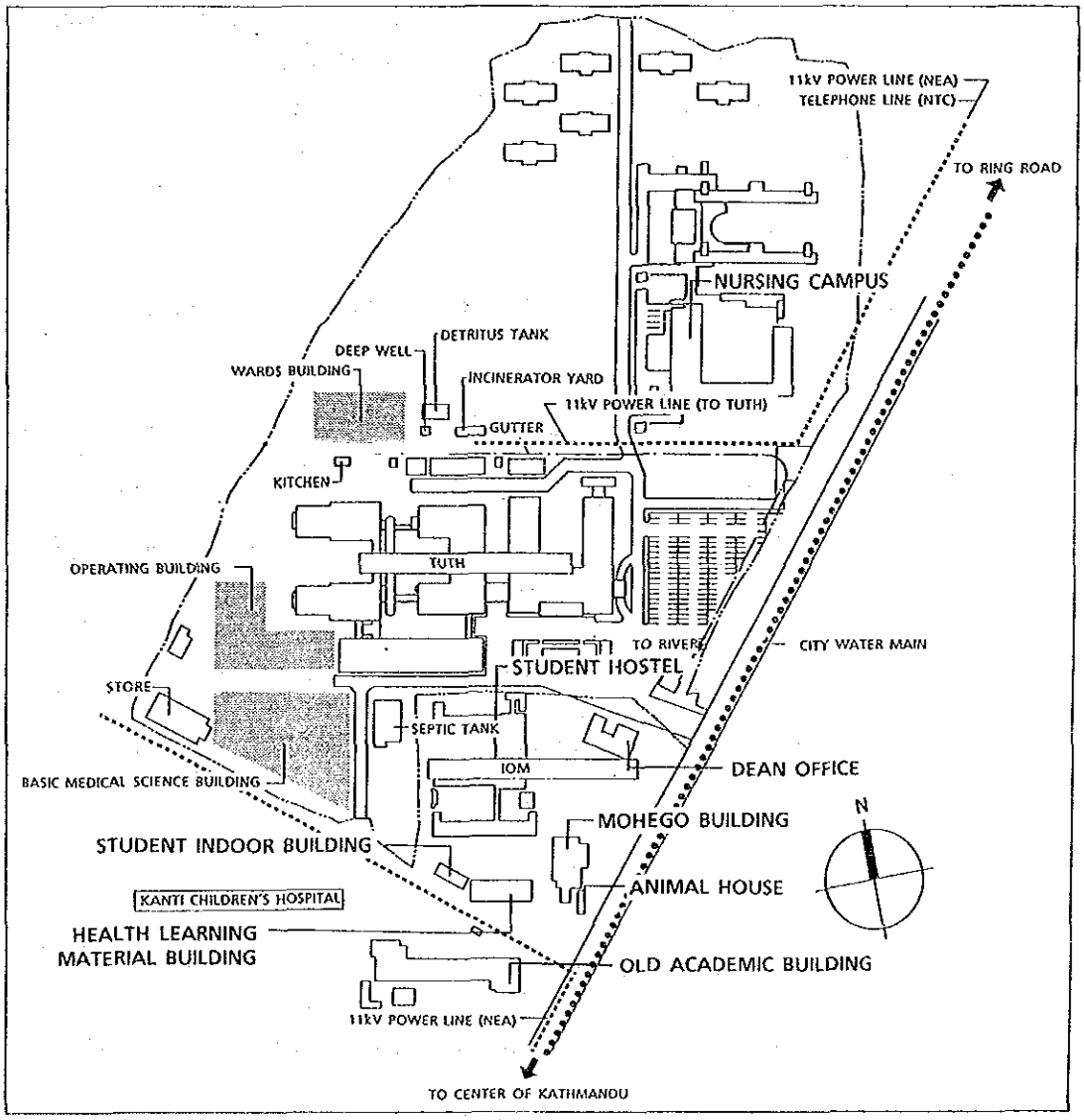
At TUTH both city water and well water are utilized. As for the city water, three water pipes, each with a diameter of one inch, are installed within TUTH. But the time when water can be taken from these pipes is restricted; therefore, none of TUTH's facilities receives a sufficient quantity of water. As for the well water, it is pumped up from a 250 meter deep well with four

inch diameter pipes. As the well is capable of supplying water in sufficient quantity, it will also be used in this project.

d. Drainage

A culvert (3 feet × 4 feet) is laid along the project site's southern boundary, with which the existing septic tanks are connected. In this project also, the septic tanks will be connected with this culvert.

Fig.3-4 Outline of Present Condition of Project Site's Infrastructure



3-3-4 Outline of the Facilities and Equipment

This project is aimed at improving the facilities and equipment of Tribhuvan University Institute of Medicine (IOM) and Tribhuvan University Teaching Hospital (TUTH). In order to implement the above-mentioned tasks practicable, it is necessary to include the following facilities and equipment in this project.

(1) Facilities

a. Basic medical science building (4,567m^2)

Lecture rooms, demonstration rooms for practical training in anatomy, physiology, pharmacology, pathology, microbiology, biochemistry, forensic medicine and community medicine, professors' rooms, readers' rooms, staff rooms, etc.

b. Wards (2,528m^2)

6-bed rooms, 1-bed rooms, 2-bed rooms, nurse stations, treatment rooms, etc.

c. Operating building (2,826m^2, including 446m^2 space of existing building to be remodeled)

Operating rooms, ICU, CCU, CSSD, doctors' and nurses' locker rooms, recovery rooms (remodeling), etc.

d. Oxygen gas plant and water treatment plant (198m^2)

e. Remodeling of the clinical laboratories (174m^2)

Laboratory

f. Hospital engineering workshop (203m^2)

g. Other necessary facilities (799m^2)

Septic tanks, elevated water tank, corridors, generator room, etc.

Total 11,295m^2 (New facilities: 10,641m^2, Remodeling: 654m^2)

(2) Equipment

a. Basic medical science building

Autopsy table, cadaver preservation pool, student channel physiograph, expirograph, flame photometer, water still, spectrophotometer, electrophoresis apparatus, pH meter, centrifuge, anaerobic jar, deep freezer, mortuary refrigerator, formalin tank, fume hood, biohazard cabinet, etc.,

b. Wards

Beds, X-ray film illuminator, electric suction pump, stretcher, wheel chair, refrigerator, etc.

c. Operating Building

Operating tables, operating light, anaesthsia apparatus, electrosurgical unit, ultrasound apparatus, bed side monitor, defbrillator, ventilator, high pressure sterilizer, etc.

d. Oxygen gas plant and water treatment plant

Oxygen gas plant

e. Remodeling of the clinical laboratories

Laboratory table, etc.

f. Maintenance workshop

Tool set, etc.

g. Replacement and addition of existing equipment in TUTH

Blood gas analyzer

3-3-5 Maintenance and Operation Plan

(1) Maintenance and Operation of the Facilities

Routine facilities maintenance and inspection, and equipment inspection and repair based on instructions in facility and equipment maintenance

manuals will be carried out by the maintenance division. Of the 29 maintenance staff stationed at TUTH, 2 have received training in Japan under Japan's technical cooperation. It is necessary to secure the staff service of the same technical level in the future. It is desirable that technology transfer required for operation maintenance and operation be carried out during the project's construction work.

(2) Maintenance and Operation of the Equipment

At the basic medical science building, adjustment, cleaning and routine maintenance of individual pieces of equipment will be carried out by MBBS teaching staff. It is not so difficult to maintain and manage the equipment installed in each demonstration room. The maintenance division will maintain and manage the equipment installed in laboratories for common use, as well as the equipment used at the operating building. This project includes rooms for use by the maintenance division to maintain and repair equipment. This division will be responsible for management of equipment used at the basic medical science building, the facilities extended or remodeled, and equipment in use at the existing hospital facilities. Since November 1989, a long-term expert sent from Japan has been working at the division. It is expected that through this expert's ability to operate, adjust, maintain and repair, troubleshoot, utilize and maintain equipment operating manuals, and keep expendable supplies and repair parts will be further enhanced.

As for the maintenance and operation of the oxygen gas plant, a maintenance engineer will be appointed prior to installation of the equipment and he/she should be trained in operation and inspection of the equipment while the construction work is in progress. As an oxygen gas plant of the same type has been in operation at Kanti Children's Hospital since 1986, it is desirable to obtain the Kanti Children's Hospital cooperation to operate and inspect the new oxygen gas plant.

(3) Maintenance and Operation Costs

Necessary annual maintenance and operation costs for new facilities are classified as follows; costs are calculated on the basis of 1989 prices.

1) Personnel Expenses

a. IOM (Basic Medical Science Building)

The present MBBS teaching staff is to maintain and manage the facilities and equipment for some time immediately after the completion of the facilities. Therefore, no increase in personnel expenses is included in the IOM's future budget. However, it will be necessary to expand the staff as the facilities are further expanded and the number of students increases. The calculations of the expected increase in personnel expenses, based on the targeted number of staff members for the year 2000 (see Table 3-3), are shown below for reference. The mean value for the base salary for each staff member as shown in "appendix 2 Table-15" is used as the base salary.

Table 3-5 Increase in Base Salary as a Result of Expansion of IOM's Staff

Staff	Number	Base Salary (monthly)	Total (Rs)
Professor	3	4,170	12,510
Reader	13	3,445	44,785
Lecturer	17	2,795	47,515
Asst. Lecturer	22	2,305	50,710
Instructor	1	2,050	2,050
Deputy Instructor	1	2,050	2,050
	Total		159,620

Allowances

The allowances include housing allowance, overtime work allowance and bonuses, accounting for about 41 percent of the yearly base salary.

Other Allowances

Other allowances including TADA will account for about 1.4 percent of the yearly base salary.

Thus, the total annual personnel expenses are calculated as follows.

Total annual personnel expenses

= Monthly base salary × 12 + allowances + Other allowances

= 159,620 Rs × 12 × (1 + 0.41 + 0.014)

= 2,727,587 Rs/year

b. TUTH (additional 100 sickbeds and extension and remodeling of the operating building)

The additional number of staff required at TUTH is the number of staff shown in Table 3-4. The total annual personnel expenses are calculated based on this number.

Table 3-5 Increase in Base Salary as a Result of Expansion of TUTH's Staff

Staff	Number	Base Salary (monthly)	Total (Rs)
Senior Nurse	2	1,655	3,310
Nurse	14	1,430	20,020
A.N.M.	10	1,175	11,750
Peon	30	703	21,090
Engineer	2	1,265	2,530
Clinical Engineer	2	1,430	2,860
	Total		61,560

Therefore, the total annual personnel expenses are calculated adding allowances (37.5%) and other allowances (0.3%).

Total annual personnel expenses

= Monthly base salary × 12 + allowances + Other allowances

= 61,560 Rs × 12 × (1 + 0.375 + 0.003)

= 1,017,956 Rs/year

2) Increased Costs of Maintenance and Operation of the New Facilities and Equipment

An itemized breakdown of the increased costs for maintenance and operation of the new facilities and equipment is shown in the following table.

Table 3-7 Increased Costs of Maintenance and Operation of the new Facilities and Equipment

Item	IOM (Rs/year)	TUTH (Rs/year)
a. Electricity	216,000	650,160
b. LPG gas	3,311	-
c. Telephone	68,400	72,000
d. Oxygen gas plant	-	247,345
e. Water treatment plant	20,336	99,457
f. Building repair	112,396	112,788
g. Consumables and spare parts	157,000	121,000
h. Others	69,614	775,286
Total	647,057	2,078,036

a. Electricity Charges

The total electricity charges are calculated after estimating the total electricity consumption of the projected facilities.

IOM (Basic medical science building)

300kW×8h/day×0.2×250days/year×1.8Rs/kWh = 216,000 Rs/year

TUTH

Wards

150kW×8h/day×0.2×365days/year×1.8Rs/kWh

= 157,680 Rs/year

Operating building

400kW×8h/day×0.3×285days/year×1.8Rs/kWh

= 492,480 Rs/year

Sub-total 650,160 Rs/year

b. LPG Gas Charges

IOM 0.83kg/day×285days/year×700Rs/50kg = 3,311 Rs/year

c. Telephone

IOM 57persons×4times/person.day×25days/month×1Rs/time×12months
= 68,400 Rs/year

TUTH 60persons×4times/person.day×25days/month×1Rs/time×12months
= 72,000 Rs/year

d. Oxygen Gas Plant

Electricity
13kW×10h/day×0.5×285days/year×1.8Rs/kWh= 33,345 Rs

Consumables (packing etc.) = 214,000 RS
Sub-total 247,345 RS

e. Water Treatment Plant

Electricity
8kW×8h/day×0.5×1.8Rs/kWh×365days = 21,024 rs/year

Chemicals

NaCℓO	0.03kg/day.m^3×110m^3/day×36Rs/kg×365days=	43,362 Rs/year
Aℓ$(SO_4)_3$	0.04kg/day.m^3×110m^3/day×18Rs/kg×365days=	28,908 Rs/year
NaOH	0.015kg/day.m^3×110m^3/day×44Rs/kg×365days=	26,499 Rs/year
	Sub-total	119,793 Rs/year

On assumption that treated water is consumed in proportion to building area of IOM and TUTH,

$$\text{IOM} = 119{,}793 \times \frac{4{,}623\text{m}^2\text{(Basic Medical Science bldg. etc.)}}{4{,}623\text{m}^2+22{,}609\text{m}^2\text{(TUTH)}} = 20{,}336 \text{ Rs/year}$$

$$\text{TUTH} = 119{,}793 \times \frac{22{,}609\text{m}^2}{4{,}623\text{m}^2+22{,}609\text{m}^2} = 99{,}457 \text{ Rs/year}$$

f. Building repair

To calculated using building repair cost in 1989,

$$\text{IOM} = 145{,}000\text{Rs/year} \times \frac{4{,}623\text{m}^2}{5{,}964\text{m}^2(\text{IOM})} = 112{,}396\text{Rs/year}$$

$$\text{TUTH} = 298{,}914.67\text{Rs/year} \times \frac{6{,}018\text{m}^2(\text{expansion of TUTH})}{15{,}949\text{m}^2(\text{existing IOM})} = 112{,}788\text{Rs/year}$$

g. Equipment consumables and spare parts

Table 3-8 IOM equipment consumables and spare parts

Equipment	Item	Cost
Flame photometer	Standard solution	4,000 Rs
Electrophoresis apparatus	Buffer pH 8.6 Filter etc.	25,000 Rs
pH meter	Standard solution etc.	3,000 Rs
Water still	Ion exchange resin etc.	25,000 Rs
Others	Papers etc.	100,000 Rs
Total		157,000 Rs

Table 3-9 TUTH equipment consumables and spare parts

Equipment	Item	Cost
High pressure sterilizer	Recording papaer, Ink pad	5,000 Rs
Water softner	Salt	13,000 Rs
Micro spray	Soap	10,000 Rs
Blood gas analyzer	Buffer, Solution etc.	80,000 Rs
Bed pan washer	Antiseptic	33,000 Rs
Others	papers etc.	10,000 Rs
Total		151,000 Rs

h. Others

IOM

On assumption that other expense is increased in proportion to student number,

$$= (\text{Printing} \cdot \text{Stationary} + \text{Office Misc} + \text{Scientific \& Educational Materials}) \times \frac{\text{Increase of student}}{\text{IOM Student}}$$

$$= (161{,}000 + 120{,}000 + 320{,}000) \times \frac{120}{1{,}036} = 69{,}614 \text{ Rs/year}$$

TUTH

On assumption that other expense is increased in proportion to bed number,

$$= (\text{Printing} \cdot \text{Stationary} + \text{Office Misc} + \text{Scientific Educational Materials}) \times \text{Persentage of free charge} \times \frac{\text{Increase of bed}}{\text{Existing bed}}$$

$$= (689{,}427.08 + 3{,}190{,}595.73 + 5{,}824{,}879.34 - 3{,}890{,}250 \text{ (oxygen gas charge)}) \times \frac{40}{100} \times \frac{100}{300}$$

$$= 775{,}286 \text{ Rs/year}$$

5) Income

a. The following hospitalization charges are expected to result as income from the addition of 100 hospital beds.

	Charges/day	No. of beds		No. of days		Use rate (%)		Ratio of paying beds (1988)		
1Bed rooms	225 Rs/day	× 16	×	365	×	0.85	×	0.90	=	1,005,210
2Bed rooms	90 Rs/day	× 24	×	365	×	0.85	×	0.80	=	536,112
6Bed rooms	6 Rs/day	× 60	×	365	×	0.85	×	0.45	=	50,260
								Total		1,591,582 Rs/year

b. The following income is expected to result from supply of the surplus output of oxygen gas to other hospitals.

Conditions: 10-hour daily operation (285-day yearly operation of the oxygen gas production plant; quantity of oxygen

gas consumed at TUTH: 40m3; price per cubic meter of oxygen (including transportation charges): 390Rs

(5m3/hour × 10 hours - 40m3) × 285 × 390 = 1,111,500 Rs/year

4) Evaluation of Maintenance and Operation Costs

a. IOM

IOM's annual budget is as shown in "Appendix 2 Table-12". The total increase in the maintenance and operation costs resulting from the expansion is estimated at 3,374,644Rs, which accounts for 7.9 percent of IOM's total annual expese of 42,495,500Rs (1989). Judging from the scale of Tribhuvan University's and IOM's past budgets, the increase of 7.9 percent is considered tolerable.

b. TUTH

The following table shows a comparison of the combined total amount of personnel expenses plus maintenance and operation costs and incomes, which are the result of implementation of this project.

Table 3-10 Expected Increase of Income and expense

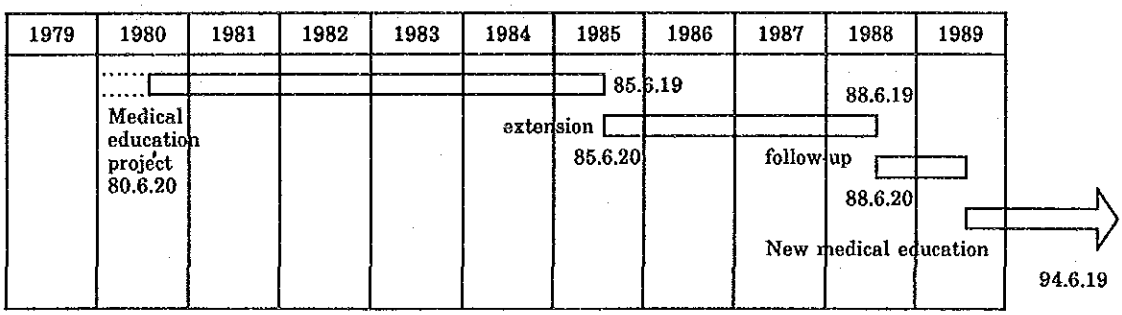
Income	Hospitalization charges	1,591,582	
	Sales of oxygen gas	1,111,500	2,703,082 Rs
Expense	Personnel expenses	1,017,956	
	Maintenance and operation costs	2,078,036 Rs	3,095,992 Rs

Increase of expense will be expected very few, and when oxygen gas plant management proceed smoothly, the hospital will be able to operate profitably.

3-4 Technical Cooperation

The Government of Japan has been implementing a technical cooperation programme in connection with the medical education at Tribhuvan University Institute of Medicine and TUTH since June 1980, and has dispatched more than 80 experts to Nepal, while accepting more than 20 Nepalese trainees for on-the-job training in Japan. This technical cooperation programme has been steadily attaining its goals. Furthermore, in June 1989, a five-year medical education programme was worked out and both sides agreed that for this programme, the Japanese side is to cooperate in the areas of basic medicine, clinical laboratory, operation, ICU/CCU, emergency, X-ray, anesthesiology and hospital management(for details of this programme, see Evaluation Report on Tribhuvan University's Medical Education Project, November 1988, Japan International Cooperation Agency, and Report on Preliminary Study of Nepal Medical Education Project, December 1988, Japan International Cooperation Agency).

Fig. 3-5 Schedule for Medical Education Project



This project's facilities and equipment will be utilized to transfer technology for above-mentioned areas.

This project does not include a CAT unit, angiocardiographic equipment and an electron microscope, which are hard to maintain and operate. However, this does not lessen the need for these high-tech devices. In proportion as the social demand for advanced medical care grows, the demand for a CAT unit and angiocardiographic equipment will mount. An electron microscope is indispensable in conducting basic research. For this reason, it is

desirable that a system be created for the development of human resources to take charge of operation, maintenance and operation of these high-tech devices and the regular supply of expendable in preparation for their introduction in the future.