

India
Health and Family Welfare Department,
Government of Tamil Nadu

**DATA COLLECTION SURVEY
ON
URBAN HEALTH CARE
IN
TAMIL NADU

FINAL REPORT**

JANUARY 2016

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
GLOBAL LINK MANAGEMENT, INC.
NIHON SEKKEI, INC.**

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Abbreviations and Acronyms

ADB	Asian Development Bank
AHU	Air Handling Unit
AIDS	Acquired Immune Deficiency Syndrome
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
AVR	Automatic Voltage Regulator
BEmONC	Basic Emergency Obstetric and Newborn Care
BME	Biomedical Engineer/Technician
BMI	Body Mass Index
BMW	Bio Medical Waste
BOR	Bed Occupancy Rate
BPL	Below Poverty Line
BSNL	Bharat Sanchar Nigam Limited
CABG	Coronary Artery Bypass Grafting
CAD	Computer Aided Design
CBR	Crude Birth Rate
CCTV	Closed Circuit Television
CDR	Crude Death Rate
CDU	Clinical Decision Unit
CEmONC	Comprehensive Emergency Obstetric and Newborn Care
CHC	Community Health Centre
CMCH	Coimbatore Medical College Hospital
CMCHIS	Chief Minister's Comprehensive Health Insurance Scheme
CMDA	Chennai Metropolitan Development Authority
CMS	College Management System
CMWSSB	Chennai Metropolitan Water Supply and Sewage Board
CPWD	Central Government Public Works Department
CRRI	Compulsory Rotatory Residential Internship
CRRT	Continuous Renal Replacement Therapy
CS-E	Consulting Services for Equipment
CS-F	Consulting Services for Facilities
CSSD	Central Sterile Service Department
CT	Computed Tomography
CVD	Cardiovascular Diseases
DALY	Disability –Adjusted Life Years
DDHS	Deputy Director of Health Services

Dep	Department
DHQH	District Headquarters Hospital
DLI	Disbursement-Linked Indicator
DME	Directorate of Medical Education
DMRHS	Directorate of Medical and Rural Health Services
DPHPM	Directorate of Public Health and Preventive Medicine
DSR	Delhi Standard Rate
DTCP	Directorate of Town and Country Planning
EC	Environmental Clearance
ECG	Electrocardiogram
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ENT	Ear, Nose, and Throat
ESI	Employee's State Insurance
ETP	Effluent Treatment Plants
FCU	Fan Coil Unit
FGD	Focus Group Discussion
FY	Fiscal Year
GDP	Gross Domestic Product
GMP	Good Manufacturing Process
GoI	Government of India
GoK	Government of Kerala
GoM	Government of Maharashtra
GoTN	Government of Tamil Nadu
HCU	High Care Unit
HEAJ	Healthcare Engineering Association of Japan
HEPA filter	High Efficiency Particulate Air filter
HFWD	Health and Family Welfare Department
HID	High Intensity Discharge
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HMS	Hospital Management System
HVAC	Heating, Ventilating, and Air Conditioning
ICB	International Competitive Bidding
ICCU	Intensive Coronary Care Unit
ICDS	Integrated Child Development Services





ICMR	Indian Council of Medical Research
ICU	Intensive Care Unit
IDSP	Integrated Disease Surveillance Programme
IHD	Ischemic Heart Diseases
IMCU	Intensive Medical Care Unit
IMR	Infant Mortality Rate
IP	Inpatient
IPHS	Indian Public Health Standards
IT	Information Technology
IVR	Interventional Radiology
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
KMCH	Kilpauk Medical College Hospital
LAN	Local Area Network
LCB	Local Competitive Bidding
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
M/M	Manning Month
MMR	Maternal Mortality Ratio
N/A	Not Available
NABH	National Accreditation Board for Hospitals and Healthcare Providers
MAS	Mahila Arogya Samiti
MBBS	Bachelor of Medicine and Bachelor of Surgery
MCH	Maternal and Child Health
MCI	Medical Council of India
MDGs	Millennium Development Goals
MIS	Management Information System
MMCH	Madurai Medical College Hospital
MoEF	Ministry of Environment, Forest and Climate Change
MoHFW	Ministry of Health and Family Welfare
MRB	Medical Services Recruitment Board
MRI	Magnetic Resonance Imaging
MV	Medium Voltage
NCD	Non-Communicable Disease
NGO	Non-Governmental Organization
NHM	National Health Mission

NICU	Neonatal Intensive Care Unit
NRHM	National Rural Health Mission
NUHM	National Urban Health Mission
Ob & Gyn	Obstetrics and Gynaecology
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OP	Outpatient
OPD	Out-patient Department
OT	Operation Theatre
PACU	Post Anaesthetic Care Unit
PC	Personal Computer
PG	Post Graduate
PHC	Primary Health Centre
PIPs	Program Implementation Plans
PMU	Programme Management Unit
POCU	Post-Operative Care Unit
PPP	Public Private Partnership
P/Q	Pre-Qualification
PWD	Public Works Department
QCBS	Quality and Cost based Selection
QCI	Quality Care Indicator
RAY	Rajiv Awas Yojana
RC	Reinforced Concrete
RCH	Reproductive and Child Health
RGGGH	Rajiv Gandhi Government General Hospital
RNTCP	Revised National Tuberculosis Control Programme
RO	Reverse Osmosis
RSBY	Rashtriya Swasthya Bima Yojana
SEC	State Empowered Committee
SEIAA	State Environmental Impact Assessment Authority
SHDRC	State Health Data Resource Centre
SICU	Surgical Intensive Care Unit
SNCU	Specialized Newborn Care Unit
SPD	Supply Processing Distribution
SRS	Sample Registration System
STD	Sexually Transmitted Diseases
STP	Sewage Treatment Plant

TANGEDCO	Tamil Nadu Generation and Distribution Corporation Limited
TB	Tuberculosis
TFR	Total Fertility Rate
TNHSP	Tamil Nadu Health System Project
TNMSC	Tamil Nadu Medical Services Corporation
TNPWD	Tamil Nadu Public Works Department
TNSCB	Tamil Nadu Slum Clearance Board
TWAD Board	Tamil Nadu Water Supply and Drainage Board
UHC	Urban Community Health Centre
UHC	Universal Health Coverage
ULBs	Urban Local Bodies
UPHC	Urban Primary Health Centre
UPS	Uninterruptible Power Supply
USG	Ultrasonography
WC	Water Closet
WHO	World Health Organization

Project Site Map



	Component 1: Upgrading tertiary hospitals
	Component 2: Strengthening referral hospitals
	Component 3: Strengthening secondary care hospitals
All 17 cities	Component 4: Strengthening hospital management
	Component 5: Strengthening primary health care in NCD

Executive Summary

1. Background

The Government of India (GoI) set Universal Health Coverage (UHC) as a national agenda and had been focusing on the improvement of public health in rural areas through the National Rural Health Mission (NRHM) since 2005. The Twelfth Five Year Plan (2012-2017) emphasized the importance of expanding public sector capacity and sought the transformation of the NRHM into a National Health Mission (NHM) covering both rural and urban areas, recognizing the need to address the health concerns of urban populations. Subsequently, National Urban Health Mission (NUHM) was launched in 2013 in order to improve the health status of the urban population particularly urban poor and other vulnerable sections by facilitating their access to quality health care.

Tamil Nadu is the most urbanized state in India with 49% of its population living in urban areas. The urban growth rate is 27% (2001-2011) and the number of urban poor is estimated at 7.3 million people. Tamil Nadu's health system is recognized as one of the most successful models in India, even though it faces challenges in urban health care. The Japan International Cooperation Agency (JICA) has been planning a cooperation agreement to strengthening urban health care in Tamil Nadu and has commissioned a survey to identify the possible cooperation plan.

2. Justification for the Project

2.1 Challenges

There is an increasing burden of Non-Communicable Diseases (NCDs) resulting in high levels of morbidity and mortality. NCD burden is also affecting the urban poor and vulnerable population who also suffer from communicable diseases. The World Health Organization (WHO) projections increasingly recognize that the magnitude of the NCD epidemic will continue to accelerate and there is a pressing need for stronger and more focused responses. Since NCDs require timely management and prevention, the health system needs to respond effectively.

In Tamil Nadu, there are full-fledged Medical College Hospitals that have difficulty in providing timely advanced medical care for those in need. The main reason for this could be overcrowded conditions in each health facility, which may be caused by increasing numbers of NCD patients vis-a-vis limited number of Medical College Hospitals which can provide advanced medical care and sub-optimal utilization of district top referral facilities¹. It is also reported that there are shortages of essential equipment in district-level top referral facilities. Further, lack of secondary health facilities in most of district capitals contributes to overflow of tertiary health facilities. Quality control at Medical College Hospitals, such as patient safety and effective hospital management needs to be improved to meet the global standard.

The primary health care needs to play a key preventive role in the health system. However, it is reported that Urban Primary Health Centres (UPHCs) are not fully equipped and utilized, except for Maternal and Child Health (MCH) related requirements.

The household survey conducted on this study revealed that, in terms of access to quality of health care among vulnerable populations, some respondents who were slum dwellers and migrants felt difficulty in accessing quality health services. The main reasons were unavailability of facilities nearby, long waiting time, and inconvenient opening time. Some respondents had limited knowledge

¹ Top referral hospital means the hospital which can provide the most advanced medical services within the catchment area. Thus, there are district and regional top referral hospital in Tamil Nadu context.

of available public health services and financial protection schemes.

2.2 Justification

As the prevalence of NCDs increase, interventions for its prevention and management at all levels should be strengthened.

Given the necessity of timely advanced medical care, it would be ideal that such services would be made available at all tertiary levels as well as District Head Quarter Hospitals (DHQs) in each district in the future. In order to expand the delivery capacity to the lower level of health facilities in the future, the upgradation of the full-fledged Medical College Hospitals is a crucial first step that is expected to enhance development of necessary qualified human resources for super specialities in the State.

At the same time, optimal utilization of district top referral facilities has to be improved with the introduction of essential equipment. The establishment of secondary health facilities in the city will be directly beneficial to increase the health care access for urban populations.

To strengthen NCD prevention, the primary health care plays a key role. The capacity of primary health care should be further improved to strengthen health promotion activities and to ensure early detection and follow up of high risk individuals.

3. Proposed Project Scope

3.1 Project title

Tamil Nadu Urban Health Care Project

3.2 Objective

The objective of the project is to improve the quality of health services in urban areas through (i) strengthening the capacity of key hospitals with upgradation of facility and equipment, and (ii) reinforcing the capacity of human resources with the focus on NCDs, thereby improving the health of people in Tamil Nadu.

3.3 Site

The Government of Tamil Nadu (GoTN) proposed 17 cities for the Project site as listed below based on the population size, needs, and priority for the health facility development.

1	Chennai	7	Erode	13	Cuddalore
2	Coimbatore	8	Vellore	14	Dindigul
3	Madurai	9	Tiruppur	15	Pudukottai
4	Tiruchirapalli	10	Thoothukudi	16	Krishnagiri
5	Salem	11	Nagercoil	17	Periyakulam
6	Tirunelveli	12	Thanjavur		

3.4 Approach

The Project proposed to employ regional and city approach.

The regional approach is a way to minimize the number of referral cases to the capital or outside the State by improving the quality of top referral facilities. Tamil Nadu is hypothetically divided into five regions within which referral of patients commonly occur: North, North West, East, West and South.

This will address the issues of overcrowded health facilities and improve the quality of care and effectiveness of its hospital management through upgrading the regional top referral facilities to be able to provide the highest possible services in the State and strengthening the district top referral facilities to reduce the burden of higher health facilities.

The city approach is to enhance the referral system within the city through strengthening the secondary health facilities as a first referral unit and reinforcing the capacity of primary health care. The enhancement of city wise referral will contribute to the optimal use of top referral facilities. The Project aims to create a model in each region with lessons to be disseminated to other cities by the State Government. Capacity development of human resources will be a cross-cutting measure for all levels of health care.

3.5 Components

Table 1: List of Components

	Components	Target Facilities/Areas
1	Upgrading Tertiary Hospitals (Facilities and Medical Equipment)	(1) Govt.Rajaji Hospital, Madurai (Madurai Medical College Hospital: MMCH) (2) Govt.Kilpauk Medical College Hospital, Chennai (KMCH) (3) Govt. Coimbatore Medical College Hospital (CMCH)
2	Strengthening Referral Hospitals (Medical Equipment)	<7 Medical College Hospitals> Salem, Vellore, Tanjavur, Tirunelveli, Tiruchirapalli, Toothukudi, Nagercoil <7 DHQs> Erode, Tiruppur, Cuddalore, Dindigul, Pudukottai, Krishnagiri, Periyakulam
3	Strengthening Secondary Care Hospitals (Facilities and Medical Equipment)	Four Secondary Care Hospitals • Avadi, Chennai • Maniyanoor, Salem • Velampalayam, Tiruppur • Kandiaperi, Tirunelveli
4	Strengthening Hospital Management	21 facilities in 17 cities
5	Strengthening Primary Health Care in NCD	Regional Training Institutes in Chennai and Madurai

(Source: Survey Team)

Table 2: Component 1: Upgrading Tertiary Hospitals (Facilities)

Sub-Component	Site	Project Description	Project Size
Facilities	MMCH	Advanced Operation Theatre (OT) centre • OT centre [General, Vascular, Cardiothoracic, Plastic, Urology, Ear, Nose, and Throat (ENT) & Paediatric Surgery OTs] + Hybrid OT • Interventional Radiology (IVR) rooms • Post-Operative Care Unit (POCU), Surgical Intensive Care Unit (SICU), Post Anesthesia Care Unit (PACU) & Cardio POCU • Imaging centre • Auditorium	18,549 m ²

Sub-Component	Site	Project Description	Project Size
	KMCH	Advanced OT centre <ul style="list-style-type: none"> • OT centre (General, Plastic, Urology, Vascular, Plastic & ENT Surgery OTs) + Hybrid OT • IVR rooms • POCU, SICU, PACU & Intensive Medical Care Unit (IMCU) • Imaging centre • Casualty (Emergency) department • Inpatient (IP) wards 	22,193 m ²
	CMCH	Advanced OT centre <ul style="list-style-type: none"> • OT centre (General, Plastic, Cardiothoracic Surgery OTs) + Hybrid OT • IVR rooms • POCU, SICU, PACU • Imaging centre • Auditorium 	15,205 m ²

(Source: Survey Team)

Table 3: Component 1: Upgrading Tertiary Hospitals (Medical Equipment)

Sub-Component	Site	Project Description
Medical Equipment	MMCH	Advanced OT centre <ul style="list-style-type: none"> ➤ OT: Operation light, Anaesthesia machine, C-arm X-ray, Endoscopes ➤ Hybrid OT & IVR: Angiography system ➤ Imaging: Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Endoscopes, ➤ Training centre, ICU simulators, etc
	KMCH	Advanced OT centre <ul style="list-style-type: none"> ➤ OT: Operation light, Anaesthesia machine, C-arm X-ray, Endoscopes ➤ Hybrid OT & IVR: Angiography system ➤ Imaging: MRI, CT, Endoscopes, C-arm X-ray, ➤ Physiotherapy, Robotic arm etc
	CMCH	Advanced OT centre <ul style="list-style-type: none"> ➤ OT: Operation light, Anaesthesia work station, C-arm X-ray, Endoscopes, ➤ Hybrid OT & IVR: Angiography system, ➤ Imaging: MRI, CT, Endoscopes, C-arm X-ray, ➤ Training centre: ICU Simulators, etc.

(Source: Survey Team)

Table 4: Component 2: Strengthening Referral Hospitals (Medical Equipment)

Site	Medical Equipment
<p>Medical College Hospitals</p> <ol style="list-style-type: none"> Salem Vellore Tanjavur Tirunelveli Tiruchirapalli Toothukudi Nagercoil 	<ul style="list-style-type: none"> ➤ Imaging department <ul style="list-style-type: none"> • Radiology: CT, Mammography, etc. • Endoscopy: Gastro-fiberscope, Duodenoscopes, etc. ➤ Haemodialysis centre <ul style="list-style-type: none"> • Haemodialysis units, Reverse Osmosis (RO) system, etc. ➤ OT <ul style="list-style-type: none"> • Operation microscope, Ultrasound apparatus, C-arm X-ray unit
<p>DHQH</p> <ol style="list-style-type: none"> Erode Tiruppur Cuddalore Dindigul Pudukottai Krishnagiri Periyakulam 	<ul style="list-style-type: none"> ➤ Imaging department <ul style="list-style-type: none"> • Radiology: Digital X-ray, Digital Fluoroscopy etc. • Endoscopy: Gastro-fiberscope, Duodenoscopes, etc. ➤ Haemodialysis centre <ul style="list-style-type: none"> • Haemodialysis units, RO system, etc. ➤ OT <ul style="list-style-type: none"> • C-arm X-ray unit, Anaesthesia work station etc

(Source: Survey Team)

Table 5: Component 3: Strengthening Secondary Care Hospitals (Facility and Medical Equipment)

Sub-Component	Site	Project Description	Project Size
Facilities	Chennai Tiruppur Salem Tirunelveli	<ul style="list-style-type: none"> • IP wards • OT block • Outpatient Department (OPD) (General medicine & surgery, Obstetrics & Gynaecology (Ob & Gyn), Paediatrics, ENT & Ophthalmology) • CEMONC & SNCU • Casualty department (Emergency) • Imaging department 	4,612 m ²
Medical Equipment	Chennai Tiruppur Salem Tirunelveli	<ul style="list-style-type: none"> • IP ward: Beds, Infusion stands • OT: Operation tables, Anaesthesia machine, • OPD: Treatment table, Film viewer, Dental units, • CEMONC & SNCU: CTG, Radiant warmer, Ventilator, • Casualty department: Emergency carts, Defibrillator, • Pharmacy: Drug refrigerators, • Imaging: Digital X-ray, Computed Radiography (CR) etc 	

Abbreviations: CEMONC= Comprehensive Emergency Obstetric and Newborn Care

SNCU= Specialized Newborn Care Unit

(Source: Survey Team)

Table 6: Component 4: Strengthening Hospital Management

Training Area		Content	Trainer
1	Training on hospital management	<ul style="list-style-type: none"> ➤ OT (Hybrid) management ➤ Infection control ➤ Central Sterile Service Department (CSSD) operation 	➤ Doctors, nurses, paramedical
2	Training on medical equipment	<ul style="list-style-type: none"> ➤ Utilization, application and operation and maintenance 	➤ Doctors, nurses, technicians

Training Area		Content	Trainer
3	Training on NCD and trauma management	<ul style="list-style-type: none"> ➤ Management of patients ➤ Coordination between different departments 	<ul style="list-style-type: none"> ➤ Emergency unit staff, doctors, nurses, ambulance staff

(Source: Survey Team)

Table 7: Component 5: Strengthening Primary Health Care in NCD

No	Sub-components	Contents
1	Establishment of model skills lab for NCD at regional training institutes (Chennai and Madurai)	<ul style="list-style-type: none"> ➤ Situation analysis/needs assessment of primary health care capacity on NCD ➤ Development of training manuals/materials ➤ Provision of up-to-date training equipment
2	Training on NCD for primary health care personnel	<ul style="list-style-type: none"> ➤ Development of training plan ➤ Creation of master trainers ➤ Training for medical officers, nurses, Auxiliary Nurse Midwives (ANMs), Urban Local Bodies (ULBs)

(Source: Survey Team)

4. Procurement plan and consulting services

4.1 Procurement Plan

The procurement plan is proposed as shown in Table 8.

Table 8: Proposed procurement plan

Package	Component Cost (JPY million)	Procurement	Implementation	Procurement Method
Package 1-1 Upgrading Tertiary Hospitals, Facilities	6,560	September, 2017 to September, 2018	October, 2018 to September, 2020	ICB with P/Q
Package 1-2 Upgrading Tertiary Hospitals (Medical Equipment)	9,110	March, 2018 to June, 2019	July, 2019 to September, 2020	ICB/LCB
Package 2: Strengthening Referral Hospitals (Medical Equipment)	2,903	December, 2016 to July, 2017	October, 2017 to July, 2018	ICB/LCB
Package 3-1 Upgrading Secondary Hospitals, Facilities	1,473	December, 2017 to September, 2018	October, 2018 to December, 2019	ICB with P/Q
Package 3-2 Upgrading Secondary Hospitals (Medical Equipment)	972	June, 2018 to December, 2018	January, 2019 to December, 2019	ICB/LCB
Package 4 Consulting Services (CS-F and CS-EQ))	137	January 2016 to October, 2016	November, 2016 to September, 2021	QCBS (80:20)

Abbreviations: ICB= International Competitive Bidding, P/Q= Prequalification

LCB=Local Competitive Bidding, QCB= Quality and Cost Based selection

CS-F= Consulting Services for Facilities, CS-EQ= Consulting Services for Equipment

(Source: Survey Team)

4.2 Consulting Services

The consulting services will be provided to achieve efficient and proper preparation and implementation of the project through the following works:

- (1) Design and construction supervision for hospital building and related civil/architectural works (CS-F)
- (2) Medical equipment procurement and installation supervision (CS-EQ)

To provide the required consulting services described above, 27 international consultants with a total of 217.5 person months (M/M) and 32 national consultants with a total of 618.0 person months (M/M), including support staff, are required.

5. Project Cost and Schedule

5.1 Project Cost

The project cost is shown in Table 9.

Table 9: Overall Project Cost Estimate

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million INR)			Total (million JPY)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
1-1 Upgrading Tertiary Hospital Facilities	0	0	0	3,565	3,565	0	6,560	6,560	0
1-2 Upgrading Tertiary Hospital Equipment	7,744	7,744	0	743	743	0	9,110	9,110	0
2 Strengthening Referral Hospitals	2,468	2,468	0	237	237	0	2,903	2,903	0
3-1 Strengthening Secondary Hospitals Facilities	0	0	0	801	801	0	1,473	1,473	0
3-2 Strengthening Secondary Hospitals Equipment	777	777	0	106	106	0	972	972	0
4 Strengthening Hospital Management	0	0	0	200	200	0	368	368	0
5 Strengthening Primary Health Care in NCD	0	0	0	109	109	0	201	201	0
Project Management & Capacity Development	0	0	0	75	75	0	137	137	0
Price Escalation	853	853	0	313	313	0	1,429	1,429	0
Physical Contingency	592	592	0	307	307	0	1,158	1,158	0
Consulting Services	818	818	0	222	222	0	1,226	1,226	0
Existing Building Demolition & Land Preparation	0	0	0	202	0	202	372	0	372
Administration Cost	0	0	0	704	0	704	1,295	0	1,295
VAT	0	0	0	1,101	0	1,101	2,025	0	2,025
Import Tax	0	0	0	270	0	270	497	0	497
Interest during construction	283	0	283	0	0	0	283	0	283
Front End Fee	51	0	51	0	0	0	51	0	51
Total	13,585	13,251	334	8,954	6,677	2,277	30,060	25,537	4,524

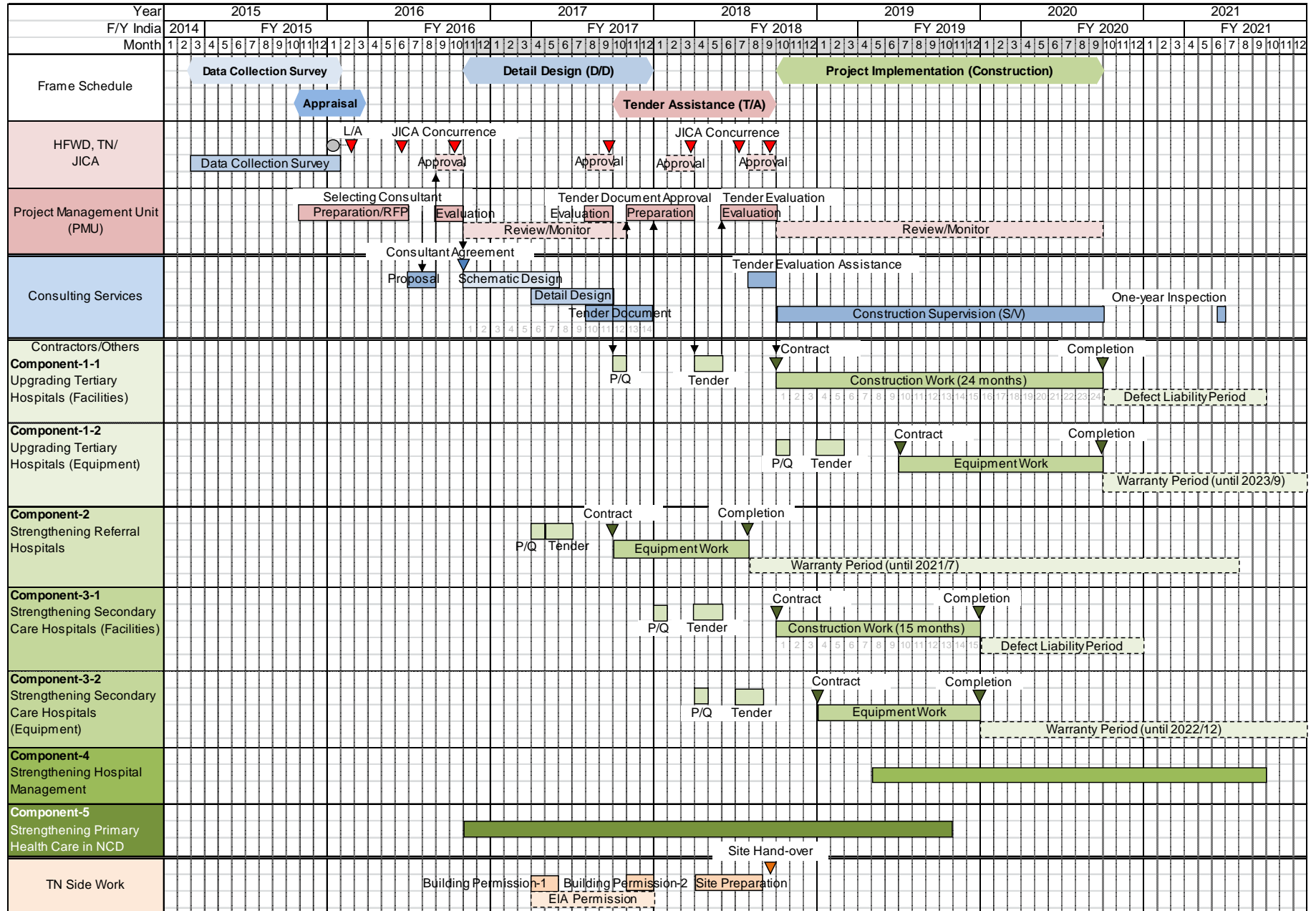
(Source: Survey Team)

5.2 Project Schedule

Figure 1 shows the overall project implementation schedule.

(Source: Survey Team)

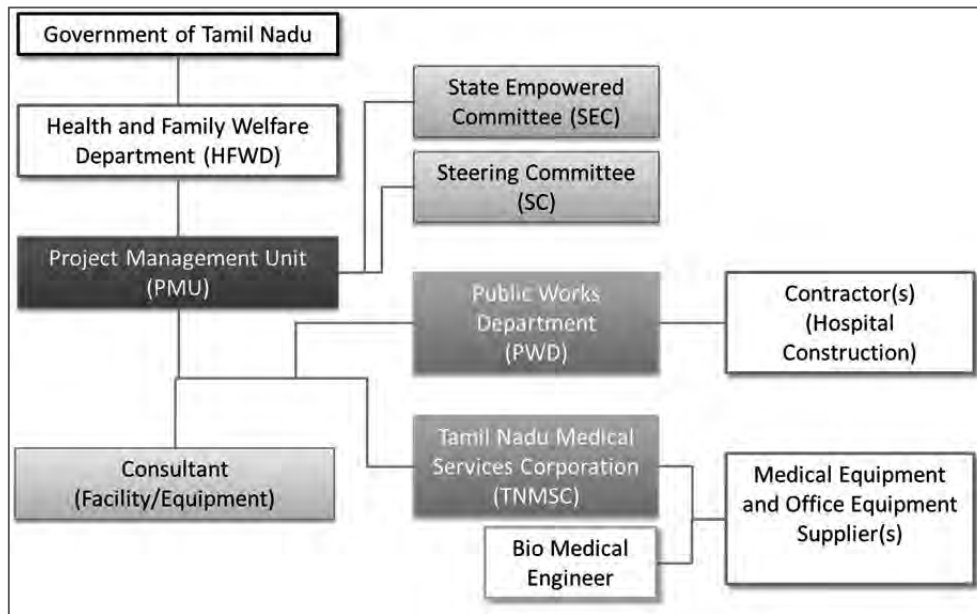
Figure 1 : Overall Project Implementation Schedule (OPIS)



6. Project Implementation Structure and Monitoring and Evaluation (M&E) Framework

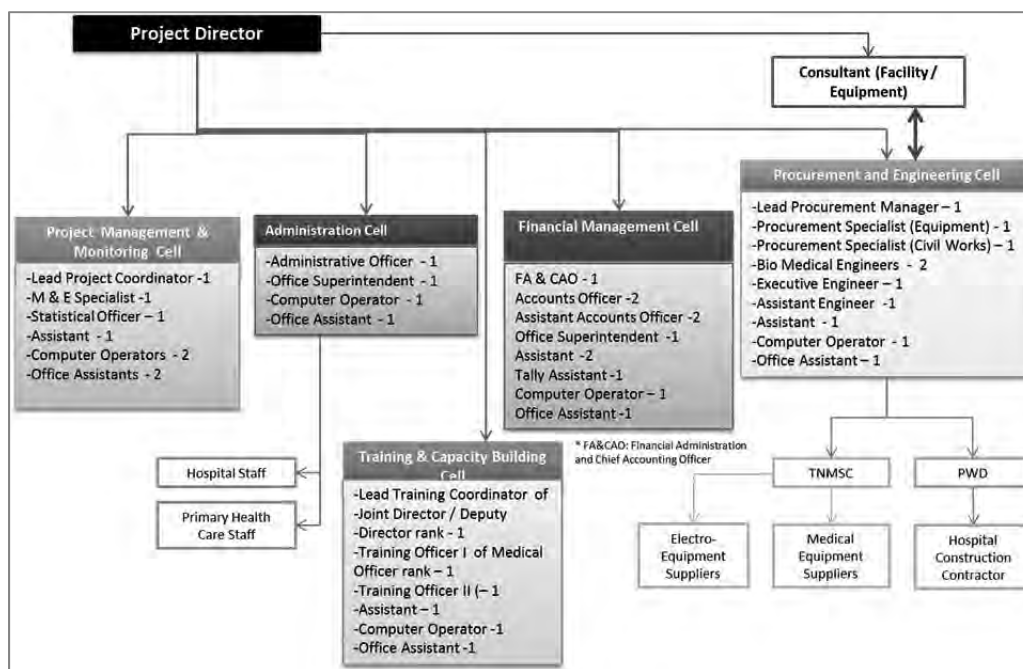
6.1 Project Implementation Structure

Overall project implementation and project management unit (PMU) structure is proposed in Figure 2 and 3. Health and Family Welfare Department, Tamil Nadu (HFWD) assumes the overall responsibility of the project. HFWD will establish a PMU within the organization which takes all necessary measures in a timely and efficient manner and be fully responsible for the project implementation.



(Source: Survey Team)

Figure 2: Project Implementation Structure



(Source: Survey Team)

Figure 3: PMU

6.2 M&E Framework

The operation and effect indicators and their baseline and target values were shown below.

Table 10: Operation and Effect Indicators

Components	Category	Indicators	Source	Baseline (2014)	Target (2023)
1	Operation	Number of percutaneous coronary intervention(PCI*1) per year in three Medical College Hospitals	Each health facility	Madurai:336 Kilpauk: 0 Coimbatore: 0	Madurai; 700 (2 units/year) Kilpauk 150 (1 unit/year) Coimbatore; 150 (1 unit/year)
		Number of cardiovascular surgeries in hybrid OT (Coronary artery bypass grafting, Aortic stent grafting, Open aortic surgery*2) per year in three Medical College Hospitals	Each health facility	Madurai: CABG= 41 Aortic stent grafting= 0 Open aortic surgery=5 Kilpauk: 0, 0, 0 Coimbatore: CABG=4 Aortic stent grafting=0 Open aortic surgery=1	Madurai: 280/year Kilpauk:200/year Coimbatore:100/year
	Effect	Number of Super Speciality seats for cardiology and cardiothoracic surgery in three Medical College Hospitals	DME	Cardiology, Cardiothoracic surgery Madurai: 2,2 (/year) Kilpauk: 0, 0 Coimbatore: 0, 0	Madurai: 4, 4 (/year) Kilpauk: 2, 2 (/year) Coimbatore: 2, 2 (/year)
		Occupancy rate of super specialty seat for cardiology and cardiothoracic surgery in three medical college hospitals	DME	Cardiologist: Cardiothoracic surgeons: Madurai: (100%, 100%) Kilpauk: N/A Coimbatore: N/A	All health facilities: 100%
2	Operation	Number of mammography conducted per year in all seven DHQHs and Vellore and Tirunelveli Medical College Hospitals	DME, DMRHS	Per unit Vellore.: 0 Tirunelveli.: 10 All 7 DHQHs: 0	MCH: 650 times/unit/year DHQH: 1000 times/unit/year
		Number of hemo-dialysis times operated per year in 7 DHQH and Tirunelveli, Nagarcoli, Thoothukudi, and Tiruchirapalli Medical College Hospitals	DME, DMRHS	Per unit <Tertiary> Tirunelveli: 460 Nagercoil:62 Thoothukudi: 202 Tiruchirapalli: 294 <Secondary> Erode:1,249 Cuddalore: 694 Other 5 DHQHs: 0	All: 600 times/unit/year

Components	Category	Indicators	Source	Baseline (2014)	Target (2023)
3	Operation	Bed Occupancy Rate (BOR) in 4 health facilities (annual average) (Formula = Total no. of IP days for the month/ total no. of bed days for the month x 100)	DMRHS	Avadi (Chennai): 85.4 Other health facilities: N/A	All: 90 %
1 & 3	Effect	Number of health facilities obtained external quality assurance certificate/accreditation from the GoI in seven health facilities	DME DMHS	N/A	All four secondary health facilities obtain external certificate from the GoI All three MCHs- Cardiology dept, Radiology dept, nephrology dept and Anaesthesia dept obtain external certificate from the GoI.

Abbreviations: DME= Directorate of Medical Education, DMRHS= Directorate of Medical and Rural Health Services

Note *1: PCI includes coronary intervention (stent), closure of congenital defects, dilatation of valves, TAVI, and TEVAR.

*2: Coronary Artery Bypass Grafting (CABG) includes on-pump bypass and off-pump bypass (OPCAB). Aortic stent grafting includes Thoracic Endovascular Aortic Repair (TEVAR), Abdominal Endovascular Aortic Repair (EVAR), and Thoracoabdominal Stent Grafting. Open aortic surgery includes thoracic aortic aneurysm, abdominal aortic aneurysm, and thoracoabdominal aortic aneurysm. Each category needs to count elective cases and urgent & emergent cases separately.

Catheter treatment can also be counted if conducted in hybrid OT.

(Source: Survey Team)

7. Environmental and Social Consideration

Total floor area of proposed new building in Kilpauk Medical College Hospital is planned more than 22,000m², which falls on the Category B (from 20,000m² to 150,000m² for building construction project) under the Indian Environmental Notification on 14th September 2006, issued by the Ministry of Environment and Forests (MoEF), India. Therefore, the project needs environmental clearance (EC) from State Environmental Impact Assessment Authority (SEIAA). In this context, the necessary survey was conducted on the Initial Environmental Examination (IEE) conforming to the Category B of the JICA Guideline.

In brief, all of seven construction sites for Component 1 and 3 are not inside or adjacent to either naturally or historical protected areas. Three health facilities of the Component 1 and Avadi Taluk Hospital of the Component 3 are reconstruction of existing buildings inside the premises of medical facility which are located in the urban area of high population cities. Tiruppur Hospital of the Component 3 is new construction on a vacant land kept for public works. Therefore, large scale negative impact is not anticipated on both environmental and social conditions for these health facilities.

HFWD will establish the PMU as soon as Loan Agreement is signed and PMU will take initiative to start EIA procedure necessary for getting EC.

Chapter 1 Introduction

1.1 Survey Background, Purpose and Methods

1.1.1 Background

The Government of India (GoI) set Universal Health Coverage (UHC) as a national agenda and had been focusing on the improvement of public health in rural areas through the National Rural Health Mission (NRHM) since 2005. Meanwhile, due to the increasing number of urban poor and vulnerable population and their health related problems, the GoI launched the National Urban Health Mission (NUHM) in May 2013 in order to effectively address the health concerns of the urban poor population. This is a sub-mission of the National Health Mission (NHM).

The Japan International Cooperation Agency (JICA) has been planning the cooperation with the GoI for strengthening urban health care in Tamil Nadu. This survey is therefore intended to identify the possible future cooperation plan.

1.1.2 Purpose and Scope of the Survey

The purpose of the survey is to understand the current implementation status of NUHM in India with a focus on Tamil Nadu and to formulate the possible future cooperation plan of JICA to contribute to the improvement of urban health care in Tamil Nadu.

The specific objectives of the survey are as follows:

1) To conduct Health Sector Analysis with a focus on urban health, especially in the context of the urban poor and vulnerable populations, in India and Tamil Nadu

- To review health outcome and socioeconomic status in relation to the urbanization in India and Tamil Nadu
- To review the implementation status of NUHM in India and Tamil Nadu.
- To identify needs, challenges and gaps in NUHM in Tamil Nadu

2) To formulate the JICA Proposed Cooperation Programme

- To identify the possible areas/components for JICA cooperation programme
- To consolidate/prioritize the programme through the dialogue with Health and Family Welfare Department (HFWD), State GoTN and other key stakeholders

3) To formulate the Out-line Design for Yen Loan Project

- To select the Yen Loan components
- To develop the out-line design of the project including the project implementation plan, costs, procurement plan and schedule, etc.

1.1.3 Methods

(1) Literature Review

Existing documents have been collected and analysed before and during the field data collection by the Survey Team.

(2) Field Data Collection – Interviews, Questionnaires and Field Visits

The Survey Team collected necessary information from the GoI and the Government of Tamil Nadu (GoTN) officials, health care facilities at the primary, secondary and tertiary levels, development partners and other relevant parties through questionnaires, key informant interviews, focus group discussions, site visits and collection of documents as appropriate.

(3) Detailed Study in Selected Cities – Sample Survey

Based on the results of the field data collection and discussion with relevant agencies, the Survey Team set criteria to select four candidate cities for the sample survey in Tamil Nadu in order to further understand the urban health sector and identify the possible areas for JICA cooperation.

In addition to general information on health indicators and health delivery system, detailed information regarding the target groups of NUHM have been collected through an exit survey in health facilities, household survey and Focus Group Discussions (FGDs) in order to understand health seeking behaviours, health status and needs, and hygienic environment of the target groups of NUHM.

(4) Yen-Loan Project Component Design

After the Yen-Loan project components were selected, the Survey Team developed the outline designs of the project including the costing, implementation and management framework, procurement plans, implementation schedule, and M&E framework.

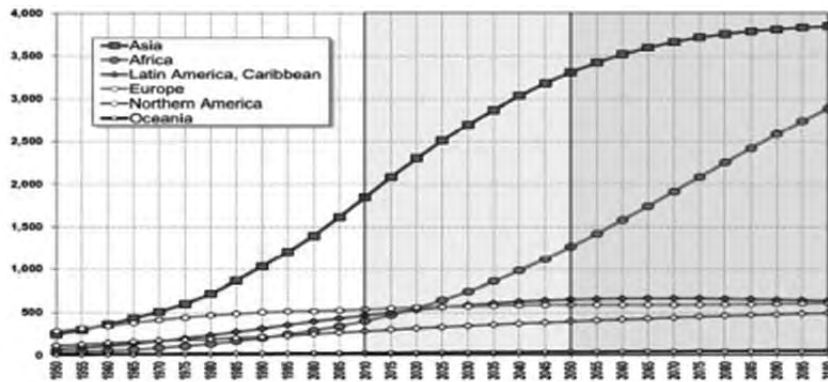
1.1.4 Period

The survey was conducted from 20 March 2015 to 26 February 2016. The field survey in India was conducted from 5 April 2015 in batches.

1.2 India: Urbanization and Poverty

The world is undergoing a large wave of urban growth, and this global shift towards a more urban population has profound implications for a wide range of issues including food, water, and energy consumption. It also presents the risk of overwhelming various public systems, including power and infrastructure, together with social issues such as health and education, as these systems need to adjust to the increased demand².

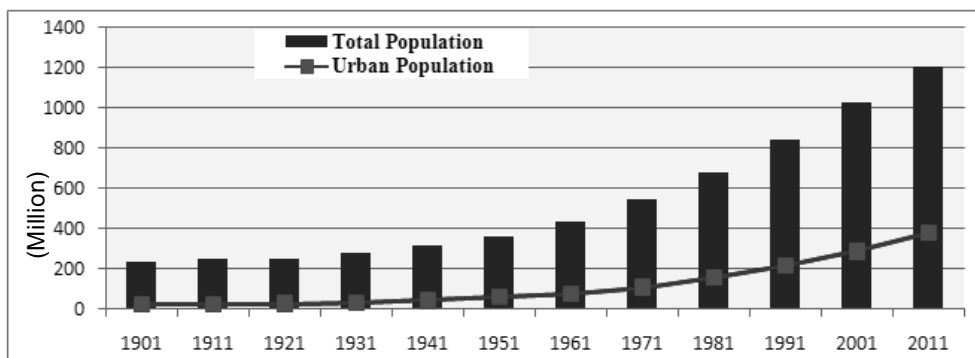
² World Urbanization Prospects, United Nations, 2012



(Source: World Urbanization Prospects, United Nations, 2012)

Figure 1-1: Urban Population by Major Regions: 2010-2100

India's population is undergoing a marked increase. The population of India as per the Census of India 2011 was 1,210.8 million, adding 182 million to its population since the Census of India 2001. In addition, 31% of India's population lives in urban areas in 2011, which increased by 28% since 2001³. The urban population is expected to increase by 50% of the total population over the next few decades.



(Source: Census of India 2011)

Figure 1-2: Trend of Urbanization in India

Table 1-1: Urban and Rural Population in India - 2001 and 2011

	Census of India 2001		Census of India 2011		Increased (%)
	Population (million)	(%)	Population (million)	(%)	
India (all)	1028.7	100.0	1210.8	100.0	17.7
Urban	286.1	27.8	377.1	31.2	31.8
Rural	742.5	72.2	833.5	68.8	12.2

(Source: Census of India 2001 and 2011)

There are many causes of urbanization, and urbanization has both positive and adverse effects on society (Table 1-2). One research report on the features of India's urbanization mentions "Urbanization is mainly a product of demographic explosion and poverty induced rural-urban migration"⁴.

³ For the Census of India 2011, the definition of urban area is as follows; 1) All places with a municipality, corporation, cantonment board or notified town area committee, etc. 2) All other places which satisfied the following criteria: i) A minimum population of 5,000; ii) At least 75% of the male main working population engaged in non-agricultural pursuits; and iii) A density of population of at least 400 persons per sq. km.

⁴ Deepak Kumar Dinkar and Harendra Narayan Singh, 2013, Features of Urbanization in India: An Analysis, Urban Society in India

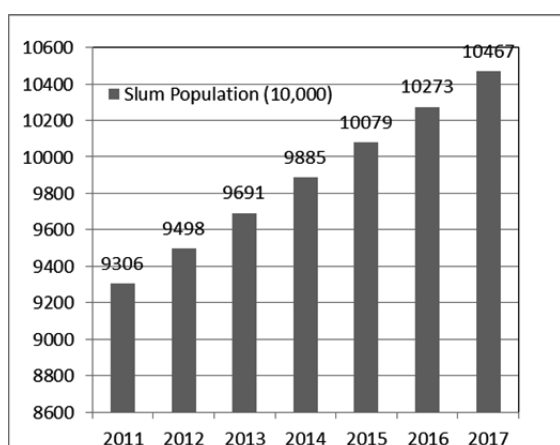
Table 1-2: Urbanization - Causes and Effects

Main Causes	Positive Effects	Adverse Effects (Problems)
<ul style="list-style-type: none"> ➤ Industrial revolution ➤ Expansion of Government services (as a result of 2nd World War) ➤ Modernization ➤ Growth of private sector ➤ Government plan for the economic development ➤ Spread of education ➤ Migration (Rural Urban transformation) 	<ul style="list-style-type: none"> ✓ Economic growth ✓ Employment opportunities in urban centres ✓ Increase in the standard living ✓ Transport and communication facilities ✓ Educational facilities 	<ul style="list-style-type: none"> ✓ Over population (accommodation problem, growth of slums, etc.) ✓ Disintegration of joint family ✓ Cost of living ✓ Increase in crime rates ✓ Impersonal relations ✓ Problem of pollutions ✓ Stress

(Source: S. Akhilesh, 2013, Urban Society in India.)

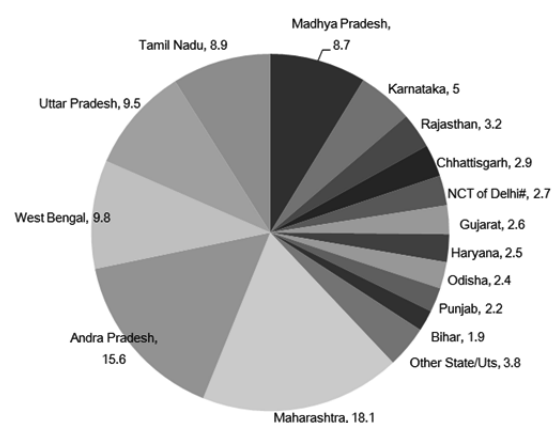
According to the Planning Commission, the GoI, the poverty rate in India is 30% of the total population that is equivalent to 360 million people. The Below Poverty Line (BPL) is used by the GoI to indicate economic disadvantage and to identify individuals and households in need of government assistance and aid. In urban area, 26% of population are BPL which is equivalent to 103 million people in 2014⁵.

Urban growth has led to rapid increase in the number of urban poor population, and the urban poor are often employed in the informal sector as seasonal or cyclical migrants who come to cities at certain times of the year for work. They often have tenuous residential status, live in insalubrious conditions, have financial responsibilities to their families in villages, and lack of access to health care, education, financial services, and social capital⁶. As shown in Figure 1-3, slum population in India is estimated to rise to over 104 million by 2017. Currently, Maharashtra state has the highest share (18%) of the slum population in India followed by Andhra Pradesh, West Bengal and Uttar Pradesh. The share of Tamil Nadu's slum population is 9% of the total slum population in India, which is the fifth highest rate among all the States in India (Figure 1-4).



(Source: Census of India 2011)

Figure 1-3: Projected Slum population in India



(Source: Census of India 2011)

Figure 1-4: State share of slum population to total slum population of India

⁵ Planning Commission, GoI. 2014 "Report of the expert group to review the methodology for measurement of poverty"

⁶ Reaching Health Care to the Unreached, Ministry of Health and Family Welfare, GoI, February 2014

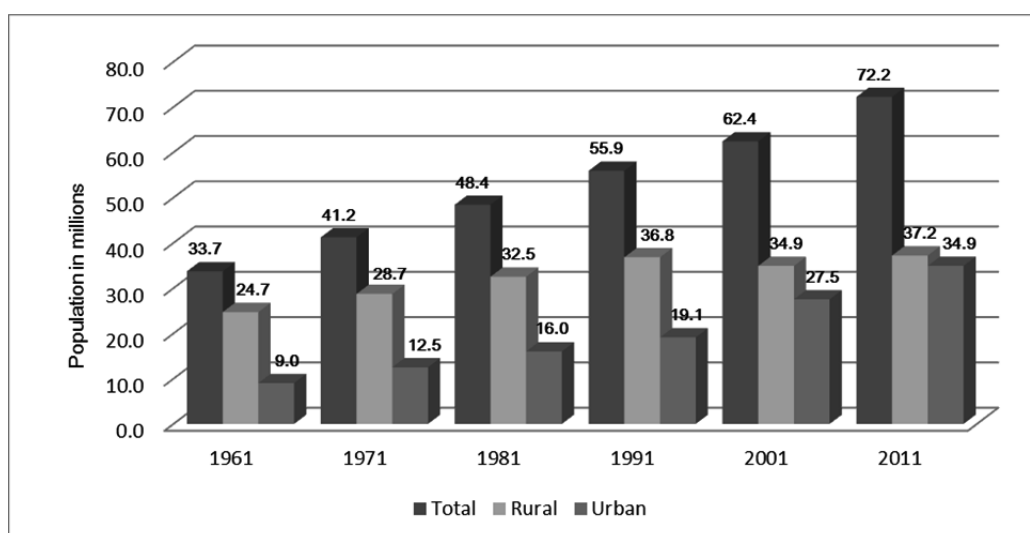
1.3 Tamil Nadu: Urbanization and Poverty

Tamil Nadu is the eleventh largest State in terms of area and the seventh most populous State in the country. The population of the state according to the Census of India 2011 stands at about 72 million and the population density of the State (555 persons/km²) is greater than the national average (382 persons/km²). Tamil Nadu is the most urbanized State in India, with 49% of its population living in urban areas and urban population growth rate of about 27% which will continue to rise due to the rise in infrastructure and development index of the State as a whole⁷.

Table 1-3: Population in Tamil Nadu

	Census of India 2001		Census of India 2011		Increased (%)
	Population (million)	(%)	Population (million)	(%)	
Tamil Nadu (all)	62.4	100.0	72.1	100.0	15.6
Urban	27.5	44.0	34.9	48.5	27.2
Rural	34.9	56.0	37.2	51.5	6.5

(Source: Census of India 2001 and 2011)

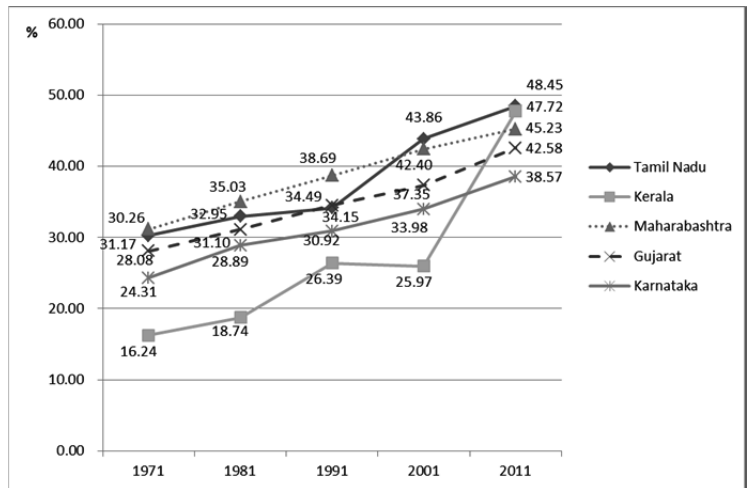


(Source: Census of India 2011)

Figure 1-5: Urban and Rural Population in Tamil Nadu (1961-2011)

Tamil Nadu's urban population has been increasing rapidly in the last 20 years from 34 % in 1991 to 49% in 2011. The increasing pace is the second highest after Kerala (21%).

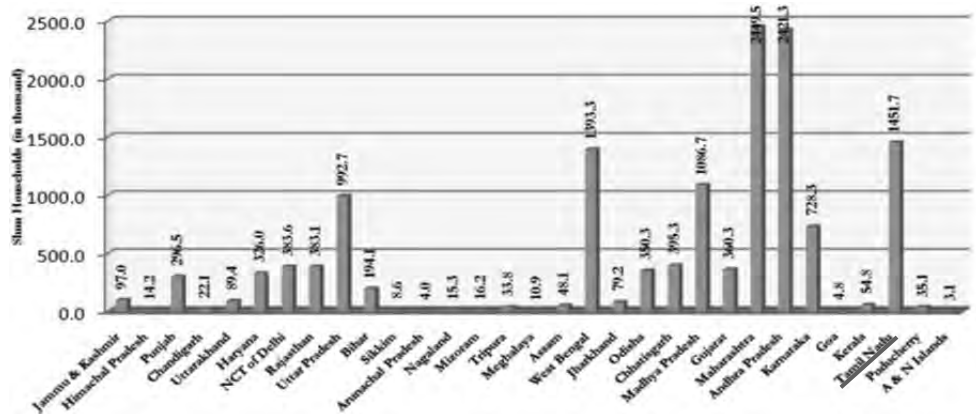
⁷ Census of India 2011



(Source: Census of India 1971-2011)

Figure 1-6: Percentage of Urban Population among top five urbanized States

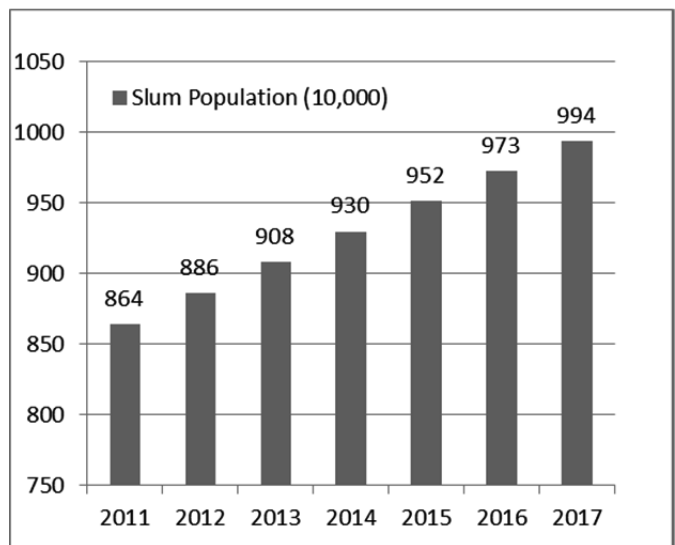
Alongside urbanization, Tamil Nadu has more than 145 million slum households which is the third highest number after Maharashtra and Madhya Pradesh in India.



(Source: Census of India 2011)

Figure 1-7: State wise Slum households

The slum population is estimated to rise in the coming years according to the Census of India 2011 (Figure 1-8)



(Source: Census of India 2011)

Figure 1-8 Slum Population in Tamil Nadu

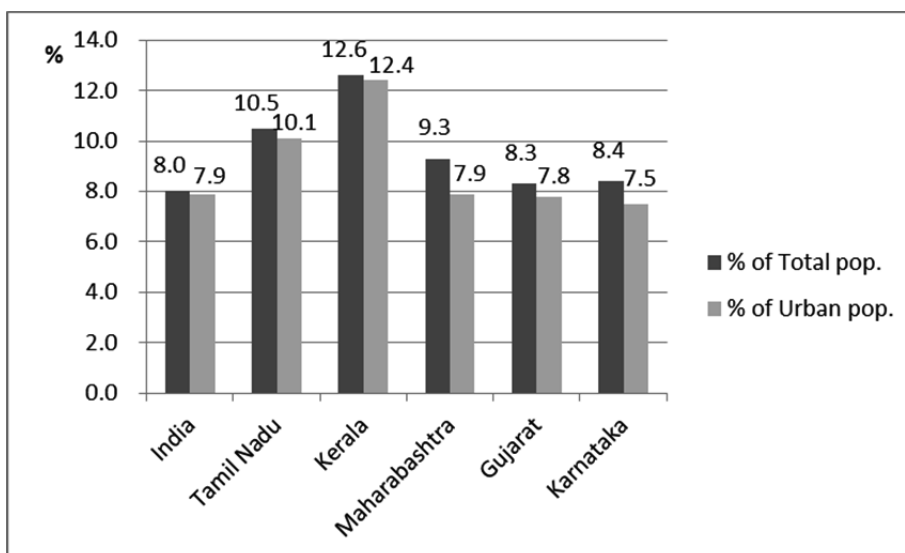
The migration stream from urban to urban within the State is also the highest in India as shown in Table 1-4.

Table 1-4: Migration streams of “Urban to urban” for intra-state migration

	1	2	3	4	5	6	7	8
State	Tamil Nadu	Mizoram	Goa	Nagaland	Maharashtra	Punjab	Karnataka	Gujarat
Rate (%)	27.4%	25.5%	21.9%	20.3%	19.2%	15.5%	15.3%	14.6%
No of migrants	1,001,633	21,271	39,519	10,447	2,401,703	264,685	745,235	801,593

(Source: Census of India 2001)

The aging population in Tamil Nadu is among the highest in India and 10% of the total urban population is 60 years old and above (Census of India 2011). The aging population presents significant pressure on the health care system.



(Source: Census of India 2011)

Figure 1-9: Rate of age group (60 years and above) among top five urbanized states

Key Message

- Tamil Nadu is the most urbanized State in India with 49% of its total population being urban, and also urbanizing at a very rapid rate as compared to other States. The population of slums, migrants and elderly is also one of the largest in the country.

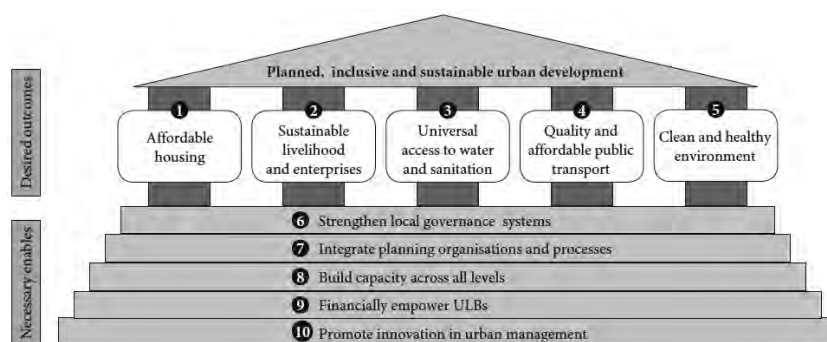
Chapter 2 Urban Health Policies and Challenges in India

2.1 Policy Framework

2.1.1 Twelfth Five Year Plan

The vision of the Twelfth Five Year Plan (2012-2017) is reflected in the sub-title: “Faster, Sustainable, and More Inclusive Growth”. It recognises that the objective of development is broad-based improvement in the economic and social conditions of the population, but also emphasises the rapid growth in Gross Domestic Product (GDP) as an essential requirement for inclusiveness. The Plan stresses that inclusiveness is not only bringing the below poverty line populations to a level above it, it must also embrace the concerns of other disadvantaged and marginalized groups.

The Twelfth Plan recognizes that effective management of the process of urbanization is critical. Sanitation, solid waste management, water, roads and decent housing are major areas to be improved.



(Source: Twelfth Five Year Plan (2012-2017), GoI)

Figure 2-1: Key Constituents of India's Urban Future

In the health sector, the Plan emphasizes the importance of expanding public sector capacity. The NRHM, launched during the Tenth Plan, made an important start in expanding health care facilities in rural areas. However, in order to address the needs of the vast majority of citizens, the Plan seeks the transformation of the NRHM into a NHM covering both rural and urban areas, recognizing the need to address the concerns of the urban population, particularly the urban poor.

The Plan seeks to strengthen initiatives taken in the previous Plan to expand the reach of health care and work towards the long term objective of establishing a system of UHC in the country. The key strategies include encouragement of cooperation between public and private sector, expansion of good quality affordable public health care, strengthening of the pillars of the health system to tackle vertical and redundancy approach, expansion of “cash-less” insurance based system, and increase in quality health personnel.

2.1.2 National Urban Health Mission

NUHM was launched in 2013 as a sub-mission under the NHM, the existing NRHM being the other sub-mission. Recognizing the suffering of urban poor that often have worse health status compared to the rural poor and the inadequate urban public health delivery system, NUHM seeks to improve the health status of the urban population particularly urban poor and other vulnerable sections, by

facilitating their access to quality health care. As per the framework⁸, NUHM is proposed to cover all State capitals, district headquarters and other cities, and towns with a population of 50,000 and above (as per the Census of India 2011) in a phased manner.

Table 2-1: Outline of NUHM

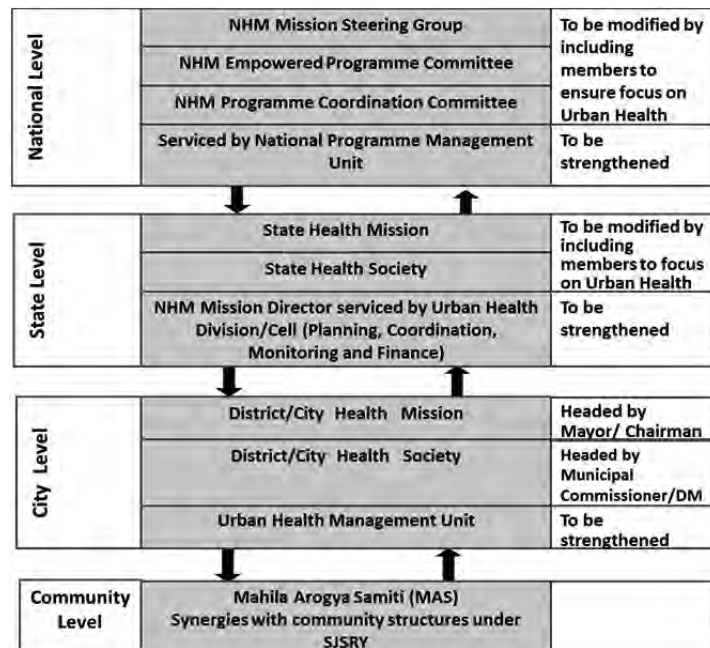
Goal	The NUHM aims to improve the health status of the urban population in general, but particularly of the poor and other disadvantaged sections, by facilitating equitable access to quality health care through a revamped public health system, partnerships, community based mechanism with the active involvement of the urban local bodies (ULBs).
Target group	<ul style="list-style-type: none"> • Urban Poor Population living in listed and unlisted slums • All other vulnerable population such as homeless, rag-pickers, street children, rickshaw pullers, construction and brick and lime kiln workers, sex workers, and other temporary migrants • Public health thrust on sanitation, clean drinking water, vector control, etc.
Strategy 1	Improving the efficiency of public health system in the cities by strengthening, revamping and rationalizing existing government primary urban health structure and designated referral facilities
Strategy 2	Promoting access to improved health care at household level through community based groups : Mahila Arogya Samitis (MAS)
Strategy 3	Strengthening public health through innovative preventive and promotive action
Strategy 4	Increasing access to health care through creation of revolving fund
Strategy 5	Information Technology (IT) enabled services and e-governance for improving access improved surveillance and monitoring
Strategy 6	Capacity building of stakeholders
Strategy 7	Prioritizing the most vulnerable amongst the poor
Strategy 8	Ensuring quality health care services

(Source: Ministry of Health and Family Welfare, GoI, May 2013, NUHM - Framework for Implementation)

⁸ Ministry of Health and Family Welfare, GoI, May 2013, NUHM- Framework for Implementation

(1) Institutional Framework

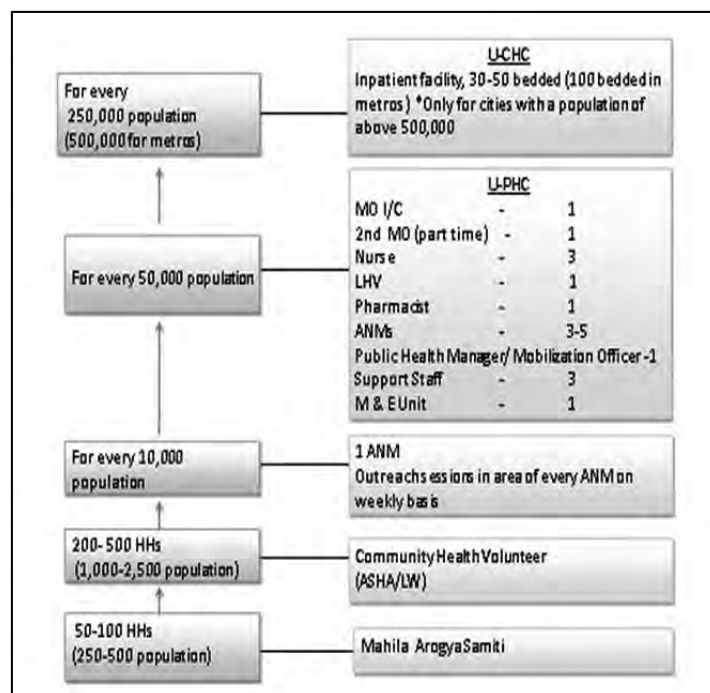
A Mission Steering Group is the highest policy making and steering institution under NUHM at the national level. It provides broad policy direction to the Mission and advises the Empowered Programme Committee of the Mission in policy and operation. The State Health Mission, District Health Mission and City Health Mission are the implementation bodies at each level.



(Source: NUHM Framework for Implementation and information from Tamil Nadu)
Figure 2-2: NUHM Institutional Framework

(2) Urban Health Care System⁹

The NUHM framework sets the urban health care system as illustrated in Figure 2-3. Urban Primary Health Centres (UPHCs) and Urban Community Health Centres (UCHCs) are the service delivery facilities and all the services would be universal in nature, whereas the outreach services would be targeted to the target groups¹⁰. It also mentioned that NUHM aims to provide a system for convergence of all communicable diseases and Non-Communicable Diseases (NCDs) through integrated planning at the city level, and to enhance the utilization of the system through the provision of a common platform and availability of all services at one point (UPHC) and a mechanism of referrals.



(Source: NUHM Framework for Implementation)
*MO: Medical Officer, LHV: Lady Health Visitor, ANM: Auxiliary Nurse Midwife, ASHA: Accredited Social Health Activist, LW: Link Worker

Figure 2-3: Urban Health Care Facilities

⁹ Mahila Arogya Samiti: Community based group which is proposed under NUHM to oversee health, water and sanitation and nutrition activities. ASHA: Trained female community health activist selected from the village/community to work as an interface between the community and the public health system.

¹⁰ NUHM targets urban population, especially “urban poor and other disadvantaged section” and definition of “urban poor” is expected to develop through household survey by the State governments.

2.2 NUHM Progress and Challenges

2.2.1 Health Finance

The projections of the Twelfth Five Year Plan envisage increasing total public funding on core health from 1.0% of GDP in 2011-2012 to 1.9% of GDP by the end of the Plan. But it is still less than half the Organisation for Economic Co-operation and Development (OECD) average of 9.3%¹¹.

As per the NUHM Framework for Implementation, the programme will be 75% funded by the GoI, and 25% by the States, while in case of the North Eastern States the funding will consist of 90% from the GoI and 10% from the States. It is estimated that the proposed NUHM would need a total of Rs.225 billion (approximately) from 2012-13 to 2016-17, of which Rs.169.6 billion (approximately) is envisaged to be the central government share in the Twelfth Five Year Plan period¹². Actual fund release would depend on the State Programme Implementation Plans (PIPs), collated from respective city and district level PIPs and subject to approval by the Ministry of Health and Family Welfare (MoHFW), the GoI. As shown in Table 2-2, so far, the expenditure for 2013-14 and 2014-15 is lower than the estimate.

Table 2-2: Financial outlay and expenditure for Department of Health & Family Welfare, MoHFW, GoI

	2013-14 (Rs. Million)		2014-15 (Rs. Million)	
	Outlay	Expenditure	Outlay	Expenditure (up to Dec. 2014)
NUHM	8.9	6,622.2	19,244.3	11,825.9

(Source: MoHFW, GoI, Annual Report 2014-15)

2.2.2 Implementation

The NUHM was officially announced in 2013, but the actual funds transfer and implementation started across States only in late 2014. Many of the States are still in the preparatory stage of its implementation. While there is no official comprehensive review report available, the results of the 8th Common Review Mission conducted for 15 States in November 2014 showed some key observations and recommendations as below¹³.

¹¹ OECD. 2014. OECD Health Statistics 2014

¹² JICA, 2014, Final Report – Data Collection Survey on Health Sector in India

¹³ Annual Common Review Mission is one of the important monitoring mechanism under NHM. Each year, 14-15 states are selected to be reviewed with the extensive field visits and state level debriefings. 8th Common Review Mission was conducted in November 2014 for 15 states (Union Territory namely Assam, Bihar, Chandigarh, Chhattishgarh, Kerala, Mizoram, Madhya Pradesh, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, West Bengal)

Key observations

- Most states are in the preparatory phase, as they have just received budgets for the first year and utilization of funds has just started.
- Pace of implementation is faster in the state of Kerala, while it is at a slow pace in states such as Uttar Pradesh, Chhattisgarh, Bihar and Uttaranchal.
- Planning & mapping of slums and other areas in the cities have been completed in states like Kerala and Odisha; and are in process in many other states.
- In many states, service delivery structures of UPHCs have been created, along with the strengthening of the existing structures in the earmarked/ identified cities.
- Involvement of ULBs in the implementation of the programme initiated to varying degrees across states - to a greater extent in Kerala and Odisha and lesser in Chhattisgarh, Bihar, and Telangana, etc.

Recommendations

- Ensure existing urban health care infrastructure and systems are seamlessly integrated with those that are being introduced with NUHM funding, and strengthen them in terms of comprehensive, need-based coverage of services, delivery, staff/human resources, drugs and equipment.
- States should leverage the flexibility in NUHM for implementing customized services through innovations, Public Private Partnerships (PPPs) and collaborations with local stakeholders.
- In many states service delivery (outreach services) is required to be strengthened to be able to fully absorb/ utilize the allocated funds.
- Recruitment of staff to the management units at the state, districts and service delivery facilities including ASHAs, on the basis of the situation assessment and gap analysis, needs to be fulfilled in many states.
- Convergence mechanisms with all related departments are required to be in place in all states, except in Kerala, which is in a better position.
- Orientation and involvement of ULBs activity needs a push in all states.

2.2.3 Donor support

The Asian Development Bank (ADB) and the GoI signed a loan agreement in July 2015 for NUHM. This is a three-year loan of US\$300 million, as well as an additional US\$2 million (planned) grant to support technical assistance for capacity development.

ADB Programme Outcome: Increased access to equitable and quality urban health system

(1) Outputs: There are three outputs to support the programme outcome:

Output 1: Urban primary health care delivery system strengthened

Output 2: Quality of urban health services improved

Output 3: Capacity for planning, management, and innovation and knowledge sharing strengthened

(2) Modality: Results-Based Lending scheme in which disbursements are made subject to the achievement and verification of the pre-set Disbursement Linked Indicators (DLIs). Through this modality, ADB aims to support the NUHM's systems and institutional capacity to implement its plans and activities, instead of establishing a standalone project.

(3) Components: In principle, ADB’s loan will support existing implementation plans and activities of the NUHM at the central level (no plans to involve specific States). The planned technical assistance will specifically contribute to: (i) State-level institutional capacity assessments; (ii) monitoring, verification, and reporting of programme results; and (iii) developing and learning from innovations in urban health¹⁴.

Table 2-3: List of DLIs for ADB’s support to the NUHM in India¹⁵

Outcome Indicators:		Outcome/Output Areas
DLI 1:	Increased institutional delivery in urban areas	Outcome: Increased access to equitable and quality urban health system
DLI 2:	Increased complete immunization among children aged below 12 months in urban areas	
Output Indicators:		
DLI 3:	City-specific primary health care delivery system established	Output 1: Urban primary health care delivery system strengthened
DLI 4:	Community outreach service improved	Output 2: Quality of urban health services improved
DLI 5:	Effective system of quality assurance for urban health services implemented	
DLI 6:	Planning, management and monitoring capacity to deliver urban health services strengthened	Output 3: Capacity for planning, management, and innovation and knowledge sharing strengthened
DLI 7:	Innovations and partnerships for urban health developed, tested and shared	

Key Messages

- India’s Twelfth Five Year Plan (2012-2017) prioritises effective management of urbanization and importance to expand public health sector capacity. Under this circumstance, NUHM was launched in 2013 to improve the health status of urban population particularly urban poor.
- NUHM implementation is still in preparatory stage in many States. There are some challenges including lower financial allocation compared with the estimated plan, slow pace of implementation and limited involvement of ULBs.

¹⁴ ADB. 2015. “Report and Recommendation of the President to the Board of Directors: Proposed Results-Based Loan and Technical Assistance Grant – India: Supporting National Urban Health Mission”.

¹⁵ Ibid.

Chapter 3 Urban Health Issues in Tamil Nadu

This section describes trends of mortality, morbidity and risk factors to understand aspects of urban health outcomes in Tamil Nadu.

3.1 India's overall mortality trends

Sample Registration System (SRS) conducted by the GoI is considered as the most reliable national data source for monitoring trends of mortality in urban areas¹⁶. According to SRS, the Crude Death Rate (CDR) has declined significantly from 14.9 per 1,000 population in 1971 to 7.0 in 2001 at an all India level. CDR is lower in urban (5.6 per 1,000 population) than rural areas (7.6) in 2012.

Rank	Top 10 Cause of Deaths (In Urban Area in India (Ages 25-69 as %)	2001-2003	Rank	Top 10 Cause of Deaths (In Urban Area in India (Ages 30-69 as %)	2004-2006
1	Cardiovascular diseases	32.8	1	Cardiovascular diseases	33.6
2	Malignant and other neoplasms	11.3	2	Malignant and other neoplasms	11.5
3	Tuberculosis	7.7	3	Digestive diseases	7.7
4	COPD, Asthma, other respiratory diseases	7.7	4	Tuberculosis	7.3
5	Digestive diseases	5.8	5	Respiratory diseases	6.5
6	Symptoms signs and ill-defined conditions	4.3	6	Genito-urinary diseases	4.3
7	Motor vehicle accidents	3.7	7	Unintentional injuries, others	4.1
8	Unintentional injuries, others	3.6	8	Unintentional injuries: motor vehicle accidents	3.5
9	Genito-urinary diseases	3.3	9	Diarrhoeal diseases	3.4
10	Diabetes mellitus	2.8	10	Diabetes mellitus	2.6

Rank	Top 10 Cause of Deaths (In Rural Area in India (Ages 25-69 as %)	2001-2003	Rank	Top 10 Cause of Deaths (In Rural Area in India (Ages 30-69 as %)	2004-2006
1	Cardiovascular diseases	22.9	1	Cardiovascular diseases	25.9
2	COPD, Asthma, other respiratory diseases	10.9	2	Malignant and other neoplasms	10.5
3	Tuberculosis	10.7	3	Respiratory diseases	9.3
4	Malignant and other neoplasms	8.9	4	Tuberculosis	9.1
5	Diarrheal diseases	5.5	5	Digestive diseases	7.2
6	All other symptoms signs, and abnormal findings	5.5	6	Unintentional injuries except motor vehicle accidents	5.0
7	Digestive diseases	4.9	7	Diarrheal diseases	4.1
8	Unintentional injuries except motor vehicle accidents	4.9	8	Unintentional injuries: suicide	3.5
9	Malaria	3.1	9	Genito-urinary diseases	3.4
10	Intentional self-harm	3.1	10	All other symptoms, signs, and abnormal findings	2.6

(Source: SRS, Top 10 causes of deaths 2001-2003 & 2004-2006, India)

Figure 3-1: Trends of Top 10 Causes of Deaths among Adults in Urban Areas (Left) and Rural Area (Right) in India

Figure 3-1 shows trends of cause of death among people ages 25-69 years of age in urban and rural areas from 2001 to 2006. According to SRS, Cardiovascular Diseases (CVD) and malignant and other neoplasms are the first and second leading causes of deaths in both urban and rural areas while both percentages are higher in urban areas. CVDs account for more than one fourth of total cause of deaths in the urban area. Proportion of mortality due to NCDs has increased while the mortality by communicable diseases such as Tuberculosis (TB) has decreased. Respiratory diseases, TB, diarrheal diseases are more common causes of deaths in rural areas while digestive diseases, genitourinary diseases, and diabetes are common in urban populations. Deaths due to unintentional injuries other than motor vehicle accidents were more reported in rural areas, while more number of motor vehicle accident cases occurred in urban areas.

According to the International Diabetes Federation, it is estimated that more than 63 million people in India were living with type 2 diabetes, but 33% of them are undiagnosed diabetes which prevent proper management of the disease. The annual number of Disability-Adjusted Life Years (DALYs¹⁷)

¹⁶ WHO also estimates the major causes of death based on combination of country life tables, cause of death models and regional cause of death pattern in 2012. WHO's estimate also shows CVD (26%) and cancer (7%) as the top two causes of deaths in the country.

¹⁷ In this context, one DALY represents the loss of one year of healthy life. (Source: World economic Forum. Harvard School of Public Health. Economics of NCDs in India. 2014)

attributable to diabetes in India nearly doubled from 4.1 million to nearly 8 million between 1990 and 2010. NCDs accounted for more DALYs in India than communicable diseases in 2010. Given the increase in the share of elderly population, the NCD burden is also likely to increase.¹⁸ Some projections¹⁹ indicate a further increase to 67% of total deaths due to NCDs by 2030, which implies that CVD would remain a major contributor of health burden. WHO pointed out that NCD burden is affecting not only wealthy populations but also the poor and vulnerable populations. The high expenditure for NCD treatments in private sector are often unaffordable to the poor families who are already overburdened with loss of income and productivity due to a breadwinner suffering from NCDs²⁰. One study shows that about one fourth of Indian families with a member afflicted by CVD, experience catastrophic expenditure.

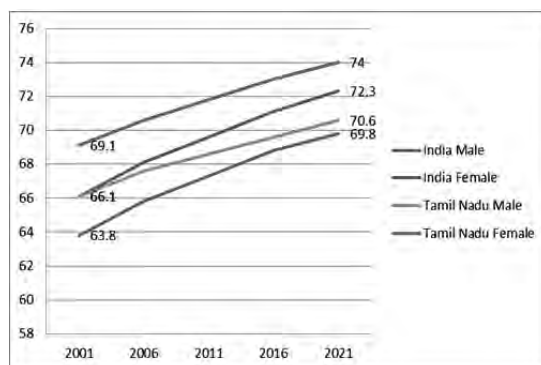
3.2 Demographic Trends and Population Aging in Tamil Nadu

Tamil Nadu has already stabilized its Total Fertility Rate (TFR) as shown in Table 3-1. The life expectancy at birth is projected to increase and hence the proportion of senior people (60 years and above) is expected to increase from 9% in 2001 to 15% in 2021²¹.

Table 3-1: Trends in TFR 2000-2012 (Unit: Birth per women)

	2000		2005		2012	
	Tamil Nadu	India	Tamil Nadu	India	Tamil Nadu	India
Total	2.1	3.2	1.7	2.9	1.7	2.4
Urban	1.8	3.5	1.6	3.2	1.7	2.6
Rural	2.2	2.3	1.8	2.1	1.7	1.8

(Source: SRS, GoI)



(Source: Population Projection for India and States, GoI 2006)

Figure 3-2: Life Expectancy at birth

¹⁸ World Economic Forum. Harvard School of Public Health. Economics of NCDs in India. 2014

¹⁹ Patel V, Chatterji S, Chisholm D, Ebrahim S, Gopalakrishna G, Mathers C, Mohan V, Prabhakaran D, Ravindran RD, Reddy KS. Chronic diseases and injuries in India. Lancet 2011; 377:413-28. Mohan S, Reddy KS, Prabhakaran D. Chronic NCDs in India. Reversing the tide. Public Health Foundation of India, 2011. Available at: http://www.phfi.org/images/what_we_do/PHFI_NCD_Report_Sep_2011.pdf

²⁰ Mahal A, Karan A & Engelau M. The economic implications of non-communicable disease for India. 2010. World Bank

²¹ The National Commission on Population. 2006. Population Projection for India and States.

3.3 Major Millennium Development Goals - Health related indicators in Tamil Nadu

Tamil Nadu has achieved or is on track to achieve the Millennium Development Goals (MDGs) health related indicators for 2015 as shown in Table 3-2. According to SRS, Tamil Nadu has already achieved the MDG target of Under Five Mortality Rate. Infant Mortality Rate (IMR) is likely to reach the target in 2015. Tamil Nadu has already achieved nearly 100% coverage of births attended by skilled health personnel. Although no clear numerical targets were set up for the Goal 6: combat Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS), Malaria and other diseases, the prevalence of HIV, TB, and Malaria are on a downward trend in Tamil Nadu.

Table 3-2: Major Health MDGs related indicators

Goal	Indicators	All India		Tamil Nadu	
		Target 2015	Current Status (Year)	Target 2015	Current Status (Year)
Goal 1 Eradicate extreme poverty and hunger	Prevalence of underweight children under three years of age	26	32.85 (Likely achievement in 2015)	21.44	17.23 (2014)*
Goal 4 Reduce Child Mortality	Infant mortality rate per 1,000 live births	26.67	40 (2013)	19.67	21 (2013)
	Under-five mortality rate per 1,000 live births	42.0	49.0 (2013)	34.0	23 (2013)
Goal 5 Improve Maternal Health	Maternal Mortality Ratio per 100,000 live births	109.3	140.00 (Likely achievement in 2015)	49.2	68 (2013-14)**
Goal 6 Combat HIV/AIDS, Malaria & other diseases	HIV prevalence rate (%) among the adults (15 to 49 years old)	-	0.27 (2011)	-	0.25(2012-13)**
	Incidence rates associated with TB per 100,000	-	171 (2013)	-	N/A
	API (Annual Parasite Incidence)=Confirmed cases during 1 year/population under surveillance x 1000	-	0.88 (2013)	-	0.1(2013)

(Source:Gol. 2014-2015. Millennium Development Goals India Country Report 2015)

*: Policy Note of Social Welfare and Nutritious meal programme dept. 2014-2015

**.:Policy Note of Health and Family Welfare Department 2014-2015)

3.4 Mortality and Morbidity trends in Tamil Nadu

According to SRS 2012, more than 60% of deaths occurred among population of 60 and above years of age followed by 15-59 years of age (34%) and 0-4 years of age (5%).

Table 3-3: Distribution of deaths by broad age groups in Tamil Nadu and India

	Broad age-groups				
	<1	1-4	5-14	15-59	60+
Tamil Nadu	4.5	0.6	1.1	33.5	60.2
India	13.0	2.8	2.3	30.5	51.4

(Source: SRS)

Urban has lower CDR (6.4 per 1,000 populations) than rural areas (8.2) in Tamil Nadu as is the case with India.

3.4.1 Infants and Children

Tamil Nadu has achieved the third lowest IMR in India²². A study on causes of death by verbal autopsy in 2003 [Indian Council of Medical Research (ICMR), 2003] found that more than 60% of infant deaths were due to certain conditions originating in the peri-natal period followed by congenital malformations, deformations and chromosomal abnormalities (12%)²³. The same study revealed that most common child deaths in 1-4 years of age were communicable and parasitic diseases (39%) followed by the nervous system diseases (12%), injury, poisoning. For children aged 5-14 years, nervous system diseases were most common among male children whilst injury and poisoning were among female children.

Among children in age group of 0 to 3 years old, 0.1% of children are reported to be severely underweight, 17% are moderately underweight and 82% are normal²⁴. According to Integrated Child Development Services (ICDS), iron deficiency anaemia is the most widespread form of malnutrition in Tamil Nadu.

Urban areas have lower IMR (18 per 1,000 live birth) and child mortality rate (4.2 per 1,000 live birth) compared to rural areas (IMR 24, child mortality rate 5.5).

Mohan et al. (2013) found that elevated blood lead levels were common among preschool children living in urban slums of Vellore, north eastern part of Tamil Nadu, especially among poor conditions of the living environment²⁵. Excess lead exposure during childhood has a risk for developing lead-induced severe anaemia as well as intellectual disability. Further study is necessary to understand the exposure pathway and casualty. One study reported that children in semi-urban slum in Tamil Nadu were found to be ill for about three months in a year on an average due to malnutrition²⁶.

3.4.2 Adults

(1) Maternal Health

According to SRS, Maternal Mortality Ratio (MMR) has declined from 131 per 100,000 live birth in 1997 to 90 in 2012. HFWD in Tamil Nadu reported that almost 88% of maternal mortality occurs in rural areas.

(2) Communicable Diseases

Integrated Disease Surveillance Programme (IDSP) allows Tamil Nadu to easily track the prevalence or incidence of major communicable diseases to prevent outbreaks.

²² According to SRS 2012, Goa state has the lowest IMR followed by Kerala.

²³ Indian Council of Medical Research. Study on causes of death by verbal autopsy in India http://www.icmr.nic.in/final/causes_death/NCD.pdf, accessed 7 August 2015.

²⁴ Integrated Child Development Services, 2014

²⁵ Venkata Raghava Mohan, Srujan Sharma, Karthikeyan Ramanujam, et. al, 2013, Effects of elevated blood lead levels in preschool children in urban Vellore, Indian Pediatrics

²⁶ Rajiv Sarkar, Prabhu Sivarathinaswamy, Bhuvaneshwari Thangaraj et.al Burden of childhood diseases and malnutrition in a semi-urban slum in southern India, BMC Public Health 2013, 13:87

1) Malaria

The incidence of malaria (15,050 cases) has decreased by 20% in 2013 compared with 2012 due to intensive control measures.

Urban areas account for 61% of cases but most of them (57%) are reported in Chennai. The rest of 39% is from rural areas²⁷. No malaria death cases were reported for the last four years²⁸.

2) Dengue

There was an outbreak²⁹ in 2012 in which 12,826 cases and 66 deaths were reported. After 2012, the number of reported cases has been decreased and no death has been reported. This is due to daily surveillance and active measurements by HFWD as well as local bodies³⁰. HFWD reports that dengue is penetrated in both urban and rural area in Tamil Nadu.

3) TB

Total number of patients registered for treatment has slightly increased from 79,830 in 2011 to 80,407 in 2013³¹. Increased population coverage by Revised National Tuberculosis Control Programme (RNTCP) could be one of the reasons for the increase³². One study³³ observed that slum dwellers in Chennai had a 1.6 times higher risk of both culture and bacteriologically positive TB than non-slum dwellers. Occurrence of TB among slum dwellers is a complex interplay of socioeconomic factors, including factors such as overcrowding, poor personal hygiene, poor ventilation and sanitation.

4) HIV/AIDS

The latest data on HIV prevalence among pregnant women (2010-11) was 0.38%, slightly lower than national average (0.4%). 22 districts were categorized into the priority group which defines that HIV/AIDS prevalence among pregnant mothers is more than 1% in the last three years in 2011. Declining trends of HIV prevalence among Men who have Sex with Men were observed. No reliable data on trends of HIV among migrants.

(3) NCDs

According to the Chennai prospective study³⁴, which included one-third of all adults aged 35 and over in Chennai city, residents had relatively higher cause-specific mortality rate compared with Japan, the United Kingdom and the United States. Table 3-4 shows age-standardized mortality rate of some diseases. Age-standardized mortality rates of CVD [Ischemic Heart Disease (IHD) and other vascular diseases] were 685 per 100,000 populations, which was more than six times higher than those of Japan (113/100,000).

²⁷ NHMTN. Vector Borne Disease Control Programme. <http://www.nrhmtn.gov.in/vbdc.html>, accessed 29 July 2015

²⁸ National Vector Borne Disease Control Programme, National Vector Borne Disease Control Programme Annual Report 2014-2015, 2015

²⁹ Most cases were reported from Tirunelveli, Virudunagar, Theni, Madurai, Thiruvallur, Vellore and Dharmapuri. Difference in number of reported cases between urban and rural areas were not clear.

³⁰ HFWD

³¹ RNTCP. Annual Status Report 2012 & 2014

³² According to RNTCP, the programme currently covers 33 districts in Tamil Nadu with a total population of 75.472 million.

³³ Dhanaraj B, Papanna MK, Adinarayanan S, Vedachalam C, Sundaram V, Shanmugam S, et al., 2015, Prevalence and Risk Factors for Adult Pulmonary Tuberculosis in a Metropolitan City of South India. PLoS ONE

³⁴ Gajalakshmi V, Peto R, Kanimozhi VC, Whitlock G, Veeramani D. Cohort profile: The Chennai prospective study of mortality among 500 000 adults in Tamil Nadu, South India. International Journal of Epidemiology 2007.

Table 3-4: Age-standardized mortality rates at age 35 to 69 in Chennai (1995-97) and Japan (1994)

Cause of death	Male		Female	
	Chennai	Japan	Chennai	Japan
IHD/other vascular diseases	685	113	428	45
Neoplastic diseases	177	310	156	152
TB	152	4	1	1
Stroke	89	71	62	37
Diabetes	58	10	58	5
Renal diseases	52	10	40	6
All causes	1,805	732	1,158	327

(Source: Chennai Cohort Study 2007)

According to Corporation of Chennai, the most common cause of deaths were heart diseases and heart attack in Chennai (38% of total deaths) from 2006 to 2011 followed by senility (7%), accidental burns (2%), and cancer (2%). The Corporation also pointed out that there was a total reversal of disease patters in the city during the past two decades from communicable diseases to NCD³⁵.

(4) Injuries

Tamil Nadu has the highest number of reported road accidents cases (15% of the total cases) as well as the suicide cases (12% of total cases) in India during 2013. It also has the third highest number of accidental deaths in India, after Maharashtra and Madhya Pradesh. Chennai had the highest incidence of road traffic accident cases (9,705) in Tamil Nadu as well as in India³⁶.

3.5 NCD Risk Factors

The GoI conducted the NCD risk factor survey in 2007-08 in Tamil Nadu based on a multisite ICMR-WHO collaborative initiative³⁷.

In urban area, blood pressure and history of raised blood sugar level especially among males, low-physical activity, and overweight especially among females are further common risk factors. Also, one fourth of males are smokers in urban areas. Tobacco and alcohol consumption are more common risk factors in rural populations. The survey pointed out that almost everyone in Tamil Nadu (99%) consumed less than five servings of fruits and vegetables per day. According to the survey, 25% of the respondents were underweight while 23% were overweight.

³⁵ Prevalence and incidence of major NCDs at State level is not available as is the case for India.

³⁶ Accidental deaths & suicides in India 2013, National Crime Records Bureau Ministry of Home Affairs. 2013

³⁷ There is no surveillance system for NCD Risk Factors in Tamil Nadu.

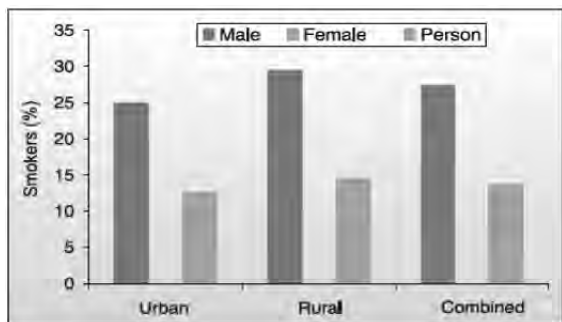


Figure 3-3: Current Smokers (%)

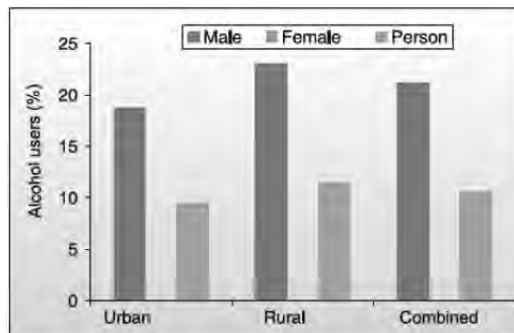


Figure 3-4: Alcohol consumption (%)

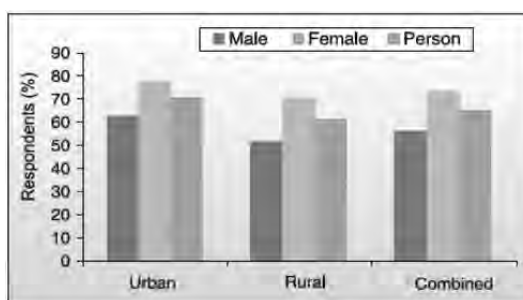
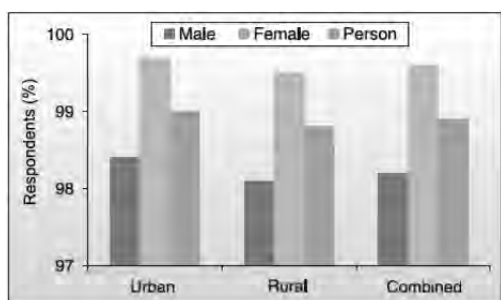


Figure 3-5: Less than 5 servings of fruits & vegetable consumption (%)

Figure 3-6: Low physical activity of respondents (%)

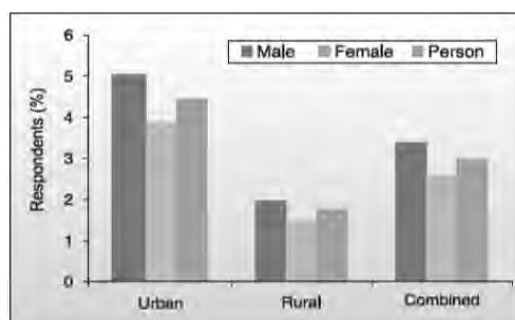
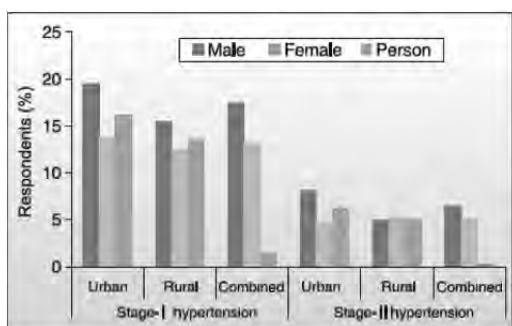


Figure 3-7: Stage I&II hypertension³⁸ (%)

Figure 3-8: History of raised blood sugar (%)

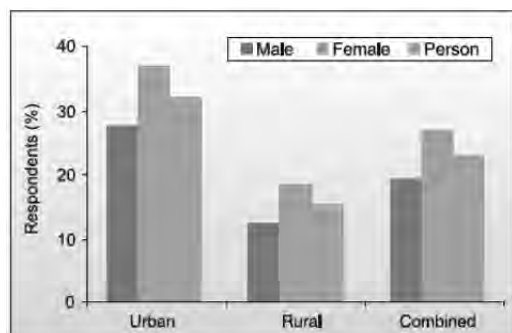


Figure 3-9: Overweight (%)

(Source: Integrated Disease Surveillance Project NCD Risk Factor Survey 2007-08 Tamil Nadu)

³⁸ Stage I is 140-159 mmHg systolic or 90-99 mmHg for diastolic. Stage II is ≥ 160 mmHg systolic or ≥ 100 mmHg for diastolic.

The Chennai prospective study shows baseline distribution of various risk factors³⁹. Approximately one-third of men aged 35-74 years of age were current smokers of tobacco and a quarter of men overall were current drinkers of alcohol. Less than one percent of women were smokers or regular drinkers. Higher Body Mass Index (BMI) was observed among younger generation. Around one fourth of women aged 35-54 were BMI of 25-30kg/m² (overweight) and 10% had a BMI of 30 or over (obesity).

Key Messages

- In India, NCD burden is projected to further increase to 67% total deaths due to NCDs by 2030.
- Population is aging in Tamil Nadu due to declining fertility rate and increasing life expectancy. More than 60% of deaths are among people of 60 and above years of age.
- Tamil Nadu has achieved or is on track to achieve the health MDGs. Mortality of communicable diseases as well as Maternal and Child Health (MCH) are on a declining trend. On the other hand, Tamil Nadu has the highest number of reported road accidents as well as suicide cases in India. In urban areas of Tamil Nadu, age standardized mortality rates due to major NCDs are much higher than those of Japan and other developed countries. Among NCD risk factors, high blood pressure, high blood sugar level and overweight are more common in urban areas.

³⁹ Vendhan gajalakshmi, Richard Peto, Vendhan Chiruvai Kanimozhi et.al., 2007, Cohort profile: the Chennai Prospective study of mortality among 500 000 adults in Tamil Nadu, South India, International Journal of Epidemiology.

Chapter 4 Urban Health System in Tamil Nadu

This chapter summarizes the health system in Tamil Nadu with a focus on urban areas. Information specific to rural areas is not included in this report.

4.1 Governance

The public services related to the urban health are largely provided by several State departments/ organizations in the area of health, urbanization, and water and sanitation.

4.1.1 Policy Framework

The Twelfth Five Year Plan Tamil Nadu (2012-2017) provides the road map for achievement of targets envisioned in “Vision Tamil Nadu 2023”. The vision aims to make Tamil Nadu the most prosperous and progressive State in India by 2023 and, as far as health sector is concerned, it has set a goal of excelling the targets achieved by the developed countries.

The vision of this Plan for health is universal access to public health services. The Plan aims to (i) provide effective tertiary care and integrated comprehensive primary health care, (ii) prevent and control communicable and non-communicable diseases (iii) promote healthy lifestyles and (iv) mainstream Indian System of Medicine. The goals and targets are set as follows (Table 4-1). It also mentions the strategies in medical education including; opening of one fully equipped new medical college every year in uncovered districts of the State, upgrading of infrastructure and manpower as well as facilities for students in the existing colleges, special thrust in the provision of medical care for vulnerable sections such as geriatric care and mental health care, etc.

Table 4-1: Monitoring Indicators

Indicator	Recent status		12 th Plan target for Tamil Nadu
	India	Tamil Nadu	
Maternal Mortality Ratio	212 (SRS 2007-9)	73 (Stat HMIS 2011-12)	44
Infant Mortality Rate	44 (SRS 2012)	22 (SRS 2012)	13
Total Fertility Rate	2.5 (SRS 2011)	1.7 (SRS 2008)	1.6
Sex Ratio (Female/1000 Male)	940 (Census 2011)	995 (Census 2011)	998
Juvenile Sex Ratio	914 (Census 2011)	946 (Census 2011)	965
Life Expectancy at Birth	M:67.3 F:69.6	M:68.6 F:71.8 (NHP 2011)	M:70 F:73
Child Birth Rate	21.8 (SRS 2012)	15.9 (SRS 2012)	14
Crude Death Rate	7.1 (SRS 2012)	7.4 (SRS 2012)	6
Couple Protection Rate	N/A	60 (NFHS III)	65
Still Birth Rate	8 (SRS 2009)	11 (SRS 2009)	6
Neonatal Mortality Rate	34 (SRS 2009)	19 (SRS 2010)	10

Abbreviations: NHP= National Health Profile, NFHS= National Family Health Survey
(Source: Twelfth Five Year Plan Tamil Nadu 2012-2017)

Based on the Twelfth Plan, HFWD issues an annual policy note to provide the plan with details of the important schemes and programmes as well as to review the achievements. The annual policy note has goals for major indicators such as MMR, Crude Birth Rate (CBR), TB, and HIV/AIDS, however, there are no specific numerical targets set for other areas in terms of mortality and morbidity.

The State also set a vision for water and sanitation to provide “a world class infrastructure - provide piped and pressurised 24x7 water supply to 100% of its residents and ensure that all of them have access to safe sanitation including open defecation free and garbage free environment ”⁴⁰ by the end of 2023.

In terms of urbanization, the State has established an ‘Urban Development Mission’ for all Municipal Corporations, Municipalities and Town Panchayats. The mission is considering the importance of urban infrastructure, and has proposed to implement two new special programmes; “Chennai Mega City Development Mission” for Chennai and its sub urban areas, and the “Integrated Urban Development Mission” for all other Municipal Corporations, Municipalities and Town Panchayats.

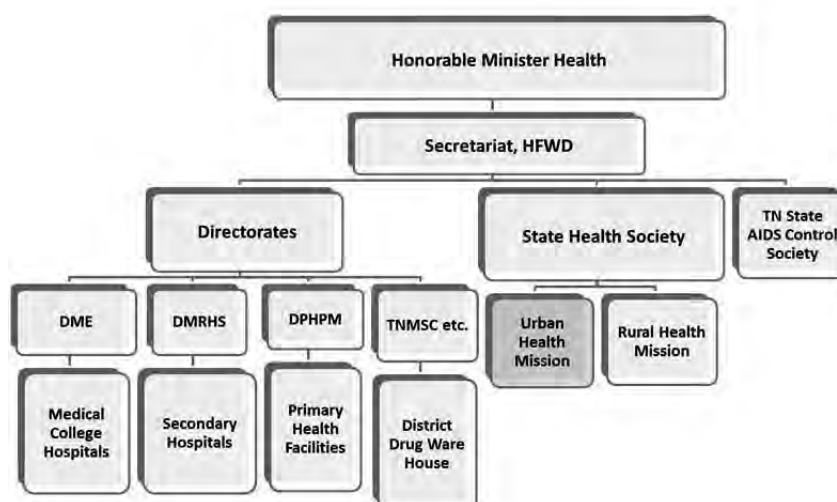
4.1.2 Institutional Arrangement - State Level

(1) Health and Family Welfare Department

Health services function under HFWD. The Secretariat is administratively responsible for all matters under HFWD.

There are a number of Directorates and Societies established within HFWD for the provision of relevant health services. The organogram is given below (List of Directorates and their functions are attached in Annex 1). The Directorate of Medical Education (DME) is responsible for creating adequate human resources and ensuring effective and accessible tertiary care. The Directorate of Medical and Rural Health Services (DMRHS) is in charge of providing secondary level medical care to the public while the Directorate of Public Health and Preventive Medicine (DPHPM) takes care of prevention and primary care services.

The State Health Society responsible for the NHM, the Tamil Nadu Health System Project (TNHSP) funded by the World Bank, and the Tamil Nadu Medical Service Corporation (TNMSC) in charge of supply of medical equipment and materials are among the others.



(Source: HFWD)

Figure 4-1: Organogram of HFWD, Tamil Nadu

⁴⁰ Tamil Nadu Vision 2023

(2) Social Welfare and Nutritious Meal Programme Department

ICDS Scheme is the GoI's welfare programme which provides nutritious food, preschool education, and primary healthcare to children under 6 years of age and their mothers. There are 54,439 ICDS centres in Tamil Nadu. 89% of programmes targets rural area. HFWD cooperates with this Department to provide health services in ICDS centres such as immunization of children and pregnant mothers, referral services with fast track system, Vitamin A supplementation for all children in the age group of 6-60 months on a campaign basis, deworming campaign for all children in the age group of 2-6 years, anaemia control programme among children in the age group of 1-3 years, menstrual hygiene programme for adolescent girls, and a health check-up on health and nutrition day.

(3) Municipal Administration and Water Supply Department

This department is responsible for the development of urban areas in the State and the management of ULBs. The Corporation of Chennai, the Commissioner of Municipal Administration, and the Directorate of Town Panchayats are integral part of this Department. The Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) for Chennai city, and Tamil Nadu Water Supply and Drainage Board (TWAD Board) for areas other than Chennai are responsible for the provision of Water Supply and Underground Sewerage facilities in the state.

(4) Housing and Urban Development Department

This Department plans various strategies for improving housing infrastructure in the State. The action plan includes promotion of satellite towns, development of slums through various projects and ensuring planned growth through farsighted programmes in urban areas. The Tamil Nadu Slum Clearance Board (TNSCB) functions under the administrative control of this Department. The main function of TNSCB is to eradicate the slums and provide hygienic tenements in Tamil Nadu, and the board has been implementing various housing, slum improvement, rehabilitation and resettlement schemes to ameliorate the living conditions of slum dwellers.

4.1.3 Institutional Arrangement - District Level

Deans and Medical Superintendents are in charge of tertiary health facilities. Joint Director of Health Services is responsible for the secondary public health facilities, such as District Head Quarter Hospitals (DHQH), Taluk Hospitals, Non-Taluk Hospitals, Tuberculosis Hospitals/Sanatorium and Leprosy Hospitals. The Joint Director's office is in DHQH.

The Deputy Director of Health Services (DDHS) is responsible for providing primary health care services and public health programmes and monitoring performance of each facility in rural areas and in all municipalities. Providing technical support and recruiting the required human resources are also roles of DDHS to all units at primary care level including municipal corporations in each district. In urban areas, ULBs are responsible for providing primary health care services as well as public health measurements, while DDHS is responsible for providing technical support and oversight of the urban maternal and child health services and human resource development. If there is any disease outbreak, DDHS is responsible to take necessary actions in both urban and rural areas. Implementation of all national health programmes is also a role of DDHS.

4.1.4 Institutional Arrangement - Urban Local Body (ULB)

ULBs include Municipal Corporations, Municipalities and Town Panchayat. The Municipalities and Town Panchayats are classified into different grades by GoTN based on their annual income. There are 12 Municipal Corporations⁴¹ in Tamil Nadu. The Municipal Corporation is responsible for administration and operation of primary health care services and public health programmes, monitoring of performance of each facility, and provision of land and infrastructure.

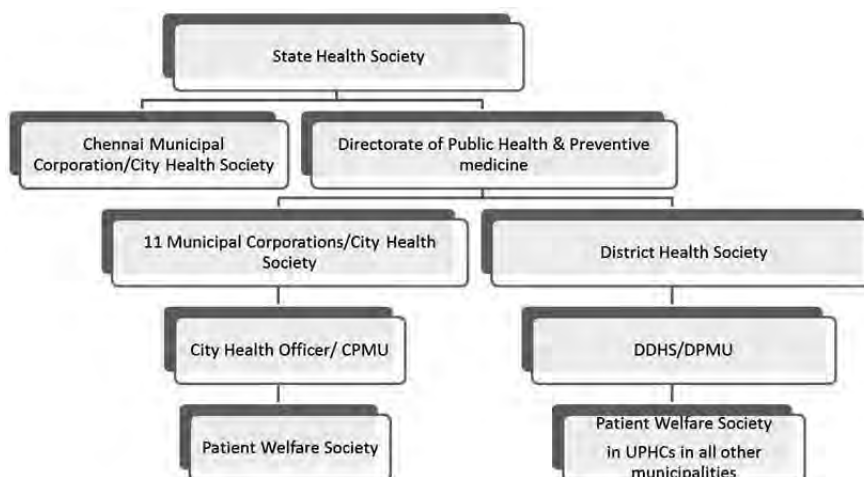
Major works of Municipal Corporations are listed in the box below.

- Prevention Services by Sanitary Inspectors & Entomologist
- Treatment Service
 - UPHCs
 - Outreach Services
- Veterinary Public Health
- Vital Statistics
- Disease Surveillance
- Safe Water Supply, Public Sanitary Convenience, Public Drainage

(Source: HFWD)

4.1.5 Structure Specific to NUHM in Tamil Nadu

The Figure 4-2 shows the NUHM implementation structure. At the State level, a State Programme Management Unit (SPMU) is formulated within the State Health Society headed by a state programme manager, and consisting of a State urban health consultant, health finance manager, Health Management Information System (HMIS) manager, and some other staff. The Health Society as well as the Programme Management Unit (PMU) is formulated at the district level. 12 Municipal Corporations formulate their own City Programme Management Unit (CPMU), with assistance from the State Health Society and DPHPM. DPHPM implements the State Urban Health Programme in the rest of the 77 municipalities. City Health Officers at the city level and Medical Officers in charge of UPHCs are implementers of activities.



(Source: HFWD)

Figure 4-2: Programme Implementation Structure for State Urban Health Mission

⁴¹ Chennai, Madurai, Coimbatore, Tiruchirapalli, Salem, Tiruppur, Tirunelveli, Thoothukud, Erode, Vellore, Thanjavur and Dindigul

4.2 Health Services

4.2.1 Health Programmes

(1) Policy, Target Indicators and Monitoring & Evaluation

The GoTN publishes an annual policy note, which serves as a policy on each health topic in Tamil Nadu.

Table 4-2 presents the focus of the policy, key target indicators, and the Monitoring and Evaluation (M&E) system. MCH has clear policy, target numerical indicators and regular M&E system. Although clear targets are not set for the communicable diseases except TB and HIV/AIDS, a regular M&E system has been established to prevent potential outbreak of communicable diseases in the State. For the main four NCDs, there is a clear policy and state implemented programme for screening, treatment and follow up for hypertension, diabetes, cervical and breast cancer. Under the programme, beneficiaries undergo opportunistic screening at all public health facilities and there is data system in place for tracking the number of people screened and those detected positive in screening. There are also awareness creation activities in the community through various approaches for encouraging men and women to undertake screening services in public health facilities.

Table 4-2: Policy, Target Indicators and M&E System by Health Topic

Topic	Policy	Target indicators	M&E
MCH	<ul style="list-style-type: none"> ✓ Focus on reduction of inter district disparities ✓ Nutrition policy 2002 “Malnutrition free Tamil Nadu” 	By 2017 IMR<13, MMR<44, CBR <14, TFR 1.6 etc.	Vital statistic is available
Adolescent Health	No clear statement	No specific indicators	Not clearly mentioned
Communicable Diseases	Prevention of any outbreak or potential outbreak	TB Indicators (universal access of 90% case detection and 90% cure of TB cases by Fiscal Year (FY) 2018) HIV/AIDS Indicators (To reduce new infections by 50% from the baseline in 2007) No other specific indicators	Integrated disease surveillance system
NCDs	Focus on: <ul style="list-style-type: none"> ✓ Promotion of health lifestyles ✓ Opportunistic screening for hypertension, diabetes, cervical and breast cancer ✓ Early diagnosis ✓ Management of diabetes, hypertension, CVD and common cancers 	No specific indicators	No. of screened cases and those detected positive cases in screening
Accidents, Injuries	Not clearly mentioned	No specific indicators	Not clearly mentioned

(Source: Policy Note 2014-2015, HFWD)

(2) Main Schemes and Programmes

Table 4-3 shows main schemes and programmes provided by HFWD as well as the central government in Tamil Nadu.

Table 4-3: Main schemes and programmes by Health Topic

Topic	Type of intervention	Main Scheme/Programme
MCH	Prevention/Control	<ul style="list-style-type: none"> ➤ Tracking system for every pregnant woman in health sub centres and PHCs during ante natal, natal and post-natal period. ➤ Provision of nutritious food programme ➤ Gestational diabetes control programme, ➤ Universal immunization Programme ➤ Mobile Medical Unit to remote areas ➤ Integrated child development service (Nutrition, Health, Pre-School) ➤ Maternal anaemia control programme ➤ Gestational diabetes control programme ➤ 24x7 delivery centres in all PHCs ➤ Rashtriya Bal Swasthya karyakram (Child health screening programme and early intervention service for defects at birth, diseases, deficiencies and developmental delays including disabilities. ➤ Neonatal ambulance services
	Financial Assistance	<ul style="list-style-type: none"> ➤ Dr. Muthulakshmi Reddy Maternity Benefit Scheme by the GoI to poor pregnant mothers from Rs.6,000 to Rs.12,000. ➤ Janani Suraksha Yojana by the State provides Rs12,000 for pregnant mothers ➤ Janani Sishu Suraksha Karyakram provides free drugs, diagnostics, and diet for the duration of the stay, free transport facility from home, inter facility transfer and transport facility back to home for every pregnant women and sick infants.
	Human Resources	<ul style="list-style-type: none"> ➤ Provision of second medical officer to the PHCs with single doctor ➤ Provision of specialist services (hiring of private specialists for MCH care) ➤ Training of medical officers in life saving anaesthetic skills and emergency obstetric care ➤ Strengthening of the DHQH in districts without medical college hospitals
	Infrastructure	<ul style="list-style-type: none"> ➤ Establishment of blood storage centres in all upgraded PHCs, ➤ Establish maternal and child health centres ➤ Establishment of obstetric Intensive Care Unit (ICU) ➤ Provision of equipment
Adolescent Health	Prevention/Control	<ul style="list-style-type: none"> ➤ School health programme to provide comprehensive health care services to all students ➤ Control of anaemia (weekly iron folic acid supplementation) ➤ Menstrual hygiene programme
Communicable Diseases	Prevention/Control	<ul style="list-style-type: none"> ➤ Revised National Tuberculosis Control Programme ➤ National Vector Borne Diseases Control Programme ➤ Integrated Disease Surveillance Programme ➤ National Diarrhoeal Disease Control Programme ➤ National HIV/AIDS Control Programme ➤ National Leprosy Eradication Programme

Topic	Type of intervention	Main Scheme/Programme
	Financial Assistance	<ul style="list-style-type: none"> ➤ Trust for children affected by HIV/AIDS ➤ Monthly pension to people affected on TB, HIV/AIDS and other vulnerable diseases
NCDs	Prevention/Control	<ul style="list-style-type: none"> ➤ National Tobacco Control Programme, ➤ National Programme for prevention and control of cancer, diabetes and cardiovascular diseases (mainly screening for hypertension, diabetes, cervical cancer, and breast cancer) ➤ National Mental Health Programme ➤ National Programme for Control of Blindness
	Human Resources	<ul style="list-style-type: none"> ➤ Allocation of NCD Nurses
	Infrastructure	<ul style="list-style-type: none"> ➤ Establishment of regional cancer centre ➤ Establishment of lifestyle clinics providing Yoga and naturopathy facilities in tertiary health facilities and DHQs.
Accidents, Trauma care	Human Resources	<ul style="list-style-type: none"> ➤ Provision of exclusive casualty medical officers in the accident and emergency ward
	Infrastructure	<ul style="list-style-type: none"> ➤ Establishment of trauma care centres in medical college hospitals and DHQH.
General	Prevention/Control	<ul style="list-style-type: none"> ➤ “104” Health Helpline to provide free access to health information, health guidance and grievance redressal facility ➤ Free “108” emergency services
	Financial Assistance	<ul style="list-style-type: none"> ➤ Chief Minister’s Comprehensive Health Insurance Scheme ➤ Employee’s State Insurance Scheme (ESI)

(Source: Survey Team)

1) MCH

MCH has a variety of programmes including family welfare, prevention and control of communicable and NCDs under DPHPM. One of the current focus is to reduce inter district disparities. Key programmes include operation of 24x7 delivery care services in all Primary Health Centres (PHCs). PHCs ensure that every pregnant mother is tracked and provided with institutional care and services including identification of high risk mothers and referral to higher referral tertiary services during ante natal and postnatal period. Exclusive Obstetric ICUs are established in Comprehensive Emergency Obstetric and Newborn Care (CEmONC) centres. To ensure adequate care, the GoTN⁴² as well as the GoI⁴³ provides cash assistance programmes for pregnant mothers.

2) Adolescent Health

School Health Programme provides comprehensive health care services to all students in government and government aided schools. Every Thursday, trained teachers identify common illnesses of students and refer them to health facilities. During the fiscal year 2014, around 3 million students were treated and 44,000 students were referred for further treatment.

3) Communicable Diseases

The GoTN undertakes daily surveillance of major communicable diseases through IDSP, 24

⁴² Dr. Muthulakshmi Reddy Maternity Benefit Scheme provides Rs.12,000 for pregnant mothers

⁴³ Janani Suraksha Yojana scheme provides an amount of Rs700 in rural and Rs.600 in urban areas to BPL mothers delivering in government facilities.

hours x 7days epidemic information cell and sentinel surveillance health facilities to prevent epidemics. While IDSP looks at the overall monitoring, district collectors take necessary measures to maintain environmental sanitation and public hygiene at district level through effective coordination with local bodies such as regular monitoring of water tanks, testing samples, sewage contamination, and solid waste management.

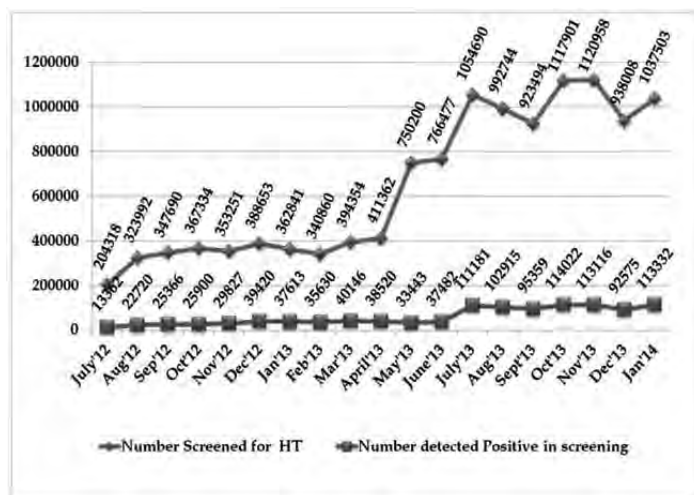
4) NCDs

Tamil Nadu has introduced four major intervention programmes for NCD prevention and control in a phased manner before the GoI started National Programme for Prevention and Control of cancer, diabetes and cardiovascular diseases and stroke (NPCDCS).

In terms of clinic based NCD intervention, opportunistic screening, treatment and follow-up of hypertension, diabetes mellitus, cervical cancer, and breast cancer have been implemented from 2012 targeting population aged 30 and above by allocating NCD nurses⁴⁴ at all levels of public health facilities at all 32 districts. Number of screening cases accounted for 25,031,749 and

19,498,490 for hypertension and diabetes respectively as of March 2015.

The number of screening has been increasing drastically since 2013 as shown in Figure 4-3. The other types of screening show similar trend. However, possibility of duplication of screening cases as well as number of positive cases reported cannot be detected under the current system.



(Source: TNHSP presentation on NCD programme, April 2015)

Figure 4-3: State Level Screening and detection of hypertension from July 2012- January 2014

A clinical manual on NCD intervention for medical and paramedical staff has been developed to equip the health care providers with necessary technical knowledge required in implementing NCD programmes by TNHSP. Several paper based tools were also introduced for NCD screening such as patient identity card, patient clinic card, NCD screening register book, hypertension and diabetes lab register book, hypertension and diabetes follow up resister book, while NCD online screens also developed on the existing HMS platform. Efforts have been made to accumulate screening data at central levels.

School based NCD intervention has been provided in approximately 17,000 public schools through the education department. Main activities were incorporating NCD issues in the

⁴⁴ Some NCD nurses were outsourced and the others were regular nurses. Their salaries were covered by TNHSP budget at first.

curriculum of students from grade 6 to grade 9, providing awareness programme to school teachers, forming junior heart clubs, organizing information, education, and communication activities.

Awareness creation activities on NCD and life style modification are also provided at selected workplaces through an agency hired for this purpose.

Under the Cigarettes and other tobacco product ACT in 2003, Tamil Nadu banned smoking in public places, advertisement, sponsorship and promotion of tobacco products, and sale to children below 18 years.

Despite covering a high number of individuals by screening, key challenges posed include establishing a good follow-up mechanism for positive cases and equipping and secondary health facilities with high end medical instruments for advanced diagnosis and management especially of those with NCD related complications⁴⁵. Moreover, continuous M&E of NCD programmes based on the trends of NCDs and risk factors will be required for comprehensive and effective prevention and control.

5) Accidents and Trauma

With assistance from the GoI, Accident and Trauma Care Centres have been established in nine tertiary health facilities such as the Medical College Hospital in Vellore, Kilpauk, Tirunelveli, Kanniyakumari, Villupuram and Salem and also 13 secondary health facilities at Perambalur, Cuddalore, Namakkal, Padmanabapuram, Tenkasi, Tambaram, Walajapet, Melur, Omalur, Karur, Krishnagiri, Kovilpatti and Dindigul. Tamil Nadu also allocated exclusive casualty medical officers in the accident and emergency ward and also preparation is under way for 40 more accident and emergency wards at secondary health facilities. Free 108 emergency ambulance service is operated throughout Tamil Nadu under public private partnership (PPP).

4.2.2 Infrastructure

(1) Availability of facilities

Tamil Nadu health service has three levels of health facilities depending on the size of and the services offered. A total of 44 tertiary health facilities (attached with Medical Colleges), 278 secondary and 402 primary health facilities were functional as of May 2015 in Tamil Nadu. Table 4-4 below shows basic statistics about public health facilities in Tamil Nadu. In the headquarters of 17 districts, there are tertiary health facilities. Only a few cities among these 17 have secondary health facilities. In the remaining 15 districts where there is no Medical College Hospital, the DHQH is the top referral facility⁴⁶ in the district. In addition to those facilities, Tamil Nadu has one Dental Hospital attached to a Dental College, ESI Hospitals, ESI Dispensaries, Indian System of Medicine Hospitals and Dispensaries, and Maternity Homes.

⁴⁵ According to hearing, most positive cases were sent to tertiary level for diagnosis and treatment.

⁴⁶ Top referral means the hospital which can provide most advanced medical services within the catchment area. Thus, there are district and regional top referral hospital in Tamil Nadu context.

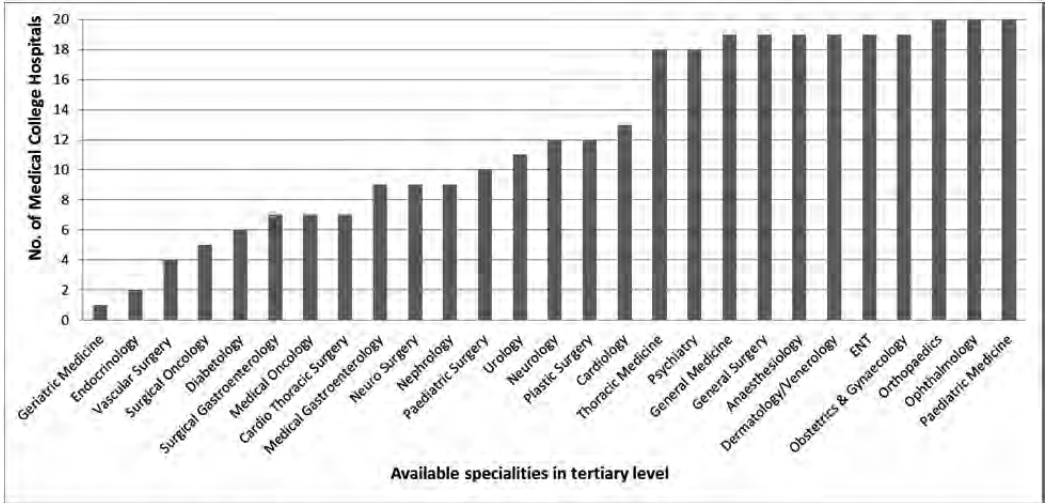
Table 4-4: Basic Statistics and Information about Major Public Health Facilities in Tamil Nadu

Type of care	Hospital name/ category	Total number of facilities	Range in total number of beds per unit	Total beds	Health Services Provided
Tertiary Care	Hospitals attached with medical college	44	0-2722	22,901	Secondary level + Speciality and super speciality care for cardiology, cardio thoracic surgery, urology, nephrology, neurosurgery, gastro-enterology, oncology, palliative care and geriatric care
Secondary Care	District Head Quarter Hospital	31	56-608	8,317	Primary level + paediatrics including neonatology, anaesthesia, ENT, Ophthalmology, dermatology and venereology, orthopaedics, physiotherapy, and D-Addiction services
	Taluk Hospital	168	18-271	12,691	
	Non-Taluk Hospital	79	6-148	3,688	
Primary Care in urban area	Urban Community Health Centre	3			UPHC + OPD and IP services: general medicine, general surgery, obstetrics & gynaecology, paediatrics, dental and AYUSH services. Eye speciality services
	Urban Primary Health Centre	399			OPD services, 24 hours emergency services, maternal and child health including family welfare, school health, national health programmes, basic laboratory, dispensary
Total	All Facilities	724		47,597	

(Source: HFWD)

(2) Tertiary health facilities

As of July 2015, 20 Medical College Hospitals provide tertiary level of care in 17 districts. The GoTN has a plan to establish new Medical Colleges and Medical College Hospitals in a phased manner in the remaining 15 districts. Figure 4-4 shows the number of Medical College Hospitals by available specialty.



(Source: HFWD)

Figure 4-4: Number of Medical College Hospitals by Available Specialty

Approximately eight health facilities are full-fledged hospitals while the other 12 health facilities, especially the ones which have recently started such as Sivagangai and Thiruvannamalai Medical College Hospitals, do not have certain super specialties such as cardiothoracic surgery, oncology, and surgical gastroenterology (refer to Annex 2 for details of Medical College Hospitals). Therefore, there are referral out cases from the Medical College Hospital to the more advanced health facilities. The

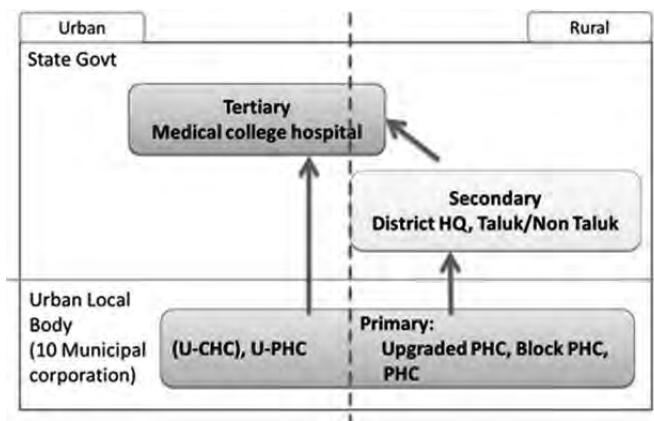
department of geriatric medicine at Madras Medical College has recently upgraded as a regional geriatric centre under the National Programme for the Health Care of the Elderly (NPHCE) by the GoI. The department provides post-graduate training programme in geriatric medicine and outpatient services. The funds from the State as well as the central government are also sanctioned for the construction of the multi super specialty building for the key Medical College Hospitals including the one in Salem, Coimbatore, Madurai, Tiruchirapalli, Thanjavur, and Tirunelveli.

In addition to Medical College Hospitals, GoTN planned to establish the regional cancer centres to provide cancer diagnosis and treatment including medical, surgical and radiotherapy departments in Chennai, Madurai, Coimbatore, Thanjavur and Tirunelveli.

(3) Secondary health facilities

Tamil Nadu has three types of secondary health facilities, namely DHQs, the top referral facilities at secondary level situated in every district, Taluk hospitals, situated in Taluk headquarters, and Non-Taluk hospitals. In terms of the speciality, dental surgeon, general medicine, general surgeon, anaesthetists, paediatricians, orthopaedic surgeon, dermatologist, ophthalmologist, obstetrics and gynaecology are the most common specialists available at the secondary level. Only few districts have neurologists, cardiologists and urologists at DHQH level.

One of the features of the urban health system is that in general there is no secondary health facility situated in the city where the Medical College Hospital is established except a few cities. This would lead to overflow of patients at the tertiary health facilities, particularly those full-fledged hospitals which receive a large number of patients from neighbouring areas.



(Source: developed by survey team based on interview with HFWD)

Figure 4-5: Image of urban health care delivery system

(4) Primary health facilities

As per the population norm set in the NUHM framework, the government plans to establish 420 UPHCs in the NUHM cities. 399 UPHCs are functioning and the remaining UPHCs are to be newly established or renovated. Out of 399 UPHCs, around 20% are currently under the control of DPHPM, while the rest is under ULBs. Eventually all the UPHCs are planned to be managed by ULBs. The establishment of the UCHC will be planned after the completion of UPHCs except Chennai where there are already being established. The dual responsibility of the State Government and ULBs for primary health care provision is one of the features of urban health. In rural areas, there are PHC and Health Sub-Centres meant for primary health care.

Table 4-5 below summarizes the standard services and procedures available at each level.

Table 4-5: List of services and procedures at primary, secondary and tertiary health facility

Level	Standard Services	Available Services/Procedures
Primary (UPHC) As per NUHM guideline and information from HFWD	Medical care: general Out-Patient Department (OPD), Reproductive and Child Health care (RCH), National Health Programme, Counselling, Social mobilization and community level activities, NCD clinic Basic laboratory services	<u>Diagnosis</u> – some UPHCs originated from maternal homes and/or with NCD screening clinics conduct blood sugar test with semi auto-analyser, colposcopy etc <u>RCH service</u> – some UPHCs originated from maternal homes conduct normal delivery, sterilization
Secondary (DHQH) As per the <i>Indian Public Health Standards (IPHS)</i> and information from HFWD	Above plus All health facilities <u>General specialties</u> General medicine, General surgery, CEmONC, Emergency, Poison treatment, Ophthalmology, ENT, Orthopaedics, Dermatology, Psychiatry, ICU, Dental, TB, AYUSH ⁴⁷ , Dialysis, Integrated Counselling and Testing Centre and antiretroviral therapy, Sexually Transmitted Diseases (STD), <u>Diagnostic and other para clinical services</u> Laboratory services including pathology and microbiology, Electro Cardiogram (ECG), X-ray, Sonography, Endoscopy, Compute Tomography (CT) scan Selected health facilities <u>Super specialties</u> Cardiology, Plastic surgery, Urology, Psychiatry, Diabetology	Above plus <u>Diagnosis</u> – Digital X-ray, CT-4 slices, Cardiac ultrasound (few selected hospitals) Laboratory services - Auto-analyzer, Elisa reader, Haematology analysers, Chemistry analysers, Electrolyte analysers, Urine analyser, etc. <u>General surgery</u> – Bone fractures, Appendicitis, Laparotomy Major surgery – Caesarian section <u>Specific treatment</u> Dialysis (in the process of installation to all DHQH)
Tertiary As per information from HFWD	Above plus <u>Super specialties</u> (not all tertiary health facilities have all the super specialties) Cardiology, Cardiothoracic surgery, Gastro-enterology, Surgical gastro-enterology, Plastic surgery, Electrophysiology, Nephrology, Urology, Neurosurgery, Oncology, Endocrinology, Geriatric medicine <u>Diagnostic services</u> Magnetic Resonance Imaging (MRI), Catheter laboratory services, Endoscopy services, Ultrasonography (USG), and others	Above plus All health facilities <u>Diagnosis</u> – MRI, CT scanners-128 slices, Microbiology <u>Major surgery</u> – Orthopaedic surgery by C-arm X-ray, Cancer procedures, Craniotomy Selected advanced Medical College Hospitals <u>Diagnosis</u> - SPECT-CT (one hospital) and Picture Archiving and Communication System (PACS) <u>Major surgery</u> - Heart surgery, Renal transplant, Neuro surgery, Micro-vascular surgeries, Catheter diagnostic and treatment by Angiography system, Chemotherapy, Radiation therapy by Cobalt-60 and LINEAC (one hospital), Rehabilitation by Ergometers

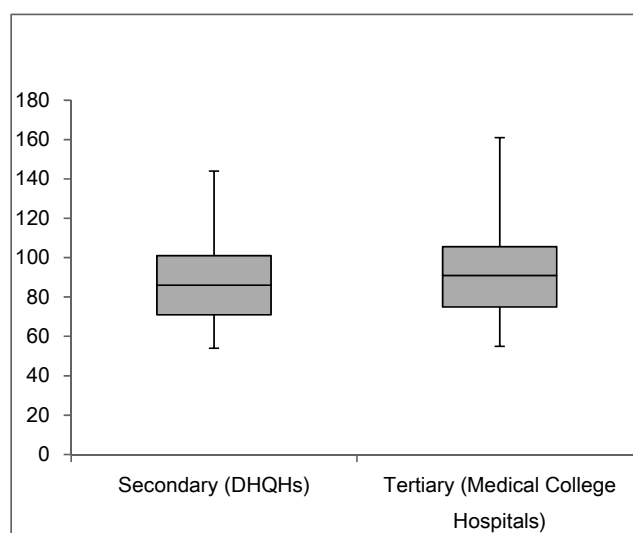
(Source: developed by survey team based on the various standards and guidelines and information from HFWD)

⁴⁷ AYUSH: Five disciplines of Indian Medicine – Ayurveda, Yoga, Unani, Siddha and Homeopathy/naturopathy.

(5) Capacity and Utilization

With respect to secondary and tertiary care in the State, the number of hospital beds is 22,901 at tertiary health facilities⁴⁸ and 24,696 at secondary health facilities⁴⁹. The number of public health facility beds is around 1.3 - 1.6 per 1,000 population in Tamil Nadu, higher than the India national average (0.9 per 1,000 population)⁵⁰, but much lower than OECD average (4.8 per 1,000 population)⁵¹.

Figure 4-6 shows the distribution characteristics of average Bed Occupancy Rate (BOR) in year 2014 in DHQs and Medical College Hospitals. Overall, the health facilities had high level of BORs. More than one fourth of both facilities had over 100% BOR and the range varied more in medical college hospitals than DHQs. The highest average BOR was 161% at tertiary level and 141% at secondary level. On the other hand, around one fourth facilities had BOR below 75% and the lower BOR was around 55% in both secondary and tertiary health facilities.



Note: y-axis shows BOR (%)
(Source: HFWD)

Figure 4-6: Range of BOR by level of facility

It is reported through various stakeholder consultations that many of the UPHCs are usually not utilized fully except for MCH services, due to the insufficient human resources and supplies and a misunderstanding that UPHCs provide only MCH, among other reasons.

(6) Quality of care

WHO defines Quality of Healthcare Services in six subsets – Patient centred, Equitable, Accessible, Effective, Safe and Efficient. *IPHS* are a set of standards to improve the quality of health care delivery targeting primary and secondary level developed under the NRHM. While they were

⁴⁸ Only count hospitals attached to the medical colleges and excludes special hospitals and peripheral hospitals under DME.

⁴⁹ Only count DHQs, Taluk Hospitals, Non Taluk Hospitals and excludes those special hospitals such as Women and Children Hospitals, Leprosy Hospitals, TB Hospitals/Sanatorium.

⁵⁰ World Health Statistics 2011

⁵¹ OECD Health at glance.

http://www.oecd-ilibrary.org/sites/health_glance-2013-en/04/03/index.html?itemId=/content/chapter/health_glance-2013-34-en&mimeType=text/html, accessed 8 August 2015

originally produced for rural areas, health facilities in Tamil Nadu aim to follow these as basic norms. However, the GoI realized that the quality of services and users' perspectives were overlooked, thus the *Operational Guidelines for Quality Assurance in Public Health Facilities* (2013) was developed to provide the system to strengthen quality assurance. Main Standards, categorised into eight Areas of Concern below, are set in the Guidelines.


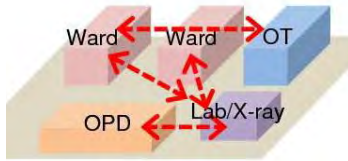

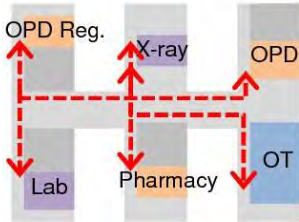
Table 4-6: Area of Concern under the Guidelines for Quality Assurance




No	Area of Concern	Main Standards
1	Service Provision	➤ Provision of curative services, diagnostic services, reproductive and maternal and child health, national health programmes, and services as per community needs
2	Patient Rights	➤ Provision of information on available services, ➤ Establishment of procedures for informing patients about treatment/medical condition, ➤ Maintenance of patient privacy, confidentiality, dignity, ➤ Service delivery in a sensitive manner to gender, religious, cultural need
3	Input	➤ Availability of infrastructure/equipment/supplies for assured services, ➤ Availability of qualified and enough human resources, ➤ Ensuring for physical safety
4	Support Services	➤ Establishment of procedure for inspection/maintenance of equipment and facility, and storage/inventory/dispensary of drugs ➤ Provision of safe, secure and comfortable environment to patients/visitors/ staff ➤ Compliance with statutory and regulatory requirement ➤ Establishment of procedure for public participation ➤ Availability of utilities and monitoring of outsourced service
5	Clinical Care	➤ Establishment of defined procedures for admission/registration/consultation/clinical services ➤ Establishment of defined clinical and diagnostic services
6	Infection Control	➤ Availability of infection control program/procedure, standard procedures for equipment, standard practices and materials for personal protection, ➤ Physical layout and environment control of patient care ➤ Availability of procedures for bio medical and hazardous waste
7	Quality Management	➤ Establishment of organizational framework for quality improvement, system for patient/ employee satisfaction, internal/external quality assurance programme, medical and death audit ➤ Availability of process to reduce wasteful action, ➤ Continuous improvement by practicing method/tools
8	Outcome	➤ Measurement of clinical and service quality indicators

(Source: Operational Guidelines for Quality Assurance in Public Health Facilities 2013, GoI)

Based on these standards, the tertiary and secondary health facilities were reviewed.

Table 4-7: The current status of tertiary health facilities

Area of Concern	Current Status
Service Provision	General specialty services are available in all health facilities. Provision of super specialties varies among health facilities as mentioned earlier.
Patient Rights	<ul style="list-style-type: none"> ➤ Grievances redressal system in public health facilities has been ordered by Government Order. ➤ Patient’s privacy (IP wards): Most of wards are “Nightingale” type 30 -50 beds large room, and patients have less privacy. ➤ Patient’s privacy (OPD): The number of out-patients surpasses the designed capacity, and they need to wait for long periods in congested waiting hall and receive diagnosis in open space with other patients.  <ul style="list-style-type: none"> ➤ Patient-centered health facility design: At some old-style health facilities, where pavilion-style building layout prevails, patients need to move long distance (sometimes, even outside the building during heavy rain) to receive necessary tests and diagnosis. This might be due to infrastructure expansion without master plan.  
Input	<p>【Infrastructure】</p> <ul style="list-style-type: none"> ➤ Space: Overall floor area per inpatient (IP) bed is about 42 m² even in Medical College Hospitals. Utilization is high as mentioned earlier and other inputs are generally short (equipment and human resources are discussed later). ➤ Buildings: Some of the existing buildings were constructed more than 50 to 70 years ago, and they are physically deteriorated and functionally out-of date. ➤ Scattered department and functions: Within a pavilion, relevant departments (which should be closely related each other) are sometimes located in scattered, and distant locations because of unplanned development over time. This causes great inconvenience and constraints to patients as well as staff to carry out comprehensive, effective medical care and training.  <ul style="list-style-type: none"> ➤ Barrier free: Accessibility for people with disability can be provided at the health facility entrance, elevator, waiting space, corridor, toilet etc.
Support Services	<ul style="list-style-type: none"> ➤ Procedures are established for general supporting services ➤ Operation and maintenance of facility and equipment should be improved for efficient and effective service delivery. ➤ Safety and comfortable environment for patients and visitors: Congestion, long waiting time, long and complicated circulation and dark/unclean places can be improved for better environment.
Clinical Care	<ul style="list-style-type: none"> ➤ Clinical procedures/protocol for different services are in place

Area of Concern	Current Status
Infection Control	<ul style="list-style-type: none"> ➤ Infection control program/procedures in place. <p>【Bio-safety Design】</p> <ul style="list-style-type: none"> ➤ Operation Theatre (OT) Block: Air quality control is not properly implemented in the OT block. Most of OT rooms do not have proper air quality control system with high efficiency particulate air (HEPA) filter and positive pressure. Currently, some OT rooms have more than two operation tables. <div style="display: flex; justify-content: space-around;">   </div> <ul style="list-style-type: none"> ➤ ICU & Neonatal Intensive Care Unit(NICU): Patient conditions are most vulnerable in these rooms, and most strict bio-safety control should be provided to prevent hospital-acquired infection. ➤ Central Sterile Service Department (CSSD): Management of sterile processing (decontaminate, inspect, assemble, package, sterilize and distribute all of the reusable patient supplies, instruments and equipment) needs to be improved. At CSSD in the most of hospitals, sterilized/ non-sterilized areas and material/equipment circulation flows are not properly separate. ➤ Bio Medical Waste (BMW) management: Basic practice is in place, however, adherence can be improved in OT areas. 
Quality Management	<ul style="list-style-type: none"> ➤ Organizational framework for quality improvement is in place ➤ System for patient and employee satisfaction assessment is not in place ➤ OT management: OTs are scattered in different buildings. This makes it difficult to manage OTs effectively and efficiently.
Outcome	<ul style="list-style-type: none"> ➤ While HMIS is being introduced, data collection and reporting to the concerned authority is conducted regularly.

(Source: Survey Team)

Table 4-8: Current status of secondary health facilities

Area of Concern	Current Status
Service Provision	<ul style="list-style-type: none"> ➤ General specialities are available in all health facilities. ➤ Several health facilities got accredited by the National Accreditation Board for Hospital and Healthcare Providers (NABH).
Patient Rights	<ul style="list-style-type: none"> ➤ Grievances redressal system in public health facilities has been ordered by Government Order
Input	<ul style="list-style-type: none"> ➤ Utilization (BOR) is quite high in some of the health facilities as mentioned earlier. Infrastructure and other inputs are in short in general (equipment and human resources are discussed later). ➤ Barrier free: Accessibility for people with disability can be improved at the health facility entrance, elevator, waiting space, corridor, toilet etc.
Support Services	<ul style="list-style-type: none"> ➤ Programmes/procedures are established for general supporting services. ➤ Operation and maintenance of facility and equipment can be improved for efficient and effective service delivery.
Clinical Care	<ul style="list-style-type: none"> ➤ Introduction and training on clinical treatment guidelines and rational use of medicine have been conducted.
Infection Control	<ul style="list-style-type: none"> ➤ Infection control program/procedure is in place. ➤ Other hospitals than the ones with NABH, bio-safety control (air quality control) and sterile processing can be improved. ➤ Bio medical waste management system is established.

Area of Concern	Current Status
Quality Management	<ul style="list-style-type: none"> ➤ Quality circles (consisting of various staff to monitor/improve quality of care) are established. ➤ Suggestion box placement and discharge feedback are conducted to obtain feedback from patients/public regularly. Patient satisfaction survey is not conducted.
Outcome	<ul style="list-style-type: none"> ➤ HMIS in in place. Quality Care Indicators (explained below) are collected regularly and used to measure the quality status.

(Source: Survey Team)

HFWD has taken steps to improve the quality of secondary health facilities first through the analysis of quality of clinical care indicators, training on rational use of medicine, development/application of clinical treatment guidelines etc. which are planned to be extended to the other levels. Assistance for acquiring above mentioned NABH accreditation has also been provided for selected health facilities.

The clinical care indicators consist of three categories - structure indicators, process indicators and outcome indicators (Table 4-9). The chief medical officer of each health facility is responsible to ensure collection of the reports from designated officials by first of every month for the preceding month. The reporting formats for the indicators have been uploaded in the HMIS online data collection website.

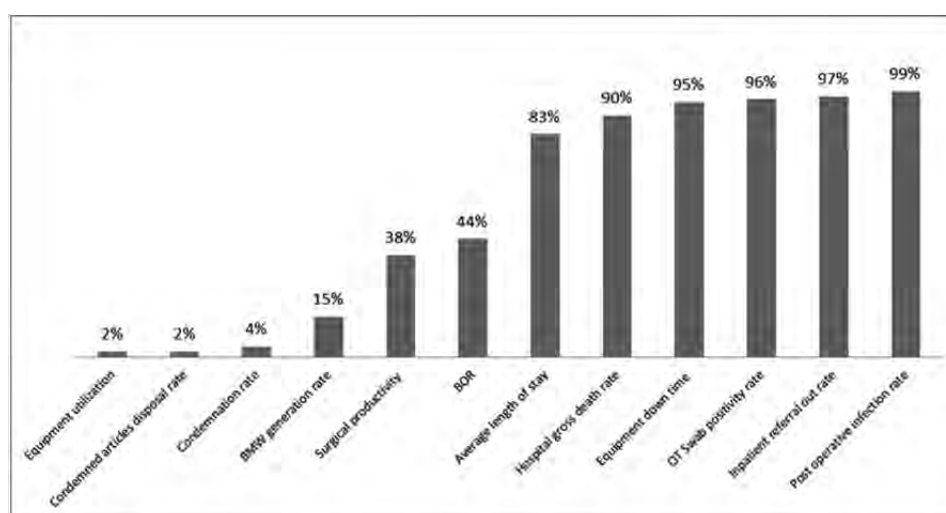
Table 4-9: List of Quality Care Indicators (QCIs) for secondary health facility

Type	Indicator	Value interpretation
Structure Indicator (the type and amount of resources used by a hospital to deliver services)	1. Bed Occupancy Rate	Higher value is better. If the value is more than 100, it is to be seen whether the quality of care is not compromised due to overcrowding.
	2. Average length of stay	Not exceed 5 days (in secondary hospital).
Process Indicators (activities & tasks undertaken to achieve service objectives)	3. Total number of major surgeries excluding sterilization, cataracts and total number of sterilization performed in the hospital	Higher value is better. If the value is more than 10%, it is considered satisfactory.
	4. Total number of patients subjected to investigations and radiological services in the hospital. (clinical lab tests, X rays, ECGs, scan etc.)	Higher value is better.
	5. Night time caesarean rate	Higher value is better.
	6. Total number of days ventilator was put into use against the total number of days the ventilator was in usable condition	Higher value is better. If the value is 30% it is appreciable. If the value is less than 25%, it means compromised quality of health care service.
	7. Total number of swabs taken from the operation theatre	Nil the value is better.
Outcome Indicator (consequence, result or impact of an intervention that may or may not be intended)	8. Post-operative wound infection rate	Lesser the value is better. If the value is less than 5%, it is considered satisfactory.
Process Indicator	9. Amount of BMW generated in the hospital during the month	Optimal value is better.

Type	Indicator	Value interpretation
Structure Indicator	10. Total number of days an equipment is kept idle without functioning for want of repair.	Lesser the value is better.
Outcome Indicator	11. Total number of deaths including new born in the hospital after becoming as IP.	Nil value is better.
Outcome Indicator	12. Hospital IP referral out rate	Lesser the value is better.
Structure Indicator	13. Number of unserviceable equipment and hospital accessories condemned during the month against the total number of unserviceable equipment and hospital accessories awaiting condemnation in the hospital.	Higher value is better. At least 10% of the accumulated articles have to be condemned and disposed.
Structure indicator	14. Condemned hospital equipment and accessories disposal rate	Higher value is better. At least 50% of the accumulated condemned articles have to be disposed during the month.

(Source: GoTN, TNHSP. 2012. Training manual (Third Edition April 2012) on QCIs)

Figure 4-7 shows the status of QCI at secondary health facilities.



(Source: HFWD)

Figure 4-7: % of secondary health facilities which achieved satisfactory level with QCI in June 2015

4.3 Human Resources

4.3.1 Current Status of Human Resources

In Tamil Nadu, the registered number of doctors is currently 112,950⁵² according to the Medical Council of India (MCI)⁵³. It means that there is one doctor per around 650 citizens and this is better than the recommendation of one doctor per 1,000 citizens by the High Level Expert Group for UHC⁵⁴. About 23,000 doctors work in public health facilities which are above 20% of registered number and the state also has a robust insurance programme taking advantages of the private sector. In secondary

⁵² Registered number is not exactly equal to working numbers. Some registered doctors have been already retired or not working by some reasons so that the number of working doctors will be slightly smaller.

⁵³ Medical Council of India, <http://www.mciindia.org/> accessed 23 July 2015

⁵⁴ High Level Expert Group Report on UHC for India, Planning Commission of India, November 2011

and tertiary sector, there are certain vacancies in specialities which are being dynamically addressed.

Table 4-10: Human Resources at Tertiary and Secondary Health Facilities in Tamil Nadu

	Tertiary			Secondary		
	Sanction	In Position	Vacant	Sanction	In Position	Vacant
Doctors	7,097	5,490 (77%)	1,607 (23%)	3,972	3,030 (76%)	942 (24%)
Nurses	8,019	7,630 (95%)	389 (5%)	6,418	5,315 (83%)	1,103 (17%)
Paramedical	6,273	3,305 (53%)	2,968 (47%)	4,991	3,342 (67%)	1,649 (33%)

(Source: Tertiary - DME, HFWD, March 2015; Secondary - DMRHS, HFWD, March 2015)

Paramedical staff have the highest vacancy as it was reported that there are not enough training courses, low incentives compared to other medical staff, heavy work-load, etc. Hence it seems the existing paramedical staff are short in the supply market⁵⁵. However, every year more than 5,000 students graduate from various courses.

For urban primary health level, the number of doctors for the UPHCs under DPHPM is almost fulfilled, but there are vacancies of paramedical personnel. The primary health personnel under ULBs had a specific issue. As the benefits and career development opportunities of health workers under ULBs employment were limited compared to the ones of the State government besides budget constraints, usually ULBs found it difficult to recruit the required number of the qualified health workers. In response to this situation, the State Government took the decision to take over the recruitment process of ULBs for the UPHC health personnel. The personnel will be deputed to UPHCs as State Government employees and paid by the NUHM budget.

The Medical Services Recruitment Board (MRB) has been established with the objective of directly recruiting various categories of staff in HFWD. Prior to the formation of MRB, the authority for direct recruitment was vested with different officials of various directorates. The Government has decided to recruit all the medical staff in HFWD, under one roof, so as to speedily fill up the vacant posts in various government medical institutions. MRB has recruited 14,195 personnel till October 2015. Of them, 5,506 were doctors including 630 surgeons and 67 dental surgeons.

4.3.2 Medical Education

Dr. M.G.R Medical University has 20 affiliated Medical Colleges and other health facilities such as pharmacy, nursing and allopathic medical courses, ayurvedic courses as well as some private medical colleges. It is the only Medical University in Tamil Nadu capable of awarding degree to maintain uniform and high standards of medical education.

DME is responsible for the establishment and maintenances of these teaching institutions.

⁵⁵ Hearing from HFWD, GoTN

Table 4-11: Public Sector - Under Graduate and Diploma Courses in Tamil Nadu (2013-14)

Course	Duration	No. of Seats
MBBS*	5 ½ Years (Including 1 year CRRI*)	2,555
BDS* (Dental)	5 Years (including 1 year CRRI)	100
B.Sc (Nursing)	4 Years	250
Post Basic B.Sc (Nursing)	2 Years	90
B.Sc Radio Diagnosis	3½ Years (Including 6 months compulsory resident internship)	60
B.Sc Radio Therapy	3½ Years (Including 6 months compulsory resident internship)	20
B.P.T.(Physiotherapy)	4 ½ Years (Including compulsory 6 month CRRI)	50
Bachelor of Cardio Pulmonary Perfusion Technology	3 Years	10
Bachelor of Pharmacy	4 Years	120
BASLP	4 Years (Including 1 year internship)	25
Diploma in Nursing	3 Years	2,000
Diploma in Pharmacy	2 Years with 500 hours (3 months of Hospital Training)	240
Para Medical Courses (23 courses)	3-4 Years	5,690

Note: CRRI (Compulsory Rotatory Residential Internship) is one-year compulsory work in the hospital attached to the medical college or in any other approved hospital as allowed in some medical colleges.

Abbreviations: MBBS= Bachelor of Medicine and Bachelor of Surgery, BDS= Bachelor of Dental Surgery,

B.Sc= Bachelor of Science, B.P.T= Bachelor of Physiotherapy,

BASLP= Bachelor in Audiology and Speech Language Pathology

(Source: DME, HFWD)

The GoTN has been trying to increase the number of medical personnel by establishing new Medical Colleges and getting permission from MCI to increase the seats. For example, in the last two years, 610 MBBS seats have been added, increasing available seats from 1,945 in 2011-12 to 2,555 in 2013-14. The State Government plans to have at least one Medical College per district⁵⁶.

In addition, Tamil Nadu Medical Colleges have established all the five disciplines (Siddha, Ayurvedha, Unani, Yoga and Naturopathy, Homoeopathy) of Indian Systems of Medicine and there are courses available for Under Graduate and Post Graduate (PG) levels. There is the Directorate of Indian Medicine and Homoeopathy who has responsibilities for making the Indian System of Medicine a complementary system of medicine, developing educational institutions, encouraging research and so on.

There are PG courses for the specialty and super specialty courses.

⁵⁶ Policy Note 2014-2015, HFWD, GoTN

Table 4-12: Public Sector - Post Graduate Courses in Tamil Nadu (2013-14)

Course	Number of Specialties	Total Intake Capacity
PG Degree	23	757
PG Diploma	15	403
MDS (Dental)*	8	40
Higher (Super) Specialties	16	191
M. Pharmacy	4	64
MSc (Nursing)	5	65
MSc (Medical Physics)	1	10
M.Phil (Clinical Social Work)	1	15
MSc (Molecular Virology)	1	21

*MDS: Master of Dental Surgery

(Source: DME, HFWD)

HFWD is trying to improve quality of education through training of senior faculty in teaching methods and encouraging continuing medical education for health personnel. Constant effort is made to improve the professional skills, their communication and interpersonal skills.

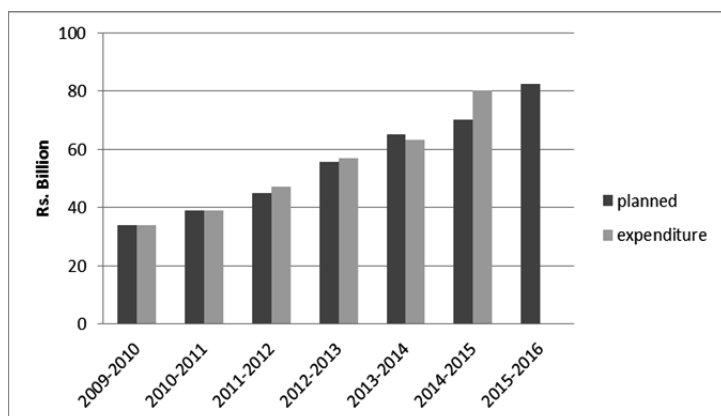
Apart from educational training, in-service training programmes are organized for health officers, medical officers, field health functionaries, nurses and other paramedical staff by the GoTN. Most commonly, they are organized/conducted based on the national programmes. Particularly, training on reproductive and child health is well covered in terms of the quality and quantity focusing on the primary level. The training for clinical areas is conducted at the secondary and tertiary level within their institutions based on needs and priorities. The TNHSP has been conducting training courses mainly for secondary and tertiary level in the areas of clinical skills as well as leadership, administration and hospital management. Regarding the primary level, there are currently seven training institutions⁵⁷ under DPHPM and the training is conducted regularly for the doctors, staff nurses, ANMs, and lab technicians. The main focus of the training is on maternal and child, and reproductive health. The institutions are also used for training of other levels of health personnel.

The GoTN has been trying to address the shortage of doctors and paramedical staff for public hospitals by establishing the MRB. Filling a vacancy gap would be the priority for the State, however, it would be important to have a strategic plan to meet the increasing demands.

⁵⁷ Seven training institutions are located – two in Chennai, one each in Villipiram, Madurai, Salem, Dindigul and Pudokottai..

4.4 Health Financing

4.4.1 Public Financing in Tamil Nadu



(Source: Secretariat, HFWD 2015)

Figure 4-8: Year Wise Budget for HFWD

The GoTN almost doubled budgetary allocation for health from Rs.43.953 billion in 2010-2011 to Rs.82.454 billion in the budget estimates for 2015-2016, which is 5% of the overall allocation of the GoTN⁵⁸. It was reported that the State health budget is increased by 10% every year as per the agreement with the GoI.

Health expenditure comprises of medical & public health and family welfare. Over 80% of health expenditure was concentrated on medical and public health services while 17% went to family welfare, which largely comprises of maternal and child health and rural family welfare services in 2014-15 in Tamil Nadu.

The health budget consists of the State budget, centrally sponsored budget and State shared budget, and is divided into the Non-Plan budget for recurrent costs like salary and consumables and the Plan budget for non-recurrent costs.

Table 4-13: Expenditure breakdown in 2014-15 (Rs. Billion)

Non-Plan	Plan			Total
	State	Central	Shared	
41.427	19.472	8.337	11.039	80.275
51.6%	24.3%	10.4%	13.8%	100%

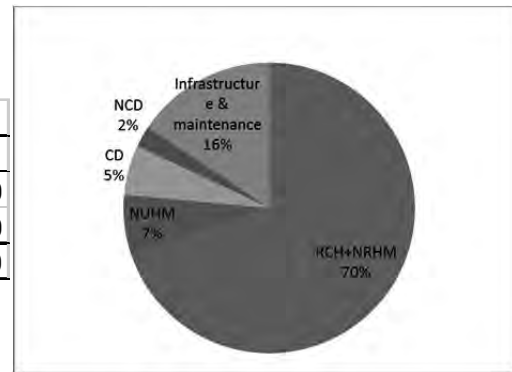
(Source: HFWD)

4.4.2 Budget and Expenditures on NHM, Tamil Nadu

NHM budget is State shared budget. The sharing pattern of the fund in the first year was 75:25 in 2013. The total centrally sponsored budget for NHM in Tamil Nadu has five flexible pools, namely RCH, NRHM, NUHM, disease control, and infrastructure and maintenance. The NHM budget in Tamil Nadu as well as the State share increased 2.7 times and from 25% to 58% from FY 2013-14 to FY 2014-15.

⁵⁸ GoTN. 2015. Speech of Thiru O.Panneerselvam, Hon'ble Chief Minister

Approved budget as per ROP 2014-2015 (Rs. Million)		
	FY 2013-14	FY2014-15
Central share released	789.9	1,182.80
State share released	263.3	1,658.10
Total	1,053.20	2,840.90



(Source: HFWD, Tamil Nadu)

Figure 4-9: Approved budget as per Report of Proceedings (ROP) 2014-15

4.4.3 Financial Protection

There is no data available to understand what percent of urban population are not protected by any health insurance in Tamil Nadu. According to the national health survey, 82% of urban population and 86% of rural population are not protected in terms of health expenditure in India. Among the rest of population under health protection coverage, most cases are under government funded insurance schemes⁵⁹.

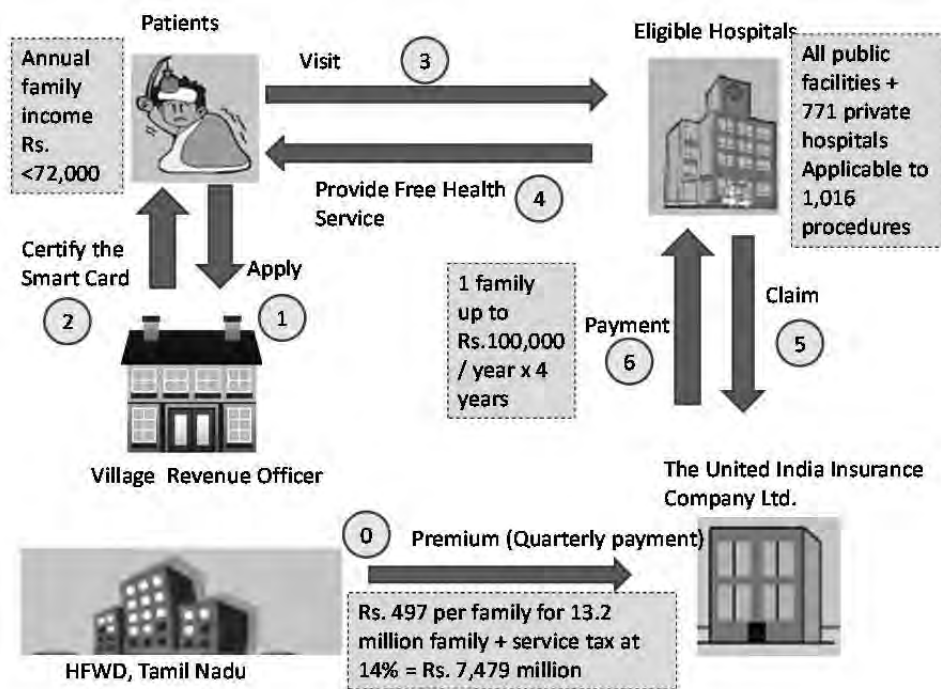
(1) Chief Minister's Comprehensive Health Insurance Scheme

The GoTN launched the "Chief Minister's Insurance Scheme for Life Saving Treatments" in 2009. The current State Government re-launched it with the name of "Chief Minister's Comprehensive Health Insurance Scheme (CMCHIS)" in 2011. An eligible family, whose annual family income is less than Rs.72,000, can receive free health services for a total value of Rs.100,000 per year during the period of 2012 to 2016. The scheme covers 1,016 procedures, including 23 diagnostic procedures and 113 follow up procedures.

As of July 2015, all public health facilities and 771 eligible private health facilities (114 single specialty and 657 multiple specialty hospitals) offer health services under this scheme. Approximately 70% of total households (13.2 million families) have been covered through this scheme. While the health services are free of cost in the public health facilities except a few costly diagnostic examinations, the benefits of having this insurance for patients are: cashless, free services at empanelled private health facilities, less likelihood of waiting period for hospital admission, and access to a special ward with air conditioner at public health facilities. The main benefit for health facilities is receiving the discretionary money from the insurance company which can be used for civil work, consumable purchase and staff incentives. The limitation is that this scheme does not cover all essential health care needs at all level of health facilities⁶⁰.

⁵⁹ National Sample Survey Office. GoI. 2015. "Key Indicators of Social Consumption in India Health (January-June 2014)". NSS KI (71/25.0)

⁶⁰ Most services covered by the insurance schemes are secondary and tertiary level of care.

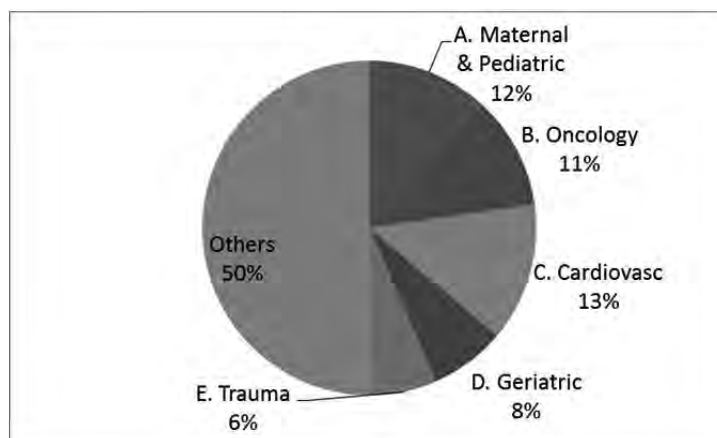


(Source: developed by Survey Team based on meeting with HFWD)

Figure 4-10: System of CMCHIS

As of 5 July 2015, total accumulated cost of the scheme from January 2012 is approximately Rs.23.7 billion for over 1.1 million cases⁶¹. On average Rs.6.84 billion was annually used. For the year 2015-2016, Rs.7.575 billion is allocated to this scheme⁶².

The most used category from January 2012 to July 2015 was medical oncology (163,553 cases) followed by nephrology (157,026 cases) and Ear, Nose, and Throat (ENT) (87,940 cases). Among the package/procedure, maintenance of haemodialysis for chronic renal failure (nephrology) is the highest number of services (143,912 cases) followed by hearing aid and ureteroscopic lithotripsy. The highest cost per case was transplantation (Rs.142,824) followed by cardiothoracic surgeries (Rs.81,003) and replacement (Rs.68,014).

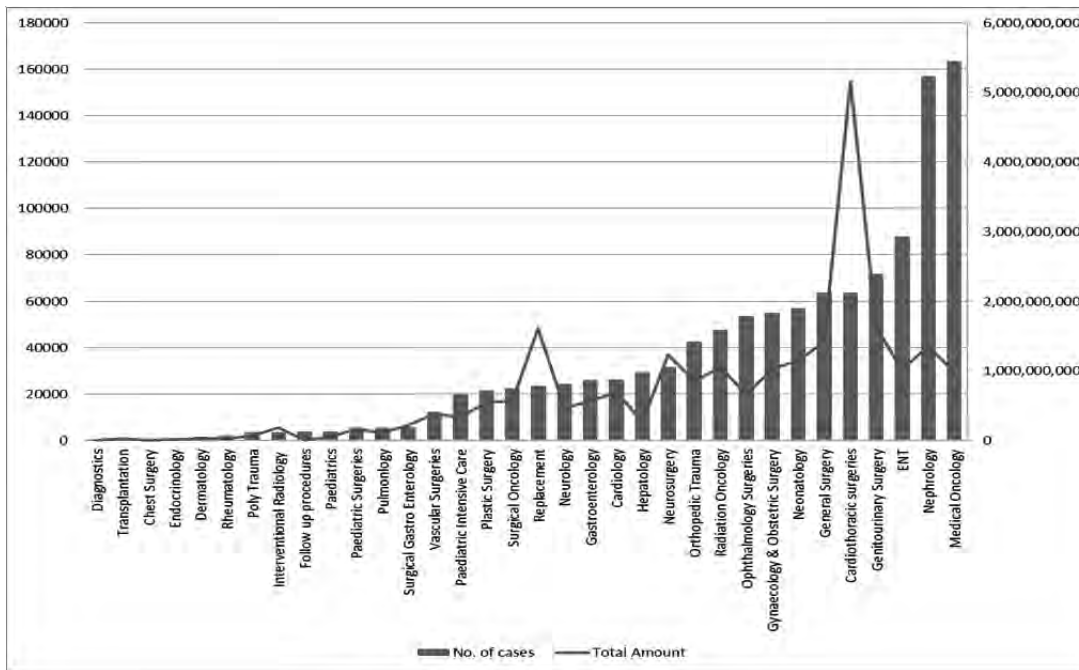


(Source: HFWD)

Figure 4-11: Proportion (amount) of packages and procedures by category 2012 to 2015

⁶¹ Hearing from TNHSP, 2015

⁶² GoTN, 2015, Budget speech



(Source: HFWD)

Figure 4-12: Total Number of Cases/Category and Total Amount from 11 January 2012 to 13 July 2015

(2) Dr. Muthulakshmi Reddy Maternity Benefit Scheme

The maternity benefit to poor pregnant women covers approximately 600,000 women annually to ensure adequate ante-natal and post-natal care and institutional delivery, nutritional support and immunization. Under the programme, Rs. 12,000 is paid in three installations for each of two deliveries to the poor pregnant women.

In addition, the GoI provides several types of insurance schemes.

(3) Employee's State Insurance

ESI aims to provide financial protection to those in the lowest income groups. For all employees earning Rs.15,000 or less per month as wages, the employer contributes 4.8% and employee contributes 1.8% of gross salary per month, total share is therefore 6.5%. The GoTN also makes a contribution. ESI covers medical care through ESI hospitals or through designated outside providers and cash compensation for loss of wages or earning capacity while in service

(4) Group Insurance Scheme to Sterilization Acceptors

Renewed family planning indemnity insurance scheme provides compensation for death, failure of sterilization, cost of treatment arising out of complication from the date of discharge, indemnity insurance per doctor per facility, and loss of wages to the sterilization acceptors.

(5) Rashtriya Swasthya Bima Yojana (RSBY)

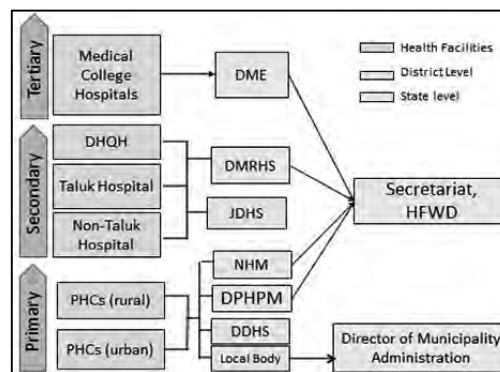
RSBY targets BPL people of unorganized sectors in India. Eligible families can use up to Rs.30,000 per year, per family for diseases requiring hospitalization. Beneficiaries need to pay only Rs.30 as registration fee.

4.5 Health Information

The state-wide HMIS has been introduced since 2008 in a phased manner to provide health data for quick and timely intervention by health directorates. As of July 2015, it was expanded to all primary health centres and secondary health facilities and has started pilot tests to upscale and implement at tertiary health facilities.

The HMIS consists of the following four components:

- HMS: to manage patient's data including past treatments and prescriptions
- Management Information System (MIS): to unify health reporting system such as quality of clinical care indicators, human resource management, stock management, asset management
- College Management System (CMS): to upload medical college specific content
- University Automation System (UAS): to automate necessary paperwork for faculty as well as students



(Source: HFWD)

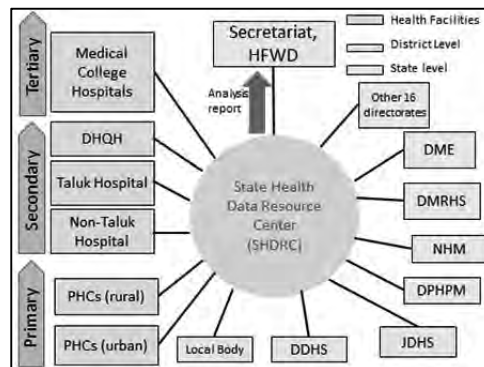
Figure 4-13: Current HMIS Flow in Public Health System in Tamil Nadu

Each patient receives a PIN number, a unique 15 digit code consisting of district code, level of facility code, hospital code and patient code. With this PIN number, all HMS connected health facilities can have access to patients' medical history.

The current challenge of this system, however, is patients' low awareness of their PIN number. Many patients are not aware of their PIN number and tend not to carry the number when they go to the health facility each time and therefore the facility needs to create a new number again, failing to link them to their previous health records. Other findings from the survey interviews at several health facilities suggest the health staff face difficulty in entering their patient data on the spot due to shortage of electrical power and to avoid additional waiting time for patients in overcrowded health facilities, causing them to enter the data after work is completed.

During the survey, however, benefits of MIS became clear through timely data sharing from DMRHS. On the other hand, regular analysis is still limited to certain indicators at State level. MIS has strong potential to strengthen the quality of health services through timely utilization of data.

HFWD planned to develop the State Health Data Resource Centre (SHDRC) to integrate health related information from all 20 directorates as well as all public health facilities so that HMIS data can be analysed and utilized for planning, M&E at each level of stakeholders⁶³.



(Source: HFWD)

Figure 4-14: Plan of SHDRC and expected HMIS Flow in Tamil Nadu

4.6 Referral System

Free access is the policy of the GoTN and there is no gate keeping system at all level of public health facilities. Therefore patients can freely choose their health facility and gain higher courses of treatment without referral and get treated more quickly without waiting months for making appointments.

Although it is not mandatory, the referral system exists in Tamil Nadu and certain numbers of public facilities as well as private health facilities use referral forms to refer patients. Each patient page in HMS has a section for referral information about the facility of referral in and out. Once HMIS is introduced to all tertiary health facilities and linked with all level of health facilities, HMIS has potentiality to strengthen referral and back referral system.

(1) From community to primary health facilities

Two teachers from each school are trained in identifying common illnesses of students for follow up action with the doctors. Students in need of higher medical treatment are referred to health facilities. ICDS Centres provide health check-up to children below 6 years of age and pregnant and lactating mothers. During health check-up and growth monitoring, sick or malnourished children who need prompt medical attention are referred to the nearest primary health centre or its sub-centre with referral form and the records are kept in the centre including results of referral. The Anganwadi workers⁶⁴ are also oriented to detect disabilities in young children and develop a special register and refer them to the nearest primary health centre.

(2) From primary health facilities to secondary or tertiary hospitals

Primary health facilities are meant to ensure that every pregnant woman is tracked and provided with

⁶³ Without SHDRC, each directorate has only access to own directorate's relevant health information and cannot see any information under the other directorate.

⁶⁴ Anganwadi worker is trained person who is allotted to ICDS centre to provide health and educational services.

institutional care and service during ante natal, natal and postnatal period. The higher risk mother identification is done at primary level and then referred to Basic Emergency Obstetric and Newborn Care (BEmONC), CEmONC and other higher referral services.

(3) From secondary hospitals to tertiary hospitals

IP referral out rate⁶⁵ is monitored as one of the quality of clinical care indicators at secondary health facilities. The indicator intends to prevent any unnecessary shift of the patients despite having resources in the admitted facility. Approximately 60% of secondary health facilities referred out less than 5% of total IP⁶⁶.

(4) From one tertiary hospital to another tertiary hospital

As mentioned in 4.2 Health Services, several new Medical College Hospitals need strengthening with certain super specialities such as vascular surgery, surgical and medical oncology, or neurosurgery. Therefore, they are obliged to refer out patients in some cases to other advanced Medical College Hospitals. Hence each full-fledged health facilities naturally plays a role of regional core centre.

4.7 Medical Equipment and Medical Supply Chain System

This section describes the current situation and some issues on supply system for medicines and drugs and medical equipment in Tamil Nadu.

4.7.1 Market for Medical Equipment

Most medical equipment used in India including Tamil Nadu is imported. Especially, high-performance equipment almost depends on imports. Local equipment manufacturers of India can be classified as:

- (1) Local subsidiary of a manufacturer of foreign origin
- (2) Joint venture of a manufacturers of foreign origin and a local company, and
- (3) Pure local manufacturers.

In the case of the local subsidiary and joint venture of the overseas manufacturers, they often hold an advanced manufacturing facility in India, which is supported by the research centre in the foreign countries. Most of the local manufacturers are specialized in the production of low-priced material, and consumable supplies. The foreign-affiliated equipment manufacturers in India have built a local sales system as follows:

- (1) Inflection of a local agent covering the whole country
- (2) Utilization of multiple local agents
- (3) Establishment of local corporations or a joint venture with a local company

The high-ranking countries that export medical equipment to India (as per 2009 data) are United States (33%), Germany (18%), and Japan (7%)⁶⁷. The major export items are imaging diagnostic devices.

⁶⁵ It is the sum of all the patients including new born who were referred out due to non-availability of services and manpower during the month. The number of all patients who have left against medical advice or who have left at request and all out outpatients are excluded.

⁶⁶ According to HMIS data, 2 hospitals referred out more than half of inpatients in June 2015

⁶⁷ JETRO, 2012, Medical Equipment market and regulations in India, page 35

4.7.2 Procurement system for Medicines and Drugs

Pharmaceutical products in India are classified roughly in the public section route of health facilities under the State Government jurisdiction, and in the personal section route of private health facility and its in-hospital drugstores, and the retail store of the town.

In Tamil Nadu, HFWD has entrusted supply of medical material such as drugs and consumables, and medical equipment for public health facilities to TNMSC. TNMSC procures medical material through a bidding procedure directly from pharmaceutical products manufacturer. TNMSC maintains a list of essential drugs in which generic drugs are procured and supplied to health facilities. In addition, there is a regulation that the new medicines are not adopted as a drug for public health facilities unless it has circulation history more than three years in the market.

TNMSC is the organization under HFWD adopting a streamlined procedure for their procurement, storage and distribution of all essential drugs and medicines to the public health facilities throughout Tamil Nadu, It was established in 1994 and has commenced functions of purchase, storage and distribution of drugs and medicines since 1995 (Detail services provided by TNMSC is attached in Annex 3).

(1) Drugs: The funds for utilization of drugs are allotted to the public health facilities once a year based on the requirement of the previous year for that particular health facility. Addition and deletion of funds is decided once a year by a Committee consisting of heads of the departments of various health facilities. Each health facility is issued a passbook with the allotment amount and they can utilize the amount for purchase of drugs from the TNMSC warehouse once in every quarter. At present, drug warehouses are available at 25 locations in various districts of the State. If required, the health facility can give a letter of consent and purchase the second quarter's utilization in the first quarter if they have the need for it. Additional allotment is given to a health facility institution depending on the need.

Drug provision is also based on the category of the drug which is classified into three groups: Essential Drug, Surgical Drug and Specialty Drug.

Table 4-14: Type of drugs

Type	Provision
Essential Drugs	utilized on a daily basis and provided at one go for the whole year based on the need of the previous year
Surgical Drugs	utilized on the basis of surgeries happening and provided twice a year (once in 6 months) based on need
Specialty Drugs	utilized on the basis of the specialty and provided four times a year (once a quarter) based on the need of the previous quarter

The medical administration is given 10% of the funds for local purchase in case of emergency or for a life-saving need, or if a particular drug is necessary but is not available in TNMSC Warehouses. Certain percentage of earnings under the CMCHIS can be utilised for purchase of drugs and consumables.

(2) Medical equipment: All medical equipment above the value of Rs.500,000 is procured through TNMSC. The equipment cost is fixed through the open tender. The budget for equipment is allotted once a year and should be utilized as per the need. If the original budget is exhausted and there is a need for additional budget, it is provided as a revised budget. Purchase of equipment costing less than Rs.500,000 can be authorized by the Deans/Medical Superintendents of the institutions. Procurement of equipment costing less than Rs.1 million should be authorized for purchase with the consent of DME. Procurement of equipment costing above Rs.1 million should be authorized for purchase with a Government Order by sending a request to HFWD through DME/DMRHS.

4.7.3 Quality Controls

(1) Quality control for drugs and medical equipment

The current situation of quality control on medical equipment and drugs is described as follows.

1) Medical equipment: Medical equipment either has been regulated as a drug, or has not been regulated at all to date. The Health Care Authority of India plans to set up guidelines to define the medical equipment as different category from drugs, and to regulate the sector. Currently, the Central Drugs Standard Control Organisation allied to the MoHFW to approve on importing, manufacturing and distributing medical equipment in India.

2) Drugs: The drug policy has introduced Good Manufacturing Process (GMP) in India since 1987. The quality of drugs, which are manufactured, sold, and marketed in India has been regulated and the GMP has been introduced in the Schedule M of Drugs & Cosmetics Rules, 1945. Principally, the drugs which do not meet the GMP are not allowed to be imported, manufactured, stored, sold, and marketed. The manufacturers or dealers will be fined or jailed if they manufacture or sell products that are (i) substandard, (ii) illegal, (iii) forged, or (iv) of less purity than the legal standard.

(2) Equipment maintenance

For major items of equipment, which cost more than Rs.1 million, generally annual maintenance service is secured in such a way that warranty for three years is included in the initial contract amount, and provision of the annual maintenance contract on payment basis with prefixed rate for seven years is stipulated in the said contract. For the most expensive items such as MRI and CT scanners, TNMSC has been directly running and managing the maintenance under the service contract with local vendors/manufacturers. The equipment which is not covered by the maintenance services contract is maintained by the health facility locally.

For each district, one Biomedical Engineer (BME) has been assigned through the TNHSP to manage medical equipment of all the public health facilities. For the Medical College Hospitals, a few BMEs are generally stationed at each facility in order to assure all the equipment are working well and keep an inventory of them. When they identify a failure of medical equipment, they verify the status and call the service agent covered by the annual maintenance service contract. If the items are not covered by the said contract, such equipment is repaired through a local vendor to rectify the deficiency. The

challenge is that maintenance services provided by the local agents are not always sufficient due to the lack of technical knowhow or some other reasons.

(3) Quality assurance of equipment performance

According to the survey interviews, quality control especially on the laboratory equipment for clinical examinations needs to be improved. It is desirable for health facilities to organize and maintain a quality assurance committee to facilitate quality control in order to secure accurate diagnosis and make an early detection of equipment failure by users themselves. It is desirable that BMEs and/or hospital staff members make a periodical check in accordance with service manuals and the staff members receive periodically user training to keep proper way of the equipment operation.

4.7.4 Equipment Supply

It was observed that the medical equipment is in short supply in some areas vis a vis the increasing demand. Constant endeavour is made to improve and update the medical equipment to meet the increasing demand. While the demand varies across facilities and it is difficult to generalize the situation, common findings are summarized below.

(1) Tertiary level

Except a few facilities, demands are high in imaging⁶⁸, endoscopy, and surgical operation items. One of the factors is the high incidence of trauma and orthopaedic cases. Cardiovascular, neuro and cancer treatment and obstetrics and gynaecology operations are also increasing. As the diabetic patients are increasing rapidly, the needs for treatment of complications especially dialysis are prominent. Based on the hypothetical calculation by the Survey Team with the average district population, the diabetes prevalence rate and the standard in Japan, it would be calculated that a district would require 540 dialysis units in Tamil Nadu However in reality, the majority of tertiary health facilities are equipped with 2-5 units and secondary health facilities with 2 units in average. The dialysis facilities need augmentation. In terms of human resources, it was reported that while some technicians are in short supply, deployment has gradually improved in response to the facility needs.

Table 4-15: Current status and requirement at tertiary health facilities

Department	Standard Equipment	Current status and Requirement
Examination		
Imaging	Digital/conventional X-ray CT Scanner MRI Mammography Interventional Radiology (IVR) angiography Position Emission Tomography (PET) scan	<ul style="list-style-type: none"> ➤ CT scanners and MRI CT (4 slices) and MRI (1.5 tesla) are available in all hospitals, whereas, CT scanner (16 slices) and MRI (3 tesla) are only available in selected hospitals. Most hospitals require more numbers due to increasing service demand and upgrading to 128 slices to deal with cardiac cases. It is essential to equip imaging department with Picture Archiving and Communication System (PACS) for teleconference. ➤ Mammography

⁶⁸ It is reported that the CT scanner and MRI run 24 hours in many hospitals and the utilization of one CT scanner is 120 -200 test/day. There is a long patient waiting list for one week or more.

Department	Standard Equipment	Current status and Requirement
		<p>Some hospitals have not been equipped with the unit, required for breast cancer diagnosis.</p> <ul style="list-style-type: none"> ➤ IVR <p>Five hospitals have been equipped, which require new procurement and also upgradation to hybrid operation system to cope with cardio and neuro patients.</p> <ul style="list-style-type: none"> ➤ PET <p>Some major hospitals require upgrading the level of cancer diagnosis. At present no public hospital has PET and efforts are on to install it.</p>
Endoscopy	Gastro fiberscope Duodenoscopes Colonoscope Bronchofiber scope ENT rigid scope Laparoscope	<ul style="list-style-type: none"> ➤ Gastro fiberscope <p>Most hospitals have a few sets of different types of endoscopy, but require greater numbers due to increasing service demand. Some hospitals also require upgrading with recording software and recorder.</p> <ul style="list-style-type: none"> ➤ Laparoscope <p>Most hospitals have a few sets, and require increasing numbers to meet present service demand including replacement of obsolete one.</p>
Physiology	Ultrasound machine ECG Portable echocardiogram	<ul style="list-style-type: none"> ➤ Ultrasound machine <p>Most hospitals have this unit and require more units as well as replacement of existing obsolete items. Some major hospitals require 1-2 sets of 4D USG with Doppler for cardiac cases.</p> <ul style="list-style-type: none"> ➤ ECG, Portable echocardiogram <p>These are well equipped.</p>
Laboratory	Haematology and biochemistry laboratory Microbiology laboratory Pathology laboratory	<p>The workload is very high, so some hospitals require auto-analysers such as automated blood culture system. Many also requested arterial blood gas analysers to monitor respiratory functions of patients. It may require laboratory information system for efficient data processing.</p>
Therapeutic		
OT	Items for General surgery Cardiothoracic surgery (CTS) Cath laboratory Ortho Oncology Paediatric. Surgery: Neuro Surgery Obstetrics and Gynaecology Blood bank	<p>Shortage of items:</p> <ul style="list-style-type: none"> ➤ General surgery: Ultrasound guided surgical endoscopy units for laparotomy, upgraded incision and coagulation devices, and some common equipment for replacement ➤ CTS: Heart lung machine, and common equipment for open heart surgery ➤ Orthopaedic surgery: C-arm X-ray, Operative Microscopy, Doppler, Arthroscopy ➤ Oncology: Electrosurgical unit, Complete Laparoscopic set, Ligature - Vessel sealer, Harmonic Scalpel, Bronchoscopy, Ventilator for ICU ➤ Paediatric Surgery: Endoscopy with Accessories, and Lithotripsy device to absorb the urinary tract calculus piece.

Department	Standard Equipment	Current status and Requirement
		<ul style="list-style-type: none"> ➤ Neuro Surgery: Endoscopy for brain/spine surgery system, Neuro Navigation system, Brain suit for tumour surgery ➤ Obstetrics and Gynaecology Mobile X-ray unit, 4D Ultrasound machine, Operative Hysteroscopy
Renal	Haemodialysis Patient monitor	Available equipment varies from 0 to 30 units in hospitals (majority is between 2-5 units) and these are absolutely in short supply.
ICU	Ventilators Patient monitors Syringe pumps Infusion pumps Defibrillators	Though the existing ICUs have been equipped properly, the health facilities need more space to accommodate all the patients and thus require increasing numbers of equipment to satisfy the ICU service demand.

(Source: developed by Survey team based on the information from the hospitals)

(2) Secondary level

Many items in secondary health facilities are overused, and replacement is required for superannuation. Diagnostic devices for abdominal, cardiovascular, cancer and trauma have the higher demands among others. For the therapeutic devices, the requirement for orthopaedic treatment and dialysis is also prominent at secondary level. Fulfilment of human resources in the secondary health facility is slightly better than the tertiary level and deployment of necessary human resources is usually prioritized for DHQH in the district without a Medical College Hospital.

Table 4-16: Current status and requirement at DHQH

Department	Standard Equipment	Current status and Requirement
Examination		
Imaging	Digital X-ray Conventional X-ray CT scanner Mammography Cardiotocography (CTG) MRI	<ul style="list-style-type: none"> ➤ X-ray for abdominal diagnosis: At least one more unit each should be procured due to increasing service demand. ➤ CT scanner (single slice/4 slices) for head injuries/cardiac diseases/cancer cases: Most hospitals have one unit, but require one more to replace obsolete one or to meet service demand. ➤ Mammography for breast cancer screening: No hospital has this modality presently. One unit is required to meet service demand ➤ CTG for foetus monitoring during delivery: 2-7 numbers are available at most of the hospitals, but hospitals require a few more. ➤ MRI: Only one hospital has this unit. It is ideal to have at least one MRI in every per district.
Endoscopy	Upper gastrointestinal Fiberscope	There are new procurement demands for Colonoscopies and Duodenoscopies from several hospitals to satisfy service demand.
Physiology	Ultrasound machine ECG	Ultrasound machine (non-cardio) and ECG are available at all the hospitals, but it is required to increase numbers of ultrasound machine for antenatal care and abdominal screening. .
Laboratory	Haematology analyser Biochemistry analyser Electrolyte analyser Eliza reader Incubators	<ul style="list-style-type: none"> ➤ Assorted analysers No shortage ➤ Incubators (Aerobic, Anaerobic) No incubators are equipped and bacteria culture is not carried out. ➤ Blood component separators This unit is required for blood component transfusion during operation at some hospitals.
Therapeutic		
OT	C-arm X ray Arterial Blood Gas (ABG) Analyser Anaesthesia machine with ventilator OT light Electro-surgical units Patient monitors Pulse Oximeters	<ul style="list-style-type: none"> ➤ C-arm X-ray New procurement is required for many hospitals to deal with bone fractures caused by traffic accidents. ➤ ABG Analyser New procurement is required for many hospitals for respiratory management during major operation ➤ Anaesthesia machine, operating lights, patient monitors, pulse oximeters Replacement is required for obsolete items.
ICU	Ventilators, Patient monitors Pumps Defibrillators	<ul style="list-style-type: none"> ➤ Ventilators, Patient monitors, defibrillators Numbers of such essential equipment are in shortage and obsolete for bed numbers. ➤ Syringe pumps and Infusion pumps More numbers are required.
NICU	Radiant warmers phototherapy machine, Infant ventilators, Suction machine	These items for NICU are recently provided by TNHSP, but more numbers are required to meet service demand.
Emergency and others	Infusion pumps, Defibrillator Oxygen supply, Negative suction, etc. Haemodialysis Blood bank/storage	Most of them are available in all the hospitals. However, the haemodialysis units are in absolute shortage considering the current trend.

(Source: developed by Survey team based on the information from the hospitals)

(3) Primary level

Based on the field survey visit to some UPHCs, it appears that UPHCs originated from MCH focused clinic are likely to be well equipped compared to the other types. Currently, the NUHM provides funds for necessary equipment in all UPHCs. The below is an example of equipment lists in a UPHC.

Table 4-17: List of equipment at UPHC

Departments	Existing equipment
MCH consulting room	Examination tables, Magnifying light and Examination light
Ultrasound room	Ultrasound machine with convex probe
Delivery	Labour/Delivery tables, Radiant warmer with O2 box, and light stand
Postnatal and antenatal room	Recovery beds
Laboratory	Biochemical analyser, centrifuge, microscopes, etc.
Pharmacy	Drug refrigerators
Immunization	Vaccine refrigerators cold boxes and vaccine carriers
HMIS	Personal computer, and printer

(Source: Field survey of UPHC Velepalayam in Tiruppur on 17 April 2015)

4.8 Donor Support for Urban Health and PPPs

This chapter summarizes major findings on donor support for urban health in Tamil Nadu and PPP models. Among the major donors supporting urban health, the World Bank as well as major NGOs supporting the poor and the vulnerable in urban areas are reviewed.

4.8.1 The World Bank

The World Bank has supported the State Health Systems Development projects in India since 1995. The review of these projects in 2002 resulted in transforming the World Bank's strategic focus to targeting the poorest segments of the population with poor health outcomes, as well as exploring new ways of delivering services including PPPs and new approaches to NCD prevention and control. Building upon these experiences and lessons, the World Bank approved the TNHSP from 2005 through to 2010 as a Specific Investment Loan of US\$110.83 million.

(1) Project Development Objective: to significantly improve the effectiveness of the health system, both public and private, in Tamil Nadu through: (i) increased access to and utilization of health services, particularly by poor, disadvantaged and tribal groups; (ii) development and pilot testing of effective interventions to address key health challenges specifically NCDs; (iii) improved health outcomes, access and quality of service delivery through strengthened oversight of the public sector health systems and greater engagement of nongovernmental sector; and (iv) increased effectiveness of public sector hospital services, primarily at district and sub-district levels.

(2) Components: There were four components and 14 sub-components as shown in Table 4-18.

Table 4-18: Components and Sub-Components of TNHSP

Components	Sub-Components
I: Increasing access to and utilization of services	<ul style="list-style-type: none"> (i) Reducing maternal and neonatal mortality by establishing at least two CEmONCs in each district (ii) Improving tribal health by strengthening existing primary and secondary services in tribal areas through PPPs with NGOs (iii) Facilitating use of hospitals by the poor and disadvantaged through community mobilization, behaviour change strategies, local-run counselling centres, and inter-personal communication training for health personnel
II: Developing effective models to combat NCDs and Accidents	<ul style="list-style-type: none"> (i) Supporting health promotion through population-based health promotion activities focused on preventing NCDs (ii) Pilot testing clinic-based NCD control through operational research, via two pilots, for screening and treatment of specific NCDs and risk factors in primary and secondary care settings (iii) Traffic injury prevention and treatment in close coordination with the Departments of Transport and Home
III: Building capacity for oversight and management of the health system	<ul style="list-style-type: none"> (i) Improving M&E by strengthening HMIS and the financial information system (ii) Improving quality of care through developing a set of quality indicators; establishing quality improvement circles to track progress; developing protocol for improved management; and regulation of public/private facilities (iii) Strengthening health care waste management through implementation of guidelines (iv) Building capacity for strategy development and implementation by establishing a strategic planning unit and PPP wing within the GoTN, conducting a health insurance pilot, and strengthening project management
IV: Improving the effectiveness and efficiency of the public sector to deliver essential services	<ul style="list-style-type: none"> (i) Rationalization of secondary care facilities by supporting the refurbishment and upgrading (ii) Rationalizing of equipment by conducting one time repair followed by implementation of proper maintenance system (iii) Human resource planning and development by establishing staffing norms and conducting training (iv) Enhancing management of public facilities

(Source: Project Appraisal Document: TNHSP, the World Bank, 2004)

In 2010, the World Bank approved additional financing of US\$117.70 million to be executed by September 2015 to support the continuation of successful activities during the original project period and to scale-up well-performing activities, including the:

- (i) the state-wide expansion of the NCD prevention and control activities which have been supported in two districts
- (ii) the state-wide implementation of hospital and health management information systems, including at tertiary healthcare facilities; and
- (iii) expansion of maternal and neonatal health services to the tertiary level.

Based on the above rationale, some sub-components were reformulated to reflect the shift from the establishment/piloting phase to the strengthening/scaling-up stage. In particular, the scope of Component II was significantly expanded to scale up the successful pilot models throughout the State, by providing necessary equipment and training for screening of cervical cancer, breast cancer,

hypertension and diabetes at all levels. The budget for this component significantly increased from US\$5.65 million planned in 2005 to US\$20.2 million in 2010 (combining the loan amount and the government commitment).

(3) Challenges: Through an interview conducted with the World Bank team, the referral linkage was identified as a major challenge, particularly affecting the impact of the NCD interventions. Other challenges at the implementation level included the effectiveness of the procurement system when handling large quantities of supplies, and training of human resources. For example, the project conducted extensive training and refresher training for medical officers, staff nurses, lab technicians, pharmacists and field staff. However institutionalizing change in screening, treatment, prescription and reporting practices as per agreed protocols still remains a major challenge. In terms of partnership models, the capacities of the partner NGOs contracted for health promotion activities were found to be sub-optimal. Therefore the existing functioning systems, such as schools and active self-help groups, have been tapped on during the scale-up stage⁶⁹.

4.8.2 NGOs

The following NGOs have been identified as locally active organizations working on issues related to urban health in Tamil Nadu.

Table 4-19: Summary of NGOs activity in urban health

NGO	Major Activity in Urban Health
Ekam Foundation	A NGO engaged in providing quality healthcare for newborn infants of poor and vulnerable communities in public health facilities in Tamil Nadu. <ul style="list-style-type: none"> Admit poor children in selected private hospitals Support public hospitals by renting ventilators, providing lab support and medicines for children with special healthcare needs.
Disha Foundation	A registered charitable Trust established in 2006 in Chennai. <ul style="list-style-type: none"> Support education of visually challenged persons by scholarships Raise funds to provide medical aid for life saving treatments for the poor and connect them with resources e.g. blood donors, other organizations.
Dean Foundation	A registered trust established in 1998 to cater to the elderly and those suffering from diseases like cancer, AIDS, neurological conditions, diabetes <ul style="list-style-type: none"> Provide hospice and palliative care and referral services Provide paediatric hospice and palliative care
Cancer Survivors Care Trust	<ul style="list-style-type: none"> Identify cancer patients and survivors Direct them to the right medical team Provide education to the children of survivors Adopt minor children of the deceased cancer victims Run mini health centres in rural and tribal areas for cancer patients

(Source: relevant NGOs)

4.8.3 Private Sector and PPPs

(1) Type of facility

Similar to the public sector, the private sector can be categorised into three types of health facilities: primary level, such as a small clinic; secondary level, called by nursing home; and tertiary level of care with multi-super specialities. Most small clinics are located in both urban and rural areas and easily available and accessible locally. Nursing homes provide mainly general and maternity services

⁶⁹ Based on the interview conducted with the World Bank team on 7 April 2015.

in urban and semi-urban areas with a bed strength ranging from 5 to 50. The tertiary health facilities are mostly located in the larger cities.

(2) Utilization status

Output of private sector remains poorly understood although it is said that the private sector in Tamil Nadu caters to a large segment of the population. According to SRS (2010), 23% of deaths in urban area occurred at private health facilities in Tamil Nadu⁷⁰, which accounts for almost the same as public health facilities. In case of expenditure in health, more than 80% was private expenditure⁷¹.

During the survey, several health officials indicated that roughly 60% of outpatient services, less than half of IP services and about 60% of laboratory services are provided by the private sector. For all accidents, patients prefer to use public health hospitals.

After introduction of CMCHIS, private health facilities have also been empanelled⁷² if the health facility meets the criteria set by the State government. Therefore private sector has the opportunity to attract more populations especially the lower and lower-middle income patients with financial protection by the Government.

(3) Quality

As the regulatory mechanism for private sector is currently not in existence in Tamil Nadu as is the case in most parts of India, there is no clear count of the number of private health facilities in the State. Currently the GoTN is in process to finalize regulation to deal with registration and monitoring of private hospitals under the Tamil Nadu Clinical Establishment Act. Private clinical establishment will be registered under this Act. Out of 301 NABH accredited hospitals, 27 hospitals are in Tamil Nadu (24 private health facilities and 3 public health facilities⁷³).

(4) PPPs

Tamil Nadu has introduced several successful interventions through PPP contracts.

1) CMCHIS

CMCHIS, funded by the GoTN, is being run by United India Insurance Company Ltd.

2) Free 108 Ambulance Service

Since 2008, the TNHSP has been supporting the Ambulance Services through PPP. The facilities and financial resources are provided by the Government, whereas management of services including human resources is run by a private company. The number of ambulances deployed has increased from 20 in 2008 to 751 in the first quarter of 2015. The service now covers all districts in the State⁷⁴.

3) Outsourcing of health facility services

Under the TNHSP, some of the hospital management services, such as cleaning, hygiene maintenance, and security, have been outsourced to private companies. Various measures have

⁷⁰ 25% at government hospital, 26% qualified professional, 27% others.

⁷¹ MHFW, 2013

⁷² As of August 2015, 114 single hospitals and 658 hospitals including both public and private are participated in the scheme.

⁷³ DHQH Namakkal (renewal under process) and DHQH Padmanabhapuram. One of the private hospital is under suspension as of August 2015.

⁷⁴ Information provided by the World Bank team on 7 April 2015.

been taken to ensure provision of smooth and high quality services, such as development of training manuals and Online Data Management System for activity monitoring, and utilization of high-end machineries for cleaning. While TNHSP initially supported the costs incurred by outsourcing these services, they are now covered by the government⁷⁵. Outsourcing of laboratory services has also been pilot-tested in seven public health facilities as of April 2015.

4.9 Water, Sanitation and Hygiene

4.9.1 Water Supply

For Chennai city, CMWSSB plays a crucial role in delivery of water supply and sewerage services. Supply and demand for water in Chennai urban agglomeration is estimated at 1,750million litres per day and 2,248million litres per day respectively⁷⁶. This gap between supply and demand requires a combination of conservative resource utilization with sustainable supply augmentation. In the case of ULBs, other than Chennai, TWAD Board has been responsible for water supply and sanitation. The coverage of protected water supply in urban areas has been extended to all cities with more than half of ULBs having 'good' coverage.

Table 4-20: Status of Water Supply in ULBs (Other than Chennai Corporation)

Local Body		Good	Average	Poor	Total
Corporations	- Good > 110 LPCD - Average > 70-109 LPCD - Poor Less than 70 LPCD	1	7	1	9
Municipalities	- Good > 90 LPCD - Average > 50-89 LPCD - Poor Less than 50 LPCD	51	67	7	125
Town Panchayats	- Good > 70 LPCD - Average > 40-69 LPCD - Poor Less than 40 LPCD	336	179	14	529
Total		388 (59%)	253 (38%)	22 (3%)	663

*LPCD = Litres Per Capita per Day, Used for the purpose to design water treatment plant and sewage treatment plant
(Source: Water Supply and Sanitation, Twelfth Five Year Plan Tamil Nadu, 2012)

However, water supply in urban slums still needs to be improved. Table 4-21 shows the situation of water supply in slum areas in the largest cities.

Table 4-21: Situation of Water Supply in Urban Slums

City	Status of Water Supply in Slums
Chennai	<ul style="list-style-type: none"> • 36% of households use public tap • 31% houses have individual tap connections • 15% get water supply from tube well • 14% of houses fetch water from tanker.
Madurai	<ul style="list-style-type: none"> • 59% of households use public tap • 25% houses have individual tap connection • 6% houses have tube well and bore well /hand pump • 2% get water supply from water tankers • 2% use river/canal/lake and open wells

(Source: Slum Free City Plan of Action under RAY, TNSCB)

⁷⁵ Based on the interview with the World Bank team on 7 April 2015.

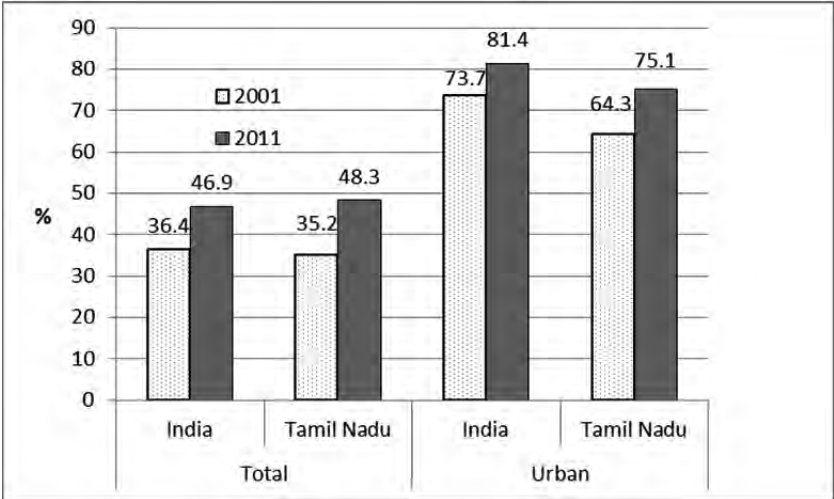
⁷⁶ Water Supply and Sanitation, Twelfth Five Year Plan Tamil Nadu 2012-2017

CMWSSB and TWAD Board have been working together with TNSCB to improve the slum situation in urban areas. Eventually, Tamil Nadu aims to achieve a Slum Free State' status.

4.9.2 Sanitation and Hygiene

The absence of adequate number of toilets linked to the underground sewerage scheme⁷⁷; absence of well-maintained public and community toilets and the practice of open defecation are posing serious sanitation and health hazards⁷⁸.

As per the Census of India 2011, 47% of the total population of India and 48% of Tamil Nadu have a latrine facility within the premises. 81% of the urban population in India and 75% in Tamil Nadu have latrine facility within the premises⁷⁹.



(Source: Census of India 2011)

Figure 4-15: Population with latrine facility

Tamil Nadu had formulated two strategies in the sanitation sector-coverage of all towns by Under Ground Sewerage System and total elimination of open defecation by 2015. To achieve the vision of Open Defecation Free State in 2015, the Commissioner of Municipal Administration has designed a universal toilet for the urban residents of Tamil Nadu, especially for the urban poor. These toilets serve as neighbourhood toilets, family toilets, public toilets, community toilets and integrated sanitary complexes.

The coverage of the piped sewerage system in urban areas was 27% and septic tank was 38% which were slightly lower than the national average (33% and 38 % respectively) according to the Census 2011. 99% of the core areas of Chennai have been covered with sewerage facilities as per the Twelfth Five Year Plan (2012-2017). There is a plan to provide sewerage network to all in the Urban Agglomeration (population greater than 100,000) by 2015 and covering all other urban areas by 2017.

In the Twelfth Five Year Plan, an amount of Rs.36,629.4 million for urban water supply and sanitation, and Rs.48,354.9 million for sewerage has been allocated towards “A World Class, Secure, Affordable and Sustainable Water Supply, Sanitation and Sewerage system Accessible to Every

⁷⁷ Treatment of wastewater is one of the important steps to prevent contamination of urban underground water.

⁷⁸ Water Supply and Sanitation, Twelfth Five Year Plan Tamil Nadu 2012-2017

⁷⁹ Census of India 2011

Citizen of Tamil Nadu”⁸⁰ by the end of 2023.

The Government accords the highest priority to the creation of quality and effective infrastructure through financial assistance from Central/State Governments and external funding agencies. However, some studies highlight the difficulty of changing behaviour and the lack of awareness of the linkages between using a toilet, the safe disposal of faeces and hygiene and health^{81 82}. Improved water and sanitation is not prioritized in many households and most communities do not view water-borne diseases like diarrhoea as life threatening. Further efforts would be required for the behaviour changes.

4.10 NUHM Progress and Challenges

4.10.1 Implementation

The State Urban Health Mission was launched in 87 cities in 31 districts except Ariyalur district where the district headquarters Ariyalur itself is less than 50,000 populations as per Census of India 2011. A total of 420 UPHCs are planned to be established as per the population norm in these cities including 343 existing facilities and 77 UPHCs to be newly created.

The activities under NUHM are categorized into the followings: (1) Planning and Mapping, (2) Programme Management, (3) Training and Capacity Building, (4) Strengthening of Health Services, (5) Regulation and Quality Assurance, (6) Community Processes, (7) Innovative Action and PPP, (8) M&E. The foundation for the activities including the formation of programme management units at all levels and the development of city level PIP (2013-2014) has been established. The establishment of health facilities (UPHCs and UCHCs) including the recruitment of human resources as well as their capacity building are underway (Refer to Annex 4 for the detail progress).

Table 4-22: NUHM Budget and Expenditure 2014-15

	Approved budget 2014-15 (Rs. Million)	Expenditure till Dec 2014 (Rs. Million)
Total amount	954.149	541.646

(Source: NHM PIP 2015-16)

⁸⁰ Water Supply and Sanitation, Twelfth Five Year Plan Tamil Nadu 2012-2017

⁸¹ UNICEF, 2012, Water, Sanitation and Hygiene Advocacy and Communication Strategy Framework 2012-2017

⁸² S. Ganesh Kumar and Sitanshu Sekhar Kar, Sustainable behavioral change related to environmental sanitation in India: Issues and challenges, Indian Journal of Occupational and Environmental Medicine. 2010 Sep-Dec

4.10.2 Target

State level indicators and targets were set up in the PIP 2013-14.

Table 4-23: State Level Indicators and Targets for Tamil Nadu State Urban Health Mission

Indicators		Baseline	Number proposed 2013-14	Number Achieved as of July 2015
1	No. of MAS formed	0	19,160	Policy decision is under consideration
2	No. of MAS	0	19,160	
3	No. of ASHA selected and trained	0	1,336	
4	No. of ANMs recruited	0	1,124	459
5	No. of UPHCs made operational	0	420	399
6	No. of UCHCs made operational	0	8 (only in Chennai)	3 (only in Chennai)
7	No. of RKS (Rogi Kalyan Samitis: Patient welfare society)*	0	420	280
8	No. of city PMUs established (personnel recruited and office space provided)	0	10	10
9	No. of cities covered under NUHM	0	87	87
10	Population covered under NUHM	0	32,427,764	32,427,764
11	No. of slums covered under NUHM	0	Under assessment	Under assessment
12	Slum population covered under NUHM	0	8,598,101	8,598,101
13	Other vulnerable population covered under NUHM	0	Under assessment	Under assessment

*Untied NHM fund to each hospital. Rs.175,000/year to all primary, Rs.300,000 to Community Health Centre (CHC), Rs.500,000 to DHQH

Abbreviation: ASHA= Accredited Social Health Activist
(Source: NUHM PIP 2013-14 and hearing from SPMU)

4.10.3 Key Challenges and Plan

NUHM PIP 2013-14 has pointed out the barriers for people not accessing urban health system. These include the shortage of skilled health personnel, inadequate training system to update skills of urban health staff, and ineffective M&E system etc.

The weak capacity of ULBs and multiplicity of service providers are regarded as one of the reasons for the malfunction of primary care and referral system. During the year 2014-2015, approximately Rs.110 million was approved for human resources. Vacancy positions of doctors, nurses, pharmacists, lab technician, ANM, and support staff are under recruitment process by the State and will likely be filled during this fiscal year. Rs.0.5 million was disbursed to each UPHC in 2014-2015 for medicines and consumable for emergency purpose. With the PMU at each level in place, the coordination among different facilities/level is expected to be improved⁸³.

⁸³ There is a case where the medical doctors are seconded from the rural PHC to urban PHC which was difficult before as the responsible authority was different.

Due to the shortage of manpower at the State level as well as district level, trainings have not systematically started yet, but they are expected to start during the next year.

The community process has not had much progress yet. The utilization of MAS and ASHA was under policy consideration while ANMs are actively involved in the community work. The outreach services have just started for the slum areas. However, it is observed that the number of outreach efforts is not enough in slums. The involvement of NGOs can be further considered.

M&E mechanisms have not been planned yet since the State is still in preparatory stage. Current expansion of HMIS to all level of institutions as well as establishment of SHDRC will support the SPMU to develop timely and effective M&E mechanism.

Key Messages

- Urban health services are provided by several actors. HFWD is responsible for overall health sector and the Municipal Corporation is responsible for the provision of urban primary health care services.
- MCH and communicable diseases have comprehensive intervention programmes including M&E system with numerical targets. NCD programmes need to be strengthened with evidence based planning and M&E system.
- There is no secondary health facilities situated in the district capital where the tertiary health facilities is established except in a few cities. The patient overflow is reported at the top referral hospitals. Quality of care should be strengthened.
- The shortage of doctors and paramedical. HFWD has taken measures to fulfil necessary human resources by speedy recruitment process, increase of medical college and number of student seats. Comprehensive long term human resource development plan is necessary.
- The State Government has been increasing annual budgetary allocation by 10%. CMCHIS takes an important role to provide financial protection to people although covering services are selective.
- HMIS is in the process to be expanded to all levels. Linking at all levels is expected to strengthen referral system among different facilities.
- The shortage of medical equipment is reported in certain places. Top referral facilities tend to have difficulties to meet ever increasing demand for NCD treatment.
- Private sector plays an important role especially for outpatients in urban health. Government aims to ensure quality of health services through implementation of the Regulations.
- State Urban Health Mission was launched in 87 cities in 31 districts.
Establishment/strengthening of primary health facilities (UPHCs and UCHCs) is underway. It is still in the preparatory stage, but is expected to accelerate its implementation.

Chapter 5 NUHM Target Group in Tamil Nadu

NUHM target groups are the following.

- Urban Poor Population
- All other vulnerable population such as homeless, rag-pickers, street children, construction and brick and lime kiln workers, sex workers, and other temporary migrants

The NUHM framework mentions that the urban poor has to be defined and selected by the State based on a household survey through community validation and transparency considering their vulnerability and state of access to basic services. While the efforts to define target groups are still underway by the State Government, the survey attempts to understand situations and issues related to the urban poor and vulnerable populations in Tamil Nadu.

5.1 Vulnerable Population

Desk review pointed out that the difficulty in accessing to health service should be considered not only by the actual distance but also by 4As (Accessibility, Affordability, Availability, Acceptability)⁸⁴. Based on the desk review, the key informant interviews were conducted with government officials, NGOs and academics. The possible populations with difficulties in accessing quality health services and their corresponding barriers are described below.

Table 5-1: Main Results

Who have difficulty in access to health services?	Why?	Where do they live?
<ul style="list-style-type: none"> • Migrant • Orphans (children, aged people) • Slum dwellers • Minimum job workers or people working in the informal sector (cleaning, scavenging, etc.) • Homeless • Sex workers • Men who have Sex with Men • Lesbian, Gay, Bisexual, Transgender (LGBT) 	<ul style="list-style-type: none"> • do not have enough knowledge/ information on public services • face stigma and discrimination • do not have enough time to spend for health • not recognized by the government 	<ul style="list-style-type: none"> • mostly slums • shelter in NGOs or Community Based Organizations • cheap compound houses

(Source: Survey team - based on the results of the Key Informants Interviews conducted in April 2015)

⁸⁴ Ministry of Foreign Affairs of Japan, March 2015, Universal Health Coverage hand book for NGOs, NGO Society for UHC Study

Table 5-2: Difficulty in Accessing to Health Services based on interviews

Accessibility	<ul style="list-style-type: none"> ✓ Urban poor people use their nearest health facility to avoid transportation cost. People use even private clinics by considering transportation cost and required time for getting public health services. ✓ Public health facilities are open in the day, but not at night. People who work in the day are therefore unable to get health access.
Affordability	<ul style="list-style-type: none"> ✓ People can use Public health facilities without any payment. In addition, CMCHIS covers costs of treatment for many protocols in empanelled private health facilities. But costs for some treatment such as common cold or fever are not covered by CMCHIS.
Availability	<ul style="list-style-type: none"> ✓ There are not enough urban health facilities in relation to population. ✓ Because of heavy crowd for accessing certain facilities at some public health facilities, people have long waiting times to get the service. Such a long queue discourages people to avail public services.
Acceptability	<ul style="list-style-type: none"> ✓ Because of stigma and discrimination, some populations such as sex workers, transgenders, and people living with HIV and AIDS (PLWHA) avoid visiting health facilities. ✓ Some people avoid visiting public health facilities as some medical staff show poor hospitality/ attitude.

(Source: Survey team based on the results of the Key Informants Interview conducted in April 2015)

Considering the estimated population size of above-mentioned groups and consultation with HFWD, the Survey Team decided to conduct further analysis on slum dwellers and migrants.

5.2 Slum dwellers

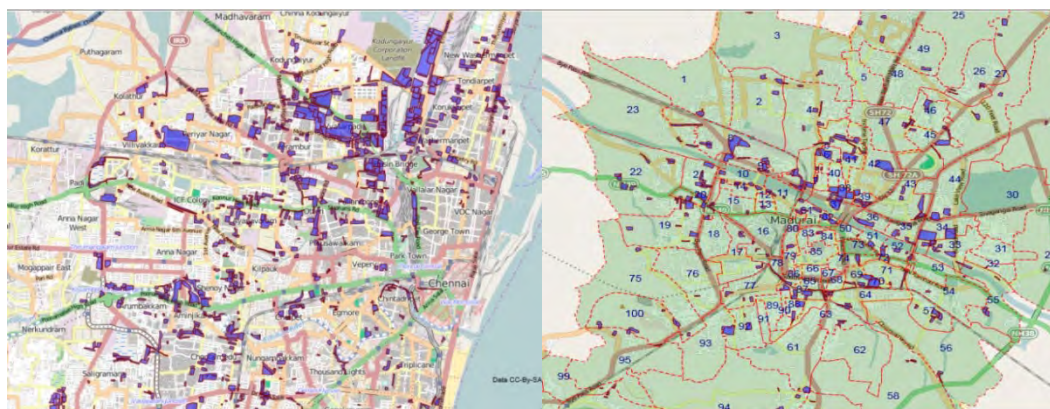
5.2.1 Definition of Slum area

TNSCB Act. defines a slum area as follows;

- a) Any area is or may be a source of danger to the health, safety or convenience of the public of that area or of its neighbourhood, by reason of the area being low-lying, insanitary, squalid, overcrowded or otherwise; or
- b) The buildings in any area, used or intended to be used for human habitation are
 - i. in any respect, unfit for human habitation; or
 - ii. by reason of dilapidation, over-crowding, faulty arrangement and design of such buildings, narrowness of faulty arrangement of streets, lack of ventilation, light or sanitation facilities, or any combination of these factors, detrimental to safety, health or morals, they may by notification, declare such area to be a slum area.

5.2.2 Volume of Slums in the State

According to the Census 2011, the slum population is estimated to be around 9.52 million in 2015, approximately 14% of total population. Slums in Tamil Nadu are normally scattered in the city because of its rapid urbanization (Figure 5-1).



Slums (blue parts) in Chennai city
(Source: TNSCB)

Slums (blue parts) in Madurai city

Figure 5-1: Scattered Slums in Chennai City and Madurai City

5.2.3 Place of residence

As cities grew, so did the slums, and the number of slum areas has been increasing. Among the cities with population more than 450,000, Madurai (34%), Chennai (31%), Salem (30%) have the higher percentage of slum population (Table 5-3).

Table 5-3: Population Growth Rate, Migrant and City Slum population in Districts
(Cities whose population is more than 450,000)

	1. District pop. growth rate (%) (2001-2011)	2. Migrants pop./ District pop.(%) 2001	3. Slum pop. / City pop. (%) 2011
Chennai	7.0	17.7	30.9
Coimbatore	18.6	5.1	7.9
Madurai	17.8	4.1	33.7
Tiruchirapalli	12.6	12.3	18.6
Tiruppur	29.1	N/A	25.3
Salem	15.4	4.9	30.2
Vellore	13.2	3.8	20.7
Erode	11.7	7.2	15.2
Tirunelveli	13.8	2.0	23.6

(Sources: 1. Census of India 2001, 2011, 2. Based on the Census of India 2001⁸⁵, 3. Tamil Nadu NUHM, PIP 2013-14)

5.2.4 Vulnerability of slum dwellers

Many articles pointed out that slum residents lack the most basic public services, such as water supply, sanitation and waste collection. At the same time, many key informants pointed out that slum dwellers are not homogeneous in terms of their house type, work and economic situation. The table below shows the income level of slum dwellers in big cities. Although more than half of slum

⁸⁵ K. Jothy and S. Kalaiselvi, November, 2011. Patterns of internal migration: An analysis using census data of Tamil Nadu. International Journal of Current Research, Vol. 3, Issue, 11, pp.089-096

households earn less than Rs.5,001, there are a small percentage of slum households that earn more than Rs.10,000.

Table 5-4: Monthly income of households in slum in three cities

	Chennai	Madurai	Tiruppur
< Rs.2,500	8%	28%	20%
Rs. 2,501 – Rs. 5,000	53%	52%	42%
Rs. 5,001 – Rs. 7,500	20%	10%	16%
Rs. 7,501 – Rs. 10,000	12%	5%	12%
> Rs. 10,000	7%	5%	10%

(Source : Slum Free City Plan of Action – Chennai, Madurai, Tiruppur)

Slums are ranked in a 3 x 3 matrix (deficiency matrix⁸⁶) based on infrastructure condition and vulnerability in Slum free city plan of action developed by TNSCB. According to the plan in Madurai, Chennai and Tiruppur, approximately 16%, 4%, and 6% of slums are ranked in the worst condition respectively.

5.2.5 Health problems of slum dwellers

According to key informants, slum residents are vulnerable to especially water borne and vector borne diseases, tuberculosis and respiratory infection due to lack of basic infrastructure and clean environment.

5.3 Migrants

5.3.1 Definition of Migrants

Census of India 2001 defines migrants as follows:

- Migrants by place of birth. Those who are enumerated at a village/town at the time of Census other than their place of birth
- Migrants by place of last residence. Those who are enumerated during the Census is other than his/her place of immediate last residence.

The Census of India classified the reasons into seven categories as a) work/employment, b) business, c) education, d) marriage, e) moved after birth, f) moved with household and g) others. In Tamil Nadu, nearly 20% of male migrants had reported work/employment as a reason for migration. The intensity of work/employment was the primary reason for migration increased significantly from intra district⁸⁷ (12%) to inter district⁸⁸ (33%). Among female life time migrants, the marriage was the most important reason (44% of migrants).

From our desk review and key informant interview, the Survey Team found the migrants by place of

⁸⁶ Deficiency matrix has two parameters, infrastructure and vulnerability. Parameters related to infrastructure are % of households covered with individual tap connection, % of households having light and ventilation, No vehicular access or road width less than 3 m, Slums with level of sewage collection facility. The vulnerability is evaluated by % of households having Individual Toilet facilities, % of Kutch Houses, % of BPL households to total households and % of Scheduled Castes / Scheduled Tribes households to total households.

⁸⁷ "Intra district" - Persons with last residence outside the place of enumeration but within the district

⁸⁸ "Inter district" - Persons with last residence outside the district of enumeration but within the same state

last residence (definition “b”) due to work/employment are more likely to be considered as “urban poor” and thus hereafter the analysis will be confined to migrants based on last residence due to work/employment.

5.3.2 Volume of migrants in the State

According to the Census of India 2001, there are 15.8 million migrants based on the place of last residence. Approximately 19% of male migrants migrated due to employment/work, while only 3.1% for female migrants. 14 districts have gained by the movement of persons between the districts while the remaining districts have a net loss of population.

5.3.3 Place of residence

From the Slum survey conducted by Tiruppur Municipal Corporation, around one fourth of slum dwellers are migrants (among them 8% are seasonal and 18% are permanent migrants). Several officers pointed out that seasonal migrants live in compound houses nearby working places.

5.3.4 Vulnerability of migrants

Several studies have pointed out that seasonal and circular migration is widespread, especially among the socio-economically deprived groups, such as the Scheduled Castes, Scheduled Tribes and Other Backward Castes, who are asset-poor and face resource and livelihood deficits⁸⁹. These migrants are usually denied essentials service such as clean water, electricity and health care⁹⁰. The studies on women migrant workers in Tamil Nadu⁹¹ found low wages and denial of fundamental rights although most of them were in the place more than three years. The same study found that presence of ICDS centres was rare where migrant workers live. 80% did not receive welfare measures due to lack of awareness of relevant schemes that were provided by the government. More than half of them did not have a ration card.

5.3.5 Health problems of migrants

Occupational health problems were pointed out in several studies. A study on migrant women workers in Karur district in Tamil Nadu in 2012 found vulnerable skin problems. Another study among women migrant workers in Tiruchirapalli district found 66% of the respondents suffer from depression and stress⁹².

The study pointed out that most of the migrated workers earn annual incomes below the level of poverty. The study in Namakkal district shows vulnerability of migrant workers to HIV/AIDS due to poverty, lack of power, lack of health awareness and unstable life-style⁹³.

⁸⁹ Deshingkar, P. and Akter, S. 2009. Migration and Human Development in India, Human Development. UNDP (Human Development Research Paper, 2009/13.)

⁹⁰ National Institute of Technical Teachers Training and Research, 2014, Submitted to TNSCB, Slum Free City Plan of Action- Tiruppur Cooperation

⁹¹ Srinivasan S. and Ilango P. 2012. Occupational Health Problems of Women Migrant Workers in Thogamalai, Karur District, Tamil Nadu, India International Research Journal of Social Sciences

⁹² S.Srinivasan, Dr. P. Ilango. 2012. A Study on the problems of migrant women workers in Thuvakudi, Tiruchirapalli District. IOSR Journal of Humanities and Social Science (JHSS)

⁹³ W.B. Vasantha Kandasamy, Florentin Smarandache. 2004. Analysis of social aspects of migrant labourers living with HIV/AIDS using fussy theory and neutrosophic cognitive maps.

5.4 Activities by the Government

The table below shows that government health-related programmes including NUHM are targeted at vulnerable populations.

Table 5-5: Activities for vulnerable population

Targets	Activities	By whom
Slum dwellers	<ul style="list-style-type: none"> ➤ UPHC may be located preferably within or near a slum area and provide preventive, promotional and non-domiciliary curative care ➤ The provision of health care with the help of outreach sessions in the slums ➤ Improve and provide housing, basic civic infrastructure, and social amenities in intervened slums 	<p>NUHM</p> <p>Rajiv Awas Yojana (RAY)</p>
Migrants	<ul style="list-style-type: none"> ➤ Improve reach of health care services, and conduct outreach services to target the segment consciously ➤ ANM takes family records and migrants are included within NUHM target group (if they stay for more than six months) ➤ HIV/AIDS interventions 	<p>NUHM</p> <p>Tamil Nadu State AIDS Control Society</p>
Homeless	<ul style="list-style-type: none"> ➤ Safeguard the life of destitute elders in the age group of 60 years and above and who are homeless/ abandoned by their families by providing a maintenance grant for old age homes run by voluntary organisations. Food, shelter, clothing, healthcare, recreational facilities, etc. are provided. 	<p>Social Welfare and Nutritious Meal Programme Department</p>
Transgender	<ul style="list-style-type: none"> ➤ Transgenders who have been recognized as the third gender are provided with identity cards, essential commodities, housing, health, education, training and employment. Destitute transgenders above 40 years of age are provided with a pension of Rs. 1,000 per month. 	<p>Social Welfare and Nutritious Meal Programme Department</p>
Orphans	<ul style="list-style-type: none"> ➤ Open shelters for children in need in urban and semi-urban areas 	<p>Social Welfare and Nutritious Meal Programme Department</p>
Sex workers, PLWHA	<ul style="list-style-type: none"> ➤ HIV/AIDS interventions 	<p>Tamil Nadu State AIDS Control Society</p>

(Sources: NUHM, Framework for Implementation MoHFW, GoI, May 2013; TNSCB; Social Welfare and Nutritious Meal Programme Department, Policy Note 2014-2015)

Key Messages

- 14% of population are slum dwellers in Tamil Nadu. Socioeconomic status and infrastructure conditions vary a lot and hence vulnerability of them cannot be generalized as a group. Majority of slum dwellers are vulnerable to water borne and vector borne diseases, TB, and respiratory infection.
- Migrants due to work/employment are considered as among the vulnerable populations. Seasonal and circular migrants are widespread and tend to have occupational health problems.

Chapter 6 Sample Survey

A detailed sample survey was conducted in four selected cities of Chennai, Madurai, Tiruppur and Tiruchirapalli from May to July 2015. The purpose of this survey was to understand the characteristics of the urban health sector and health-seeking behaviour of the selected NUHM target populations.

6.1 Methodology

6.1.1 City selection

The target cities for sample survey were selected in the following manner.

- 1) Step 1: Categorize the 17 cities proposed by HFWD based on population size and select the groups with larger populations (Group 1: > 8 million, Group 2: >1 million, Group 3: >400,000)⁹⁴
- 2) Step 2: Select at least one city from each group considering the (i) population growth rate (2001-2011), (ii) percentage of slum population, (iii) health indicators such as MMR, IMR, (iv) number of health facility beds per 100,000 persons, and (v) geographic representation.

The cities selected were Chennai, Madurai, Tiruppur, and Tiruchirapalli.

The characteristics of the four cities are as follows.

Table 6-1: Profile of selected four cities

	Chennai	Madurai	Tiruppur	Tiruchirapalli
City Population (million)	8.96 (2015)	1.14 (2014)	0.87 (2011)	0.91 (2011)
Population growth rate of 2001-2011	7.8	18.5	29.7	12.1
% of slum population (2013)	30%	34%	33%	19%
MMR (per 100,000 live birth)	36.9 (2015)	34 (2015)	70.1 (2014)	90 (2014)
IMR (per 1,000 live birth)	6.1 (2015)	31 (2015)	6.8 (2014)	10.4 (2014)
No. of beds/100,000 persons* (2015)	159.6	114.4	41.4	76.0
The budget of the Corporation	17.4billion (2014-15)	4.1 billion (2015-16)	5.9 billion (2014-15)	3.1 billion (2014-15)
The budget for health sector (%)	2.0% (2014-15)	1.6% (2015-16)	2.9% (2014-15)	8.6% (2014-15)
NUHM budget (2014-15) (million)	469.7	31.26	31.75	26.7

*Only counted secondary health facilities and tertiary health facilities.

(Source: HFWD, Respective City Corporations, Census of India 2011)

Chennai is the capital of Tamil Nadu and the fourth most populous metropolitan area in India comprising the city and its suburbs⁹⁵. In the year 2011, Chennai city was expanded from 174 km² to

⁹⁴ Out of 17 cities (Chennai, Coimbatore, Madurai, Tiruchirapalli, Salem, Tirunelveli, Erode, Vellore, Tiruppur, Thoothukudi, Nagercoil, Thanjavur, Cuddalore, Dindigul, Pudukottai, Krishnagiri, Periyakulam), Group 1 (population >8 million): Chennai, Group 2 (8 million >population >1 million): Madurai and Coimbatore, and Group 3 (1 million >population >0.4 million): Tiruchirapalli, Tiruppur, Salem, Vellore, Erode and Tirunelveli are shortlisted.

⁹⁵ Census of India 2011

426 km² and number of zones increased from 10 to 15 with the population growing from 4.7 million to 7 million⁹⁶.

Madurai is the third largest city in Tamil Nadu by population, after Chennai and Coimbatore, covering 147.9 km² in area. Madurai has mainly been an agrarian city, producing major crops like paddy, millets and pulses but in recent years, it has developed as a second tier city for Information Technology (IT). The city is also known for its textiles and automobile industry, as well as tourist area with a number of historical monuments⁹⁷.

Tiruppur has a key textiles industrial hub producing cotton knitted garments. There are nearly 2,500 hosiery units and 900 processing units (dyeing, bleaching, etc.) employing nearly 45,000 workers in the city⁹⁸. Between the years 1941 and 1991, the population growth rate increased by 40% in each decade and the current growth rate is the second highest rate in Tamil Nadu following Kancheepuram⁹⁹.

Tiruchirapalli is the fourth largest municipal corporation. Tiruchirapalli is widely acknowledged as the industrial hub of Tamil Nadu. The city was ranked as the first cleanest city in the State and sixth in the country based on National Urban Sanitation Policy for the year 2010 by the Ministry of Urban Development.

6.1.2 Survey Content

- 1) Health status of the city:
Major health indicators, prevalence of major diseases
- 2) Health service delivery system of the city:
List of facilities for public and private, available services, human resources, financing,
- 3) Household survey :
Socio-economic status of target groups, access and barriers to health services, health status and needs, social determinant for health, expenditure on health care, living conditions
- 4) Exit survey at health facility:
Health seeking behaviour, access and barriers to health services, social determinant for health, expenditure on health care, referral functionality
- 5) FGDs :
Socio-economic status, health seeking behaviour, health problem and needs

⁹⁶ State Health Society Tamil Nadu NUHM 2013-2014. PIP of Chennai Corporation

⁹⁷ Business and Economy in Madurai. <http://www.maduraionline.in/city-guide/business-and-economy-in-madurai>, accessed 14 July 2015.

⁹⁸ GoTN. 2006. Master plan for Tiruppur local planning area.

http://tiruppur.nic.in/lpa/pdf/masterplan/schedules/MASTER_PLAN_G.O_ANNEXURES.pdf, accessed 8 August 2015

⁹⁹ Website of Census 2011, <http://www.census2011.co.in/census/state/districtlist/tamil+nadu.html>, accessed 30 July 2015

6.1.3. Sampling Method for Household survey and Exit survey at health facility

(1) Sample size

The required sample size was estimated using the following formula: $Sample\ size = z^2 (p*q) / d^2$

where,

$z = 1.96$ (given a 95% confidence level and thus an alpha value of 0.05)

$p =$ estimated or expected minimum prevalence of the condition or service in the target population in the intervention area

$q = 1-p$

$d =$ the absolute accuracy (\pm an absolute percent from the estimated minimum prevalence) of the measurement at the given confidence level

As prevalence of different service use by the target group was not known, 'p' was considered as 50% i.e. 0.5. Now, for accuracy (d) of 10% and 95% confidence interval, the sample size was calculated as: $1.96^2 (0.5 \times 0.5) / 0.1^2 = 96$.

Since the sampling technique was multi-stage, it is assumed to design effect (deff) of 2. Therefore the formula was, $Sample\ size\ n = deff * z^2 (p*q) / d^2 = 2 * 96 = 192$

Thus, 200 households in each city is decided as necessary sample size for the household survey and exit survey separately.

(2) Target population

- Household survey – Slum dwellers with lower income and middle lower income were decided as the target population based on desk review and key informant interview mentioned in the Chapter 5.
- Exit survey – Slum dwellers receiving health services from the primary to tertiary level facilities at both public and private are targeted.
- FGD – Migrants in Tiruppur are selected as another vulnerable population who may not live in the slum. Four FGDs with migrants within the State (male and female, age of 25-34 years old and 35-45 years old) and three FGDs with migrants from North India¹⁰⁰ (male 25-34 years old, male 35-45 years old and female 25-45 years old) are conducted in the textile factory area.

¹⁰⁰ They are from Uttar Pradesh, Orrisa, and Jharkhand.

6.1.4 Sampling Methods

(1) Household survey

1	List of slums in each city was obtained from the Corporation/other government body
2	Selection of slums (10 slums) was done based on “deficiency matrix” on infrastructure and vulnerability (set in TNSCB survey) as well as the geographic representation. Geographical location of slums was also considered to select 10 slums for each city. An attempt was made to select slums spread across different parts of the city.
3	Listing of households (prior to Main Survey) for preparing the sampling frame was conducted from North-East corner of the slum and preceded with clockwise movement. Households were selected using systematic random sampling from the sampling frame prepared through house listing. An attempt was made to select the poorest and lower-middle income group.
4	Structured interview is targeted with the selected currently married women at household level while Head of the household is present.

(2) Exit Survey

1	Survey intended to cover the Medical College Hospital, DHQH, UPHC, private health facilities
2	A short screener questionnaire was used to identify eligible respondents. Patients were approached randomly and selected based on the screening criteria ¹⁰¹ . An attempt was made to ensure respondents in “30-54 year age group” and “55 and above” category. For male and female respondents, 1:1 ratio was followed.

6.1.5 Limitation

There are several limitations to the surveys. One is that the responses depend on the respondent’s recall and perception. For example, the perception of physical distance to the health facility was quite short in Madurai but many respondents expressed difficulty in accessing health care due to distance. Knowledge of health conditions was generally limited among respondents, thus it was difficult for them to specify the type of illness and they tended to report the symptoms such as acute pain, chronic pain, fever, etc. Respondents at the exit survey may have selection bias with only those who were willing to spare time after receiving the health care services.

6.2 Summary of Findings of household survey and exit survey

This section summarises major findings of the household survey and the exit survey at health facilities. The household survey covered 814 households and the exit survey covered 817 patients in total.

¹⁰¹ Screening criteria: slum dweller and age

6.2.1 Profile of respondents

(1) Household Survey

Total number of respondents was 814. Majority of them (over 99%) were residents in nature. Only 0.6% households were of migrants. The household size varied from two to 14 members. The average and median household size were four. 32% of respondents were male. The most common educational level of household heads were up to primary (35%), none (27%), and up to upper-primary (24%). 30% of household heads were illiterate. Out of 814 household heads, 751 heads have a job. Most of them (43%) were daily labourers and type of jobs for the rest were varied such as petty business, manufacturing worker, government service etc. The average and median monthly household income was Rs.6,893 and Rs.6,750 respectively. Approximately 6% of households had less than Rs.2,000 monthly income.

Table 6-2: Profile of respondents' households at household survey

	Overall	Chennai	Madurai	Tiruchirapalli	Tiruppur
Rate of male respondents	32%	36%	21%	30%	41%
Rate of female respondent	68%	64%	79%	70%	59%
Household head labour force participation rate	92%	89%	96%	92%	92%
Daily labour (occupation of household head)	43%	32%	37%	42%	61%
Household head Illiterate rate	30 %	42%	10%	27%	41%
Median of monthly household income (Rs.)	6,750	8,750	4,500	6,750	6,750

(2) Exit Survey

Total number of respondents was 817. Around 52% of respondents were male. Over 75% of them have lived in the slums for four years or over and migrants were around 6%. The household size varied from one to 20 members. The average and median household size were four. Labour force participation rate was 97% in males and 45% in females. More than half of females (51%) were housewives. The most common work was daily labourers (28%) followed by professional/technical work (6%), agriculture and forestry (5%), and manufacturing work (4%). The average and median monthly household income was Rs.7,763 and Rs.6,750 respectively among respondents at public facilities and Rs.8,792 and Rs.8,750 at private facilities. The more number of respondents at public facilities (39%) had lower income, equal to or less than Rs.6,000, than those at private facilities (26%).

Table 6-3: Profile of respondents at exit survey

	Overall	Chennai	Madurai	Tiruchirapalli	Tiruppur
Rate of male respondents	53%	36%	21%	30%	41%
Rate of female respondent	47%	64%	79%	70%	59%
Labour force participation rate	71%	89%	96%	92%	92%

	Overall	Chennai	Madurai	Tiruchirapalli	Tiruppur
Daily labour	28%	32%	37%	42%	61%
Median of monthly household income (Rs.)	6,750	7,687	6,170	7,494	6,177

6.2.2 Health Problems

The household survey revealed that more than 30% of respondents (245 out of 814) had a family member who fell sick during the last one month in total. The proportion varied from less than 10% (Madurai) to 47% (Chennai)¹⁰². Among them, fever and cough were most commonly reported (101 people including their family members) followed by diarrhoea (23), acute pain (24) and chronic pain (21).

As shown in Table 6-4, NCD screening rate, particularly for breast cancer and cervical cancer, was low among females. Out of 592 females who were 30 years of age or over, eligible for NCD screening, 184 female household members (31 %) had opportunity to undertake at least one of NCD screening tests in total. Screening rate was less than half in Madurai (16%) compared with Chennai (39%), Tiruppur (36%) and Tiruchirapalli (36%). Although around 20% of respondents had screening for diabetes mellitus or/and hypertension, screening rate for breast cancer or/and cervical cancer was less than 5% in total¹⁰³. Among those who had taken NCD screening, around 24% were diagnosed with diabetes mellitus, 32% with hypertension, and 14% with cervical cancer. No one was diagnosed for breast cancer¹⁰⁴. Most of positive cases were under treatment (97%).

Table 6-4: NCD screening and positive cases among eligible female

Type of screening		All	Chennai	Madurai	Tiruppur	Tiruchirapalli
No. of female aged 30 and above in the targeted households		592	104	162	161	165
No. of female who took NCD screening services		184 (31%)	41 (39%)	26 (16%)	58 (36%)	59 (36%)
Diabetes Mellitus	Screening Rate	134/592 (23%)	27/104 (26%)	13/162 (8%)	55/161 (34%)	39/165 (24%)
	Positive Rate	32/134 (24%)	6/27 (22%)	8/13 (62%)	9/55 (16%)	9/39 (23%)
Hypertension	Screening Rate	156/592 (26%)	32/104 (31%)	17/162 (10%)	51/161 (32%)	56/165 (34%)
	Positive Rate	50/156 (32%)	13/32 (41%)	12/17 (71%)	8/51 (16%)	17/56 (30%)
Breast Cancer	Screening Rate	21/592 (4%)	7/104 (7%)	0/162 (0%)	2/161 (1%)	12/165 (7%)
	Positive Rate	0/21 (0%)	0/7 (0%)	0/0 (0%)	0/2 (0%)	0/12 (0%)
Cervical Cancer	Screening Rate	29/592 (5%)	13/104 (13%)	0/162 (0%)	4/161 (2%)	12/165 (7%)
	Positive Rate	4/29 (14%)	4/13 (31%)	0/0 (0%)	0/4 (0%)	0/12 (0%)

¹⁰² It was 20% in Tiruppur and 43% in Tiruchirapalli.

¹⁰³ Although there might have recall bias, it was 0% in Madurai, 7% (breast cancer) and 13% (cervical cancer) in Chennai, 7% (both cancer) in Tiruchirapalli and 1% (breast cancer) and 3% (cervical cancer) in Tiruppur.

¹⁰⁴ It might be due to small number of people screened for breast cancer. Only 21 respondents in total had the screening for breast cancer.

NCD screening rate among male household members was slightly lower than female (22%, 155 out of 719). Among them, 30% and 26% were positive to diabetes and hypertension respectively. They were 78% and 83% positive cases for diabetes and hypertension respectively that were receiving treatment.

Table 6-5: NCD screening and positive cases among eligible male

Type of screening		All	Chennai	Madurai	Tiruppur	Tiruchirapalli
No. of male aged 30 and above in the targeted households		719	200	150	206	163
No. of male who took NCD screening services		155 (22%)	46 (23%)	26 (17%)	55 (27%)	28 (17%)
Diabetes Mellitus	Screening Rate	155/719 (22%)	46/200 (23%)	26/150 (17%)	55/206 (27%)	28/163 (17%)
	Positive Rate	46/155 (30%)	12/46 (26%)	14/26 (54%)	7/55 (13%)	13/28 (46%)
Hypertension	Screening Rate	155/719 (22%)	46/200 (23%)	26/150 (17%)	55/206 (27%)	28/163 (17%)
	Positive Rate	41/155 (26%)	13/46 (28%)	8/26 (31%)	3/55 (5%)	17/28 (61%)

(Note: Percentages shows the screening rate.)

61 families (7%) and 10 families (1%) noted the presence of a family member with CVD and TB respectively. The proportion of families with CVD patients was the highest in Tiruchirapalli (15%) among the four cities (Madurai 4%, Chennai 8%, and Tiruppur 2%). However, this does not imply accurate prevalence, due to low awareness of the diseases.

6.2.3 Health care seeking behaviour

(1) Birth

According to the household survey, approximately 24% (195) families gave birth within the last five years. Of these families, more than 70% of the cases delivered in public facilities, 27% in private or NGO health facilities, and 1% delivered at home. Home delivery was reported only in Madurai.

(2) General Utilization

According to the household survey, out of 245 families (30%) who had an ill family member in the last one month, 202 (82%) went to a health facility for care. More than half of them (52%) utilized public facilities while the other half (48%) went to private sector and other type of facilities. Among public facilities, secondary level was more commonly used. In terms of public primary level, most of them (33 out of 35) used public dispensaries while only one person used UPHC and sub centre. Out of 44% families (90) who used private sector, more than half went to a private doctor or clinic. The rest of the people (4%) used traditional healer, pharmacy and so on.

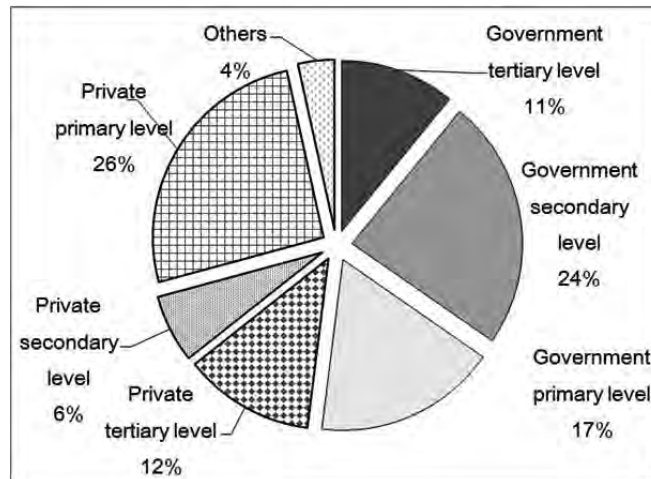


Figure 6-1: Type of Health Facilities Selected by the Respondents during the last month (N=202)

(3) Reasons for visiting health facilities

In the exit survey, around 49% of respondents came to the facility because of unbearable pain while 39% were routine visit and the rest were referred cases from other facilities and advised by families and relatives.

(4) Reasons for not using public health facilities

Out of 94 people who didn't go to a public facility, 93 people reported the reasons. The most common reason was the distance from their residence to a public facility (48%, 46), followed by long waiting time (31%, 30), quality of care (27%, 26) and opening time (25%, 24).

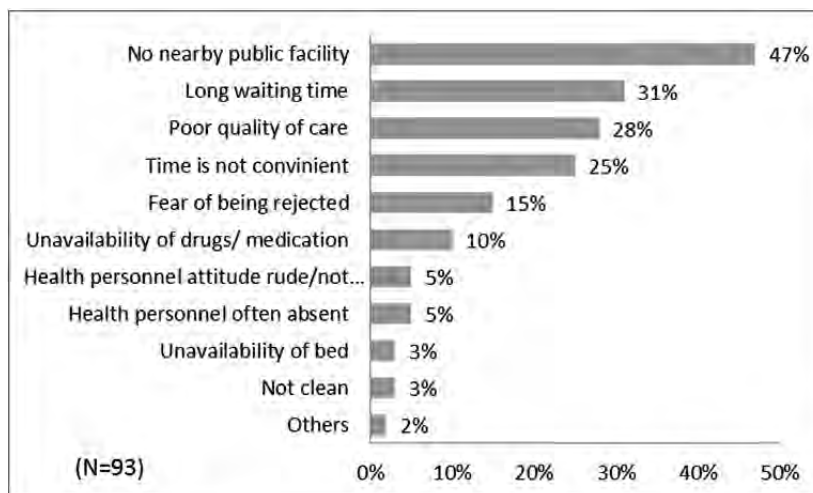


Figure 6-2: Reasons for Not Using Public Health Facilities (N=93, multiple answers)

(5) Factors for choosing health facility to visit

Majority of respondents in exit survey (86% for public and 80% for private users) reported that the health facility where the survey was conducted was their first choice. Among them, the main reasons for selection of the health facility were the nearest distance from home (64% and 56% respectively), convenient opening time (41% and 32% respectively), quality of care (39% and 42% respectively), and low cost (31% and 33% respectively).

(6) Outreach

The utilization rate of outreach services was low in general except Madurai. In Madurai, 62% of respondents had received some kind of services, of which the most common service was medical treatment (41%). Whereas, around 70 -80% of respondents in other three cities have never used outreach services.

(7) Referral

According to the exit survey data at the tertiary hospitals, 73% (218 out of 297) patients went straight to the tertiary facility and 37% sought care or help from somewhere else first. 78% of them were from public facilities, especially from secondary level (46%), and around one fourth were from private sector. The appropriateness of seeking tertiary services could not be assessed in this survey due to the limited information. The usage of the referral slip was limited.

6.2.4 Distance

According to the responses to the question “how far is the nearest public health facility from your house” in the household survey, majority of respondents in Madurai and Chennai answered relatively shorter distance while more than 80% of respondents in Tiruppur mentioned that it was more than 5 km to the nearest public health facility. The results were based on their perception and did not mean the actual distance.

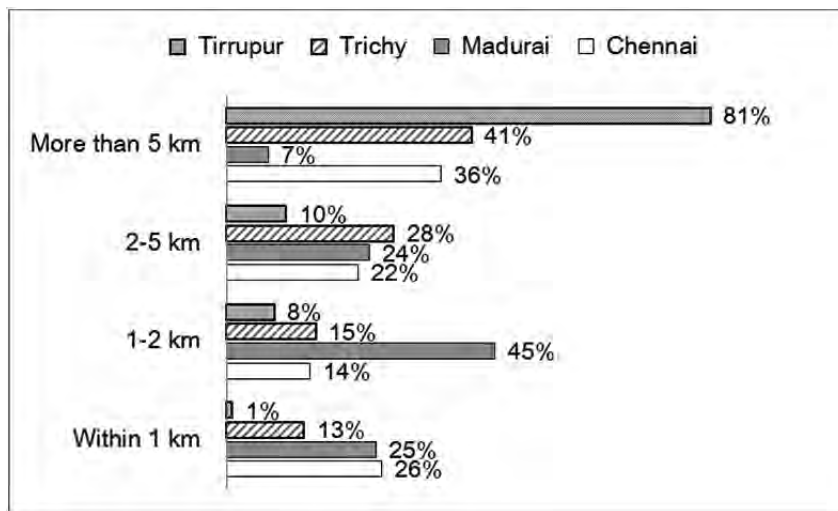


Figure 6-3: Distance from the Nearest Public Health Facility (N=814)

According to the exit survey, approximate time required to reach the health facility from home varied from 2 minutes to 10 hours. The median time was 30 minutes in both sector and in all cities except the respondents at private health facilities in Madurai, where half of them took more than 50 minutes to reach the health facility visited.

6.2.5 Cost

(1) Average expenditure per month

Figure 6-4 compares monthly average expenditure in the household survey on rent, food, education for children, electricity and water, entertainment, health and saving by household income level. The largest proportion was used for food for all income level. On average, respondents in the household survey used Rs.500 for health. Household expenditure on health was around 19 % for those income was equal to or less than Rs.3,000, while 10% for those household income was between Rs.3,001 and 7,500 and 5% for those income was more than Rs.7,500.

Table 6-6: Monthly household expenditure by income level

Monthly household income level (Rs.)	No. of household*	Rent	Food	Education	Electricity, Water	Entertainment	Health	Saving
<= 3,000	146 (18%)	0 (0%)	1,775 (69%)	26 (1%)	275 (11%)	0 (0%)	500 (19%)	0 (0%)
3,001 - 7,500	336 (42%)	0 (0%)	2,550 (49%)	50 (1%)	300 (6%)	0 (0%)	500 (10%)	1,813 (35%)
> 7,500	316 (40%)	0 (0%)	3,000 (30%)	300 (3%)	500 (5%)	0 (0%)	500 (5%)	5,800 (58%)

*: There were 16 respondents who refused or failed to answer the question on household income.

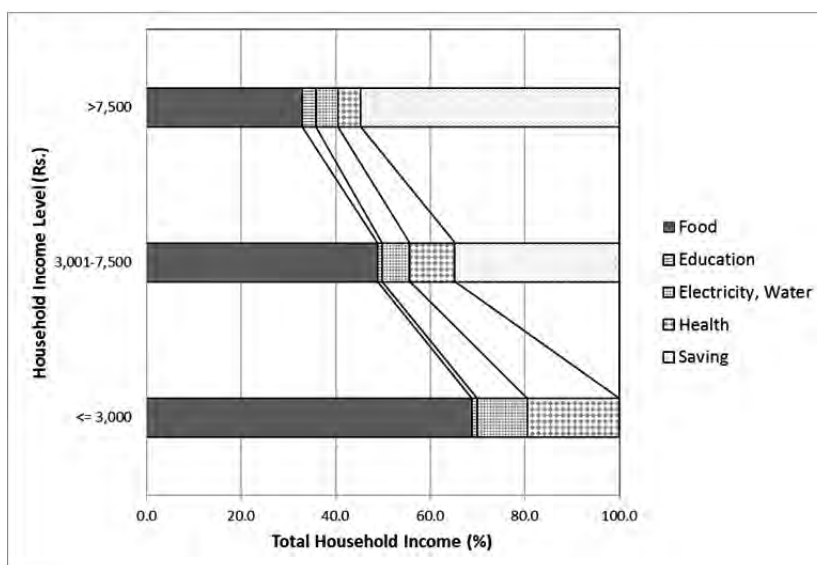


Figure 6-4: Monthly household expenditure by income level

(2) Treatment including drugs

Among 202 respondents who utilized health care services in the last month, 190 people remembered whether they had paid for it including for drugs. Among them, 139 (73%) paid some amount of money in the health facilities. The overall median amount paid was Rs.300 and the average was Rs.1,487. 51 people (27%) received free health service.

(3) Transportation

Almost 90% of 202 respondents incurred less than Rs.101 for transportation to the health facility. The

median cost was Rs.25 and the average was Rs.87. Approximately 21% (42) of them could reach health facilities without any cost.

In the exit survey, average and median transportation cost was Rs.73 and Rs.30 among those who visited public health facility and Rs.92 and Rs.35 among those who visited private health facility. Proportion of respondents who spent more than Rs.300 was significantly higher among those who visited private health facility in Chennai (23%) than others.

(4) Financial Protection

In the household survey, proportion of families who have been covered by a health scheme or health insurance was 40%. Tiruchirapalli had the highest coverage (60%) among the four cities (Chennai 38%, Madurai 24%, and Tiruppur 36%). Out of 324 households who have been covered, 291 families (90%) received support from the Chief Minister’s Comprehensive Health Insurance Scheme.

In the exit survey, nearly 48% patients at public health facilities and 43% at private health facilities had some sort of health insurance. CMCHIS was the most popular as overall around 83% patients at public facilities and 79% patients at private facilities were reported to have this insurance coverage. However, only 17% (64 out of 373) them were actually covered for treatment on the day.

6.2.6 Level of satisfaction with health care services

Over 90% of respondents in the exit survey satisfied to some extent. Satisfaction level was higher in Chennai than Tiruppur and Tiruchirapalli. There was no significant difference by sector as well as level of health facilities.

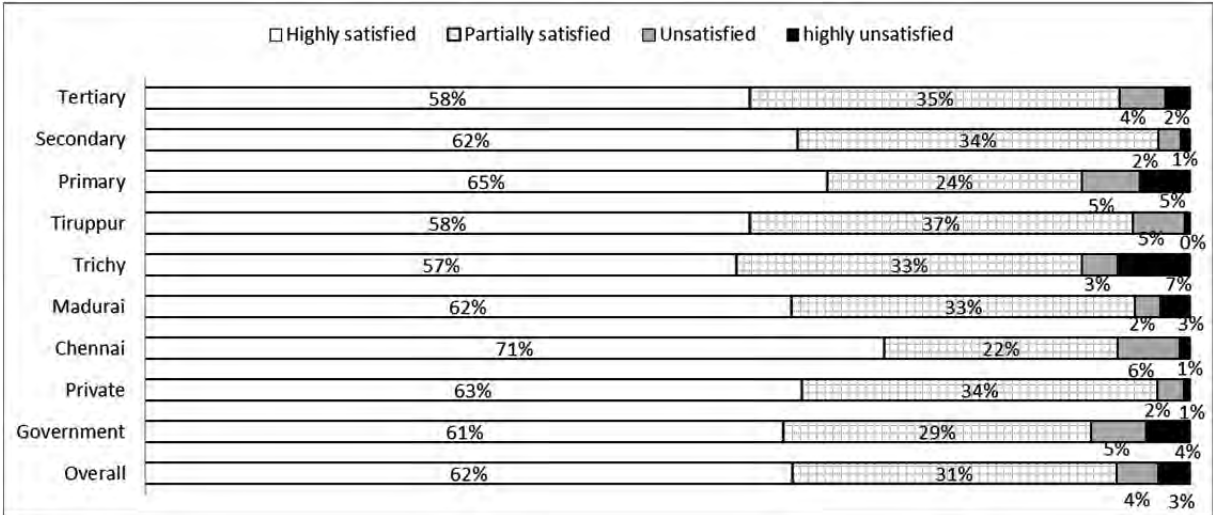


Figure 6-5: Patients’ level of satisfaction with health services by sector and level of health facilities

Main factors of satisfaction were quality of care, availability of drugs, useful information, and cleanliness of the facility. On the other hands, main reasons of dissatisfaction were lack of drugs, quality of care, and long waiting time and too crowded room.

6.2.7 Main issues to access health care services

According to the household survey, almost half of the respondents experienced several issues in relation to the access to health care for their families. The most common health concerns were expenses (31%), followed by unavailability of health facility nearby (23%) and long waiting time for treatment (18%, 150). In Madurai, 44 families (22%) answered that they do not know where to go for health care services compared to only 2 families (1%) in Chennai and 10 families in Tiruchirapalli and Tiruppur (5% each). Fear of health care facilities was also higher in Madurai (10%, 20) compared with other cities (Chennai 2%, Tiruchirapalli 5%, and Tiruppur 3%).

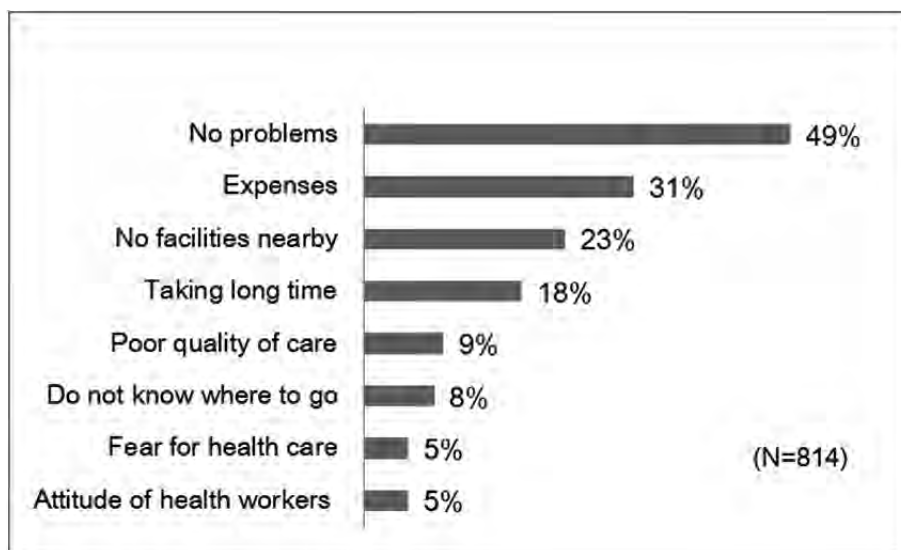


Figure 6-6: Main Problems in Relation to the Access to Health Care Service (N=814)

6.2.8 Water and Sanitation

In terms of water and sanitation, the situation varied among cities. Particularly, the toilet availability in the house varied from 84% in Madurai to 16% in Tiruppur (72% in Chennai and 46% in Tiruchirapalli). Apart from Madurai (73%), around half of the households did not have a drinking water source in the house (Chennai 36%, Tiruchirapalli 49%, and Tiruppur 54%).

6.3 Focus Group Discussion

From the household survey, it was found out that the majority of the respondents in slums lived in their house for long period, and the floating population was very small. The results of the FGDs with migrants (within and from outside the State) are shown below

Summary of focus group discussion among local migrants at Tiruppur

- Participants were recruited outside textile mills when they come out by age group (25-34 years old and 35-45 years old) and gender (male and female). Most of them come from villages of Madurai, Thanjavur, Dindigul to earn money on a daily basis through brokers or contractors.
- General issues of the migrants were depression due to separation from their families; unhygienic living conditions such as water pollution and contamination of sewage; air pollution; and lack of physical safety, especially among female migrants; and unhealthy foods.
- Health issues raised includes joint pains, headaches, eye problem due to short sleeping, asthma, respiratory problems due to dust coming from the textiles, stomach upset, cold, fever, skin problems, infections, snake and other insect bites as they go outside for open defecation.
- Most participants prefer to use private clinic although some of them have never used private facilities due to fare of high cost. The main reasons of using private facilities are lack of crowd and no need to stand in queue for long time. Even using free public health services, they need to spend transportation cost and also lose out on one day wage and hence some of participants consider it worthwhile to spend Rs.150 to visit private clinic instead. There was low awareness of governmental scheme for poor population, such as health insurance scheme and governmental pharmacies.

Summary of focus group discussion among migrants from North India

- Participants were recruited outside textile mills when they come out after their shift and participated in three group discussions by age group (25-34 years old and 35-45 years old), and gender (male and female). Most of them come from states like Uttar Pradesh, Orissa and Jharkhand and work in dyeing, packaging, checking departments.
- According to the FGD moderator, participants were scared to answer certain questions about working and living environment as they were concerned it might cause problems to their work later.
- Health issues raised were headache, joint ache, cold and cough. They prefer to get medicines from nearby pharmacies since it would not take much time and they trust staff at pharmacies. The second option is to visit a private doctor/clinic since the doctor tries to communicate with them using Hindi.
- Only in case of delivery, female migrants used public health facilities. Those females had come to Tiruppur with her husband after marriage and had given birth in Tiruppur.
- Younger migrants were aware of governmental health insurance scheme but they left the card in their hometown so that their family can use it.

6.4 Health Service Delivery in the city

6.4.1 Madurai

There are 31 public primary health facilities, one Medical College Hospital and satellite hospitals including Government Hospital Balarangapuram, Government Infectious Disease Hospital, Government Cholera Collection Centre, and Government Hospital for Thoracic Medicine which are attached to Madurai Medical College in the city. The Medical College Hospital serves as the top referral hospital in the southern part of Tamil Nadu. All specialty and super specialty are available except allergies and geriatric medicine¹⁰⁵. Vacancy rate of doctors are 52% at primary level and 19% at tertiary level as of 2015.

Table 6-7: Existing Public Health Facilities in Madurai City and Responsible Bodies

Level of Health Service		Total Number of facilities	Responsible
Primary	UPHC	31 (8 will be added soon)	Municipal Corporation
	UHC	0	-
Secondary	DHQH	0	-
Tertiary	Medical College Hospital	1	DME

(Source: HFWD and Madurai Municipal Corporation)

Madurai has a large network of private health facilities (approximately 516 private facilities in the city), including smaller clinics and nursing homes, and large 100-500 bedded super specialty hospitals (e.g. Jawahar Hospital, Christian Mission Hospital, and Apollo Hospital).

There are five single hospitals, 39 multi-special hospitals, and 22 diagnostic centres in the private facility covered by CMCHIS in the district.

6.4.2 Tiruppur

There are 9 UPHCs and one DHQH in Tiruppur city. Among 9 UPHCs, 8 UPHCs will be established in the near future. The DHQH is the top referral and the only secondary health facility in the city. The health facility will be upgraded to a tertiary health facility in the near future. In addition to primary care services, nearly all specialty services are available in the health facility except for venereology, plastic surgery and thoracic medicine. Vacancy rate of doctors are 77% at primary level and 23% at DHQH as of 2015.

Table 6-8: Existing Public Health Facilities in Tiruppur City and Responsible Bodies

Level of Health Service		Total Number of facilities	Responsible
Primary	UPHC	9 (8 will be added soon)	Municipal Corporation
	UHC	0	-
Secondary	DHQH	1	Joint Director, DMRHS
Tertiary	Medical College Hospital	0	-

(Source: HFWD, Tamil Nadu)

There are several private health facilities in Tiruppur, including some with multi-specialty and super specialty services such as orthopaedics, cardiology, gastroenterology, ENT, obstetrics and

¹⁰⁵ Although separate departments are not available, the hospital provides medical services for allergies and geriatrics in general OPD.

gynaecology, fertility, dialysis, eye care, and plastic surgery. According to stakeholders consulted in the city, a large proportion of the city's population avail of private health facilities.

There are five single hospitals, five multi-special hospitals, and 10 diagnostic centres in the private facility covered by CMCHIS in the district.

6.4.3 Chennai

There are 155 public primary health facilities, four secondary health facilities, and four tertiary health facilities in the city. Three Medical College Hospitals serve as the top referral facilities for the whole of Tamil Nadu. Vacancy rate of doctors are 36% at primary level, 2% at DHQH, and 14% at tertiary level as of 2015.

Table 6-9: Existing Public Health Facilities in Chennai City and Responsible Bodies

Level of Health Service		Total Number of facilities	Responsible
Primary	UPHC	140	Municipal Corporation
	UHC	15	Municipal Corporation
Secondary	DHQH	3	Joint Director, DMRHS
Tertiary	Medical College Hospital	4	DME

Note: In addition to peripheral hospitals, there is a communicable disease hospital focusing on secondary level of communicable disease care under Chennai Municipal Corporation.
(Source: HFWD)

According to Cooperation of Chennai, there are 466 private facilities and more than 10,000 private medical practitioners in the city. Chennai is also a medical tourism hub in India, attracting 45% of international health tourists and 30-40% of domestic health tourists.¹⁰⁶

There are 24 single hospitals, 115 multi-special hospitals, and 29 diagnostic centres in the private facility covered by CMCHIS in the district.

6.4.4 Tiruchirapalli

There are 17 public primary health facilities, one secondary health facility, and one public tertiary health facility in the city. According to the former City Health Officer, two urban PHCs will be upgraded to urban CHCs within this year. Mahatma Gandhi Memorial Government Hospital, attached to K.A.P. Viswanatham Government Medical College, has recently established super specialty building in 2014 and almost two thirds of departments will be shifted in the building. This hospital is the top referral facility in the district and receives referral cases from surrounding three districts, namely Karur, Ariyalur, and Perambalur. Vacancy rate of doctors are 18% at secondary level and 23% at tertiary level as of 2015.

¹⁰⁶ NABH. "Chennai – India's Health Capital". India Health Visit"

Table 6-10: Existing Public Health Facilities in Tiruchirapalli City and Responsible Bodies

Level of Health Service		Total Number of facilities	Responsible
Primary	UPHC	17	Municipal Corporation
		0	DDHS
	UHC	0	Municipal Corporation
Secondary	DHQH	1	Joint Director, DMRHS
Tertiary	Medical College Hospital	1	DME

(Source: HFWD)

Consultations with several stakeholders at the Mahatma Gandhi Medical College suggest that approximately 60% of Tiruchirapalli's population avail of private health facilities at 5-6 hospitals. The city has 10 private multi-specialty hospitals and around 140 private nursing homes¹⁰⁷.

There are five single hospitals, 33 multi-special hospitals, and 21 diagnostic centres in the private facility covered by CMCHIS in the district.

Key Messages

- Almost half of household survey respondents who sought the health care service in the last one month went to the public facilities and the remaining half went to the private facility.
- The main reasons for selecting the facility were the distance from residence irrespective of whether facility is public or private and quality of care. The perceived reasons for not using public facilities included unavailability of facilities, long waiting time, not convenient opening time and fear of rejection.
- Half of respondents in the household survey had issues in relation to the access to health care of their families. The most common concerns were expenses, followed by non-availability of health facility nearby and waiting time. Average monthly expenditure on health was Rs.500 among all income level. This amount accounts for almost 20% of total monthly income for those whose income level was less than Rs. 3,000.
- The utilization of outreach services was low among respondents.
- Majority of the respondents in slum lived in their house for long period, and floating population was very small.
- Some slum dwellers and migrants are not aware of available public financial protection schemes and health facilities. Migrants suffered from health problems related to their occupation but had difficulties to access health care.

¹⁰⁷ State Health Society- Tamil Nadu. 2013-2014. "Tiruchirapalli City Corporation". NUHM PIP. Volume II:1181.

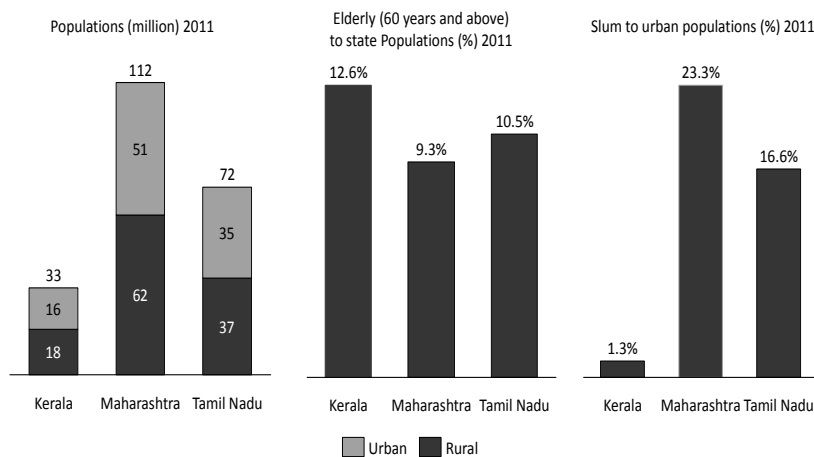
Chapter 7 NUHM in Other States

Kerala and Maharashtra have been selected¹⁰⁸ as sample states to study NUHM implementation in comparable State with urban health issues. The study was conducted through desk review and telephonic consultation with key stakeholders.

7.1. State Profiles

Kerala performs better than Tamil Nadu and Maharashtra on several socio-economic and health indicators such as economic growth, human development, sex ratio, literacy, poverty levels and child and maternal health, but its per capita income is lower than the other two States.

Tamil Nadu tops the list of urbanized States in India (49%), closely followed by Kerala (48%) and Maharashtra (45%). Maharashtra has the highest proportion of urban slum population (23%), followed by Tamil Nadu (17%), whereas Kerala's urban slum population is very small (1%), as depicted in Figure 7-1 below¹⁰⁹. Good economic indicators, a clear policy on land rights, and successful housing security schemes such as 'One Lakh Housing' are some factors which have driven down the slum population in Kerala¹¹⁰.



(Source: Census of India 2011)

Figure 7-1: Key demographic and urbanization statistics for Kerala, Maharashtra and Tamil Nadu

In Kerala, NCD account for more than 50% of deaths in the age group of 30-60 years due to high rates of diabetes, hypertension, cardiovascular diseases and cancer¹¹¹. Maharashtra has a high prevalence of vector borne diseases with the number of dengue deaths showing an upward trend. There is also a rising incidence of tuberculosis, a high incidence of malnourishment, obesity and AIDS in urban areas¹¹². Tamil Nadu and Maharashtra respectively accounted for 11% and 9% of all

¹⁰⁸ The two states have been selected based on their relative progress achieved on NUHM to date, and broadly comparable levels of urbanization and growth as Tamil Nadu. This was agreed with the MoHFW, GoI.

¹⁰⁹ Census of India 2011

¹¹⁰ Centre for Development Studies (2005), "Human Development Report"

¹¹¹ K.R. Thankappan, Bela Shah et al (2009), "Risk Factor Profile for Chronic Non-communicable Diseases: Results of a Community Based Study in Kerala". The study was based on a sample of 7,449 individuals stratified by age group, sex and place of residence.

¹¹² Yashwantrao Chavan Academy of Development Administration (2012), "Human Development Report Maharashtra - Towards Inclusive Human Development"

deaths caused by road accidents in India in 2011¹¹³.

The private sector accounts for a large share of health services in both the States – more than 70% of all health facilities in Kerala and 89% of out-patients in Maharashtra are comprised of the private sector. Both Governments use the national insurance scheme RSBY, to extend health services to urban slum populations^{114 115}.

7.2 NUHM Implementation

Key points to note on NUHM implementation in the two States are as follows:

- NUHM in Kerala largely focuses on strengthening primary health care, by for example strengthening and establishing UPHCs, UCHCs, evening OP clinics; improving the capacity of ULBs; controlling communicable diseases and overcoming water and sanitation challenges (e.g. by strengthening ward sanitation committees, running behaviour change programmes, fogging to prevent dengue, conducting water surveillance)¹¹⁶. Given the high incidence of diabetes, cancer and CVDs in migrant populations, NUHM also focuses on NCDs with treatments through OP facilities; geriatric special clinics on Saturdays; door to door NCD screening; NCD outreach camps; and provision of medicines and diagnosis through testing services¹¹⁷. The Government of Kerala (GoK) also plans to re-open RCH centres; hold immunization camps; screen migrants for health issues and provide health cards; and strengthen the pain and palliative care programmes and schemes for the elderly population¹¹⁸.
- NUHM in Maharashtra mainly prioritizes appointing health personnel such as ANMs, organizing outreach camps in slum areas, forming RKS, constructing and renovating new UPHCs/UCHCs, and procuring materials such as medicines for these UPHCs.
- Maharashtra (Rs.3,212 million) has a much higher budget for NUHM than Tamil Nadu (Rs.954 million) and Kerala (Rs.365 million) in 2014-15. Kerala and Maharashtra had spent 18% and 49% of their NUHM 2014-15 budget by December 2014, as depicted in Figure 7-2 below¹¹⁹. The largest proportion of funds in Kerala have been budgeted for infrastructure (30%), followed by other services (23%) and procurement (14%); in Maharashtra, the largest proportion of funds have also been budgeted for infrastructure (55%), followed by procurement (12%) and human resources (10%). Only a very small percentage of funds have been allocated in all three States for community involvement – 5% in Maharashtra; 0.2% in Tamil Nadu and no funds have been allocated for community activity in Kerala.

¹¹³ Journal of Orthopaedics, Traumatology and Rehabilitation (2013) “National Statistics on road traffic accidents in India”

¹¹⁴ Government of Kerala, HFWD(2013), “Draft Health Policy 2013”

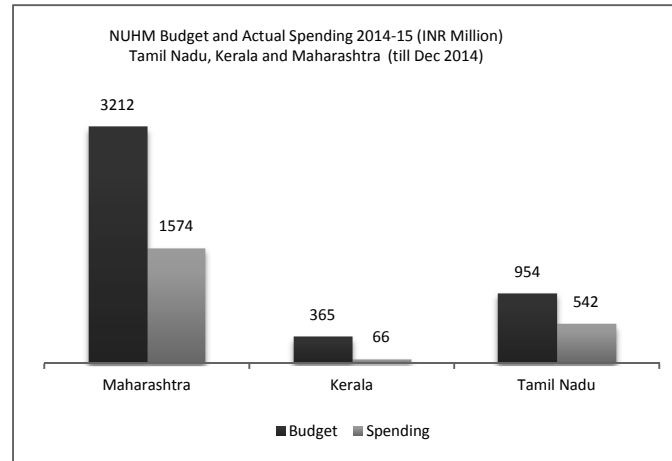
¹¹⁵ Stakeholder Interviews with NHM Government representatives (refer to Annex 2 for list of stakeholders)

¹¹⁶ Government of Kerala, NHM (2013) “City Health Plan”

¹¹⁷ Government of Kerala, NHM (2013) “City Health Plan”

¹¹⁸ The Hindu (2013) “Health centres to resume services under NUHM”

¹¹⁹ Government of Maharashtra and Kerala, Ministry of Health and Family Welfare (2013, 2014 and 2015), “National Urban Health Mission PIPs and ROPs 2013-14 and NHM PIPs and ROPs 2014-15 and 2015-16”. Data for actual spending under NUHM in Tamil Nadu is not available.



(Source: NHM PIP 2015-2016 in each State)

Figure 7-2: NUHM Budget and Spending (2014-15)

7.3 Lessons learnt from NUHM in Kerala

Kerala's relative success in the provision of health care is attributable to high resource allocation to health care; well-developed health infrastructure; a strong cadre of health care professionals; and active engagement of ULBs. The following aspects of NUHM implementation have worked well in the State and can offer lessons for Tamil Nadu:

- Kerala implements NUHM through its ULBs, which have strong managerial, technical and public health competencies to provide primary health services. To strengthen the financial position of ULBs, Kerala provides untied grants in three streams – Development, Maintenance and General Purpose¹²⁰.
- Kerala has leveraged the self-help group and community volunteer model of Kudumbashree, the State poverty eradication mission, to organize MASs in the State¹²¹. The model provides useful learning on how to make MASs more representative by drawing one committee member from a cluster of 10-20 houses¹²². This also strengthens community structures at the slum and city levels and allows better coordination between government functionaries and the community.

On the flip side, the stakeholder consultations suggest that NUHM implementation in the State could benefit from greater State Government involvement in human resource management (e.g. in terms of providing manpower and filling vacancies).

¹²⁰Yashwantrao Chavan Academy of Development Administration (2009) "Best Practices in Financial Management of ULBs in India"

¹²¹GoI, NHM (2015) "National Dissemination 8th Common Review Mission Kerala"

¹²²GoI, Ministry of Health and Family Welfare (2014), "Making the Urban Health Mission work for the Urban Poor. Report of the Technical Resource Group National Urban Health Mission". Kudumbashree model is based on a three-tier system of Neighborhood Groups (NHGs) at the grass root, Area Development Society (ADS) at wards and Community development Society (CDS) at the local body level. Each NHG has five volunteers for community health activities, infrastructure development and income generation.

In addition to NUHM, the following urban health programmes in Kerala could offer lessons:

- Kerala is the first State in India with a formal palliative policy, which has furthered the Neighbourhood Network in Palliative Care (NNPC) model – a community based initiative to provide home based palliative care that uses volunteers and government funding for local community based care units.
- The GoK launched the Old Age Policy, 2013 for the provision of elderly care by building old age and special care homes and ensuring availability of geriatric medicine.
- The GoK has built its State NCD control programme (Amruthum Arogyam) based on national programme. It has announced free treatment for cancer and launched the Karunya Benevolent Fund, which provides financial assistance to those suffering from acute ailments like cancer and heart diseases and for palliative care.
- The GoK has also completed pilot projects on Electronic Health Record and Electronic Medical Record, and increasing adoption of e-health solutions.
- Kerala has developed quality health standards such as Kerala Accreditation Standards for Hospitals.
- The GoK has planned to extend its 108 emergency services to manage trauma cases across the State and is building a special cadre of doctors and nurses to treat trauma cases¹²³.

7.4 Lessons learnt from NUHM in Maharashtra

The following aspects of NUHM implementation in Maharashtra have worked well:

- Maharashtra is one of five States in India that has successfully implemented Community Based Monitoring and Planning (CBMP), which has contributed to increased access, quality and accountability of health services. CBMP in Maharashtra is implemented through health officials, elected village representatives, civil society organizations and active community members forming multi-stakeholder monitoring and planning committees. Implementation of CBMP includes awareness raising and preparatory activities, capacity-building of participants, assessment of health services, organization of public hearings and dialogue events.
- Government of Maharashtra (GoM) has introduced innovative models like Mobile Medical Units that are useful, where health facilities cannot be easily constructed¹²⁴.
- The GoM has set-up Nutrition Rehabilitation Centres and nutrition drives that tackle malnutrition in urban areas; women check-up camps and health trainings that focus on health for commercial sex workers.
- Maharashtra has central provisioning of free medicines and diagnostics.
- The GoM has encouraged the use of e-health innovations such as software to manage medical officers, process transfer requests and track ASHAs. In particular, Maharashtra and Tamil Nadu are considered leaders in e-governance, closely followed by Kerala¹²⁵.

In addition to NUHM, the following urban health programmes in Maharashtra also offer lessons:

¹²³ Government of Kerala, HFWD(2013), “Draft Health Policy 2013”

¹²⁴ MMUs are vehicles stocked with medical equipment and manned by health personnel like doctors and nurses in metro and big cities.

¹²⁵ Government of Maharashtra (2013) “State of e-governance in Maharashtra (2013)” As per the Readiness Assessment Report 2010

- To combat NCDs, Maharashtra started implementing national programme and launched the Rajiv Gandhi Jeevandayee Arogya Yojana (RGJAY) to facilitate access to NCD treatments through specialty services for Below Poverty Line as well as Above Poverty Line families.
- To combat malnutrition, Maharashtra launched Rajmata Jijau Mother – Child Health and Nutrition Mission (RJMCHNM) in March 2005, which helped improve three main nutrition indicators – underweight, stunting and wasting of children below two years¹²⁶.
- The GoM provides palliative care through the National Palliative Care Programme 2014-15 and the Children Palliative Care Project started in October 2010. Maharashtra also launched a scheme called Bal Arogya Abhiyan aimed at early detection of birth defects, diseases and deficiencies in children.

Key Messages

- Lessons learnt from Kerala NUHM implementation include the active engagement of ULBs and leverage of self-help group and community volunteers. It is the first State in India with formal palliative policy and implements a community based initiative to provide home based palliative care.
- Maharashtra has successfully implemented the community based monitoring and planning which contributed to increased access, quality and accountability of health services. It provides palliative care to the population including children through national palliative care programme 2014-2015 and children palliative care project.

¹²⁶ Government of Maharashtra (2012), "Maharashtra Human Development Report 2012 – towards inclusive development"

Chapter 8 Proposed Project Scope

8.1 Challenges in urban health

Tamil Nadu is one of the most urbanized States in India with 49% of its population living in urban areas. The urban growth rate is 27% (2001-2011) and the population of slum, migrants and elderly is one of the largest in the country. Tamil Nadu's health system is recognized as one of the successful models in India due to significant progress in improving MCH as well as communicable disease control and increasing access to health care services in the last few decades.

Although Tamil Nadu is one of the best performing states in healthcare, it also has some challenges to overcome due to demographic and epidemiological transition.

There is an increasing burden of NCDs with high levels of morbidity and mortality. NCD accounts for more DALYs in India than communicable diseases. NCD burden is also affecting urban poor and vulnerable population who still suffer from communicable diseases. WHO projections show that magnitude of the NCD epidemic continues to accelerate and the pressing need for stronger and more focused responses is increasingly recognized. Hence health systems need to respond to NCDs which require timely management and prevention.

In Tamil Nadu, full-fledged Medical College Hospitals have difficulty in providing timely advanced medical care such as cardiothoracic surgeries for those in need. Main reason could be the overcrowded condition of health facilities. This may be caused by increasing number of NCD patients as well as limited number of Medical College Hospitals which can provide advanced medical care and sub-optimal utilization of district top referral facilities. It is reported that shortage of essential equipment in the area of imaging and laboratory tests, surgical operations, and haemodialysis occurred in district top referral facilities. Furthermore, lack of secondary health facilities in most of district capitals also contributes to overflow of tertiary health facilities.

Quality control at Medical College Hospitals, such as patient safety and effective hospital management needs to be improved to meet global standards.

Other reasons might be related to patient health seeking behaviour. It is reported that people tend to seek medical care after getting severely ill as NCDs cause no symptom at early stage and are most often diagnosed after resulting in complications. This may also increase number of patients who require timely advanced medical care at tertiary level.

Primary health care plays a key role in prevention. However, it is reported that UPHCs are not fully utilized except MCH.

In terms of access to quality health care among vulnerable population, some respondents who were slum dwellers and migrants felt difficulty in accessing to quality health service in household survey. Main reasons were lack of availability/ information of a facility nearby, long waiting time, inconvenient opening time, poor quality of care and fear of rejection. Some of them had limited knowledge of available public health services and financial protection schemes. Expenses were one of the most common concerns in relation to the access to health care of their families.

8.2 Justification

Based on the above challenges, it is clearly necessary to improve the quality of health services in urban areas.

While communicable diseases and reproductive and child health care need continuous efforts for further improvement, the NCD burden is expected to increase continuously in India. As the prevalence of NCDs increases, the intervention for its prevention and management at all levels should be strengthened.

At the moment, advanced medical care is available in only limited number of full-fledged Medical College Hospitals. Considering necessity of timely management, it is ideal to provide such services at all tertiary level as well as DHQs in each district in the future. In order to expand capacity to the lower level of hospitals in the future, upgradation of the full-fledged Medical College Hospitals in the areas of clinical capacity, effective management and patient safety is crucial as the first step and it is also expected to enhance development of necessary qualified human resources for super specialities in the State. Given the fact that NCD treatment in the private sector causes high expenditure, ensuring specialized medical care at public tertiary health facilities is necessary for vulnerable population.

At the same time, optimal utilization of district top referral facilities has to be improved with essential equipment to meet with increasing demands for timely NCD management. It will also reduce overflow of full-fledged Medical College Hospitals. The establishment of a secondary health facility in the city will be directly beneficial to increase the access of urban population including the vulnerable population to health care.

To strengthen NCD prevention, primary health care plays a key role. NUHM has been supporting the establishment of infrastructure as well as human resources and necessary supplies. Therefore, the basic physical inputs will be forthcoming. However, in order to cope with increasing NCD burden, the capacity should be further improved to strengthen health promotion activities to reduce NCD risks and ensure early detection and follow up of high risk individuals.

While the project intends to integrate its support into the existing initiatives and programmes, the project should provide additionality to the financial support of the centrally sponsored programmes. Therefore, the provision of infrastructure and supplies at the urban primary level covered by the NUHM will not be the target of the project.

8.3 Project Overview

8.3.1 Project Title and Objective

Project title is Tamil Nadu Urban Health Care Project

The objective of the project is to improve the quality of health services in urban areas through (i) strengthening the capacity of key hospitals with upgradation of facility and equipment, and (ii) reinforcing the capacity of human resources with the focus on NCDs, thereby improving the health of people in Tamil Nadu

8.3.2 Project Component and Site

The GoTN proposed 17 cities for the Project site as listed below based on the population size, needs,

and priority for the health facility development.

1	Chennai	7	Erode	13	Cuddalore
2	Coimbatore	8	Vellore	14	Dindigul
3	Madurai	9	Tiruppur	15	Pudukottai
4	Tiruchirapalli	10	Thoothukudi	16	Krishnagiri
5	Salem	11	Nagercoil	17	Periyakulam
6	Tirunelveli	12	Thanjavur		

Based on the larger population size, all 12 Corporations were selected, namely Chennai, Coimbatore, Madurai, Tiruchirapalli, Salem, Tirunelveli, Erode, Vellore, Tiruppur, Thoothukudi, Dindigul, and Thanjavur. The population size varies from 8.7 million¹²⁷ in Chennai Corporation to over two hundred thousand in Dindigul Corporation¹²⁸.

The rest of five cities were selected based on needs and priority for health facility development, Table 8-1 shows different selection reasons of the cities for assistance to improve quality of urban health services.

Table 8-1: Selection reasons of the five cities

Name of City	Selection Reason
Cuddalore	Cuddalore is one of the highly populated districts. The DHQH has one of the largest numbers of outpatients and IPs among all DHQHs in Tamil Nadu and upgrading existing equipment is necessary.
Pudukottai	Although Pudukottai has one of the largest DHQH as the top referral facility of district, BOR is quite low (63% ¹²⁹) and strengthening functioning of the hospital is necessary.
Krishnagiri	Although DHQH Krishnagiri is the top referral facility, it does not have some basic equipment for diagnosis and investigation.
Nagercoil	Kanyakumari Medical College Hospital is in Nagercoil, the capital town of Kanyakumari district. The district is highly urbanized and more than 82% of population live in urban area. The Medical College Hospital needs to upgrade it as the top referral facility.
Periyakulam	DHQH Periyakulam had functioned as the top referral facility until 2004 when Theni Medical College Hospital was inaugurated. The DHQH still functions as one of the top referral hospitals and it is one of the most crowded DHQH in Tamil Nadu.

(Source: Survey Team)

The Project has four components with different implementation sites across the 17 cities. The selection criteria are explained below in the section 8.4.

¹²⁷ Data obtained from Chennai Corporation

¹²⁸ Census of India 2011

¹²⁹ Data was obtained from DMRHS.

Table 8-2: Project Components and Sites

	Components	Target Facilities/Areas
1	Upgrading Tertiary Hospitals (Facilities and Medical Equipment)	<ul style="list-style-type: none"> • Madurai Medical College Hospital (MMCH) • Kilpauk Medical College Hospital (KMCH) • Coimbatore Medical College Hospital (CMCH)
2	Strengthening Referral Hospitals (Medical Equipment)	Seven Medical College Hospitals <ul style="list-style-type: none"> • Salem Medical College Hospital • Vellore Medical College Hospital • Tanjavur Medical College Hospital • Tirunelveli Medical College Hospital • Tiruchirapalli Medical College Hospital • Toothukudi Medical College Hospital • Nagercoil (Asaripallam) Medical College Hospital Seven DHQs <ul style="list-style-type: none"> • Erode DHQH • Tiruppur DHQH • Cuddalore DHQH • Dindigul DHQH • Pudukottai DHQH • Krishnagiri DHQH • Periyakulam DHQH
3	Strengthening Secondary Care Hospitals (Facilities and Medical Equipment)	Four Secondary Care Hospitals <ul style="list-style-type: none"> • Avadi, Chennai • Maniyanoor, Salem • Velampalayam, Tiruppur • Kandiaperi, Tirunelveli
4	Strengthening Hospital Management	21 facilities in 17 cities
5	Strengthening Primary Health Care in NCDs	Regional Training Institutes in Chennai and Madurai

(Source: Survey Team)

8.3.3 Approach

The Project proposed to employ regional and city approach.

The regional approach is a way to minimize the number of referral cases to the capital or outside the State through improving the quality of top referral facilities. Tamil Nadu is divided into five regions within which referral of patients commonly occur: North, North West, East, West and South. This will address the issues of overcrowded health facilities and improve the quality of care and effectiveness of its hospital management through upgrading the regional top referral facilities to be able to provide the highest possible services in the State and strengthening of district top referral facilities to reduce the burden of higher health facilities.

The city approach is to enhance the referral system within the city through strengthening the secondary care facilities as a first referral unit and reinforcing the capacity of primary health care. The enhancement of city wise referral will contribute to the optimal use of the top referral facilities. The Project aims to create a model in each region with lessons to be disseminated to the other cities by the State Government. Capacity development of human resources will be crosscutting measure for entire level.

8.4 Selection of Target Cities and Facilities

The selection of target cities and facilities in components 1-3 has been conducted as follows.

(1) Component 1: Upgrading Tertiary Hospitals

Selection criteria were set to identify the regional core centres which serve as regional top referral facility from the viewpoint of the level of the usage as well as the academic role. Then, 10 cities/Medical College Hospitals were systematically scored using the following indicators and methods which were determined in the discussion with HFWD.

Criterion 1: Urbanization status

Criterion 2: Overburden status

Criterion 3: Availability of specialty services

Criterion 4: Availability of medical student seats

Table 8-3: Selection Criteria and Scoring Methods

	Indicators	Data/Formula used	Scoring
1	Urbanization status	<ul style="list-style-type: none"> City population District Population Density 	City population <ul style="list-style-type: none"> Group A (>1.5 million): 3 points Group B (1.1-1.5 million): 2 points Group C (0.5-1 million): 1 point Group D (<0.5 million): 0 point District Density <ul style="list-style-type: none"> More than twice as average: 3 points More than average but less than twice: 2 points Average: 1 point Below average: 0 point
2	Overburden status	BOR	Hospital <ul style="list-style-type: none"> With BOR more than 100%: 3 points With BOR 90-100%: 2 points With BOR 80-89%: 1 point With BOR <80%: 0 point
3	Availability of specialty services	Availability of OP and IP of the specialty departments [List of the department] Cardiology, Neurology, Cardiothoracic Surgery, Neurosurgery, Orthopaedics, Vascular Surgery	Hospital <ul style="list-style-type: none"> Availability of OP of the listed department: 1 point each Availability of IP of the listed department: 1 point each
4	Availability of medical student seats	<ul style="list-style-type: none"> Post Graduate (PG) Diploma seats PG M.D. Medicine seats PG M.S. Surgery seats Super Specialty M.Ch. surgery seats Super Specialty D.M. Medicine seats 	Medical College <ul style="list-style-type: none"> Availability of the relevant PG Diploma seats: 1 point Availability of the relevant PG M.D. seats: 1 point Availability of the relevant PG M.S. seats: 1 point Availability of the relevant M.Ch. seats: 1 point Availability of the relevant D.M. seats: 1 point

(Source: HFWD)

Table 8-4: Scoring Results

Region	City	1. Urbanization	2. Overburden	3. Department	4. Seat	TOTAL
North	Chennai*	5	0	10	4	19
	Vellore	2	2	7	2	13
North West	Salem	2	2	10	2	16
West	Coimbatore	3	2	11	4	20
East	Tiruchirapalli	2	0	5	2	9
	Thanjavur	1	3	10	5	19
South	Madurai	3	2	10	5	20
	Tirunelveli	1	3	10	3	17
	Thoothukudi	0	0	8	0	8
	Nagercoil	0	3	7	2	12

* Kilpauk Medical College Hospital
(Source: Survey Team)

Among the top five cities/medical college hospitals based on the scoring results, further consideration was made in accordance with the current infrastructure status as well as the future plan of renovation or new construction. Finally three hospitals were shortlisted as priority in discussion with HFWD.

Table 8-5: Selected Hospitals

No.	City	Facility
1	Chennai	Govt. Kilpauk Medical College Hospital
2	Madurai	Govt. Rajaji Hospital
3	Coimbatore	Govt. Coimbatore Medical College Hospital

(2) Component 2: Strengthening Referral Hospitals

The top referral hospitals in 14 cities which were not selected in component 1 were chosen for the components 2.

(3) Component 3: Strengthening Secondary Care Hospitals

It was proposed to select one city per region to strengthen or create a model secondary care hospital. The criteria for the city selection are (i) population size, (ii) availability of secondary health facilities, and (iii) priority within the region. As a result, the four cities – Chennai, Salem, Tiruppur and Tirunelveli – were selected.

Table 8-6: Selection of Model Secondary Care Hospital

Region	City	Population	Selection
North	<u>Chennai</u>	8,696,010	Selected: need to cater emerging population in the newly developed factory areas
North West	<u>Salem</u>	839,549	Selected: need to improve referral system to reduce burden of Salem medical college hospital
West	Coimbatore	1,601,438	Not selected
	<u>Tiruppur</u>	874,116	Selected: need to cater rapidly increasing vulnerable population such as migrants
East	Tiruchirapalli	916,857	Not selected as there is secondary health facility in the city
South	Madurai	1,557,120	Not selected
	<u>Tirunelveli</u>	474,838	Selected: need to improve referral system to reduce burden of Madurai

(Source: Concept note for strengthening Urban Health Care in Tamil Nadu in collaboration with JICA, HFWD)

8.5 JICA Technical Assistance

HFWD and JICA discussed possibilities of future technical assistance, by conducting training courses or implementing technical cooperation projects to maximize the outcome of the Project. Both sides confirmed that the cost of the technical assistance will be borne by JICA outside of the Project's budget. Further study will be conducted upon the official request by HFWD.

The possible areas of the technical assistance are below.

- Japanese Style Hospital Design
- Enhancing primary health care services for vulnerable population

Chapter 9 Proposed Project Design

9.1 Proposed Project Components

9.1.1 Component 1-1: Upgrading Tertiary Hospitals (Facilities)

(1) Study of Design Policies

1) Basic Design Concept

The priorities of the facilities’ sub-components, design requirements and designs should be determined to meet the following purposes of the project:

a) Improving NCD Treatment

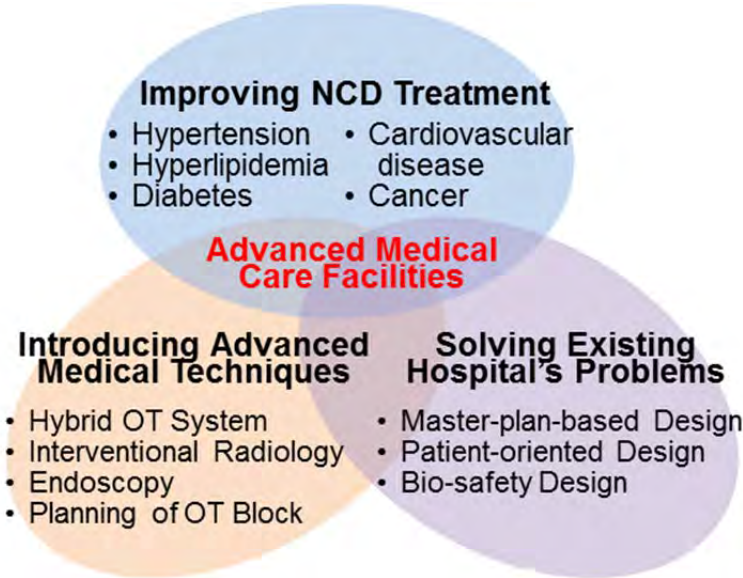
To strengthen national efforts to address the burden of NCDs, the project provides advanced treatment for CVD, cancers, chronic respiratory diseases and diabetes, etc.

b) Solving Existing Health Facilities’ Problems

By replacing and recasting physically deteriorated and functionally outdated existing buildings with a comprehensively designed modern “Central Diagnosis block”, the project aims to solve problems that the existing hospital campus has been facing to improve the patient safety and effective hospital management based on a longer-term Master Plan.

c) Advanced Medical Techniques

The project intends to promote advanced medical technology such as hybrid OT system, IVR (minimally invasive surgery) and endoscopies. The project also aims to introduce designs and planning of the international standard OT and ICU by constructing state-of-art facilities as well as operation and maintenance of those facilities.

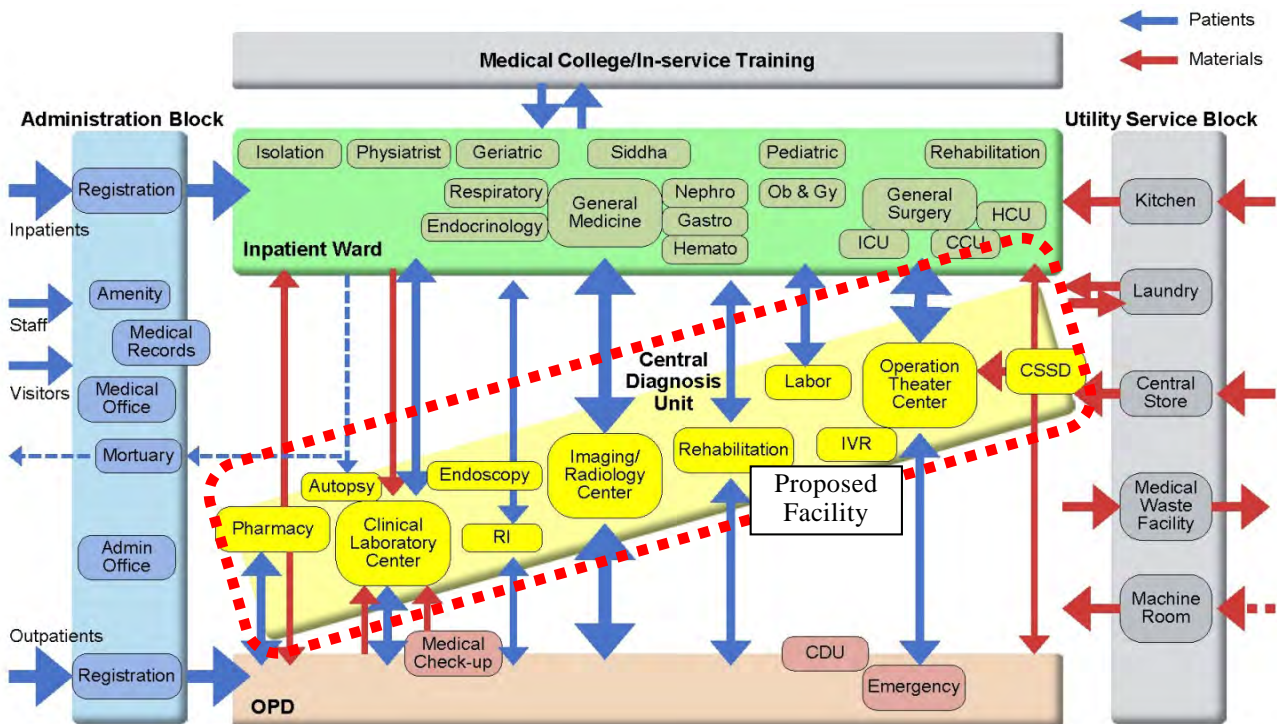


(Source: Survey Team)

Figure 9-1: Design Concept of the Facilities

In order to fulfil the aforementioned three project purposes, the project will introduce advanced medical care functions to public health facilities in Tamil Nadu.

Figure 9-2 shows a conceptual diagram of functions, their relationships and circulation linkages at a typical health facility building. In general, IP wards and the OPD do not need elaborate designs or high-end mechanical systems. It is reasonable and recommended that the project mainly deal with the central diagnosis functions (in particular, the OT block and imaging department), by introducing state-of-the-art designs and promoting advanced electrical and mechanical systems.



(Source: Survey Team)

Figure 9-2: Functional Diagram of Common Health Facility Buildings

The fundamental design concept for the proposed buildings is to integrate the scattered, existing central diagnosis functions (OT rooms and ICU) into one location, and to provide international standard bio-safety design and patient-oriented services.

2) Master Plan Development

Health facility buildings should be developed continuously and seamlessly. Developing physical infrastructure based on a sound and concrete Master Plan for redevelopment is critical to accomplishing anticipated health facility designs without interrupting on-going medical activities.

The Survey Team proposes the outlined Master Plan layout for each target tertiary health facility, and intends to design the proposed building as a first step of the planned and phased redevelopment. The following issues should be addressed when elaborating the Master Plan:

a) Block plan layout based on functions

Most of the existing central diagnosis and OPD blocks are separated by specialty, determined by the staff's convenience rather than patient focused, resulting in similar functions being scattered throughout the health facility premises.

Integrating similar functions in one location and relocating scattered buildings to a function-based layout is very important for providing patient-oriented services, as well as enabling effective and organized operation and management.

b) Visibly structured building configurations

The aforementioned function-based buildings should be laid out with visible structures and connected by a central corridor or centre court to provide patients with a sense of destination and direction. Using the central spine (wide corridor) to connect phased-construction buildings will also enable organized redevelopment.

c) Segregation of circulation

Different types of circulation (such as patients, medical staff, service staff and materials) are not properly separated at most of the existing health facility campuses. In most campuses, vehicle and patient access are mixed. Inside the OT block, even sterilized and un-sterilized materials are often brought along the same circulation.

The proposed Master Plan should provide properly segregated vehicle and patient road systems within the campus, as well as segregated human and material circulation (both sterilized and un-sterilized) inside each building.

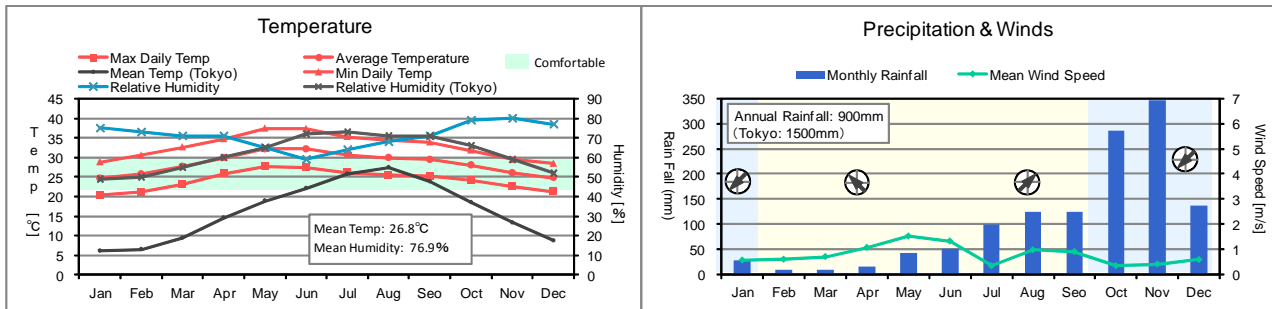
3) Natural Conditions

a) Temperature and Humidity

Chennai and Madurai share a tropical monsoon climate. The proposed buildings will basically be oriented to an east-west axis, and most rooms will face southward or northward in order to minimize heat gain by direct solar radiation. The rooms facing southward will be provided with louvres to prevent direct sun exposure and to reduce the heat load caused by solar radiation. Air-conditioners will be installed in rooms in which medical activities require temperature control.

b) Precipitation

Rainfall in Tamil Nadu is concentrated, therefore the proposed buildings' roof angles, downspout pipe sizes, and overflow devices will be designed to address the concentrated amount of rainfall. An exterior drainage plan within the premises will also be designed.



(Source: World Climate and World Weather Service Information)

Figure 9-3: Temperature and Precipitation in Chennai

c) Wind Direction and Velocity

In Tamil Nadu, the prevailing winds blow from southwest throughout the year. The air circulation patterns of the proposed buildings will be designed to utilize natural ventilation in accordance with the prevailing wind directions.

4) Construction/Procurement Circumstances

Local construction companies carry out many large-scale, high-rise construction projects in Chennai, Madurai and Coimbatore, and many experienced and skilled labours are available in these cities. The capabilities of the local construction companies and local workforce will be utilized to reduce construction costs by coordinating and adjusting the design of the proposed buildings (which include advanced OT rooms and other related functions) to meet local construction methods. It will be necessary to carefully assess the construction management experience of local sub-contractors, as the utility work of the proposed buildings will require a relatively high level of technical expertise.

5) Applied Standards and Grades

The criteria for designing the proposed buildings will basically conform to those set by the GoI.

a) Hospital Planning

- *Guidelines for District Hospitals/Community Health Centres (CHC), IPHS*
- *Standard Requirements for Medical Colleges, MCI*
- *Design Guidelines, NABH*

b) Building Designs

- *Indian Standard*
- *Building Code of India 2005*
- *Tamil Nadu Town and Country Planning Act.*
- *Development Control Regulations, Directorate of Town and Country Planning*
- *Second Master Plan for Chennai Metropolitan Area, Development Regulations, Chennai Metropolitan Development Authority*

Standards to design OT rooms and ICUs will conform to the design guidelines of the Healthcare Engineering Association of Japan (HEAJ) to ensure the quality required as international-standard OT facilities.

6) Public Works Department Cost Norms and Unit Cost Applied to the Project

In India, the unit cost for public buildings is defined by “Plinth Area Rates” set by the Public Works Department (PWD). The central government PWD (CPWD) and Tamil Nadu PWD (TNPWD) have their own, separate cost norms. Table 9-1 shows the base and additional costs of each institution.

Table 9-1: Cost Norms of TNPWD and CPWD

Cost Norm	Description of Work	Plinth Area Rates (Rs/m ²)	
		Tertiary Hospital	Secondary Hospital
TNPWD base cost	<ul style="list-style-type: none"> • Civil (Building) work • Service work • Exterior work 	35,350	31,800
Additional costs for special construction	<ul style="list-style-type: none"> • General interior work arrangement • Signature work • Special façade work • Labour welfare funds, etc. • Unforeseen item adjustment 	48,250 (+12,900)	43,400 (+11,600)
CPWD base cost [Delhi Standard Rate(DSR)] item	<ul style="list-style-type: none"> • Civil (Building) work • Service work • Exterior work • Elevators 	48,773	--
Additional costs for special construction (Non-DSR item)	<ul style="list-style-type: none"> • Special Heating, ventilating, and air conditioning (HAVC) for OT rooms, etc. • Interior finish for OT rooms, etc. • Emergency power back-up • Waste water treatment system • Medical gas supply system • Access control system & Closed Circuit Television (CCTV) 	63,722 (+14,949)	--

(Source: TNPWD)

It is recommended that CPWD’s additional cost estimate be used for Component 1 (tertiary hospitals) and TNPWD’s additional cost estimate be used for Component 3 (secondary hospitals) to ensure the quality and workmanship required by the proposed buildings of each component.

Table 9-2 shows reference plinth area rates for previous public health facility projects.

Table 9-2: Plinth Area Rates of Previous Health Facility Projects (Reference)

Institution Name	Construction Year	Total Floor Area (m ²)	Total Sanctioned Project Cost (Rs.)	Plinth Area Rates (Rs./ m ²)	
				Actual	PCI Adjusted
Super-specialty block, RGGGH	2001	63,721	1,044,700,000	16,395	42,950
New IP building Institute of Ob & Gyn	2008	24,336	535,500,000	22,004	39,607

Abbreviation: RGGGH= Rajiv Gandhi Government General Hospital, Ob & Gyn= obstetrics/gynaecology

(Source: HFWD)

(2) Study of Proposed Sites

1) Madurai Medical College Hospital (MMCH) – Government Rajaji Hospital

The MMCH was established in 1792 and is the second oldest Medical College Hospital in Tamil Nadu. It is one of the full-fledged Medical College Hospitals, along with RGGGH and Stanley Medical College Hospital in Chennai. A profile of the hospital is shown below.

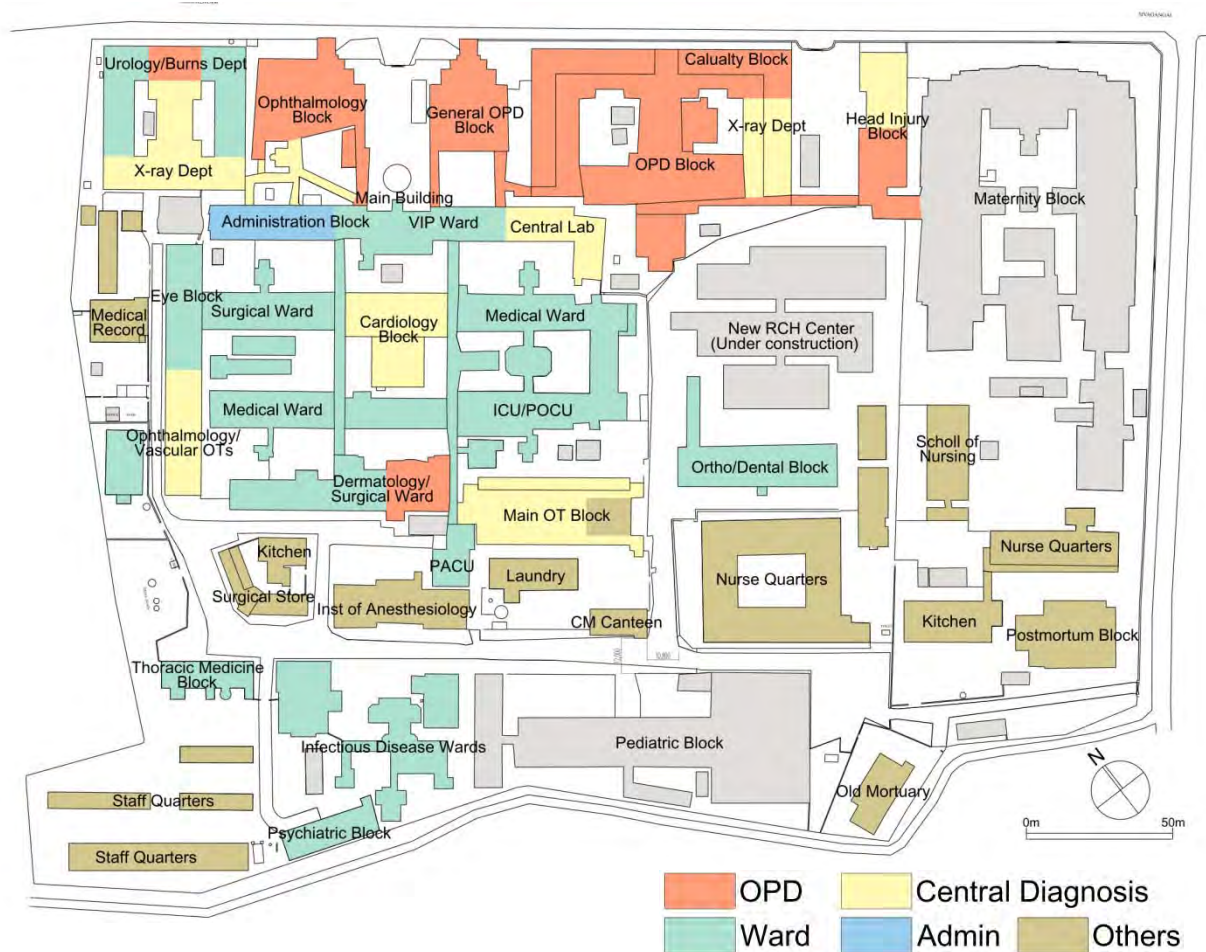
Table 9-3: Profile of MMCH

Hospital Name:	Madurai Medical College Hospital																																				
Location:	Goripalayam, Madurai 625002																																				
Role & Function	Tamil Nadu Government (tertiary) general hospital belonged to the Madurai Medical College (MMC). MMCH is the referral centre for the south of Tamil Nadu (covers 8-10 districts).																																				
Outline	Established in 1792, MMCH has functioned as the clinical education hospital for MMC.																																				
Specialties	<p>General Specialties:</p> <table style="width:100%; border:none;"> <tr> <td><input checked="" type="checkbox"/> General Medicine</td> <td><input checked="" type="checkbox"/> General Surgery</td> <td><input checked="" type="checkbox"/> Anaesthesiology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Dermatology/Venereology</td> <td><input checked="" type="checkbox"/> ENT</td> <td><input checked="" type="checkbox"/> Ob & Gyn</td> </tr> <tr> <td><input checked="" type="checkbox"/> Orthopaedics</td> <td><input checked="" type="checkbox"/> Ophthalmology</td> <td><input checked="" type="checkbox"/> Paediatrics</td> </tr> <tr> <td><input checked="" type="checkbox"/> Thoracic Medicine</td> <td></td> <td></td> </tr> </table> <p>Super-specialties:</p> <table style="width:100%; border:none;"> <tr> <td><input checked="" type="checkbox"/> Cardiology</td> <td><input checked="" type="checkbox"/> Cardiothoracic Surgery</td> <td><input checked="" type="checkbox"/> Diabetology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Endocrinology</td> <td><input checked="" type="checkbox"/> Geriatric Medicine</td> <td><input type="checkbox"/> Geriatric Surgery</td> </tr> <tr> <td><input type="checkbox"/> Haematology</td> <td><input type="checkbox"/> Hepatology</td> <td><input checked="" type="checkbox"/> Medical Gastroenterology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Surgical Gastroenterology</td> <td><input checked="" type="checkbox"/> Neurology</td> <td><input checked="" type="checkbox"/> Neuro Surgery</td> </tr> <tr> <td><input checked="" type="checkbox"/> Nephrology</td> <td><input checked="" type="checkbox"/> Orthopaedic Surgery</td> <td><input checked="" type="checkbox"/> Plastic Surgery</td> </tr> <tr> <td><input checked="" type="checkbox"/> Psychiatry</td> <td><input checked="" type="checkbox"/> Medical Oncology</td> <td><input type="checkbox"/> Radiation Oncology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Surgical Oncology</td> <td><input checked="" type="checkbox"/> Vascular Surgery</td> <td><input checked="" type="checkbox"/> Urology</td> </tr> </table>				<input checked="" type="checkbox"/> General Medicine	<input checked="" type="checkbox"/> General Surgery	<input checked="" type="checkbox"/> Anaesthesiology	<input checked="" type="checkbox"/> Dermatology/Venereology	<input checked="" type="checkbox"/> ENT	<input checked="" type="checkbox"/> Ob & Gyn	<input checked="" type="checkbox"/> Orthopaedics	<input checked="" type="checkbox"/> Ophthalmology	<input checked="" type="checkbox"/> Paediatrics	<input checked="" type="checkbox"/> Thoracic Medicine			<input checked="" type="checkbox"/> Cardiology	<input checked="" type="checkbox"/> Cardiothoracic Surgery	<input checked="" type="checkbox"/> Diabetology	<input checked="" type="checkbox"/> Endocrinology	<input checked="" type="checkbox"/> Geriatric Medicine	<input type="checkbox"/> Geriatric Surgery	<input type="checkbox"/> Haematology	<input type="checkbox"/> Hepatology	<input checked="" type="checkbox"/> Medical Gastroenterology	<input checked="" type="checkbox"/> Surgical Gastroenterology	<input checked="" type="checkbox"/> Neurology	<input checked="" type="checkbox"/> Neuro Surgery	<input checked="" type="checkbox"/> Nephrology	<input checked="" type="checkbox"/> Orthopaedic Surgery	<input checked="" type="checkbox"/> Plastic Surgery	<input checked="" type="checkbox"/> Psychiatry	<input checked="" type="checkbox"/> Medical Oncology	<input type="checkbox"/> Radiation Oncology	<input checked="" type="checkbox"/> Surgical Oncology	<input checked="" type="checkbox"/> Vascular Surgery	<input checked="" type="checkbox"/> Urology
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<input checked="" type="checkbox"/> Surgical Oncology	<input checked="" type="checkbox"/> Vascular Surgery	<input checked="" type="checkbox"/> Urology																																			
Operation Days	OPD: 7:30-13:00/15:00-16:00, 7 days/week																																				
No. of Beds	Total: 2,518																																				
	ICU: 12	High Care Unit (HCU): 8	NICU: 75	Others: 15																																	
No. of Patients	OPD: 6,000/day	ED: /year	Admit: 365/day	BOR: 93 (2014)																																	
No. of Operations	OP Theatres: 17 rooms/51 tables	Major: 49/day	Minor: 53/day																																		
Maintenance system	Maintained by BME in the hospital. For items costing more than ten thousand, maintained and operated by TNMSC.																																				
Staffing (Actual)	Total: 1,337																																				
	MDs: 427	Nurses: 414	Para-med: 347	Others: 149																																	

(Source: MMCH)

a) Current State of MMCH Main Campus

Figure 9-4 shows the layout of MMCH's existing major buildings. The MMCH campus faces Panagal Road, and Madurai Medical College is located on the other side of the road. The campus is a rectangular site of about 350 x 275 metres, with the total site area of the entire campus approximately 95,900 m². The maternity block and nurses' quarters are located in the eastern portion.



(Source: Survey Team)

Figure 9-4: Existing MMCH Buildings

Table 9-4 shows the sizes and functions of MMCH’s existing major buildings. Most of the existing buildings on the main campus were constructed more than 70 years ago, in the 1940s (during the British colonial era), and they are physically deteriorated and functionally out-of-date. As a result of unplanned chronological development, rooms and departments that should be functionally located in close proximity are often far away. This situation makes it very difficult for patients to find the appropriate places for treatment and diagnosis.

The total floor area of the buildings is approximately 105,800 m², and the total floor area per bed is approximately 42 m², which is relatively low for a Medical College Hospital.

Table 9-4: Sizes and Functions of Existing MMCH Buildings

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Function/Department
Main building	2	5,040	1940s	Entrance hall, Administration block, Central lab, VIP ward
X-ray/Urology/Burns	3	7,134	1940s	X-ray dept, Urology/Burns/Plastic surgery dept
Ophthalmology OPD	2	2,862		Ophthalmology OPD, Female surgical ward
General OPD	2	1,906		OPD registration, Consultation rooms
Main OPD block	2	8,606	1940s	OPD, Casualty dept, X-ray dept

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Function/Department
Head injury block	2	1,962		Neurosurgery dept
Male surgical ward	2	1,862	1940s	Surgical ward, General medicine ward (Male)
Male medical ward	2	1,902	1940s	General medicine ward, Cardiology ward (Male)
Female medical ward	2	1,910	1940s	General medicine ward, Cardiology ward (Female)
Dermatology/Surgical ward	2	2,212		Dermatology OPD/ward, Surgical ward
Cardiology block	2	1,662	1980s	Cardiothoracic OTs, Cath labs, Intensive Coronary Care Unit (ICCU)
Eye block	2	2,114	1980s	Ophthalmology OTs/ward, Vascular OTs, Dialysis unit
Main OT block	2	2,672	1940s	OT, Auditorium
ICU/POCU/PACU block	2	Total 2,748		ICU, Post-Operative Care Unit (POCU), Post Anaesthetic Care Unit (PACU)
Laundry/Kitchen, etc.	1	Total 1,130		Laundry, Kitchen, Surgical stores
Institute of Anaesthesiology	2	1,326		Anaesthesiology department, Nurses quarters
Paediatric block	2	6,298		
Maternity block	2	12,040		
Ortho/Dental wards	5	4,425		
Infectious disease wards	2	Total 2,946		Tuberculosis, Leprosy, STD wards
Thoracic ward	2	684		
New mortuary	2	1,404		
Other service facilities	--	Total 1,898		Medical record, Water and sanitation, etc.
Nurse quarters	2/3	Total 7,448		
School of Nursing	2	1,068		
Staff quarters	2	Total 2,100		
New Reproductive and Child Health (RCH) centre	7	18,445	Under construction	Centre of Excellence for Reproductive and Child Health
Total		105,804		(approximately 42 m²/bed)

(Source: MMCH)

b) Utility Infrastructure

- Electric Power

The MMCH site receives three 11kV 50Hz power feeds from the local power supplier, Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO). The feed is a dual supply system, enabling power supply to be maintained by one side of the power grid should other side fails. The incoming 11kV feeds are routed to the buildings on the site either underground or via an overhead route. There are three sets of 500kVA transformers on the poles on the site for distribution of low voltage power to each building. All transformers are dedicated for health facility use. There are two numbers of 160kVA and 2 numbers of 125kVA diesel engine generators in the rooms, as emergency power supplies for medical equipment and lighting in the buildings. An average of 15 power blackouts a month, each lasting for 10 to 30 minutes, has been reported.

- Telephone

Telephone lines are provided by the local Bharat Sanchar Nigam Limited (BSNL), in multiple routes from outside the site via overhead or underground lines to the buildings. There are a total of 15 external lines for the entire site. There is also a public telephone on the site.

- Water Supply

The MMCH site receives water supply at five points from the city water main under the public road north side of the site. There are two underground water reservoirs on the site. Water is pumped up to elevated tanks, from which it is supplied to each building on the premises. The water used is potable. There are deep wells for flushing water as well. Although water is not generally treated in the hospital, a limited amount is treated with a compact water purifier for the laboratory. There are often water stoppages in Madurai City, so water trucks make up for the shortage of water. Hot water is supplied to the kitchen by solar heating.

- Drainage

Wastewater is discharged to the septic tanks on the site and pumped out to the city sewer main located on the south and north side of the site. Wastewater is not treated in the septic tanks. No stormwater drainage exists on the site.

- Fire Fighting System

No fire-fighting systems, such as sprinklers and hoses, are installed in the hospital. There are portable fire extinguishers only.

- Gas

There is no city gas distribution in Madurai City. Liquefied Petroleum Gas (LPG) in cylinders is used in the kitchen.

- Medical Gas

Oxygen gas is supplied by a central piping system with a liquid oxygen storage tank. There are only oxygen outlets in the existing buildings.

- Heating Ventilating, and Air Conditioning (HVAC) System

Most of the rooms in the hospital are not air-conditioned, except for the OT, ICU, diagnostic imaging room, and laboratory.

c) Waste Disposal

General waste is temporarily stored in the collection point by the south gate, and collected by the municipal service four times a day. The collection point is in an insanitary condition, open without walls or roof. Waste is not treated at the site. Medical waste is collected in the storage hut, which is surrounded by a wire fence. Each type of infectious waste sharp waste, such as syringes and human tissue is supposed to be separately collected in a color-coded plastic waste container, but the hospital staff does not strictly enforce this regulation.

d) Soil Conditions

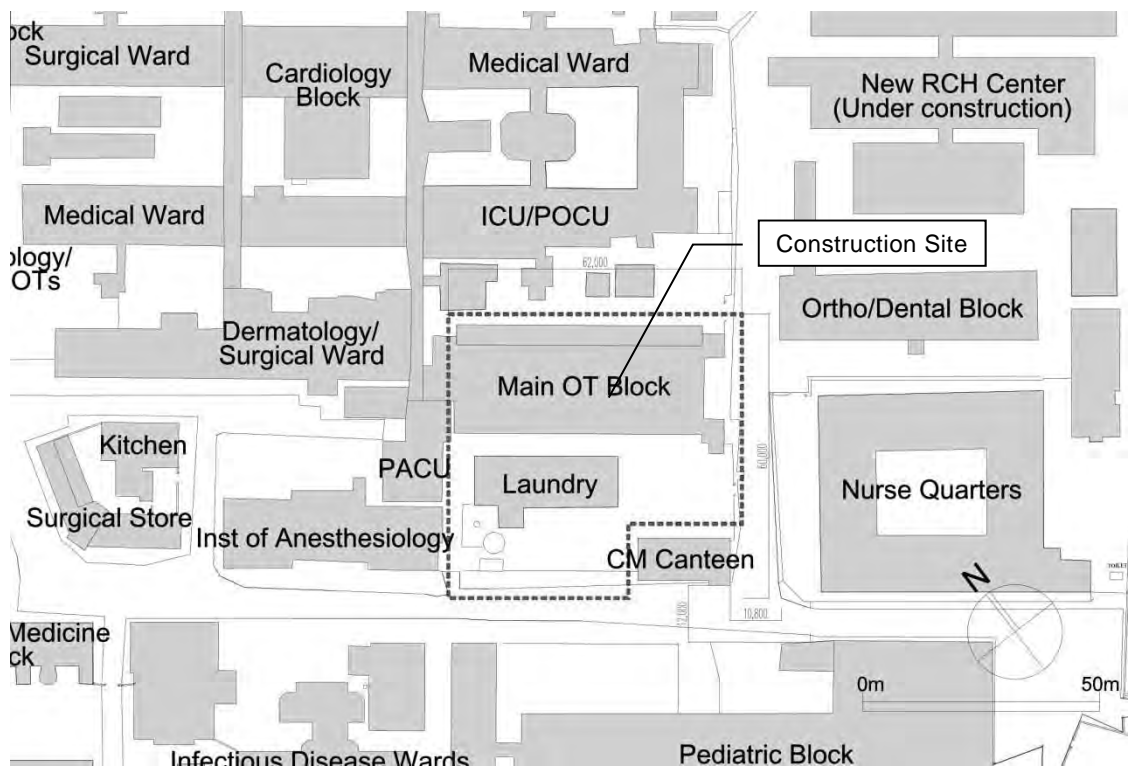
According to the *Soil Investigation Report for the New RCH Centre* (an on-going construction project), the designed supporting layer should be highly weathered rock at 9 metres below ground level, which has an N-value over 50. The length of the piles was designed to be

approximately 10 metres below ground level, but actual pile length will be 4.0 metres below the bottom of the basement floor (since the proposed building has a basement). Therefore, it is not realistic to use a pile foundation at this site; soil improvement (stirred soil cement method) should be used instead. The availability and reliability of these construction methods should be reviewed carefully during the Detailed Design phase.

e) Construction Site of the Proposed Building

The construction site of the proposed building was finalized to maintain good functional connections with the existing wards and relevant departments, and to minimize any negative impact on on-going medical activities.

Figure 9-5 shows the location and size of the proposed building construction site. The site is a rectangular shape of about 62 x 60 metres, where the existing main OT block building is located. The buildings to be demolished are shown in Table 9-5.



(Source: Survey Team)

Figure 9-5: Current State of Proposed Building Construction Site

Table 9-5: Existing Buildings to be demolished

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Remarks
Main OT Block	2	2,672	1940s	OT, Auditorium
Laundry	1	349	--	

(Source: Survey Team)

The Laundry will be transferred to the old Mortuary area by the end of 2015; demolishing this building will not affect on-going activities. It is also necessary to relocate the existing liquid oxygen tank. The Chief Minister’s Canteen will remain at the existing location.

f) Roles of the Three Campuses

Table 9-6 shows department and function demarcations among the three MMCH campuses, after the super specialty block begins operating at the end of 2015. Although the super specialty block has OT for neurosurgery, nephrology and surgical gastroenterology, most elective surgeries remain at the main campus.

Table 9-6: Roles of the Three Hospital Campuses

Campus	Main Campus	Trauma Centre	Super Specialty Block (from end-2015)
No. of Beds	2,218	300	307
Specialties	<ul style="list-style-type: none"> • General medicine • General surgery • Dermatology/Venereology • ENT • Ob & Gyn • Orthopaedics • Ophthalmology • Paediatrics • Emergency (general, including Toxicology) <p>Super-specialty</p> <ul style="list-style-type: none"> • Cardiology/Cardiothoracic surgery • Dialectology • Endocrinology • Orthopaedic surgery • Plastic surgery • Vascular surgery <p>(Oncology will be transferred to the new Regional Cancer Centre)</p>	<ul style="list-style-type: none"> • Orthopaedics surgery (injury) • Neuro surgery (injury) • Emergency (accident) 	<ul style="list-style-type: none"> • Neurosurgery • Neurology • Urology • Nephrology • Medical gastroenterology • Surgical gastroenterology
Total Floor Area (m ²)	105,804 m ²	23,519 m ²	25,116 m ²

(Source: MMCH)

2) Kilpauk Medical College Hospital (KMCH)

The KMCH was established in 1960 as the third Medical College Hospital in Chennai, after RGGGH and Stanley Medical College Hospital. A profile of the hospital is shown below.

Table 9-7: Profile of KMCH

Hospital Name:	Kilpauk Medical College Hospital			
Location:	Poonamallee High Rd, Kilpauk, Chennai, Tamil Nadu 600010			
Role & Function	Tamil Nadu Government (tertiary) general hospital belonging to Kilpauk Medical College (KMC). Burns department is the top referral centre in Tamil Nadu. Microvascular surgery unit for recanalization follows tubectomy. Diabetology department receives an average 600 OPD patients/day.			
Outline	Established in 1960, KMCH has functioned as the clinical education hospital for KMC. Outline of KMC: <ul style="list-style-type: none"> • Undergraduate course: 150 MBBS /year. All facilities conform to MCI guidelines. • Postgraduate courses: 130 postgraduates/year. 10 clinical and 7 non-clinical postgraduate courses, 5 super-specialty courses. • Nursing course: Diploma in nursing & midwifery. 100 students/year 			
Specialties	General Specialties: <input checked="" type="checkbox"/> General Medicine <input checked="" type="checkbox"/> General Surgery <input checked="" type="checkbox"/> Anaesthesiology <input checked="" type="checkbox"/> Dermatology/Venereology <input checked="" type="checkbox"/> ENT <input checked="" type="checkbox"/> Ob & Gyn <input checked="" type="checkbox"/> Orthopaedics <input checked="" type="checkbox"/> Ophthalmology <input checked="" type="checkbox"/> Paediatrics <input checked="" type="checkbox"/> Thoracic Medicine Super-specialties: <input checked="" type="checkbox"/> Burns Ward <input checked="" type="checkbox"/> Cardiology <input type="checkbox"/> Cardiothoracic Surgery <input checked="" type="checkbox"/> Diabetology <input type="checkbox"/> Endocrinology <input type="checkbox"/> Geriatric Medicine <input type="checkbox"/> Geriatric Surgery <input type="checkbox"/> Haematology <input type="checkbox"/> Hepatology <input checked="" type="checkbox"/> Medical Gastroenterology <input checked="" type="checkbox"/> Surgical Gastroenterology <input checked="" type="checkbox"/> Neurology <input checked="" type="checkbox"/> Neuro Surgery <input checked="" type="checkbox"/> Nephrology <input checked="" type="checkbox"/> Orthopaedic Surgery <input checked="" type="checkbox"/> Plastic Surgery <input checked="" type="checkbox"/> Psychiatry <input checked="" type="checkbox"/> Medical Oncology <input type="checkbox"/> Radiation Oncology <input checked="" type="checkbox"/> Surgical Oncology <input type="checkbox"/> Vascular Surgery <input checked="" type="checkbox"/> Urology			
Operation Days	OPD: 7:30-13:00 7 days/week, 365 days/year			
No. of Beds	Total: 1,098			
	ICU: 40	HCU:	NICU: 42	Others:
No. of Patients	OPD: 2,400/day	ED: /year	Admit: 750/day	BOR: 66 (2014)
No. of Operations	Total OT tables:	Major: 26/day	Minor: 35/day	
Staffing (Actual)	Total: 1,208			
	MDs: 280	Nurses: 198	Para-med: 237	Others: 493

(Source: KMCH)

a) Current State of the KMCH Main Campus

Figure 9-6 shows the layout of KMCH's existing major buildings. The KMCH campus faces Poonamalle Road, and KMC is located on the other side of the road.

The campus is a rectangle of about 200 x 400 metres, with a total site area of the entire campus of approximately 76,500 m² (site area exclusively used for the hospital is approximately 40,675 m²). Its eastern portion is used by KMC's hostels and an athletic ground.

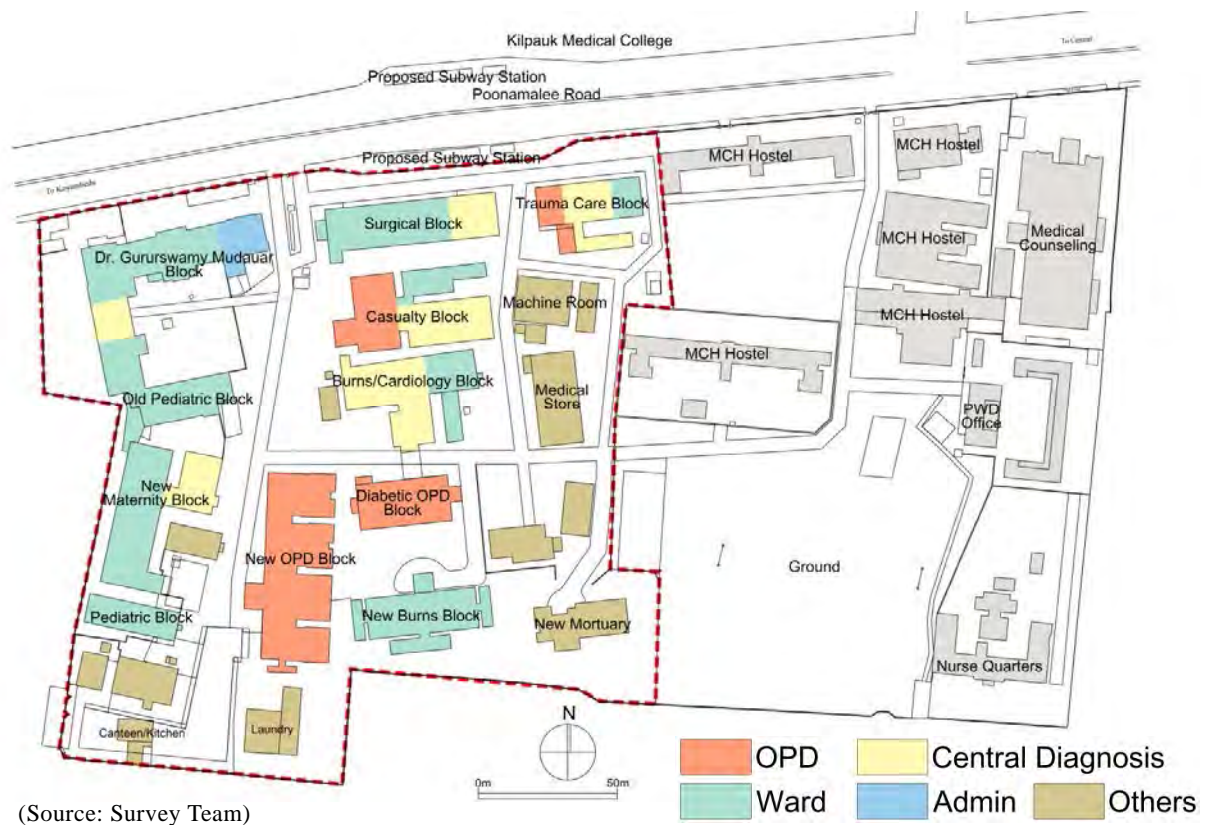


Figure 9-6: Existing KMCH Buildings

Table 9-8 shows the sizes and functions of KMCH’s existing major buildings. Most of the buildings, except for OPD and maternity department, were constructed more than 40 years ago and are physically deteriorated and functionally out-of-date. Total floor area per bed is approximately 35 m², which is relatively low for a Medical College Hospital.

Table 9-8: Sizes and Functions of Existing KMCH Buildings

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Function/Department
Dr. Guruswamy Mudauar block	3	6,204	1960	General medicine ward (90 beds), Nephrology ward (30 beds), Intensive Medical Care Unit (IMCU), Dialysis units, Paediatric dept (PICU, etc.), Obstetrics ward, Administration offices (Dean’s office, etc.)
New maternity block	3	3,510	2014	Ob & Gyn ward, CEMONC centre (funded by NRHM)
Paediatric block	3	1,056	--	Paediatric ward
New OPD block	2	3,260	2012	General/Specialty OPD
Diabetic OPD block	2	1,200	--	Diabetic OPD
Burns/Cardiology	4	4,380	1980s	Casualty & Zero delay ward, Central lab, Blood bank, ward
Casualty block	4	4,964	2000s	ICCU, Cardiology dept, Burns dept, ICU, Cardiology dept
Surgical block	7	7,035	1960	PACU, General surgery OTs, POCU, Surgical wards
Trauma care block	5	3,290	1980s	Orthopaedics OPD, CSSD, OTs, Orthopaedics wards
New burns ward	3	2,598	Under Construction	Burns wards
New mortuary	1	423		
Others	--	1,724	--	
Total		39,644		(approximately 35 m²/bed)

(Source: KMCH)

b) Utility Infrastructure

- Electric Power

The KMCH site receives a single 11kV 50Hz power feed from the local power supplier, TANGEDCO. The feed is a dual supply system, enabling power supply to be maintained by one side of the power grid should other side fails. The incoming 11kV feed is routed to the indoor substation on the site via an underground route. There are two 500kVA transformers in the electrical room at the site for distribution of low voltage power to each building on the premises. The transformers are dedicated to hospital use. There are 2 numbers of 25kVA, one 125kVA and one 250kVA diesel engine generators for emergency power supplies to medical equipment, refrigerators and lighting in the buildings. An average of two power blackouts a week, each lasting for 5 to 10 minutes, has been reported.

- Telephone

Telephone lines are provided by BSNL via an underground route from outside. There are a total of 10 external lines for the entire site. There is also a public telephone on the site.

- Water Supply

The KMCH site has one connection from the city water main of 18 inches diameters under the public road on the north of the site. There are three meters and five underground water reservoirs in the site. Water is pumped up to elevated tanks, and then supplied to each building on the premises. Well water is also available, and seems to be supplied to the reservoir. Deep wells are of 9 inches diameter and 60-70 metres deep. Water is not treated in the hospital. There are often water stoppages in Chennai City, so water trucks make up for the shortage of water. Hot water is available for kitchen use.

- Drainage

Wastewater is discharged to the city sewer main of 250m² diameters on the north side of the site. There are two connections on the site. There are no septic tanks. There is a stormwater drainage system in Chennai City. Wastewater and stormwater are discharged separately from the site. There is a culvert drainage for stormwater on the site that is connected to public drainage, but it is choked with sediment. Public stormwater drainage under Poonamallee Road on the north side of the site is 1.2 metres wide and 2.0 metres deep.

- Fire Fighting System

No fire fighting system, such as sprinklers and hoses, are installed in the hospital. Only portable fire extinguishers are provided.

- Gas

There is no city gas distribution system in Chennai City. LPG for the kitchen is supplied via cylinders.

- Medical Gas

Oxygen, vacuum, and N₂O are supplied by a central piping system. There is a liquid oxygen storage tank (6,000L) and multiple cylinder manifolds and compressors on the site.

- HVAC System

Most of the rooms in the hospital are not air-conditioned, except for OT, ICU, diagnostic imaging room, laboratory and doctors' rooms. Most of the air-conditioners are wall mounted. There are ceiling fans in some rooms.

c) Waste Disposal

General waste is temporarily stored in the collection point at the centre of the site. It is collected by the municipal service once a day. The collection point is surrounded by steel walls, but is in an insanitary condition. Wastes are not treated on the site. Medical wastes are collected in the storage container at the corner of the site. The infectious waste, sharp waste (syringes, etc.) and human tissue are separately collected in color-coded plastic bags. Blood leakage on the floor of the storage container was observed, and conditions are generally insanitary and hazardous.

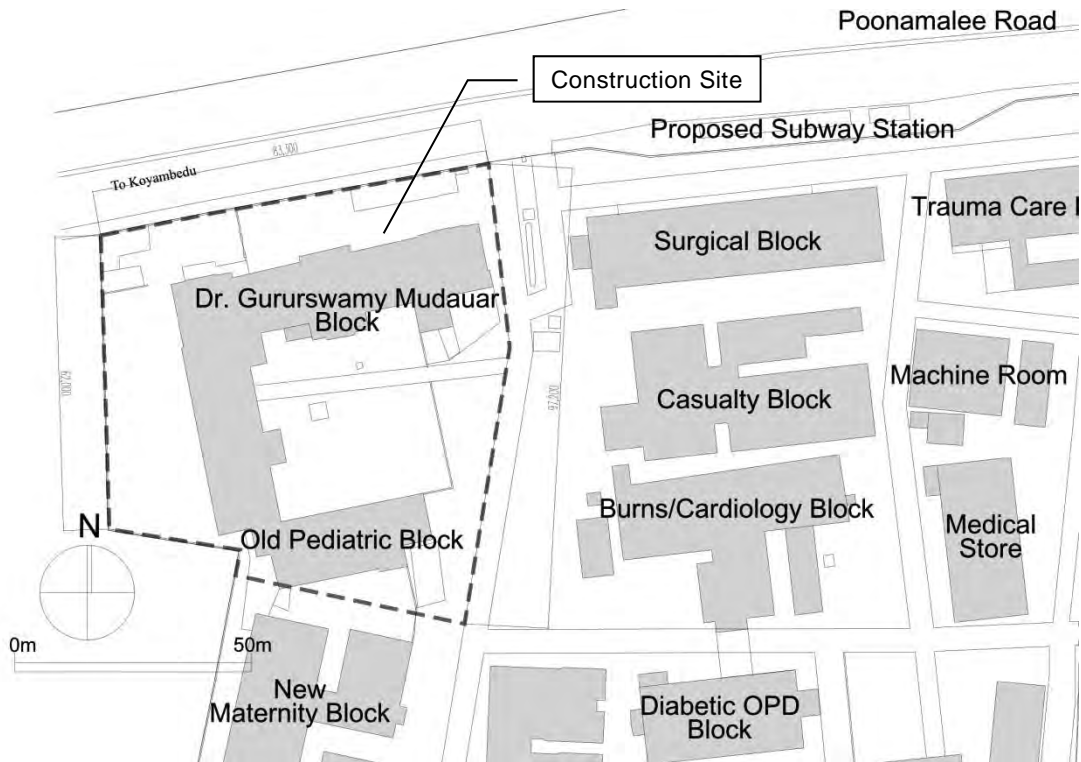
d) Soil Conditions

According to the *Soil Investigation Report for the New Burns Block building* (an on-going construction project), the designed supporting layer should be a clay stone/silt stone layer located at 26 metres below ground level, which has an N-value over 50. Since the supporting layer is relatively deep, it is reasonable to use a pile foundation system for the proposed building.

e) Construction Site of the Proposed Building

The construction site of the proposed building was finalized to maintain good functional connections with the existing wards and relevant departments, and to minimize any negative effects on on-going medical activities.

Figure 9-7 shows the location and size of the construction site. It is a rectangular area of about 70 x 80 metres where the existing Dr. Guruswamy Mudauar block building is located. The building to be demolished is shown in Table 9-9.



(Source: Survey Team)

Figure 9-7: Current State of Proposed Building Construction Site

Table 9-9: Existing Building to be demolished

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Remarks
Dr. Guruswamy Mudauar block	3	6,204	1960	Including old paediatric block

(Source: Survey Team)

3) Coimbatore Medical College Hospital (CMCH)

Table 9-10: Profile of Government CMCH

Hospital Name:	Coimbatore Medical College Hospital																																				
Location:	Trichy Road, Coimbatore																																				
Role & Function	Tamil Nadu Government (tertiary) medical college of Coimbatore Medical College (CMC).																																				
Outline																																					
Specialties	<p>General Specialties:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/> General Medicine</td> <td><input checked="" type="checkbox"/> General Surgery</td> <td><input checked="" type="checkbox"/> Anaesthesiology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Dermatology/Venereology</td> <td><input checked="" type="checkbox"/> ENT</td> <td><input checked="" type="checkbox"/> Ob & Gyn</td> </tr> <tr> <td><input checked="" type="checkbox"/> Orthopaedics</td> <td><input checked="" type="checkbox"/> Ophthalmology</td> <td><input checked="" type="checkbox"/> Paediatrics</td> </tr> <tr> <td><input checked="" type="checkbox"/> Thoracic Medicine</td> <td></td> <td></td> </tr> </table> <p>Super-specialties:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/> Cardiology</td> <td><input checked="" type="checkbox"/> Cardiothoracic Surgery</td> <td><input checked="" type="checkbox"/> Diabetology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Endocrinology</td> <td><input type="checkbox"/> Geriatric Medicine</td> <td><input type="checkbox"/> Geriatric Surgery</td> </tr> <tr> <td><input type="checkbox"/> Haematology</td> <td><input type="checkbox"/> Hepatology</td> <td><input checked="" type="checkbox"/> Medical Gastroenterology</td> </tr> <tr> <td><input type="checkbox"/> Surgical Gastroenterology</td> <td><input checked="" type="checkbox"/> Neurology</td> <td><input checked="" type="checkbox"/> Neuro Surgery</td> </tr> <tr> <td><input checked="" type="checkbox"/> Nephrology</td> <td><input checked="" type="checkbox"/> Orthopaedic Surgery</td> <td><input checked="" type="checkbox"/> Plastic surgery</td> </tr> <tr> <td><input checked="" type="checkbox"/> Psychiatry</td> <td><input checked="" type="checkbox"/> Medical Oncology</td> <td><input type="checkbox"/> Radiation Oncology</td> </tr> <tr> <td><input checked="" type="checkbox"/> Surgical Oncology</td> <td><input checked="" type="checkbox"/> Vascular Surgery</td> <td><input checked="" type="checkbox"/> Urology</td> </tr> </table>				<input checked="" type="checkbox"/> General Medicine	<input checked="" type="checkbox"/> General Surgery	<input checked="" type="checkbox"/> Anaesthesiology	<input checked="" type="checkbox"/> Dermatology/Venereology	<input checked="" type="checkbox"/> ENT	<input checked="" type="checkbox"/> Ob & Gyn	<input checked="" type="checkbox"/> Orthopaedics	<input checked="" type="checkbox"/> Ophthalmology	<input checked="" type="checkbox"/> Paediatrics	<input checked="" type="checkbox"/> Thoracic Medicine			<input checked="" type="checkbox"/> Cardiology	<input checked="" type="checkbox"/> Cardiothoracic Surgery	<input checked="" type="checkbox"/> Diabetology	<input checked="" type="checkbox"/> Endocrinology	<input type="checkbox"/> Geriatric Medicine	<input type="checkbox"/> Geriatric Surgery	<input type="checkbox"/> Haematology	<input type="checkbox"/> Hepatology	<input checked="" type="checkbox"/> Medical Gastroenterology	<input type="checkbox"/> Surgical Gastroenterology	<input checked="" type="checkbox"/> Neurology	<input checked="" type="checkbox"/> Neuro Surgery	<input checked="" type="checkbox"/> Nephrology	<input checked="" type="checkbox"/> Orthopaedic Surgery	<input checked="" type="checkbox"/> Plastic surgery	<input checked="" type="checkbox"/> Psychiatry	<input checked="" type="checkbox"/> Medical Oncology	<input type="checkbox"/> Radiation Oncology	<input checked="" type="checkbox"/> Surgical Oncology	<input checked="" type="checkbox"/> Vascular Surgery	<input checked="" type="checkbox"/> Urology
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Operation Days	OPD: 7:30-13:00/15:00-16:00, 7 days/week																																				
No. of Beds	Total: 1,182 (sanctioned)/1,485 (actual)																																				
	ICU: 21	HCU:	NICU: 37	Others:																																	
No. of Patients	OPD: 7,000/day	ED: /year	Admit: 365/day	BOR: 90 (2014)																																	
No. of Operations	OP Theatres:	Major: 38/day	Minor: 29/day																																		
Maintenance system	Maintained by BME in the hospital. For items costing more than ten thousand, maintained and operated by TNMSC.																																				
Staffing (Actual)	Total: 1,514																																				
	MDs: 336	Nurses: 219	Para-med: 402	Others: 557																																	

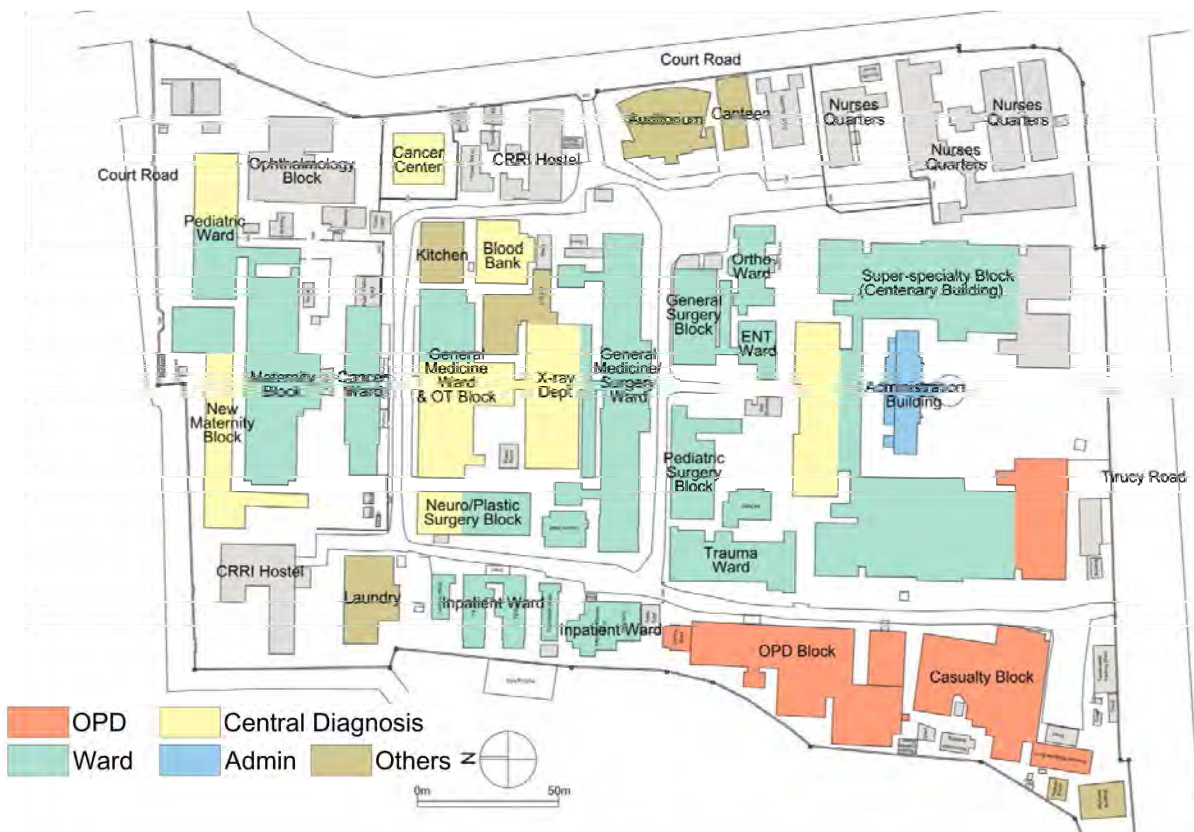
(Source: CMCH)

a) Current State of the CMCH Main Campus

Figure 9-8 shows the layout of CMCH's existing major buildings. The CMCH campus is located in the centre of Coimbatore Corporation, straddled by Trichy Road and Court Road. The campus is a rectangular area of about 250 by 330 metres, with a total site area of approximately 73,850 m².

Table 9-11 shows the sizes and functions of CMCH's existing major buildings. The front side of the campus is occupied by the newly constructed Super Specialty block (Centenary) building, which opens at the end of 2015 and consists of IP wards for 9 specialties as well as OT and casualty blocks.

Most of the buildings were constructed more than 40 years ago and are physically deteriorated and functionally out-of-date. Total floor area per bed is approximately 64 m², which is rather ample, compared to KMCH.



(Source: Survey Team)

Figure 9-8: Existing CMCH Buildings

Table 9-11: Sizes and Functions of Existing CMCH Buildings

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Function/Department
Super specialty block (Centenary building)	5	35,625	Under construction (to be operated from end-2015)	Emergency department, Machine room, OT block, ICUs, CRRRI hostels, and the following specialties departments: <ul style="list-style-type: none"> • Orthopaedics • Orthopaedic surgery • Plastic surgery • Neurosurgery • Cardiology • Cardiothoracic surgery • Nephrology • Urology • Medical gastroenterology Total IP ward: 608 beds
Administration block	2	1,018	1906	Administration department (Dean's office, etc.), Historical heritage building
Casualty block	1	1,676	1980s	Casualty (inc.0-delay ward), Forensic medicine
OPD block	3	6,054	1980s	OPD, ICCU
Trauma care ward	2	1,520	N/A	Orthopaedics ward
Paediatric surgery	3	1,815	N/A	N/A
General surgery	2	1,750	N/A	N/A
Ortho ward	3	1,140	N/A	N/A
Old main building	2	10,076	1906	General medicine ward, General surgery ward, OT block, POCU, X-ray department, CSSD
Neuro/Plastic surgery	3	1,806	1980s	CT, MRI, Plastic surgery ward, Neurosurgery ward
Cancer ward	2	1,392	N/A	N/A
Regional cancer centre	3	972	Under construction	PET

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Function/Department
Eye ward	2	1,736	N/A	Ophthalmology OPD, ward
Maternity block	2	3,294	N/A	Ob & Gyn ward
New maternity block	4	4,444	N/A	Labour room, OT block, CEmONC centre (funded by NRHM)
Paediatric block	N/A	2,385	N/A	OT block, NICU, Paediatric ward
Infectious disease ward	1	Total 1,067	N/A	N/A
Auditorium	1	689	2012	300 seats
Others	N/A	Total 8,608	N/A	Canteen, Laundry, CRRRI hostels, Nurses quarters, etc.
Total	N/A	87,067	N/A	(approximately 64 m ² /bed)

(Source: CMCH)

b) Utility Infrastructure

- Electric Power

The CMCH site receives a 11kV 50Hz power feeds from the local power supplier, TANGEDCO. The feed is a dual supply system, enabling power supply to be maintained by one side of the power grid should other side fails. The incoming 11kV feeds are routed from Court Road to a substation with two 500kVA transformers on east side of the premise and another set of substation with two 500kVA transformers behind Paediatric Surgery Ward. Low-voltage power is distributed from the substations to the buildings on the premises. All transformers are dedicated to hospital use. There are two 250kVA and two 125kVA diesel engine generators, for emergency power supplies to medical equipment and lighting in the buildings. An average of one power blackout every three to four days, each lasting for approximately an hour, is reported.

- Telephone

Telephone lines are provided by the local BSNL, in multiple routes from outside the site via underground lines to the buildings. There are a total of six external lines for the entire site. There is no provision of a public telephone on the site.

- Water Supply

The CMCH site receives water from a city water main of five in. in diameter under the public road on the south, east, and north of the site. There are four connections from the city main, along with multiple deep wells. Water is pumped up from the underground reservoirs to elevated tanks and supplied to each building on the premises. Drinking water is treated at four reverse osmosis plants. Other water is not treated at the hospital. There are some water stoppages in Coimbatore City, but these do not affect the hospital because of the buffer capacity of the reservoir. Hot water from solar heating is supplied to the kitchen and newborn nursery.

- Drainage

Wastewater is discharged to the septic tanks on the site and pumped out to the city main sewer located on the south side of the site. Wastewater is not treated in the septic tanks. No stormwater drainage exists on the site.

- Fire Fighting System

No fire fighting systems, such as sprinklers and hoses, are installed in the hospital. Only portable fire extinguishers are provided.

- Gas

There is no city gas distribution in Coimbatore City. LPG for the kitchen is supplied via cylinders.

- Medical Gas

Oxygen is supplied via a central piping system from a liquid oxygen storage tank. No medical gas outlets other than oxygen outlets are installed in the existing buildings.

- HVAC System

Most of the rooms in the hospital are not air-conditioned except for the OT, ICU, diagnostic imaging room, and laboratory. Most of the air-conditioners are wall mounted. Ducted air-conditioners have been mounted in the OTs in the super specialty block. Linear flow diffusion and High Efficiency Particulate Air (HEPA) filters are not installed. There are ceiling fans in some rooms.

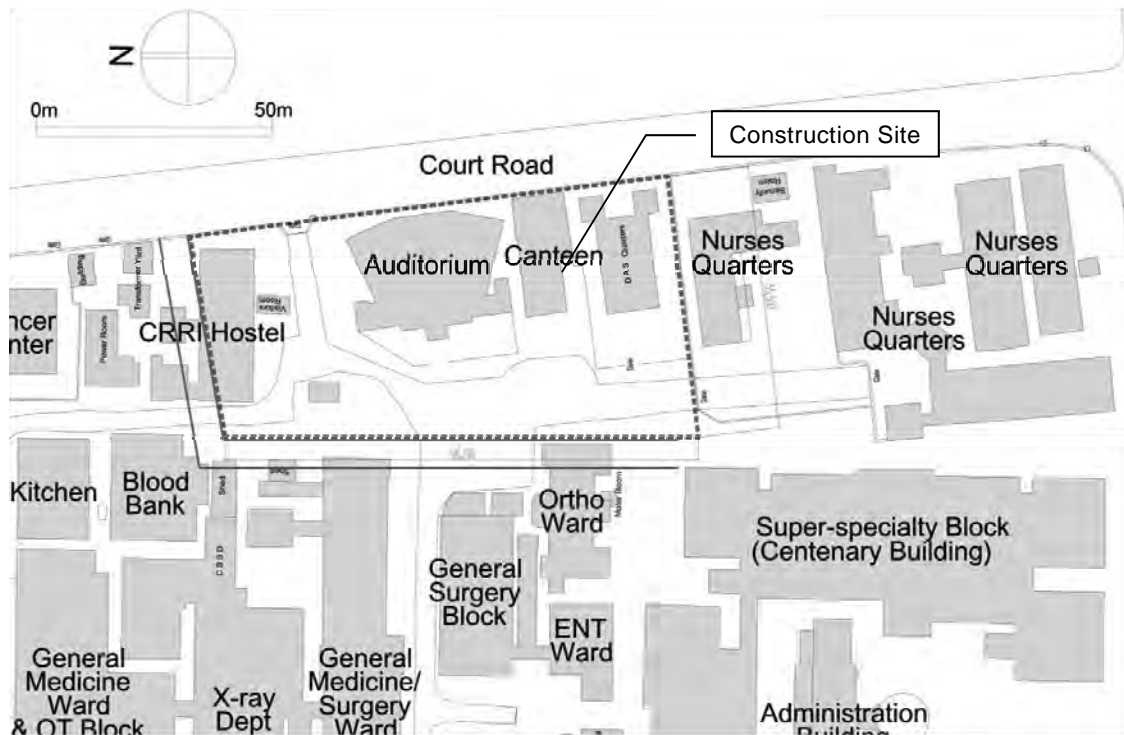
c) Waste Disposal

General waste and medical waste are temporarily stored at a collection point on the north side of the site. The collection point is surrounded by walls, covered by a roof and kept clean. General waste is collected by the municipal service daily. Medical waste is collected by the treatment undertaker. Waste is not treated on the site. Infectious waste, sharp waste such as syringes and human tissue are supposed to be separately collected in a color-coded plastic container, but the hospital staff does not strictly enforce this regulation.

d) Soil Conditions

According to the *Soil Investigation Report for the new Super Specialty Block* (an on-going construction project), the supporting layer should be weathered rock at 2 to 3 metres below ground level, which has an N-value over 60. The Survey Team recommends that the foundation be directly supported by this weathered rock layer, without a pile foundation. It will be difficult to excavate this weathered rock layer deep enough to build a basement structure.

e) Construction Site of the Proposed Building



(Source: Survey Team)

Figure 9-9: Current State of Proposed Building Construction Site

The construction site of the proposed building was finalized to maintain good functional connections with the existing wards and relevant departments, and to minimize any negative impact on on-going medical activities.

Figure 9-9 shows the location and size of the construction site. The site is a rectangle of about 40 x 90 metres. It is necessary to relocate the existing road and gate to a new location, shown in red on the drawing. The buildings to be demolished are shown in Table 9-12.

Table 9-12: Existing Buildings to be demolished

Building Name	No. of Floors	Total Floor Area (m ²)	Construction Year	Remarks
Auditorium	Reinforced concrete (RC) 1	689	2012	300 seats
CRR hostel	RC 2	970	N/A	-
Canteen	Brick 1	252	N/A	-
Staff quarters	RC 1	273	N/A	-

(Source: Survey Team)

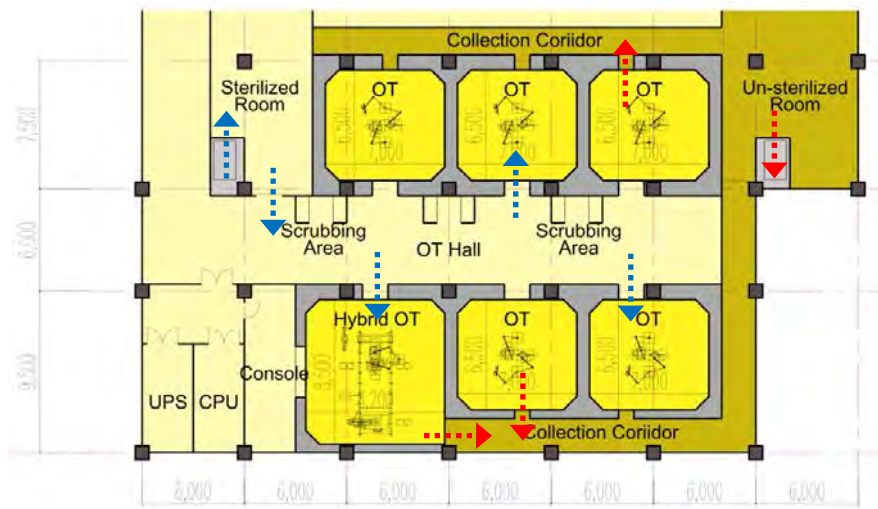
The CRR hostel will be transferred to the new super specialty block building by the end of 2015. Demolishing of this building will not affect hospital services.

(3) Study of Design Requirements

The Survey Team proposes the standard OT and IP ward modules shown below, based on design standards commonly used in international hospitals.

1) OT Rooms

The standard size of a general OT module is 7.0 metres by 6.5 metres (internal dimensions) and for hybrid OTs, 8.5 by 8.2 metres (internal dimensions), taking into consideration the layout of medical equipment and operation activities. Surgical materials and instrument supply circulations form the “collection corridor” system, which segregates the OT hall/sterilized room (sterilized areas) from the collection corridor/un-sterilized room (un-sterilized area). Sterilized and un-sterilized rooms have individual elevators to transport materials and instruments from/to CSSD.

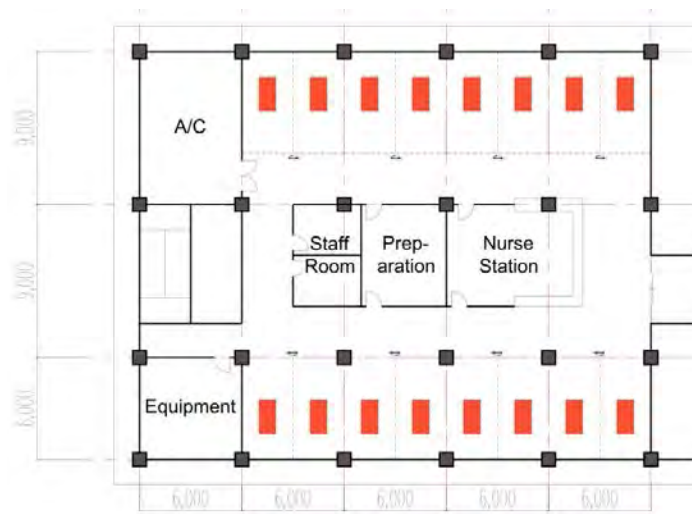


(Source: Survey Team)

Figure 9-10: Standard OT Room Modules

2) ICU

The typical bed cubicle size is 3.0 by 6.0 metres.

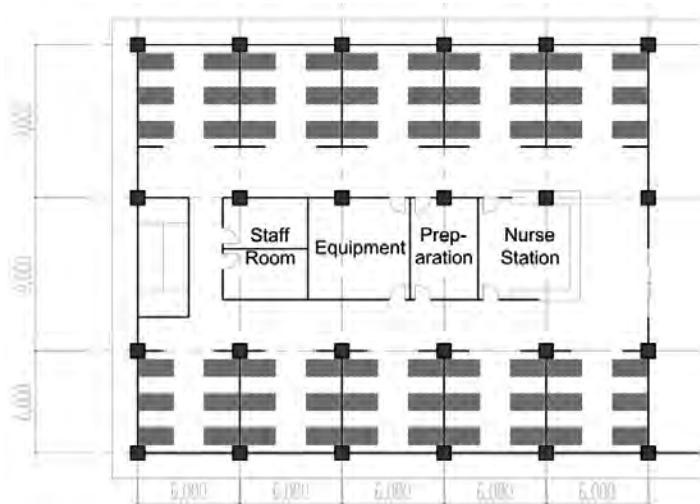


(Source: Survey Team)

Figure 9-11: Standard ICU Room Modules

3) Inpatient Wards

Typical IP modules contain cubicles with six beds, each measuring 6.0 by 6.0 metres, based on MCI’s recommended ward size. The walls between the cubicles are floor-to-ceiling high to provide outlets for patient bed headboards. The walls between the cubicles and corridors are low partitions to provide visual contact for the nursing staff.



(Source: Survey Team)

Figure 9-12: Standard Room Module of General IP Ward

4) OT Block Specifications

The Survey Team proposes that the target standard for air quality in the OT rooms, related clean rooms and ICUs meet the recommendations of the *Air Conditioning System Design Guidelines* issued by the HEAJ.

Table 9-13: Air Quality of OT block

Room Type	Air Pressure	Air Conditioning/ Ventilation	Clean Room Level (Federal Standard 209D)	Remarks
OT, OT Hall	Positive	Air Handling Unit (AHU)	100 (Biological clean room) 1,000 – 10,000	Vertical laminar airflow
IVR room	Positive	AHU	100,000	Vertical laminar airflow
ICU, PACU	Positive	AHU	100,000	

(Source: Survey Team)

(4) Outline of the Proposed Sub-components

1) Architectural Plan

a) MMCH

• Space Program and Stacking Plan

Table 9-14 shows the functions and departments on each floor. The proposed building will be constructed on a site where the existing main OT block and auditorium (200 seats) are located. It is therefore necessary for the proposed building to include an auditorium as well as central diagnosis units.

Table 9-14: Stacking Diagram of MMCH

Floor	Major Functions/Department	Floor Area (m ²)
4 th Floor	<ul style="list-style-type: none"> • Training centre: Clinical simulation lab, etc. • Biomedical engineering centre • Auditorium (450 seats) & Meeting room • Anaesthesia department office 	2,481
3 rd Floor	<ul style="list-style-type: none"> • POCU : 20 beds • Surgical ICU (SICU): 10 beds • PACU : 20 beds • Cardio POCU: 20 beds 	3,294
2 nd Floor	<ul style="list-style-type: none"> • OT centre: 12 OT rooms & 1 Hybrid OT (Cardiothoracic, Vascular, Plastic & Paediatric surgeries) • Pre-OT rooms, Changing rooms, etc. 	3,294
1 st Floor	<ul style="list-style-type: none"> • OT centre: 13 OT rooms (General surgery & ENT) • Pre-OT rooms, Changing rooms, etc. 	3,294
Ground Floor	<ul style="list-style-type: none"> • Imaging centre: MRI, CT, Digital X-rays, Mammography, USG • IVR centre: 2 IVR rooms, Pre-OT rooms, Changing rooms, etc. • Endoscopy units • Emergency laboratory, Supply Processing Distribution (SPD), In-service pharmacy • Administration office 	3,321
Basement (Stilt Floor)	<ul style="list-style-type: none"> • CSSD • Parking lots • Machine rooms 	2,865
Total		18,549

(Source: Survey Team)

• Design Requirements

The fundamental strategy for establishing the design requirements of the proposed building is to integrate the scattered existing central diagnosis functions (OT rooms and ICUs) into one location. The number of rooms and beds in the proposed building are basically the same as for existing facilities.

<OT Rooms>

Table 9-15 shows the transitions of OT rooms between the proposed building and other related buildings throughout the entire campus. The proposed building will integrate scattered OT rooms for general, cardiothoracic, vascular, plastic and paediatric surgeries into one advanced OT centre. Some specialty operations will be transferred to a new super specialty block, to be operated from the end of 2016, and Ob & Gyn operations will be transferred to a new maternity

complex. Currently, some OT rooms have more than two operation tables. The MCI Standard recommends a limit of one OT table in each OT room. The proposed building's OT room is principally designed for a single OT table. Along with the aforementioned 25 OT rooms, one hybrid OT room will be included in the proposed building.

Table 9-15: Comparison of Existing and Proposed OT Rooms

Specialty	Existing Building		Proposed Building	Other Buildings
	No. of OT rooms	No. of OT tables		
General surgery	4	8	8	--
ENT	1	3	3	--
Ob & Gyn	2	5	--	5 (Maternity block)
Orthopaedics	2	5	--	5 (Trauma centre)
Paediatric	2	4	4	
Cardiothoracic surgery	2	2	2	
Surgical gastroenterology	1	2	--	2 (Super specialty block)
Neuro/Plastic surgery	2	3	3	2 (Super specialty block)
Surgical oncology/Urology	2	4	--	4 (Super specialty block)
Thoracic/Vascular surgery	1	2	2	--
Non-elective surgery		--	3	--
Total	--	38	25	8 (Super specialty block) 10 (Other block total)

(Source: Survey Team)

<ICUs>

Table 9-16 shows a comparison of ICUs in the existing and proposed buildings.

Table 9-16: Comparison of Existing and Proposed Care Unit Beds

Care Unit Name	Existing Building	Proposed Building	Remarks
	No. of Beds		
POCU	49	20	24 hours after operation
SICU	6	10	
PACU	11	20	Patients on ventilators
Cardiothoracic POCU	12	10	
Total	78	60	

(Source: Survey Team)

The average length of stay in the POCU is currently about 5 to 7 days. The MMCH intends to reduce this to within one day by limiting the ward to fundamental post operation care only and transferring recovered patients quickly. The number of beds in the POCU in the proposed building will be reduced to 20 in order to meet The MMCH's plan.

<Other Functions>

➤ Imaging Department

X-ray, CT scan and MRI scan rooms are currently shared by IPs and outpatients, and the average number of X-ray images taken per day is more than 240. This makes it very difficult for IPs to receive detailed imaging reports. In order to improve this situation, a new imaging department for exclusive use by IPs will be provided at the proposed building.

➤ **CSSD**

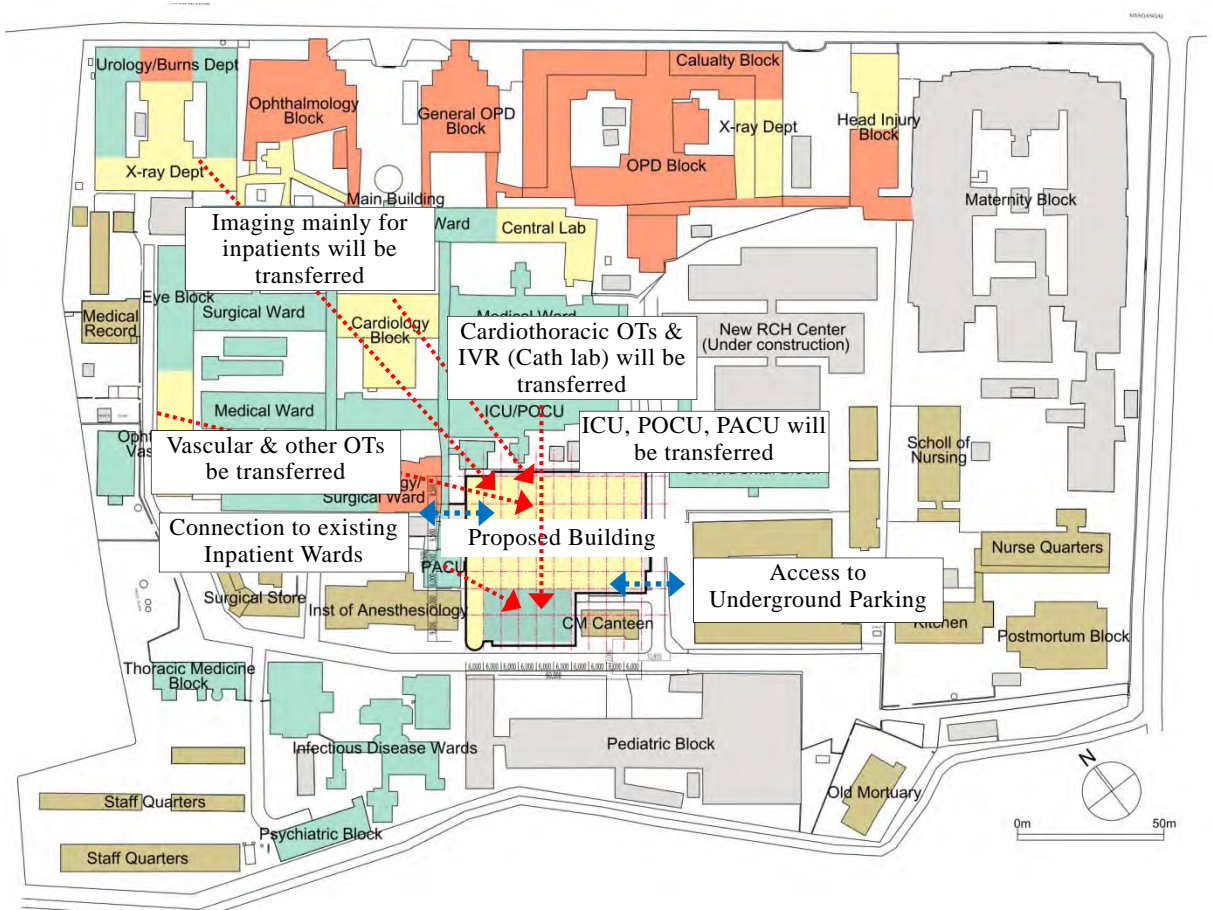
In the existing OT block, instruments and materials sterilized by autoclaving in the CSSD are taken on the same corridor as un-sterilized instruments, and it is very likely that this is causing nosocomial infections. The proposed building will have one-way circulation routes to segregate sterilized and un-sterilized materials via separate corridors and lifts.

- **Block Plan Layout and Functional Relationship**

Figure 9-13 shows the proposed building's block plan layout on the MMCH main campus and its functional relationship with existing buildings.

Besides general, plastic and paediatric surgeries (which are operated at the existing main OT block), cardiothoracic and vascular surgeries will be transferred to the proposed building. Other relevant functions associated with operations (ICUs, imaging and the anaesthesia department office) will also be transferred to the proposed building.

The proposed building will be connected to the corridor of the existing ward by internal connecting bridges on the ground and first floor levels.



(Source: Survey Team)

Figure 9-13: Block Plan Layout of the Proposed Building

- Building Configuration

Figure 9-14 shows the proposed building's axonometric configuration.

4th Floor: 2,481 m²

- Clinical simulation lab
- Biomedical engineering centre
- Auditorium (450 seats)
- Meeting room (100 seats)
- Anaesthesia department office

3rd Floor: 3,294 m²

- POCU : 20 beds
- SICU : 10 beds
- PACU : 20 beds
- Cardio POCU: 10 beds

2nd Floor: 3,294 m²

- OT centre: 12 OT rooms & 1 Hybrid OT (Cardiothoracic, Vascular, Plastic & Paediatric surgeries)
- Pre-OT rooms, Changing rooms, etc.

1st Floor: 3,294 m²

- OT centre: 13 OT rooms (General surgery & ENT)
- Pre-OT rooms, Changing rooms, etc.

Ground Floor: 3,321 m²

- Imaging centre: MRI, CT, Digital X-rays, Mammography, USG
- IVR centre: 2 IVR rooms
- Endoscopy units
- Pain clinic
- Emergency laboratory
- SPD & In-service pharmacy
- Administration office

Basement Floor: 2,865 m²

- CSSD
- Parking lots
- Machine rooms

(Source: Survey Team)

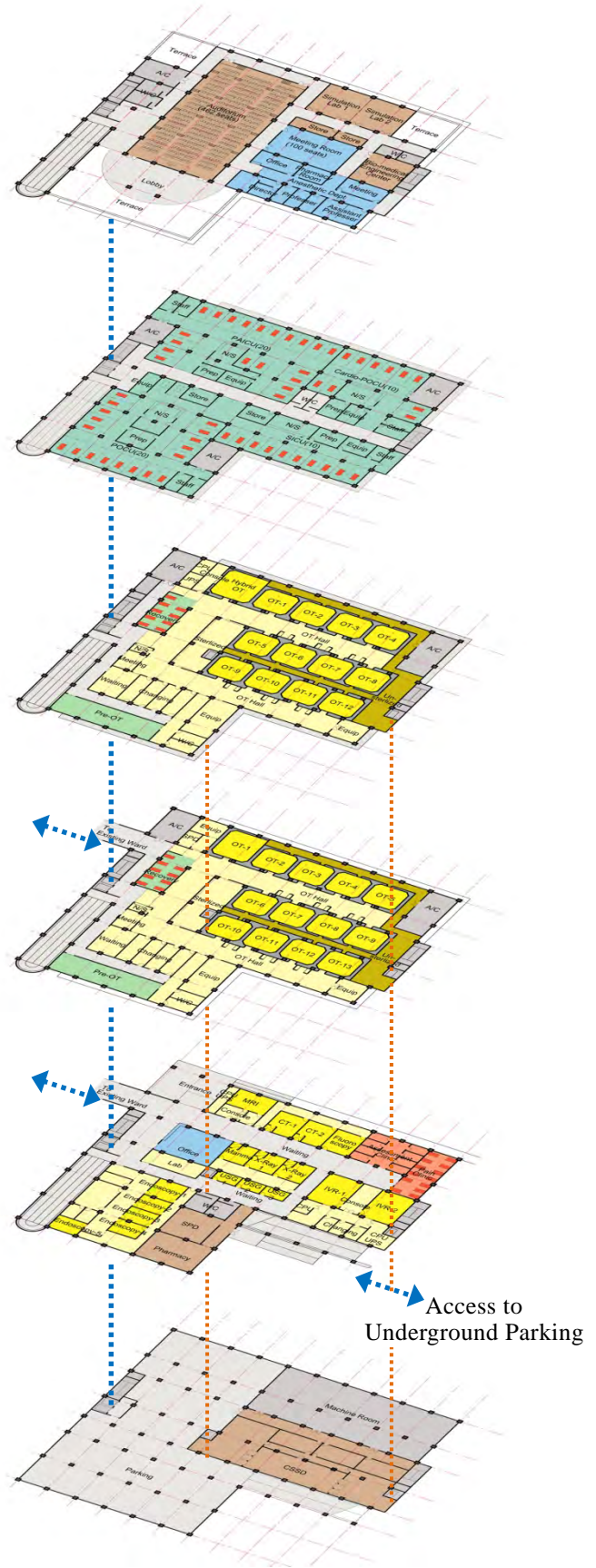
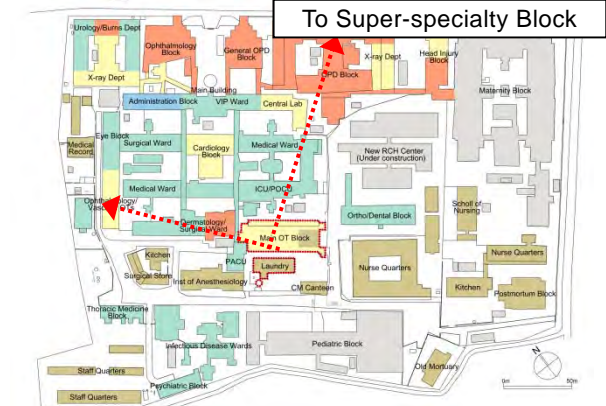
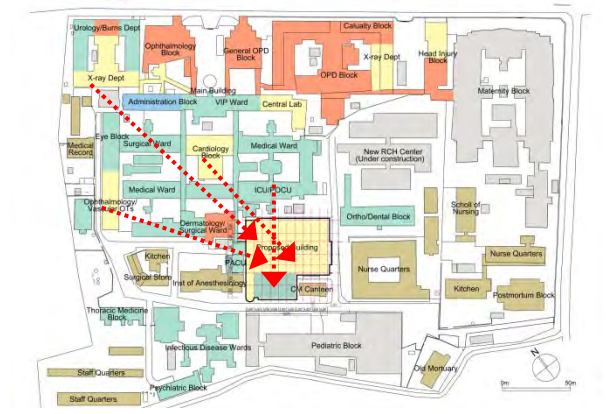
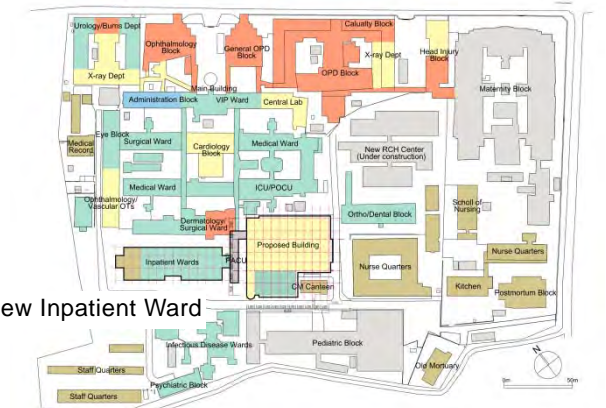
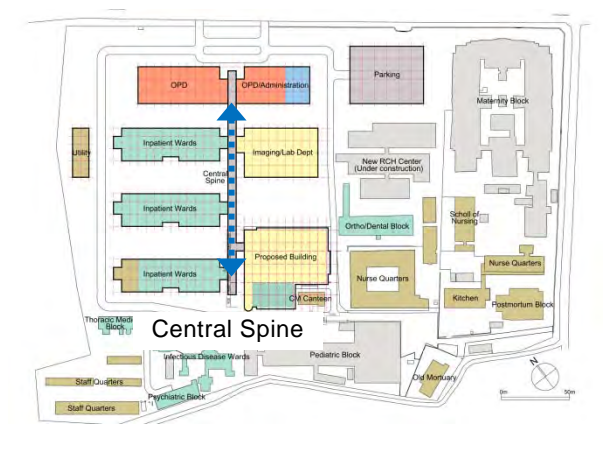


Figure 9-14: Proposed Building Configuration

- Future Master Plan and Phased Development Plan

Table 9-17: Phased Master Development Plans

Phase	Block Plan Layout	Development Plan
Phase-1		<ul style="list-style-type: none"> ➤ Demolishing the existing main OT block building and laundry ➤ Some super specialty operations will be transferred to the new super specialty block building, and other (mainly general surgery) operations will be temporarily transferred to the eye block.
Phase-2 (Proposed Building)		<ul style="list-style-type: none"> ➤ Constructing the proposed building, and integrating OTs and ICUs into one location. The Imaging dept for IPs will also be transferred to the proposed building (Imaging for outpatients will remain at the existing location). ➤ The proposed building will basically be designed as IP facilities, which will improve capabilities for elective surgeries and intensive care after the surgeries. ➤ Some existing OT rooms and ICU wards will be vacant, and they will be renovated as IP wards.
Phase-3		<ul style="list-style-type: none"> ➤ Demolishing the existing Institute of Anaesthesiology building (which will be transferred to the proposed building), and constructing the first new IP ward building (G+6 floors), which will include some service functions (kitchen, etc.) on the ground floor. ➤ This new IP ward building has more than 720 beds, and will be able to accept IPs at two or three blocks. This will allow the demolition of other existing wards and construction of new IP ward blocks.
Phase-4 (Final Stage)		<ul style="list-style-type: none"> ➤ Demolishing the existing ward building and gradually replacing it with new IP ward buildings (G+6 floors), central diagnosis unit (G+2 floors) and OPD block (G+ 2 floors). All buildings will be connected by the central spine, which enables organized expansion and development. ➤ Drop-off and open space will be designed in front of the hospital complex, and a service access road around the buildings will also be built. ➤ Total floor area: approx. 132,550 m² (M/P: 73,800 + existing: 58,750). Total floor area per IP bed: approx. 55 m²/bed. ➤ Total number of wards: approx. 2,500 beds.

(Source: Survey Team)



(Source: Survey Team)

Figure 9-15: Aerial View of the Proposed Building, MMCH



(Source: Survey Team)

Figure 9-16: Aerial View of the Proposed Building, KMCH

b) KMCH

- Space Program and Stacking Plan

Table 9-18 shows the functions and departments on each floor. The proposed building will be constructed on the site where the existing Dr. Guruswamy Mudaurar block is located. It will include impatient wards for general medicine and the nephrology department, currently located at the Dr. Guruswamy Mudaurar block, as well as central diagnosis units.

Table 9-18: Stacking Diagram of KMCH

Floor	Major Functions/Department	Floor Area (m ²)
5 th Floor	<ul style="list-style-type: none"> • Urology ward: 30 beds • Gynaecology surgery ward: 60 beds 	1,866
4 th Floor	<ul style="list-style-type: none"> • Nephrology ward: 30 beds • Dialysis unit ward: 30 beds 	1,866
3 rd Floor	<ul style="list-style-type: none"> • General medicine ward: 90 beds 	1,866
2 nd Floor	<ul style="list-style-type: none"> • OT centre: 12 OT rooms & 1 Hybrid OT (General, Vascular, Plastic, Micro, Paediatric surgeries, Urology, ENT, etc.) • Pre-OT rooms, changing rooms, etc. • POCU : 10 beds • Anaesthesia department office (Professors' rooms, office and lecture room) 	4,174
1 st Floor	<ul style="list-style-type: none"> • IVR centre: 2 IVR rooms, Pre-OT rooms, Changing rooms, etc. • SICU : 10 beds • ICCU/PACU : 20 beds • IMCU : 20 beds • Blood bank department • Administration office, Meeting room 	4,174
Ground Floor	<ul style="list-style-type: none"> • Casualty department: Treatment rooms, Casualty ward • Zero delay ward/Clinical Decision Unit (CDU): 20 beds • Imaging centre: MRI, CT, Digital X-rays, Mammography, USGs • Endoscopy units • Emergency laboratory, SPD, In-service pharmacy • Administration office, Conference hall 	4,246
Basement (Stilt Floor)	<ul style="list-style-type: none"> • Physical medicine & Rehabilitation department • CSSD • Parking Lots • Machine room 	4,001
Total		22,193

(Source: Survey Team)

- Design Requirements

The fundamental strategy for establishing the proposed building's design requirements is to integrate scattered existing central diagnosis functions (OT rooms and ICUs) into one location. The number of rooms and beds in the proposed building are basically the same as those in the existing facility.

<OT Rooms>

Table 9-19 shows the transition of OT rooms between the existing and proposed building throughout the entire KMCH campus. The proposed building intends to integrate scattered OT rooms for general surgery, orthopaedics and other specialties in one advanced OT centre. Some Ob & Gyn operations will continue to use OT rooms in the new maternity block building, which

was constructed in 2013. Currently, some OT rooms have more than two operation tables. The MCI Standard recommends a limit of one OT table in each OT room. The proposed building's OT room is principally designed for a single OT table. Along with the aforementioned 12 OT rooms, one hybrid OT room will be included in the proposed building.

Table 9-19: Comparison of Existing and Proposed OT Rooms

Specialty	Existing Building		Proposed Building	Other Buildings
	No. of OT rooms	No. of OT tables		
General surgery	3	6	4	--
Surgical gastroenterology				
Urology				
Plastic surgery				
Orthopaedics	3	4	1	--
Neurosurgery				
Vascular surgery				
Ob & Gyn				
ENT	2	4	--	4
Burns department.	1	2	1	--
Emergency (Trauma)	2	4	1	2
Ophthalmology	1	2	1	2
Total	13	24	12	14

(Source: Survey Team)

<ICUs>

Table 9-20 shows a comparison of ICUs in the existing and proposed units.

Table 9-20: Comparison of Existing and Proposed Care Unit Beds

Care Unit Name	Existing Building	Proposed Building	Remarks
	No. Beds		
POCU	30	10	24 hours after operation
SICU	6	10	
PACU	3	20	Patients on ventilators
Coronary Care Unit (CCU)	6	20	
IMCU	7	60	
Total	52	60	

(Source: Survey Team)

The average length of stay of POCU is currently about 5 to 7 days. The KMCH intends to reduce this to within one day by limiting the ward to fundamental post-operative care only and transferring recovered patients quickly. The number of POCU beds in the proposed building will be reduced to 10 in order to meet the KMCH's target.

<Inpatient Wards>

The proposed building will include wards for general medicine (90 beds) and nephrology (30 beds) and dialysis units, which are currently located in the Dr. Guruswamy Mudaurar block. An

IP bed cubicle in these wards will have six beds, and measure 6.0 by 6.0 metres, based on the MCI's recommended ward size.

<Other Functions>

➤ Imaging Department

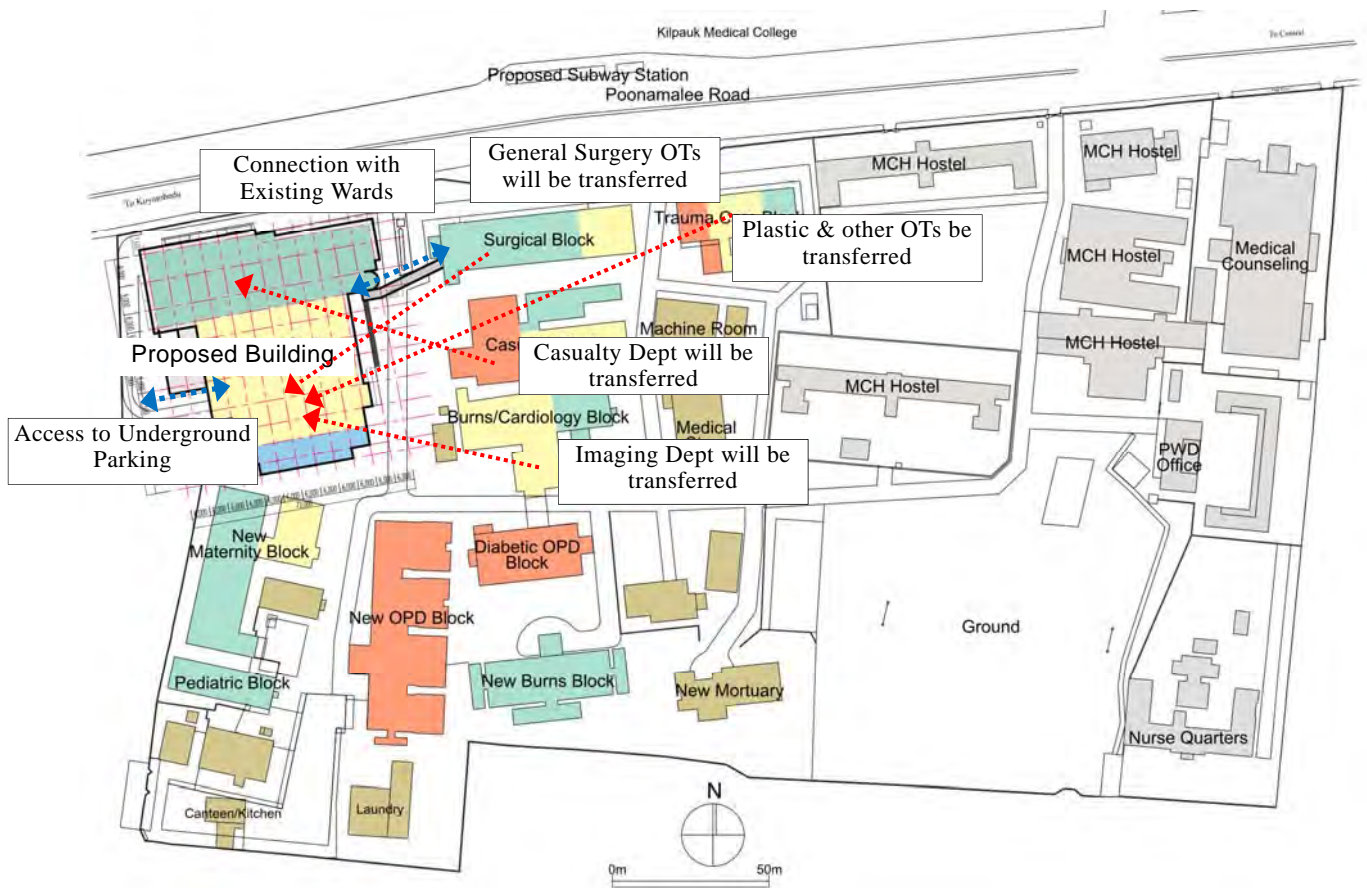
X-ray, CT and MRI rooms are currently located in a relatively old, deteriorated building. The project aims to transfer the existing imaging department to the proposed building.

➤ CSSD

In the existing OT block, sterilized and un-sterilized instruments and materials are brought by a lorry on the same route, which is very likely causing nosocomial infections to occur. The proposed building will have one-way circulation loop inside the building to segregate sterilized and un-sterilized materials via separate corridors and lifts.

• Block Plan Layout

Figure 9-17 shows the proposed building's block plan layout on the KMCH main campus and its functional relationship with existing buildings.



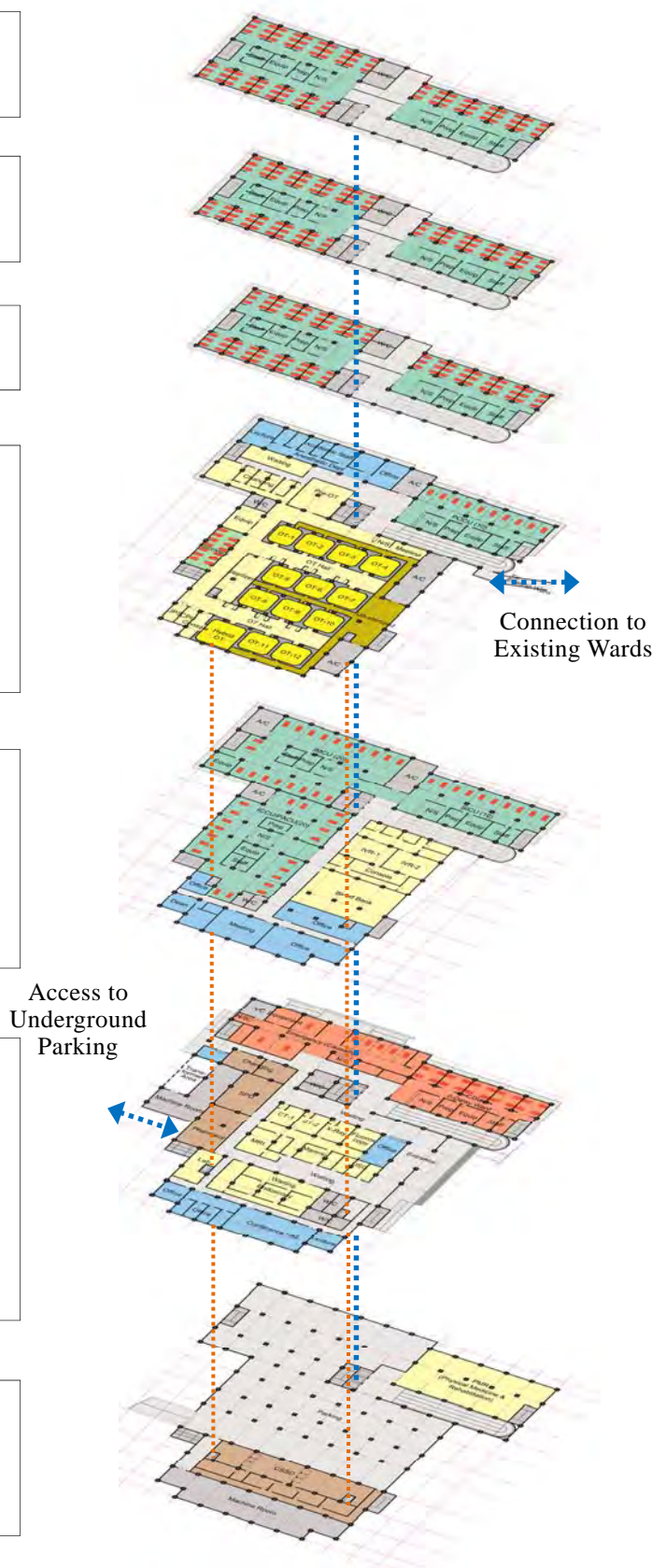
(Source: Survey Team)

Figure 9-17: Block Plan Layout of the Proposed Building

- Building Configuration

Figure 9-18 shows the proposed building's axonometric configuration.

- | |
|---|
| <p>5th Floor: 1,866 m²</p> <ul style="list-style-type: none"> • Urology ward: 30 beds • Gynaecology surgery ward: 60 beds |
| <p>4th Floor: 1,866 m²</p> <ul style="list-style-type: none"> • Nephrology ward: 30 beds • Dialysis unit ward: 30 beds |
| <p>3rd Floor: 1,866 m²</p> <ul style="list-style-type: none"> • General medicine ward: 90 beds |
| <p>2nd Floor: 4,174 m²</p> <ul style="list-style-type: none"> • OT centre: 12 OT rooms, 1 Hybrid OT (General, Vascular, Plastic, Micro, Paediatric surgeries, Urology, ENT, etc.) • Pre-OT rooms, Changing rooms, etc. • POCU : 10 beds • Anaesthesia department office |
| <p>1st Floor: 4,174 m²</p> <ul style="list-style-type: none"> • IVR centre: 2 IVR rooms • SICU : 10 beds • ICCU/PACU: 20 beds • IMCU: 20 beds • Blood bank department • Administration office |
| <p>Ground Floor: 4,246 m²</p> <ul style="list-style-type: none"> • Casualty department • Zero delay ward/CDU: 20 beds • Imaging centre: MRI, CT, Digital X-rays, Mammography, USG • Endoscopy units • Emergency laboratory • SPD & In-service pharmacy • Administration office |
| <p>Basement Floor: 4,001 m²</p> <ul style="list-style-type: none"> • PMR department • CSSD • Parking lots • Machine rooms |

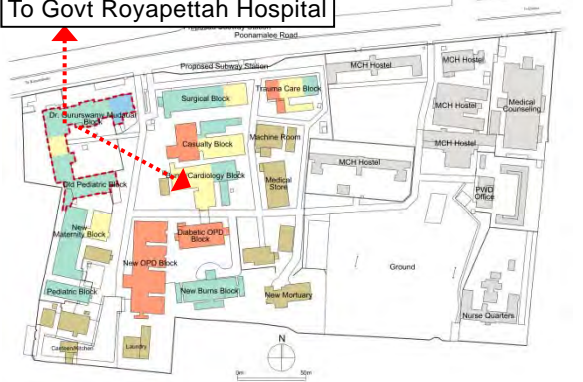

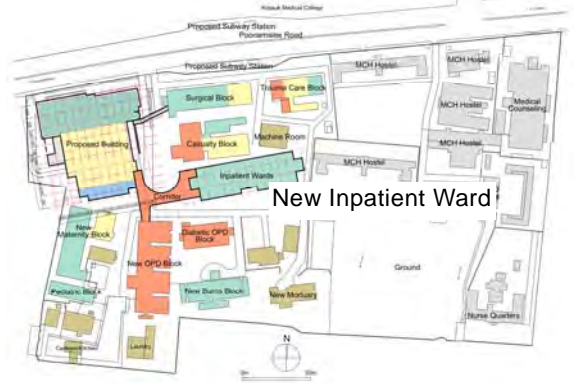
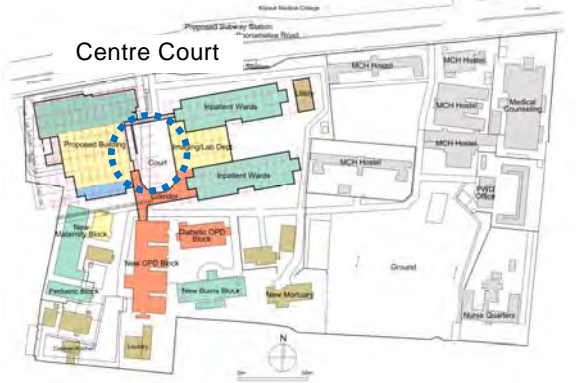


(Source: Survey Team)

Figure 9-18: Proposed Building Configurations

- Future Master Plan and Phased Development Plan

Table 9-21: Phased Master Development Plans

Phase	Block Plan Layout	Development Plan
Phase-1	 <p>To Govt Royapettah Hospital</p>	<ul style="list-style-type: none"> ➤ Demolishing the existing Dr. Guruswamy Mudaurar block. IP wards will be transferred to the existing burns ward (which will be moved to a new building). ➤ Some specialties such as urology will temporarily be transferred to Government Royapettah Hospital, which is attached to KMCH.
Phase-2 (Proposed Building)		<ul style="list-style-type: none"> ➤ Constructing the proposed building, integrating OTs and ICUs into one location. The imaging department, casualty department and blood bank will also be transferred to the proposed building. ➤ General medicine ward, nephrology ward and dialysis units will be brought back to the proposed building. ➤ Some existing OT rooms, ICUs and specialty rooms such as cardiology will be vacant, and will be renovated as IP wards.
Phase-3	 <p>New Inpatient Ward</p>	<ul style="list-style-type: none"> ➤ Demolishing the existing burns/cardiology block building, and constructing the first new IP ward building (G+4 floors), which has more than 600 beds. This building will be able to accept most of the existing IP wards' patients. This will enable demolition of all the remaining ward buildings.
Phase-4 (Final Stage)	 <p>Centre Court</p>	<ul style="list-style-type: none"> ➤ Demolishing existing ward buildings and gradually replacing them with a new IP ward building (G+4 floors) and central diagnosis unit (G+2 floors). All buildings will be connected via the centre court, which enables organized expansion and development. ➤ Total floor area: approximately 79,300 m² (M/P: 45,900 + existing: 33,400). Total floor area per IP bed: approximately 66 m²/bed. ➤ Total number of wards: approximately 1,300 beds

(Source: Survey Team)

c) CMCH

- Space Program and Stacking Plan

Table 9-22 shows the functions and departments on each floor. The proposed building will be constructed on a site where the existing auditorium (300 seats) is located. The proposed building will include a 300-seat auditorium as well as central diagnosis units.

Soil immediately below the ground surface is rather hard, weathered rock with an N-value over 60, so it is difficult to build a basement floor in the proposed building.

Table 9-22: Stacking Diagram of CMCH

Floor	Major Functions/Department	Floor Area (m ²)
4 th Floor	<ul style="list-style-type: none"> Auditorium (450 seats) 	1,267
3 rd Floor	<ul style="list-style-type: none"> IVR centre: 2 IVR rooms, Pre-OT Rooms, Changing rooms, etc. SICU : 10 beds ICCU/PACU: 20 beds Lecture rooms Simulation labs 	3,444
2 nd Floor	<ul style="list-style-type: none"> OT centre: 10 OT rooms & 1 Hybrid OT (General surgery, Cardiothoracic surgery, Plastic surgery, etc.) Pre-OT rooms, Changing rooms, etc. POCU : 10 beds 	3,444
1 st Floor	<ul style="list-style-type: none"> Imaging centre: MRI, CT, Digital X-rays, Mammography, USGs Endoscopy units Pain clinic Emergency laboratory, SPD, In-service pharmacy Bio-medical engineering centre Administration office 	3,444
Ground Floor (Stilt Floor)	<ul style="list-style-type: none"> Entrance hall CSSD Parking lots Machine room 	3,606
Total		15,205

(Source: Survey Team)

- Design Requirements

At CMCH, a new super specialty block building is nearly completed and will be in operation from the end of 2015. The functions and space requirements of the proposed building should be carefully studied to avoid duplications with the super specialty block. The fundamental strategy for establishing the proposed building's design requirements is to integrate scattered, existing central diagnosis functions (OT rooms and ICUs) into one location. The number of rooms and beds in the proposed building are basically the same as the existing numbers.

<OT Rooms>

Table 9-23 shows a comparison of OT rooms in the existing and proposed buildings, and the super specialty block. The specialty block centralizes specialty operations, while the proposed building will centralize general, cardiothoracic and plastic surgeries.

Currently, some OT rooms have more than two operation tables. The MCI Standard recommends a limit of one OT table in each OT room. The proposed building's OT room is principally designed for a single OT table.

Table 9-23: Comparison of Existing and Proposed OT Rooms

Specialty	Existing Building		Proposed Building	Other Buildings
	No. of OT rooms	No. of OT tables		
General surgery	4	6	4	--
ENT	2	3	--	3 (ENT block)
Ob & Gyn	5	6	--	5 (Maternity block)
Orthopaedics	2	3	--	3 (Super specialty block)
Paediatric	3	3	--	3 (Maternity block)
Cardiothoracic surgery	1	1	2	
Urology		(2) future plan	--	2 (Super specialty block)
Surgical gastroenterology		(2) future plan	1	2 (Super specialty block)
Neurosurgery	2	3	--	3 (Super specialty block)
Plastic surgery (ENT facial)			2	
Surgical oncology	1	1	1	1 (Super specialty block)
Thoracic/Vascular surgery	1	1	--	1 (Super specialty block)
Total	--	29	10	12 (Super specialty block) 11 (Other block total)

(Source: Survey Team)

<Intensive Care Units>

Table 9-24 shows a comparison of ICUs between the existing and proposed units.

Table 9-24: Comparison of Existing and Proposed Care Unit Beds

Care Unit Name	Existing Building	Proposed Building	Remarks
	No. of Beds		
POCU	80	10	24 hours after operation
SICU	10	10	
PACU	8	20	Patients on ventilators
CCU	6		
Total	104	40	

(Source: Survey Team)

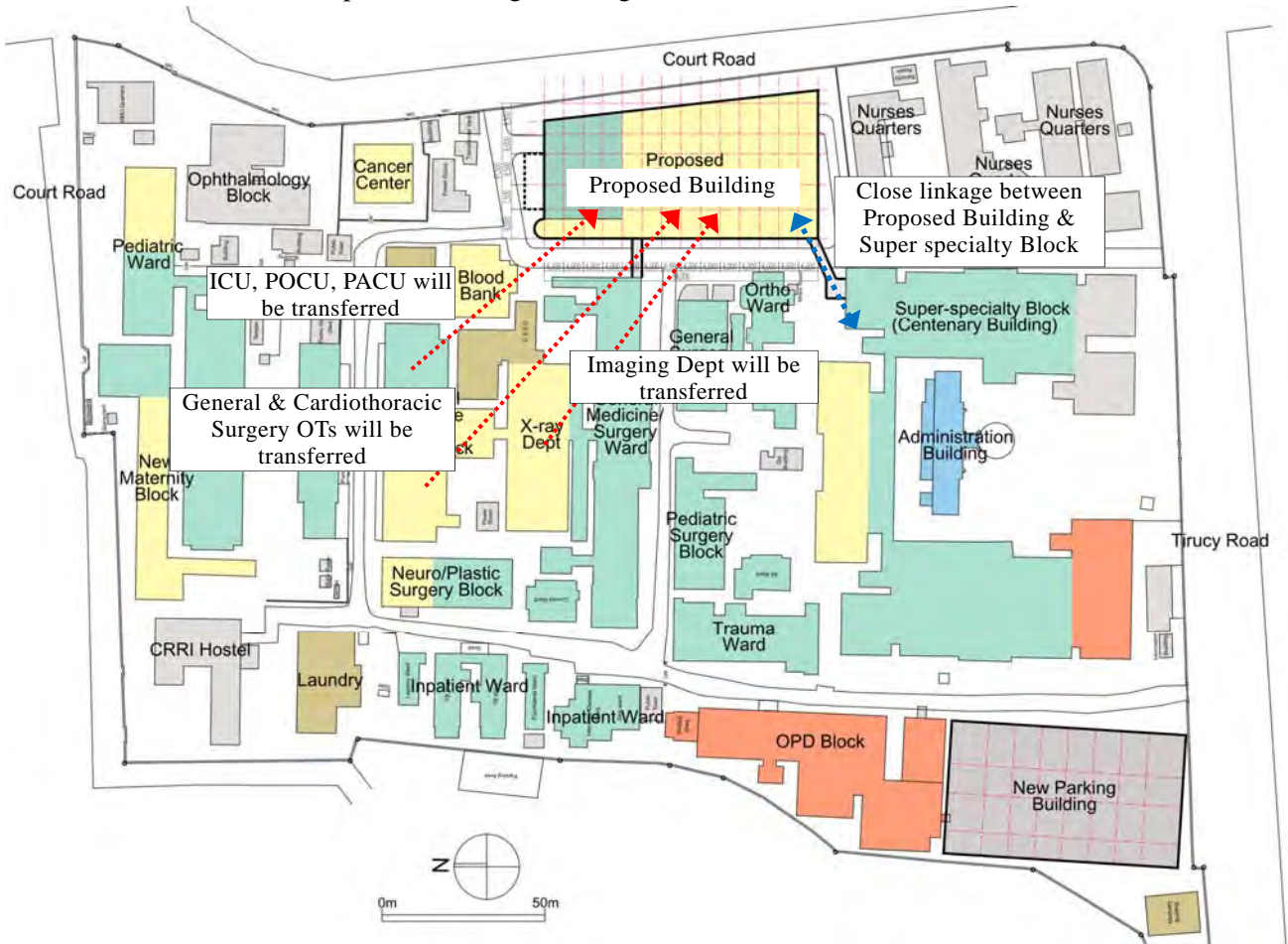
<Other Functions>

➤ Imaging Department

X-ray, CT scan and MRI scan rooms are currently located in a relatively old, deteriorated building. The project will transfer the existing imaging department to the proposed new building.

- Block Plan Layout

Figure 9-19 shows the proposed building's block plan layout on the CMCH main campus and its functional relationship with existing buildings.



(Source: Survey Team)

Figure 9-19: Block Plan Layout of the Proposed Building

- Building Configuration

Figure 9-20 shows the proposed building's axonometric configuration.

4th Floor: 1,267 m²

- Auditorium (450 seats)
- Lecture room

3rd Floor: 3,444 m²

- IVR centre: 2 IVR rooms
- SICU : 10 beds
- ICCU/PACU: 20 beds
- Lecture rooms
- Simulation labs

2nd Floor: 3,444 m²

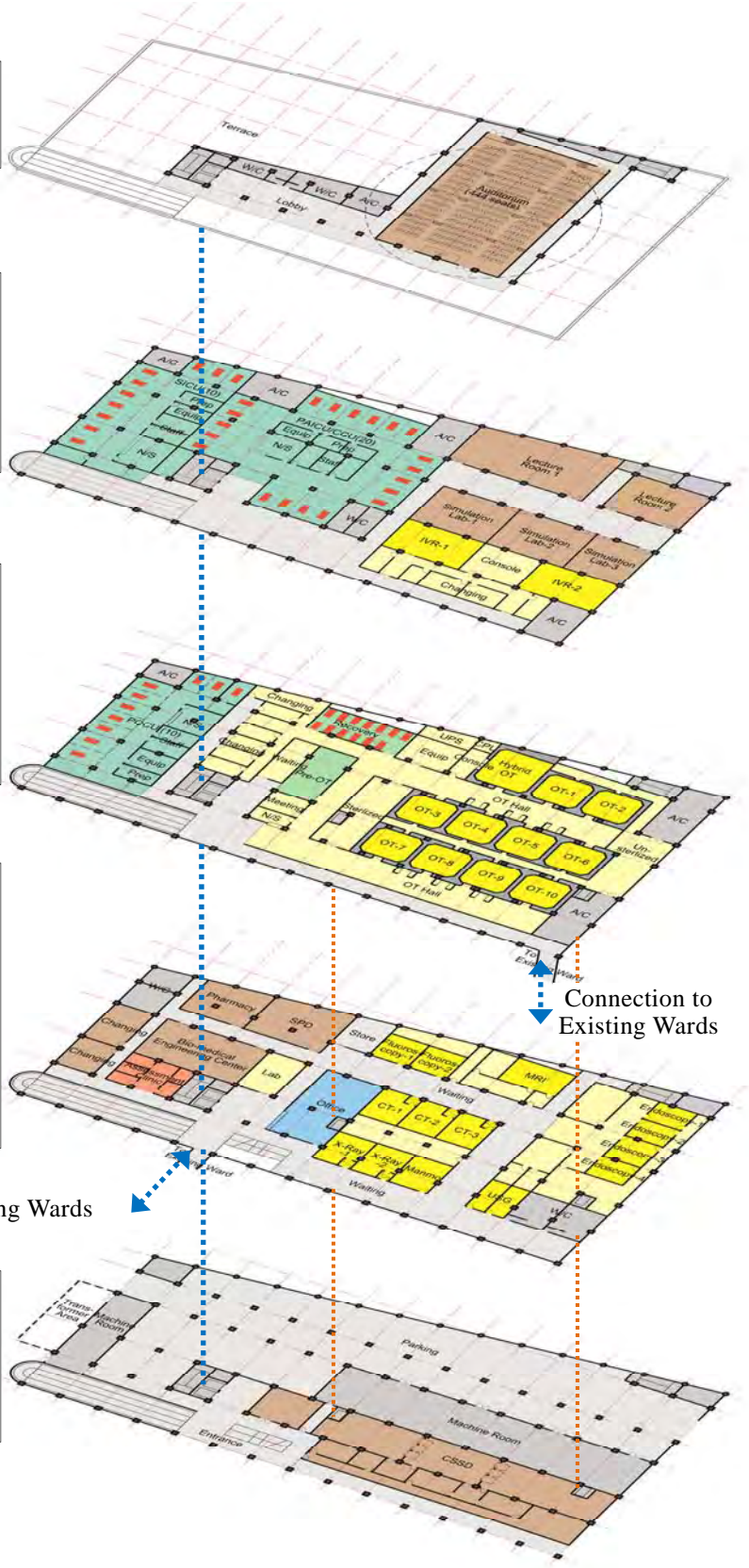
- OT centre: 10 OT rooms
1 Hybrid OT (General surgery, Cardiothoracic surgery, Plastic surgery, etc.)
- Pre-OT rooms, Changing rooms, etc.
- POCU : 10 beds

1st Floor: 3,444 m²

- Imaging centre: MRI, CT, Digital X-rays, Mammography, USG
- Endoscopy units
- Pain clinic
- Emergency laboratory
- SPD & In-service pharmacy
- Bio-medical engineering centre
- Administration office

Ground Floor: 3,606 m²

- Entrance hall
- CSSD
- Parking lots
- Machine room



(Source: Survey Team)

Figure 9-20: Proposed Building Configuration

- Future Master Plan and Phased Development Plan

Table 9-25: Phased Master Development Plans

Phase	Block Plan Layout	Development Plan
Phase-1		<ul style="list-style-type: none"> ➤ Demolishing the existing auditorium, CRRI hostel (which will be transferred to the super specialty block) and canteen, etc.
Phase-2 (Proposed Building)		<ul style="list-style-type: none"> ➤ Constructing the proposed building, integrating OTs and ICUs into one location. Imaging department will also be transferred to the proposed building. ➤ Some existing OT rooms ICU wards will be vacant, so these will be renovated as IP wards.
Phase-3		<ul style="list-style-type: none"> ➤ Demolishing the existing trauma ward, paediatric surgery block, general surgery block and ENT ward buildings, and constructing a new OPD building (G+1 floors).
Phase-4 (Final Stage)		<ul style="list-style-type: none"> ➤ Demolishing existing ward buildings and gradually replacing them with new IP ward buildings (G+3 floors) and a central diagnosis unit (G+2 floors). All buildings will be connected via the central spine, which enables organized expansion and development. ➤ Total floor area: approximately 92,300 m² (M/P: 41,500 + existing: 50,800). Total floor area per IP bed: approximately 66 m² /bed. ➤ Total number of wards: approx. 1,400 beds, including the super specialty block.

(Source: Survey Team)

2) Structural Plan

The superstructure of the proposed buildings will be RC, which is locally common. The frame will be a simple rigid structure, in both X and Y directions, without bracing or seismic walls in order to ensure that room layouts can be changed and partition walls moved with ease in the future. The height of the main floor will be 4.5 metres (OT room and ICU) or 4.0 metres (IP ward), and the main span will be 6.0 x 9.0 metres. Exterior/interior walls between columns will be made of Autoclaved Concrete Block or a drywall system (lightweight steel and gypsum board).

There are 300-seat auditoriums at the top of the proposed buildings on the MMCH and CMCH sites. Since the structure of their roofs requires a relatively long span, it will be necessary to use steel beams to support the roofs.

a) Applicable Standards and Decrees

The structural design of the proposed buildings will conform to the following relevant standards:

- *IS 1893 (Part 1) 2002 Criteria for earthquake resistant design of structures:
Part 1 General provisions and buildings (fifth revision)*
- *IS 1875 (Part 2) 1987 Code of practice for design loads (other than earthquake) for buildings and structures:
Part 2 Imposed loads (second revision)*
- *IS 875 (Part 3) 1987 Code of practice for design loads (other than earthquake) for buildings and structures:
Part 3 Winds loads (second revision)*
- *IS 875 (Part 5) 1987 Code of practice for design loads (other than earthquake) for buildings and structures:
Part 5 Special loads and load combinations (second revision)*
- *IS 1080 1985 Code of practice for design and construction of shallow foundations in soils (other than raft, ring):*
- *IS 1904 1986 Code of practice for design and construction of foundations in soils:
General requirements (third revision)*
- *IS 456 2000 Code of practice for plain and RC. Indian standard institution*
- *IS 1785 2008 Mechanical properties of high strength deformed bars and wires*

b) Design Load

➤ Importance Factor

Since the proposed buildings comprise the central diagnosis functions of a hospital, a Seismic Importance Factor of 1.5 will be assigned.

➤ Live Load

Live load will be calculated based on the layout of heavy medical equipment (such as MRI and CT scanners) and utility equipment in each room. Table 9-26 shows the live loads for the major rooms.

Table 9-26: Live Loads of Major Rooms

Room	Uniformly Distributed Load (kN/ m ²)	Concentrated Load (kN)
IP ward (Bed rooms)	2.0	1.8
Kitchen, laundry and laboratory	3.0	4.5
X-ray and MRI rooms, OT room, store	Not less than 3.0 (To be reviewed)	2.7
Offices	2.5	2.7
Corridors, lobby and staircases	4.0	4.5
Machine room	Not less than 5.0 (To be reviewed)	4.5

(Source: Survey Team)

c) Foundation Plans

Soil conditions vary from site to site. The Survey Team has proposed a foundation system optimized for each project site to avoid unequal settlement of the buildings.

- MMCH

The supporting layer should be a highly weathered rock layer at 9 metres below ground level, which has an N-value over 50. The length of the designed piles will be approximately 10 metres below ground level, with an actual length of 4.0 metres below the basement floor (since the proposed building has a basement). Therefore, it is not realistic to use a pile foundation for this site, and the soil improvement method (stirred soil cement) should be used instead. Availability and reliability of these construction methods should be reviewed carefully during the Detailed Design phase.

- KMCH

The supporting layer should be a clay stone/silt stone layer located at 26 metres below ground level, which has an N-value over 50. It is recommended that a pile foundation be used, with end-bearing bored piles cast in situ, and an axial force of approximately 600 tf (necessary diameter will be determined during the Detailed Design phase). The length of the piles will be approximately 28 metres (construction length), with an actual length of 23.0 metres (28 to 5.0: B1F floor height). Designed concrete strength is F_c 24 to 27 N/m².

- CMCH

The supporting layer should be a weathered rock layer located at 2 to 3 metres below ground level, which has an N-value over 50. It is recommended that the foundation be directly supported by this weathered rock layer, rather than a pile foundation.

3) Electrical Plan

Unless stated otherwise, the following specifications will be common to the proposed buildings at all three sites.

a) Power Reception

The new building will receive Medium Voltage (MV) power branched from the existing substations. Due to the expected load of the proposed building, the proposed building shall have its own substation. The incoming lines will be dedicated to the proposed building and routed to the new dedicated substation via-underground route. The existing substation may, depending on its design capacity, require upgrades in capacity or modifications in system configurations.

b) Substation System

The substation will typically consist of a MV switchgear or a MV ring main unit, one or multiple transformers with capacities up to 2,000kVA each, and LV distribution banks. The transformer should preferably be installed outdoors, while other equipment should preferably be installed in a dedicated electrical room.

c) Generator System

As the emergency power supply for possible blackouts, one or multiple diesel-engine radiator-cooled generators with unit capacities up to 1,500kVA each should be considered. Depending on the possibility of future demand increase, additional unit space may be considered. The amount of generator fuel to be reserved should depend on the operation policy, local availability of the fuel and available space for storage. It should be sufficient to cover the duration mandated by local regulations, the blackout time reported at each site.

d) Battery System

In addition to the generator system for continuous back-up power supply, a Uninterruptible Power Supply (UPS) battery system will be considered for instantaneous power blackouts for loads including life-support equipment, operation theatres, IT equipment, and electrical system control power, etc. In order to avoid an excessive amount of batteries, the backup time will be limited to 10 minutes. The battery bank should be locally available for easier replacement.

e) External Lightning Protection System

Tamil Nadu is considered to be a lightning risk state and an external lightning protection system that consists of lightning receptors, down conductors, and grounding electrodes will be considered for the proposed building, depending on the building nature, shape and surrounding conditions.

f) Mains and Power Supply System

Local distribution boards/motor control panels will be installed by area/application to receive low voltage power from the electrical room and distribute it to the local loads including mechanical equipment, medical equipment and power sockets. The wiring method will be by cabling, conduits, cabling trays and bus ducting, depending on the load and wiring volume. Automatic voltage regulators (AVR) are considered necessary for medical equipment, but are not necessary for infrastructure facilities.

g) Lighting System

Energy efficient fluorescent and/or Light Emitting Diode (LED) lighting are considered the primary sources, but such sources as High Intensity Discharge (HID) and incandescent may also be applied for supplementary purposes. The design illuminance will meet local standards. Lighting control will be grouped so that where daylight is available, excessive lights can be turned off. In common areas, scheduled control may be considered. Dimmer controls may be considered for some rooms in inspection areas. Generator power will be made available for all or partial lighting in the critical or essential areas to maintain minimum medical services in the event of blackouts. Emergency lighting and exit lighting will be installed as per local codes and regulations. Power sockets for general use and for medical equipment will be wired to separate circuits in order to reduce the possibility of failure in a general power socket circuit affecting the circuits of the medical equipment sockets.

h) Telephone Reception System

The proposed building will receive a new, dedicated feed from the local BSNL. The number of external lines will be approximately 30. Incoming lines will be routed either overhead or underground, depending on the conditions and possible passageways to the building at each site.

i) Telephone/ Local Area Network (LAN) System

Telephone outlets, RJ45 modular sockets and associated wiring routes, including conduits and cabling trays, will be installed. The cabling trays may be shared with other low-voltage system wiring.

The wiring and installation of a private branch exchanger, telephone sets, and network equipment, including PCs and servers, will be conducted by the TN side.

j) CCTV System

A wiring route that consists of a conduit and cabling tray will be installed where cameras and other system components are expected. The cabling tray will be shared with other systems.

k) Access Control System

A wiring route that consists of a conduit and cabling tray will be installed where system components including controllers, card readers, electrical locks, etc., are expected. The cabling tray will be shared with other systems.

l) Public Address System

A public address system will be installed for general announcements or paging from reception, cashiers and dispensers to waiting areas. The loudspeakers will be equipped with attenuators to enable local adjustments.

m) Nurse Call System/Toilet Call System

A nurse call system that consists of local call buttons, local indicators, local

microphones/speakers, reset buttons, and an indicator/control panel for patients in bed to call the nurse station will be installed.

Similarly, a toilet call system to notify nearby nurse stations or reception of emergency alarms in select toilets will be installed.

n) TV Reception System

A TV reception system will not be provided.

o) Automatic Fire Alarm System

An automatic fire alarm system consisting of addressable smoke or heat detectors, local indicator panels, control panels, alarm sounders, lamps and manual call points as per local codes and regulations will be installed. The system will be equipped with a dedicated battery power supply.

4) Mechanical Plan

a) Basic concept

- A simple system providing lower operational cost and easy maintenance will be designed.
- A redundant system to allow continuous medical services, even in a time of disaster or shutdown of lifeline services, will be adopted.
- Careful consideration will be made concerning hospital-wide infection prevention.

Unless stated otherwise, the following specifications will be common to the proposed buildings at all three sites.

b) Water Supply

The proposed building will receive city water from the city water main, with reserves held in an onsite water tank, and pumped to each point. The capacity of the water tank should be sufficient based on the conditions of the city water supply. Water will be filtered and sterilized. Hot water will be supplied by heaters at each consuming area.

c) Drainage

Wastewater shall be discharged to the city sewer main. For saving the water resource, Sewage Treatment Plant (STP) will be installed. Recycled wastewater shall be used as flushing water and cooling tower makeup water. Wastewater containing infectious bacteria should be sterilized. Waste liquid from laboratories should be collected by the treatment undertaker, and secondary wastewater will be discharged after neutralization. For these purposes, Effluent Treatment Plants (ETP) shall be installed. STP and ETP will be installed only for proposed building.

At KMCH, stormwater will be discharged to the city sewer main. There is no drainage system for stormwater at MMCH and CMCH, so it will permeate into the soil.

d) Sanitary Equipment

Western-style Water Closets (WCs) will be installed in the toilets for hospital staff, with toilet paper roll dispensers. In the toilets for the outpatients, Asian-style WCs with water sprays are preferred. Urinals will be installed on the walls, and be combined with automatic flushing valve.

e) Fire Fighting System

The fire fighting system will comply with local codes and standards. Sprinklers, hoses, wet risers, and portable fire extinguishers will be installed in the proposed building.

f) Air-conditioning and Ventilation System

It is recommended that the air-conditioning system of the proposed building be a water-cooled chiller system due to its high efficiency. Availability and cost of cooling tower makeup water should be considered. No heating system is required. The operation theatre and ICU will be air-conditioned by AHUs meeting cleanroom quality standards. The other rooms will be air-conditioned by Fan Coil Units (FCUs). Waiting rooms will preferably not be air-conditioned but rather naturally ventilated, following the practice of existing facilities. Air intake for air-conditioned rooms should be handled by the AHU. Toilet, storage and electric rooms, where sources of odours, heat and humidity are expected, should be ventilated to secure negative pressure. The draft chamber exhaust will be routed to the roof and treated if necessary prior to release into the air.

Table 9-27: Air-conditioning and Ventilation System

Room Type	Air Pressure	Air-conditioning/ Ventilation	Air Quality (Federal Standard 209D)	Remarks
OT, OT Hall	Positive	AHU	100 (Biological clean room) 1,000 – 10,000	Vertical laminar airflow
IVR room	Positive	AHU	100,000	Vertical laminar airflow
ICU, PACU	Positive	AHU	100,000	
Laboratory	Equivalent	AHU* + FCU	-	
Office	Equivalent	AHU* + FCU	-	
Ward	Equivalent	AHU* + FCU	-	

*AHU: Fresh air treating AHU

(Source: Survey Team)

g) Building Management System

A building management system will be installed to monitor and control the HVAC system, water supply system, wastewater treatment system, etc.

5) Waste Disposal

General waste and medical waste from the proposed building will be carefully collected at the existing collection point on the site and treated. No incinerator or treatment system will be provided by this project.

9.1.2 Component 1-2: Upgrading Tertiary Hospitals - Medical Equipment

(1) Places to be equipped

In the component 1-2, the plan is to equip newly constructed facilities in three medical college hospitals.

The surrounding conditions for the equipment installation

- 1) Electricity: the electric power is provided in relatively stable conditions. However, it was reported that overcurrent occurred three to four times a year which damage electronic items such as computers. Therefore highly precision equipment, which is sensitive to power fluctuation such as imaging diagnostic apparatuses require attachment of UPS in order to prevent data from getting erased, besides AVR and Automatic Voltage Switcher.
- 2) Water quality: Since the local water quality contains much hardness, RO plant, that is, water treatment is planned to procure for the items such as haemodialysis equipment, which will get affected by water quality.
- 3) Local agents: For the items which need the periodical maintenance or need consumables constantly, it makes prerequisite to have a local agent in India or neighboring countries to offer in bidding.

(2) The objective of equipment procurement

Three medical college hospitals were selected to upgrade and expand the capability and functions of tertiary care. The target departments are consisted of imaging diagnosis, surgical operations, ICUs, and other related service departments.

The objective of this equipment procurement plan is to procure the equipment necessary for the diagnosis and treatment services which newly built facilities are supposed to provide. And thus the equipment will be chosen to meet the function of each department.

(3) Conceiving and proposing equipment plan

The equipment plan is proposed to introduce the latest medical technology by procurement of most advanced items as a solution of the issues which target health facilities face based on the analysis of the existing equipment of target facilities and current activities. The Survey Team made out the typical equipment plan for each department in the facilities layout plan designed by the Survey Team through interviews to doctors in charge of each target department to review the original equipment plan and compile the result of discussions into the draft equipment plan.

The basic policy of the equipment plan for this project is described as follows:

- To propose latest medical technology with advanced equipment necessary for issues on performance of medical services which target department faces
- To make out major specifications of equipment so as to meet the technology level of medical personnel, and
- To limit the scale within the range where the target hospitals can secure manpower disposition to operate and maintain the equipment properly so that the sustainability is assured.
- To minimize the equipment cost to control numbers of equipment by reuse of existing equipment if they are still working well.

The summary of most advanced technology, which is planned to introduce in this particular project with required equipment is described as follows:

Table 9-28: Summary of most advanced technology

No.	Medical technology	Main items
1	<p>Hybrid operating room: Component 1 (Medical College Hospitals)</p> <p>The hybrid operating room is an operating room which enables to perform both thoracotomy and laparotomy and intravascular treatment using an angiography and the catheter.</p> <ul style="list-style-type: none"> • In case that requires both bypass operations and catheter treatment such as aortic aneurysms, it enables to continue treating these operations by putting together into the same place an operating room, a cardiac catheter room, and required apparatuses, though each is installed separately conventionally, which can largely reduce the burden of such patients, • While performing radiography in the hybrid operating room, and observing a high-resolution 3D image promptly, it enables to carry out aortic aneurysm treatment or angioplasty quickly and safely on the spot, • Another good point of the hybrid operating room is that it makes possible to conduct operations and catheter treatment in such a place provided with clean environment and equipment necessary for an operation. The aortic aneurysm does not often have subjective symptoms, and it is difficult to predict when it explodes. It comes possible to make a thoracic surgery and laparotomy during catheter treatment immediately even if it explodes. 	<ul style="list-style-type: none"> • X-ray Angiography system (Biplane) • Hybrid Operating Table • Pendant arm • Heart Lung Machine • Anaesthesia machine • LED Operating lights
2	<p>IVR: Component 1 and 2</p> <p>A treatment result of PCI, that is the catheter treatment for coronary diseases such as angina or myocardial infarction, has been improving with the development of stents year by year.</p> <ul style="list-style-type: none"> • PCI has two approaches, Trans-Radial Intervention (TRI) and Trans-Femoral Intervention (TFI). TRI approach makes haemostasis easier and it is not necessary for a patient to lie in bed after the operation. • Surgeons can choose the better approach among the said two approaches depending upon conditions of patients. However, usable catheters are limited in size. Since TFI uses the catheter of a bigger size by application to the total femoral artery a manual skill of PCI becomes easier. On the contrary, it would more often cause a bleeding and a hematoma. In addition, patient needs rest after the operation in the bed for several hours. • Desirably, TRI is applied to such cases when applicable to TRI, and TFI is applied to such cases when a catheter of a bigger size is required for urgent cases and complicated cases. 	<ul style="list-style-type: none"> • X-ray Angiography system (Biplane/Single plane) • Injectors • Anaesthesia machine • Operation tables • LED operating lights
3	<p>Operating room: Component 1 and 2</p> <p>Air-conditioning system by laminar air flow creates almost dust-free environment, which contributes to controlling nosocomial infections. Main items of equipment have the following functions to support the most advanced operations designed in this project:</p> <ul style="list-style-type: none"> ➤ Anaesthesia machine Unification with the vital-signs monitor has realized very careful control and displays warning immediately when sensing some kind of abnormality. ➤ LED operating light 	<ul style="list-style-type: none"> • Anaesthesia machine • LED operating light • Operating table • Pendant arm

No.	Medical technology	Main items
	<ul style="list-style-type: none"> • The irradiation light can reach to the much deeper area, which makes easier to do a surgical operation. When an electric bulb burns out, it will be replaced with a backup electric bulb instantly, and • A camera-mounted type, to be connected to TV monitor, and DVD to record operation scenes. ➤ Operating table <ul style="list-style-type: none"> • Table sliding secures space under the table to make the fluoroscopy by C-arm X-ray easier, • Table top adopts X-rays transmission board, which makes intraoperative radioscopy and photography possible. • It is usable for endoscopy surgeries with movements such as sliding, lifting, trendelenburg and lateral inclination, observing operation field with a video scope. ➤ Pendant arm <ul style="list-style-type: none"> • This item will suspend most of equipment and contribute to enhancing the safety and cleanliness in the operating rooms as no cables are laid on the floor. 	
4	<p>Fiberscopes: Component 1 and 2</p> <ul style="list-style-type: none"> • A video scope is comprised of a scope observing patient body, the main body, which supplies light, air and water to the scope and displays an image, and a peripheral device. • Compared to a conventional standard picture, the video scope can provide the image which is extremely clearer than conventional constitution by the connection to a hi-vision camera having high resolution. 	<p>Broncho fiberscopes Gastro fiberscopes Duodeno-fiberscopes Colono-fiberscopes Endoscopy table Washing unit</p>
5	<p>Imaging: Component 1 and 2</p> <ul style="list-style-type: none"> ➤ Ultrasound machine with transesophageal echocardiography (TEE) <ul style="list-style-type: none"> • A method to watch cardiac movement using an ultrasound wave through the esophagus by inserting a probe from a mouth enables to observe heart and aortic vein at near distance. ➤ MRI <ul style="list-style-type: none"> • This device can discover various lesions and has ability for overwhelming inspection about the lesions such as brain in particular and a cerebral blood vessel, the ovary, the abdominal region such as the prostates, the backbone, and limbs. ➤ CT scanners <ul style="list-style-type: none"> • This device can make the coronary photography over all heart domains and depict the minute vasculature in the cerebrovascular domain. • The data processing enables to make and observe three-dimensional image, which can discover even a very small lesion. ➤ C-Arm X-ray unit <ul style="list-style-type: none"> • This device is used to grasp a position and the state of the affected part in an operating room of the orthopaedics in real time, and has high operability not to disturb the progress of the operation. ➤ Digital Mammography <ul style="list-style-type: none"> • This device can detect calcification which is one of the early cases of the breast adenocarcinoma or tumour, which is used for screening. 	<ul style="list-style-type: none"> • Ultrasound machine with TEE • MRI • CT • C arm X-ray unit • Digital Mammography

(Source: Survey Team)

(4) Current status and requirement

Current status and requirement for the Medical College Hospitals is described in 4.7.4 Equipment supply, Table 4-15. Detail equipment needs in each hospital are attached in Annex 8.

(5) Major Specifications of Most Advanced Equipment

The equipment cost varies based on the specifications and should be carefully studied to meet the diagnostic and treatment services required. The survey team had a discussion on specifications on the most advanced items with specialist doctors of HFWD and confirmed the required level of such items. Tables 9-29 and 9-30 show the draft core specifications of the items with the comments of the specialist doctors. Though the specifications and equipment numbers will be finalized at the time of the detailed design study, the cost estimation for the most advanced items has been performed based on the following table. The specifications and equipment numbers will be finalized at the time of the detailed design study,

Table 9-29: Major Specifications of Medical Equipment for Medical College Hospitals

No.	Description	Specifications	Use and particulars
1	MRI	3.0 Tesla	<p>Use: Diagnoses for general purposes, including trauma cases cerebrovascular cases and others</p> <p><u>Grade justification:</u></p> <ul style="list-style-type: none"> ➤ Should be most suitable for a target medical college, placed with the core to bring up future specialist doctors, ➤ Can provide the most image information in MRI and highest in diagnosing ability, ➤ Should be the same grade as that of RGGGH.
2	CT	1st model: > 128slices 2nd model: > 60 slices	<p>Use: Diagnoses mainly for cardiology cases</p> <p><u>Grade justification:</u></p> <ul style="list-style-type: none"> ➤ 1st model: 120 slices level required for precision diagnosis for cardiac cases, ➤ 2nd model: 60 slices level required for screening level
3	Ultrasound machine	4D Echo with Doppler	<p>Use: High resolution needed for surgical cases, cardiovascular cases</p> <p><u>Grade justification:</u></p> <ul style="list-style-type: none"> ➤ Highest resolution required for diagnosis, surgical cases, cardiovascular cases, and ➤ Required for medical college hospital level for specialist training.
4	IVR	1st model: Biplane angiography system 2 nd model: Single-plane angiography system	<p><u>Use:</u> Treatments such as thrombolysis, angioplasty (PTCA) and others</p> <p><u>Grade justification:</u></p> <ul style="list-style-type: none"> ➤ 1st model: highest grade biplane model which can deal with neurosurgical cases, and even paediatric cases, and to train doctors for specialists, and ➤ 2nd model: single plane model for ordinary heart diseases.

No.	Description	Specifications	Use and particulars
5	Hybrid operation	1) Biplane angiography system with CT, and 2) Specially designed models of surrounding items	<p><u>Use:</u></p> <ul style="list-style-type: none"> ➤ To be applied for a combination of surgery and catheter treatment, that is, combination of Percutaneous Angioplasty (PTA), and ➤ Extracting of lining membrane or a bypass operation to deal with the Arteriosclerosis Obliterans (ASO) and arteriosclerosis of peripheral artery. <p><u>Grade justification:</u></p> <ul style="list-style-type: none"> ➤ required for upgrading the facility to world class, and ➤ specially developed for hybrid operations
6	Operation tables	Suitable for C-arm fluoroscopy	<p><u>Use:</u> Orthopaedic surgery, endoscopy and other operations and diagnosis under the C-arm fluoroscopy.</p> <p><u>Grade justification:</u> To provide radiolucency and workability required to operate C-arm fluoroscopy for surgical operations such as orthopaedic surgery.</p>
7	Operating light	Attached with camera, monitors and recording equipment	<p><u>Use:</u> Upgrading teaching ability of a medical college</p> <p><u>Grade justification:</u> Required to upgrade interpretation ability by images of high grade of DVD, high-vision</p>

(Source: Survey Team)

(6) Summary of Equipment Plan

1) MMCH

The target departments to be integrated are imaging, surgical operations, ICUs and other service departments. A summary of the equipment plan for the MMCH is shown in Table 9-30, and the detailed draft equipment plan is attached to the end of this report.

Table 9-30: Summary of Equipment Plan for MMCH

No.	Floor	Departments	Service	Equipment
1	4th	Training centre	ER simulation, ICU simulation, nursing simulation	ER simulators, ICU simulation system, nursing simulators
2	4th	Biomedical engineering centre	Maintenance management	Testing machines for check-up, personal computers
3	3rd	ICU	PACU	Patient monitors, Ventilators, Haemodialysis machine
			Cardiothoracic POCU	Patient monitors, ventilators, ICU beds
			SICU	Patient monitors, ventilators, ICU beds
			Surgical post operative intensive care unit	Patient monitors, ventilators, ICU beds
4	2nd	OT-I	Surgical operation	Operation lights with camera, heart-lung machine system, ultrasound machine for cardiology
			Hybrid operation	Angiography system with CT, hybrid operation table, TV monitors
			Recovery	Patient monitors, Ventilators, Haematology analyser
5	1st	OT-II	Surgical operation	Operation tables, operation lights, operating microscope
			Recovery	Recovery beds, patient monitors, Ventilators
			Conference	DVD recording system LCD monitors
6	G	IVR centre	IVR for cardiovascular cases	Angiography system-single plane, angiography system-biplane, operation light with camera
7	G	Endoscopy	Endoscopy	Gastro-fiberscope, colonoscope, esophago gastro duodenoscope
8	G	Pharmacy	Pharmacy	Drug refrigerators
				Distiller
9	G	Pain clinic	Pain Control	C-arm X-ray unit, OT table, ultrasound machine
10	G	Imaging	X-ray	MRI, CT scanner, PACS
			Ultrasound	Ultrasound machine for cardiology
11	G	Laboratory	Clinical testing	ABG, haematology analyser, biochemistry analyser
12	B	CSSD	CSSD	Washer disinfectant, ultrasonic cleaner, autoclaves

(Source: Survey Team)

2) KMCH

The target departments to be integrated are imaging, surgical operations, ICUs, wards, emergency, physical medicine & rehabilitation, and other service departments. A summary of the equipment plan for KMCH is shown in Table 9-31.

Table 9-31: Summary of Equipment Plan for KMCH

No.	Floor	Departments	Service	Equipment
1	5th	Gynaecology ward	IP care	IP beds, ultrasound machine with Doppler, ECG
			Pelvic training centre	Pelvic trainer
2	5th	Urology ward	IP care	Inpatient beds, ultrasound machine with Doppler, ESWL
3	4th	Nephrology ward	IP care	IP beds
4	4th	Haemodialysis centre	Haemodialysis	Haemodialysis units, dialysis beds, RO system
5	3rd	General medicine ward	IP care	Inpatient beds
6	2nd	POCU	Post-operative care	Patient monitors, ventilators, difficult intubation trolley
7	2nd	Anaesthesia department	Postgraduates training	CPR trainers, intubation simulator, venous cannulation simulators
8	2nd	OT	Surgical operation	Operation tables, heart-lung machine system, C-arm X-ray unit
			Hybrid operation	Angiography system w/ CT, hybrid operating table, heart-lung machine system
			Recovery	Patient monitors, ventilators, haematology analyser
			Conference	DVD system, LCD monitors
9	1st	IMCU	Intensive Care	Patient monitors, CRRT machine, ultrasound machine with echo probe
10	1st	ICCU	Intensive Coronary Care	Patient monitors, ventilators, ICU beds
11	1st	PACU	Post anaesthesia care	Patient monitors, echocardiogram with Doppler, ventilators
12	1st	SICU	Surgical intensive care	Patient monitors, ventilators, ICU beds
13	1st	IVR centre	IVR	Angiography system-single, angiography system-biplane, work station for imaging analysis
14	1st	Blood bank	Blood bank	Blood bank refrigerators, blood freezers
15	G	Endoscopy	Endoscopy	Gastro-fiberscope, colonoscope, oesophagi gastro duodenoscope
16	G	Emergency	Emergency service	Patient monitors, operating light with camera, operating tables
17	G	Zero-delay ward	CDU	Patient monitors, ventilators, ICU beds
18	G	Imaging	Radiology	MRI, CT scanner, ultrasound machine for cardiology
19	1st	Laboratory	Clinical testing	ABG, haematology analyser, electrolyte analyser
20	B	Physical medicine & rehabilitation centre rehabilitation centre	Physiotherapy	Gait lab, robotic arm, virtual reality system
21	B	CSSD	CSSD	Washer disinfectors, ultrasonic cleaner, high pressure water nozzle

(Source: Survey Team)

3) CMCH

The target departments to be integrated are imaging, surgical operations, ICUs, patient wards, emergency, physical medicine & rehabilitation, and other service departments.

A summary of the equipment plan for CMCH is shown in Table 9-32.

Table 9-32: Summary of Equipment Plan for CMCH

No.	Floor	Departments	Service	Equipment
1	3rd	Training centre	ER simulation ICU simulation Nursing simulation	ER simulators, ICU simulation system, nursing simulators
2	3rd	ICU	Cardiothoracic POCU	Patient monitors, ventilators, ICU beds
			Surgical intensive care	Patient monitors, ventilators, ICU beds
3	3rd	IVR centre	IVR for cardiovascular cases	Angiography system-single, angiography system-biplane, work station for imaging analysis
4	2nd	OT	Surgical operation	Operation lights, operation microscope, heart-lung machine system
			Hybrid operation	Angiography system with CT
				Hybrid operating table
				Heart-lung machine
			Recovery	Patient monitors, ventilators, ABG
Conference	DVD system, LCD monitors			
5	2nd	ICU	Post operative care	Patient monitors, hemodialysis machine
6	1st	Imaging department	X-ray, ultrasound	MR, CT scanner, ultrasound machine
7	1st	Endoscopy	Endoscopy	Gastro-fiberscope, colonoscope, duodenoscope, fume hood
8	1st	Pharmacy	Pharmacy	Medical refrigerator, RO unit
9	1st	Biomedical engineering centre	Maintenance management	Maintenance tool sets, testing machines for check-up, work tables and other items
10	1st	Laboratory	Clinical testing	ABG, haematology analyzer, electrolite analyzer
11	G	CSSD	CSSD	Washer disinfecter, ultrasonic cleaner, autoclaves

(Source: Survey Team)

9.1.3 Component 2: Strengthening Referral Hospitals

The Component 2 will develop 14 hospitals: seven Medical College Hospitals and seven DHQs by equipping those institutions. The Survey Team conducted data collection via field surveys and questionnaires to determine, confirm, and prioritize the equipment requirements of each institution. The equipment plan was conceived to determine the project cost based upon the priority of each item.

(1) Profile of the target health institutions

Table 9-33 and 34 show profile of the target health institutions.

Table 9-33: Profile of 7 Medical College Hospitals

No.	1	2	3	4	5	6	7
Name	MCH Vellore	MCH Salem	MCH Tiruchirappalli	MCH Thanjavur	MCH Thoothukudi	MCH Tirunelveli	MCH Nagercoil (Asaripallam)
Location	Vellore	Salem	Tiruchirappalli	Thanjavur	Thoothukudi	Tirunelveli	Nagercoil
Hospital Type	Tertiary	Tertiary	Tertiary	Tertiary	Tertiary	Tertiary	Tertiary
No. of Beds (total)	882	1,272	1,241	1,350	1,112	1,536	840
ICU/HCU							
NICU							
No. of Patients							
OPD (/day)	1,803	4,880	2,665	3,122	1,579	3,647	2,064
In-patients (/day)	866	1,243	925	1,069	804	1,293	618
Surgery							
Major (/day)	26	41	23	18	23	36	19
Minor (/day)	19	62	37	13	34	14	92
Specialty							
General Medicine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
General Surgery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Anaesthesiology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dermatology/Venerology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ENT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Obstetrics & Gynaecology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Orthopaedics	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ophthalmology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Paediatric Medicine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Thoracic Medicine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Super specialty							
Burns Ward							
Cardiology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Cardiothoracic Surgery		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
Colorectal Surgery							
Diabetology	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Endocrinology							
Geriatric Medicine						<input checked="" type="checkbox"/>	
Geriatric Surgery							
Hematology							
Hepatology							
Medical Gastroenterology		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Surgical Gastroenterology		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Neurology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Neuro Surgery		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Nephrology		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Orthopaedic Surgery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Paediatric Surgery		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Plastic Surgery		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Psychiatry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Medical Oncology						<input checked="" type="checkbox"/>	
Radiation Oncology							
Surgical Oncology						<input checked="" type="checkbox"/>	
Rheumatology							
Thoracic Surgery							
Vascular Surgery	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Urology				<input checked="" type="checkbox"/>			
Siddha Medical wing							
Staffing (total)	262	696	258	293	237	430	197
MD	44	120	30	44	34	71	37
Nurse	139	284	148	151	121	210	82
Co-medical	66	248	66	77	68	126	65
Others	13	44	14	21	14	23	13

(Source: DME)

Table 9-34: Profile of 7 DHQHs

No.		1	2	3	4	5	6	7
Name		Govt Erode HQRS	Govt Tirrupur HQRS	Govt Cuddalore HQRS	Govt Dindigul HQRS	Govt Puddukkottai HQRS	Govt Krishnagiri HQRS	Govt Periyakulam HQRS
Location		Erode	Tirrupur	Cuddalore	Dindigul	Pudukkottai	Krishnagiri	Periyakulam
Hospital Type		Secondary	Secondary	Secondary	Secondary	Secondary	Secondary	Secondary
No. of Beds (total)	ICU/HCU NICU	608	516	588	377	574	277	260
No. of Patients	OPD (/year)	651,890	936,225	630,355	794,605	818,695	569,035	466,105
	OPD (/day)	1,786	2,565	1,727	2,177	2,243	1,559	1,277
	In-patients (/year)	136,145	161,695	201,845	181,770	167,170	110,960	91,615
	In-patients (/day)	373	443	553	498	458	304	251
	Surgery							
	Major (/year)	166,805	206,590	240,900	211,700	194,545	149,285	43,800
	Major (/day)	457	566	660	580	533	409	120
	Minor (/year)	164,980	191,260	412,450	298,205	79,935	379,965	106,945
	Minor (/day)	452	524	1,130	817	219	1,041	293
Staffing (total)	MD	61	45	49	56	55	30	18
	Nurse	80	65	89	96	77	50	53

(Source: DMRHS)

(2) Current status and requirement of the target health institutions

The survey result on equipment needs of the Medical College Hospitals and the DHQHs is compiled in 4.7.4 Equipment Supply, Table 4.15 and Table 4.16 respectively. Detail equipment needs in each hospital are attached in Annex 9.

(3) Major Specifications of Most Advanced Equipment

The equipment cost varies based on the specifications and should be carefully studied to meet the diagnostic and treatment services required. The survey team had a discussion on specifications on the most advanced items with specialist doctors of HFWD and confirmed the required level of such items. Tables 9-35 and 9-36 show the draft core specifications of the said items with the comments of the specialist doctors. Though the specifications and equipment numbers will be finalized at the time of the detailed design study for this particular project, the cost estimation for the most advanced items has been performed based on the following table.

Table 9-35: Major Specifications of Medical Equipment for Medical College Hospitals

No.	Description	Specifications	Use and particulars
1	CT	1st model: > 128slices 2nd model: > 60 slices	<u>Use:</u> Diagnoses mainly for cardiology cases <u>Grade justification:</u> ➤ 1st model: 120 slices level required for precision diagnosis for cardiac cases, ➤ 2nd model: 60 slices level required for screening level
2	Ultrasound machine	4D Echo with Doppler	<u>Use:</u> High resolution needed for surgical cases, cardiovascular cases <u>Grade justification:</u> ➤ Highest resolution required for diagnosis, surgical cases, cardiovascular cases, and ➤ Required for medical college hospital level for specialist training.

No.	Description	Specifications	Use and particulars
3	Operation tables	Suitable for C-arm fluoroscopy	<u>Use:</u> Orthopaedic surgery, Endoscopy and other operations and diagnosis under the C-arm fluoroscopy. <u>Grade justification:</u> To provide radiolucency and workability required to operate C-arm fluoroscopy for surgical operations such as orthopaedic surgery.
4	Operating light	Attached with camera, monitors and recording equipment	<u>Use:</u> Upgrading teaching ability of a medical college <u>Grade justification:</u> Required to upgrade interpretation ability by images of high grade of DVD, high-vision

(Source: Survey Team)

Table 9-36: Major Specifications of Medical Equipment for DHQHs

No.	Description	Specifications	Use and particulars
1	MRI	>1.5 T	<u>Use:</u> Diagnoses for general purposes, including trauma cases cerebrovascular cases and others <u>Grade justification:</u> Taking into consideration not so many specialists are available in interpreting images, and securing the grade to high levels of diagnosis as medical college hospitals.
2	CT	> 60 slices	<u>Use:</u> to provide imaging information for diagnoses mainly for cardiology cases and neurosurgical cases <u>Grade justification:</u> To secure the grade required for diagnosis of heart diseases.
3	Ultrasound machine	3D Echo with Doppler	<u>Use:</u> To provide imaging information for diagnoses for cardiology and obstetrics & gynaecology <u>Grade justification:</u> To secure functions to ensure imaging diagnosis, and training ability for specialist doctors.
4	Operation tables	Suitable for C-arm fluoroscopy	<u>Use:</u> To provide imaging information required for orthopaedic surgery, endoscopy and other operations conducted under C-arm fluoroscopy. <u>Grade justification:</u> To provide radiolucency and workability required operating C-arm fluoroscopy for surgical operations such as orthopaedic surgery.

(Source: Survey Team)

(4) Standard equipment package

1) Tertiary Level (Seven Medical College Hospitals)

The standard equipment package covers the core departments of the Medical College Hospitals, including radiology, MRI, ultrasound, endoscopy, haemodialysis and OT. The imaging diagnosis equipment will enable precise diagnoses so as to determine the post-operative plans for surgical operations and other treatments. Endoscopes are used to diagnose gastroenteritis, respiratory diseases and ENT diseases, which are predominant among Medical College Hospitals. The operation equipment covers items necessary for orthopaedic surgery corresponding to increasingly complicated fractures caused by road traffic accidents, IVRs to deal with arteriosclerosis-related diseases such as ischemic strokes, and surgical endoscopy items for laparotomies and minimally invasive procedures. The haemodialysis equipment treats renal disorders and is strongly requested by HFWD to cope with increasing cases of diabetes. The standard equipment package was discussed with HFWD and consensus was reached that a requirements survey will be carried out for the target seven Medical College Hospitals based upon the said package. The survey team recommended adding some items of equipment such as continuous renal replacement therapy to deal with toxicology cases as the result of specialist doctors of HFWD.

Table 9-37 shows the Standard Equipment Package for Medical College Hospitals.

Table 9-37: Standard Equipment Package for Medical College Hospitals

No.	Departments	Service	Room name	Item No.	Equipment		
1	Imaging	X-ray	General X-ray	AA-01	Digital X-ray		
			Fluoroscopy	AA-02	Digital Fluoroscopy		
			Mammography	AA-03	Mammography		
			MRI	AA-04	MRI		
			CT scan	AA-05	CT scan for Cardiology		
			Mobile X-ray	AA-06	Mobile X-ray unit		
			CR room	AA-07	CR machine for General, Mobile		
			DR room	AA-08	DR machine for Fluoroscopy		
			Ultrasound	AA-09	Ultrasound machine		
		Endoscopy	Gastro-intestinal	BB-01	Gastro-fiberscopes		
				BB-02	Duodeno-scopes		
				BB-03	Colono-scopes		
				BB-04	Endoscopic table		
				BB-05	Endoscope washing apparatus		
			Bronchoscopy	BB-06	Broncho-fiberscope, video		
				BB-07	Endoscopic table		
				BB-08	Endoscope washing apparatus		
				BB-09	Endoscope auxiliary equipment		
			ENT	BB-10	ENT fiberscope, video		
				BB-11	ENT rigid scope set		
				BB-12	Endoscope auxiliary equipment		
		2	Haemodialysis Centre	Haemo dialysis	Haemodialysis	CC-01	Haemodialysis units
					CC-02	Dialysis beds	
CC-03	RO system						
CC-04	Blood tubes and others						
CC-05	Patient monitor						
CC-06	CRRT						
3	Operation Theatre	Medical Operation	General Operation	DD-06	Operation Microscope		
			Orthopaedics	DD-07	Ultrasound apparatus, for cardiovascular operations		
				DD-09	C-arm X-ray unit		
				Interventional Radiology (IVR)	DD-11	Angiography system	
			DD-12	Work station for imaging analysis			
			DD-13	Anaesthesia machine			
			DD-14	Polygraph			
			DD-15	Injector			
			DD-16	Operation Light			
		DD-17	Defibrillator				
		DD-18	Instruments set and others				
		DD-19	Doppler flowmeter				
		Digestive surgery	DD-20	Gastro-intestinal fiberscopes			
			DD-21	Endoscope auxiliary equipment			
DD-22	Endoscope washing apparatus						
Laparoscope	DD-23	Laparoscopes					

(Source: Survey Team)

2) Secondary Level (Seven DHQs)

The standard equipment package covers the core departments of the DHQs, including radiology, endoscopy, haemodialysis, OT, blood bank, and Ob & Gyn. The state-of-the-art imaging equipment will enable definitive diagnoses for determining treatment plans for post-operative surgeries, and other treatments. Gastrointestinal endoscopes prevail among the DHQs through the TNHSP. The OT equipment provides necessary items for orthopaedic surgery corresponding to the increasingly complicated fractures caused by road traffic accidents, and laminar flow to maintain the required cleanliness in the OT room. The haemodialysis equipment treats renal disorders and is strongly requested by HFWD to cope with increasing cases of diabetes in the DHQs. The standard equipment package was discussed with HFWD and eight items were added to the said package. A requirements survey was carried out for the target seven DHQs through questionnaires. The survey team recommended adding some items of equipment also to DHQH such as continuous renal replacement therapy to deal with toxicology cases as the result of specialist doctors of HFWD. Table 9-38 shows the standard equipment package for DHQs. The draft equipment plan was conceived by selecting items that have been prioritized by required numbers and existing numbers.

Table 9-38: Standard Equipment Package for DHQs

No.	Departments	Service	Room name	Item No.	Existing Equipment			
1	Imaging dept.	X-ray	General X-ray	FF-01	Digital X-ray			
				FF-02	Digital Fluoroscopy			
				Add-4	X-ray Machine 300 mA			
			CR room	FF-03	Mammography			
				FF-04	CR machine			
				FF-05	CT			
		Endoscopy	Gastro-intestinal	FF-06	MRI			
				GG-01	Gastro-fiberscope			
				GG-02	Duodeno-scopes			
			Ultrasound	GG-03	Colono-scope			
				GG-04	Endoscopic table			
				GG-05	Endoscope auxiliary equipment			
2	Haemodialysis	Haemodialysis	Haemodialysis	GG-06	Ultrasound machine			
				HH-01	Haemodialysis units			
				HH-02	Dialysis beds			
				HH-03	RO system			
				HH-04	Blood tubes and others			
				HH-05	Patient monitor			
3	Operation Theatre	Operation	Operation general	HH-06	CRRT			
				Ob & Gy	II-01	Operation tables		
					II-02	Electrosurgical unit		
			II-03		Anaesthetic apparatus with ventilator			
			Orthopaedics	II-04	C-arm X-ray machine			
				II-05	Patient monitors			
				II-06	Defibrillators			
				Add-1	Anaesthesia Work Station			
				Add-2	Laminar Air Flow			
			4	Blood Bank	Blood Bank	Component Separation	Add-3	Ceiling Shadowless Lamp
							Add-5	Multi-parameter Monitor with Et CO2
							Add-8	Arterial Blood Gas Analyser
Add-7	Blood Component Separator Unit							
5	Ob & Gy	Delivery	Delivery Room	Add-6	CTG Monitor			

(Source: Survey Team)

9.1.4 Component 3-1: Strengthening Secondary Care Hospitals – (Facilities)

(1) Study of Proposed Sites

Table 9-39 shows the outlines of the proposed construction sites in four areas.

Table 9-39: Outlines of the Proposed Construction Sites

Sub-Component	Location	Land Area (m ²)	Land Owner
1. Avadi Taluk Hospital, Chennai	Inside Avadi Taluk Hospital	--	DMRHS
2. Velampalayam Center, Tiruppur	Inside PHC, 15 Velampalayam	4,047	DPHPM
3. Maniyanoor Center, Salem	Maniyanoor	3,035	Salem Corporation
4. Kandiaaperi Center, Tirunelveli	Kandiaaperi	10,117	Tirunelveli Corporation

(Source: Survey Team)

(2) Outline of the Proposed Sub-components

1) Architectural Plan

a) Space Program and Stacking Plan

Table 9-40 shows the functions and departments on each floor for the proposed secondary health facilities.

Table 9-40: Stacking Diagram of Proposed Secondary Care Hospital

Floor	Major Functions/Department	Floor Area (m ²)
2 nd Floor	<ul style="list-style-type: none"> • IP wards: male: 30 beds and female: 30 beds • Administration office and meeting room 	1,584
1 st Floor	<ul style="list-style-type: none"> • CEmONC centre • OT block: 2 OT rooms, pre-OT rooms, changing rooms, etc. • Clinical laboratory 	1,584
Ground Floor	<ul style="list-style-type: none"> • OPD & pharmacy • Imaging department: Digital X-rays, USG, etc. • Casualty (Emergency) department • Administration office 	1,444
Total		4,612

(Source: Survey Team)

b) Design Requirements

According to DMRHS standards, the proposed secondary health facilities should provide the following clinical services:

- General OPD & NCD clinic
- CEmONC & Specialized Newborn Care Unit (SNCU)
- Trauma care unit & poison treatment
- Digital X-ray
- IP wards (male & female)

c) Staffing Plan

Table 9-41 shows the standard staffing requirements for a 50- to 100-bed health facility, as defined by DMRHS. The proposed building is designed to accommodate all staff members.

Table 9-41: Staffing Plan of Typical Secondary Health Facility

Category	Designation & No of Staffing
Medical Doctor Total: 20	Hospital Superintendent: 1, Medical Specialist: 2, Surgery Specialist: 2, Ob & Gyn Specialist: 2, Dermatology/Venereologist: 1, Paediatrician: 2, Anaesthetist: 2, ENT Surgeon: 1, Ophthalmologist: 1, Orthopedician: 1, Casualty Doctor: 3, Dental Surgeon: 1, AYUSH Physician: 1
Para-medical Staff Total: 62	Staff Nurse: 25, Attendant (MPHW): 12, Matron: 2 Technician (Lab, ECG, Dialysis, etc.): 9 Assistant (Lab, OT, Statistical, etc.): 8 Radiographer: 2, Pharmacist: 3, Physiotherapist: 1
Administrative Staff Total: 12	Junior Administrative Officer: 1, Assistant: 1, Accountant: 1, Computer Operator: 1, Electrician: 1, Plumber: 1 Driver: 2, Peon: 2, Security Staff: 2
Total: 94	

(Source: Survey Team)

2) Building Configuration

Figure 9-21 shows the proposed building's axonometric configuration.

- 2nd Floor: 1,584 m²**
- General medical ward
 - Male ward: 30 beds
Nurse station: Preparation room, etc.
 - Female ward: 30 beds
Nurse station: preparation room, etc.
 - Administration office
 - Meeting room

- 1st Floor: 1,584 m²**
- OT block: 2 OT rooms
 - Pre-OT rooms, recovery room and changing rooms, etc.
 - CEmONC centre: Antenatal, prenatal and postnatal rooms, delivery room, NICU, etc.
 - Clinical lab

- Ground Floor: 1,444 m²**
- OPD department: 5 consultation rooms and pharmacy
 - Casualty (Emergency) department: Treatment room, zero delay ward (CDU) and doctor's room
 - Imaging department: 2 digital X-ray rooms and 2 ultra sound rooms, etc.
 - Administration office
 - Machine rooms, etc.

(Source: Survey Team)

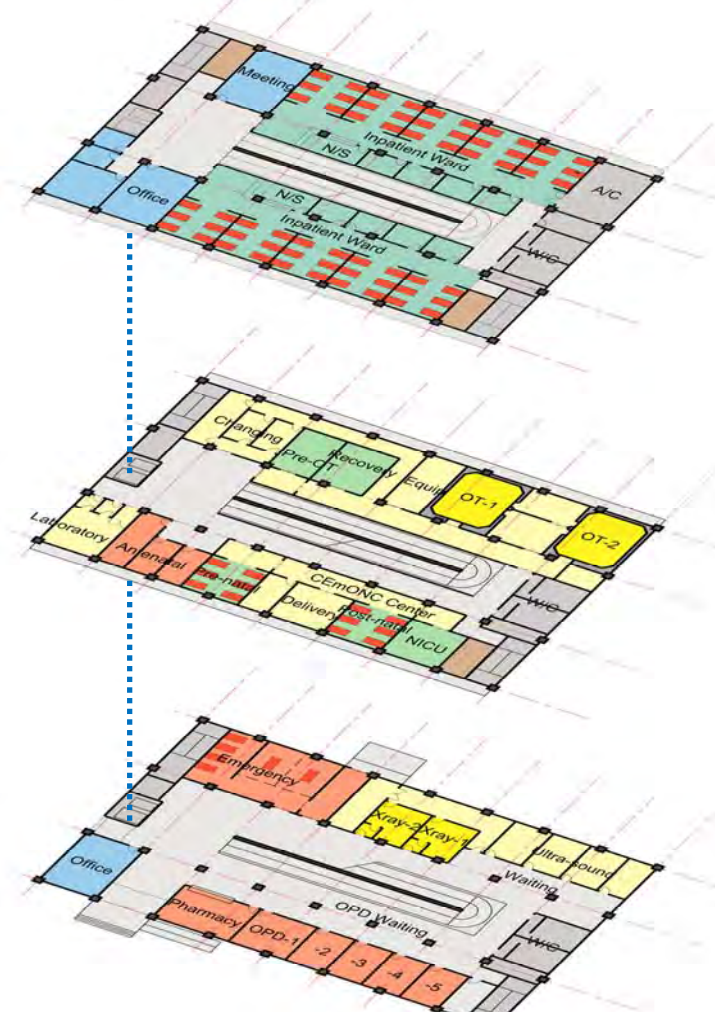


Figure 9-21: Proposed Building Configuration

3) Electrical Plan

Unless stated otherwise, the following specifications will be common to the proposed buildings at all four sites.

a) Power Reception

The new building will either receive a new 11kV 50Hz power line from the local TANGEDCO grid or power branched from the existing substation in the site. Due to the expected load for the proposed building, the incoming line for the building will be dedicated for use in the proposed building and routed to a new dedicated substation via underground route. The existing substation may, depending on its design capacity, require upgrades in capacity or modifications in system configurations.

b) Substation System

The substation will typically consist of a MV switchgear or a MV ring main unit, one or multiple transformers with capacities up to 500kVA each, and LV distribution banks. The transformer should preferably be installed outdoors, while other equipment is recommended to be installed in a dedicated electrical room.

c) Generator System

To provide an emergency power supply for possible blackouts, one or multiple radiator-cooled diesel generators with unit capacities up to 500kVA each should be considered. Depending on the possibility of future demand increase, additional unit space may also be considered. The amount of generator fuel to be reserved should depend on the operation policy, local availability of the fuel and space available for storage. But the supply should cover the minimum duration mandated by local regulations and be sufficient to cover blackout times reported at each site.

d) Battery System

In addition to the generator system for continuous backup power supply, a UPS battery system should be considered for instantaneous power blackout for such loads as life-support equipment, OTs, IT equipment, electrical system control panels, etc. In order to avoid an excessive amount of batteries, backup time should be limited to 10 minutes. The battery bank should be locally available for easier replacement.

e) External Lightning Protection System

Tamil Nadu is considered to be a lightning risk state and an external lightning protection system that consists of lightning receptors, down conductors, and grounding electrodes should be considered for the proposed building, depending on the building nature, shape, and surrounding conditions.

f) Mains and Power Supply System

Local distribution boards/motor control panels will be installed by area/application to receive low voltage power from the electrical room and distribute it to the local loads, including

mechanical equipment, medical equipment, and power sockets. Wiring will be via cabling, conduit, cabling trays and bus ducting, depending on the load and volume.

An AVR should be considered necessary for medical equipment, but not as part of the comprehensive infrastructure facilities.

g) Lighting System

Energy efficient fluorescent and/or LED lights are considered the primary lighting sources, but such sources as HID and incandescent lights may also be applied for supplementary purposes. The design illuminance will meet local standards. Lighting control will be grouped in such a manner that, where daylight is available, excess lights can be turned off. In common areas, scheduled controls may be considered. Dimmer controls should be considered for some rooms in inspection areas. Generator power will be made available for all or partial lighting in the critical or essential areas to maintain minimum medical services in the event of blackouts. Emergency lighting and exit lighting will be installed as per local codes and regulations. Power sockets for general use and for medical equipment will be wired to separate circuits in order to reduce the possibility of failures in the general power socket circuit affecting the circuits of the medical equipment sockets.

h) Telephone Reception System

The proposed building will receive a new, dedicated feed from the local BSNL. The number of external lines will be approximately 10. The incoming line will be routed either overhead or underground depending on the conditions and possible passageways to the building at each site.

i) Telephone/LAN System

Telephone outlets, RJ45 modular sockets and associated wiring routes, including conduits and cabling trays, will be installed. The cabling trays may be shared with other low-voltage system wiring.

The wiring, private branch exchanger, telephone sets, and network equipment including PC's, servers, etc., will be conducted by the Tamil Nadu side.

j) CCTV System

A wiring route that consists of a conduit and cabling tray will be installed where cameras and other system components are expected. The cabling tray will be shared with other systems.

k) Access Control System

A wiring route that consists of a conduit and cabling tray will be installed where system components such as controllers, card readers, electrical locks, etc. are expected. The cabling tray will be shared with other systems.

l) Public Address System

For the purpose of general announcement or paging from the reception, register, cashier and dispenser to waiting areas, public address system shall be installed. The loudspeakers shall be equipped with attenuator to enable local adjustments.

m) Nurse Call System/Toilet Call System

A nurse call system for IP wards, consisting of local call buttons, local indicators, local microphones/speakers, reset buttons, and an indicator/control panel, will be installed in the nurse stations. Similarly, a toilet call system to notify nearby nurse stations or reception of an emergency in selected toilets will be installed.

n) TV Reception System

No TV reception system will be provided.

o) Automatic Fire Alarm System

An automatic fire alarm system that consists of addressable smoke or heat detectors, local indicator panels, a control panel, alarm sounders, lamps and manual call points will be installed as per local codes and regulations. The system will be equipped with a dedicated battery power supply.

4) Mechanical Plan

Unless stated otherwise, the following specifications will be common to the proposed buildings at all four sites.

a) Water Supply

The proposed building will receive city water from the city water main. This water will be stored in the water tank, and pumped up to each point. The capacity of the water tank should be sufficient based on the conditions of the city water supply. It is recommended that the water tank be installed on the health facility premises for ease of maintenance. Water should be filtered and sterilized. Hot water will be supplied by hot water heaters at each consuming area.

b) Drainage

Wastewater will be discharged into the city sewer main. Under the supervision of local authorities, STP will be installed, if necessary. Wastewater contaminated with infectious bacteria will be sterilized. Waste liquid from laboratories will be collected by the treatment undertaker, while secondary wastewater will be discharged after neutralization. For these purposes, ETP shall be installed, if necessary. In the site where city sewer main is not available, wastewater shall be discharged to the nearest river after being treated by septic tank. Stormwater will be discharged into the city sewer main. If there is no rainwater drainage on the site, stormwater will permeate into the soil.

c) Sanitary Equipment

A Western-style water closet will be installed in the toilet for health facility staff, with a toilet paper roll dispenser. In the toilet for outpatients, it is preferable to have an Asian-style WC with water spray is. Urinals will be hung on the walls.

d) Fire Fighting System

The fire fighting system will comply with local codes and standards.

e) Air-conditioning and Ventilation System

The air-conditioning system for the proposed building is recommended to consist of air-cooled packaged air conditioners. No heating system is required. The toilets, storage and electrical rooms, where sources of odours, heat and humidity are expected, will be ventilated to secure negative pressure. Exhaust from the draft chamber will be routed to the roof and treated, if necessary, prior to release into the air.

5) Waste Disposal

General waste and medical waste from the proposed building will be collected at the existing collection point on the site. All waste will be properly collected and treated. No incinerator or treatment system is provided by this project.

9.1.5 Component 3-2: Strengthening Secondary Care Hospitals – Medical Equipment

The medical equipment plan for secondary care hospitals has been conceived and planned following the standards for secondary care hospitals indicated by HFWD. The required medical equipment covers the needs for imaging, lab services, cardiac, labour ward & neonatal, ENT, eye, dental, anaesthesia and wards of 60 beds. The numbers of each type of equipment have been estimated and minimized to equip the facilities designed by the Survey Team.

Table 9-42: Summary of Equipment Plan for Secondary Care Hospitals

No.	Floor	Department	Service	Room name	Equipment
1	2 nd	IP wards	IP care	Ward, meeting room, office	Patient beds, irrigator, ice makers
2	1 st	OT	General surgery, Ob & Gyn	Operation room, recovery room, CSSD	Operation tables, anaesthetic apparatus with ventilator, electrosurgical unit, washer disinfectant, autoclaves
3		NICU	NICU	NICU (6 beds)	Radiant warmer, phototherapy unit, patient monitor, ventilator
4		Laboratory	Laboratory	Biochemistry, haematology	Biochemistry analyser, haematology analyser, electrolyte analyser
5		Ob & Gyn	Counselling	Counselling room	Ob & Gyn examination table, examination light, PC
				Delivery	Delivery room
			Antenatal room	Foetal Doppler detectors, beds	
	Postnatal room		Recovery beds		
6	G	Imaging	X-ray, Ultrasound	General X-ray, digital X-ray, ECG, ultrasound	Digital X-ray, , mobile X-ray unit, ECG, ultrasound machine
7		Emergency	CPR, Treatment	CPR room, treatment room	Emergency carts, operation light stand, defibrillator
8		Pharmacy	Pharmacy	Pharmacy	Drug refrigerator, vaccine refrigerator, water distillator
9		OPD	Counselling	Counselling	
				Dental clinic, paediatric clinic, ophthalmology clinic, ENT clinic, general medicine clinic, surgical clinic	Dental treatment unit, slit lamp, ENT treatment unit with chair
10	Transportation	Referral	Ambulance	Ambulance	

(Source: Survey Team)

9.1.6 Component 4: Strengthening Hospital Management

In order to realize the intended effects of the component 1 to 3, it is essential to equip the respective health facility personnel to be able to fully utilize the provided facilities and medical equipment. For the medical equipment, in addition to the core technicians and doctors, it would be important to train nurses to handle the basic operation. The proposed areas of training are shown below, however, actual contents will be decided based on the needs assessment/gap analysis at the onset of the project. It will cover all 21 health facilities in 17 cities.

Table 9-43: Contents of training

No	Training area	Content	Trainee
1	Training on hospital management	<ul style="list-style-type: none"> ➤ OT (Hybrid) management ➤ Infection control ➤ CSSD operation 	Doctors, nurses, paramedical
2	Training on medical equipment	<ul style="list-style-type: none"> ➤ Utilization, application and operation and maintenance 	Doctors, nurses, technicians
3	Training on NCD and trauma care management	<ul style="list-style-type: none"> ➤ Management of patients ➤ Coordination between different departments 	Emergency unit staff, doctors, nurses, ambulance staff

(Source: Survey Team)

9.1.7 Component 5: Strengthening Primary Health Care in NCD

In order to improve the capacity of primary health care on the NCD prevention, early detection and primary treatment, the project aims to strengthen the training capacity through establishment of model skills lab for NCDs in the existing regional training institutes, namely the Institute of Public Health, Poonamallee in Chennai and Health and Family Welfare Training Centre in Madurai and revision/development of training materials. The situation analysis will be conducted as a first step for the detail design of the project activities.

Table 9-44: Sub-component and contents

No	Sub-components	Contents
1	Establishment of model skills lab for NCD at regional training institutes (Chennai and Madurai)	<ul style="list-style-type: none"> ➤ Situation analysis/needs assessment of primary health care capacity on NCD ➤ Development of training manuals/materials ➤ Provision of up-to-date training equipment
2	Training on NCD for primary health care personnel	<ul style="list-style-type: none"> ➤ Development of training plan ➤ Creation of master trainers ➤ Training for medical officers, nurses, ANMs, ULBs

(Source: Survey Team)

Training equipment necessary for diagnosis, treatment and nursing on NCD, ICU, MCH and Emergency as well as audio visual equipment will be provided for the skills labs. The summary of equipment plan is shown as follows.

Table 9-45: Summary of Simulators

No.	Departments/Rooms	Summary of equipment
1	Lecture Room	➤ Electronic white board, electric screen, ceiling projectors, and computers
2	Skills Training Room (1) NCD (2) ICU (3) MCH (4) Emergency Room	<ul style="list-style-type: none"> ➤ Physical assessment model with ECG, blood pressure measurement trainer, height and internal fat scale with weighing machine ➤ Dressing simulators, injection training arm, and nursing simulators ➤ Delivery simulators, suction simulator, and radiant warmers ➤ Endotracheal intubation trainer for adults and infants, CPR simulators, and BLS simulators

(Source: Survey Team)

9.2 Human Resource Requirements

The proposed human resource requirements for the project are explained below. Additional staff posts will be created as per the existing norms of manpower deployment policy of the GoTN, in consultation with the Finance department, the GoTN.

9.2.1 Component 1: Upgrading Tertiary Hospitals

(1) Medical Staff

The medical staffs need to be increased to utilize newly established facilities such as hybrid OT and cardiothoracic surgery department in addition to the existing staff.

Table 9-46: Required staff for Hybrid OT and cardiothoracic surgery

	MMCH	KMCH	CMCH
Radiologist (Hybrid OT)	2	2	2
Cardiothoracic surgeon	-	1	-
Other necessary staff for cardiothoracic surgery	-	As required	-

(Source: Survey Team)

Intensive care units such as POCU, PACU will also need to increase medical staff to respond to the increased number of beds and improved quality of care. Table 9-47 shows the increase in medical staff required to operate ICUs in the proposed buildings properly. The number of staff members has been calculated based on the *ICU Design Standard* in Japan (one doctor/unit, one staff nurse/two ICU beds, one staff nurse/four HCU beds).

Table 9-47: Increase in ICU Medical Staff

Site	Unit Name	Existing Building			Proposed Building		
		No. of beds	Doctors	Staff Nurses	No. of beds	Doctors	Staff Nurses
MMCH	POCU	49	2 (1shif)	3+2+2(3shifts)	20	1	5
	SICU	6	1+1+1(3shifts)	1+1+1(3shifts)	10	1	5
	PACU	11	3+2+2(3shifts)	5+1+1(3shifts)	20	1	10
	Cardio ICU	12	2+2+2(3shifts)	6+2+2(3shifts)	10	1	5
	Total	78	18	27	60	12 (4x3shifts)	65 (25x3shifts)
KMCH	POCU	30	2+2+2(3shifts)	2+2+2(3shifts)	10	1	3
	SICU	6	1+1+1(3shifts)	1+1+1(3shifts)	10	1	5
	PACU	3	1+1+1(3shifts)	1+1+1(3shifts)	20	1	10
	ICCU	6	1+1+1(3shifts)	2+1+1(3shifts)	20	1	10
	IMCU	7	1+1+1(3shifts)	2+1+1(3shifts)	60	12 (4x3shifts)	84 (25x3shifts)
Total	52	18	20	10	1	3	
CMCH	POCU	80	4+3+3(3shifts)	4+4+4(3shifts)	10	1	3
	SICU	10	3+3+3(3shifts)	3+3+3(3shifts)	10	1	5
	PACU	8	4 (1shif)	4 (1shif)	20	1	10
	CCU	6	3+2+2(3shifts)	3+2+2(3shifts)	40	9 (3x3shifts)	54 (18x3shifts)
	Total	104	30	32			

(Source: Survey Team)

(2) Maintenance Staff

The proposed buildings are equipped with advanced building technologies such as HEPA filters and air flow control in OT rooms. It is necessary to employ new technical staff familiar with these technologies, and to increase other staff to respond to the increased maintenance work. Table 9-48 shows the necessary number of maintenance staff for each type of technology.

Table 9-48: Necessary Number of Maintenance Staff

Category	Designation	No. of Staff
Air-conditioning	➤ Assistant engineer	1
	➤ Maintenance staff	2
Plumbing	➤ Maintenance staff	2
Electrical	➤ Maintenance staff	2
Total		7

(Source: Survey Team)

9.2.2 Component-2: Strengthening Referral Hospitals

Medical personnel should be increased where necessary in departments that have been newly equipped through this project.

(1) Seven Medical College Hospitals

The manpower disposition/increase plan for the seven Medical College Hospitals is shown in Table 9-49. The plan requires an increase in medical staff to strengthen imaging departments, OTs, haemodialysis centres, and others. The numbers of required staff have been estimated by each institution in responses received by the Survey Team during its data collection survey.

Table 9-49: Personnel Plan for 7 Medical College Hospitals

Medical College Hospitals			Vellore		Nagercoil (Asaripallam)		Tirunelveli		Salem		Thoothukudi		Tiruchirappalli		Thanjavur	
No.	Departments	Medical personnel	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
1	Haemodialysis centre	Doctors	-	0	0	0	2	2	3	-	1	-	4	1	-	-
		HD Technician	-	0	0	0	0	6	6	-	0	2	12	2	-	-
		Nurses	-	0	5	5	4	6	-	-	0	-	0	0	-	-
2	Imaging dept.	Doctors (Radiologists)	-	1	6	5	7	5	12	-	4	1	16	14	1	-
		X-ray technicians	-	-	6	5	28	46	23	-	13	1	14	11	7	1
		Doctors (Endoscopy-GI)	-	-	2	1	2	2	4	-	2	1	4	2	-	-
		Technicians	-	2	0	0	0	2	0	-	0	1	6	0	0	1
		Nurses	-	-	1	-	2	6	1	-	1	-	0	0	-	-
		Doctors (Bronchoscopy)	0	1	2	-	2	2	2	-	2	-	4	1	-	-
		Technicians	0	1	0	-	0	2	1	-	0	-	6	0	-	-
		Doctors (Endoscopy-ENT)	0	1	0	-	6	2	5	-	3	1	4	0	-	-
		Technicians	0	1	0	-	0	2	2	-	0	1	6	0	-	-
3	Operation Theatre	Doctors	-	2	31	-	56	16	3	-	31	-	75	46	3	-
		Operation nurses	-	-	21	-	32	18	-	-	14	-	60	18	8	-
		Operation assistants	-	-	1	-	12	10	-	-	2	-	40	12	-	-
		Doctor (Endoscopy)	-	0	4	-	2	4	3	-	0	-	8	3	3	-
		Operation nurses	-	-	0	-	0	6	2	-	0	-	6	4	-	-
		Operation assistants	-	-	0	-	0	4	1	-	0	-	20	6	-	-
		Nurses	-	-	0	-	0	4	-	-	0	-	0	0	-	-

Legend: (a) Present Nos. of personnel, (b) Required Nos. of personnel
(Source: Survey Team)

(2) Seven DHQHs

For Component 2, the personnel plan of the seven DHQHs is shown as the following table. For radiology departments, increases in the numbers of radiologists and technicians are required to run new equipment and interpret the images. For endoscopy equipment, some health facilities have several gastro fiberscopes and other health facilities have no endoscopes. The health facilities that will procure endoscopes are recommended to also train/hire doctors through HFWD who can operate the equipment properly. For OT equipment, C-arm X-ray units are planned to cope with complicated fractures. Since most of the health facilities have orthopaedic doctors, there should be no difficulty manipulating and operating the units properly. Other new equipment will replace obsolete items, but the present staff numbers can operate these without necessitating additional personnel.

Table 9-50: Personnel Plan for 7 DHQHs

DHQHs			Cuddalore		Dindigul		Erode		Krishnagiri		Periyakulam		Pudukottai		Truppur	
No.	Department	Medical personnel	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
1	Haemodialysis centre	Medical Officer	1	0	1	0	1	0	1	0	0	0	1	0	1	0
		Staff Nurse	2	1	2	1	2	1	2	1	0	1	2	1	2	1
		Technician	1	1	1	1	1	1	1	1	0	1	1	1	1	1
2	Imaging dept.	X-ray technician	1	2	2	3	2	2	2	2	2	2	3	2	2	2
		X-ray assistants	0	2	1	3	1	1	0	1	0	1	0	1	1	1
		Medical technicians	1	2	0	1	2	1	1	1	0	1	1	1	1	1
		Radiologist	2	2	1	2	2	2	1	2	0	2	1	2	1	2
		Doctor (Endoscopy)	0	1	1	1	0	1	0	0	0	0	0	1	1	1
		Technician	0	2	1	2	0	2	0	0	0	0	0	2	2	2
3	Operation Theatre	Surgeons (Doctors)	2	0	4	0	7	0	8	0	1	0	6	0	7	0
		Obstetrician/Gynaecologist	7	0	9	0	8	0	7	0	4	0	8	0	6	0
		Orthopedician	5	0	6	0	3	0	4	0	1	0	5	0	3	0
		Anaesthesiologist	2	0	6	0	6	0	3	0	2	0	8	0	3	0
		Operation nurses	6	0	3	0	3	0	3	0	3	0	6	0	3	0
		Operation assistants	1	0	0	0	0	0	2	0	3	0	0	0	0	0
		Nurses	3	0	3	0	3	0	3	0	3	0	3	0	3	0

Legend: (a) Present Nos. of personnel, (b) Required Nos. of personnel
(Source: Survey Team)

9.2.3 Component 3: Upgrading Secondary Care Hospitals

Table 9-51 shows the staffing plan at each proposed secondary care hospital. If the hospital is newly established, the following staff members should be employed to operate the proposed building.

Table 9-51: Staffing Plan of Proposed Building

Category	Designation and Staffing Numbers
Medical Doctor	Hospital Superintendent: 1, Medical Specialist: 2, Surgery Specialist: 2, Ob & Gyn Specialist: 2, Dermatology/Venereologist: 1, Paediatrician: 2, Anaesthetist: 2, ENT Surgeon: 1, Ophthalmologist: 1, Orthopedician: 1, Casualty Doctor: 3, Dental Surgeon: 1, AYUSH Physician: 1
Para-medical Staff	Staff Nurse: 25, Attendant (MPHW): 12, Matron: 2 Technician (Lab, ECG, Dialysis, etc.): 9 Assistant (Lab, OT, Statistical, etc.): 8 Radiographer: 2, Pharmacist: 3, Physiotherapist: 1
Administrative Staff	Junior Administrative Officer: 1, Assistant: 1, Accountant: 1, Computer Operator: 1, Electrician: 1, Plumber: 1 Driver: 2, Peon: 2, Security Staff: 2
Total: 94	

(Source: Survey Team)

9.3 Operation and Maintenance Costs

9.3.1 Component 1: Upgrading Tertiary Hospitals

(1) Operation and Maintenance Cost of the Proposed Facilities

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

a) Running Costs

Annual running costs for three sub-components of the Project are calculated based on the situation and charge system of existing buildings.

b) Maintenance Costs

Building maintenance costs (maintenance fees of exterior wall, roof, etc.) and mechanical system maintenance costs (purchasing spare parts of utility systems) are calculated based on the current situations.

The breakdown of estimated annual operation and maintenance cost is shown in Table 9-52. Estimated annual operation and maintenance cost for three sub-components of the Project is approximately Rs. 100 million (approximately JPY 185 million)

Table 9-52 Estimated Annual Operation and Maintenance Costs (Rs.)

Cost	Item	MMCH	KMCH	CMCH
Running Cost	Electricity charge	24,815,040	24,815,040	24,815,040
	Power generator fuel cost	1,663,200	1,663,200	1,663,200
	Telecom charge	672,000	672,000	672,000
	Water charge	1,869,739	2,237,054	1,532,664
	Medical gas charge	1,800,000	1,800,000	1,800,000
Maintenance Cost	Building maintenance	1,181,979	1,414,182	968,893
	Utility maintenance	1,418,375	1,697,018	1,162,672
	Elevator maintenance contract fees	15,000	22,500	15,000
Total		33,435,333	34,320,994	32,629,469

(Source: Survey Team)

(2) Operation and Maintenance Cost of Medical Equipment

Since the equipment cost includes equipment warranty cost for initial three years, maintenance cost should be secured from the fourth year and operation cost should be prepared from the first year and be adjusted at the next fiscal year based upon the achievement of the previous year. The BMEs and accounting officers of each health facility should be in a position to watch out the consumption of spare parts procured and consumable items purchased as evidence in budget claiming for the next year.

Annual operation and maintenance service cost is estimated with 8% for maintenance + 3% for operation of the total cost of equipment costing more than Rs.1,000,000. The operation and maintenance service cost for the Component 2 and 3 were also estimated in the same way.

Table 9-53: Annual operation and maintenance cost for three Medical College Hospitals (JPY)

Medical Institutions	MMCH	CMCH	KMCH
A	2,922,997,000	2,348,722,000	3,161,816,000
B	321,000,000	258,000,000	347,000,000

Note: A= Total cost of the equipment costing more than Rs.1,000,000

B= Annual operation and maintenance service cost

(Source: Survey Team)

9.3.2 Component 2: Strengthening Referral Hospitals

The annual operation and maintenance cost for seven Medical College Hospitals and DHQs is summarised below.

Table 9-54: Annual operation and maintenance service cost for seven Medical College Hospitals (JPY)

Medical Institutions	MCH Vellore	MCH Tirunelveli	MCH Nagercoil (Asarpallam)	MCH Salem	MCH Thoothukudi	MCH Tiruchirapalli	MCH Thanjavur
A	287,407,000	419,339,000	148,440,000	88,560,000	196,712,000	197,003,000	51,180,000
B	31,614,000	46,127,000	16,328,000	9,741,000	21,638,000	21,670,000	5,629,000

Note: A= Total cost of the equipment costing more than Rs. 1,000,000

B= Annual operation and maintenance service cost

(Source: Survey Team)

Table 9-55: Annual operation and maintenance service cost for seven DHQs (JPY)

Medical Institutions	DHQH Erode	DHQH Pudukkottai	DHQH Tirupur	DHQH Periyakulam	DHQH Krishnagiri	DHQH Cuddalore	DHQH Dindigul
A	201,239,000	204,896,000	209,988,000	190,585,000	121,064,000	197,406,000	208,346,000
B	22,136,000	22,538,000	23,098,000	20,964,000	13,317,000	21,714,000	22,918,000

Note: A= Total cost of the equipment costing more than Rs.1,000,000

B= Annual operation and maintenance service cost

(Source: Survey Team)

9.3.3 Component 3: Upgrading Secondary Care Hospitals

(1) Operation and Maintenance Cost of the Proposed Facilities

The breakdown of estimated annual operation and maintenance cost is shown in Table 9-56. Estimated annual operation and maintenance cost for each sub-components of the Project is approximately Rs.6.5 million (approximately JPY 12 million).

Table 9-56 Estimated Annual Operation and Maintenance Costs (Rs.)

Cost	Item	Each Health Facility
Running Cost	Electricity charge	4,155,840
	Power generator fuel cost	237,600
	Telecom charge	264,000
	Water charge	464,890
	Medical gas charge	900,000
Maintenance Cost	Building maintenance	200,161
	Utility maintenance	240,193
	Elevator maintenance contract fees	15,000
Total		6,477,684

(Source: Survey Team)

(2) Operation and Maintenance Cost of Medical Equipment

Table 9-57 Annual operation and maintenance service cost for four health facilities (JPY)

Medical Institutions	Salem	Tiruppur	Tirunelveli	Chennai
A	166,560,000	166,560,000	166,560,000	166,560,000
B	18,321,000	18,321,000	18,321,000	18,321,000

Note: A= Total cost of the equipment costing more than Rs.1,000,000

B= Annual operation and maintenance service cost

(Source: Survey Team)

Chapter 10 Procurement Plan and Consulting Services

10.1 Procurement Procedures

The GoTN will discuss with JICA and arrive at the number of packages, type of packages and specific procurement steps for services and goods.

10.1.1 Facilities Construction

Procurement for facility construction will be conducted through International Competitive Bidding (ICB). The proposed construction work is relatively large scale, and the functional and technical requirements for such aspects as advanced health facilities are very high. This requires that the contractor's workmanship and construction management expertise also be high. It is therefore desirable to implement Pre-Qualification (P/Q) reviews of the candidate contractor's technical capabilities and financial viability. The contract for construction work will be either lump-sum or item-rate.

10.1.2 Medical Equipment

For procurement of medical equipment of foreign countries' origin, it will be necessary to apply ICB procedures for this project, since an ICB is the most efficient way to satisfy the following requirements. The schedule for equipment procurement will include detailed design, P/Q, tendering and evaluation, procurement, and supervision of equipment installation work according to ICB procurement procedures. The medical equipment plan includes high-precision equipment, which needs periodic maintenance and regular supply of spare parts and consumable items. In order to maintain such equipment, it is desirable that the equipment manufacturers have established local agents in India or in neighbouring countries, which can perform maintenance services in a timely manner. It is also recommended that the equipment procurement range be limited to Development Assistance Committee (DAC) member countries in order to guarantee the accuracy and quality of such precision equipment. For procurement of medical equipment manufactured locally, such items may be considered to apply Local Competitive Bidding (LCB)¹³⁰ procedures. For packaging of the equipment plan, grouping of equipment was considered in the light of more efficient maintenance management and cost saving.

10.1.3 Consulting Services

A consulting firm will be recruited to assist with project implementation in technical areas. International and national consultants will be selected and engaged by the GoTN through the firm, using quality and cost-based selection (80:20 ratio), and in accordance with *JICA's Guidelines for the Employment of Consultants* under Japanese Official Development Assistance (ODA) Loans.

¹³⁰ LCB implies the national level competitive bidding.

10.2 Procurement Packages

The Survey Team proposes the following procurement packages for the ODA Loan portion, after considering the content and components of the project, and their relationship with reasonable procurement methods.

Table 10-1: Outline of Procurement Packages

Component Name	Package Name	Package Amount (JPY million)	Procurement Method
1-1 Upgrading Tertiary Hospitals (Facilities)	1-1-a MMCH, Madurai	2,175	ICB with P/Q
	1-1-b KMCH, Chennai	2,602	ICB with P/Q
	1-1-c CMCH, Coimbatore	1,783	ICB with P/Q
1-2 Upgrading Tertiary Hospitals (Medical Equipment)	Item-wise Packages	9,110	ICB/LCB
2: Strengthening Referral Hospitals (Medical Equipment)	Item-wise Packages	2,903	ICB/LCB
3-1 Strengthening Secondary Care Hospitals (Facilities)	3-1-a Avadi Taluk Hospital, Chennai	368	ICB with P/Q
	3-1-b Velampalayam Hospital, Tiruppur	368	ICB with P/Q
	3-1-c Maniyanoor Hospital, Salem	368	ICB with P/Q
	3-1-d Kandiaperi Hospital, Tirunelveli	368	ICB with P/Q
3-2 Strengthening Secondary Care Hospitals (Medical Equipment)	Item-wise Packages	972	ICB/LCB
Consulting Services	Consulting Services for Facilities (CS-F) and Consulting Services for Equipment (CS-EQ)	137	QCBS (80:20)

(Source: Survey Team)

Table 10-2 shows the procurement schedule for each package.

Table 10-2: Procurement Schedule of Each Package

Package	Component Cost (JPY million)	Procurement	Implementation	Procurement Method
Package 1-1 Upgrading Tertiary Hospitals, (Facilities)	6,560	September, 2017 to September, 2018	October, 2018 to September, 2020	ICB with P/Q
Package 1-2 Upgrading Tertiary Hospitals (Medical Equipment)	9,110	October, 2018 to June, 2019	July, 2019 to September, 2020	ICB/LCB
Package 2: Strengthening Referral Hospitals (Medical Equipment)	2,903	April, 2017 to September, 2017	October, 2017 to July, 2018	ICB/LCB
Package 3-1: Strengthening Secondary Care Hospitals (Facilities)	1,473	December, 2017 to September, 2018	October, 2018 to December, 2019	ICB with P/Q
Package 3-2: Strengthening Secondary Care Hospitals (Medical Equipment)	972	April, 2018 to December, 2018	January, 2019 to December, 2019	ICB/LCB
Package 4-1: Consulting Services (CS-F and CS-EQ))	137	January, 2016 to October, 2016	November, 2016 to September, 2021	QCBS (80:20)

(Source: Survey Team)

10.3 Work to be borne by the Tamil Nadu Side

10.3.1 Component 1 and Component 3

Table 10-3 shows the work demarcations between the Japanese ODA Loan portion and the Tamil Nadu side for the Component 1 and 3. All the sites included in the Component 1 have functioning existing buildings. It will be necessary to relocate certain on-going services and to demolish the existing buildings that currently occupy the construction sites of the proposed buildings. This work should be completed by the Tamil Nadu side before the start of construction work.

Table 10-3: Work Demarcations (Component 1 and Component 3)

Item		ODA Loan portion		Tamil Nadu Side
		Facilities	Equipment	
Land Preparation	Securing the construction sites			○
	Demolishing/relocating the existing buildings			○
	Relocating the existing utility piping, pits and cables			○
	Installing fences and gates within the sites			○
Utility System	Providing necessary utilities (electric power, telephone/ internet connection, supply water, drainage, etc.) to operate the facilities including expansion/modification/removal of existing system			○
Building Permits	Obtaining all necessary building permits			○
	Obtaining Environmental Impact Assessment (EIAs) and clearing other relevant processes			○
Relocation of Services	Moving existing equipment and services to the proposed buildings			○
Renovation of Existing Buildings	Provision of electric power, ventilation fans and other necessary infrastructure for medical equipment to be provided by the Project			○
	Strengthening load bearing capacity of floor slabs			○

Item		ODA Loan portion		Tamil Nadu Side
		Facilities	Equipment	
Medical Utility Systems	Medical equipment to be provided in the project		○	
	Hospital beds		○	
	Cabinets, laboratory tables and other medical fixtures		○	
	Safety cabinets		○	
	Scrubber units on rooftop	○		
	Medical gas supply system	○		
	Substation system	○		
	Emergency generator system	○		
	UPS & AVR (medical equipment)		○	
	UPS & AVR (building facility)	○		
	Disposal of obsolete existing medical equipment			○
Furniture, etc.	General furniture (tables and desks)			○
	Blinds and curtains			○
	Lecture tables, chairs	○		
	Audio-visual system		○	
ICT	PACS		○	
	IT equipment & LAN cables inside the proposed buildings		○	
	PABX, telephone handsets, wiring inside the proposed buildings			○
	Cable racks inside the proposed buildings	○		
Others	CCTV system equipment and wiring			○
	Access control system equipment and wiring			○
	Mechanical security system equipment, wiring and wiring route			○
	TV reception system			○

(Source: Survey Team)

10.3.2 Component 2

Table 10-4 shows the work demarcations between the Japanese ODA Loan portion and the Tamil Nadu side for the Component 2.

Table 10-4: Work Demarcations (Component 2)

Item		ODA Loan portion		Tamil Nadu Side
		Facilities	Equipment	
Utility system	Providing necessary utilities (electric power, internet connection, supply water, drainage, etc.) to operate the equipment to be procured newly.			○
Renovation of existing buildings and construction of new facility	Site survey to make an infrastructure inspection on equipment installation		○	
	Securing enough space to accommodate CT, MRI and other equipment in the existing building and/or land to set up new building.			○
	Planning renovation work to secure the enough space in the existing building, and construction work in case no space for new CT and/or MRI is available in the existing building.			○
	Renovation work and/or construction work necessary for equipment installation		○	
Building permits	Obtaining all necessary permits for building renovation and/or construction.			○

(Source: Survey Team)

10.4 Content of Consulting Services

10.4.1 Scope of Consulting Services

The consulting services will be provided to achieve efficient and proper preparation and implementation of the project through the following works:

- (1) Design and construction supervision for health facility building and related civil/architectural works (CS-F)
- (2) Medical equipment procurement and installation supervision (CS-EQ)

The consulting services will be carried out by one team. The TOR of the consulting services is attached in Annex 12.

10.4.2 Necessary Experts and Assignments

To provide the required consulting services described above, 27 international consultants with a total of 217.5 person months (M/M) and 32 national consultants with a total of 618.0 person months (M/M), including support staff, are required as shown in Tables 10-5 and 10-6.

Table 10-5: Estimated Person-Months (M/M) of International Consultants

Category	Designation & No of Staffing
CS-F (Facilities) Total: 151.5	Facility Team Leader: 15.5, Senior Architect: 10.5, Architect-1: 3.5, Architect-2: 10.5, Architect-3: 7.0, Hospital Design Specialist: 6.0, Interior Designer: 4.5, Landscape Architect: 2.5, Senior Structural Engineer: 10.5, Structural Engineer-1: 3.5, Structural Engineer-2: 3.5 Senior Electrical Engineer: 10.5, Electrical Engineer-1: 3.5, Electrical Engineer-2: 3.5 Senior Mechanical Engineer: 10.5, Mechanical Engineer-1: 3.5, Mechanical Engineer-2: 3.5 Civil Engineer: 9.5, Signature Specialist: 9.5, Cost Expert-1: 9.0, Cost Expert-2: 4.5 Tender Document Specialist: 6.5
CS-EQ (Medical Equipment) Total: 66.0	Equipment Planning Expert: 8.0 Equipment Specialist-1: 18.0, Equipment Specialist-2: 15.0, Equipment Specialist-3: 15.0 Facility Engineer-1: 10.0,
International Total: 217.5	

(Source: Survey Team)

Table 10-6: Estimated Person-Months (M/M) of National Consultants

Category	Designation & No of Staffing
CS-F (Facilities) Total: 198.0	Deputy Facility Team Leader: 27.0, Senior Architect: 19.5, Architect-1: 9.5, Architect-2: 9.5, Architect-3: 9.5, Senior Structural Engineer: 19.5, Structural Engineer-1: 4.5, Senior Electrical Engineer: 19.5, Electrical Engineer-1: 4.5, Civil Engineer: 7.5, Signature Specialist: 7.5, Quantity Surveyor-1: 19.0 Construction Supervise Specialist-1: 24.0 Hospital Training Coordinator: 17.0
CS-ES (Medical Equipment) Total: 153.0	Equipment Planning Expert: 31.0 Equipment Specialist-1: 18.0, Equipment Specialist-2: 18.0, Equipment Specialist-3: 15.0 Facility Engineer (Architect)-1: 11.0, Facility Engineer (Electrical): 11.0, Facility Engineer (Mechanical): 11.0, disbursement Support (2 nos): 38.0
Operators, etc. Total: 267.0	Computer Aided Design (CAD) Operator-1: 33.0, CAD Operator-2: 9.0, CAD Operator-3: 6.0, CAD Operator-4: 6.0 Inspector-1 (Facility): 24.0, Inspector-2 (Facility): 24.0, Inspector-3 (Facility): 24.0 Management Assistant: 47.0, Office Manager: 47.0 Office Support Staff: 47.0
National Total: 618.0	

(Source: Survey Team)

Chapter 11 Project Cost and Financial Plan

11.1 Total Project Cost Estimate

11.1.1 Prerequisites for Project Cost Estimate

The total project cost was estimated based on the following prerequisites defined by JICA's Loan Project General Standards in 2015.

- Benchmark of estimation: November, 2015
- Applicable currencies: Foreign currencies: Japanese yen and US dollars
Local currency: Indian rupees (Rs)
- Currency exchange rates: USD 1 = JPY 120.1, USD 1 = Rs 65.1
Rs 1 = JPY 1.84
- Price escalation: Foreign currency portion: 1.8% per year
Local currency portion: 1.3% per year
- Physical contingency: Construction: 5.0%, Consulting services: 5.0%
- Taxes: VAT: 16.0%, Import tax: 4.0%
- Interest during project: Construction/procurement: 0.3% per year (health sector project)
Consulting services: 0.01% per year
- Front-end fee: 0.2% in first year

11.1.2 Project Cost Estimate

Table 11-1: Overall Project Cost Estimate

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million INR)			Total (million JPY)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
1-1 Upgrading Tertiary Hospital Facilities	0	0	0	3,565	3,565	0	6,560	6,560	0
1-2 Upgrading Tertiary Hospital Equipment	7,744	7,744	0	743	743	0	9,110	9,110	0
2 Strengthening Referral Hospitals	2,468	2,468	0	237	237	0	2,903	2,903	0
3-1 Strengthening Secondary Hospitals Facilities	0	0	0	801	801	0	1,473	1,473	0
3-2 Strengthening Secondary Hospitals Equipment	777	777	0	106	106	0	972	972	0
4 Strengthening Hospital Management	0	0	0	200	200	0	368	368	0
5 Strengthening Primary Health Care in NCD	0	0	0	109	109	0	201	201	0
Project Management & Capacity Development	0	0	0	75	75	0	137	137	0
Price Escalation	853	853	0	313	313	0	1,429	1,429	0
Physical Contingency	592	592	0	307	307	0	1,158	1,158	0
Consulting Services	818	818	0	222	222	0	1,226	1,226	0
Existing Building Demolition & Land Preparation	0	0	0	202	0	202	372	0	372
Administration Cost	0	0	0	704	0	704	1,295	0	1,295
VAT	0	0	0	1,101	0	1,101	2,025	0	2,025
Import Tax	0	0	0	270	0	270	497	0	497
Interest during construction	283	0	283	0	0	0	283	0	283
Front End Fee	51	0	51	0	0	0	51	0	51
Total	13,585	13,251	334	8,954	6,677	2,277	30,060	25,537	4,524

(Source: Survey Team)

11.2 Project Cost Breakdown

11.2.1 Component 1-1: Upgrading Tertiary Hospitals (Facilities)

The construction cost of each sub-component is calculated by multiplying the building's total floor area (plinth area), which is the sum of each floor area, by Plinth Area Rates, as defined by CPWD and TNPWD.

It is recommended to use CPWD's additional cost estimate for Component 1-1 to ensure the quality and workmanship required for the proposed buildings of each component.

Table 11-2: Cost Estimate for Upgrading Tertiary Hospitals (Facilities)

Sub-component	Outline/Function	Total Plinth Area (m ²)	Plinth Area Rate (Rs./ m ²)	Estimated Cost	
				Rs.	JPY
MMCH	Basement + 5 floors • Advanced OT centre • Imaging department • Auditorium	18,549	63,722	1,181,979,000	2,174,841,360
KMCH	Basement + 6 floors • Advanced OT centre • Imaging department • IP Wards	22,193		1,414,182,000	2,602,094,880
CMCH	5 floors • Advanced OT centre • Imaging department • Auditorium	15,205		968,893,000	1,782,763,120
Total		55,947		3,565,054,000	6,559,699,360

(Source: Survey Team)

11.2.2 Component 1-2: Upgrading Tertiary Hospitals (Medical Equipment)

Component 1-2 is the medical equipment for the three proposed buildings. The costs of equipment are calculated based upon cost proposals by the target institutions and discussion with TNMSC. The costs were examined and reviewed by the Survey Team by means of comparison with cost estimates of local equipment agents. For the most advanced items of equipment, the estimates refer to cost data provided by manufacturers of medical equipment. Table 11-3 shows the cost breakdown of Component 1-2.

Table 11-3: Cost Breakdown of Component 1-2 (Medical Equipment)

Sub-Component	Equipment Cost (JPY)
MMCH	3,176,532,284
KMCH	3,475,967,450
CMCH	2,457,500,266
Total cost (JPY)	9,110,000,000

(Source: Survey Team)

11.2.3 Component 2: Strengthening Referral Hospitals (Medical Equipment)

Component 2 consists of the medical equipment for the target seven Medical College Hospitals and seven DHQs, which is planned to upgrade and enhance the functions of the said institutions. The costs are examined in the same manner described for the Component 1-2.

Table 11-4 shows the cost breakdown for the Component 2.

Table 11-4: Cost Breakdown of Component 2 (Medical Equipment)

Sub-Component	Equipment Cost (JPY)
1) Vellore Medical College Hospital	278,094,000
2) Tirunelveli Medical College Hospital	344,782,000
3) Nagercoil (Asaripallam) Medical College Hospital	166,610,000
4) Salem Medical College Hospital	109,756,000
5) Thoothukudi Medical College Hospital	265,521,000
6) Tiruchirapalli Medical College Hospital	192,930,000
7) Thanjavur Medical College Hospital	61,906,000
8) Erode DHQH	213,337,000
9) Pudukottai DHQH	227,393,000
10) Tiruppur DHQH	222,262,000
11) Krishnagiri DHQH	220,815,000
12) Periyakulam DHQH	151,628,000
13) Cuddalore DHQH	227,393,000
14) Dindigul DHQH	220,805,000
Total cost (JPY)	2,903,232,000

(Source: Survey Team)

11.2.4 Component 3-1: Strengthening Secondary Care Hospitals (Facilities)

The construction cost of each sub-component is calculated by multiplying the building's total floor area (plinth area), which is a sum of each floor area, by Plinth Area Rates, as defined by CPWD and TNPWD.

It is recommended to use TNPWD's additional cost estimate for Component 3-1.

Table 11-5: Cost Estimate of Component 3-1 (Facilities)

No	Sub-component	Outline/Function	Total Plinth Area (m ²)	Plinth Area Rate (Rs./m ²)	Estimated Cost	
					Rs.	JPY
1	Avadi Hospital, Chennai	3 floors OPD, emergency, CEmONC, OT rooms & IP Wards	4,612	43,400	200,161,000	368,296,240
2	Velampalayam Hospital, Tiruppur	3 floors OPD, emergency, CEmONC, OT rooms & IP Wards	4,612		200,161,000	368,296,240
3	Maniyanoor Hospital, Salem	3 floors OPD, emergency, CEmONC, OT rooms & IP Wards	4,612		200,161,000	368,296,240
4	Kandiaperi Hospital, Tirunelveli	3 floors OPD, emergency, CEmONC, OT rooms & IP Wards	4,612		200,161,000	368,296,240
Total			18,448		800,644,000	1,473,184,960

(Source: Survey Team)

11.2.5 Component 3-2: Strengthening Secondary Care Hospitals (Medical Equipment)

The Survey Team estimated the equipment cost for the four new facilities described in Component 3-1 in the same manner described for Component 1-2. Table 11-6 shows the cost breakdown for Component 3-2.

Table 11-6: Cost Breakdown of Component 3-2 (Medical Equipment)

Sub-Components	Equipment Cost (JPY)
Avadi Hospital, Chennai	242,950,000
Velampalayam Hospital, Tiruppur	242,950,000
Maniyanoor Hospital, Salem	242,950,000
Kandiaperi Hospital, Tirunelveli	242,950,000
Total cost (JPY)	971,800,000

(Source: Survey Team)

11.2.6 Component 4: Strengthening Hospital Management

The cost of strengthening hospital management is estimated by the broad budget of proposed subcomponents' activities

Table 11-7: Cost Breakdown of Component 4

No	Sub-component	Estimated Cost	
		Rs.	JPY
1	Training on hospital management	30,000,000	55,200,000
2	Training on medical equipment	100,000,000	184,000,000
3	Training on NCD and trauma care management	70,000,000	128,800,000
Total cost		200,000,000	368,000,000

(Source: Survey Team)

11.2.7 Component 5: Strengthening Primary Health Care in NCD

The cost of strengthening primary health care in NCD is estimated by the broad budget of proposed subcomponents' activities

Table 11-8: Cost Breakdown of Component 5

No	Sub-component	Estimated Cost	
		Rs.	JPY
1	Establishment of model skills lab for NCD at regional training institutes in Chennai and Madurai	50,000,000	92,000,000
2	Training on NCD for primary health care personnel	59,000,000	108,560,000
Total cost		109,000,000	200,560,000

(Source: Survey Team)

Chapter 12 Project Implementation Schedule

12.1 Prerequisites

The overall project implementation schedule was devised based on the following prerequisites:

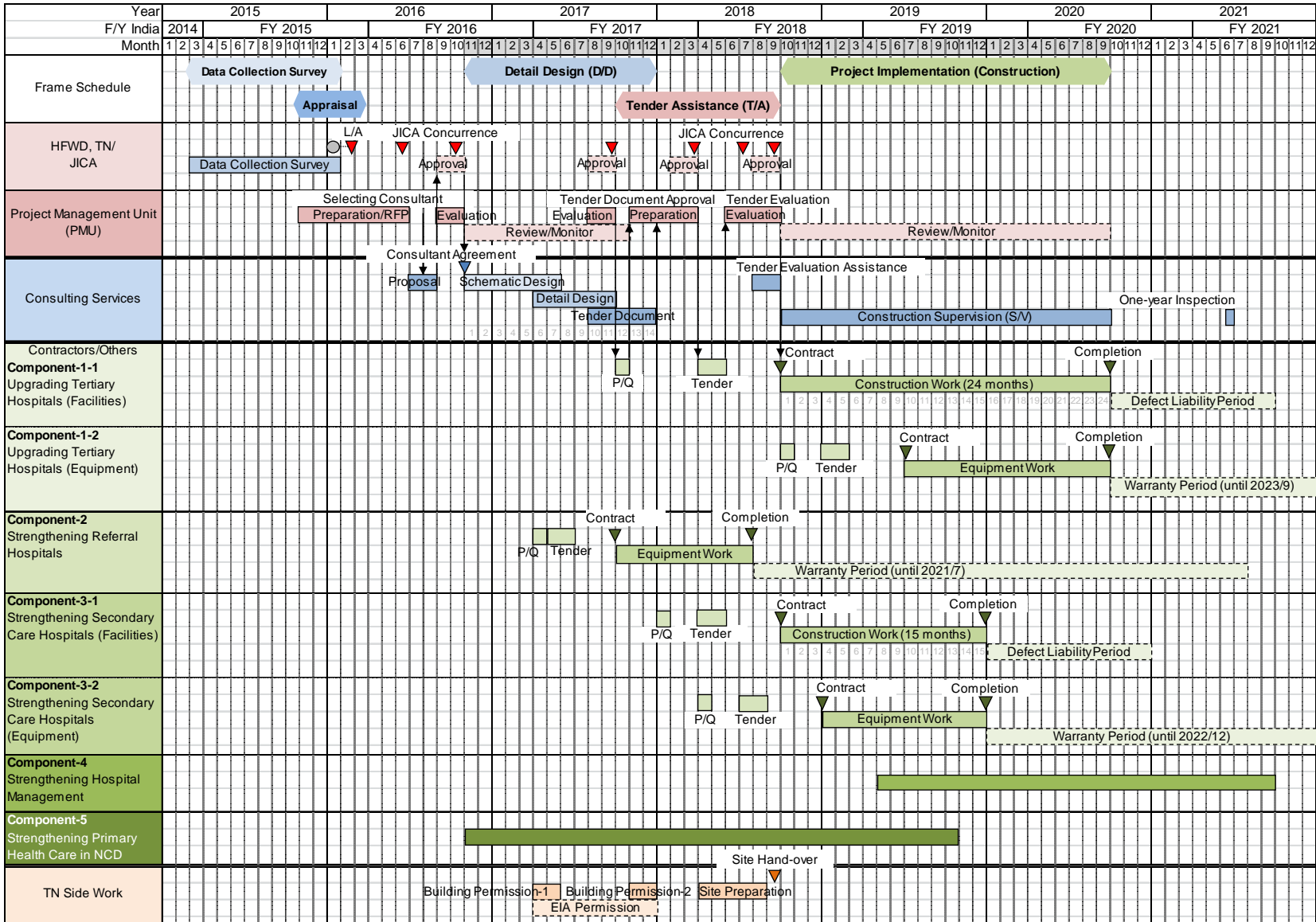
- Project Milestones:
 - Loan Pledge: January, 2016
 - Signing of L/A: February, 2016
- Selection of the Engineering Consultant (CS-F/CS-EQ)
 - Revising procurement plan, making TOR & EOI, JICA concurrence: 6.0 months
 - Releasing RFP, making proposal (by consultant): 2.0 months
 - Evaluating submitted proposals (QCBS), JICA concurrence: 2.0 months
 - Negotiations, JICA concurrence and consulting agreement: 1.0 month
- Detailed Design
 - Schematic design: 5.0 months
 - Detailed design: 6.0 months
 - Tender document: 5.0 months
- Tender Process
 - Obtaining Investment approval, revising PP & tender document: 4.0 months
 - Approving procurement plan & tender documents, JICA concurrence: 3.0 months
 - Releasing P/Q, making P/Q (by contractor) and evaluating P/Q, JICA concurrence: 3.5 months
 - Releasing tender document and making tender (by contractor): 2.0 months
 - Evaluating submitted tenders and JICA concurrence: 3.5 months
 - Negotiations, JICA concurrence and awarding contract: 3.0 months
 - Issuing L/C etc.: 1.0 month

- Construction Work and Equipment Procurement Work

In general, facility construction schedules are affected significantly by the geological and climatic conditions of the proposed site. Therefore, it is desirable to determine a realistic schedule after reviewing local contractors' expertise dealing with the aforementioned conditions. There are some existing buildings on the proposed sites, and the construction schedule should reflect the necessary period for their demolition and/or relocation.

12.2 Implementation Schedule

Figure 12-1 shows the overall project implementation schedule.



(Source: Survey Team)

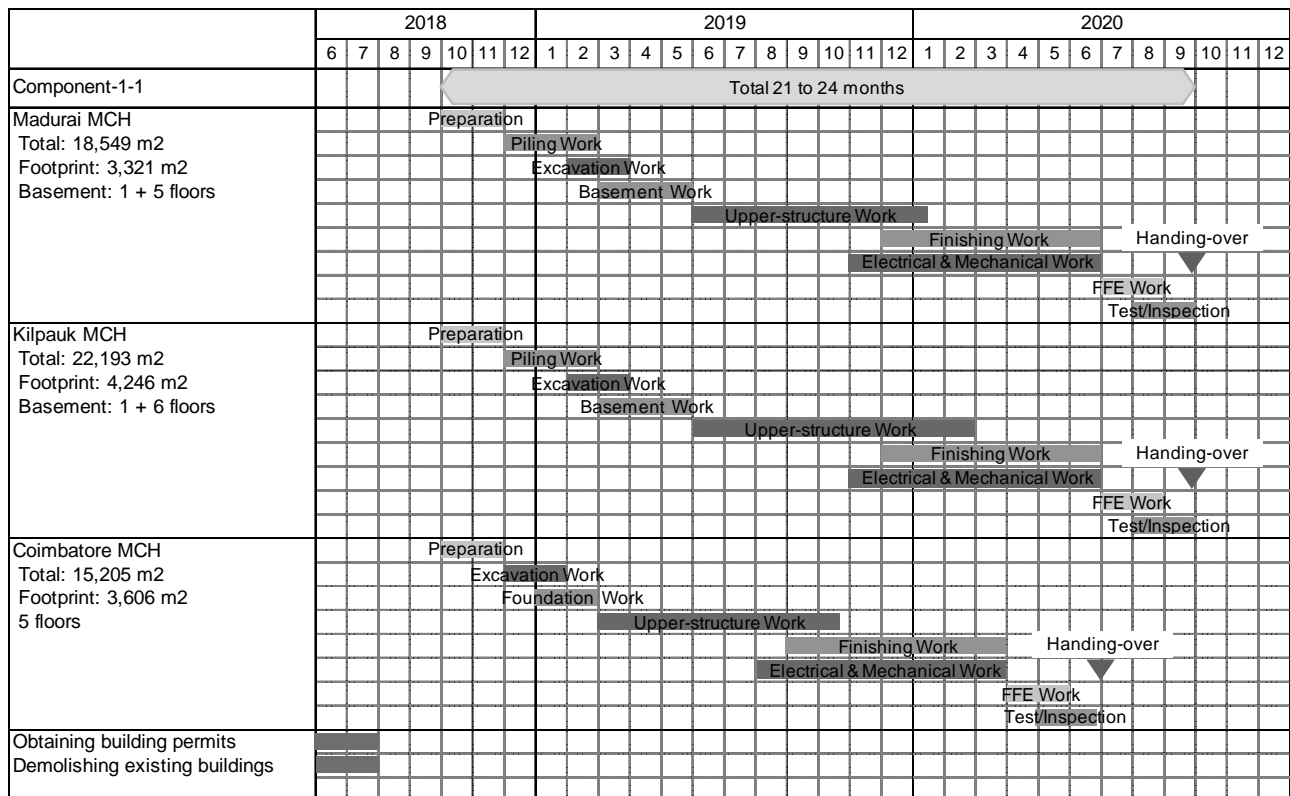
Figure 12-1: Overall Project Implementation Schedule (OPIS)

12.3 Schedule of Each Project Component

12.3.1 Component 1-1: Upgrading Tertiary Hospitals (Facilities)

The construction schedule of the proposed buildings needs careful consideration to reflect local contractors' expertise, supply of construction materials and temporary equipment, and building configurations. The Survey Team proposes the construction schedules for each sub-component shown in Figure 12-2 after taking into consideration the following specific issues:

- Soil conditions: According to preliminary soil investigation reports, soil conditions at the Kilpauk (Chennai) and Madurai sites are generally soft and brittle, and the proposed buildings at those two sites need piling work. However, the soil at the Coimbatore site is rather hard, and the proposed building at this site may not need a pile foundation. If the proposed building requires it, another three months should be added for piling work.
- The number of floors and basement: The number of under- and above-ground floors significantly affects the period required to construct the structures. The KMCH has a basement plus 6 floors, and its entire structure work may require 12 months.



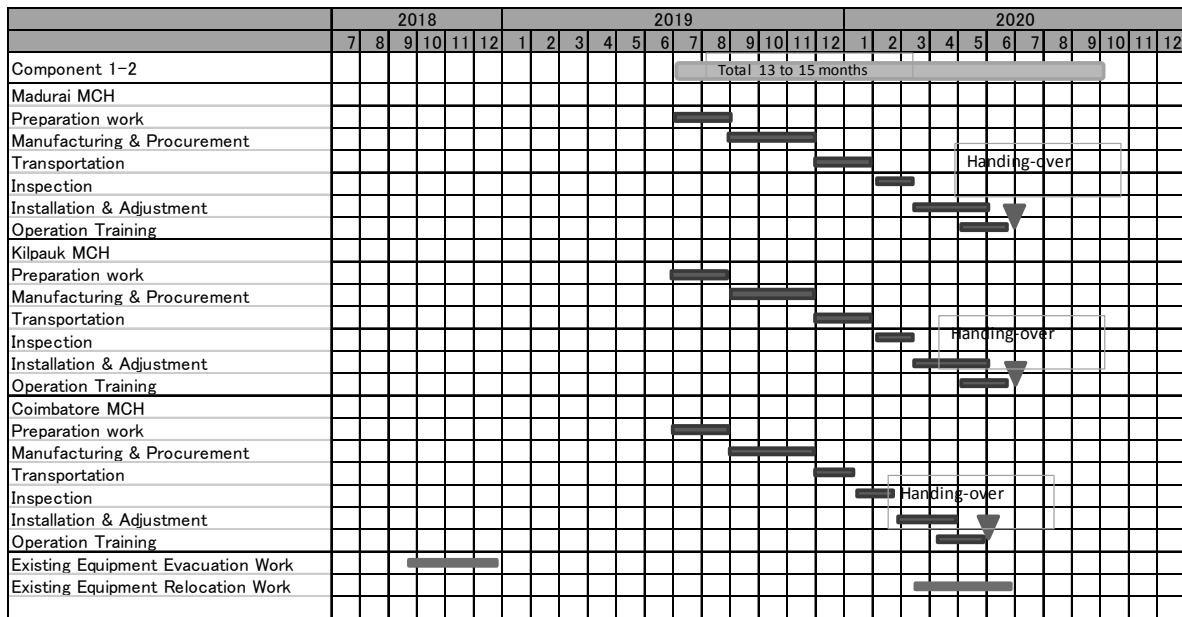
(Source: Survey Team)

Figure 12-2: Facilities Construction Schedule

12.3.2 Component 1- 2: Upgrading Tertiary Hospitals (Medical Equipment)

The equipment work schedule depends on the supply and installation capabilities of local medical equipment agents. The Survey Team proposes the equipment work schedules for each sub-component shown in Figure 12-3 after taking into consideration the following conditions:

- The evacuation of existing equipment will have been completed before the existing building is completed, and
The relocation of existing equipment will have been carried out by the Tamil Nadu side.



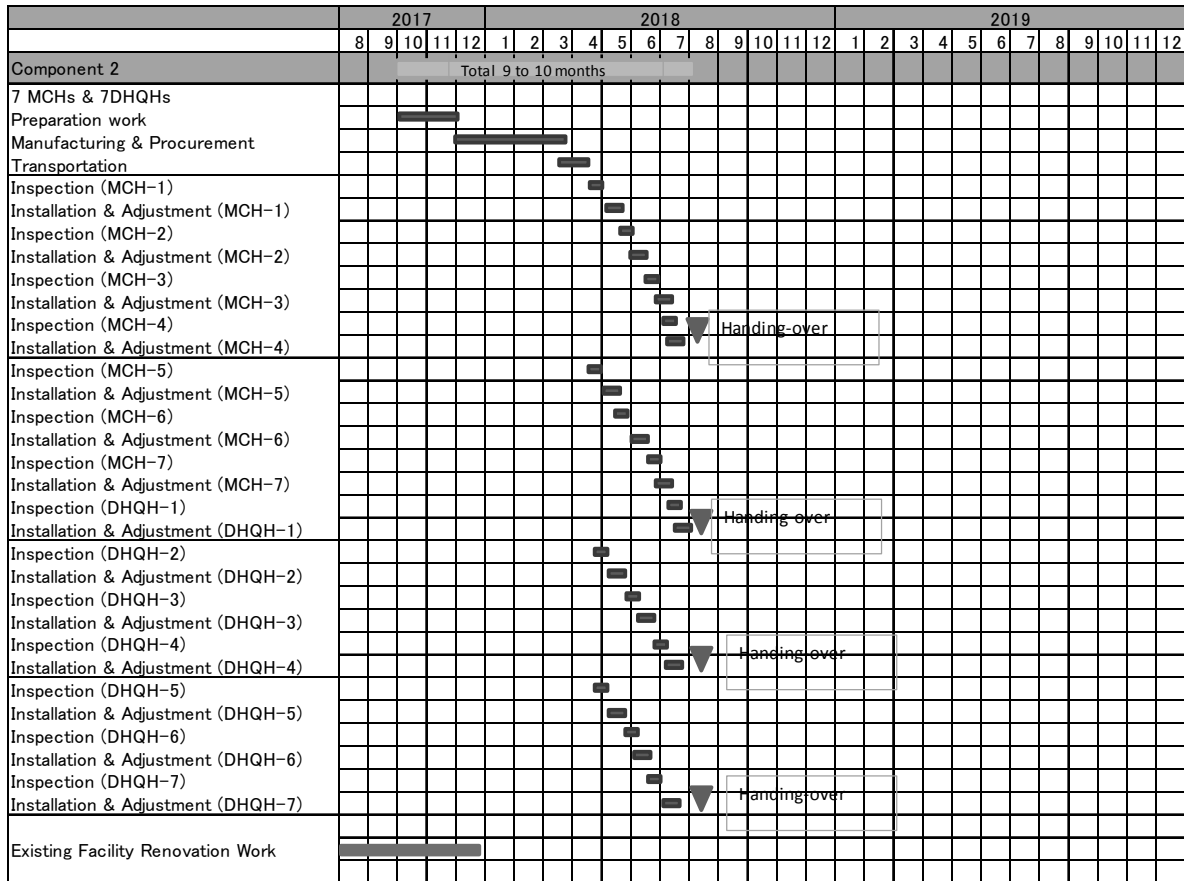
(Source: Survey Team)

Figure 12-3: Equipment Work Schedule for Component 1-2

12.3.3 Component 2: Strengthening Referral Hospitals

The Survey Team proposes the equipment work schedules for each sub-component shown in Figure 12-4 after taking into consideration the following conditions:

- The renovation work to accommodate new medical equipment will have been completed before the existing building is completed, and
- The modification work on utilities required for new medical equipment to be procured will have been completed by the Tamil Nadu side.

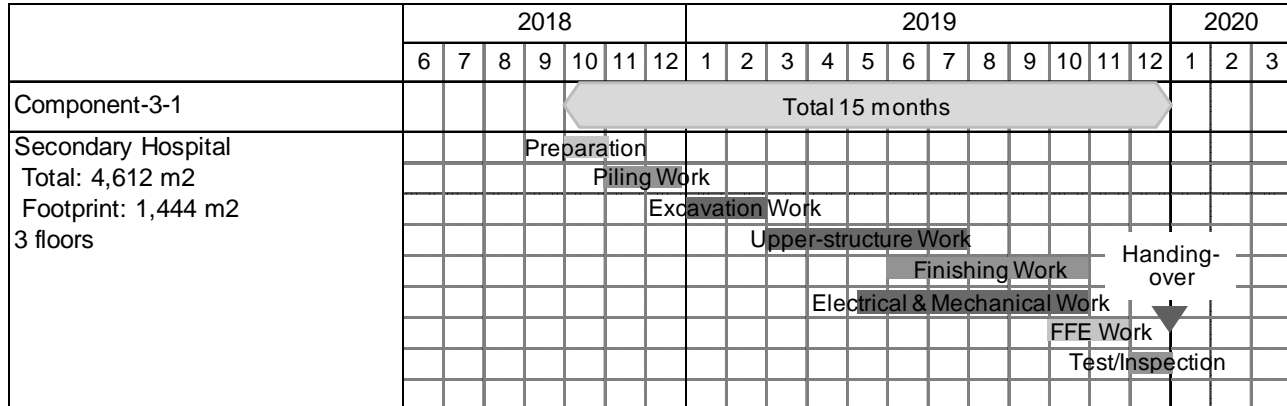


(Source: Survey Team)

Figure 12-4: Equipment Work Schedule for Component 2

12.3.4 Component 3-1: Strengthening Secondary Care Hospitals (Facilities)

Figure 12-5 shows the building construction schedule for each secondary care hospital in Component 3-1.



(Source: Survey Team)

Figure 12-5: Facilities Construction Schedule for Component 3-1

12.3.5 Component 3-2: Strengthening Secondary Care Hospitals (Medical Equipment)

The Survey Team proposes the equipment work schedules for each sub-component shown in Figure 12-6.

(Source: Survey Team)

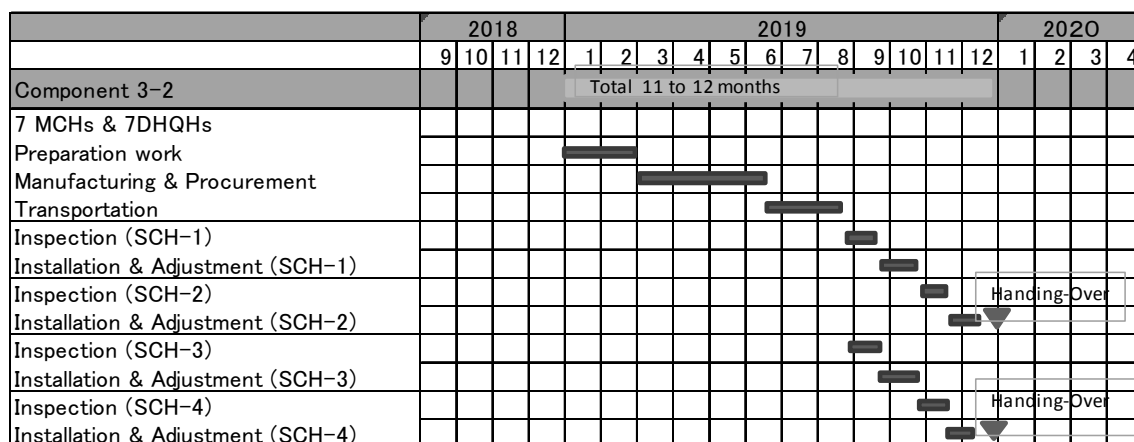
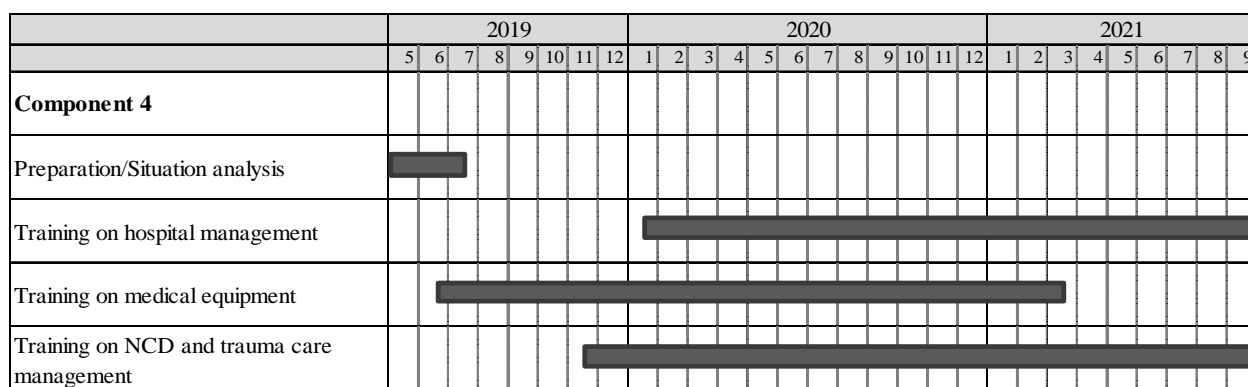


Figure 12-6: Equipment Work Schedule for Component 3-2

12.3.6 Component 4: Strengthening Hospital Management

The proposed training on different courses will be organized in due course considering the progress of facility construction and medical equipment installation in respective facilities/organizations.

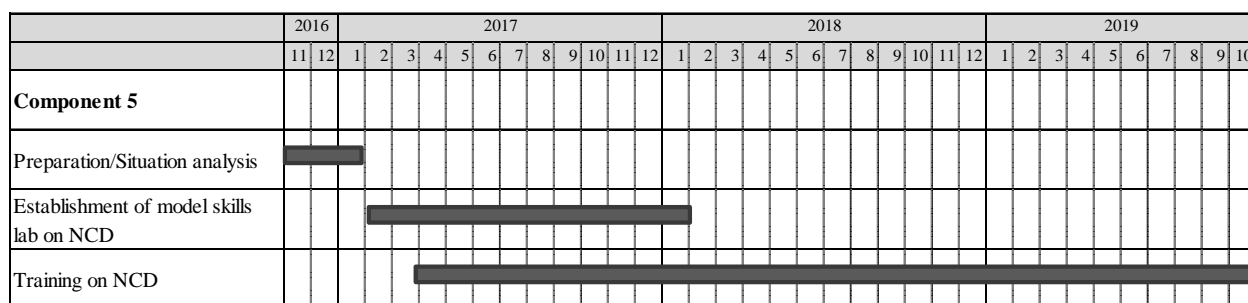


(Source: Survey Team)

Figure 12-7: Tentative training schedule

12.3.7 Component 5: Strengthening Primary Health Care in NCD

The activities for primary health care can start from the onset of the project.



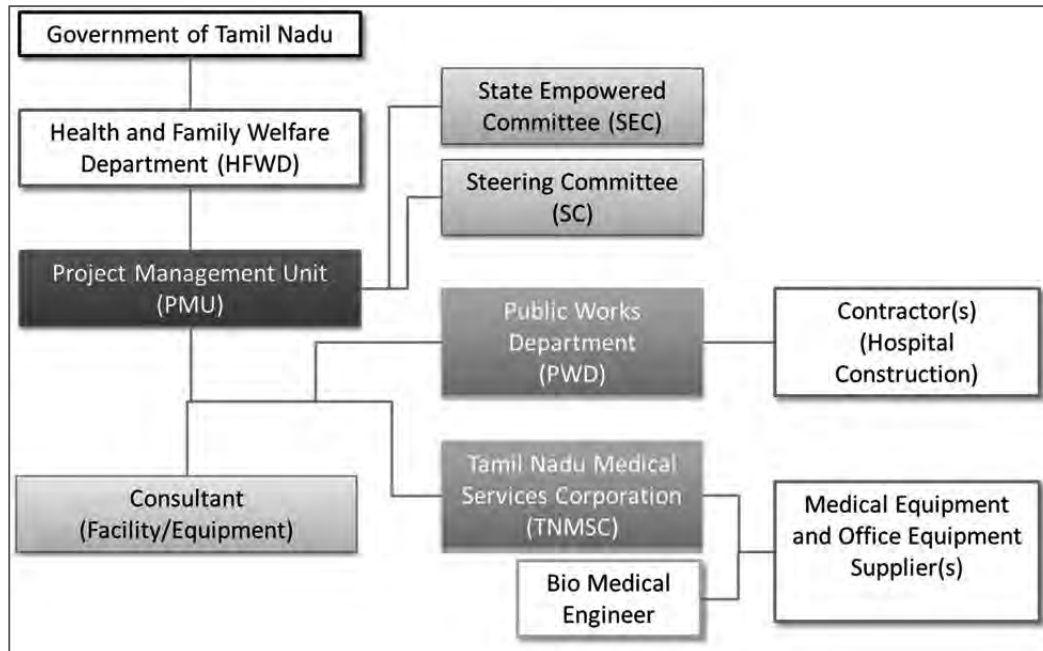
(Source: Survey Team)

Figure 12-8: Tentative activity schedule

Chapter 13 Project Implementation Structures

13.1 Implementation Structure

The overall project implementation structure is proposed as the figure below.



(Source: Survey Team)

Figure 13-1: Project Implementation Structure

13.2 Roles and Responsibilities of related Organizations

13.2.1 Health and Family Welfare Department (HFWD), the GoTN

HFWD assumes the overall responsibility of the project. HFWD will establish a PMU within the organization which takes all necessary measures in a timely and efficient manner and will be fully responsible for the project implementation. The PMU will be headed by the Project Director and consist of officers in charge of implementation, M&E, finance and administration.

13.2.2 State Empowered Committee (SEC)

SEC constituted with high level representation from the concerned departments of the GoTN will be formulated with financial powers to ensure the efficient and effective implementation of the project. The mandate, composition of members and frequency and modality of the meeting are shown in Table 13-1. It is proposed that activities with the expenditure between Rs. 10 million to Rs. 500 million per activity will be approved by SEC.

Table 13-1: Description of SEC

Mandate
<ul style="list-style-type: none"> • Approve annual action plan • Review progress and achievement • Provide administrative and financial sanction for activities of the project. • Ensure inter-departmental coordination
Members
<ul style="list-style-type: none"> • Chairperson: Chief Secretary to the GoTN • Member: Secretary to the GoTN, HFWD • Member: Secretary to the GoTN, Finance Department • Member: Secretary to the GoTN, Planning, and Development and Special Initiatives Department • Member: Secretary to the GoTN, TNPWD • Member Secretary: Project Director
Special Invitees for the Meetings
<ul style="list-style-type: none"> • Mission Director, NHM • Engineering Chief, TNPWD • Managing Director, TNMSC • DME • DMRHS • DPHPM
Frequency of the Meeting
<ul style="list-style-type: none"> • Periodical Meeting every six months (Monitoring and review of progress, managerial advice, and planned activities) • Ad hoc meeting based on request

(Source: Survey Team)

13.2.3 Steering Committee

The Steering Committee for the Project will be formulated for the purpose of supervising the PMU. The mandate, composition of members, and frequency and modality of the meetings are shown in Table 13-2.

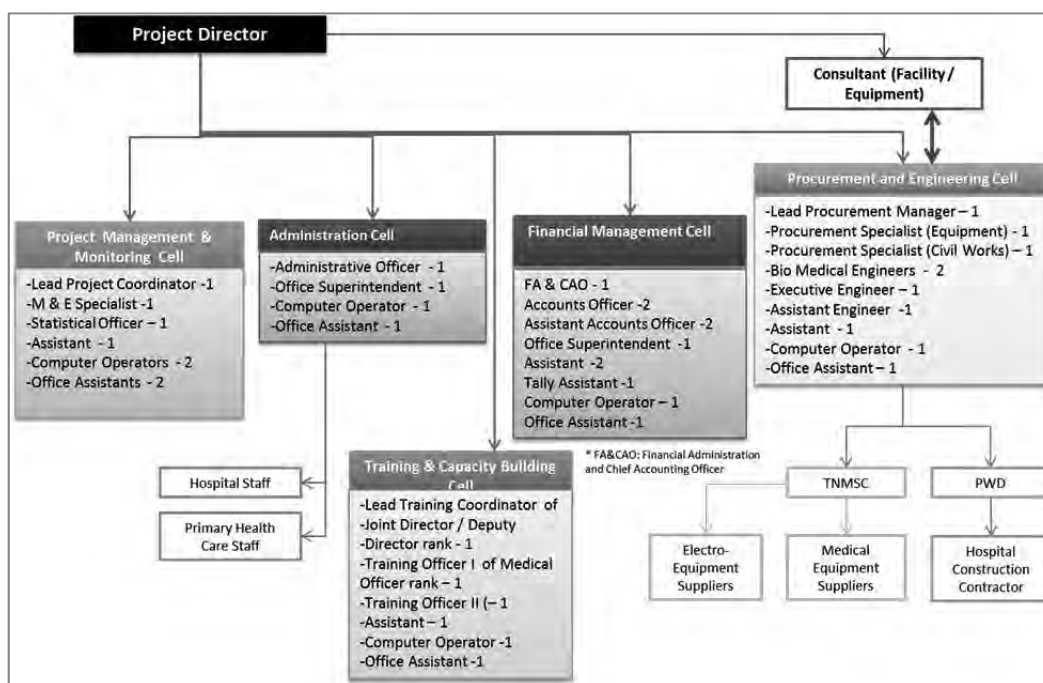
Table 13-2: Description of SC

Mandate
<ul style="list-style-type: none"> • Supervise and guide the PMU • Seek suitable convergence and reduce overlap among projects • Monitor funds flow • Ensure inter-directorate coordination • Facilitate smooth implementation of the project
Members
<ul style="list-style-type: none"> • Secretary, Health • Representative from Finance Department • Project Director, Member Secretary • Mission Director, NHM • Managing Director, TNMSC • Engineering Chief, TNPWD • All Head of Directorates in HFWD
Frequency of the Meeting
<ul style="list-style-type: none"> • Periodical meeting every three months • Ad hoc meeting based on request

(Source: Survey Team)

13.2.4 PMU

The PMU will consist of 1) Project Management and Monitoring Cell, 2) Administration Cell, 3) Training and Capacity Building Cell, 4) Procurement and Engineering Cell, and 5) Financial Management Cell. The PMU will be responsible for plans and implementation of all the activities under the Project. It is proposed that any activities with the expenditure of below Rs. 10 million will be approved by the PMU. Proposed structure and designation of PMU members and required numbers are shown in Figure 13-2 and Table 13-3.



(Source: Survey Team)

Figure 13-2: PMU

Table 13-3: Designation and Required numbers of PMU Members

Project Management & Monitoring Cell (PMMC)
<ul style="list-style-type: none"> • Project Director -1 • Lead Project Coordinator -1 (Contract) • M & E Specialist -1 (Regular) of Joint Director / DD rank • Statistical Officer – 1 (Regular) • Assistant - 1 (Contract) to look after cell activities • Computer Operators - 2 (Contract) • Office Assistants - 2 (Contract)
Administration Cell
<ul style="list-style-type: none"> • Administrative Officer - 1 (Regular) to look after Establishment • Office Superintendent - 1 (Regular) to look after Establishment • Computer Operator - 1 (Contract) • Office Assistant - 1(Contract)
Training & Capacity Building Cell (TCBC)
<ul style="list-style-type: none"> • Lead Training Coordinator (Regular) of Joint Director / Deputy Director rank - 1 • Training Officer I (Regular) of Medical Officer rank – 1 • Training Officer II (On contract of Nursing Superintendent rank) – 1

<ul style="list-style-type: none"> • Assistant – 1 (Regular) • Computer Operator -1 (Contract) • Office Assistant -1 (Contract)
Procurement and Engineering Cell (PEC)
<ul style="list-style-type: none"> • Lead Procurement Manager (Regular) in the capacity of Joint Director / Deputy Director – 1 • Procurement Specialist (Equipment) in the rank of a Medical Officer - 1 (Regular) • Procurement Specialist (Civil Works) – 1 (Regular) in the capacity of Superintending Engineer on deputation from TNPWD • BMEs - 2 (On contract ; one BME for 10 Tertiary care and other BME for 11 Secondary care institutions) • Assistant Executive Engineer – 1 on deputation from TNPWD • Assistant Engineer -1 (on deputation from PWD) • Assistant - 1 (Contract) • Computer Operator - 1 (Contract) • Office Assistant – 1 (Contract)
Financial Management Cell (FMC)
<ul style="list-style-type: none"> • FA & CAO (Additional Director / Joint Director) from T & A dept. - 1 (Regular) • Accounts Officer -1 (Budget & Bills) (Regular) • Accounts Officer -1 (Audit & Accounts) (Professionally qualified to be contracted) • Assistant Accounts Officer -1 (Audit & Reconciliation) (Contract) • Assistant Accounts Officer -1 (Bills - Equipment) (Regular) • Office Superintendent -1 (Regular) • Assistant -1 (Cheque issue / BRS) (Regular) • Assistant -1 (Coordination with TNMSC / PWD) (Contract) • Tally Assistant -1 (Regular) • Computer Operator – 1 (Contract) • Office Assistant -1 (Contract)

(Source: Survey Team)

13.2.5 Tamil Nadu Public Works Department (TNPWD) and Tamil Nadu Medical Service Corporation (TNMSC)

The procurement in the project will be under control of TNPWD for construction of facilities and TNMSC for medical equipment. PMU will closely work with both agencies to ensure the smooth implementation process.

13.2.6 Consulting Service

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

Chapter 14 Monitoring and Evaluation Framework

14.1 M&E Implementation Framework

ODA loan projects have a set of indicators called “Operation and Effect Indicators”. The definitions of these indicators are stated below:

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

As a process of evaluation, baseline values at the time of appraisal, target values, and their achievement deadlines are supposed to be recorded on the ex-ante evaluation. Ex-ante evaluation has been performed for all ODA loan projects and the results have been released as ex-Ante Evaluation Reports immediately after the conclusion of loan agreement.

After the initiation of the project, PMU is expected to regularly monitor the progress of indicators and share the results with HFWD and JICA. The activities under Component 4 and 5 will be monitored based on the training monitoring sheet.

14.2 Operation and Effect Indicators

The indicators and their baseline and target values were shown in Table 14-1. These indicators are set based on the project design mentioned in this report.

Table 14-1: Indicators and target

Components	Category	Indicators	Source	Baseline (2014)	Target (2023)
1	Operation	Number of percutaneous coronary intervention (PCI*1) per year in three Medical College Hospitals	Each health facility	Madurai:336 Kilpauk: 0 Coimbatore: 0	Madurai; 700 (2 units/year) Kilpauk 150 (1 unit/year) Coimbatore; 150 (1 unit/year)
		Number of cardiovascular surgeries in hybrid OT (Coronary artery bypass grafting, Aortic stent grafting, Open aortic surgery*2) per year in three Medical College Hospitals	Each health facility	Madurai: CABG= 41 Aortic stent grafting= 0 Open aortic surgery=5 Kilpauk: 0, 0, 0 Coimbatore: CABG=4 Aortic stent grafting=0 Open aortic surgery=1	Madurai: 280/year Kilpauk:200/year Coimbatore:100/year

Components	Category	Indicators	Source	Baseline (2014)	Target (2023)
	Effect	Number of Super Speciality seats for Cardiology and Cardiothoracic surgery in three Medical College Hospitals	DME	Cardiology, Cardiothoracic surgery Madurai: 2,2 (/year) Kilpauk: 0, 0 Coimbatore: 0, 0	Madurai: 4, 4 (/year) Kilpauk: 2, 2 (/year) Coimbatore: 2, 2 (/year)
		Occupancy rate of Super Specialty seat for Cardiology and Cardiothoracic surgery in three Medical College Hospitals	DME	Cardiologist: Cardiothoracic surgeons: Madurai: (100%, 100%) Kilpauk: NA Coimbatore: NA	All health facilities: 100%
2	Operation	Number of mammography conducted per year in all seven DHQs and Vellore and Tirunelveli Medical College Hospitals	DME, DMRHS	Per unit Vellore.: 0 Tirunelveli.: 10 All 7 DHQs: 0	MCH: 650 times/unit/year DHQH: 1000 times/unit/year
		Number of hemo-dialysis times operated per year in 7 DHQH and Tirunelveli, Nagarcoli, Thoothukudi, and Tiruchirapalli Medical College Hospitals	DME, DMRHS	Per unit <Tertiary> Tirunelveli: 460 Nagercoil:62 Thoothukudi: 202 Tiruchirapalli: 294 <Secondary> Erode:1,249 Cuddalore: 694 Other 5 DHQs: 0	All: 600 times/unit/year
3	Operation	BOR in 4 health facilities (annual average) (Formula = Total no. of IP days for the month/ total no. of bed days for the month x 100)	DMRHS	Avadi (Chennai): 85.4 Other health facilities: NA	All: 90 %
1 & 3	Effect	Number of health facilities obtained external quality assurance certificate/accreditation from the GoI in seven health facilities	DME DMHS	NA	All four Secondary health facilities obtain external certificate from the GoI All three MCHs- Cardiology dept, Radiology dept, nephrology dept and Anaesthesia dept obtain external certificate from the GoI.

Components	Category	Indicators	Source	Baseline (2014)	Target (2023)
Qualitative indicator		Patient satisfaction (e.g. % of positive comments in suggestion box) in 3 Medical College Hospitals			
		Staff satisfaction level in 3 Medical College Hospitals			

Note *1: PCI includes coronary intervention (stent), closure of congenital defects, dilatation of valves, TAVI, and TEVAR.

*2: Coronary Artery Bypass Grafting (CABG) includes on-pump bypass and off-pump bypass. Aortic stent grafting includes Thoracic Endovascular Aortic Repair (TEVAR), Abdominal Endovascular Aortic Repair (EVAR), and Thoracoabdominal stent grafting. open aortic surgery includes thoracic aortic aneurysm, abdominal aortic aneurysm, and thoracoabdominal aortic aneurysm. Each category needs to count elective cases and urgent & emergent cases separately. Catheter treatment can also be counted if conducted in hybrid OT.

(Source: Survey Team)

Chapter 15 Environmental and Social Considerations

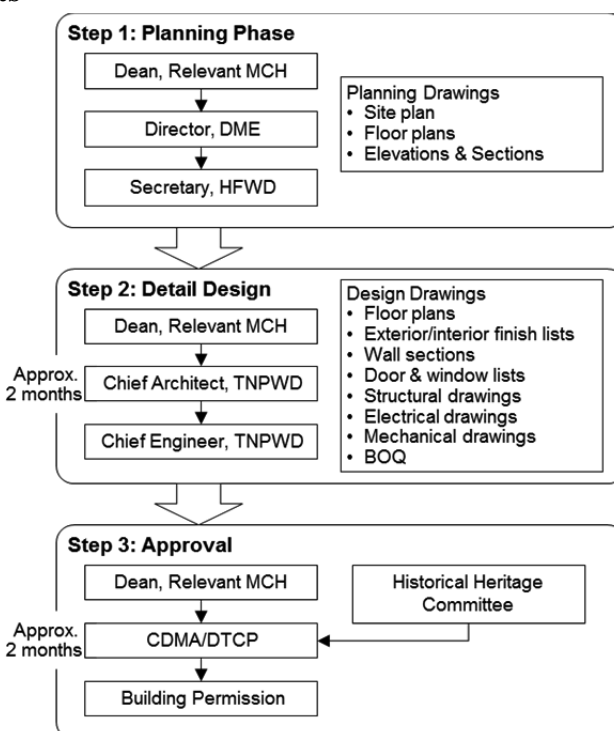
15.1 Procedure for Obtaining Building Permits

Figure 15-1 shows the typical process for obtaining building permits in Tamil Nadu.

In Step 1, the Dean of the relevant health facilities submits a proposal with plans to the Director, DME and Secretary, HFWD.

In Step 2, detailed design drawings (usually prepared by TNPWD) are reviewed by the relevant engineers in PWD. Since design drawings for the Project are prepared by the Consulting team, it is necessary to confirm that this step is required.

In Step 3, the Dean of the relevant health facilities applies for a technical review to the Chennai Metropolitan Development Authority (CMDA) in Chennai or the Directorate of Town and Country Planning (DTCP) in other corporations, and obtains building permits.



(Source: Survey Team)

Figure 15-1: Building Permit Process in Tamil Nadu

Table 15-1 shows the particulars of regulations at each site in Component 1-1 and Component 3-1.

Table 15-1: Outline of Regulations at Each Site in Component 1-1 and 3-1

Site	FSI (Floor Space Index) (m ²)	No. of floors	Height (m)	Applicable Regulations
MMCH	14,574	B1 + 5	29.0	DTCP
KMCH	17,078	B1 + 6	32.5	CMDA
CMCH	14,175	5	22.5	DTCP
Component 3-1 Each Secondary Hospital	4,072	3	14.0	DTCP

Note: FSI excludes parking lot area from total floor area.]

(Source: Survey Team)

15.2 Environmental and Social Consideration

Total floor area of proposed new building in Kilpauk Medical College Hospital is planned more than 22,000m² in the process of the Survey, which falls on the Category B (from 20,000m² to 150,000m² for building construction project) under the Indian Environmental Notification on 14th September 2006, issued by the Ministry of Environment and Forests (MoEF), India. Therefore, the project needs environmental clearance (EC) from State Environmental Impact Assessment Authority (SEIAA). In this context, the necessary survey was conducted on the Initial Environmental Examination (IEE) conforming to the Category B of the JICA Guideline.

15.2.1 Outline of the project components with possible environmental impacts

(1) Name of the Proposed Project: Tamil Nadu Urban Health Care Project

(2) Project Components which can possibly affect the environment:

Environmental and social consideration is applied to Component 1 and Component 3 of the proposed project. Component 1 is upgrading of tertiary hospitals (reconstruction of main treatment facility) at three sites and Component 3 is strengthening secondary care hospitals (new construction of model health facility) at four sites. Table 15-2 summarises the name, place of construction and area of the target health facilities.

Table 15- 2: Name, Place and Total Floor Area of the Target Health Facilities

Component	Name of Health Facilities	Location	Facility Sizes
Component 1-1 Upgrading Tertiary Hospitals	MMCH	Panagal Rd., Goripalayam, Madurai	B1F + 5FL Total floor area: 18,549m ²
	KMCH	Poonamallee High Rd., Kilpauk, Chennai	B1F + 6FL Total floor area: 22,193 m ²
	CMCH	Avinashi Rd., Coimbatore	5FL Total floor area: 15,205 m ²
Component 3-1 Strengthening Secondary Care Hospitals	Avadi Hospital, Chennai	New Military Rd., Tirumalairajapuram, Avadi, Chennai	3FL, Total floor area: 4,612 m ²
	Velampalayam Hospital, Tiruppur	Velampalayam, Tiruppur	3FL, Total floor area: 4,612 m ²
	Maniyanoor Hospital, Salem	Maniyanoor, Salem	3FL, Total floor area: 4,612 m ²
	Kandiaperi Hospital, Tirunelveli	Kandiaperi, Tirunelveli	3FL, Total floor area: 4,612 m ²

(Source: Survey Team)

15.2.2 Baseline Environmental and Social Situation of the Project Site

(1) Three Health facilities of Component 1

1) MMCH

The proposed facility is reconstruction of existing buildings composed of OTs and other rooms. MMCH is located at the centre of new central business area in the eastern part of Madurai, the headquarters of Madurai district. It is surrounded by a trunk road (Pabagal Road) on the north, and low-rise shop-cum-house buildings on the south, east and west parts. Madurai Medical College is located on the opposite side of Pabagal Road.

2) KMCH

The proposed facility is reconstruction of existing buildings including wards and management offices. KMCH is located in the Chepet Area on the western part of Chennai, the capital of the State of Tamil Nadu. It is surrounded by a trunk road (Poonamallee Road) on the north, a regulating reservoir on the south, office of Fishery Department (under construction) on the east, and public facilities such as medical school and Education Department on the west. Kilpauk Medical College is located on the opposite side of Ponamallee Road.

3) CMCH

The proposed facility is reconstruction of existing buildings inside the premises of CMCH. It is located in the centre of Coimbatore, the headquarters of Coimbatore district, and near to the Coimbatore Central Station. It is surrounded by at trunk road, and low-rise shop-cum-house buildings on the north, east and west parts of the CMCH.

(2) Four Health Facilities of Component 3

1) Avadi Taluk Hospital

The proposed facility is new construction of a secondary health facility by demolishing non-used building in the premises of Avadi Taluk Hospital. This hospital is located 20km to the west from the centre of Chennai. It is surrounded by a trunk road (New Military Road) on the south, rail way line of Southern Railway on the north part, and shops-cum-houses on other parts. Avadi Station is adjacent on the north side.

2) Tiruppur Hospital

The proposed facility is new construction of a secondary hospital on a vacant space inside the premises of a UPHC. It is located at Velampalayam area, 5km to the north-west from the centre of Tiruppur, the headquarters of Tiruppur district. It faces a one-lane road on the south side and surrounded mainly by houses and vacant lots.

3) Salem Hospital

The proposed facility is new construction of a secondary hospital in Maniyapur area in Salem, the headquarters of Salem district. The plot map provided by Tamil Nadu shows that there exist a shop and an office inside the proposed plot and a slaughter house is on the north. It is necessary to confirm land use condition during the detail design phase.

4) Tirunelveli Hospital

The proposed facility is new construction of a secondary hospital on a vacant space inside the premises of Kandiaperi Hospital, the suburb area of Tirunelveli, the headquarters of Tirunelveli district. It is located 2.5km to the west of Tirunelveli Station and surrounded by low-rise houses and farm land. A trunk road (Tirunelveli - Pottalpudur Road) is about 50 m to the south of the site. It is necessary to confirm land use condition during the detail design phase.

In brief, all of seven construction sites are not inside or adjacent to either naturally or historical

protected areas. Three health facilities of the Component 1 and Avadi Taluk Hospital of the Component 3 are reconstruction of existing buildings inside the premises of medical facility which are located in the urban area of high population cities. Tiruppur Hospital of the Component 3 is new construction on a vacant land kept for public works Therefore, large scale negative impact is not anticipated on both environmental and social conditions for these health facilities.

15.2.3 Legal Framework of Environmental and Social Consideration in India

(1) Legal Framework

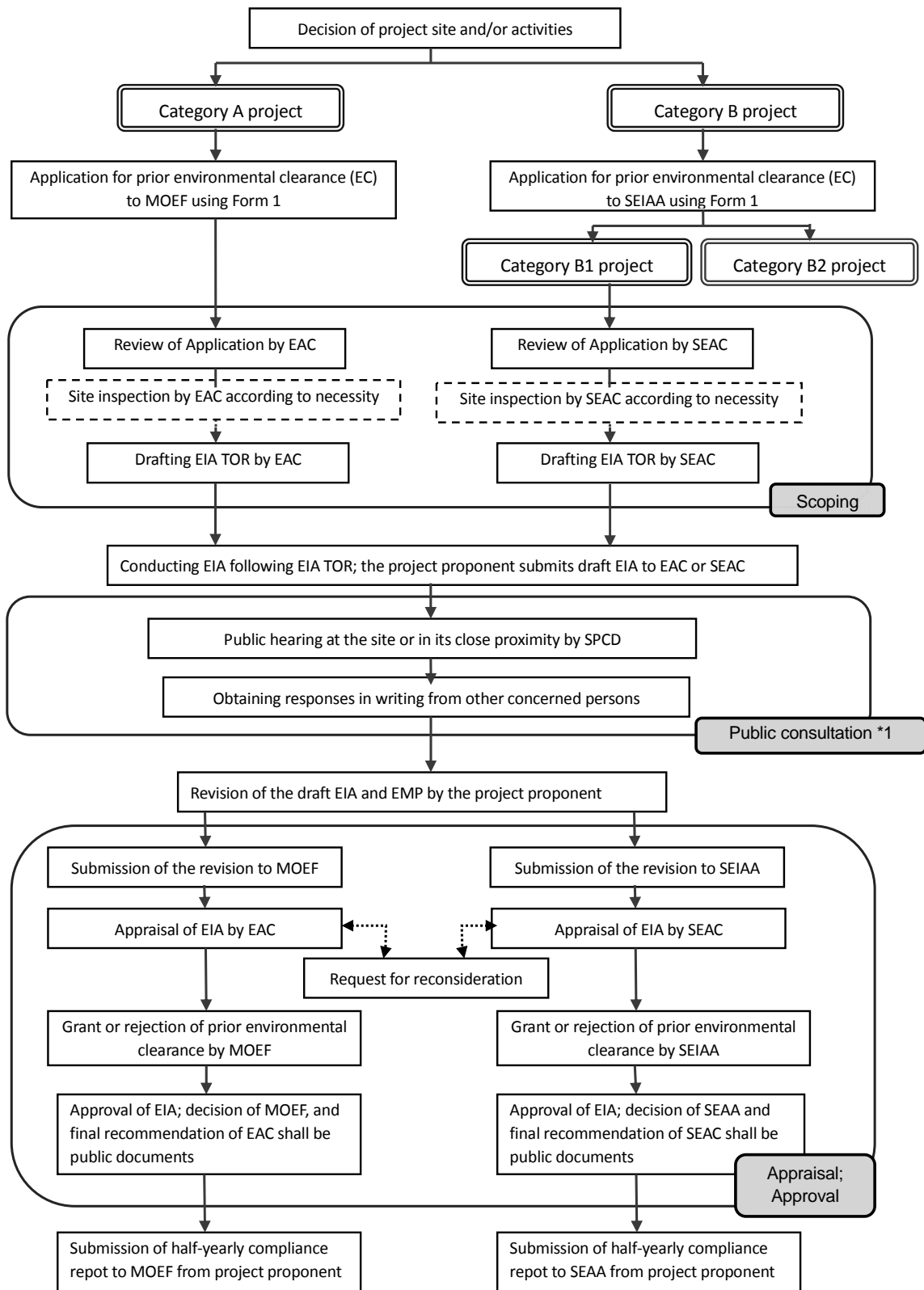
The Notification (2006) issued by the MoEF, India, provides that projects falling under Category A in the Schedule shall require prior EC from the MoEF and that projects falling under Category B shall require the said clearance from the SEIAA, before any construction work or preparation of land by the project owner.

(2) System and regulations

The Environmental (Protection) Act (1986), The Environmental (Protection) Rules (1986) and Notification on environment (1994; 1997, 2006, 2009, 2011, 2014 amendments) are the important regulations on the environmental impact assessment in India. The gap between JICA guideline and Indian Notification is summarized at Annex 13.

(3) EIA Procedure

EIA Procedure in India extracted from the Notification (2006) is summarized at Figure 15-2.



Note *1: Buildings/Construction projects/Area development projects and townships are exempted from public consultation.

Abbreviations: EAC = Expert Appraisal Committee, SEAC = State or Union territory level Expert Appraisal Committee, SPCB = State Pollution Control Board, UGPCC = Union territory Pollution Control Committee, MOEF= Ministry of Environment and Forests, SEIAA = State/Union territory Environment Impact Assessment Authority

(Source: Survey Team based on the EIA Notification 2006, India)

Figure 15-2: Procedure of Getting EC in India

(4) Necessity, procedure and timing of EIA

“Schedule 8a” of the Notification (2006) provides that buildings and construction projects whose total area is between 20,000m² and 150,000m² fall under Category B and it is required to conduct EIA and receive EC from SEIAA. As the total planned area of Kilpauk Hospital among the seven proposed health facilities exceeds 20,000m², this hospital is required to get EC from SEIAA of the State of Tamil Nadu before construction. HFWD will establish the PMU as soon as Loan Agreement is signed and PMU will take initiative to start EIA procedure necessary for getting EC.

15.2.4 Consideration of Alternatives

Alternatives will be considered based on the options of detailed design. The design consultant in charge of environmental and social consideration shall exchange information with the design consultants of infrastructure design, building design, facility design, and medical equipment in order to identify the items that possibly give impacts on the natural and social environment and that pose safety problem; such as, location of garbage storage contents and management plan of medical equipment. Among them, the environmental consultant shall determine the items that possibly generate trade-off between techniques and cost or other issues. The environmental consultant shall examine alternatives that contain the expected degree of impacts and mitigation level from viewpoint of social and environmental consideration to select the most suitable plan.

The process of alternative examination is (i) based on the degree of impact of the project on the natural and social environment without project (zero option), (ii) comparing plans (alternatives) that include measures to the affecting items, (iii) selecting the most suitable plan, and (iv) strengthening the basis and relevance of the selected plan. For this project, (i) location of all seven health facilities were decided by Tamil Nadu side; (ii) all health facilities except Salem are reconstruction of existing buildings or new construction inside the premises of medical facility; and (iii) the new health facilities use existing access flow and infrastructure inside the premises. Therefore, the contents of alternatives are limited to the building facility and equipment (though other problems may be found by the site survey and detail hearing) and the alternatives may focus on the arrangement of rooms and facilities inside the hospital, medical equipment and work safety. Alternatives relating to the location of construction are not applied to the proposed project because it was determined through discussions between the Survey Team and concerned authorities of Tamil Nadu. Also, The Survey Team does not consider the Zero Option: because, (i) the project aims to improve medical/health conditions of local people and (ii) construction site, facilities and equipment are proposed through discussions with concerned authorities in the course of the survey.

15.2.5 Scoping and TOR

(1) Result of Scoping

Scoping was conducted using JICA environmental check list 19 “Other Infrastructure Project” to find a range of significant or potentially significant impacts and study methods. As the result, it can be concluded that the degree of impact from the proposed project is limited, though contamination by used water and wastes is anticipated to a certain extent and need proper management. Table 15-3 shows the important items that the environmental impact is anticipated. The result of scoping of all check items on the check list 19 is attached at Annex 13.

Table 15-3: Result of Scoping – Issues possibly Giving Negative Impact

Category	Environmental Item	Evaluation		Reason of Assessment	
		Before/ During construction phase	Operational phase	Construction phase	Operational phase
Pollution Control	Air Quality	B-	C-	Due to transportation of construction materials and equipment as well as operation of construction machines, air quality becomes worse temporarily.	The new health facilities will use commercial power but diesel generators will be installed as emergency power supply device. Also, it is anticipated that transportation to the new health facilities will increase.
	Water Quality	C-	B-	Water contamination is anticipated by drainage of used water from construction works.	Water used in the health facilities will be discharged to the city sewer main.
	Wastes	B-	B-	It is anticipated that waste lumber and waste materials are generated.	Both non-medical wastes (general wastes) and medical wastes will be generated.
	Soil Contamination	C-	C-	Soil contamination is likely anticipated due to leakage of oil for construction and other materials from construction site to a certain volume.	Waste water and wastes are potentially anticipated to contaminate soil of the health facilities lot and surrounding area.
	Noise and Vibration	B-	C-	Noise and vibration are anticipated due to the operation of construction machinery and vehicles.	The medical equipment will generate neither making noise nor vibration. The generator as emergency power is low noise type. However, cooling device to be installed on the roof may generate noises to a certain extent.
Natural Environment		D	D	All of seven target health facilities are located in the urban area and not inside or adjacent to the designated protected areas.	
Social Environment	Resettlement	B-	B-	There is possibility that construction of health facilities in Salem and Tirunelveli may occur disturbance of land right or land use right.	
	Living and Livelihood	D	B+	Five health facilities will be constructed inside the premises of existing medical facilities while other two health facilities will be constructed on the vacant land acquired and kept for public works. Therefore, construction will not affect living and livelihood of local people. On the other hand, living condition of local people will be improved by the upgrading tertiary health facilities or strengthening secondary care hospitals.	
	Working Conditions	B-	C-	Accidents are anticipated if construction equipment is not maintained and operated properly.	Accidents relating to use of medical equipment and machinery are anticipated if they are not maintained and operated properly.

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

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

C +/- : Extent of positive/negative impact is unknown (A further examination is needed and the impact could be clarified as the study progresses.)

D : No impact is expected.

(Source: Survey Team)

(2) Draft TOR

A draft TOR for EIA study was prepared on the basis of the result of scoping. Table 15-4 shows TOR for the items that possibly affect the environment negatively. TOR of all items is attached at Annex 13.

Table 15-4: Draft TOR

Category	Environmental Item	Items of examination	Means of examination
Pollution Control	Air Quality	1) Confirmation of related to air quality standards of India, Japan; and, if necessary, WHO.	Examination of existing documents
		2) Grasp of present condition of air quality.	Survey of existing documents (State of Tamil Nadu); actual measurement if required
		3) Estimate of degree of impact caused by increase of vehicles during construction period.	Examination of properness: items of construction, construction method, period, type of machinery, place, period and time of operation, number of construction vehicles, moving route
		4) Estimate of degree of impact caused by increase of vehicles to the new health facility at operation period.	Estimate of impact on the basis of the forecast of number of clients and vehicles to the new health facilities.
		5) Living conditions relating to air quality of surrounding communities.	Field survey and hearing.
	Water Quality	1) Confirmation of water quality standards if India, Japan, and if required, WHO	Examination of existing documents
		2) Quality of water used in the existing health facilities (general, examination, infectious waste water).	Collection of official data at the concerned government offices; observation and hearing; actual measurement if necessary.
		3) Situation of waste water management of the existing health facilities.	Observation and hearing.
	Waste	1) Confirmation of water quality standards if India, Japan, and if required, WHO	Examination of existing documents
		2) Means of disposal of medical wastes, cells and tissues and sharps in the health facilities.	Observation and hearing
		3) Garbage treatment system of the locality.	Information collection at the concerned organizations; estimate of garbage to be generated during operation period.
	Soil Contamination	1) Measures to avoid oil leaking during the construction period	Examination of means of oil disposal during construction period.
		2) Source of contamination from health facilities.	Examination of existing documents, information collection and hearing at the concerned organizations.
	Noise and Vibration	1) Confirmation of related standards of noise and vibration of India and Japan	Examination of existing documents
		2) Estimate of degree of impact caused by construction.	Examination of properness: items of construction, construction method, period, type of machinery, place, period and time of operation.
		3) Estimate of degree of impact caused by the new health facilities.	Examination of existing documents, observation of existing health facilities.

Category	Environmental Item	Items of examination	Means of examination
Social Environment	Resettlement	1) Land title and land use.	Site observation and hearing.
	Living and Livelihood	-	Change of accessibility of poorer households and Scheduled Castes to high level medical services, as monitoring factors on project impact
	Working Conditions	1) Measures to be taken for work safety during the construction period.	Examination of working plan; monitoring by the supervision team.
		2) Capacity building plan of medical staff and workers in the field of proper O&M of medical equipment and facilities.	Examination of the project plan.

(Source: Survey Team in charge of environmental and social considerations)

15.2.6 Result of Environmental Survey (result of prediction)

PMU will start EIA procedure, as soon as established, for the Kilpauk Hospital as provided in the Notification by referencing to the result of scoping mentioned above.

15.2.7 Result of Environmental Impact Assessment

EIA will be assessed and PMU will receive the decision from SEIAA after Loan Agreement is signed.

15.2.8 Cost for Undertaking Mitigation Measures

PMU will set a mitigation plan in consistency with the result of EIA. Also they will need to request and acquire budget for implementation of mitigation measures to the GoTN.

15.2.9 Preparation of Environmental Management Plan and Environmental Monitoring Plan

Environmental management plan (EMP) will be prepared in response to the result of EIA and in order to avoid or mitigate negative impacts of the project and to enhance positive impact on natural and social environments.

The Survey Team prepared a preliminary EMP of the proposed project addressing the environment items being evaluated by the scoping to have possibility of negative/positive impacts. Cost for mitigation measure is not included because the degree of impact is not evaluated at this survey. It should be noted that radiation strength is added in the monitoring plan parameters, because radiation leak is anticipated from health facility laboratories. Also, preliminary environmental monitoring plan (EMoP) and monitoring form are prepared (refer to Annex 13 for EMP, Annex 13 for EMoP and Annex 13 for monitoring form).

15.2.10 Stakeholder Meeting

HFWD held on 25th November 2015 a stakeholder meeting at Kilpauk Hospital, the target of EIA according to the Indian Notification, to explain about the project to and get opinion from the local stakeholders.

JICA Guideline for Environmental and Social Considerations provides that project proponents etc. shall be encouraged to consult with local stakeholders when necessary in the case of JICA Category B projects. Section 7 of the Indian Notification provides that Indian Category B projects or activities shall undertake public consultation, too, but building projects are exempted. In this case, compliance with JICA guideline is crucial for a candidate of Yen Loan project.

At the stakeholder meeting, Deputy Director of DME gave a brief introduction about JICA Loan Project and explained the background of this stakeholder meeting and Dean of KMCH welcomed public attendants. Then, the survey team presented the outline of the proposed plan of reconstruction of KMCH and explained that some slight negative impact items were anticipated on the environment, such as waste and water contamination but they would be minimized by proper mitigation measures. Participants of the meeting welcomed the proposed project because it would benefit the large number of local people. The minute of the stakeholder meeting is attached at Annex 13.

15.2.11 Land Acquisition and Resettlement

As three health facilities of Component 1 and two health facilities of Component 3, Avadi, (Chennai) Velampalayam, (Tiruppur) and Kandiaperi (Tirunelveli) will be constructed inside the premises of existing medical facilities, neither land acquisition nor resettlement will occur in the proposed project for these five health facilities. On the other hand, the Survey Team was explained that the land was acquired and kept for public works but the team has not confirmed actual land use conditions of Salem site. Site inspection and more detail survey are needed during the detail design.

15.2.13 Other Issues

JICA Environmental Check List: attached at Annex 13.

Annex 1: Directorates and their functions
Under Health and Family Welfare Department (HFWD),
Government of Tamil Nadu

Directorates and their functions under HFWD

	State level	Responsibilities
1	Secretariat of HFWD	<ul style="list-style-type: none"> All matters relating to medical services/medical subordinate services/family welfare programme under the administrative control of HFWD Medical Service Recruitment Board, Administration of all medical service ACTs and Rules of HFWD and Tamil Nadu Medical Code. Drug Control Administration Preparation of Budget and Policy External assistance to Medical Institutions Granting of financial assistance to indigent persons from the Chief Minister's Public Relief Fund
2	Directorate of Medical Education (DME)	<ul style="list-style-type: none"> Development of medical education including para-medical personnel to cater to the health needs of the State. Administration of medical colleges and teaching hospitals Effective supervision of the selection committee, for admission to specified medical and nursing courses of study
3	Directorate of Medical and Rural Health Services (DMRHS)	<ul style="list-style-type: none"> Providing secondary level of medical services through the grid of DHQH, Taluk Hospitals, Non Taluk Hospitals, Dispensaries and Mobile Medical Units, besides District TB Centres, TB Hospitals and TB Clinics and Leprosy Hospital are under the control of the Directorate. Planning, Implementation and monitoring of national and state health programmes at facility level All regulation on medical facilities
4	Directorate of Public Health and Preventive Medicine (DPPM)	<ul style="list-style-type: none"> Planning, implementation and monitoring of various national and state health programmes Providing primary health care, which includes Maternity and Child Health Services, Immunization of children against vaccine preventable diseases, control of communicable diseases, elimination of leprosy, iodine deficiency disorder control programme, prevention of food adulteration, health check-up of school children, health education to communities and collection of vital statistics under birth and death registration system and environmental sanitation. Implementing prevention and control of waterborne diseases like acute diarrheal diseases, typhoid, dysentery prevention and control of sexually transmitted diseases including HIV/AIDS. The director is Commissioner of municipal administration
5	Directorate of Family Welfare (DFW)	<ul style="list-style-type: none"> Providing maternal and child health care and attempting to achieve the State targets of MMR, TFR, IMR, CBR by the end of the Twelfth Five Year Plan (2012-17). Planning, Implementation and monitoring of Family Welfare Programme, aiming to provide maternal and child health care thereby to bring down the birth rate and avoid higher order of birth and prevention of female foeticide and female infanticide.
6	Directorate of Indian Medicine (DIM)	<ul style="list-style-type: none"> Providing health service to the public through Indian systems of medicine such as Siddha, Ayurveda, Unani, Yoga and homoeopathy Providing and monitoring education and research activities in Indian streams of medicine Supporting all like-minded education and research bodies for the development of Indian systems of medicine
7	Directorate of Medical and Rural Health Services (ESI)	<ul style="list-style-type: none"> The Employees' State Insurance (ESI) Scheme of Tamil Nadu has 8 hospitals and 195 dispensaries under overall control of Labour and Employment Department. HFWD, Tamil Nadu depute its medical and para-medical staff in ESI health facilities to deliver health services

	State level	Responsibilities
8	Directorate of Drug Control	<ul style="list-style-type: none"> Enforcement of the Drugs and Cosmetic Act, 1940 and Rules, 1945 Enforcement of the Drugs Price Control Act, 1995 Enforcement of the Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 Medical Services Cooperation also procure drugs
9	Directorate of State Health Transport Department	<ul style="list-style-type: none"> Reduce the downtime of vehicles taken up for repairs Keep a high percentage of fleet utilization of vehicles Provide more fleet of vehicles for the successful implementation of health programmes
10	Tamil Nadu Medical Service Corporation (TNMSC)	<ul style="list-style-type: none"> Ensuring ready availability of all essential drugs & medicines and equipment within government medical institutions throughout the state Procurement, storage and distribution of 114 veterinary drugs to the various veterinary dispensaries under the control of the Directorate of Animal Husbandry.
11	Tamil Nadu State AIDS Control Society (TANSACS)	<ul style="list-style-type: none"> Implementing the National AIDS Control Programme (Blood Safety and Training, Control of STDs, Care and Support for people living with HIV/AIDS, Sentinel Surveillance, Advocacy and Social Mobilization) Implementing Tamil Nadu Special Initiatives (Tamil Nadu Trust for Children affected by HIV/AIDS, Monthly pension and social benefits for the people living with HIV/AIDS)
12	State Health Society (SHS)	<ul style="list-style-type: none"> SHS was registered under Tamil Nadu Societies Regulation Act. It constituted merging the health societies for leprosy, tuberculosis, blindness control and integrated disease control programme except Tamil Nadu State AIDS Control Society. Society: implementation body for specific health issues followed by the Tamil Nadu Society Act. Society has more operational freedom comparing with departments.
13	Tamil Nadu Health System Project (TNHSP)	<ul style="list-style-type: none"> The TNHSP has been operational since January 2005 The entire fund has been utilized within the project period, though additional financing has been provided for continuation of successful initiatives such as maternal and child health (MCH), improving quality of care and improving quality of human resources for health (HRH). The TNHSP is also involved in the following: <ul style="list-style-type: none"> ✧ The state-wide expansion of the Non-Communicable Diseases (NCDs) prevention and control activities ✧ State-wide implementation of Hospital and Health Management Information System (HMS and HMIS) in health facilities Expansion of MCH services to tertiary level
14	Department of Food Safety & Drug Administration (Food Safety Division)	<ul style="list-style-type: none"> At the state level, Commissioner of Food Safety Office has been created and all 32 revenue districts have designated officers under the Act. Field officers ensure safety of food and food related items and provide license as per the Act.
15	Medical Recruitment Board (MRB)	<ul style="list-style-type: none"> In order to fill up posts in a speedy manner, the state government has constituted Medical Services Recruitments Board (MRB). The MRB is in-charge of recruitment of about 250 categories of posts for medical service, medical subordinate service, public health service, public health subordinate service, and basic service.

(Source: HFWD, JICA. 2014. Final Report-Tamil Nadu - Data collection survey on health sector in India)

**Annex 2: Outline of Medical College Hospitals
in Tamil Nadu**

Outline of Medical College Hospitals (MCHs) in Tamil Nadu (as of July 2015)

Name	Rajiv Gandhi Govt. GH	Govt. Stanley MCH	Govt. Kilpauk MCH	Govt. Super Speciality Hospital	Chengalpattu MCH	Govt. Vellore MCH	Govt. Thiruvannamalai MCH	Govt. Villupuram MCH	Govt. Mohan Kumaraman galam MCH	Mahatma Gandhi Govt. Hospital	Govt. Thiruvarur MCH	Govt. Thanjavur MCH	Govt. Sivagangai MCH	Govt. Rajaji Hospital	Govt. Theni MCH	Govt. Thoothukudi MCH	Tirunelveli MCH	Govt. Kanyakumari MCH	Govt. Dharmapuri MCH	Coimbatore MCH
Location	Chennai	Chennai	Chennai	Chennai	Chengalpattu	Vellore	Thiruvannamalai	Villupuram	Salem	Trichy	Thiruvarur	Thanjavur	Sivagangai	Madurai	Theni	Thoothukudi	Tirunelveli	Kanyakumari	Dharmapuri	Coimbatore
No. of Beds (total)	2,722	1,661	1,133	400	1,203	900	440	500	1,272	1,398	500	1,176	500	2,518	900	1,112	1,143	600	816	1,367
No. of Patients																				
OPD (/day)	7,647	5,746	2,302		3,040	1,803	1,979	1,917	4,880	2,665	961	3,122	1,085	6,843	1,461	1,579	3,647	2,064	1,741	4,898
In-patients (/day)	2,440	1,248	745	146	660	866	475	803	1,243	925	700	1,069	375	2,344	815	804	1,293	618	744	1,235
Surgery																				
Major (/day)	59	43	25		26	26	13	21	41	23	17	18	15	68	21	23	36	19	22	39
Minor (/day)	58	84	18		53	19	55	27	62	37	4	13	8	111	6	34	14	92	141	34
Specialty																				
General Medicine	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
General Surgery	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Anaesthesiology	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Dermatology/Venerology	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
ENT	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Obstetrics & Gynaecology	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Orthopaedics	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Ophthalmology	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Paediatric Medicine	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Thoracic Medicine	☑	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Super speciality																				
Burns Ward			☑											☑						
Cardiology	☑	☑	☑	☑	☑	☑			☑	☑		☑		☑			☑		☑	☑
Cardiothoracic Surgery	☑	☑		☑					☑					☑					☑	☑
Colorectal Surgery														☑						☑
Diabetology		☑	☑		☑	☑						☑		☑						☑
Endocrinology	☑													☑						
Geriatric Medicine	☑													☑						
Geriatric Surgery	☑																			
Hematology	☑																			
Hepatology	☑																			
Medical Gastroenterology	☑	☑	☑						☑			☑		☑						☑
Surgical Gastroenterology	☑	☑	☑						☑			☑		☑						☑
Neurology	☑	☑	☑	☑	☑	☑			☑	☑		☑		☑			☑		☑	☑
Neuro Surgery	☑	☑	☑	☑	☑	☑			☑	☑		☑		☑			☑		☑	☑
Nephrology	☑	☑	☑	☑	☑	☑			☑	☑		☑		☑			☑		☑	☑
Orthopaedic Surgery	☑	☑	☑		☑	☑		☑	☑	☑	☑	☑		☑	☑	☑		☑	☑	☑
Paediatric Surgery	☑	☑	☑		☑	☑			☑	☑		☑		☑				☑	☑	☑
Plastic Surgery	☑	☑	☑	☑	☑	☑			☑	☑		☑		☑				☑	☑	☑
Psychiatry	☑	☑			☑	☑			☑	☑		☑		☑				☑	☑	☑
Medical Oncology	☑		☑	☑	☑	☑			☑	☑		☑		☑		☑		☑	☑	☑
Radiation Oncology	☑			☑	☑	☑			☑	☑		☑		☑				☑	☑	☑
Surgical Oncology	☑		☑	☑	☑	☑			☑	☑		☑		☑				☑	☑	☑
Rheumatology	☑		☑		☑	☑			☑	☑		☑		☑				☑	☑	☑
Thoracic Surgery	☑				☑	☑			☑	☑		☑		☑				☑	☑	☑
Vascular Surgery	☑	☑	☑		☑	☑			☑	☑		☑		☑			☑		☑	☑
Urology	☑	☑	☑		☑	☑			☑	☑		☑		☑				☑	☑	☑
Siddha Medical wing																				
Facility & Equipment																				
No. of Operation Theatre Tables	50	35	28	12	6	4	13	13	27	8	5	10	10	51	8	11	11	11	11	14
Medical Equipment																				
Digital X-ray	1	2	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CT	5	3	1		1	1	1	1	2	1	1	1	1	4	1	1	1	1	1	1
MRI	2	1	1		1	1	0	1	1	1	1*	1	1*	1	1*	1*	1*	1*	1*	1
Endoscopy	9	7	3		5	3	2	3	5	3	3	3	2	5	3	4	3	3	3	6
Dialysis Units	30	12	7		2	2	0	2	6	2	2	7	0	5	0	4	4	2	0	11
Lab Auto-analyzer																				

(Source: HFWD) * Under Installation

**Annex 3: Services provided by Tamil Nadu Medical
Service Corporation (TNMSC)**

Services provided by Tamil Nadu Medical Service Corporation (TNMSC)

No.	Contents of services
1	Procurement, testing storage and distribution of human drugs, medicines, Surgical items & Sutures, kits, reagents to the Government Medical Institutions of the State.
2	Procurement, testing storage and distribution of Veterinary drugs, medicines, Surgical items & Sutures to the government Veterinary medical institutions of the State.
3	Procurement and installation of medical equipment's to the government medical institutions of the State.
4	Procurement and installation of medical equipment's, instruments to the government Veterinary institutions of the State.
5	Finalization of Annual Rate Contract for Specialty Drugs and Medicines for direct procurement by the medical institutions in the State.
6	Finalization of rate contract every two years for various frequently used surgical appliances, Instruments for direct procurement by the medical institutions in the State.
7	Providing support services for the special maternity wards at two hospitals in Chennai, for pay wards at Government Stanley Medical Collage Hospital and for the Master Health Check-up facility at Government General Hospital Chennai.
8	Operating CT scan centres, MRI Centres, Lithotripsy centres in the medical institutions of the State on user charge collection basis.
9	Providing support services for maintenance of medical and non-medical equipment in the medical institution in the State.
10	Procurement and testing of drugs and medicines for other willing states in India.
11	Consultancy services on the procurement logistics systems to other states in India.
12	Sale of selected lifesaving medicines to the Public at one centre in Chennai.

(Sources: <http://www.tnmisc.com/tnmisc/new/index.php>, accessed 20 July 2015)

Annex 4: Progress of NUHM activity

Progress of NUHM activity (as of July 2015)

Sl. No.	Activity	Current status
1. Planning & Mapping		
1	Mapping of all urban health facilities/poor households	<ul style="list-style-type: none"> • 343 facilities are mapped with regard to infrastructure and manpower. • 50 out of 87 NUHM cities are mapped identifying slum and vulnerable population.
2	Preparation of slum/city specific plans	<ul style="list-style-type: none"> • PIP by cities was developed in 2013/14 and it was revised in 2014/15.
2. Programme Management		
3	Setting up of State/District/City level society and PMU	<ul style="list-style-type: none"> • State PMU has been established • District PMUs: all targets of 29 have been created headed by Deputy Director of Health Services and assisted by existing Assistant Programme Manager with additional other support staffs. • City PMUs: all targets of 10 have been formed headed by existing City Health Officer with Stastical Assistant and Account Assistant.
3. Training & Capacity Building		
4	Training and capacity development of Urban Local Bodies (ULBs)	<ul style="list-style-type: none"> • 3 state level meetings/orientations have conducted as planned. • 7 regional wise seminar meetings are planned, and 2 completed.
5	Training of ANM/health workers	<ul style="list-style-type: none"> • Existing 77 ANM training has be conducted, remaining training will be done once the recruitment is complete.
6	Training and capacity building of Mahila Arogya Samitis (MAS)	<ul style="list-style-type: none"> • No activities planned. Utilization of MAS is under policy consideration.
7	Selection and capacity building of community workers/ASHA	<ul style="list-style-type: none"> • Tamil Nadu currenty practices to utilize ANM as a frontline worker - bridge with community instead of ASHA. (Utilization of ASHA is under policy consideration)

Sl. No.	Activity	Current status
8	Other trainings/orientations	<ul style="list-style-type: none"> Accounting training for 654 staffs (ULB, UPHC) are planned. 108 ULB staff will be trained in August 2015 for 5 days, then the remaining staffs will be trained subsequently.
4. Strengthening of Health Services		
9	Outreach services/camps	<ul style="list-style-type: none"> Special Outreach Camps (3camps/month/UPHC) in urban areas to increase accessibility of health services for the slum has started a few months ago. Rs.10,000 is given per one camp. Outreach camps in the construction site is about to start in collaboration with Labor Department
10	Provision of ANM/Lady Health Visitor (LHV)	<ul style="list-style-type: none"> Mentioned below No. 11
11	Provision of Urban PHC for every 50,000 population	<ul style="list-style-type: none"> 420 UPHCs to be established as per population, out of which 343 functioning with some to be upgraded, 77 new UPHC to be created. Vacancy positions of doctors, nurses, pharmacists, lab technician, ANM (Auxiliary Nurse Midwife), and supportive staff are under recruitment process and will be filled during this physical year. Position of Lady Health Visitor (LHV)/sector health nurse as well as public health mobility officers will not be allocated as the budgets were not approved due to not filling criteria of the position. DPH is now in charge of the recruitment instead of ULBs so that the health staff can obtain same benefits from the state.
12	Provision of Urban CHC for every 2.5-3 lakhs population in cities above 5 lakh population	<ul style="list-style-type: none"> No. of functioning UCHC: 7 (only in Chennai) No. of sanctioned new UCHC: 8 (only in Chennai) (The remaining cities are under plan) No HRs have been sanctioned

Sl. No.	Activity	Current status
13	IEC/BCC	• There is a plan for display board in UPHC on timings of services provided, grievance mechanism, financial benefits, specific programs, citizen charter, TV for visual display etc.
5. Regulation & Quality Assurance		
14	Quality assurance	• Conducted under NHM
6. Community Processes		
15	Mahila Arogya Samiti (MAS) /community groups	• No specific activities (Utilization of MAS is under policy consideration)
16	ASHA	• Tamil Nadu currently practices to utilize ANM as a frontline worker - bridge with community in stead of ASHA. (Utilization of ASHA is under policy consideration)
17	NGO support/involvement	• No specific activities
7. Innovative Actions & PPP		
18	Control of vector borne disease	• The activities are planned for cities other than Municipal Corporation for the year 2015/16
8. Monitoring and Evaluation		
19	Baseline/Endline survey	• Baseline survey is planned No M&E framework is developed
20	Research studies in urban public health	• No specific activities
21	IT based monitoring initiatives	• UPHC staff trained on HMIS (only maternal related data) enters the clinic data for the reporting. (reporting rate to be confirmed)

Annex 5: Functional Space Arrangements (FSA)
(Room Allocation List)

Government Rajaji Hospital (MMCH), Madurai

Floor	Unit Name	Room Allocation				Remarks	
		Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)		No. of Beds
Ground Floor	Pain Clinic	Pain Clinic	93	1	93	13	
		Procedure Room	10	1	10		
		Consultation Room	10	2	20		
	Assessment Clinic	Consultation Room	10	5	50		
		Imaging Center	CT	42	2	84	
			Console Room (CT)	35	1	35	
			MRI	48	1	48	
			Console Room (MRI)	36	1	36	
			CPU Room (MRI)	24	1	24	
			Ante Room (MRI)	12	1	12	
			X-Ray	36	2	72	
			Fluoroscopy	42	1	42	
			USG	15	3	45	
			Manmography	36	1	36	
			Endoscopy Center		Endoscopy Room	27	5
	Washing Room	60			1	60	
	Preparation / Recovery Room	54			1	54	
	Changing	15			2	30	
	IVR Center		IVR	67	2	134	
			Console Room	38	1	38	
			CPU Room	14	2	28	
			Preparation Room	14	1	14	
	SPD Pharmacy		SPD	85	1	85	
Pharmacy			108	1	108		
Administration	Administration Office	162	1	162			
NET Total					1,483		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					1,838		
Total Floor Area					3,321		
1st Floor 2nd Floor	Operation Theater	Nurses Station	13	1	13		
		Pre-OT	72	1	72		
		Waiting	32	1	32		
		Operation Theater	44	12	528		
		Operation Theater (Large/Hybrid)	80	1	80		
		Console/CPU/UPS (Hybrid Operation Theater)	57	1	57		
		Recovery	83	1	83	9	
		Equipment Room	36	1	36		
		Un-Sterilized	95	1	95		
		Sterilized	107	1	107		
		Changing	154	1	154		
		Meeting	30	1	30		
		NET Total					1,287
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					2,007		
Total Floor Area					3,294		
3rd Floor	PAICU	Ward (1Bed)	18	20	360	20	
		Nurses Station	54	1	54		
		Preparation Room	24	1	24		
		Equipment Room	24	1	24		
		Staff Room	18	2	36		
	Cardio-POCU		Ward (1Bed)	18	10	180	10
			Nurses Station	51	1	51	
			Preparation Room	24	1	24	
			Equipment Room	24	1	24	
	SICU		Ward (1Beds)	18	10	180	10
			Nurses Station	40	1	40	
			Preparation Room	27	1	27	
			Equipment Room	27	1	27	
	POCU		Ward (1Bed)	18	20	360	20
			Nurses Station	59	1	59	
			Preparation Room	33	1	33	
			Equipment Room	23	1	23	
			Staff Room	18	2	36	
	NET Total					1,634	
	Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					1,660	
Total Floor Area					3,294		
4th Floor	Bio-medical Engineering Center	Bio-medical Engineering Center	85	1	85		
		Clinical Simulation Lab	86	1	86		
	Clinical Simulation Lab		Clinical Simulation Lab (Large)	36	2	72	
			Clinical Simulation Lab (Small)	114	3	342	
			Lecture Room	27	1	27	
	Anesthesia Department Office		Director Room	27	1	27	
			Visitor Room	27	1	27	
			Professor Room	18	3	54	
			Assistant Professor Room	27	2	54	
			Pharmacy Room	27	1	27	
			Office	40	1	40	
			Meeting	40	1	40	
	Auditorium	Auditorium (300seats)	468	1	468		
NET Total					854		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					1,627		
Total Floor Area					2,481		
Basement Floor	CSSD	Washing Room	100	1	100		
		Packing Room	135	1	135		
		Sterilized Material Store	135	1	135		
		Changing	40	2	80		
		Office	40	1	40		
	Machine Room	Machine Room	560	1	560		
NET Total					1,050		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					1,815		
Total Floor Area					2,865		

Government Kilpauk Medical College Hospital (KMCH), Chennai

Floor	Unit Name	Room Allocation				Remarks	
		Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)		No. of Beds
Ground Floor	Emergency (Casualty)	Resuscitation	36	3	108	3	
		Treatment	18	5	90	5	
		Nurses Station	20	1	20		
		Equipment Room	36	1	36		
		Preparation Room	18	1	18		
		Staff Room	18	2	36		
	Zero-Delay Ward	Ward (4Beds)	36	5	180	20	
		Nurses Station	36	1	36		
		Equipment Room	36	1	36		
		Preparation Room	24	1	24		
		Staff Room	21	2	42		
		CT	45	2	90		
	Imaging Center	MRI	54	1	54		
		CPU Room (MRI)	18	1	18		
		X-Ray	45	1	45		
		Fluoroscopy	45	1	45		
		Manmography	36	1	36		
		Console Room	72	1	72		
		USG	18	3	54		
		Office	65	1	65		
	Endoscopy Center	Endoscopy Room	30	3	90		
		Washing Room	45	1	45		
		Preparation / Recovery Room / Changing	72	1	72		
	SPD	SPD	120	1	120		
	Pharmacy	Pharmacy	140	1	140		
		Administration	Administration Office	210	1	210	
	Administration	Conference Hall	170	1	170		
		Lecture	36	1	36		
		Staff Changing	45	2	90		
		NET Total				2,078	
	Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)				2,168		
	Total Floor Area				4,246		
	1st Floor	IMCU	Ward (1Bed)	18	20	360	20
			Nurses Station	38	1	38	
			Preparation Room	24	1	24	
			Equipment Room	36	1	36	
			Staff Room	12	2	24	
		ICCU/PACU	Ward (1Bed)	18	20	360	20
Nurses Station			36	1	36		
Preparation Room			24	1	24		
Equipment Room			24	1	24		
Staff Room			12	2	24		
SICU		Ward (1Bed)	18	10	180	10	
		Nurses Station	36	1	36		
		Preparation Room	24	1	24		
		Equipment Room	36	1	36		
		Staff Room	12	2	24		
IVR Center		IVR	75	2	150		
		Console Room	52	1	52		
		CPU Room	18	2	36		
		Preparation Room	12	1	12		
		Equipment Room	12	1	12		
		Changing	18	2	36		
Blood Bank		Registration	18	1	18		
		Blood Collection Room	36	1	36		
		Lab	18	1	18		
		Chief and HOD Room	12	1	18		
		Component Room	12	1	18		
		Donor Room / Donor Waiting	18	1	18		
		Donor Medical Examination Room	12	1	12		
		Washing Room	18	1	27		
		Sterilisation Room	18	1	27		
		Record Room	18	1	18		
		Staff Room	18	2	36		
		Administration	Office	319	1	319	
Meeting			114	1	114		
Dean Room / Waiting			93	1	93		
NET Total				2,320			
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)				1,854			
Total Floor Area				4,174			
2nd Floor	Operation Theater	Nurses Station	16	1	16		
		Pre-OT	110	1	110		
		Waiting	75	1	75		
		Operation Theater	44	12	528		
		Operation Theater (Hybrid)	68	1	68		
		Console/CPU/UPS (Hybrid Operation Theater)	68	1	68		
		Recovery	130	1	130	18	
		Un-Sterilized	140	1	140		
		Sterilized	100	1	100		
		Changing	120	1	120		
		POCU	Ward (1Bed)	18	10	180	10
			Nurses Station	36	1	36	
	Preparation Room		24	1	24		
	Anesthesia Department Office	Equipment Room	36	1	36		
		Staff Room	18	2	36		
		Office	54	1	54		
		Lecture	54	1	54		
	Assistant Professor Room	Assistant Professor Room	36	1	36		
		Associate Professor Room	18	4	72		
NET Total				1,883			
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)				2,291			
Total Floor Area				4,174			

Floor	Unit Name	Room Allocation					Remarks
		Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	No. of Beds	
3rd Floor	Ward	Ward(6Beds)	36	15	540	90	
4th Floor		Nurses Station	120	2	240		
5th Floor		Preparation Room	90	3	270		
		Equipment Room	42	2	84		
		Staff Room	15	1	15		
		Day Room	54	1	54		
NET Total					1,203		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					663		
Total Floor Area					1,866		
Basement Floor	CSSD	Washing Room	114	1	114		
		Packing Room	90	1	90		
		Sterilized Material Store	54	1	54		
		Changing	24	2	48		
		Office	24	1	24		
	Physical Medicine and Rehabilitation Department	Reception	4	1	4		
		Outpatient Consulting Room	26	1	26		
		PMR Chief Room	13	1	13		
		Ultrasound guided Intervention procedure Room	10	1	10		
		EMG and NCV Room	6	1	6		
		Electro therapy section	63	1	63		
		Exercise therapy section	63	1	63		
		Occupational therapy section	63	1	63		
		Prosthetic and Orthotic section	63	1	63		
		Allied health professional Room	10	1	10		
		Store Room	10	1	10		
		Class Room	26	1	26		
		Neuro Rehabilitation unit	76	1	76		
	Machine Room	Machine Room	357	1	357		
	NET Total					1,120	
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					2,881		
Total Floor Area					4,001		

Government Coimbatore Medical College Hospital (CMCH), Coimbatore

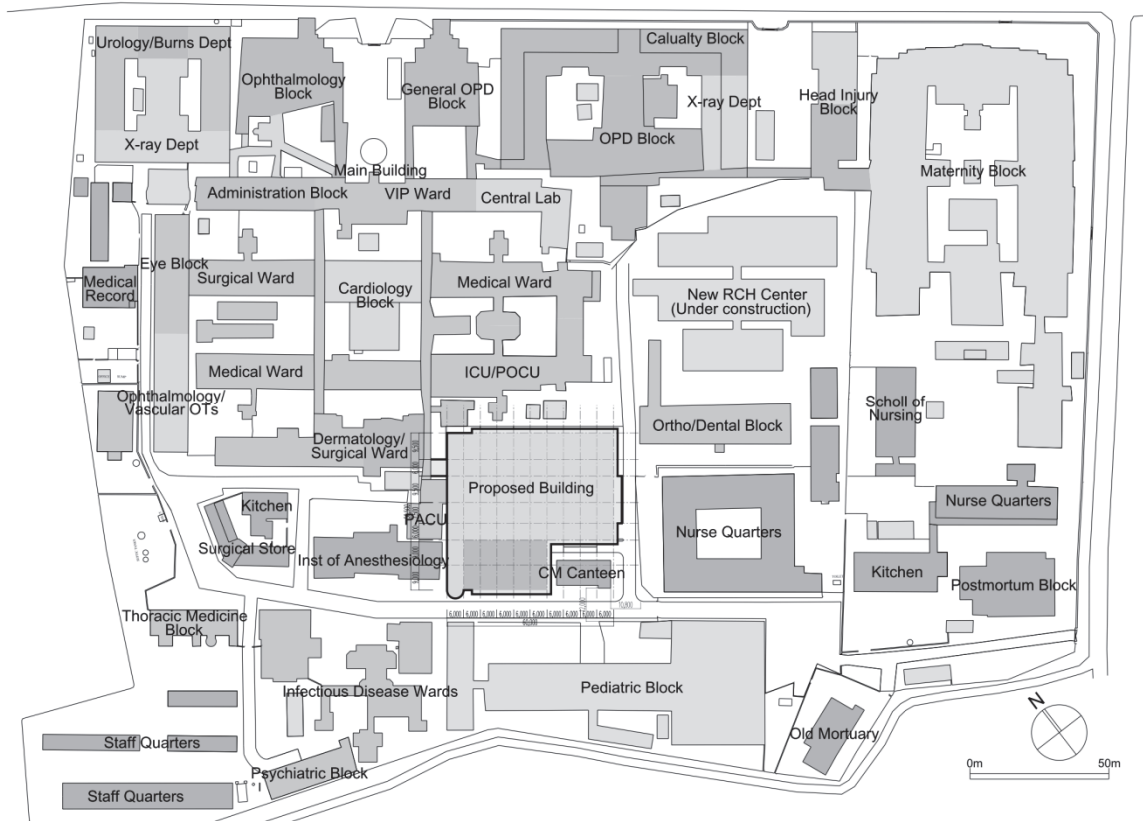
Floor	Unit Name	Room Allocation					Remarks
		Room Name	Room Area (sqm)	No. of Rooms	Sub-total (sqm)	No. of Beds	
Ground Floor	CSSD	Washing Room	129	1	129		
		Packing Room	90	1	90		
		Sterilized Material Store	99	1	99		
		Changing	28	2	56		
		Office	24	1	24		
	Machine Room	Machine Room	437	1	437		
NET Total					835		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					2,771		
Total Floor Area					3,606		
1st Floor	Imaging Center	MRI	54	1	54		
		CPU Room (MRI)	24	1	24		
		Ante Room (MRI)	12	1	12		
		Console Room (MRI)	35	1	35		
		CT	45	3	135		
		X-Ray	45	2	90		
		Manmography	45	1	45		
		Console Room (CT/X-ray/Manmo)	90	1	90		
		Fluoroscopy	36	2	72		
		Console Room (Fluoroscopy)	34	1	34		
		USG	22	2	44		
	Office	150	1	150			
	Endoscopy Center	Endoscopy Room	29	4	116		
		Washing Room	82	1	82		
		Preparation / Recovery Room / Changing	132	1	132		
	SPD	SPD	120	1	120		
	Pharmacy	Pharmacy	86	1	86		
Administration	Staff Changing	50	2	100			
Bio-medical Engineering Center	Bio-medical Engineering Center	210	1	210			
NET Total					1,631		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					1,813		
Total Floor Area					3,444		
2nd Floor	Operation Theater	Nurses Station	18	1	18		
		Pre-OT	75	1	75		
		Waiting	42	1	42		
		Operation Theater	44	11	484		
		Operation Theater (Large)	58	1	58		
		Recovery	84	1	84	13	
		Un-Sterilized	104	1	104		
		Sterilized	105	1	105		
		Changing	150	1	150		
	Meeting	27	1	27			
	POCU	Ward (1Bed)	18	10	180	10	
		Nurses Station	45	1	45		
		Preparation Room	18	1	18		
		Equipment Room	18	1	18		
Staff Room		18	2	36			
NET Total					1,444		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					2,000		
Total Floor Area					3,444		
3rd Floor	IVR Center	IVR	90	2	180		
		Console Room	67	1	67		
		CPU Room	18	2	36		
		Preparation Room	12	1	12		
		Equipment Room	12	1	12		
		Changing	18	2	36		
		SICU	Ward (1Bed)	18	10	180	10
	Nurses Station		45	1	45		
	Preparation Room		18	1	18		
	Equipment Room		18	1	18		
	Staff Room		18	2	36		
	PAICU/CCU	Ward (1Bed)	18	20	360	20	
		Nurses Station	35	1	35		
		Preparation Room	18	1	18		
		Equipment Room	18	1	18		
		Staff Room	18	2	36		
	Clinical Simulation Lab	Clinical Simulation Lab (Large)	114	2	228		
		Clinical Simulation Lab (Small)	85	1	85		
		Lecture Room (Large)	224	1	224		
		Lecture Room (Small)	114	1	114		
NET Total					1,758		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					1,686		
Total Floor Area					3,444		
4th Floor	Auditorium	Auditorium (300seats)	440	1	440		
	Lecture Room	Lecture Room	143	1	143		
NET Total					583		
Common Area (Toilets, Pantry, Storage, Corridor and Stairs, etc.)					684		
Total Floor Area					1,267		

Annex 6: Floor Plans of Preliminary Design

Component 1-1

Government Rajaji Hospital (MMCH), Madurai

Site Plan

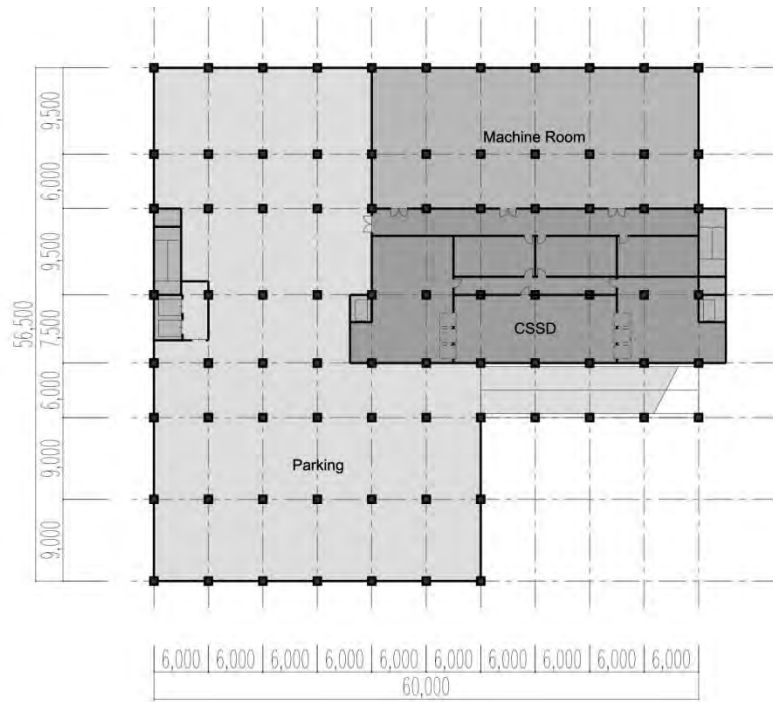


Building Outline

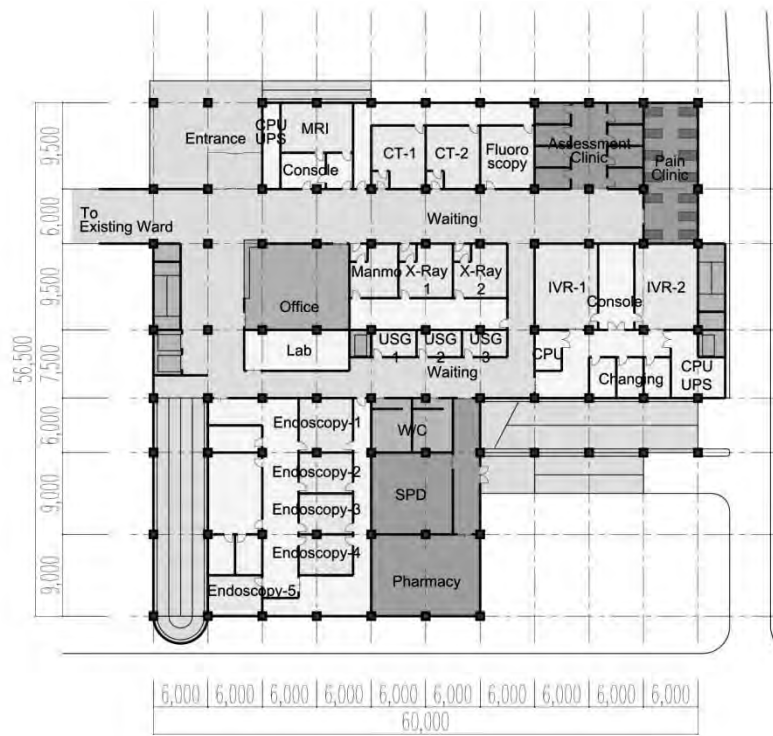
Stacking Diagram of Government Rajaji Hospital (MMCH)

Floor	Major Functions/Department	Floor Area (m ²)
4 th Floor	<ul style="list-style-type: none"> Training Centre: Clinical Simulation Lab, etc. Biomedical Engineering Centre Auditorium (450 seats) & Meeting Room Anesthesia Department Office 	2,481
3 rd Floor	<ul style="list-style-type: none"> POCU (Post Operative Care Unit): 20 beds SICU (Surgical ICU): 10 beds PACU (Post Anesthetic Care Unit): 20 beds Cardio POCU: 20 beds 	3,294
2 nd Floor	<ul style="list-style-type: none"> Operation Theatre Centre: 12 OT rooms & One Hybrid OT (Cardiothoracic, Vascular, Plastic & Pediatric Surgeries) Pre-OT rooms, Changing rooms, etc. 	3,294
1 st Floor	<ul style="list-style-type: none"> Operation Theatre Centre: 13 OT rooms (General Surgery & ENT) Pre-OT rooms, Changing rooms, etc. 	3,294
Ground Floor	<ul style="list-style-type: none"> Imaging Centre: MRI scan, CT scan, Digital X-rays, Mammography, USGs IVR Centre: 2 IVR rooms, Pre-OT rooms, Changing rooms, etc. Endoscopy Units Emergency Laboratory, SPD (Supply Processing Distribution), In-service Pharmacy Administration Office 	3,321
Basement (Stilt Floor)	<ul style="list-style-type: none"> CSSD (Central Sterile and Supply Department) Parking Lots Machine Rooms 	2,865
Total		18,549

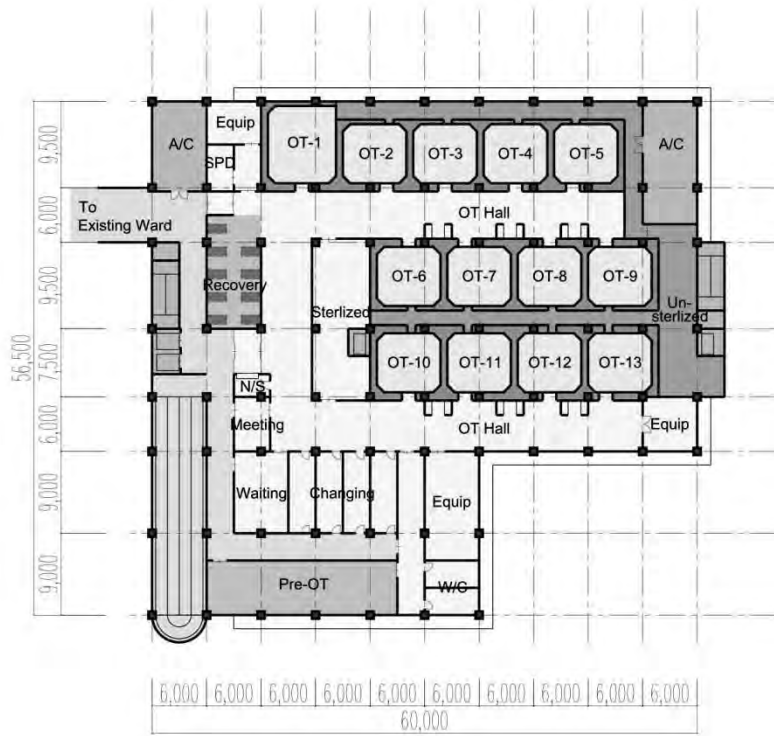
Basement Floor Plan



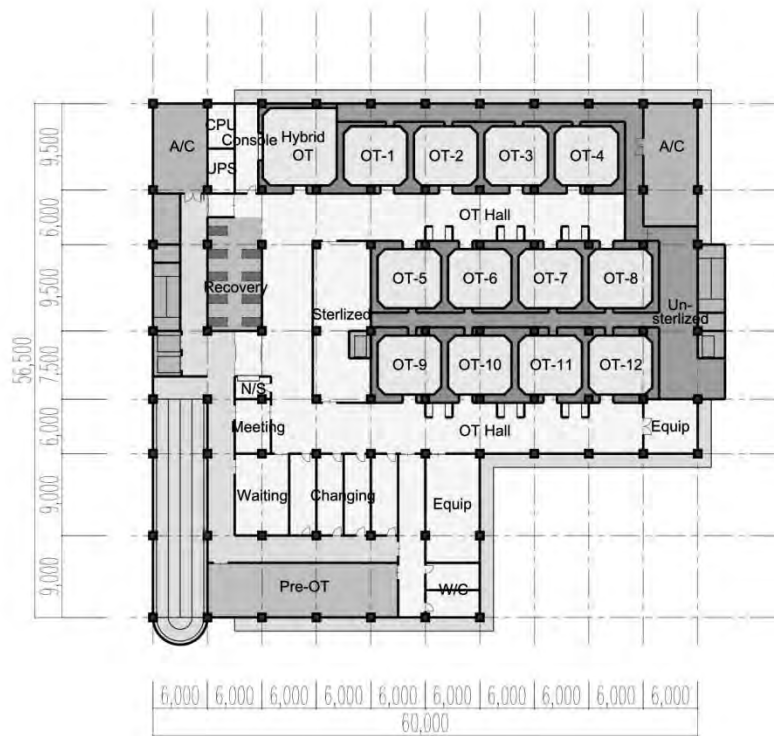
Ground Floor Plan



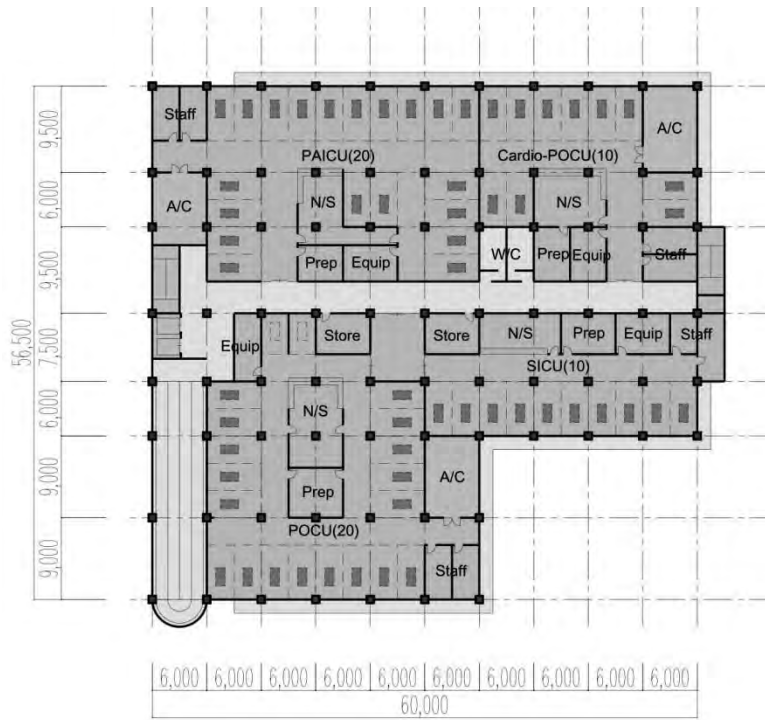
1st Floor Plan



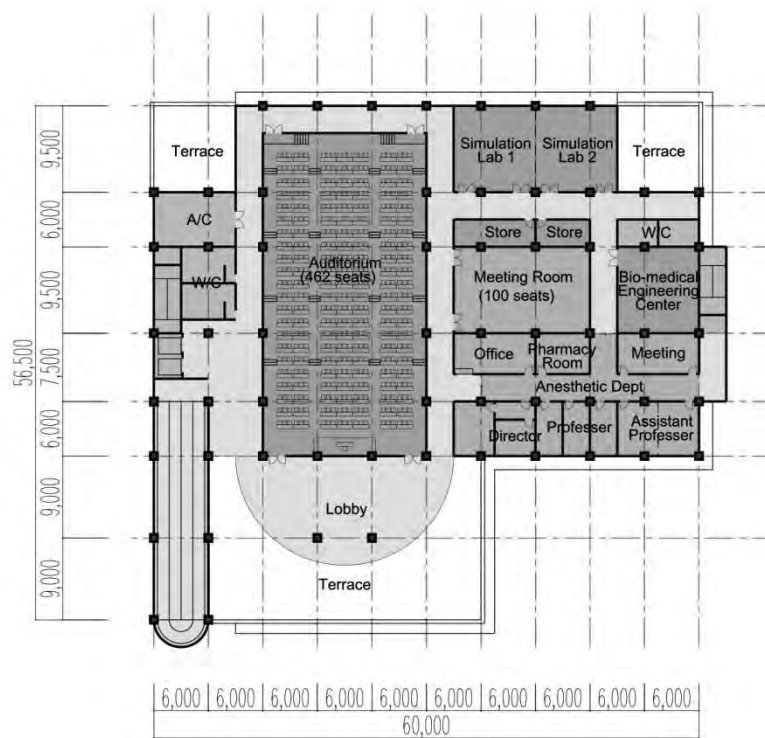
2nd Floor Plan



3rd Floor Plan

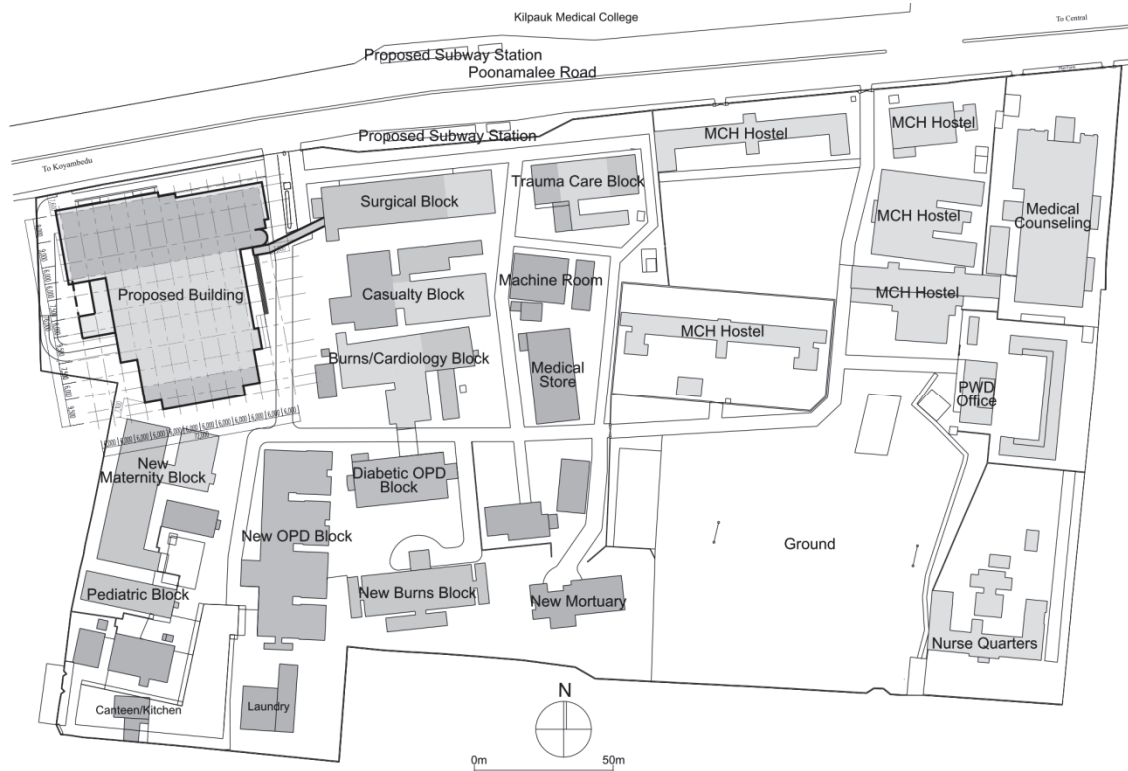


4th Floor Plan



Kilpauk Medical College Hospital (KMCH), Chennai

Site Plan

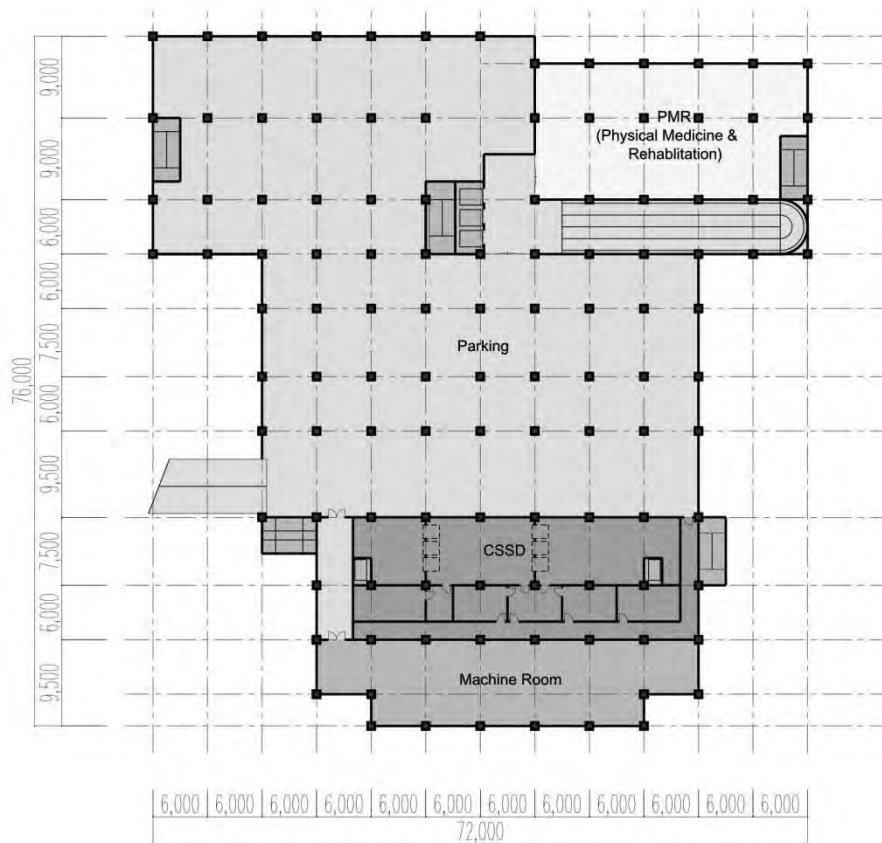


Building Outline

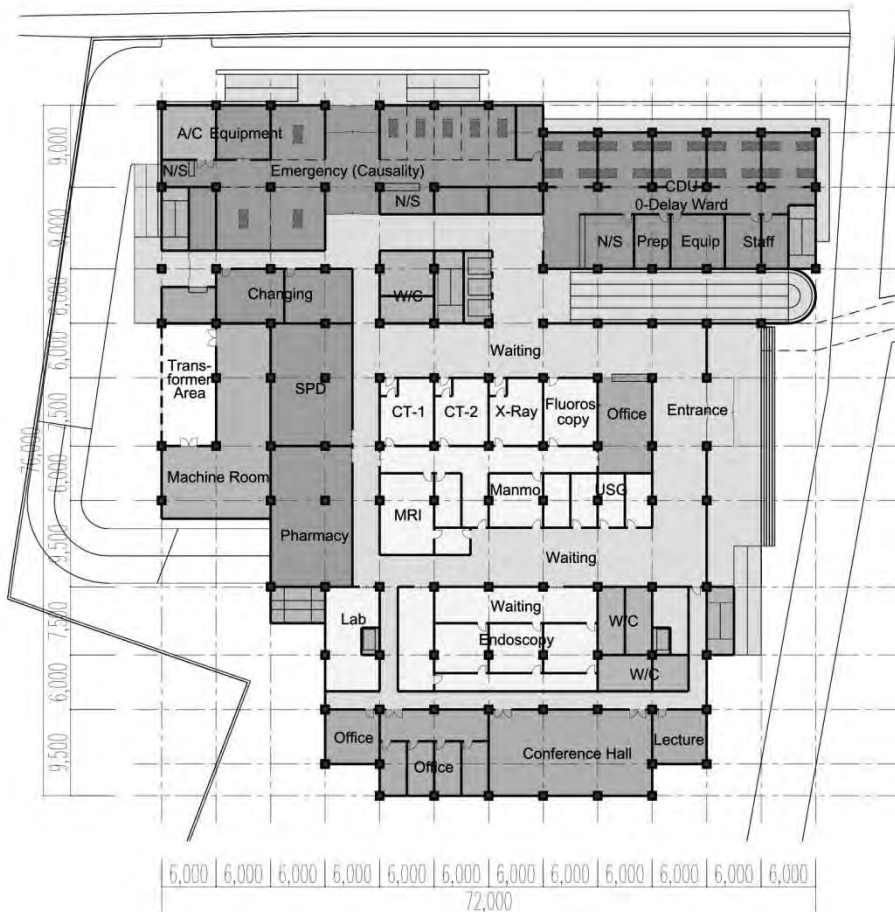
Stacking Diagram of Kilpauk Medical College Hospital

Floor	Major Functions/Department	Floor Area (m ²)
5 th Floor	<ul style="list-style-type: none"> Urology Ward: 30 beds Gynecology Surgery Ward: 60 beds 	1,866
4 th Floor	<ul style="list-style-type: none"> Nephrology Ward: 30 beds Dialysis Unit Ward: 30 beds 	1,866
3 rd Floor	<ul style="list-style-type: none"> General Medicine Ward: 90 beds 	1,866
2 nd Floor	<ul style="list-style-type: none"> Operation Theatre Centre: 12 OT Rooms & One Hybrid OT (General, Vascular, Plastic, Micro, Pediatric surgeries, Urology, ENT, etc.) Pre-OT Rooms, Changing Rooms, etc. POCU (Post Operative Care Unit): 10 beds Anesthesia Department Office (Professors' Rooms, Office and Lecture Room) 	4,174
1 st Floor	<ul style="list-style-type: none"> IVR Centre: 2 IVR Rooms, Pre-OT Rooms, Changing Rooms, etc. SICU (Surgical ICU): 10 beds ICCU (Intensive Coronary Care Unit)/PACU (Post Anesthetic Care Unit): 20 beds IMCU (Intensive Medical Care Unit): 20 beds Blood Bank Department Administration Office, Meeting Room 	4,174
Ground Floor	<ul style="list-style-type: none"> Casualty Department: Treatment Rooms, Casualty ward Zero Delay Ward/CDU (Clinical Decision Unit): 20 beds Imaging Centre: MRI scan, CT scan, Digital X-rays, Mammography, USGs Endoscopy Units Emergency Laboratory, SPD (Supply Processing Distribution), In-service Pharmacy Administration Office, Conference hall 	4,246
Basement (Stilt Floor)	<ul style="list-style-type: none"> PMR (Physical Medicine & Rehabilitation) Department CSSD (Central Sterile and Supply Department) Parking Lots Machine Room 	4,001
Total		22,193

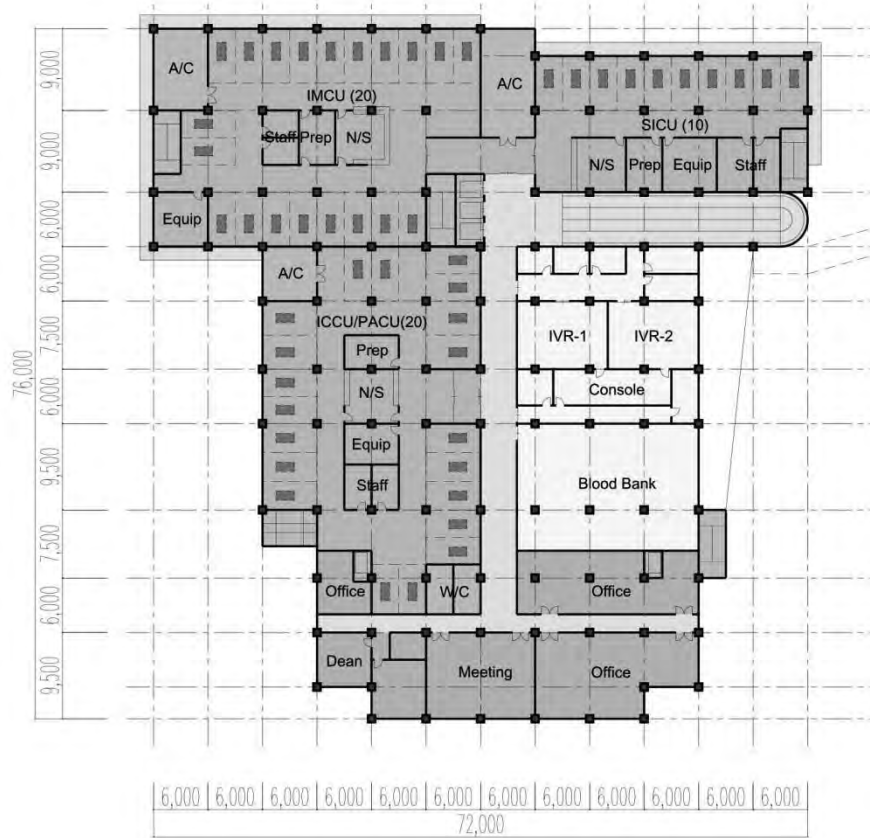
Basement Floor Plan



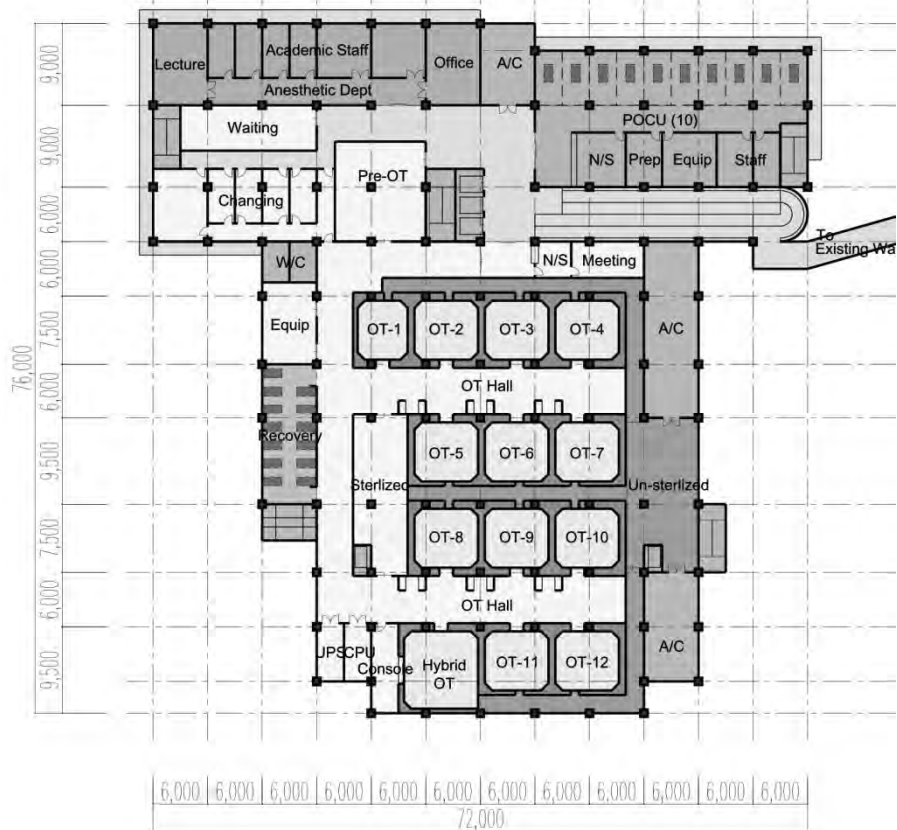
Ground Floor Plan



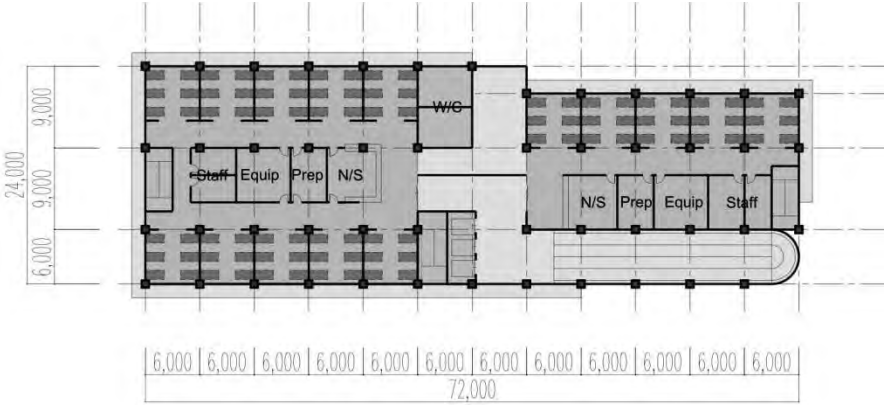
1st Floor Plan



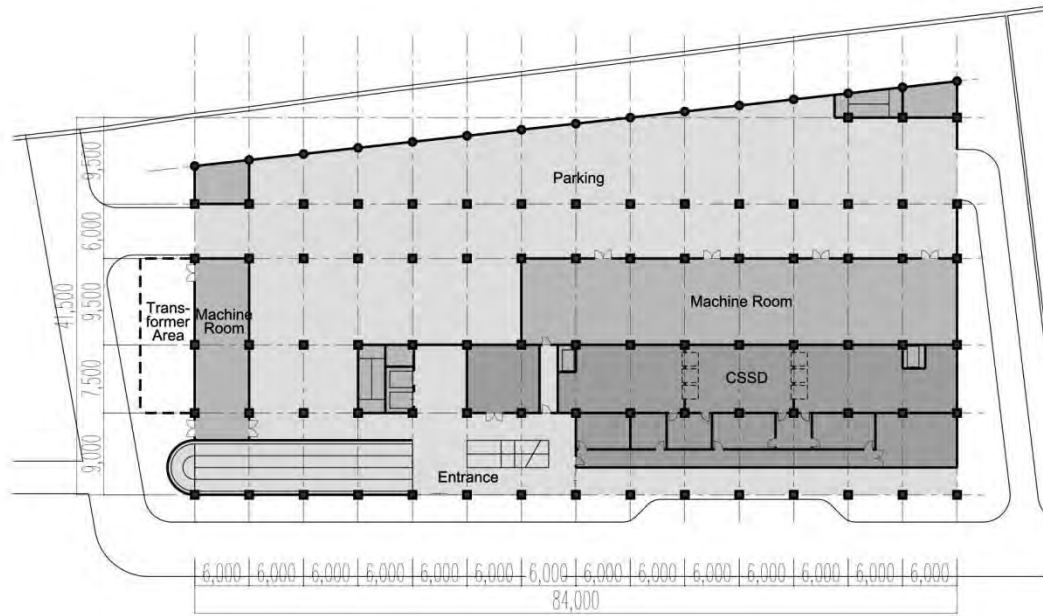
2nd Floor Plan



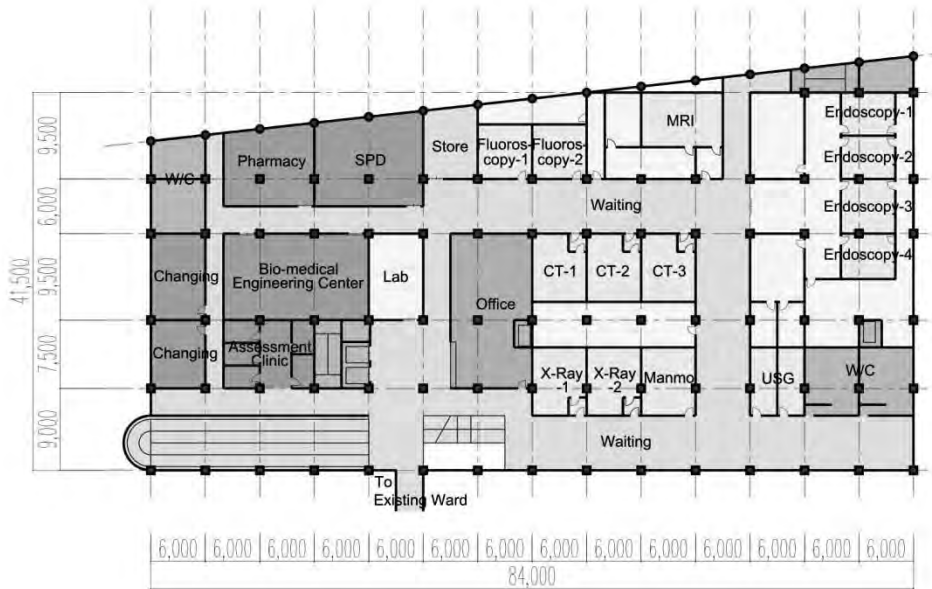
Typical Floor Plan



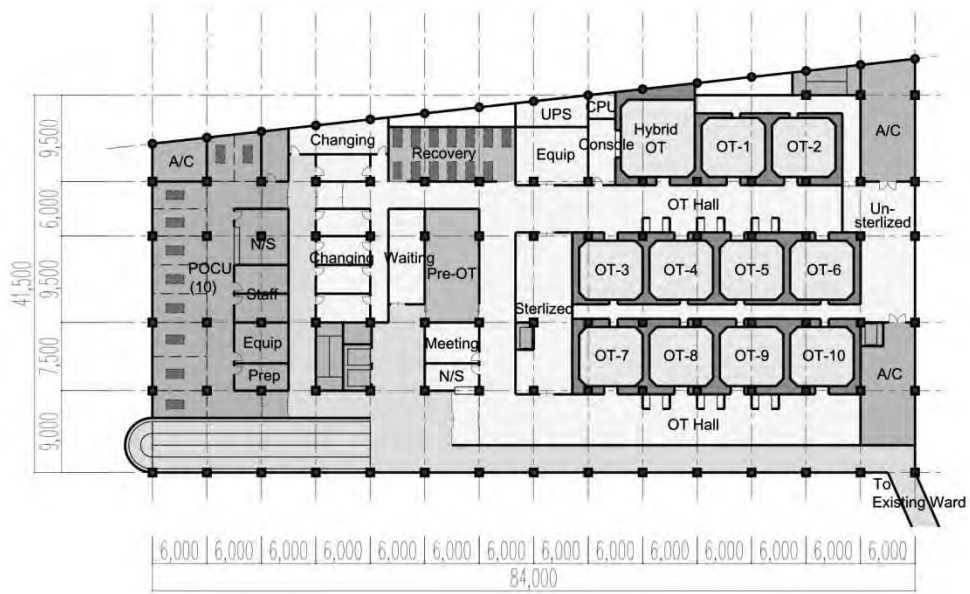
Ground Floor Plan



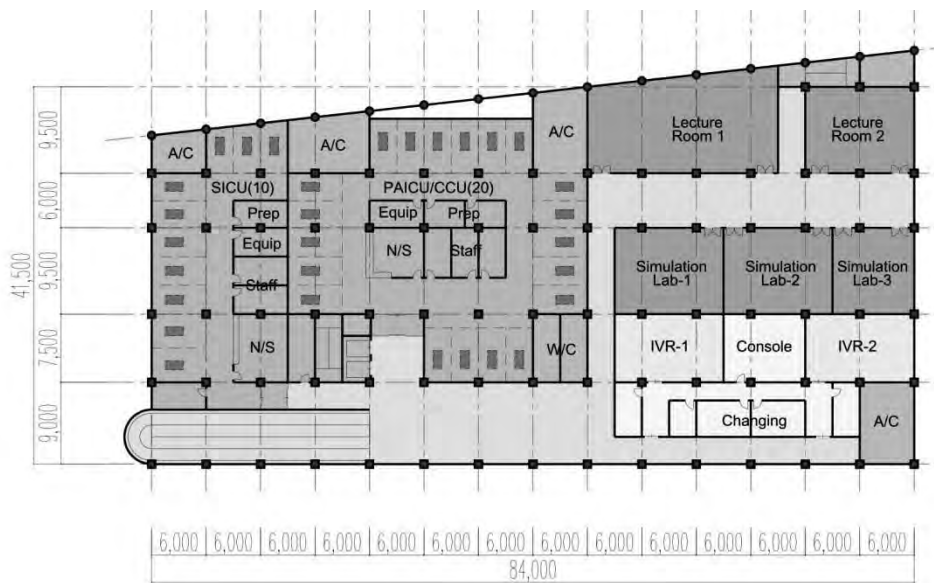
1st Floor Plan



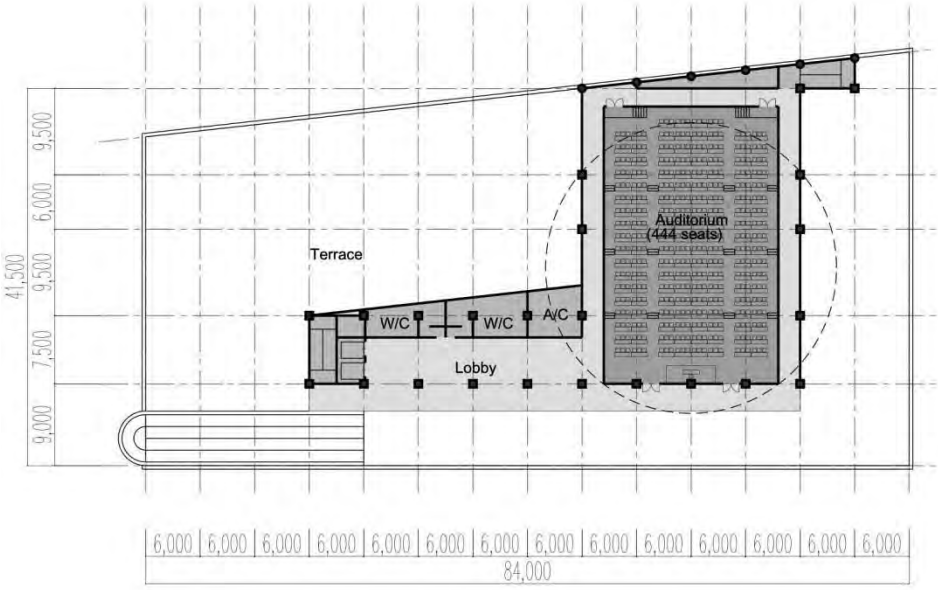
2nd Floor Plan



3rd Floor Plan



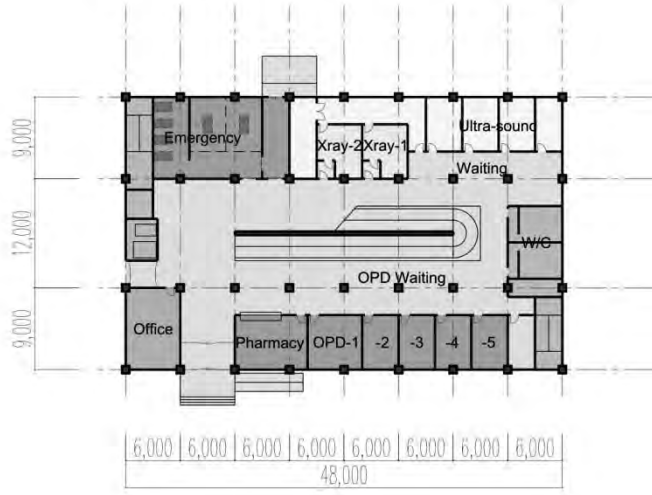
4th Floor Plan



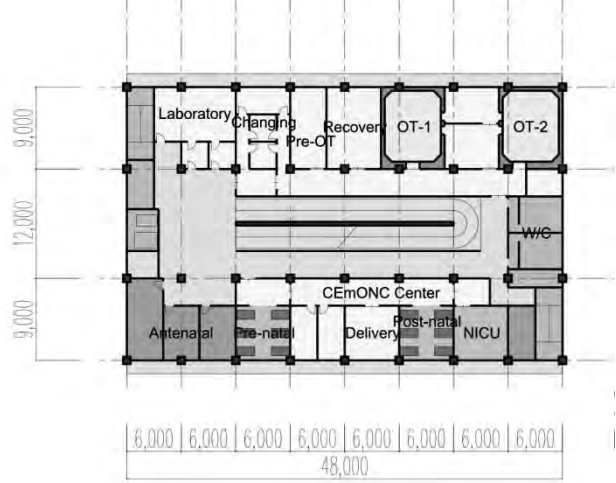
Annex 7: Floor Plans of Preliminary Design

Component 3-1

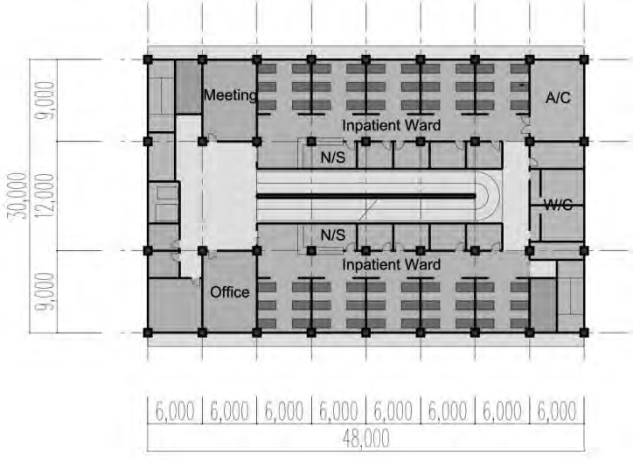
Ground Floor Plan



1st Floor Plan



2nd Floor Plan



Annex 8: Medical Equipment List

Component 1-2

1) Equipment list for 3 Medical College Hospitals

1-1 Government Rajaji Hospital (MMCH), Madurai

No.	Floor	Departments	Service	Room name	Item No.	Equipment	Q'ty	
1	4th	Training Centre	ER Simulation	Simulation Lab-1	AA-01	ER simulators	1	
			ICU simulation	Simulation Lab-2	AA-02	ICU simulation system	2	
			Nursing simulation		AA-03	Nursing simulators	1	
2	4th	Biomedical Engineering Centre	Maintenance management	Workshop	BB-01	Maintenance tool sets	3	
					BB-02	Testing machines for check-up	3	
					BB-03	Work tables and other items	1	
					BB-04	Personal computers	3	
				Office	BB-05	Printers and copy machines	1	
3	3rd	ICU	Post Anesthesia Intensive Care Unit	PAICU Rooms (20 beds)	CC-01	Patient monitors w/ ET-CO2	20	
					CC-02	Ventilators	20	
					CC-03	Syringe pump	20	
					CC-04	Infusion pump	20	
					CC-05	PCA Pumps	20	
					CC-06	IABP	2	
					CC-07	TEE	2	
					CC-08	ABG	3	
					CC-09	TEG	2	
					CC-10	CO monitor	2	
					CC-11	Instrument sets and others (ICU)	20	
					CC-12	Defibrillator	10	
					CC-13	Haemodialysis machine	2	
					CC-14	CRR T machine	3	
					CC-15	SLED-F machine	1	
					CC-16	RO plant	1	
					CC-17	Difficult intubation trolley	1	
					CC-18	Ultrasound Machine	1	
					CC-19	ICU beds	20	
			Cardiothoracic Post Operative Intensive Care	Cardio-PO ICU Rooms (10 beds)	CC-20	Patient monitors	10	
					CC-21	Ventilators	10	
					CC-22	Syringe pump	10	
					CC-23	Infusion pump	10	
					CC-24	Instrument sets and others (ICU)	10	
					CC-25	Defibrillator	5	
					CC-26	ICU beds	10	
Surgical Intesive Care Unit	SICU rooms (10 beds)	CC-27	Patient monitors	10				
		CC-28	Ventilators	10				
		CC-29	Syringe pump	10				
		CC-30	Infusion pump	10				
		CC-31	Instrument sets and others (ICU)	10				
		CC-32	Defibrillator	5				
		CC-33	ICU beds	10				
Surgical Post Operative Intesive Care Unit	PO ICU Rooms (20 beds)	CC-34	Patient monitors w/ ET-CO2	20				
		CC-35	Defibrillator	5				
		CC-36	Difficult intubation trolley	1				
		CC-37	ICU beds	20				
		CC-38	Instruments set and others (HCU)	20				
4	2nd	Operation Theater-I	Surgical Operation	Operation Rooms (OR) (1) Cardiothoracic Surgery (2) Vascular Surgery (3) Plastic Surgery (4) Pediatric Surgery Subtotal ORs	DD-01	Operation tables	12	
					4	DD-02	Electrosurgical unit	12
					2	DD-03	Anesthesia work station	12
					2	DD-04	Broncho fibrescope	2
					4	DD-05	Videassisted thoracoscope	2
					12	DD-05	Ultrasound machine	2
						DD-06	Sylinge pump	12
						DD-07	Infusion pump	12
						DD-08	Fluid and blood warmer	12
						DD-09	TV monitors	12
						DD-10	ABG	12
						DD-11	Pendant arm system	24
						DD-12	Nerve stimulator	5
						DD-13	C-arm X-ray unit for pediatric urology	1
						DD-14	Uro Dynamic study unit	1
						DD-15	Difficult intubation trolley	1
						DD-16	Harmonic scalpel	1
						DD-17	Flexible Urethroscope set w/laser	1
						DD-18	Urethroscope w/TURP set	1
						DD-19	Arthroscope set	1
						DD-20	ND Yog Laser	1
						DD-21	BIS monitor	5
						DD-22	Patient monitor	0
						DD-23	Defibrillator	0
						DD-24	Operation Microscope for ENT and Neurosurgery w/CCD camera	2
						DD-25	Operation Lights w/camera	12
						DD-26	Heart-lung machine system	2
						DD-27	Ultrasound Machine for Cardiology	2
						DD-28	Scrub sink	12
	DD-29	Instruments set and others	1					

				Hybrid OR	1	DD-30	Angiography system w/CT	1
						DD-31	Hybrid operation table	1
						DD-32	Work station for imaging analysis	1
						DD-33	Anesthesia workstation	1
						DD-34	Pendant arm system	2
						DD-35	Polygraph	1
						DD-36	Injector	1
						DD-37	Operation Light w/camera	1
						DD-38	Defibrillator	1
						DD-39	Heart-lung machine	1
						DD-40	ABG	1
						DD-09	TV monitors	1
						DD-41	Instruments set and others	1
						DD-42	Scrub sink	1
		Recovery		Recovery room (9 beds)		DD-43	Recovery beds	9
						DD-44	Patient monitors	4
						DD-45	Ventilators	4
						DD-46	Haematology analyzer	1
						DD-47	ABG	1
						DD-48	Electrolyte analyzer	1
				Meeting room (Conference)		DD-49	DVD system	1
						DD-50	LCD monitors	5
5	1st	Operation Theater-II	Surgical Operation	Operation Rooms (OR)		DD-50	Operation tables	13
				(1) General Surgery	8	DD-51	Operation Lights w/camera	13
				(2) ENT Surgery	3	DD-52	Electrosurgical units	13
						DD-53	Anesthesia work station	13
						DD-54	Pendant arm system	26
						DD-55	TV monitors	13
						DD-56	ABG	13
						DD-57	Nerve stimulator	6
						DD-58	Difficult intubation trolley	1
						DD-59	BIS monitor	5
						DD-60	Patient monitors w/ ET-CO2	13
						DD-61	Defibrillators	5
						DD-62	ENT Operating Microscope	1
						DD-63	Operating Microscope	1
				Laparoscope	2	DD-64	Laparoscope set	3
						DD-65	Stapling device assorted	3
						DD-66	Endo-stapler	3
						DD-67	Harmonic scalpel	2
						DD-68	ND Yog Laser	2
						DD-69	Endoscopic embedded laryngoscope	2
						DD-70	Ultrasound machine	2
						DD-71	Sylinge pump	13
						DD-72	Infusion pump	13
						DD-73	Fluid and blood warmer	13
						DD-74	Autoclave, high speed	5
						DD-75	Scrub sink	13
						DD-76	Instruments set and others	8
		Recovery		Recovery room (9 beds)		DD-77	Recovery beds	9
						DD-78	Patient monitors	4
						DD-79	Ventilators	4
						DD-80	Haematology analyzer	1
						DD-81	ABG	1
						DD-82	Electrolyte analyzer	1
		Conference		Meeting room (Conference)		DD-83	DVD recording system	1
						DD-84	LCD monitors	5
6	G	IVR Centre	Interventional Radiology for Cardiovascular cases	IVR O/T	2	CC-11	Angiography system-Single plane	1
						CC-12	Angiography system-Biplane	1
						CC-13	Work station for imaging analysis	2
						CC-14	Anesthesia machine	2
						CC-15	ABG	2
						CC-16	TV monitors	2
						CC-17	Pendant arm system	4
						CC-18	Polygraph	2
						CC-19	Injector	2
						CC-20	Operation Light w/camera	2
						CC-21	Defibrillator	2
						CC-22	Instruments set and others	2
7	G	Endoscopy	Endoscopy	Gastro-intestinal Endoscopy	2	EE-01	Gastro-fiberscope	1
						EE-02	Colonoscope	2
						EE-03	Esophago Gastro Duodenoscope	1
						EE-04	Endoscopic table	0
						EE-05	Endoscope auxiliary equipment	2
				ENT	3	EE-06	ENT rigidscope	2
						EE-07	Broncho fibrescope	0
						EE-08	ND Yog Laser	1
						EE-09	Endoscopic table	2
						EE-10	Endoscope auxiliary equipment	1
8	G	Pharmacy	Pharmacy	Pharmacy		FF-01	Drug refrigerators	2
						FF-02	Distiller	1

9	G	Pain clinic	Pain Control	Pain clinic	1	GG-01	C-arm X-ray unit	1
				Assesmentn clinic	8	GG-02	OT table	1
						GG-03	Ultrasound machine	1
						GG-04	Anesthesia machine w/Boyle's machine	1
						GG-05	Patient monitor	1
						GG-06	Treatment tables	7
						GG-07	Patinet beds	13
10	G	Imaging	X-ray	General X-ray		HH-01	Digital X-ray	2
				Fluoroscopy		HH-02	Digital Fluoroscopy	1
				Mammography		HH-03	Digital Mammography	1
				MRI		HH-04	MRI	1
						HH-05	MRI compatible anesthesia	1
				CT scan		HH-06	CT scanner-I	1
						HH-07	CT scanner-II	1
				Mobile X-ray		HH-08	Digital Mobile X-ray unit	8
						HH-09	PACS	1
						HH-10	Lazer printer	8
			Ultrasound	Ultrasound	HH-11	Ultrasound Machine for general use	1	
					HH-12	Ultrasound Machine for Cardiology	2	
11	G	Laboratory	Clinical testing	Laboratory		II-01	ABG	1
						II-02	Urine analyzer	1
						II-03	Blood coagulometer	1
						II-04	Haematology analyzer	1
						II-05	Biochemistry analyzer	1
						II-06	Electrolite analyzer	1
12	B	CSSD	CSSD	Receiving and wash		JJ-01	Washer Disinfecter	3
						JJ-02	Ultrasonic cleaner	1
						JJ-03	High pressure water nozzle	2
						JJ-04	Working tables & others	1
				Sterilizing		JJ-05	Autoclaves	3
						JJ-06	Formalin sterilizer	1
						JJ-07	Working tables & others	1
				Packing		JJ-08	Working tables & others	1

1-2 Kilpauk Medical College Hospital (KMCH), Chennai

No.	Floor	Departments	Service	Room name	Item No.	Equipment	Q'ty				
1	5th	Gynaecology Ward	Inpatient care	Inpatient rooms	NW-01	Inpatient beds	60				
					NW-02	Furniture	60				
					NW-03	Ultrasound machine w/Doppler	1				
					NW-04	ECG	1				
					NW-05	Pelvic trainer	2				
2	5th	Urology Ward	Inpatient care	Inpatient rooms	NW-06	Inpatient beds	30				
					NW-07	Furniture	30				
					NW-08	Ultrasound machine w/Doppler	1				
					NW-09	ESWL	1				
					NW-10	Video urodynamic machine	1				
					NW-11	Instruments and others	1				
3	4th	Nephrology Ward	Inpatient care	Inpatient rooms	NW-01	Inpatient beds	30				
					NW-02	Furniture	30				
					NW-03	Instruments and others	1				
4	4th	Haemodialysis Centre	Haemodialysis	Haemodialysis	HD-01	Haemodialysis units	23				
					HD-02	Dialysis beds	23				
					HD-03	RO system	1				
5	3rd	General Medicine Ward	Inpatient care	Inpatient rooms	GM-01	Inpatient beds	90				
					GM-02	Furniture	90				
					GM-03	Instruments and others	1				
6	2nd	POCU	Post Operative Care	POCU rooms	PA-10	Patient monitors w/ ET-CO2	10				
					PA-11	Ventilators	1				
					PA-12	Defibrillator	3				
					PA-13	Difficult intubation trolley	1				
					PA-14	ICU beds	10				
					PA-15	Instruments set and others (HCU)	30				
7	2nd	Anaesthesia dept.	Postgraduates training	Class room for 40 students	AN-01	CPR trainers	2				
					AN-02	Intubation simulator	2				
					AN-03	Venous cannulation simulators	2				
					AN-04	Audio-visual equipment	1				
8	2nd	Operation Theatre	Surgical Operation	Operation Rooms (OR) (1) General Surgery (2) Plastic Surgery (3) Micro-Surgery (4) Paediatric Surgery (5) Vascular Surgery Sub-total	OP-01	Operation tables	12				
					OP-02	Operation Lights w/camera	12				
					OP-03	Electrosurgical units w/harmonic scalpel	12				
					OP-04	Anaesthesia work station	12				
					OP-05	Patient monitors	12				
					OP-06	Pendant arm system	24				
					OP-07	Defibrillators	6				
					OP-08	Operation Microscopes	4				
					OP-09	Heart-lung machine system	2				
					OP-10	TV monitors	12				
					OP-11	ABG	12				
					OP-12	Syringe pump	24				
					OP-13	Infusion pump	12				
					OP-14	Fluid and blood warmer	12				
					OP-14	Nerve stimulator	6				
					OP-15	Ultrasound Machine for Venous Cannulation and nerve localization	2				
					OP-16	Broncho fiberscope	2				
					OP-17	Ultrasound Machine for Cardiology	2				
					OP-18	C-arm X-ray unit	1				
					OP-19	Arthroscope set	1				
					OP-20	Laparoscopy set	11				
					OP-21	Hysteroscopy set	2				
					OP-22	Flexible Urethroscope set w/laser	1				
					OP-23	Urethroscope w/TURP set	1				
					OP-24	PCNL set	1				
					OP-25	TURIS	1				
					OP-26	Scrub sink	12				
					OP-27	Autoclave, high speed	8				
					OP-28	Instruments set and others	8				
							Hybrid OR	1	OP-29	Angiography system w/ CT	1
									OP-30	Hybrid operating table	1
									OP-31	TV monitor	1
									OP-32	ABG	1
									OP-33	Work station for imaging analysis	1
									OP-34	Anaesthesia work station	1
									OP-35	Polygraph	1
									OP-36	Injector	1
									OP-37	Operation Light w/ camera	1
									OP-38	Pendant arm system	2
									OP-39	Defibrillator	1
									OP-40	Heart-lung machine system	1
									OP-41	Scrub sink	1
									OP-42	Instruments set and others	1
							Recovery		OP-43	Recovery beds	13
									OP-44	Patient monitors	6
									OP-45	Ventilators	6
									OP-46	Haemotology analyzer	1
				OP-47	ABG	1					
				OP-48	Electrolyte analyzer	1					
		Conference		OP-49	DVD system	1					
				OP-48	LCD monitors	5					

9	1st	IMCU	Intensive Care	ICU Rooms	CC-01	Patient monitors	12	
					CC-02	Ventilators	14	
					CC-03	Syringe pump	20	
					CC-04	Infusion pump	20	
					CC-05	ECG	3	
					CC-06	PCA Pumps	20	
					CC-07	IABP	2	
					CC-08	TEE	2	
					CC-09	ABG	3	
					CC-10	TEG	2	
					CC-11	CO monitor	2	
					CC-12	Instrument sets and others (ICU)	20	
					CC-13	Defibrillator	10	
					CC-14	CRRT machine	3	
					CC-15	RO plant	1	
					CC-16	Difficult intubation trolley	1	
					CC-17	Ultrasound Machine w/ echo probe	1	
					CC-18	ICU beds	20	
10	1st	ICCU	Intensive Coronary Care	ICCU Rooms	CC-19	Patient monitors	4	
					CC-20	Ventilators	10	
					CC-21	Syringe pump	10	
					CC-22	Infusion pump	10	
					CC-23	Instrument sets and others (ICU)	10	
					CC-24	Defibrillator	1	
11	1st	PACU	Post Anaesthesia Care		CC-25	ICU beds	10	
					PA-01	Patient monitors	10	
					PA-02	Ventilators	10	
					PA-03	Syringe pump	10	
					PA-04	ABGA	1	
					PA-05	Echocardiogram w/Doppler	1	
					PA-06	Infusion pump	10	
					PA-07	Instrument sets and others (ICU)	10	
					PA-08	Defibrillator	5	
PA-09	ICU beds	10						
12	1st	SICU	Surgical Intensive Care	SICU rooms	CC-26	Patient monitors	10	
					CC-27	Ventilators	10	
					CC-28	Syringe pump	10	
					CC-29	Infusion pump	10	
					CC-30	Instrument sets and others (ICU)	10	
					CC-31	Defibrillator	5	
13	1st	IVR Centre	Interventional Radiology	IVR O/T	CC-32	ICU beds	10	
					IV-01	Angiography system-Single	1	
					IV-02	Angiography system-Biplane	1	
					IV-03	Work station for imaging analysis	2	
					IV-04	Pendant arm system	4	
					IV-05	TV monitor	2	
					IV-06	ABG	2	
					IV-07	Anaesthesia work station	2	
					IV-08	Polygraph	2	
					IV-09	Injector	2	
					IV-10	Operation Light w/camera	2	
					IV-11	Defibrillator	2	
					IV-12	Pendant arm system	2	
IV-13	Instruments set and others	2						
14	1st	Blood Bank	Blood Bank	Blood Bank	DD-01	Blood Bank Refrigerators	12	
					DD-02	Blood Freezers	3	
15	G	Endoscopy	Endoscopy	Gastro-intestinal Endoscopy	2	EE-01	Gastro-fiberscope	1
					EE-02	Colonoscope	1	
					EE-03	Oesophagi Gastro Duodenoscope	2	
					EE-04	Endoscopic table	2	
					EE-05	Endoscope auxiliary equipment	2	
				ENT	1	EE-06	ENT rigid scope	2
					EE-07	Broncho fiberscope	1	
					EE-08	ND Yog Laser	1	
					EE-09	Endoscopic table	2	
					EE-10	Endoscope auxiliary equipment	2	
16	G	Emergency	Emergency service	Resuscitation	FF-06	Operation Light, stand	5	
					FF-07	Patient monitors	5	
					FF-08	Instruments set and others	8	
					FF-09	Operating Light with camera	3	
				Operation Rooms (OR)	FF-10	Aesthetic Work Station	3	
					FF-11	Pendant arm system	3	
					FF-12	Operation tables w/camera	3	
					FF-13	Patient monitors	3	
FF-14	Defibrillators	1						
17	G	0-Delay Ward	CDU	CDU rooms	GG-01	Patient monitors	20	
					GG-02	Ventilators	20	
					GG-03	Syringe pump	20	
					GG-04	Infusion pump	20	
					GG-05	Instrument sets and others (ICU)	20	
					GG-06	Defibrillator	10	
					GG-07	ICU beds	20	

18	G	Imaging	Radiology	General X-ray	HH-01	Digital X-ray	0
				Fluoroscopy	HH-02	Digital Fluoroscopy	1
				Mammography	HH-03	Digital Mammography	1
				MRI	HH-04	MRI	1
					HH-05	MRI compatible anaesthesia machine	1
				CT scan	HH-06	CT scanner-I	1
					HH-07	CT scanner-II	1
				Mobile X-ray	HH-08	Digital Mobile X-ray unit	4
				PACS	HH-09	PACS	1
					HH-10	Laser printer	6
				Ultrasound	HH-11	Ultrasound Machine for general use	2
					HH-12	Ultrasound Machine for Cardiology	2
19	1st	Laboratory	Clinical testing	Laboratory	LA-01	ABG	1
					LA-02	Urine analyzer	1
					LA-03	Blood coagulometer	1
					LA-04	Haematology analyzer	1
					LA-05	Biochemistry analyzer	1
					LA-06	Electrolite analyzer	1
20	B	Physical Medicine & Rehabilitation Centre (PMR)	Physiotherapy	Physiotherapy	PR-01	Gait lab	1
					PR-02	Functional robotic gait therapy	1
					PR-03	Robotic arm	1
					PR-04	Virtual reality system	1
					PR-05	Unweighting support system	1
					PR-06	Balance system	1
					PR-07	FES	2
					PR-08	EMG bio feed back	3
					PR-09	Musculoskeletal ultrasound	1
					PR-10	Scanning laser	1
					PR-11	Basic physio therapy equipment	1
					PR-12	Basic occupational therapy equipment	1
					PR-13	Basic prosthetic and orthotic fabrication equipment	1
	PMR ward	PMR rooms	PR-01	Inpatient beds	30		
			PR-02	Furniture	30		
21	B	CSSD	CSSD	Receiving and wash	CS-01	Washer Disinfectors	4
					CS-02	Ultrasonic cleaner	2
					CS-03	High pressure water nozzle	2
					CS-04	Working tables & others	1
				Sterilizing	CS-05	Autoclaves	6
					CS-06	Formalin sterilizer	1
					CS-07	Working tables & others	1
				Packing	CS-08	Working tables & others	1

1-3 Coimbatore Medical College Hospital (CMCH), Coimbatore

No.	Floor	Departments	Service	Room name	ItemNo.	Equipment	Q'ty		
1	3rd	Training Centre	ER Simulation	Simulation Lab-1	AA-01	ER simulators	2		
			ICU simulation	Simulation Lab-2	AA-02	ICU simulation system	2		
			Nursing simulation	Simulation Lab-3	AA-03	Nursing simulators	2		
2	3rd	ICU	Cardiothoracic Post Operative Care	PAICU/CCU Rooms (20beds)	BB-01	Patient monitors	20		
					BB-02	Ventilators	20		
					BB-03	Syringe pump	20		
					BB-04	Infusion pump	20		
					BB-05	Instrument sets and others (ICU)	20		
					BB-06	CRRT machine	3		
					BB-07	Defibrillator	10		
					BB-08	ICU beds	20		
					BB-09	Patient monitors	10		
					BB-10	Ventilators	10		
					BB-11	Syringe pump	10		
					BB-12	Infusion pump	10		
					BB-13	Instrument sets and others (ICU)	10		
					BB-14	Defibrillator	5		
					BB-15	ICU beds	10		
3	3rd	IVR Centre	Interventional Radiology for Cardiovascular cases	IVR OR	CC-01	Angiography system-Single	1		
					CC-02	Angiography system-Biplane	1		
					CC-03	Work station for imaging analysis	2		
					CC-04	Anesthesia machine	2		
					CC-05	TV monitors	2		
					CC-06	ABG	1		
					CC-07	Polygraph	2		
					CC-08	Injector	2		
					CC-09	Operation Lights w/camera	2		
					CC-10	Defibrillator	2		
					CC-11	Instruments set and others	2		
4	2nd	Operation Theater	Surgical Operation	Operation Rooms (OR)	DD-01	Operation tables	10		
					DD-02	Operation lights w/camera	10		
					(1) General Surgery	2	DD-03	Electrosurgical unit	10
					(2) Orthopedic Surgery	3	DD-04	Anesthesia work station	10
					(3) Cardiothoracic Surgery	2	DD-05	Patient monitor	10
					(4) ENT	3	DD-06	Defibrillator	5
					Sub-total	10	DD-07	Operation Microscope w/CCD camera	2
							DD-08	Heart-lung machine system	4
							DD-09	Ultrasound Machine for Cardiology	2
							DD-10	Pendant arm system	20
							DD-11	ABG	10
							DD-12	TV monitors	10
							DD-13	Arthroscope set	1
							DD-14	Scrub sink	10
							DD-15	C-arm X-ray unit	2
							DD-16	Arthroscope set	1
							DD-17	Instruments set and others	1
				Hybrid Operation	Hybrid OR	1	DD-18	Angiography system w/CT	1
							DD-19	Hybrid operating table	1
							DD-20	Work station for imaging analysis	1
							DD-21	Anesthesia workstation	1
							DD-22	Pendant arm system	2
							DD-23	Polygraph	1
							DD-24	Injector	1
							DD-25	Operation Light w/camera	1
							DD-26	Defibrillator	1
							DD-27	Heart-lung machine	1
							DD-28	Instruments set and others	1
							DD-29	Scrub sink	1
					DD-30	ABG	1		
				Recovery	Recovery room (13 beds)		DD-31	Recovery beds	13
							DD-32	Patient monitors	6
							DD-33	Ventilators	6
	DD-34	Haemotology analyzer	1						
	DD-35	ABG	1						
	DD-36	Electrolyte analyzer	1						
	DD-37	DVD system	1						
Conference	Meeting room (Conference)		DD-38	LCD monitors	5				
5	2nd	ICU	Post Operative Care	POCU Rooms (10 beds)	EE-01	Patient monitors w/ ET-CO2	10		
					EE-02	Ventilators	10		
					EE-03	Syringe pump	10		
					EE-04	Infusion pump	10		
					EE-05	PCA Pumps	10		
					EE-06	ABG	3		
					EE-07	Instrument sets and others (ICU)	10		
					EE-08	Defibrillator	5		
					EE-09	Hemodialysis machine	2		
					EE-10	CRRT machine	1		
					EE-11	SLED-F machine	1		
					EE-12	RO plant	1		
					EE-13	Difficult intubation trolley	1		
					EE-14	Ultrasound Machine	1		
					EE-15	ICU beds	10		

6	1st	Imaging dept.	X-ray	General X-ray		FF-01	Digital X-ray	1
				Fluoroscopy		FF-02	Digital Fluoroscopy	1
				Mammography		FF-03	Mammography	1
				MRI		FF-04	MRI	1
						FF-05	MRI compatible anesthesia	1
				CT scan		FF-06	CT scanner-I	1
						FF-07	CT scanner-II	1
				Mobile X-ray		FF-08	Digital Mobile X-ray unit	3
						FF-09	PACS	1
					Ultrasound	Ultrasound		FF-10
7	1st	Endoscopy	Endoscopy	Gastro-intestinal Endoscopy	2	GG-01	Gastro-fiberscope	1
						GG-02	Colonoscope	1
						GG-03	Duodenoscope	1
						GG-04	Endoscopic table	2
						GG-05	Endoscope auxiliary equipment	2
				ENT	2	GG-06	ENT fiberscope, video	1
						GG-07	Endoscopic table	2
						GG-08	Endoscope auxiliary equipment	1
8	1st	Pharmacy	Pharmacy	Preparation		HH-01	Medical refrigerator	1
				Storage		HH-02	Water distiller	1
						HH-03	RO unit	1
						HH-04	Fume hood	2
						HH-05	Autoclave, vertical	1
9	1st	Biomedical Engineering Centre	Maintenance management	Workshop		II-01	Maintenance tool sets	3
						II-02	Testing machines for check-up	3
						II-03	Work tables and other items	1
						II-04	Personal computers	2
				Office		II-05	Printers and copy machines	1
10	1st	Laboratory	Clinical testing	Laboratory		JJ-01	ABG	1
						JJ-02	Urine analyzer	1
						JJ-03	Blood coagulometer	1
						JJ-04	Haematology analyzer	1
						JJ-05	Biochemistry analyzer	1
						JJ-06	Electrolyte analyzer	1
11	G	CSSD	CSSD	Receiving and wash		KK-01	Washer Disinfectant	4
						KK-02	Ultrasonic cleaner	2
						KK-03	High pressure water nozzle	2
						KK-04	Working tables & others	1
				Sterilizing		KK-05	Autoclaves	6
						KK-06	Formalin sterilizer	1
						KK-07	Working tables & others	1
				Packing		KK-08	Working tables & others	1

2) Result of Equipment Needs Survey for 3 Medical College Hospitals

2-1 Government Rajaji Hospital (MMCH), Madurai

No.	Departments	Service	Room name	Item No.	Existing Equipment	Quantity	Required Quantity and Justification	Priority	Priority of all items		
1	Imaging dept.	X-ray	General X-ray	AA-01	Digital X-ray	1	1	A	Increasing demand daily 80 -100 patients taken on Digital X-ray single machine. Total X-rays - 200/day		
			Fluoroscopy	AA-02	Digital Fluoroscopy		1	A	MCI requirement -need I fluoroscopy		
			Mammography	AA-03	Mammography	1	1	B	NCD patients -increased referral -included in CMCHIS		
			MRI	AA-04	MRI	1	1	B	old machine -No software upgradation advanced software -MR spectroscopy perfusion		
			CT scan	AA-05	CT scan for Cardiology	1	-	-	-		
			Mobile X-ray	AA-06	Mobile X-ray unit	6	2	A	Required for ICU, IRCU, PICU, SICU		
			CR room	AA-07	CR machine for General, Mobile	2	1	B	Required for Digital Mammo Images		
			DR room	AA-08	DR machine for Fluoroscopy	-	-	-	-		
		Ultrasound	Ultrasound	AA-09	Ultrasound machine	6	2	A	Separate unit needed for Annabusstands, emergency room, Master Health room, etc.		
			Orthopanto tomographs (OPG)		-	-	-	-	Required for expert dental treatment		
		Endoscopy	Gastro-intestinal	BB-01	Gastro-fiberscope	1					
				BB-02	Duodenoscopes	1					
				BB-03	Colonoscope	1					
				BB-04	Endoscopic table	2					
				BB-05	Endoscope washing apparatus	Nil					
			Bronchoscopy	BB-06	Bronchofiber scope, video		1	A	First		
				BB-07	Endoscopic table		1	A	First		
				BB-08	Endoscope auxiliary equipment		1 set	A	First		
			ENT	BB-09	ENT fibre scope, video	Nil					
				BB-10	ENT rigid scope set	6					
				BB-11	Endoscope auxiliary equipment	4					
		2	Haemodialysis centre	Haemodialysis	Haemodialysis	CC-01	Haemodialysis units	5	5	A	
						CC-02	Dialysis beds	5	5	A	
CC-03	RO system					1	1	A			
CC-04	Blood tubes and others					-	-	-			
CC-05	Patient monitor					2	3	B			
3	Operation Theatre	Medical Operation	General Operation	DD-06	Operation Microscope	5					
				DD-07	Ultrasound apparatus, for cardiovascular operations						
				DD-09	C-arm X-ray unit	5					
			Interventional Radiology (IVR)	DD-11	Angiography system	1					
				DD-12	Work station for imaging analysis	1					
				DD-13	Anaesthesia machine	1					
				DD-14	Polygraph	1					
				DD-15	Injector						
				DD-16	Operation Light	1					
				DD-17	Defibrillator	1					
				DD-18	Instruments set and others						
				DD-19	Doppler flowmeter	1					
			Digestive surgery	DD-20	Gastro-intestinal fiberscopes	1 set					
				DD-21	Endoscope auxiliary equipment	1					
				DD-22	Endoscope washing apparatus	Nil					
Laparoscope	DD-23	Laparoscopes	7								

2-2 Kilpauk Medical College Hospital (KMCH), Chennai

No.	Depts.	Room name	Equipment	Required quantity	Justification	Priority
1	Radiology	Fluoroscopy	Digital Fluoroscopy	3	patient numbers are increasing 2times higher than last year	5th
2		CT scan	CT scan for Cardiology	2		25th
3		Ultrasound	Ultrasound machine	2		16th
4	O/T	O/R	Anaesthesia machine w/ventilator	5		47th
5			Patient monitor	3	1 is to be replaced, 1is required to cope with service demand	28th
6			ABG	1		52th
7			Operating light, stand	3		22th
8	OPD	Endoscopy	Gastro fiberscope	2		13th
9			Duodenoscope	1		46th
10	CSSD	CSSD	Washer disinfecter	1		47th
11	Urology	Urology ward/SICU	Arterial blood gas analyser	2	for intensive care	13th
12			Ventilator	2	for intensive care	13th
13		ESWL	ESWL-shock wave lith0	1	for managing renal/ureteric calculi	2nd
14		Urodynamics	video urodynamics & uroflowmetry	1	to diagnose increasing number of neurogenic dysfunctions	3rd
15		Ultrasound	Ultrasound with Doppler & Trus probe	2	For streamlining and Decreasing waiting time and volume overload	10th
16	O/T	O/T	C-ARM machine with accessories	2	For PCNL/Miniper C/URS	10th
17			Flexi URS with Laser	1	For better stone clearance and patient management	1st
18			Diathermy underwater cutting with vessel seal	3	for open / Laparoscopic Surgeries	14th
19			Bipolar Diathermy for saline trap	2	For better and efficient tarp with Minimal Complication	5th
20			Laparoscopy set with accessories	2	Minimally invasive management methods	4th
21			Ureterorenos cope with Accessories	6	To manage the increasing number of stone patients and for equipping the increased postgraduates for training purposes	9th
22			Basic Endoscopy with Accessories	3		12th
23			PCNL set with accessories	3		8th
24			Mini-Perc with accessories	2		
25			Stone punch with accessories	2		
26			Internal Urethrectomy set	3		12th
27			Pneumatic lithoclast with accessories and compressor	4		
28			Lithoclast master	2		6th
29			Class Room	Smart Board with camera and accessories	1	For teaching postgraduates
30		Harmonic Scalpel	1		7th	
31	Physical Medicine and Rehabilitation	Not available	Gait lab	1	One of the first advanced equipment that will be made available necessary to assess the walking pattern of poor patients which will influence the treatment methods disabled patients	1
32		Not available	Locomat functional robotic gait therapy	1	It will be the first state of art equipment in TN Govt medical service for improving gait and walking pattern of the poor neurologically affected patients like stroke and traumatic injury	2
33		Not available	Robotic arm	1	It will be the first such equipment to improve the hand farction of the poor neurologically affected patients like stroke and traumatic injury	3
34		Not available	Virtual realty system	1	As above the state of art equipment for rehabilitation, particularly gait, hand function in virtual realty enabling the patient to practice in real imagery	4
35		Not available	Unweighting support system	1	As per recent advanced evidenced based medicine, Body weight supported treadmill training is base line for improving gait and walking of the poor neurologically involve patients	5

36		Not available	Balance system	1	Equipment which improves the static and dynamic balance – which is very essential in neuro rehabilitation	6	
37		Available – Exercise therapy room	Functional Electrical Stimulator with suitable Laptop with latest configuration	2	To promote gait and walking with FES is the another mode improving the lifestyle of the Neurologically impaired patient – essential for the Department.	7	
38		Available – Exercise therapy room	EMG Biofeed back	3	One of the evidence based treatment modality which enhances the recovery of the Stroke and traumatic brain injury patients – very essential for the dept	8	
39		Available – Interventional therapy room	Musculoskeletal Ultrasound for diagnosis and interventional Program with standard accessories	2	We have one MS Ultrasound of low resolution capacity which does not allow to visualize the deeper structure. Hence required a state of art US machine with good musculoskeletal probe	9	
40		Available laser therapy room	Scanning laser unit – HPL 3.2	1	We have one Laser therapy unit which has a cluster probe. However for larger areas and for better coverage Scanning Laser therapy unit is essential	10	
41		Occupational therapy Not available	Occupational therapy equipment set	1 set	Essential for the training upper limb function and ADL Training	11	
42		Exercise therapy and Electrotherapy room - Available	Shortwave Diathermy	0	To upgrade the Exercise therapy unit it is required to improve the post-operative performance of orthopaedic patients. Constant Passive Motion equipment will enhance early recovery of these poor patients	12	
43			Ultrasound	0			
44			IFT	0			
45			Traction unit	0			
46			Cryotherapy unit	0			
47			Laser – cluster probe	0			
48			Electrical stimulator	0			
49			Wax bath tub	0			
50			Treadmill-motorized	0			
51			EMG and NCV machine	0			
52			And other exercise therapy gadgets are available	0			
53			Constant passive motion for knee	2			
54			Constant passive motion for shoulder	1			
55			Prosthetic and orthotic workshop Room Available	Set of Equipment and tools for fabrication of artificial limbs and splints or calipers	1	One of the pillars of the Rehab unit assisting the patients in their early recovery	
56	Blood bank	Donor room	Donor	2	More donors collection at a time	5th	
57			Sation (Donor couch)				
58			Component room	Refrigrator centrifuge	0	0	0
59			Component room	Plasma expressor	2	At a time more componets preparation	7th
60			Component room	Tube SEALER	1	More tube sealing at a time	6th
61			Storage room	Blood Bank Refrigerator	2	Available BBR store 400 units blood at present . so require additional BBR for store more blood units	2th
62			Storage room	40 Deep freezer	1	Store More plasma	6 th
63			Storage room	Platelets agitator	1	Store More platelets	4th
64	Burns, Plastic and Reconstructive Surgery	No rooms only O.T	Microinstruments set for Reconstructive Surgery	3	Microvascular instruments are required for performing microsurgical procedure for putting back severed hand, fingers, and for transferring tissues for reconstruction	1st	
65			Liposuction Machine	2	To perform liposuction for fat deposits and generalised disorders of fat accumulation	4th	
66			Surgical Loupes	4	For performing dissection of tissues and all reconstructive surgical procedures	3rd	
67			Operating microscopes	2	For performing microvascular procedures on blood vessels smaller than 1mm	2nd	
68			Therapeutic Laser	1	For providing pain relief and scar modulation to restore function rehabilitate patient.	5th	

69	Surgical Gastroenterology	Endoscopy room	Video gastroscope/ colonoscope/ side viewing duodenoscope/ choledochoscope/ bronchoscope	Video gastroscope-3	Attached.	2	
70			Video coloscope-2				
71			Side viewing duodenoscope- 1				
72			Choledochoscope-1 bronchoscope- 0				
73		Surgical Theatre (EOT)	Karl storz Advanced laparoscopic unit	Advanced Vessel sealing unit with accessories (Harmonic scalpel)	Two	Attached.	1
74				ERBE Electrosurgical unit(vio 300)	Two	Attached.	3
75				Aesculab vascular instrument and loupe	one	Attached.	4
76				CUSA (Cavitron Ultrasonic Surgical Aspirator)	One	Attached.	7
77	Intra-operative ultrasound with Laparoscopic probe			One	Attached.	5	
78	LAPROSCOPE			3	3 surgical units	6	
79	General Surgery	Theatre	HARMONIC SCALPEL	2	Reduces operating time	5	
80			OGD SCOPE	1		4	
81			COLONOSCOPE	1		7	
82			ENDOSCOPIC ULTRASOUND	1		8	
83			ENDOSCOPIC STAPLING DEVICE	1		6	
84			VENTILATORS	10		9	
85			MULTIPARA MONITORS	10		1	
86			SUCTION APPARATUS	6		3	
87			INFUSION PUMPS	10		12	
88			DEFIBRILATOR	2		10	
89			ABG (ARTERIAL BLOOD GAS ANALYSER)	1		11	
90						2	
91	Obst & gynaec	ICU	Ventilator	3	Patients numbers are increasing. So need is more	1	
92		Labour ward	Ultrasound with Doppler with Transabdominal, Transvaginal & cardiac probes	1	Not available. Hence required	2	
93		O/T	Diathermy with underwater cutting vessel sealer	6	Patients numbers are increasing. So need is more	3	
94			Laparoscopy set with accessories	5	Patients numbers are increasing. So need is more	4	
95			Operative hysteroscopy with accessories	2	Not available. Required as this hospital is a tertiary center	5	
96			Harmonic scalpel	2	Not available. Required as this hospital is a tertiary center	6	
97	Labour ward	Labour ward	Multipara monitor	8	Required to cope with service demand	7	
98	Obst & gynae	O/T	Syringe pump	4	Patients numbers are increasing. So need is more	8	
99			Operating microscope	2	Required to cope with service demand	10	
100			Infusion pump	4	2 to be replaced to cope with service demand	13	
101			Lap pelvic trainer	3	Required to cope with service demand	14	
102		ICU	Defibrillator	2	Not available. Required as this hospital is a tertiary center	9	
103			Mobile X- ray machine	1	Not available. Required as this hospital is a tertiary center	11	
104			Portable ECG machine	1	Not available. Required as this hospital is a tertiary center	12	
105		Nephrology		Hemodialysis Machine (4008 S V10 Fresenius with NIBP)	30	Increasing number of patients with kidney diseases	1st
107	Reverse Osmosis water treatment plant : (2000 liters per hour)			2	Increasing no. of dialysis patients	5th	
108	Pulse Oxymeter with patient monitor			30	.Increasing no. of living donor kidney transplants	3rd	
109	Dialyser Reuse Machine (Renatron)			2	To initiate cadaver transplant programme	4th	
110	CRRT machine			2	. We need CRRT machines to do dialysis for critically ill hemodynamically unstable patients.	2nd	

111	Radiology	CT scan	128 Slice CT scanner / 320 slice CT scanner	1 No	Annexure	
112			State of the Art 4D Ultrasound Doppler with stick -.	2 Nos		
113			Radiological information system (RIS) with 10 computers & software	1 No		
114			Standalone Color Doppler	4 Nos		
115			Digital x-ray 600 mA	1 No		
116			Film Scanner	2 Nos		
117			Digital fluoroscopy x-ray unit	1 No		
118			Digital mobile x-ray	2 Nos		
119			Prone Table digital Mammogram	1 No		
120			Vacuum Extraction & Stereotactic Biopsy Device	1 No		
121			Radio-frequency Ablator	1 No		
122			Boyle apparatus with anesthesia workstation and monitors	1 No		
123			Ventilators	1 No		
124			Wireless detector solution	1 No		
125			Biplane with Dyna CT unit	1 No		
126			Work stations with Medical Grade Monitors	10 sets		
127	Anaesthesia	O/T Complex	Operation Theatre Table	12	To replace the old one+new	
128			Operation Theatre Ceiling light	12		
129			Diathermy	12		
130			Anaesthesia Work station	12		
131			Patient monitor	12		
132			Defibrillator	6		
133			Heart lung machine	2	New for CT OT	
134			Operating Microscope	2	To replace the old one+new	
135			Volumetric Infusion pumps	12	New for OT	
136			Syringe pumps	24		
137			Fluid and blood warmer	6		
138			nerve stimulator cum mapper	6		
139			ultrasonogram	2	To replace the old one+new	
140			Fibreoptic Bronchoscope	2	New for OT	
141			C-Arm X ray unit	2	To replace the old one- one new	
142			Ultrasound machine for cardiology	2		
143			Scrub sink	12	New for OT	
144			Hybrid O/T	Angiography system	1	
145				Workstation for imaging and analysis	1	
146				Injector	1	
147				Polygraph	1	
148				Operation Theatre Ceiling light	1	
149				Anaesthesia Work station	1	
150				Patient monitor	2	
151				Defibrillator	1	
152			Heart lung machine	1		
153			Scrub sink	1		
154			High speed autoclave	8		
155		Emergency O/T	Operation Theatre Table	2		
156			Operation Theatre Ceiling light	2		
157			Diathermy	1		
158			Anaesthesia Work station	2		
159			Patient monitor	4		
160			Defibrillator	1		
161			Pedastal light	4		
162			Operating Microscope	2		
163			Volumetric Infusion pumps	2		
164			Syringe pumps	2		
165			Fluid and blood warmer	1		
166			Instrument set	8		
167		CSSD	Bulk sterilizer with separate ends for loading unsterile material, unloading sterile	6	New for CSSD	
168			Formalin sterilizer-1no and Heat sealing machine-1no to seal ETO Packing	1		
169			Instrument Washer And Disinfector And Dryer	4		
170			High pressure water nozzle	2		
171			Working table	4		
172			Ultrasound instrument cleaner	1		

173		PACU	Patient monitor	10	New for PAICU	
174			ICU bed	10		
175			Defibrillator	5		
176			Volumetric Infusion pumps	10		
177			Syringe pumps	10		
178			Ventilator	10		
179			ABG	1		
180			Echo with Doppler	1		
181		POCU	Patient monitor	20	New for POCU	
182			ICU bed	20		
183			Defibrillator	5		
184			Ventilator	2		
185		ANAESTHESIOLOGY	40 seater Class room capacity	1		
186			Audiovisual System Computer with laser Printer and Accessories(Table& Chair)LCD Projector	2	New for Classroom	
187			Resuscitation equipments (CPR) Trainer mannequin	2		
188			Resuscitation equipments intubation Trainer mannequin	2		
189			Resuscitation equipments intravenous cannulation Trainer mannequin	2		
190	Neurosurgery	Hybrid O/T	Operating microscope	1	Refer Annexure I	1
191			Neurodrill and craniotome	1		2
192			Neuroendoscope	1		5
193			C-arm	1		3
194			CUSA(Cavitron ultra sonic aspirator	1		6
195			Mayfield skull clamp with sitting position requirements	1		4
196			CTSP stereotactic frame	1		11
197			Craniotomy set	4		9
198			Laminectomy set	4		10
199			Diathermy	4		8
200			Suction apparatus/pressure regulated	2	Refer Annexure I	7
201	Orthopaedics	O/T COMPLEX	C-ARM X RAY UNIT	2		
202			C-ARM COMPATIBLE OPERATION TABLE	3		
203			ELECTRICAL SAW & ELECTRICAL DRILL	3		
204			CUE SAW	1		
205			UNDER WATER DIATHERMY	2		
206			NAVIGATION SYSTEM FOR TRAUMA,REPLACEMENT & SPINE.	1		
207			AO INSTRUMENTATION SET:1)LARGE SET 2)SMALL SET	3		
208			OPERATIVE LIGHT WITH CAMERA	1		
209			SPINE INSTRUMENTATION SET	1		
210			ATHROSCOPIC SET WITH INSTRUMENTS	2		
211			PNEUMATIC TORNQUET	3		

212	General Medicine	IMCU	ECHO	1		9th	
213				ECG	2	Increasing No of out-patients.Increasing admissions.Limited investigations because of less no of equipments.more emergency cases. To checkblood Glucose and Arterial Blood Analysis.To deliver accurate dosage.	8th
214			IMCU COT	10			1st
215			Ventilators	10			4th
216			Defibrillator	3			10th
217			Nebuliser	2			11th
218			Ophthalmoscope	1			6th
219			Pulse oximeter	10			7th
220			Computer and Printer	1			12th
221			ABG Machine	1			5th
222			Infusion Pumps	10			2nd
223			Glucometer with strips	5			3rd
224			CCU	ECHO	3	Increasing No of out-patients.Increasing admissions.Limited investigations because of less no of equipments.more emergency cases. To checkblood Glucose and Arterial Blood Analysis.To deliver accurate dosage.	1st
225				TMT	2		6th
226				ECG	3		4th
227				Holter Monitor	2		9th
228				ICCU cot	12		11th
229				Temporary Pacing	2		7th
230				Ventilators	4		8th
231				Defibrillator	5		5th
232				Central monitor	2		3rd
233				Computer and Printer	1		10th
234				Infusion Pumps	4		2nd

2-3 Coimbatore Medical College Hospital (CMCH), Coimbatore

S. No.	Departments	Service	Room Name	Item No.	Equipment	Required Quantity and justification	Priority		
1	Imaging Dept.	X-Ray	General X-Ray	AA-01	Digital X-ray	1	A		
			Fluoroscopy	AA-02	Digital Fluroscopy	1	A		
			Mammogagraphy	AA-03	Mammograpphy	1	A		
			MRI	AA-04	MRI	1 (1.5T MRI)			
			CT Scan	AA-05	CT Scan for Cardiology	128 slice CT-1 (No Cardiac CT at present)			
			Mobile X-ray	AA-06	Mobile X-ray Unit	3			
			CR Room	AA-07	CR Machine for General Mobile	3			
			DR Room	AA-08	DR Machine for Fluroscopy	1			
		Ultrasound	Ultrasound	AA-09	Ultrasound Macine	For better patient care / high end 4 D USG - 2 nos	A		
		Endoscopy	Gastrointestinal	BB-01	Gastrofiberscope	1 for new building			
				BB-02	Duodenoscope	1			
				BB-03	Colonoscope	2			
				BB-04	Endoscopic Table	3			
				BB-05	Endoscope washing appartus	3			
			Bronchoscopy for CTS	BB-06	Bronchofiber scope /video	2	A		
				BB-07	Endoscopic table	2			
				BB-08	Endoscope auxillary equipment	Only conventional bronchoscope available			
			ENT	BB-09	ENT Fiber scope/video	2- Nasopharyngoscope			
				BB-10	ENT rigid scope set	Storz 3 chip HD-1 Single Chip-1	A		
				BB-11	Endoscope auxillary equipment	2	A		
		2	Hemodialysis centre	Hemodialysis	Hemodialysis	CC-01	Hemodialysis Unit	6	A
					CC-02	Dialysis bed	10		
					CC-03	RO system	2		
CC-04	Blood tubes and others				-				
CC-05	patient monitor				16 for patient care	A			
3	Operation Theater	Medical Operaiton	General Operation Orthopedics	DD-6	Operatiion Microscope	2, Karl Zeiss Vario 88-2, ENT-1 Labomed-1 Micro Vascular-1	A		
				DD-7	Ultrasound apparatus for Cardio Vascular operations	2			
				DD-9	C-arm x-ray unit	3	A		
			Interventional Radiology	DD-11	Angiography system	Required-1	A		
				DD-12	Work station for imaging analysis	1	A		
				DD-13	Anaesthesia machine	10 for better patient care	A		
				DD-14	Polygraph	2			
				DD-15	Injector	2	A		
				DD-16	Operatiion Light	14	A		
		Digestive surgery	DD-17	Defibrillator	5 for better patient care	A			
			DD-18	Instruments set & others	Required				
			DD-19	Doppler flowmeter					
			DD-20	Gastroinestinal fiberscopes	1 1	A			
			DD-21	Endoscope axillary equipment	2 1	A A			
	DD-22	Endoscope washing apparatus	2	A					
	Laparoscope	DD-23	Laparoscopes	6	A				

Annex 9: Medical Equipment List

Component 2

Seven Medical College Hospitals

No.	Departments	Service	Room name	Item No.	Target Institutions	MCH Vellore	MCH Tirumelveli	MCH Nagercoil	MCH Salem	MCH Thoothukudi	MCH Trichy	MCH Thanjavur	
					Equipment	Qty	Qty	Qty	Qty	Qty	Qty		
1	Imaging	X-ray	General X-ray	AA-01	Digital X-ray	1	1	0	0	0	0	1	
				AA-02	Digital Fluoroscopy	0	1	2	0	1	0	0	
				AA-03	Mammography	1	1	0	0	0	0		
			AA-04	MRI	0	0	0	0	0	0	0		
			AA-05	CT scan for Cardiology	1	1	0	0	1	0	0		
			AA-06	Mobile X-ray unit	2	3	1	2	7	0	1		
			AA-07	CR machine for General, Mobile	0	0	0	0	0	0	0		
			AA-08	DR machine for Fluoroscopy	1	1	0	1	1	0	0		
			AA-09	Ultrasound machine	1	0	4	2	0	6	1		
		Ultrasound	Endoscopy	Gastro-intestinal	BB-01	Gastro-fiberscopes	0	1	2	1	0	2	0
					BB-02	Duodeno-scopes	0	1	2	1	1	2	0
					BB-03	Colono-scopes	0	1	2	2	1	2	0
					BB-04	Endoscopic table	0	4	2	2	2	2	0
					BB-05	Endoscope washing apparatus	0	1	3	1	1	2	0
			Bronchoscopy	BB-06	Broncho-fiberscope, video	0	1	0	2	0	1	0	
				BB-07	Endoscopic table	0	2	2	0	0	1	0	
				BB-08	Endoscope washing apparatus	0	1	1	1	0	1	0	
				BB-09	Endoscope auxiliary equipment	0	2	0	0	0	1	0	
ENT	BB-10	ENT fiberscope, video	1	2	1	0	1	1	0				
	BB-11	ENT rigid scope set	2	2	0	4	1	1	0				
BB-12	Endoscope auxiliary equipment	2	2	1	0	1	1	0					
2	Haemodialysis Centre	Haemo dialysis	Haemodialysis	CC-01	Haemodialysis units	0	10	1	0	2	6	0	
				CC-02	Dialysis beds	0	0	0	0	0	6	0	
				CC-03	RO system	0	1	0	0	0	1	0	
				CC-04	Blood tubes and others	0	0	0	0	0	0	0	
				CC-05	Patient monitor	0	0	3	0	2	6	0	
				CC-06	CRRT	3	3	3	3	3	3	3	
3	Operation Theatre	Medical Operation	General Operation	DD-06	Operation Microscope	1	1	1	0	1	1	0	
				DD-07	Ultrasound apparatus, for cardiovascular operations	1	1	2	0	0	0	0	
				DD-09	C-arm X-ray unit	2	1	0	0	0	1	0	
			Interventional Radiology (IVR)	DD-11	Angiography system	0	0	0	0	0	0	0	
				DD-12	Work station for imaging analysis	0	0	0	0	0	0	0	
				DD-13	Anaesthesia machine	0	0	0	3	0	0	0	
				DD-14	Polygraph	0	0	0	0	0	0	0	
				DD-15	Injector	0	0	0	0	0	0	0	
				DD-16	Operation Light	3	0	0	0	0	0	0	
				DD-17	Defibrillator	1	0	0	0	0	0	0	
				DD-18	Instruments set and others	1	0	0	0	0	0	0	
				DD-19	Doppler flowmeter	0	0	0	0	0	0	0	
			Digestive surgery	DD-20	Gastro-intestinal fiberscopes	1	2	0	0	0	2	0	
				DD-21	Endoscope auxiliary equipment	1	1	0	0	0	2	0	
				DD-22	Endoscope washing apparatus	1	1	0	1	0	2	0	
Laparoscopy	DD-23	Laparoscopes	1	1	2	2	0	6	6				

Seven DHQs

No.	Departments	Service	Room name	Item No.	Target DHQ Hospitals	Erode	Pudukottai	Tiruppur	Krishnagiri	Periyakulam	Cuddalore	Dindigul
					Existing Equipment	Qty	Qty	Qty	Qty	Qty	Qty	
1	Imaging dept.	X-ray	General X-ray	FF-01	Digital X-ray	0	0	0	0	1	0	1
				FF-02	Digital Fluoroscopy	0	0	0	0	1	0	1
				Add-4	X-ray Machine 300 mA	0	0	0	0	1	0	0
				FF-03	Mammography	1	1	1	1	1	1	1
				FF-04	CR machine	1	1	1	1	1	1	0
				FF-05	CT	1	0	0	1	0	0	0
		Endoscopy	MRI	FF-06	MRI	0	1	1	0	0	1	1
				GG-01	Gastro-fiberscope	1	1	0	0	0	0	0
				GG-02	Duodeno-scopes	1	1	0	0	0	0	1
				GG-03	Colono-scope	1	1	0	0	0	0	1
				GG-04	Endoscopic table	0	0	0	0	0	0	0
				GG-05	Endoscope auxiliary equipment	0	0	0	0	0	0	0
2	Haemodialysis	Haemodialysis	Haemodialysis	HH-01	Haemodialysis units	2	2	2	2	2	2	2
				HH-02	Dialysis beds	0	0	0	0	0	0	0
				HH-03	RO system	0	0	0	0	0	0	0
				HH-04	Blood tubes and others	0	0	0	0	0	0	0
				HH-05	Patient monitor	0	2	2	1	2	3	3
				HH-06	CRRT	3	3	3	3	3	3	3
3	Operation Theatre	Operation	Operation general Ob & Gy Orthopaedics	II-01	Operation tables	2	6	0	2	4	7	3
				II-02	Electrosurgical unit	3	0	0	0	3	0	0
				II-03	Anaesthetic apparatus with ventilator	2	2	4	1	2	3	3
				II-04	C-arm X-ray machine	1	1	1	1	1	1	0
				II-05	Patient monitors	0	4	6	0	0	3	1
				II-06	Defibrillators	0	2	6	1	1	3	1
				Add-1	Anaesthesia Work Station	1	1	1	1	1	1	1
				Add-2	Laminar Air Flow	1	1	1	1	1	1	1
				Add-3	Ceiling Shadowless Lamp	1	1	1	1	1	1	1
				Add-5	Multi-parameter Monitor with Et CO2	1	1	1	1	1	1	1
Add-8	Arterial Blood Gas Analyser	1	1	1	1	1	1	1				
4	Blood Bank	Blood Bank	Component Separation	Add-7	Blood Component Separator Unit	1	1	1	1	1	1	
5	Ob & Gy	Delivery	Delivery Room	Add-6	CTG Monitor	1	1	1	1	1	1	

Results of Equipment Needs Survey for Seven Medical College Hospitals

No.	Departments	Service	Room name	Item No.	Equipment	Medical college hospitals			MCH Vellore			MCH Tirunelveli			MCH Nagercoil			MCH Salem			MCH Thoothukudi			MCH Trichy			MCH Thanjavur				
						(A)	(B)	prty	(A)	(B)	prty	(A)	(B)	prty	(A)	(B)	prty	(A)	(B)	prty	(A)	(B)	prty	(A)	(B)	prty	(A)	(B)	prty	(A)	(B)
1	Imaging	X-ray	General X-ray	AA-01	Digital X-ray	1	1	A	1	1	A	0	0	-	-	0	-	0	0	C	0	0	B	1	1	A					
				AA-02	Digital Fluoroscopy	2	0	B'	1	1	A	2	2	3AA	-	0	-	1	1	A	0	0	B	0	0	-					
				AA-03	Mammography	1	1	1	1	1	B	-	0	-	-	0	-	1	0	B	0	0	B	0	0	-					
			AA-04	MRI	1	0	A'	1	0	B	1	0	-	-	0	-	0	0	C	0	0	B	0	0	-						
			AA-05	CT scan	1	1	A'	1	1	A	-	0	-	-	0	-	1	1	A	1	0	B	0	0	-						
			AA-06	Mobile X-ray	2	2	1	6	3	A	1	1	2AA	2	2	3/3	8	7	A	0	0	B	1	1	A						
			AA-07	CR room	1	0	1	1	0	A	-	0	-	-	1	0	2/3	1	0	B	0	0	B	1	0	A					
			AA-08	DR room	1	1	A'	1	1	A	-	0	-	-	1	-	1	1	B	0	0	B	0	0	-						
			AA-09	Ultrasound	2	1	1	3	0	B	4	4	1/AA	2	2	1/3	0	0	C	6	6	A	1	1	A						
		Endoscopy	Gastro-intestinal	BB-01	Gastro-fiberscope	0	0	B'	1	1	A	2	2	2/BB	1	1	4/6	0	0	C	2	2	A	0	0	-					
				BB-02	Duodenoscopes	0	0	B'	1	1	A	2	2	3/BB	1	1	3/6	1	1	A	2	2	A	0	0	-					
				BB-03	Colonoscope	0	0	B'	1	1	A	2	2	1/BB	2	2	5/6	1	1	A	2	2	A	0	0	-					
				BB-04	Endoscopic table	0	0	B'	4	4	A	2	2	4/BB	2	2	-	2	2	A	2	2	A	0	0	-					
				BB-05	Endoscope washing apparatus	0	0	B'	1	1	A	3	3	5/BB	1	1	6/6	1	1	A	2	2	A	0	0	-					
			Bronchoscopy	BB-06	Bronchofiber scope, video	0	0	B'	1	1	A	-	0	-	2	2	1/2	0	0	C	1	1	A	0	0	-					
				BB-07	Endoscopic table	0	0	B'	2	2	A	2	2	6/BB	0	0	-	0	0	C	1	1	A	0	0	-					
				BB-08	Endoscope washing apparatus	-	0	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BB-09	Endoscope auxiliary equipment		0	0	B'	2	2	A	-	0	-	0	0	-	0	0	C	1	1	A	0	0	-								
ENT	BB-10		ENT fiber scope, video	1	1	-	2	2	A	1	1	7/BB	0	0	-	1	1	A	1	1	A	0	0	-							
	BB-11	ENT rigid scope set	2	2	-	2	2	A	-	0	-	4	4	2/2	1	1	A	1	1	A	0	0	-								
BB-12	Endoscope auxiliary equipment	2	2	-	2	2	A	1	1	8/BB	0	0	-	1	1	A	1	1	A	0	0	-									
2	Haemodialysis Centre	Haemo dialysis	CC-01	Hemodialysis units	0	0	-	10	10	A	1	1	1/CC	0	0	-	2	2	A	6	6	A	0	0	-						
			CC-02	Dialysis beds	0	0	-	0	0	A	-	0	-	0	0	-	2	0	B	6	6	A	0	0	-						
			CC-03	RO system	0	0	-	1	1	A	-	0	-	0	0	-	0	0	C	1	1	A	0	0	-						
			CC-04	Blood tubes and others	0	0	-	0	0	A	-	0	-	0	0	-	1	0	B	0	0	B	0	0	-						
			CC-05	Patient monitor	0	0	-	0	0	A	3	3	2/CC	0	0	-	4	2	A	6	6	A	0	0	-						
			CC-06	CRRT	0	3	-	0	3	-	0	3	-	0	3	-	0	3	-	0	3	-	0	3	-	0	3	-			
5	Operation Theater	Medical Operation	General Operation Orthopedics	DD-06	Operation Microscope	2	1	A	1	1	A	1	1	4/DD	0	0	-	1	1	A	1	1	A	0	0	-					
				DD-07	Ultrasound apparatus, for cardiovascular operations	2	1	A	4	1	A	2	2	3/DD	0	0	-	0	0	C	0	0	B	0	0	-					
				DD-09	C-arm X-ray unit	3	2	A	4	1	A	0	0	-	0	0	-	0	0	C	3	1	A	0	0	-					
		Interventional Radiology (IVR)	DD-11	Angiography system	0	0	-	1	0	A	1	0	2/DD	0	0	-	0	0	C	1	0	B	0	0	-						
			DD-12	Work station for imaging analysis	0	0	-	1	0	A	0	0	-	0	0	-	0	0	C	1	0	B	0	0	-						
			DD-13	Anesthesia work station	0	0	-	1	0	A	0	0	-	3	3	2/3	0	0	C	3	0	B	0	0	-						
			DD-14	Polygraph	0	0	-	1	0	A	0	0	-	0	0	-	0	0	C	1	0	B	0	0	-						
			DD-15	Injector	0	0	-	1	0	A	0	0	-	0	0	-	0	0	C	3	0	B	0	0	-						
			DD-16	Operation Light w/camera	4	3	-	1	0	A	0	0	-	0	0	-	0	0	C	3	0	B	0	0	-						
			DD-17	Defibrillator	2	1	-	1	0	A	0	0	-	0	0	-	0	0	C	6	0	B	0	0	-						
		DD-18	Instruments set and others	1	1	-	1	0	A	0	0	-	0	0	-	0	0	C	6	0	B	0	0	-							
		DD-19	Doppler flowmeter	0	0	-	1	0	A	0	0	-	0	0	-	0	0	C	2	0	B	0	0	-							
		Digestive surgery	DD-20	Gastro-intestinal fiberscopes	1	1	-	4	2	A	0	0	-	0	0	-	0	0	C	2	2	A	0	0	-						
DD-21	Endoscope auxiliary equipment		1	1	-	1	1	A	0	0	-	0	0	-	0	0	C	2	2	A	0	0	-								
DD-22	Endoscope washing apparatus		1	1	-	1	1	A	0	0	-	1	1	3/3	0	0	C	2	2	A	0	0	-								
DD-23	Laparoscopes		1	1	-	1	1	A	2	2	1/DD	2	2	1/3	0	0	C	6	6	A	12	6	A								

Results of Equipment Needs Survey for Seven DHQs

Departments	Service	Room name	Item No.	Existing Equipment	DHQs			Erode			Pudukkottai			Tirupur			Krishnagiri			Periyakulam			Cuddalore			Dindigul		
					(A)	(B)	Prty	(A)	(B)	Prty	(A)	(B)	Prty	(A)	(B)	Prty	(A)	(B)	Prty	(A)	(B)	Prty	(A)	(B)	Prty	(A)	(B)	Prty
1	Imaging dept.	X-ray	General X-ray	FF-01	Digital X-ray	1	0	24	1	0	23	1	0	21	1	0	19	1	1	17	1	0	18	1	0	18		
				FF-02	Digital Fluoroscopy	0	0	-	1	0	24	0	0	-	1	0	20	1	1	18	1	0	20	1	0	20		
				A4-4	X-ray Machine 300 mA	1	0	21	1	0	25	1	0	23	1	0	21	1	1	19	1	0	21	1	0	21		
			FF-03	Mammography	1	1	10	1	0	10	1	0	10	1	0	10	1	1	10	1	0	10	1	0	10			
			FF-04	CR machine	1	1	11	1	0	11	1	0	11	1	1	11	1	1	11	1	1	11	1	1	11			
			FF-05	CT	1	1	19	1	0	19	0	0	-	1	1	14	0	0	-	0	0	-	0	0	-	0	0	
		FF-06	MRI	1	0	20	1	1	18	1	1	18	1	0	18	0	0	-	1	1	19	1	1	19				
		Endoscopy	Gastro-intestinal	GG-01	Gastro-fiberscope	1	0	16	1	0	20	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0
				GG-02	Duodenoscopes	1	0	17	1	0	21	1	0	19	0	0	-	0	0	-	0	0	-	1	1	-		
				GG-03	Colonoscope	1	0	18	1	0	22	1	0	20	0	0	-	0	0	-	0	0	-	1	1	-		
				GG-04	Endoscopic table	1	0	22	1	0	26	1	0	24	0	0	-	0	0	-	1	0	23	1	0	23		
				GG-05	Endoscope auxiliary equipment	1	0	23	1	0	27	1	0	25	0	0	-	0	0	-	1	0	24	1	0	24		
		Ultrasound	Ultrasound Diagnostics	GG-06	Ultrasound machine	3	1	7	2	1	2	2	1	2	2	1	2	1	2	1	2	1	1	2	1	1	2	
		2	Hemodialysis	Hemodialysis	HH-01	Hemodialysis units	2	0	12	2	0	12	2	0	12	2	1	12	2	2	12	2	0	12	2	1	12	
					HH-02	Dialysis beds	0	0	-	4	0	29	0	0	-	2	0	22	0	0	-	5	0	26	3	0	26	
					HH-03	RO system	0	0	-	2	0	28	0	0	-	0	0	-	0	0	-	2	0	25	1	0	25	
					HH-04	Blood tubes and others	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	0
HH-05	Patient monitor				0	0	-	2	0	16	2	0	16	2	1	16	2	2	15	3	0	16						

Annex 10: Medical Equipment List

Component 3-2

Secondary Care Hospital

No.	Floor	Departments	Service	Room name	Item No.	Equipment	Qty		
1	2nd	Inpatient Ward	Inpatient care	Ward	AA-01	Patient beds	60		
				Meeting room	AA-02	Ward furniture	60		
				Office	AA-03	Irrigator	10		
					AA-04	Ice makers	2		
					AA-05	Refrigerators	2		
					AA-06	Furniture for meeting room	1		
2	1st	Operation Theatre	General Surgery Ob & Gy	Operation Rooms (OR)	BB-01	Operation tables	2		
				Recovery room	BB-02	Electrosurgical unit	2		
					BB-03	Operation Lights	2		
					BB-04	Pendant arm system	4		
					BB-05	Anaesthetic apparatus with ventilator	2		
					BB-06	Patient monitor	2		
					BB-07	Defibrillator	2		
					BB-08	Scrub sink	1		
					BB-09	Instruments sets and others	2		
					BB-10	Recovery beds	2		
					CSSD	BB-11	Washer disinfectant	1	
						BB-12	Autoclaves	2	
3	1st	NICU	NICU	NICU (6 beds)	CC-01	Radiant warmer	6		
					CC-02	Phototherapy unit	6		
					CC-03	Patient monitor	6		
					CC-04	Ventilator	6		
					CC-05	Infusion pump	6		
					CC-06	Syringe pump	6		
					CC-07	Resuscitation set	6		
					CC-08	Instrument set for NICU	3		
4	1st	Laboratory	Laboratory	Biochemistry Haematology	EE-01	Biochemistry analyser	1		
					EE-02	Haematology analyser	1		
					EE-03	Centrifuges	2		
					EE-04	Blood gas analyser	1		
					EE-05	Elisa Reader w/Washer	1		
					EE-06	Electrolyte analyzer	1		
					EE-07	Microscopes	2		
					EE-08	Laminar air flow work Station	1		
					EE-09	Water bath	1		
					EE-10	Dry oven	1		
					EE-11	Glassware and others	1		
					EE-12	Vertical Autoclave	1		
					EE-13	Portable autoclave	1		
5	1st	Obstetrics & Gynaecology	Consulting	Consulting room	FF-01	Ob & Gy Examination table	1		
					FF-02	Examination light	1		
					FF-03	PC	1		
					Delivery	Delivery room	FF-04	Delivery beds	3
							FF-05	Light stand	3
							FF-06	Suction machines	3
							FF-07	Cardiotocograph (CTG)	3
					Antenatal room	Antenatal room	FF-08	Obstetric instruments and others	6
							FF-09	Fetal Doppler Detectors	2
							FF-10	Beds	6
							FF-11	Recovery beds	12
6	G	Imaging	X-ray	General X-ray Mobile X-ray Dental X-ray	GG-01	Digital X-ray	2		
					GG-02	Mobile X-ray unit	1		
					GG-03	Dental X-ray unit	1		
					GG-04	Laser printer	1		
					GG-05	ECG	1		
					GG-06	Ultrasound Machine	2		
7	G	Emergency	CPR Treatment	CPR room Treatment room	HH-01	Treatment tables	4		
					HH-02	Emergency carts	2		
					HH-03	Operating light stand	2		
					HH-04	Stretchers	2		
					HH-05	Defibrillator	2		
					HH-06	Suction machines	2		
					HH-07	Medicine cabinet	1		
8	G	Pharmacy	Pharmacy	Pharmacy	II-01	Drug refrigerator	2		
					II-02	Vaccine refrigerator	1		
					II-03	Water distillator	1		
9	G	OPD	Consulting	Consulting rooms -Dental Clinic -Pediatric Clinic -Ophthalmology clinic -ENT clinic -General medicine clinic -Surgical clinic sub-total	JJ-01	Treatment tables	3		
					JJ-02	Dental treatment unit	1		
					JJ-03	Table-top Autoclave	1		
					JJ-04	Examination lights	4		
					JJ-05	Slit lamp	1		
					JJ-06	Direct Ophthalmoscope	1		
					JJ-07	Refractometer	1		
					JJ-08	ENT treatment unit w/ chair	1		
					JJ-09	Nebulizer	2		
					JJ-10	Instruments and others	6		
					JJ-11	Furniture for consulting rooms	6		
					JJ-12	PCs	6		
10	-	Transportation	Referral	Ambulance	KK-01	Ambulance	1		

Annex 11: Training Equipment List

Component 5

Draft In-service Training Equipment Plan

Room name	Item No.	Equipment	Quantity	
1	Lecture Room	AA-01	Electronic white board	1
		AA-02	Ceiling projector with fixing material	7
		AA-03	Electric Screen, 70 inches	1
		AA-04	PCs	40
2	Training Room	BB-01	Physical assessment model with ECG and table	2
	(1) NCD	BB-02	Blood pressure measurement trainer	10
	(2) ICU	BB-03	Height and internal fat scale with weighing machine	4
	(3) MCH	BB-04	Dressing simulators	4
	(4) ER	BB-05	Injection training arm for adults and infants	10
		BB-06	Vein access simulator for adults and infants	10
		BB-07	Nursing simulator for male and female	2
		BB-08	Urination simulators for male and female	2
		BB-09	Tubal feeding simulator	2
		BB-10	Delivery simulators	2
		BB-11	Suction simulator	2
		BB-12	Radiant Warmer	2
		BB-13	Suction machine	2
		BB-14	Resuscitator for adults and neonates	4
		BB-15	Endotracheal Intubation Trainer for Adults and Infants	4
		BB-16	CPR Simulator for adults	4
		BB-17	CPR Trainer for Infants	4
		BB-18	BLS Simulator	4
		BB-19	AED Trainer with Mannequin	4

Annex 12: Terms of Reference
For Consulting Services (Facilities and Equipment)

Terms of Reference
For Consulting Services (Facilities and Equipment) on Implementation of
Tamil Nadu Urban Health Care Project

Chapter 1 Background

1.1 Scope of the Project

The state of Tamil Nadu has received a loan from the Japan International Cooperation Agency (hereinafter referred to as "JICA") to finance the Project for Strengthening Urban Health Care in Tamil Nadu, which is to improve the quality of health services in urban areas through (i) strengthening the capacity of key hospitals with upgrading of facility and equipment, (ii) reinforcing the capacity of primary health care, and (iii) strengthening human resources.

The project has five (5) components with different implementation sites across the targeted 17 cities as shown in Table 1

Table 1 Project Components and Sites

	Components	Target Facilities/Sites	Scope
1	Upgrading Tertiary Hospitals (Facility and Medical Equipment)	<ul style="list-style-type: none"> • Government Rajaji Hospital, Madurai • Government Kilpauk Medical College Hospital, Chennai • Government Coimbatore Medical College Hospital 	<ul style="list-style-type: none"> - Hospital building construction including auxiliary works (e.g. utility, reinforcing walls and/or ceilings) - Medical equipment supply/installation
2	Strengthening Referral Hospitals (Medical Equipment)	Seven Medical College Hospitals of: Salem/Vellore/Tanjavur/ Tirunelveli/Trichy/Toothukudi/Nagercoil Seven District Headquarter Hospitals in: Erode/Tiruppur/Cuddalore/Dindigul/Pudukottai/ Krishnagiri/Periyakulam	<ul style="list-style-type: none"> - Medical equipment supply
3	Strengthening Secondary Care Hospitals (Facility and Medical Equipment)	Four Secondary Care Hospitals: Avadi (Chennai)/Maniyanoor (Salem)/Velampalayam (Tiruppur)/ Kandigaiperi (Tirunelveli)	<ul style="list-style-type: none"> - Hospital building construction including auxiliary works (e.g. utility, reinforcing walls and/or ceilings) - Medical equipment supply/installation
4	Capacity Development	21 Projects under Component 1, 2 and 3	<ul style="list-style-type: none"> - Training on hospital management, medical equipment
5	Strengthening Primary Health Care on NCD	Primary Health Training Centers (Chennai and Madurai)	<ul style="list-style-type: none"> - Training on NCD for primary health care personnel

Component 1 and Component 3 consist of facilities development and equipment supply/installation. Facilities include hospital building construction and auxiliary works: utility development (power supply, water supply, sewerage), telecommunication and information network, waste disposal, and reinforcing floor/ceiling/wall, while equipment includes, digital imaging equipment (MRI, CT, X-ray, and others), equipment necessary for operation theaters, monitors, ventilators and others. Under Component 2, medical equipment for major medical college hospitals and district headquarter hospitals will be supplied.

1.2 Project Implementation Framework

The Project Management Unit (PMU) headed by the Project Director under Health and Family Welfare Department (HFWD) will be formed for implementation of the Project. The Consultant will be engaged by the contract with PMU. Although overall responsibility to complete the Project rests on PMU, procurement and disbursement will be conducted through other state government's agencies: hospital building construction by Public Works Department (PWD) and medical equipment by Tamil Nadu Medical Service Corporation (TNMSC). Besides, the authorized bio medical engineers of Tamil Nadu will be involved in medical equipment installation/inspection. The Government of Tamil Nadu is also involved in policy/decision making for implementation of the Project through State Steering Committee (SC) and the State Empowered Committee (SEC). The Consultant needs to understand such involvement of other relevant authorities/agencies and is requested to coordinate with them.

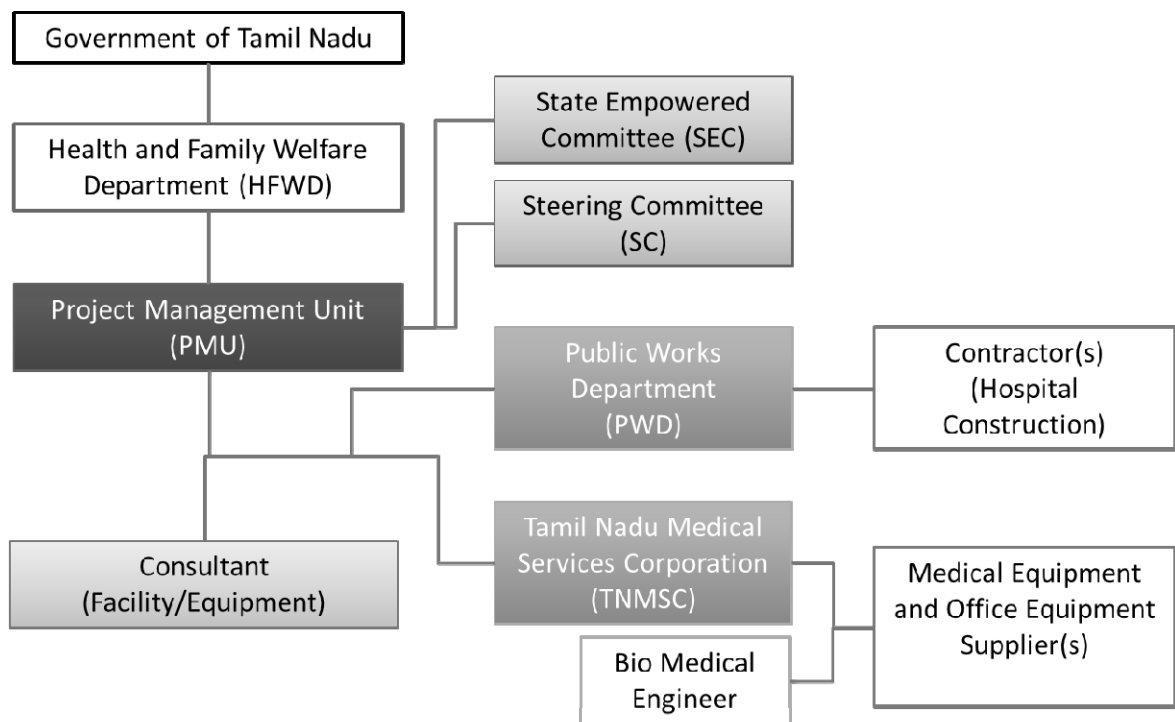


Fig. 1 Project Implementation Structure

Project Management Unit (PMU), headed by Project Director is the core implementation body of the Project. Under Project Director, five (5) cells will be established: Project Management & Monitoring Cell, Administrative Cell, Training & Capacity Building Cell, Procurement and Engineering Cell, and Financial Management Cell, with staff of forty (40) officials/assistants. PWD and TNMSC will also play substantial role for particularly procurement of works/equipment. The Consultant shall coordinate and collaborate with those organizations and realize smooth and efficient project implementation.

Chapter 2 Objectives of Consulting Services

The consulting services will be provided by an international consulting firm (hereinafter referred to as “the Consultant”) in association with national consultants in compliance with Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012. The objective of the consulting

services is to achieve the efficient and proper preparation and implementation of the Project through the following works:

- (1) Design and construction supervision for hospital building and related civil/architectural works (Consulting Services for Facilities)
- (2) Medical equipment procurement and installation supervision (Consulting Services for Equipment Supply)

The Consultant shall coordinate with PMU, PWD, and TNMSC and shall be allowed to utilize technical skills and manpower of those agencies/organization: PMU for project management; PWD for designing and construction supervision of hospital building construction; and TNMSC for medical equipment procurement/installation/commissioning.

Furthermore, the Consultant shall assist PMU in project management: project implementation planning, coordinating with relevant agencies, supervising performance of relevant parties, monitoring progress of implementation, and advising to implement the Project on time and in the budget.

Through implementation of the Project as well as the above activities, the Consultant is expected to transfer the concept and ability of designing patient-oriented hospitals, and knowledge of medical equipment for international level patient treatment.

Chapter 3 Scope of Consulting Services

The Consultant shall carry out the following services:

Part 1	Consulting Services (Facility) (Hospital Building Construction)
Activity 1	Preparatory Survey and Designing
Activity 2	Procurement of Works
Activity 3	Construction Supervision
Activity 4	Reporting/Deliverable
Part 2	Consulting Services (Medical Equipment Supply)
Activity 5	Preparatory Survey and Designing
Activity 6	Procurement of Equipment
Activity 7	Installation Supervision/Inspection
Activity 8	Reporting/Deliverables

The Consultant will be engaged by PMU and carry out the following services. Tasks of each activity are as follows:

Part 1 Engineering Services (Facility) (Hospital Building Construction)

Activity 1 Preparatory Survey and Designing

Task 1.1 Preparatory Survey and Analysis

The Consultant will carry out the following preparatory study and analysis:

- Previous Study Review: Reviewing the JICA's Data Collection Survey Report, other previous studies and Master Plan, etc.;
- Decrees and Regulations: Surveying the relevant laws, decrees, regulations and standards, e.g. Indian National Building Code, to have the proposed buildings designs conforming with those legal requirements;
- Site Pre-Condition Analysis: Analyzing site's physical (geological/topological), and technical conditions; carrying out geological and/or topographic surveys if necessary, and reviewing the soil condition & topographic conditions of the project sites;
- Facility Analysis: Surveying site's current utility conditions/capacity, gathering application's information; and
- Operation (Medical Activities) Analysis: Analyzing hospital's staff/visitors/supply flows and security systems.

Task 1.2 Establishing Implementation Schedule and Design Policy

Based on the preparatory study and analysis, the Consultant will establish the schedule of hospital construction (Component 1 and Component 3) and the design policy.

Task 1.3 Functional Space Programming

This is one of the vital works in designing. The Consultant will conduct following works and prepare "Functional Space Program (FSP):"

- Existing Facilities Review: Reviewing existing buildings & obtaining each hospital's requirements;
- Use Conditions Analysis: Surveying use condition of the existing facilities & discussing with each hospital staff to collect design requirements of the proposed facilities;
- Activities Analysis: Reviewing and analyzing hospital's current/future research activities and staff allocations;
- Space Analysis for Individual Room: Studying room-by-room space needs; and
- Stacking Plans: Preparing stacking plan showing sectional relationship and room adjacency.

Task 1.4 Schematic Design Drawings

Following FSP, the Consultant will carry out schematic designs and prepare the following schematic design drawings. Schematic designs shall identify works to be done by the Client (or Utility Provider), equipment supplier or the contractor of building works:

- Cut Sheet illustrating equipment layout/utility requirement in major hospital rooms;
- Façade Design with 3D rendering drawings;
- Architectural Design based on finalized site layout/design concept/FSP/other preconditions;
- Preliminary Structural Drawings for electrical and mechanical works with structural/electrical/mechanical calculation;

- Design Development Drawings; and
- Preliminary Cost Estimation

Design Development Drawings with preliminary cost estimates shall be submitted to PMU/PWD for review and approval.

Particular attention shall be paid for realizing the concept of patient-oriented design and universal design, which considers patients, aged, children, disabled, pregnant women at designing stage.

Task 1.5 Planning for Demolishing and Relocating of Existing Facilities

Following the schematic design and analysis of present utilization of equipment and hospital buildings/rooms, the Consultant will prepare the overall plan for demolishing and/or relocation of existing buildings and equipment during new building construction. A plan for demolishing and relocations of equipment facilities shall be prepared and provided in accordance with Task 5.4 and incorporated into the overall demolish/relocation plan.

Task 1.6 Detail Designing and Cost Estimation

Following the approvals for schematic designs as well as preliminary cost estimates, the Consultant will proceed to detail designing works. The Consultant, based on the schematic designs, analysis, and calculations, will prepare the detail design which enables the contractor/supplier/utility providers, if applicable, to complete his/her works. The Consultant will prepare the following:

- Design Development Drawings, which is architectural base plans/ sections/elevations/other major drawings; and
- Construction Method Analysis, based on surveying local construction, and proposal of optimized construction methods;
- Detailed Drawings for architectural/structural/electrical/mechanical and other necessary works with technical calculation sheet;
- Bill of Quantities;
- Cost Estimates based on the detail design;
- Cost Estimates for building operation and maintenance: estimates for utility consumption, minor/major repairs of the building, and other necessary O&M for the building;
- Building Permission Drawings: those documents for obtaining necessary permissions from the relevant authorities.

Task 1.7 Technology Transfer

Technology transfer of designing of hospital to introduce the universal design to PMU/PWD is essential for further development of health care sector in India. The Consultant shall provide opportunities for PMU/PWD to be involved in the designing work: briefing the design concept and demonstrating designing works.

Activity 2 Procurement of Works

As it is illustrated in figure of the implementation structure, PWD is the party to call for the tender for hospital building works, either in International Competitive Bidding (ICB) or Local Competitive Bidding (LCB). The Consultant will provide advisory services to PMU/PWD for preparation of prequalification and bidding documents. The procurement shall be made in accordance with the Guidelines of Procurement under the

Japanese ODA Loan, April 2012 (JICA's Procurement Guidelines) and relevant guidelines of the Government of Tamil Nadu or the Government India, in case applicable:

Task 2.1 Contract Packaging

As agreed between JICA and PMU, each hospital building construction will be contracted to the contractor: one hospital building construction work for one contractor. The Consultant may propose alternative packaging and conditions of participation of bids. Prequalification requirement and/or technical and financial requirement shall be set according to such contract packaging.

Task 2.2 Prequalification

The Consultant shall provide necessary technical inputs for preparing prequalification documents. PMU/PWD shall incorporate such inputs in prequalification document and conduct prequalification. The Consultant will assist PMU/PWD in:

- Preparing prequalification document with evaluation criteria, as required and according to the applicable standard documents of PWD or JICA;
- Making announcement, and issuing addendum/corrigendum;
- Answering clarification from the applicant on prequalification document;
- Evaluation of applications and preparation of Prequalification Evaluation Report for review and approval of relevant authorities.

Task 2.3 Bidding Document Preparation

While prequalification is undergoing, the Consultant will assist PMU/PWD in preparing the bidding document. The bidding document shall be prepared in accordance with the applicable standard bidding documents of PWD or JICA. As required for bidding, the documents include General Instruction to Tenders, Data Sheet including instruction to comply with JICA's Guidelines for Environmental and Social Considerations, Design/Drawings, Bidding Formats, Bill of Quantities, General and Special Conditions of Contract, and evaluation criteria. The bidding document shall also include the following safety requirements:

- Requirement for assuring safety during building works based on relevant international/national guidelines;
- Requesting the bidder to submit the safety plan in accordance with above safety requirement;
- Requesting the bidder to assign the safety engineer and specify in the bidding document;
- As instructed in the bidding document, the contractor shall submit method of statement of construction safety prior to construction.

Task 2.4 Bid Evaluations and Reporting

According to the preset evaluation criteria, the Consultant will assist PMU/PWD in bid evaluation and preparing the bid evaluation report. At evaluation of bids, the Consultant will assist PMU/PWD in reviewing the construction safety as follows:

- Confirming the bidder has submitted the safety plan;
- Review the safety plan; and
- Instructing to modify the statement of construction safety to the awarded contractor prior to

construction.

Task 2.5 Assistance during Bidding

The Consultant will assist PMU/PWD in the following before or during bidding:

- Inviting bids, conducting pre-bid conferences, issuing addendum/corrigendum;
- Answering clarification from the bidder on bidding documents

Task 2.6 Contract Negotiation

The Consultant will assist PMU/PWD in contract negotiation and in facilitating negotiations including preparation of minutes of negotiation meeting; and prepare a draft and the final contract agreement.

Activity 3 Construction Supervision

The Consultant shall perform his duties during the contract implementation period of the contracts in providing construction supervision. FIDIC MDB Harmonized Edition (2010) complemented with the Specific Provisions as included in the Standard Bidding Documents under Japanese ODA Loans for Procurement of Works will be applied to the building works of the Project. The Consultant shall, as the Engineer, execute construction supervision and contract administration services in accordance with the power and authority delegated by the Employer.

Task 3.1 Construction Supervision Plan

Based on relevant clauses of FIDIC and the contractor's requirement defined in the Contract, the Consultant shall prepare the construction supervision plan and submit PMU for review and approval. The supervision plan shall include: supervision team structure and role of engineers assigned for supervision; engineers' deployment plan; site inspection and measurement procedures; procedures of claim for payment; monitoring disbursement; and procedures to issue certificates. The construction supervision plan shall define the role of PMU, PWD, and the Consultant.

Task 3.2 Particular Services in Supervision

The Consultant will assist PMU in other services not referred to FIDIC:

- Liaising with the authorities for relocation of utilities and securing supply of utilities required for hospital operation;
- Arranging the periodic and ad hoc meetings with the contractor;
- Ensuring the contractor to implement Environmental Management Plan and monitor according to Environmental Monitoring Plan, recommending the remedial measures if required;
- Ensuring the contractor to apply the statement of construction safety;
- Reviewing as-built drawings submitted by the contractor; and
- Preparation of building operation and maintenance manual.

Task 3.3 Disbursement Assistance

Claims for payment will be submitted by the contractor in accordance with the payment conditions defined

by the Contract. The Consultant in addition to measurement and evaluation of value of claims, will assist PMU/PWD in preparing the request for disbursement to be made to JICA. The Consultant will also prepare the annual and quarterly disbursement forecast, and monitor the progress of construction and disbursement.

Activity 4 Reporting/Deliverables Submission

The Consultant will submit PMU following deliverables in Table 2:

Table 2 Deliverables for Part 1 Services

Category	Deliverable	Timing	No. of Copies
Consultancy Services	Inception Report	Within 1 month after commencement of the services	10
	Quarterly Progress Report	Every quarter	10
Designing Works	Schematic Design Report with Calculation Sheet	Within 7 month after commencement of the services	10
	Final Detail Design Report with Cost Estimates	Within 11 month after commencement of the services	10
Bidding Assistance	Pre-qualification Document	At time of completion of each stage	5
	Pre-qualification Evaluation Report		5
	Bidding Documents with Drawings and B/Q		5
	Technical Evaluation Report		10
	Bid Evaluation Report		10
Construction Supervision	Quarterly Progress Report including Environmental Monitoring	Every quarter	10
	Building Operation and Maintenance Manual	At time of completion of hospital construction	10
Completion	Construction Completion Report	Within 3 month after completion construction	10
	Project Completion Report (for submission to JICA) combining with Part 2 Services	At the end of Services	10

Part 2 Consulting Services (Medical Equipment Supply)

Activity 5 Preparatory Survey and Preparation of Specifications

Task 5.1 Preparatory Survey and Analysis

The Consultant will carry out the following preparatory study and analysis:

- Previous Study Review: Reviewing the Data Collection Survey report, other previous studies and Master Plan, etc.;
- Review of requested equipment list: According to the present needs of each hospital, requested equipment list reviewed and modified within the available loan amount; and
- Facility Analysis (for Component 2): Surveying installation site's current utility conditions/capacity, identification of requirement of auxiliary works in building works, mechanical and electrical works and works for utility, of which information shall be shared with Part 1 Services;
- Facility Analysis (for Component 3): By coordinating with the schematic design for the building

(Part 1 Services), confirming all conditions is fulfilled to newly install the equipment.

Task 5.2 Establishing Equipment Procurement Plan

Based on the preparatory study and analysis, the Consultant will establish the equipment procurement plan: equipment list; packaging; procurement method (ICB with PQ and PQ evaluation criteria; LCB and bidder's qualification); schedule of bidding, installation, and commissioning. Such equipment procurement schedule shall be in conformity with building construction schedule, if applicable, and in implementation of auxiliary works required for the equipment newly installed. The Consultant will consult with PMU/TNMSC for details of the procurement plan.

Task 5.3 Preparation of Equipment Specifications

Based on the reviewed and revised equipment list, the Consultant will prepare specification of that equipment. The Consultant will estimate the cost of equipment in consideration with the market price. In case the estimated cost exceeds the loan allocated amount, the Consultant will propose PMU the alternative plan for reducing the cost. PMU will review and revise the procurement plan where consultation with JICA is required. Cost estimation will identify separately the maintenance cost for the period designated by PMU/TNMSC.

Task 5.4 Planning of Disposing and Relocating of Equipment in Use

Following the schematic design and analysis of present utilization of equipment and hospital buildings/rooms, the Consultant will identify necessity of disposing/relocating the equipment currently in use, and prepare the plan for disposing and/or relocating during new building construction or during installation of new equipment. Hospital building construction shall be in conformity with demolishing and relocation of existing equipment.

Task 5.5 Detail Designing of Auxiliary Works

Based on the specification of equipment and identification of auxiliary works for installation of equipment, the Consultant will prepare detail design for auxiliary works. The Consultant shall prepare those detail design and/or instruction along with the detail design of building construction works.

Activity 6 Procurement of Equipment (For TNMSC)

As it is illustrated in figure of the implementation structure, TNMSC is the party to call for the tender for procurement of medical equipment, either by International Competitive Bidding (ICB) or by Local Competitive Bidding (LCB). TNMSC will carry out the following works. The procurement shall be made in accordance with the Guidelines of Procurement under the Japanese ODA Loan, April 2012 (JICA's Procurement Guidelines) and relevant guidelines of the Government of Tamil Nadu or the Government India where applicable:

Task 6.1 Procurement Packaging

Prior to prequalification or bidding, the contract packaging: whether or not going for ICB or LCB, need to be decided and followed by whether or not prequalification is required, shall be determined. Following the agreed packages of equipment procurement with PMU and JICA and based on the estimated cost, TNMSC will determine the procurement package.

Task 6.2 Prequalification

TNMSC will conduct prequalification, if applicable:

- Preparing prequalification document with evaluation criteria, as required and according to the applicable standard documents of TNMSC or JICA;
- Announcement, and issuing addendum/corrigendum;
- Answering clarification from the applicant on prequalification document;
- Evaluation of applications and preparation of Prequalification Evaluation Report for review and approval of relevant authorities.

Task 6.3 Bidding Document Preparation

While prequalification is undergoing, TNMSC will prepare the bidding document. The bidding document shall be prepared in accordance with the applicable standard bidding documents of TNMSC or JICA. As required for bidding, the documents include General Instruction to Tenders, Data Sheet including instruction to comply with JICA's Guidelines for Environmental and Social Considerations, Design/Drawings, Bidding Formats, Bill of Quantities, General and Special Conditions of Contract, and evaluation criteria.

Task 6.4 Bid Evaluations and Reporting

According to the preset evaluation criteria, TNMSC will conduct bid evaluation and prepare the bid evaluation report.

Task 6.5 Works during Bidding

PMU/TNMSC will work in the following before or during bidding:

- Inviting bids, conducting pre-bid conferences, issuing addendum/corrigendum;
- Answering clarification from the bidder on bidding documents

Task 6.6 Contract Negotiation

PMU/TNMSC will conduct contract negotiation and prepare a draft and the final contract agreement.

Activity 7 Installation and Inspection

The Consultant shall supervise installation, conduct inspection and issue the certificate for the medical equipment installed at the beneficiary hospitals.

Task 7.1 Installation and Inspection Plan

Following the overall project implementation plan and the contract with the Supplier, the Consultant shall prepare the plan for installation and inspection, and submit PMU for review and approval. The installation and inspection plan shall include: engineers' deployment plan; timing of inspection of installation and commission; procedures of claim for payment; monitoring disbursement; and procedures to issue certificates. Authorized Bio Medical Engineers will inspect installation and commission and issue the certificate. The Consultant will countersign with the officer in charge at the beneficiary hospital.

Task 7.2 Supervision of Installation and Commissioning

The Consultant will assist PMU in supervision for installation and commissioning with Bio Medical Engineer. According to the procedures set by Task 7.1, the Consultant will prepare necessary documents/format for testing and commissioning; the Bio Medical Engineer, PMU, the Consultant, and the End User will certify completion of installation of equipment.

Task 7.3 Disbursement Assistance

Claims for payment will be submitted by the contractor in accordance with the payment conditions defined by the contract. The Consultant, in addition to measurement and evaluation of value of claims, will assist in PMU/TNMSC to prepare the request for disbursement to be made to JICA. The Consultant will also prepare the annual and quarterly disbursement forecast, and monitor the progress of construction and disbursement.

Task 7.4 Technical Transfer

The Consultant will ensure that the Supplier holds workshop/training for use of equipment to the hospital staff. Equipment's user's manual in writing and/or in audio/visual material will be compiled in one file (box) and will serve for users.

Activity 8 Reporting/Deliverables Submission

The Consultant will submit PMU following deliverables in Table 3:

Table 3 Deliverables for Part 2 Services

Category	Deliverable	Timing	No. of Copies
Consultancy Services	Inception Report (together with Part 1 Services)	Within 1 month after commencement of the services	10
	Quarterly Progress Report (together with Part 1 Services)	Every quarter	10
Specifications	Specification Report with Cost Estimates	Within 11 month after commencement of the services	10
Supervision	Quarterly Progress Report with Part 1 Services	Every quarter	10
Completion	Installation /Commissioning Completion Report	Within 3 month after completion of installation/commissioning	10
	Project Completion Report (for submission to JICA) with Part 1 Services	At the end of Services	10

Chapter 4 Implementation Schedule

The total duration of consulting services will be 59 months followed by 12 months of defects liability period for hospital buildings. The implementation schedule expected is as shown in Table 4. The Project mainly consists of three components. The Consultant shall consider timing of hospital building construction, installation of medical equipment with auxiliary works, testing and commissioning; then prepare the work plan for consulting services.

Table 4 Implementation Schedule

Component	Key Activities	Date	Duration in Months
1-1 Upgrading Tertiary Hospital (Facility)	Commencement of Consulting Services	November 2016	17 (from commencement of consulting services)
	Completion of detail design, preparation of drawings and tender documents	March 2018	
	Tender process including prequalification (P/Q) and tendering	August 2017 to September 2018	14
	Commencement of Construction Work	October 2018	24
	Completion of Construction Work	September 2020	
	Defect Liability Period	October 2020 to September 2021	12
3-1 Strengthening Secondary Hospital (Facility)	Commencement of Consulting Services	November 2016	17 (from commencement of consulting services)
	Completion of detail design, preparation of drawings and tender documents	March 2018	
	Tender process including prequalification (P/Q) and tendering	November 2017 to September 2018	11
	Commencement of Construction Work	October 2018	15
	Completion of Construction Work	December 2019	
	Defect Liability Period	January 2020 to December 2021	12
1-2 Upgrading Tertiary Hospital (Equipment)	Commencement of Consulting Services	November 2016	26 (from commencement of consulting services)
	Completion of detailed design, preparation of specifications, drawings and tender documents	December 2018	
	Tender process including prequalification (P/Q) and tendering	August 2018 to June 2019	11
	Commencement of Equipment Work	July 2019	15
	Completion of Equipment Work	September 2020	
	Warranty Period	October 2020 to September 2023	36
2 Strengthening Referral Hospitals (Equipment)	Commencement of Consulting Services	November 2016	6 (from commencement of consulting services)
	Completion of review of equipment and finalizing specifications	April 2017	
	Tender process including prequalification (P/Q) and tendering	February to September 2017	8
	Commencement of Equipment Work	October 2017	10
	Completion of Equipment Work	July 2018	
	Warranty Period	August 2018 to July 2021	36
3-2 Strengthening Secondary Care Hospitals (Equipment)	Commencement of Consulting Services	November 2016	18 (from commencement of consulting services)
	Completion of detailed design, preparation of specifications, drawings and tender documents	Jun 2018	
	Tender process including prequalification (P/Q) and tendering	February 2018 to December 2018	11
	Commencement of Equipment Work	January 2019	12
	Completion of Equipment Work	December 2019	
	Warranty Period	January 2020 to December 2022	36
4 Strengthening hospital management	Implementation of activity	May 2019 to September 2021	29
5	Implementation of activity	November 2016 to	36

Component	Key Activities	Date	Duration in Months
Strengthening primary health care		October 2019	

Chapter 5 Staffing (Expertise required)

Twenty seven (27) Professional (A) international consultants, twenty three (23) Professional (B) national consultants will be engaged for 59 months' duration of consulting services, and total man-months for Professional (A) will be 217.5, Professional (B) will be 351. Total consulting input of professional (A) and (B) will be 568.5 man-months. The Consultant may propose to assign other sub-ordinates, e.g. CAD operator, Office Manager, and other staff. A detailed schedule of consulting services and a distribution of man-months is shown in Attachment 1.

(1) Minimum Qualification of Key Team Members

The minimum qualification, unless otherwise stated "preferable," of Key Team Members is shown in Table 5-1 and Table 5-2. All experts have to have at least Degree of Graduate and good English proficiency.

Table 5-1 Minimum Qualification of Key Team Members (International Professionals)

Designation	Qualification
Team Leader	1) Academic degree in: Architecture 2) Experience in field: Architecture, 15 years, 5 projects 3) Particular Experience (1): Planning or designing for education and health facilities: 1 project each, construction supervision: 1 project 4) Particular experience (2): Team Leader or Deputy Team Leader, 1 project 5) Particular experience (3): Japanese ODA Loan Project in any sectors, preferable 6) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Senior Architect	1) Academic degree in: Architecture 2) Experience in field: Architecture, 10 years, 3 projects 3) Particular Experience (1): Planning or designing education or health facilities, 1 project 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Hospital Design Specialist	1) Academic degree in: Architecture 2) Experience in field: Architecture, 10 years, 3 projects 3) Particular Experience (1): Planning or designing hospitals or university research building, 1 project 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Senior Structural Engineer	1) Academic degree in: Structural Engineering, 1 st Class Structure Engineer 2) Experience in field: Structural Engineering, 10 years, 3 projects 3) Particular Experience (1): Designing hospitals or university research building, 1 project 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Senior Electrical Engineer	1) Academic degree in: Electrical Engineering, 1 st Class Structure Engineer 2) Experience in field: Structural Engineering, 10 years, 3 projects 3) Particular Experience: Designing hospitals or university research building, 1 project 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Senior Mechanical Engineer	1) Academic degree in: Mechanical Engineering, 1 st Class Structure Engineer 2) Experience in field: Mechanical Engineering, 10 years, 3 projects 3) Particular Experience: Designing hospitals or university research building, 1 project 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Equipment Planning Expert	1) Academic degree in: Engineering or Medicine 2) Experience in field: Medical and/or health sector, 15 years, 5 projects 3) Particular experience (1) Medical equipment planning and/or procurement, 2 projects

Designation	Qualification
	4) Particular experience (2): Team Leader or Deputy Team Leader, 1 project 5) Particular experience (3): Japanese ODA Loan Project in any sectors, preferable 6) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Equipment Specialist -1, 2&3	1) Academic degree in: Engineering or Medicine 2) Experience in field: Medical and/or health sector, 10 years, 3 projects 3) Particular experience: Medical equipment planning and/or procurement, 1 projects 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable
Facility Engineer	1) Academic degree in: Engineering or Architecture 2) Experience in field: Architect, 10 years, 3 projects 3) Particular experience: Designing/construction supervision for hospital building construction, 1 projects 4) Regional Experience: In SAARC or ASEAN, 1 year, preferable

Table 5-2: Minimum Qualification of Key Team Members (Local Professionals)

Designation	Qualification
Deputy Facility Design Team Leader	1) Academic degree in: Architecture 2) Experience in field: Architecture, 15 years, 5 projects 3) Particular Experience (1): Planning/designing hospital building or education facilities, 3 projects 4) Particular experience (2): Projects funded by international funding agency (e.g. WB, ADB, JICA), preferable 5) Regional Experience: In Tamil Nadu, 1 year, preferable
Equipment Planning Expert	1) Academic degree in: Engineering, Medicine, or Health 2) Experience in field: Medical and/or health sector, 15 years, 5 projects 3) Particular Experience (1): Planning/designing/procurement of medical equipment, 3 projects 4) Particular experience (2): Projects funded by international funding agency (e.g. WB, ADB, JICA), preferable 5) Regional Experience: In Tamil Nadu, 1 year, preferable
Equipment Specialist -1, 2, & 3	1) Academic degree in: Engineering, Medicine, or Health 2) Experience in field: Medical and/or health sector, 10 years, 3 projects 3) Particular Experience (1): Planning/designing/procurement of medical equipment, 1 projects 4) Particular experience (2): Projects funded by international funding agency (e.g. WB, ADB, JICA), preferable 5) Regional Experience: In Tamil Nadu, 1 year, preferable
Facility Engineer -1, 2&3 (Architect, Mechanical, and Engineering)	1) Academic degree in: Engineering, Architecture 2) Experience in field: Architect, 10 years, 3 projects 3) Particular experience: Designing/construction supervision for hospital building construction, 1 projects 4) Regional Experience: In Tamil Nadu, 1 year, preferable

Consultant may propose other experts and supporting staffs required to accomplish the tasks outlined in the ToR. It is the Consultant's responsibility to select the optimum Team and to propose the professionals which he believes best meets the needs of PMU.

(2) Scope of works for the respective personnel of Team members

The Consultant shall understand the major tasks and duties of team members and provide task description in accordance with Form TECH-5 of Section 3.

Chapter 6 Obligations of the Executing Agency

A certain range of arrangements and services will be provided by the Executing Agency to the Consultant for smooth implementation of the Consulting Services. In this context, the Executing Agency will:

(1) Report and data

Make available to the Consultant existing reports and data related to the Project.

(2) Office space

Provide an office space in the DMS Complex of the Executing Agency in Chennai with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, should be clearly stated in the proposal with its rental cost for the case the Executing Agency is NOT able to provide such facilities;

(3) Cooperation and counterpart staff

Appoint counterpart officials, agent and representative as may be necessary for effective implementation of the Consulting Services;

(4) Assistance and exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- work permit and such other documents;
- entry and exit visas, residence permits, exchange permits and such other documents
- clearance through customs;
- instructions and information to officials, agent and representatives of the Borrower's Government;
- exemption from any requirement for registration to practice their profession; and
- privilege pursuant to the applicable law in the Borrower's Country.

[End]

Annex 13: Environmental and Social Consideration related documents

Annex13-1 Gaps between Relevant Laws and Guidelines in India and JICA Guidelines	A13-1
Annex 13-2 Result of Project Scoping using the Check List 19 provided by JICA	A13-3
Annex 13-3 EIA TOR: Items and methodology for environmental examination	A13-5
Annex 13-4 Preliminary Environmental Management Plan	A13-7
Annex 13-5 Preliminary Environmental Monitoring Plan	A13-12
Annex 13-6 Preliminary Environmental Monitoring Form	A13-14
Annex 13-7 Minute of the Stakeholder Meeting at Kilpauk Medical College Hospital	A13-17
Annex 13-8 Check List 19 of the JICA Guideline for Environmental and Social Considerations	A13-19

Aspect	JICA Guidelines	Indian Environmental Notification	Gaps	Mechanisms to Bridge Gaps
Environmental items that give impacts	<p>Check list attached to GL</p> <ul style="list-style-type: none"> They Include pollution, impact on natural environment and social environment. Social environment includes health, safety, and involuntary resettlement. Items to be addressed in the specific project are narrowed down to the needed ones through the scoping process. 	<p>Check list (Appendix II)</p> <p>1 land environment, 2 water environment, 3 Vegetation, 4 Fauna, 5 Air environment, 6 Aesthetics, 7 Socio-economic aspects, 8 Building materials, 9 Energy conservation, 10 Environmental management plan including mitigation measures monitoring plan</p>	<ul style="list-style-type: none"> Impact on protected area and heritage are not mentioned (they are mentioned in the Application Form) Involuntary resettlement is not mentioned in Indian checklist. Impact on vulnerable peoples is not mentioned. 	JICA recommends project proponent to consider the gap items.
Categorization	<ul style="list-style-type: none"> Categorization is based on the degree of impact in consideration with project outline, scale or location. Category A project requires EIA and category B project requires IEE. 	<ul style="list-style-type: none"> Categorization is based on the size or volume of project. Category A project requires environmental clearance (EC) of central government while category B project requires EC from state/level impact assessment authority. 	IEE is not mentioned in the Notification.	-
Initial Environmental Examination (IEE)	IEE is an alternative case of EIA and executed based on easily available information including existing data and simple field surveys.	There is no IEE system in Indian system of environmental and social consideration. (The case of the projects which are not required EIA report seems similar to IEE.).	-	-
Public Consultation	As one of the basic principles applied to all JICA projects, JICA incorporates stakeholder opinions into decision-making processes regarding	Public consultation is not applied to all projects, but there are six cases of exemption including building project.	Stakeholder meeting or public consultation is not applied to all projects in Indian Notification.	JICA recommends project proponent to hold meetings with stakeholders on the project.

Aspect	JICA Guidelines	Indian Environmental Notification	Gaps	Mechanisms to Bridge Gaps
	environmental and social considerations by ensuring participation of stakeholders.			
Information Disclosure	As one of the basic principles applied to all JICA projects, JICA discloses information on environmental and social considerations in collaboration with project proponents etc., to ensure accountability and to promote the participation of various stakeholders.	Environmental Notification does not mention Information disclosure. SEIAA discloses the list of application on the web but not the contents.	Project Proponent should to adhere to the framework of the lending agencies.	JICA explains information disclosure of information relating to the environmental and social consideration.

Source: Prepared by JICA Expert in charge of environmental and social conditions

Category	Environmental Item	Evaluation		Anticipated impacts	
		Before/during construction phase	Operational phase	Construction phase	Operational phase
Pollution Control	(1) Air Quality	B-	C-	Due to transportation of construction materials and equipment as well as operation of construction machines, air quality becomes worse temporarily.	The new hospitals will use commercial power but diesel generators will be installed as emergency power supply device. Also, it is anticipated that transportation to the new hospitals will increase.
	(2) Water Quality	C-	B-	Water contamination is anticipated by drainage of used water from construction works.	Water used in the hospitals will be discharged to the city sewer main.
	(3) Wastes	B-	B-	It is anticipated that waste lumber and waste materials are generated.	Both non-medical wastes (general wastes) and medical wastes will be generated.
	(4) Soil Contamination	C-	C-	Soil contamination is likely anticipated due to leakage of oil for construction and other materials from construction site to a certain volume.	Waste water and wastes are potentially anticipated to contaminate soil of the hospital lot and surrounding area.
	(5) Noise and Vibration	B-	C-	Noise and vibration are anticipated due to the operation of construction machinery and vehicles.	The medical equipment will generate neither making noise nor vibration. The generator as emergency power is low noise type. However, cooling device to be installed on the roof may generate noises to a certain extent.
	(6) Subsidence	D	D	No water extraction is planned.	No water extraction is planned.
	(7) Odor	D	D	No construction works are anticipated that cause bad smell.	Hospitals will not emit bad odor to the surrounding area.
Natural Environment	(1) Protected Areas	D	D	All seven hospitals are located in the urban area and not within or adjacent to the designated protected area. They are not inside or adjacent to: biosphere reserves, national parks, wildlife sanctuaries, elephant reserves, tiger reserves, bird sanctuaries, and conservation reserves and community reserves.	
	(2) Ecosystem	D	D	All seven hospitals will not affect natural environment and ecosystem.	
	(3) Hydrology	D	D	As construction will not pump up ground water, it will not cause hydrologic changes.	As hospitals will not pump up ground water, they will not cause hydrologic changes.
	(4) Topography and Geology	D	D	No construction works cause large-scale alteration of the topographic features and geologic structures.	Hospitals will not possibly cause large-scale alteration of the topographic features and geologic structures.
Social Environment	(1) Resettlement	B-	B-	There is possibility that construction of hospitals in Salem may cause disturbance of land right or land use right.	

Category	Environmental Item	Evaluation		Anticipated impacts	
		Before/during construction phase	Operational phase	Construction phase	Operational phase
Social Environment	(2) Living and Livelihood	D	B+	As construction site is inside the premises of medical facilities, construction work will not adversely affect living and livelihood.	
	(3) Heritage	D	D	The project will not damage the local heritage	
	(4) Landscape	D	D	There is no possibility that the project will adversely affect the local landscape.	
	(5) Ethnic Minorities and Indigenous Peoples	D	D	Construction of new hospitals will not disturb culture and lifestyle of ethnic minorities because it is inside the premises of existing medical facilities or on the vacant land kept for public works.	Government health service supports living condition of poor households and scheduled caste. The chief minister comprehensive health insurance covers poor households whose annual income is below Rs 75,000.
	(6) Working Conditions	B-	C-	Accidents are anticipated if construction equipment is not maintained and operated properly.	Accidents relating to use of medical equipment and machinery are anticipated if they are not maintained and operated properly.

Source: Prepared by JICA Expert in charge of environmental and social conditions

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

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

C +/- Extent of positive/negative impact is unknown (A further examination is needed and the impact could be clarified as the study progresses.)

D No impact is expected.

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.

In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

Category	Environmental Item	Evaluation		Items of examination	Means of examination
		Construction	Operation		
Pollution Control	(1) Air Quality	B-	C-	1) Confirmation of related to air quality standards of India, Japan and, if necessary, WHO.	Examination of existing documents
				2) Grasp of present condition of air quality.	Survey of existing documents (State of Tamil Nadu); actual measurement if required
				3) Estimate of degree of impact caused by increase of vehicles during construction period.	Examination of properness: items of construction, construction method, period, type of machinery, place, period and time of operation, number of construction vehicles, moving route
				4) Estimate of degree of impact caused by increase of vehicles to the new hospital at operation period.	Estimate of impact on the basis of the forecast of number of clients and vehicles to the new hospitals.
				5) Living conditions relating to air quality of surrounding communities.	Field survey and hearing.
	(2) Water Quality	C-	B-	1) Confirmation of water quality standards if India, Japan, and if required, WHO	Examination of existing documents
				2) Quality of water used in the existing hospitals (general, examination, infectious waste water).	Collection of official data at the concerned government offices; observation and hearing; actual measurement if necessary.
				3) Situation of waste water management of the existing hospitals.	Observation and hearing.
	(3) Wastes	B-	B-	1) Means of disposal of construction wastes.	Examination of existing documents, information collection and hearing at the concerned organizations.
				2) Means of disposal of medical wastes, cells and tissues and sharps in the hospitals.	Observation and hearing
				3) Garbage treatment system of the locality.	Information collection at the concerned organizations; estimate of garbage to be generated during operation period.
	(4) Soil Contamination	C-	C-	1) Measures to avoid oil leaking during the construction period	Examination of means of oil disposal during construction period.
				2) Source of contamination from hospitals.	Examination of existing documents, information collection and hearing at the concerned organizations.
	(5) Noise and Vibration	B-	C-	1) Confirmation of related to noise standards of India and Japan.	Examination of existing documents
				2) Estimate of degree of impact caused by construction.	Examination of properness: items of construction, construction method, period, type of machinery, place, period and time of operation.
3) Estimate of degree of impact caused by the new hospitals.				Examination of existing documents, observation of existing hospitals.	

Category	Environmental Item	Evaluation		Items of examination	Means of examination	
		Construction	Operation			
	(6) Subsidence	D	D	-	-	
	(7) Odor	D	D	-	-	
Natural Environment	(1) Protected Areas	D	D	-	-	
	(2) Ecosystem	D	D	-	-	
	(3) Hydrology	D	D	-	-	
	(4) Topography and Geology	D	D	-	-	
Social Environment	(1) Resettlement	B-	B-	Land title and land use.	Site observation and hearing.	
	(2) Living and Livelihood	D	B+	-	-	
	(3) Heritage	D	D	-	-	
	(4) Landscape	D	D	-	-	
	(5) Ethnic Minorities and Indigenous Peoples	1)	D	D	Equal work conditions of among all caste.	Information collection at the concerned organizations.
		2)			Participation of ethnic minorities (scheduled caste) in the medical and health services.	
(6) Working Conditions	1)	B-	C-	Measures to be taken for work safety during the construction period.	Examination of working plan; monitoring by the supervision team.	
	2)			Capacity building of medical staff and workers in the field of proper O&M of medical equipment and facilities.	Examination of the project plan.	

Source: Prepared by JICA Expert in charge of environmental and social conditions

A. Construction phase

Category	Environmental Item	Evaluation	Anticipated impacts	Mitigation Measures (preliminary)	Implementer	Responsible Organization
Pollution Control	(1) Air Quality	B-	Due to transportation of construction materials and equipment as well as operation of construction machines, air quality becomes worse temporarily.	PMU and supervising consultant shall instruct contractor to use unleaded gasoline and maintain their vehicles to keep clean exhaust gas at the construction period. They will conduct periodical monitoring.	Contractor	PMU, Municipality
	(2) Water Quality	C-	Water contamination is anticipated by drainage of used water from construction works.	PMU and supervising consultant shall instruct contractor to follow the Indian laws and regulations on water drainage. They will conduct periodical monitoring.	Contractor	PMU, Municipality
	(3) Wastes	B-	It is anticipated that waste lumber and waste materials are generated.	PMU and supervising consultant shall instruct contractor to treat wastes properly. They will conduct periodical monitoring.	Contractor	PMU, Municipality
	(4) Soil Contamination	C-	Soil contamination is likely anticipated due to leakage of oil for construction and other materials from construction site to a certain volume.	PMU and supervising consultant shall instruct contractor to use construction machinery of the low leakage type. They will do periodical monitoring. They will conduct periodical monitoring.	Contractor	PMU, Municipality
	(5) Noise and Vibration	B-	Noise and vibration are anticipated due to the operation of construction machinery and vehicles.	PMU and supervising consultant shall instruct contractor to drive construction vehicles at low speed, and monitor the noise and vibration by installing sound-level meter and vibration meter at the boundary of the construction site.	Contractor	PMU, Municipality
	(6) Subsidence	D	No water extraction is planned.	-	-	-
	(7) Odor	D	No construction works are anticipated that cause bad smell.	-	-	-
Natural Environment	(1) Protected Areas	D	All seven hospitals are located in the urban area and not within or adjacent to the designated protected area. They are not inside or adjacent to: biosphere reserves, national parks, wildlife sanctuaries, elephant reserves, tiger reserves, bird sanctuaries, and conservation reserves	-	-	-

Category	Environmental Item	Evaluation	Anticipated impacts	Mitigation Measures (preliminary)	Implementer	Responsible Organization
			and community reserves.			
	(2) Ecosystem	D	All seven hospitals will not affect natural environment and ecosystem.	-	-	-
	(3) Hydrology	D	As construction will not pump up ground water, it will not cause hydrologic changes.	-	-	-
	(4) Topography and Geology	D	No construction works cause large-scale alteration of the topographic features and geologic structures.	-	-	-
Social Environment	(1) Resettlement	B-	There is possibility that construction of hospitals in Salem and Tirunelveli may occur disturbance of land right or land se right.	Confirmation of location and land ownership is required on site at the data collection survey.	PMU	PMU
	(2) Living and Livelihood	D	As construction site is inside the premises of medical facilities, construction work will not adversely affect living and livelihood	-	-	-
	(3) Heritage	D	The project will not damage the local heritage	-	-	-
	(4) Landscape	D	There is no possibility that the project will adversely affect the local landscape.	-	-	-
	(5) Ethnic Minorities and Indigenous Peoples	D	Construction of new hospitals will not disturb culture and lifestyle of ethnic minorities because it is inside the premises of existing medical facilities or on the vacant land kept for public works.	-	-	-
	(6) Working Conditions	B-	Accidents are anticipated if construction equipment is not maintained and operated properly.	Safety and health measures at the construction shall be included in the terms of reference to the contractor. PMU and supervision team will instruct contractor to take measure against accident and conduct periodical monitoring of working condition.	Contractor	PMU

B. Operational phase

Category	Environmental Item	Evaluation	Anticipated impacts	Mitigation Measures (tentative)	Implementer	Responsible Organization
Pollution Control	(1) Air Quality	C-	The new hospitals will use commercial power but diesel generators will be installed as emergency power supply device. Also, it is anticipated that transportation to the new hospitals will increase.	JICA consultant team will recommend the target hospitals to use diesel of high quality for the generator.	Hospital	Hospital, Municipality
	(2) Water Quality	B-	Water used in the hospitals will be discharged to the city sewer main.	The survey team planned that water used in the hospitals will be treated in the sewage treatment plant for domestic waste water and effluent treatment plant for trade effluent (laundry and biomedical) till water quality complies with the Indian effluent standard before drained. However, periodical monitoring of discharged water is needed.	Hospital	Hospital, Municipality
	(3) Wastes	B-	Both non-medical wastes (general wastes) and medical wastes will be generated.	The survey team planned that non-medical wastes will be collected and treated by the municipal wastes service; medical wastes will be separated and sorted into infectious wastes, cells and tissues and sharps, and collected by the professional garbage collector.	Hospital	Hospital, Municipality
	(4) Soil Contamination	C-	Waste water and wastes are potentially anticipated to contaminate soil of the hospital lot and surrounding area.	In order to avoid soil contamination caused by effluent and leachate from hospital, the survey team planned capacity development/ training as a part of Component 4 addressed to the hospital workers on the O&M of facilities including waste management..	-	-
	(5) Noise and Vibration	C-	The medical equipment will generate neither making noise nor vibration. The generator as emergency power is low noise type. However, cooling device to be installed on the roof may generate noises to a certain extent.	The survey team planned to install sound insulation wall or silencer as measures against noise and vibration if the equipment and cooling device will not comply with the noise standard. Also they will recommend to the hospital staffs and hospital users to drive slowly inside and around the hospitals.	-	-

Category	Environmental Item	Evaluation	Anticipated impacts	Mitigation Measures (tentative)	Implementer	Responsible Organization
	(6) Subsidence	D	No water extraction is planned.	-	Hospital	Hospital, (Department of Atomic Energy)
	(7) Odor	D	Hospitals will not emit bad odor to the surrounding area.	-	-	-
Natural Environment	(1) Protected Areas	D	All seven hospitals are located in the urban area and not within or adjacent to the designated protected area. They are not inside or adjacent to: biosphere reserves, national parks, wildlife sanctuaries, elephant reserves, tiger reserves, bird sanctuaries, and conservation reserves and community reserves.	-	-	-
	(2) Ecosystem	D	All seven hospitals will not affect natural environment and ecosystem.	-	-	-
	(3) Hydrology	D	As hospitals will not pump up ground water, they will not cause hydrologic changes.	-	-	-
	(4) Topography and Geology	D	Hospitals will not possibly cause large-scale alteration of the topographic features and geologic structures.	-	HFWD	HFWD
Social Environment	(1) Resettlement	B-	There is possibility that construction of hospitals in Salem may occur disturbance of land right or land se right.	Confirmation of location and land ownership is required on site	-	-
	(2) Living and Livelihood	B+	Construction of new hospitals will improve health service condition and it will positively affect living condition of local people.	-	-	-
	(3) Heritage	D	The project will not damage the local heritage	-	-	-
	(4) Landscape	D	New hospitals will not spoil landscape because they follow the government regulation. The height of all hospitals is less than regulated building height: MMCH 12m (regulation 29.0m), KMCH 20m (regulation 32.5m), CMCH 20m (regulation 22.5m), and hospitals of Component 3 has 3 stories (regulation 14.0m)	-	-	-
	(5) Ethnic Minorities and Indigenous	D	Government health service supports living condition of poor households and scheduled caste. The chief minister comprehensive health	-	Hospitals	Hospitals, HFWD

Category	Environmental Item	Evaluation	Anticipated impacts	Mitigation Measures (tentative)	Implementer	Responsible Organization
	Peoples		insurance covers poor households whose annual income is below Rs 75,000.			
	(6) Working Conditions	C-	Accidents relating to use of medical equipment and machinery are anticipated if they are not maintained and operated properly.	The proposed Project is planned to install medical equipment having various kinds of control device to a void risk. Also, it is planned that a part of Plan Component 4 to implement O&M capacity building for the hospital medical staff and workers to enhance the capacity of appropriate use of medical equipment and facilities.	Hospital	Hospital, Municipality

Source: Prepared by JICA Expert in charge of environmental and social conditions

A. Construction phase

Category	Environmental Item	Monitoring Parameters	Means of Monitoring	Environmental Standard	Monitoring Point	Frequency of Monitoring
Pollution Control	Air Quality	Temperature, humidity, wind velocity, dust, SO ₂ , NO ₂ , CO	Actual measurement	National Ambient Air Quality Standards (2009), Central Pollution Control Board (CPCB)	Construction sites	once/ three months
	Water Quality	pH, colour, BOD, COD, N, Total P	Actual measurement	Water quality criteria, CPCD	Outlets	once/ three months
	Wastes	Kind of wastes, amount, record of collection	Observation	-	Construction sites	once/ month
	Soil Contamination	Oil leaking	Observation	-	Construction sites	once/ month
	Noise and Vibration	Noise (db)	Actual measurement	The noise pollution (regulation and control) rules (2000), CPCB	Boundary of premises of the medical facilities	once/ three months
Natural Environment		No specific parameter to monitor	-	-	-	-
Social environment	Resettlement	Compensation (if resettlement occurs)	Interview and observation			
	Working Conditions	Construction accidents, traffic accidents	Record of accidents	-	Construction sites, route of vehicles used for transportation of materials and other necessity	once/ day

B. Operational phase

Category	Environmental Item	Monitoring Parameters	Means of Monitoring	Environmental Standard	Monitoring Point	Frequency of Monitoring
Pollution Control	Air Quality	Temperature, humidity, wind velocity, dust, SO ₂ , NO ₂ , CO; quality of gasoline	Actual measurement; record	National Ambient Air Quality Standards (2009), Central Pollution Control Board (CPCB)	Waste water treatment facilities, wastes depository, mortuary	once/ three months
	Water Quality	pH, colour, BOD, COD N; bacteria, virus	Actual measurement	Water quality criteria, CPCD	Outlets	Always
	Wastes	Kind of wastes, amount, cleanness, record of waste collection	Observation	-	Depository	once/ month

Category	Environmental Item	Monitoring Parameters	Means of Monitoring	Environmental Standard	Monitoring Point	Frequency of Monitoring
	Soil Contamination	-	Observation	-	Premises of medical facilities	once/ three months
	Noise and Vibration	Noise (db)	Actual measurement	The noise pollution (regulation and control) rules (2000), CPCB	Premises of the medical facilities	once/ three months
	Radiation*	α rays, β rays	Actual measurement	Atomic energy (radiation protection) rules (2004), Department of Atomic Energy	Inside and near to the radiology laboratories	Always
Natural Environment		No specific parameter to monitor	-	-	-	-
Social environment	Resettlement	Compensation (if resettlement occurs)	Interview and observation			
	Working Conditions	Construction accidents, traffic accidents	Record of accidents	-	Construction sites, route of vehicles used for transportation of materials and other necessity	once/ day

Note: Radiation leakage from radiation laboratories is added as monitoring target.

Source: Prepared by JICA Expert in charge of environmental and social conditions

The latest results of the below monitoring items shall be submitted to the lenders as a part of the Quarterly Report throughout the construction phase.

A. Construction phase

Name of the construction site / _____ /

Date of monitoring / _____ / Date of reporting / _____ /

Person in charge of monitoring / _____ /

Person in charge of reporting / _____ /

1. Response/Actions to comments and guidance from Government Authorities (at EC) and the Public

Monitoring item	Monitoring results during the reporting period
Number and contents of formal comments made <u>by the public</u>	
Number and contents of responses from <u>the Government agencies</u> (conditions of EC)	

2. Pollution control

Item	Unit	Measured Value (mean)	Measured Value (max)	Indian standards	Standards for contract	Referred international standards	Measurement points	Frequency
(1) Air quality								
Temperature	°C							
humidity	%							
wind velocity	m/s							
Dust								
SO ₂								
NO ₂								
CO								
(2) Water quality								
pH								
Colour								
BOD								
COD								
N								
Total P								
Bacteria								
Virus								
(3) Waste								
Kind of waste								
Amount								
Record of collection								
(4) Noise and vibration								
Noise (dB)	dB							
(5) Radiation								
α rays, β rays								

3. Social environment

Land right		
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Construction accidents		
Traffic accidents		
Others		

B. Operational phase

Name of the construction site / _____ /

Date of monitoring / _____ / Date of report / _____ /

Person in charge of monitoring / _____ /

Person in charge of report / _____ /

1. Response/Actions to comments and guidance from Government Authorities (at EC) and the Public

Monitoring item	Monitoring results during the reporting period	Frequency
Number and contents of formal comments made <u>by</u> the public		
Number and contents of responses from <u>the</u> Government agencies (conditions of EC)		

2. Pollution control

Item	Unit	Measured Value (mean)	Measured Value (max)	Indian standards	Standards for contract	Referred international standards	Measurement points	Frequency
(1) Air quality								
Temperature	°C							
humidity	%							
wind velocity	m/s							
Dust								
SO ₂								
NO ₂								
CO								
(2) Water quality								
pH								
Colour								
BOD								
COD								
N								
Total P								
(3) Waste								
Kind of waste								
Amount								
Cleanness	-							
Record of collection								
(4) Soil contamination								
Oil leaking								
(5) Noise and vibration								
Noise (dB)								

3. Social environment

Item	Monitoring results	Measures to be taken
Land right		
Health condition of staff and workers		

Medical accidents		
Traffic accidents		
Others		

Source: Prepared by JICA Expert in charge of environmental and social conditions

Date :	November 25, 2015 (Wednesday)
Time:	9:30 -11:00
Venue:	Government Kilpauk Medical College Hospital, Chennai
Names of the Participants:	<ul style="list-style-type: none"> • Mr. Balasubraanian, President of Lions Club (Kilpauk) • Mr. Kaatturgsampath, Lions Club (Kilpauk) • Mr. J Rubannanicra, Secretary, Kilpauk Co-op Society • Mr. A Diwakar, Assistant, Kilpauk Co-op Society • Mr. R Babu, Corporation driver, Resident nearby • Mr. P Mahamari, Self-employed, Resident nearby • Mr. M Thirugnanam, Self-employed, Resident nearby • Dr. Narayana Babu, Dean KMCH • Dr. Thirunavukkarasu, Deputy Superintendent, KMCH • Dr. K V Leela, Vice Principal, KMC • Ms. R. Vijayalakshi, Staff Nurse, Resident of Nurse Quarter • Ms. A Seonailti, Staff Nurse, Resident of Nurse Quarter • Ms. S Anuralhi, Staff Nurse, Resident of Nurse Quarter • Ms. V Masanoum, Staff Nurse, Resident of Nurse Quarter • Ms. M Sekri, Staff Nurse, Resident of Nurse Quarter • Ms. P Gomathi Staff Nurse, Resident of Nurse Quarter • Ms. A Uma, Staff Nurse, Resident of Nurse Quarter • Ms. A Thenmothi, Staff Nurse, Resident of Nurse Quarter • Ms. V Selvarnary, Staff Nurse, Resident of Nurse Quarter • Er. Ravindran, EE, PWD • Dr. T. Sabeetha, Deputy Director (Infrastructure), DME • Mr. Kensaku Ichikawa, JICA Country Officer • Mr. Yohei Horiba, JICA survey team • Mr. Satoshi Okamoto, JICA survey team, and others
Objective/Agenda:	<ul style="list-style-type: none"> • To explain EIA issues of the proposed building and gather public opinions
Points of Discussion:	
<p>1. DME's Introduction: Dr. Sabeetha, DME P&D, gave a brief introduction about JICA Loan Project and explained the background of this stakeholder meeting.</p> <p>2. KMCH's Introduction: Dr. Narayana Babu, Dean KMCH welcomed public attendants and JICA survey team, etc.</p> <p>3. Explanation of Project Outline: Mr. Satoshi Okamoto, JICA survey team, explained the following points:</p> <ul style="list-style-type: none"> • Current situations of KMCH campus and existing buildings • Outline of the proposed building: <ul style="list-style-type: none"> ➤ Location (constructing at area after existing Dr. Gurusamy Mudalauar block is removed) ➤ Size and configurations (contains one Basement, G + 5 floor) ➤ Aerial view <p>4. EIA Issues Discussed: Mr. Satoshi Okamoto, JICA survey team, explained JICA's basic study principle of EIA issues and the following results of preliminary EIA study report:</p>	

Though there are some slight impact items (such as air quality and water quality), negative impact caused by them will be minimized by proper mitigation measures. Since the proposed building will contribute to public health care system, constructing this building will be justified after considering benefit/impact comparison.

- Air quality: exhaust of generator should be studied carefully to avoid negative impact.
- Biomedical waste and water quality: STP (Sewage Treatment Plant) and ETP (Effluent Treatment Plan) should be designed as per the regulations.
- Air pollution, noise and vibration during demolition work of existing building and construction work of proposed building should be minimized by proper consecution plans (such as separate construction vehicle access and temporary fence). Those measure should be defined in bidding documents.

Er. Ravindran, EE, PWD also explained the following issues:

- Debris of construction work: Tamil Nadu EIA defines to clear all debris caused by construction work.
- Ground water quality: Ground water will not be polluted by construction work

5. Public Opinions:

Mr. Balasubraanian, President of Lions Club, states:

- I welcome this project and appreciate work for public welfare.
- Proposed building is linked to metro station, and this project will be benefit for large number of public.

Mr. Thirugnanam, Self-employed and resident nearby, asked:

- I have question about the patient status after demolishing the existing Dr. Gurusamy Block

Dr. Thirunavukkarasu, Deputy Superintendent, KMCH, answered:

- Necessary arrangement (converting other building to temporary ward) will be taken so that patient welfare will not be affected.

Mrs P. Gomathi, Staff Nurse, KMCH and resident of Nurse quarter nearby states;

- I welcome the project, since the project will be benefit to poor patients of this locality.

6. Meeting Close

The meeting ended with the vote of thanks by Dr. P. Thirunavukkarasu.

7. Photos of the Stakeholder Meeting:



Category	Environmental Item	Main Check Items	Yes: Y No: N NA: Not applied	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process?	(a) N	(a) EIA reports are required for the building $\geq 20,000\text{m}^2$ and $< 150,000\text{m}^2$ according to the Notification 2006 and Notification 2014. JICA requested HFWD for assigning an environmental specialist in PMU who is in charge of environmental management and monitoring of the Project and explained HFWD that all necessary clearance or permissions are obtained before commencement of the construction. HFWD took note of it.
		(b) Have EIA reports been approved by authorities of the host country's government?	(b) NA	(b)
		(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	(c) NA	(c)
		(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(d) NA	(d)
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	(a) N	(a) Notification 2006 provides that public consultation is not required to the building projects categorized as B1. However, PMU should explain the project to the surrounding community before construction starts.
		(b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(b) NA	(b)
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) N	(a) JICA expert will examine alternatives.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, (such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust) emitted from the proposed infrastructure facilities and ancillary facilities comply with the country's emission standards and ambient air quality standards? Are any mitigating measures taken?	(a) N	(a) The new hospitals are not production facilities and will not generate critical air pollution (emit neither SOx nor NOx).

Category	Environmental Item	Main Check Items	Yes: Y No: N NA: Not applied	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
Pollution Control		(b) Are electric and heat source at accommodation used fuel which emission factor is low?	(b) Y	(b) The new hospitals will use commercial power but diesel generators will be installed as emergency power supply device. JICA consultant team shall recommend PMU and target hospitals to use diesel of high quality.
	(2) Water Quality	(a) Do effluents or leachates from various facilities, such as infrastructure facilities and the ancillary facilities comply with the country's effluent standards and ambient water quality standards?	(a) Y	(a) Water used in the hospitals will be treated in the septic tank until water quality complies with the Indian effluent standard before drained into public sewage system. Water used for medical examination will be neutralized and infectious waste water will be sterilized before drained.
	(3) Wastes	(a) Are wastes from the infrastructure facilities and ancillary facilities properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) Non-medical wastes (general wastes) will be collected and treated by the municipal wastes service. Medical wastes will be separated and sorted into infectious wastes, cells and tissues and sharps, and collected by the professional garbage collector. The JICA consultant team will give training on the O&M of facilities including waste management to the staffs.
	(4) Soil Contamination	(a) Are adequate measures taken to prevent contamination of soil and groundwater by the effluents or leachate from the infrastructure facilities and the ancillary facilities?	(a) NA	(a) Used water and wastes will be treated and managed as mentioned above to avoid soil contamination.
	(5) Noise and Vibration	(a) Do noise and vibrations comply with the country's standards?	(a) Y	(a) The medical equipment will generate neither disturbing noises nor vibration. The generator for the purpose of emergency power is low noise type. However, cooling device to be installed on the roof may generate noises. It is planned to take measures such as sound insulation wall or silencer if it will not comply with the noise standard.
	(6) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The new hospitals will not extract groundwater.
	(7) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) N	(a) The new hospitals will not generate bad odor.
3 Natural Environment	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) All seven hospitals are located in the urban area. They are not inside or adjacent to the designated protected areas: biosphere reserves, national parks, wildlife sanctuaries, elephant reserves, tiger reserves, bird sanctuaries, and conservation reserves and community reserves.

Category	Environmental Item	Main Check Items	Yes: Y No: N NA: Not applied	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
Natural Environment	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	(a) N	(a) -
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	(b) N	(b) -
		(c) Is there a possibility that changes in localized micro-meteorological conditions, such as solar radiation, temperature, and humidity due to a large-scale timber harvesting will affect the surrounding vegetation?	(c) N	(c) -
		(d) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(d) N	(d) -
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	(a) N	(a) The new hospitals will not cause the hydrologic charges.
(4) Topography and Geology	(a) Is there a possibility the project will cause large-scale alteration of the topographic features and geologic structures in the project site and surrounding areas?	(a) N	(a) The site of five hospitals is inside the existing medical facilities and that of remaining two hospitals is the land kept for public works. Thus, the Project will not cause large scale alteration.	
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	(a) Y	(a) Confirmation of location and land ownership is required on site at survey.
		(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?	(b) NA	(b)
		(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	(c) NA	(c)
		(d) Is the compensations going to be paid prior to the resettlement?	(d) NA	(d)
		(e) Is the compensation policies prepared in document?	(e) NA	(e)

Category	Environmental Item	Main Check Items	Yes: Y No: N NA: Not applied	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
Social Environment		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people living below the poverty line, ethnic minorities, and indigenous peoples?	(f) NA	(f)
		(g) Are agreements with the affected people obtained prior to resettlement?	(g) NA	(g)
		(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	(h) NA	(h)
		(i) Are any plans developed to monitor the impacts of resettlement?	(i) NA	(i)
		(j) Is the grievance redress mechanism established?	(j) NA	(j)
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(a) N	(a) The project will not adversely affect the living conditions because five of seven hospitals are inside the premises of existing medical facilities and remaining two will be constructed on the vacant land. Living life of inhabitants will be improved positively after construction because the new hospitals will increase their accessibility to medial service of the area.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) The project will not damage the local heritage because project sites are not inside or adjacent to the heritages. The world heritage in Tamil Nadu are: Brihadeeswarar Temple, Airavateswar Temple, Mahabalpuram, Nilgiri Mountain Railway,
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) -
		(b) Is there a possibility that landscape is spoiled by construction of high-rise buildings such as huge hotels?	(b) N	(b) -
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(a) N	(a) -

Category	Environmental Item	Main Check Items	Yes: Y No: N NA: Not applied	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
Social Environment		(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(b) N	(b) -
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	(a) N	(a) The project proponent (MOH of Tamil Nadu, PMU after L/A) and target hospitals do not violate laws and ordinances associated with the working conditions.
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	(b) Y	(b) PMU and supervising consultant will supervise contractor to keep proper maintenance and operation of construction equipment. It is planned that medical equipment has various kinds of control devices to avoid risks of damaging life of patients and operators: such as, alarm of oxygen level for anaesthai.
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	(c) Y	(c) Medical equipment requires appropriate operation and maintenance. Component 4 of the Project proposes technical assistance. It composes of capacity development: training on (i) bio safety management addressed to hospital workers, anaesthesia surgeons and nurses; (ii) facility management and maintenance for hygiene and ventilation addressed to anaesthesia/ surgeons, hospital engineers/ technicians; and (iii) equipment operation and maintenance addressed to users of equipment and officers.
		(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(d) Y	(d) JICA consultant team shall recommend the target hospitals to give proper instruction to the security guards not to violate safety of other individuals and local residents.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	(a) Y	(a) The construction plan shall consider and take adequate measures to reduce impacts during construction. Monitoring is needed during construction period.
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	(b) Y	(b) The consultant team shall adequately supervise the contractors to avoid adverse impacts on natural environment and instruct them, if necessary, to take adequate measures to reduce impacts.

Category	Environmental Item	Main Check Items	Yes: Y No: N NA: Not applied	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
Others		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(c) Y	(c) The consultant team shall adequately supervise the contractors to avoid adverse impacts on social environment and instruct them, if necessary, to take adequate measures to reduce impacts.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	(a) N	(a) JICA consultant team recommends PMU, soon after it is established, to start EIA procedure including preparation of monitoring plan in accordance with Indian and JICA guidelines on environmental and social consideration.
		(b) What are the items, methods and frequencies of the monitoring program?	(b) NA	(b) PMU will determine the detail of the monitoring plan based on the result of EIA study.
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	(c) N	(c) PMU will take the responsibility of all EIA process including monitoring. JICA mission explained HFWD for assigning an environmental specialist in PMU and to obtain all necessary clearance /permission before commencement of construction and HFWD took note of it.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(d) Y	(d) Paragraph 7 of Notification 2006 provides that it shall be mandatory for the project management to submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions.
6 Note	(1) Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways and Bridges checklist should also be checked (e.g., projects including access roads to the infrastructure facilities).	(a) N	(a) Not necessary
		(b) For projects, such as installation of telecommunication cables, power line towers, and submarine cables, where necessary, pertinent items described in the Power Transmission and Distribution Lines checklists should also be checked.	(b) N	(b) Not necessary
	(2) Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a)

Source: Prepared by JICA Expert in charge of environmental and social conditions

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.

In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.