PREPARATORY SURVEY
ON
JICA PROGRAM FOR IMPROVEMENT OF MEDICAL WASTE WATER AND SOLID WASTE TREATMENT SYSTEM
IN
THE SOCIALIST REPUBLIC OF VIET NAM

FINAL REPORT
SUMMARY

JANUARY 2011

JAPAN INTERNATONAL COOPERATION AGENCY (JICA)

YACHIYO ENGINEERING CO.,LTD.
SYSTEM SCIENCE CONSULTANTS INC.

SA2
JR
11-013

PREPARATORY SURVEY
ON
JICA PROGRAM FOR IMPROVEMENT OF MEDICAL WASTE WATER AND SOLID WASTE TREATMENT SYSTEM
IN
THE SOCIALIST REPUBLIC OF VIET NAM

FINAL REPORT
SUMMARY

JANUARY 2011

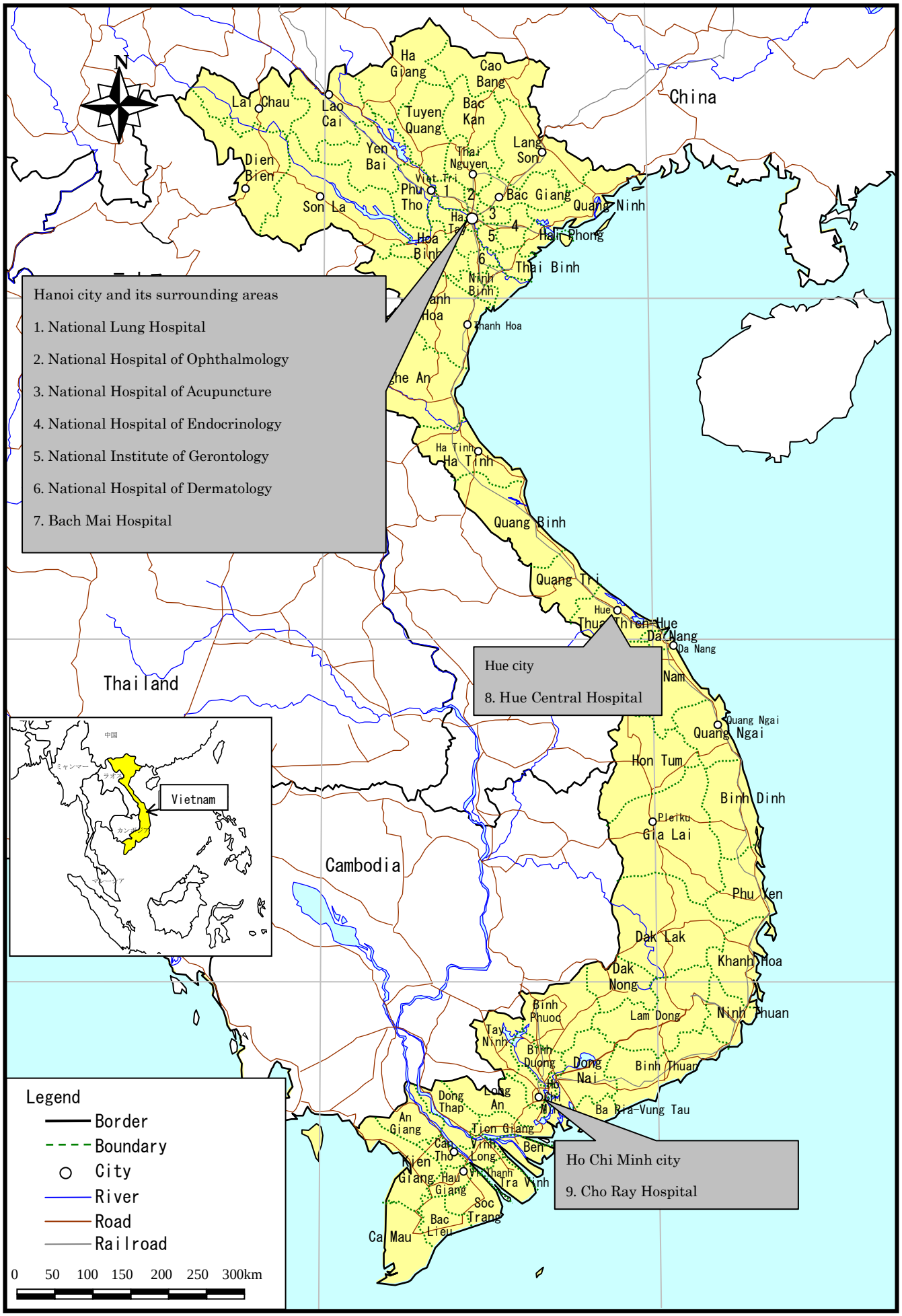
JAPAN INTERNATONAL COOPERATION AGENCY (JICA)

YACHIYO ENGINEERING CO.,LTD.
SYSTEM SCIENCE CONSULTANTS INC.

Exchange rates

Exchange rates of US dollar -VND and VND- Japanese Yen in this study are set below,

(1) US dollar vs. Vietnamese Dong (VND) (As of January 2011)
US dollar 1= VND 18,982
(2) VND vs. Japanese Yen (As of January 2011)
VND 1 = Japanese Yen 0.00438



LOCATION MAP (VIETNAM)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATION

ADB	: Asian Development Bank
CITENCO	: City Environment Company
DOC	: Department of Construction
DOF	: Department of Finance
DOH	: Department of Health
DONRE	: Department of Natural Resources and Environment
EIA	: Environmental Impact Assessment
GEF	: Global Environment Facility
IC	: Infection Control
ICC	: Infection Control Committee
ICD	: Infection Control Department
ICN	: Infection Control Network
MOC	: Ministry of Construction
MOF	: Ministry of Finance
MOH	: Ministry of Health
MONRE	: Ministry of Natural Resources and Environment
MOST	: Ministry of Science and Technology
MOT	: Ministry of Transportation
MPI	: Ministry of Planning and Investment
MSA	: Medical Examination and Treatment Management Agency
MWWSWM	: medical wastewater and solid waste management
JICA	: Japan International Cooperation Agency
ODA	: Official Development Assistance
POPs	: Persistent Organic Pollutants
PPC	: Provincial People’s Committees
RI	: Radio Isotope
UNDP	: United Nation Development Program
URENCO	: Urban Environmental Company
VEA	: Vietnam Environmental Protection Agency
VIHEMA	: Health Environment Management Agency
WB	: World Bank
WHO	: World Health Organization

CHAPTER 1 INTRODUCTION

In the Country Assistance Program for Vietnam, formulated in 2009 by the Government of Japan.(GoJ) "Environment" was added to "Economy" and "Society" as a new pillar of the plan. GoJ expressed its willingness to extend comprehensive assistance, centering on 4 areas (a. Promotion of economic growth and strengthening of international competitiveness, b. Improvements in living and social conditions and corrections of disparities, c. Environmental conservation, d. Strengthening of governance (forming the foundation of the 3 pillars mentioned above)). Japan will continue to deeply respect the ownership of the Vietnamese government, positively evaluate its development policy and its high-level goals, and furnish assistance enabling continuation of the process of "reducing poverty through growth" achieved heretofore by Vietnam.

Improvement of medical wastewater/solid waste (MWWSW) treatment system is consistent with Japan's assistance policy, that contribute to solution of the critical issues such as achievement of the proper handling medical waste to minimize the risk of diseases infection and improvement of the quality of urban sewage. For instance, when MWWSW containing pathogens and antibiotics is discharged to the environment without appropriate treatment, it may cause outbreak of infectious diseases or change the characteristics of bacteria to have resistance to several antibiotics. In particular, if untreated MWWSW outflows during flooding caused by torrential rains, such risk will be heighten and widely spread.

From these perspectives, the Vietnamese government recognizes that MWWSW is an important issue that fields such as health or the environment are cross-sectional. In Decision No.64/2003/QD-TTg by the Prime Minister, it is noted that healthcare facilities, although listed as generators of toxic or hazardous wastewater/solid waste, are essential facilities for public so that it is not easy to close instantly but needs urgent countermeasures to improve MWWSW management systems like other industrial sources.

In particular, the risk of infection by improper management of MWWSW has been increasing in Hanoi where 644 million populations are concentrated. Therefore measures for appropriate management of MWWSW become imperative. The Ministry of Health (MOH) in Vietnam has requested grant aid to Japanese government for development of medical wastewater treatment system at some central hospitals. However, in order to promote appropriate treatment of medical wastewater, prompt actions are required for a wide range of issues such as policy development, administrative capacity building, human resources development, procurement of equipment, and designing proper system and formulation of management system. Therefore both Vietnamese and Japanese sides agreed to conduct a preparatory survey for formulation of a cooperation program in order to develop an understanding of the whole picture and then to discuss solutions for specific issues.

This study is to understand the situation about a wide range of issues related to MWWSW management including identification of issues that may hamper a proper MWWSW management and proposing the necessary measures to reduce MWWSW generation and to enhance proper treatment. Results of the study are finally compiled as a model system and a road map for improvement and a new development. Findings and proposals in this study will be utilized as recommendations for JICA to design future cooperation strategy in this sector with considering JICA's policy, direction and effectiveness of the cooperation program.

In this study, 5 Japanese experts were dispatched and the work in Vietnam was composed of 2 periods. During the 1st study period from September 14th to October 24th 2010, current conditions on MWWSW management was clarified through the fact-finding survey by questionnaire and site survey etc., and issues and measures have also been identified. On October 19th 2010, a workshop was held in Hanoi and issues and measures identified by the study were discussed among Vietnamese stakeholders, i.e. MOH, the Ministry of Natural Resources and Environment (MONRE), the Department of Health (DOH), surveyed hospitals in Hanoi, Hue and Ho Chi

Minh City, etc. and common perception was shared among the workshop participants. During the 2nd study period from January 6th to 26th 2011, the Draft Final Report (DFR), was prepared by updating the Interim Report and adding the roadmap on MWWSW management, proposed possible JICA's assistance program and model system for MWWSW management. DFR was basically approved by MOH at the Stakeholder Meeting on January 13th 2011. On January 20th 2011, Seminar on the Improvement of MWWSW Management System in Vietnam was held in Hanoi with the participation of variety of stakeholders, i.e. MOH, MONRE, DOH, surveyed hospitals, the World Bank, the Asian Development Bank (ADB), the World Health Organization (WHO) and other related agencies.

In this Final Report, Introduction (Chapter 1), MWWSW management in Vietnam (Chapter 2), Current conditions and practices of MWWSW management (Chapter 3), Issues and challenges on MWWSW management (Chapter 4) and Road map and JICA's assistance program on MWWSW management in Vietnam (Chapter 5) are described.

CHAPTER 2 MWWSW MANAGEMENT IN VIETNAM

2.1 Administrative and Legislative Frame

As a leading administrative body of health-related services and systems MOH is a central agency to manage and control of MWWSW generated at healthcare and health-related facilities[1]. Besides MOH, MONRE, the Ministry of Construction (MOC), and others have direct or indirect responsibility and duties for MWWSW management. The Ministry of Planning and Investment (MPI) and the Ministry of Finance (MOF) have also influential roles for MWWSW management with respect to establishing overall policy and strategy or allocation and arrangement of budget for investment in MWWSW management projects.

2.1.1 National agencies

(1) Ministry of Health (MOH)

MOH is responsible for: (i) monitoring MWWSW management activities of healthcare and health-related facilities to ensure the completion of functioning provisions, (ii) developing MWWSW management plan, capital investment for construction, selection of treatment technologies and equipment in coordination with the Ministry of Science and Technology (MOST) and MOC, and (iii) monitoring the implementation of these policies and provisions. Figure 2.1 shows the organization structure of MOH in which several departments or agencies have role or responsibility for MWWSW management directly or indirectly. Amongst these departments and agencies, the Health Environment Management Agency (VIHEMA) and the Department of Medical Equipment, Facilities and Construction have vital roles to plan, select and evaluate MWWSW management systems at central level healthcare facilities in general, and monitor the systems. VIHEMA is also responsible for health and environmental issues of healthcare facilities with giving training to staffs at healthcare facilities.

<u>Health Environment Management Agency (VIHEMA)</u>

VIHEMA is commissioned to advise to the Minister of Health to perform functions of MOH related to health environment issues such as:

- environmental protection of healthcare and health-related facilities and burial activities and environmental health,
- hygiene and occupational health and diseases and safety control, health impact control due to a climate change,
- management of chemicals, disinfectants, insecticide for domestic and medical use, and
- other tasks related to health environment.

a. MWWSW management and environmental protection

In connection with MWWSW management, VIHEMA presides over in setting up strategy, scheme, and plan for environment protection in the health sector. VIHEMA also drafts and submits legal documents on environmental protection for healthcare and health related-facilities including technical standards on environmental health, etc. Furthermore VIHEMA (i) organizes and evaluates the environmental impact of MOH projects with warning on environment activities in the field of health, (ii) prevents and responses to environmental incidents, (iii) overcomes pollution and restores health environment, and (iv) proposes solutions for conservation and sustainable development in the field of health.

[1] Healthcare facilities are places where medicine is practiced, including hospitals, clinics, dental offices, out-patient surgery centers, birthing centers and nursing homes, while health-related facilities include medical school, research institutes, and pharmaceutical industries and so on in this report.

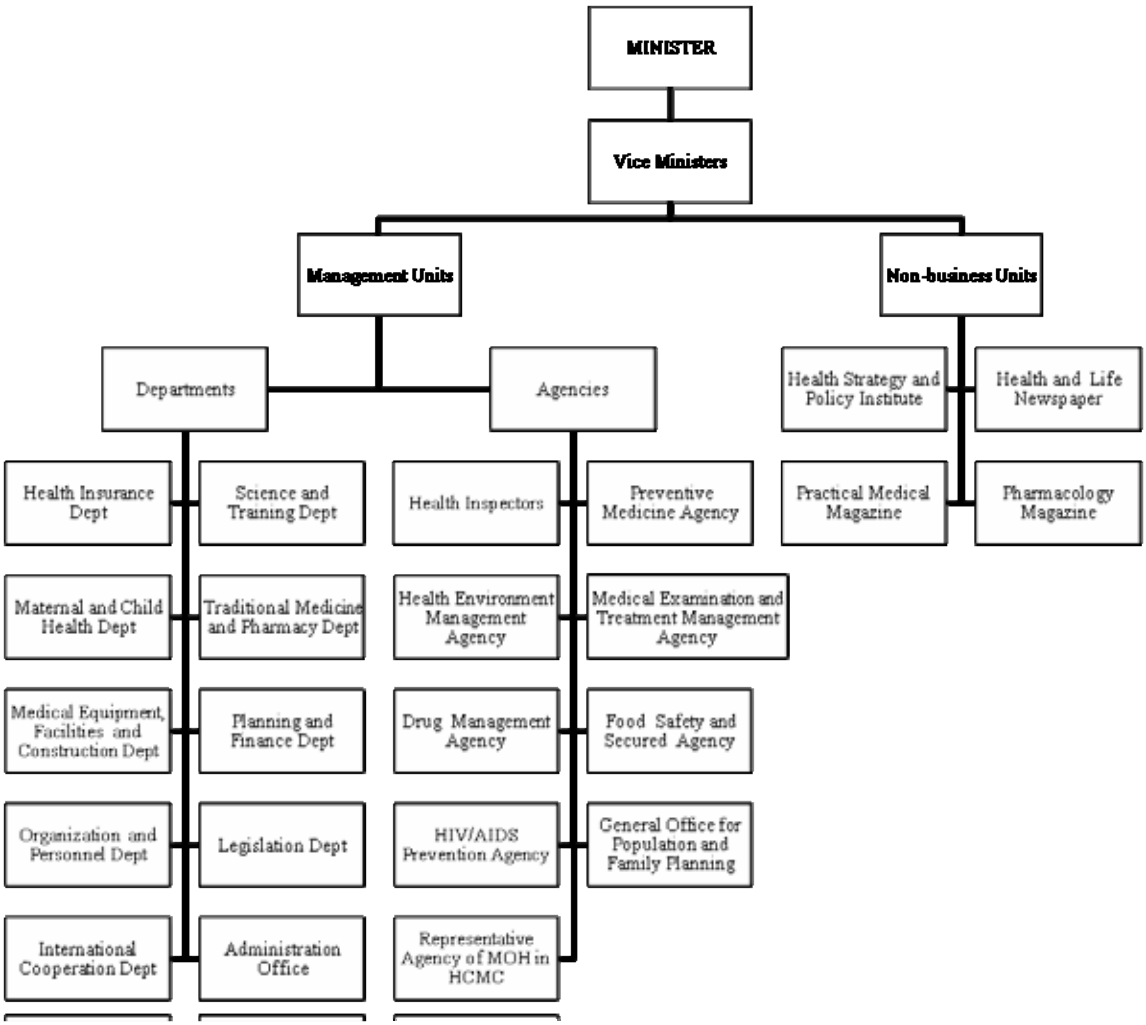


Figure 2.1 Organization Structure of the Ministry of Health

(Based on Decision No. 1874/QD-TTg dated on 12th November 2009 and Decree No. 22/2010/ND-CP dated on 09th March 2010)

b. Research and information collection

Other roles remitted are:

- to manage and allocate budget and funds for environmental protection,
- to guide the conduct, transfer, application of scientific and technological research findings on health environmental protection,
- to exchange information and documents on scientific environmental within the country or with other countries, and
- to compile and publish data and information regarding health environment.

c. Guide and direction

VIHEMA directs and guides technical activities in the assigned field to health facilities below provincial level under management of other ministries. VIHEMA, in collaboration with relevant agencies and units, inspects, detects, recommends and impose penalties violation of law units in terms of environment protection, environmental health, occupational hygiene and health, etc. according to the Agency's competence.

Department of Medical Equipment, Facilities and Construction

The Department of Medical Equipment, Facility and Construction is the specialized department of MOH. The Department has the function to offer consultation and support the minister to manage the investment of medical equipment and facilities including ones for MWWSW treatment. It formulates legal documents for instruction of: (i) purchases, management, usage, maintenance and checkup of medical equipment, (ii) production, selling and technical services about medical equipment.

The Department formulates a list of standard medical equipment for medical facilities in accordance with the technical levels set by MOH, national standards about medical equipment. The Department also evaluates the list, specifications, technical standards of the medical equipment of the investment projects using state budget and submits bidding plans, invitation for bidding, bidding results of medical equipment purchase by the organizations under MOH to the minister for approval of using developing investment budget.

The Department organizes a consultancy committee for medical equipment and formulates programs, contents and plans for training of technical and management staffs regarding medical equipment. In addition the Department organizes monitoring and evaluation of purchasing, management and usage of medical equipment in the healthcare facilities. In collaboration with the Planning and Finance Department, the Department plans allocation of developing investment budget every year and evaluates the usage of investment and construction budget.

(2) Ministry of Natural Resources and Environment (MONRE)

MONRE is a central agency in charge of environmental management and protection in Vietnam. Its major roles in waste management include:

- to issue guidelines, regulations, and standards for waste management in coordination with other ministries,
- to compile annual and long-term waste management plans and formulate policies and strategies,
- to plan and allocate budgets for research and development,
- to appraise and approve Environmental Impact Assessment (EIA) reports for waste management projects,
- to inspect and supervise waste management activities, and
- to raise public awareness and approve recycling and treatment technologies.

As for hazardous waste management, MONRE, as directed by Decision 155/1999/QD-TTg, has the following functions:

- to manage hazardous waste and guide the implementation of hazardous waste management,
- to work out policies, strategies, legislation on environmental protection and submit to the Government;
- to develop standards, technical qualifications of hazardous waste containers, technologies for hazardous waste treatment,
- to work out environment fees for hazardous waste management together with MOF,
- to approve the EIA report for the listed projects,
- to monitor environmental protection and coordinate enforcement of hazardous waste management, and
- to conduct training, awareness raising for hazardous waste management and provisions on hazardous waste control.

Vietnam Environmental Administration (VEA)

VEA under MONRE is the body specifically assigned to the mandate of the environmental protection. VEA has mission to develop and submit laws and regulations, policies, strategies,

plans, national targets, programs and projects on the environment. VEA organizes implementation of preventive measures in order to prevent, mitigate and respond to environmental contamination caused by environmental accidents. Assessment and appraisal of the reports of strategic environmental assessment, EIA, integrated EIA, and environmental protection commitment is another role of VEA together with a provision of guidance to examine, evaluate and appraise equipment and treatment facilities prior to operation. Waste management, promotion of environment quality, protection of the environment in river basins and coastal zones and handling environmental pollution at the hot spots are also included in the duty of VEA.

(3) Ministry of Construction (MOC)

MOC is a line ministry with the highest authority in municipal solid waste and wastewater and urban drainage management, primarily in terms of technical oversight of these sectors. Its responsibilities and jurisdiction in waste and wastewater management are as follows: (i) formulating policy and legislation, planning and construction of solid waste treatment facilities, and (ii) developing and managing plans for the construction of waste and wastewater management infrastructure nationally and provincially. Recently MOC updated National Solid Waste Management Strategy[2] and issued the Decision for integrated solid waste management[3] in collaboration with MONRE. This Decision enhances a role of the state in integrated solid waste management by means of socialization, mobilizing its resources, and strengthening investment in line with economic and social development plan and other plans. In addition, MOC is reported to be in preparation of a master plan for national hazardous waste management[4] in which hazardous medical waste management plan is likely included as well.

(4) Ministry of Planning and Investment (MPI) and Ministry of Finance (MOF)

MPI has great influence in policy making at the ministerial level, managing state budget for investment financed by the Government Treasury, credits or ODA loans and grants. In this regard, MPI manages the demands of finance for investment with taking into account of relevant development plan and strategy, and reviews and formulates policies and mechanisms to mobilize domestic and foreign financing for investment. Coordination of ODA funded projects is done by MPI.

MOF manages and provides state fund and other financial sources to ministries and agencies, provincial governments to implement the projects. All major investment plans must be approved by MPI. Furthermore, MPI in coordination with MOF also issues economic incentives to facilitate environmental protection activities including waste and wastewater management[5]. MOF in coordination with MPI allocates budgets for waste and wastewater management activities, focusing more specifically on financial and pricing issues.

2.1.2 Local agencies

Provincial People's Committee (PPC) is an executive unit of local administration, while the Provincial People's Council is a representative of provincial government. PPC has several departments mirroring to the national level ministries. PPC is responsible to oversee local level administration and their responsibilities in waste and wastewater management are as follows:

- To implement regulations on environmental protection, direct their agencies in organizing, coordinating with the respective central agencies to work out annual and long-term management plans,
- To make approval of relevant projects based on the conditions of each locality,

[2] Decision 152/1999/QD- TTg dated on 10/7/1999 of the Prime Minister approving *Strategy of Waste Control in Urban Sector and Industrial Zones by the Year 2020.*

[3] Decision 2149/2009/QD-TTg dated on 17/12/2009 approving *National Strategy for Integrated Management of Solid Waste up to 2015 with a Vision to 2050.*

[4] *Master Plan on Hazardous Solid Waste Treatment up to 2025* (795/QD-BXD) (in progress)

[5] Decree No: 4/2009/NĐ-CP dated on 14/1/2009, *Incentives and Supports for Environment Protection Activities.*

- To mobilize investment capital from various sources for the projects and work out mechanisms to encourage private participation in the sectors,
- To direct the Department of Natural Resources and Environment (DONRE) and the Department of Construction (DOC) in carrying out the projects in terms of design, construction, monitoring, EIA, etc.

DOC supervises the implementation of urban development plans of the province or city, organizing the designing and construction of the waste and wastewater treatment facilities, supporting PPC in making decisions on the projects, and reporting to PPC for approval in coordination with DONRE.

DONRE plays important roles in the waste and wastewater management: monitoring of environmental quality; managing and implementing policies and regulations issued by MONRE and PPC; appraising EIA for the projects; and coordinating with DOC and the Urban Environmental Company (URENCO) in selecting landfill sites, all of which are then proposed to get approval by PPC.

DOH supervises the implementation of MWWSW management plan in healthcare and health-related facilities. Monitoring of environmental protection in these facilities is also included in their roles in coordination with DONRE. Investment plan for MWWSW management proposed by healthcare and health-related facilities is assessed in collaboration with relevant local authorities, and then proposed to PPC to get approval.

URENCO collects municipal solid waste and treats or disposes of at landfill site. They may also collect and dispose of some industrial and hazardous waste generated from industries and healthcare facilities as a contract basis.

In November 2006, the government established the Environmental Police Department in the Ministry of Public Security[6]. This watchdog agency has tasks of detecting, preventing and fighting against environmental offenders. Divisions of the environmental police are also established in the Departments of Police of provinces.

2.2 Policy and Strategy on MWWSW Management in Vietnam

Policy and strategy for MWWSW management is found in several legal documents that include the plan and strategy for: (i) environmental and waste management, (ii) MWWSW management, and (iii) development for healthcare services and infection control.

(1) Plan and strategy for environmental and waste management

Decision No.256/2003/QD-TTg dated on 2/12/2003 by the Prime Minister on National Strategy on Environmental Protection up to Year 2010 and Vision to 2020.

Decision No. 153/2004/QD-TTg dated on 17/8/2004 of the Prime Minister approving Strategic Orientation for Sustainable Development (Vietnam Agenda 21)

Order 23/2005/CT-TTg dated on 21/6/2005 of the Prime Minister accelerating Solid Waste Management in Cities and Industrial Areas.

Decision 2149/2009/QD-TTg dated on 17/12/2009 approving the National Strategy for Integrated Solid Waste Management up to 2015 with a Vision to 2050.

(2) Plan or strategy of MWWSW management

Decision No.1873/2009/QD-BYT: Plan of Environmental Protection in Health Sector in Period from 2009 to 2015.

Official letter 7164/BYT- KCB dated 20/10/2008, issued by the Minister of Health on Reinforcing healthcare waste treatment and management

[6] Decision No.1899/2006/QD-BCA dated on 29/11/2006 on *Established Environmental Police Agency under Public Security Agency.*

(3) Hospital development and infection control plan

Decision No.30/2008/QD-TTg dated on 22/2/2008 on approving the Master Plan of Healthcare Network Development until 2010 with a Vision to 2020

2.3 Regulations and Standards

(1) Laws, decree, decision and circular

Among these legal documents followings are considered the most essential laws and regulations for MWWSW management.

- Decision 1895/1997/BYT-QĐ dated on 19/09/1997 promulgating Regulation on Hospital Management,
- Decision 155/1999/QĐ-TTg dated on 16/7/1999 of Prime Minister promulgating Regulation on Hazardous Waste Management,
- Law 52/2005/QH11 dated on 29/11/2005 on Environmental Protection,
- Decree 59/2007/NĐ-CP dated on 9/4/2007 on Solid Waste Management,
- Decision 43/2007/QĐ-BYT dated on 30/11/2007 of Ministry of Health promulgating Regulation on Health Care Waste Management.

(2) Standards, criteria, and codes

Besides these laws and regulations mentioned in the previous section followings are standards, criteria or codes linked to MWWSW management.

- TCVN 5939-1999: Air quality-Emission standards for healthcare solid waste incinerator: Allowable limits (This standard became legally binding standards in QCVN 02: 2008/BTNMT)
- TCVN 6707-2000: Prevention and warning signs for hazardous waste
- TCVN 6705-2000: Non-hazardous solid wastes - Classification
- TCVN 6706-2000: Hazardous solid wastes - Classification
- TCVN 6696-2000: Requirements for environmental protection for sanitary landfills
- TCXDVN 261-2001: Landfill - Standard for designing
- TCVN 7241-2003: Health care solid waste incinerators - Determination of dusts concentration in flue gas
- TCXDVN 320-2004: Hazardous waste Landfill - Standard for designing
- TCVN 7382-2004: Hospital wastewater-Effluent standards (This standard became legally binding standards in QCVN 28:2010/BTNMT)
- TCVN 7380-2004: Healthcare solid waste incinerators- Specifications
- TCVN 7381-2004: Healthcare solid waste incinerator- Assessment and appraisal methods
- TCVN 5945-2005: Industrial wastewater-Effluent standards (This standard became legally binding standards in QCVN 24:2009/BTNMT)
- TCXDVIN 365-2007: General hospital design guideline
- QCVN 02: 2008/BTNMT: National technical regulation on the emission of healthcare solid waste incinerators
- QCXDVN 01: 2008/BXD: Vietnam Building Code-Regional and urban planning and rural residential planning
- QCVN 24:2009/BTNMT: National technical regulation on industrial wastewater
- QCVN 28:2010/BTNMT: National Technical Regulation on Health Care Wastewater

CHAPTER 3 CURRENT CONDITION & PRACTICES OF MWWSW MANAGEMENT

3.1 Current MWWSW Management in Vietnam

3.1.1 Status of MWWSW management

At the end of 2008, there were 13,506 health facilities with more than 221,695 beds[7] in the country. Besides, there were 14 institutes of preventive medicine; 190 provincial preventive centers; 686 district health centers; nearly 100 research and training facilities; and 181 drug manufacturing and related industries[8]. Both healthcare facilities and beds are increased in number from the previous year. In Vietnam, the amount of hazardous medical wastes is increasing. In 2005, the total amount of solid waste arising from healthcare facilities was around 300 tons per day, of which 40 tons was hazardous medical wastes and poorly treated[9]. The amount of waste generation depends on the number of bed, the extent and kinds of medical services and accessibility for people to health services. In 2010, the amount of medical waste is expected to be 380 tons per day, of which about 45 tons is hazardous solid waste. It is expected to grow to approximately 600 tons in 2015 and over 800 tons in 2020.

According to the survey conducted in 2006 by the Institute of Occupational Health and Environmental Sanitation, MOH hospital wastes were collected in accordance with the requirements prescribed in the Regulation on Health Care Waste Management at about 50% of total hospitals. Although more than 500 incinerators had been installed to handle medical waste, more than 33% of them did not work at the time of survey because of high operation and maintenance cost as well as lower performance. In the same survey, 63% of the total hospitals had no wastewater treatment systems and 70% of the wastewater treatment system had not achieved a requirement of effluents standards. The recent study conducted by JICA at 5 big cities, i.e. Hai Phong, Hanoi, Hue (Province), Da Nang, Ho Chi Minh City, showed 82 out of 166 surveyed hospitals had wastewater treatment system (49%), but system was not operated at 17 (21%) hospitals out of 82 by various reasons.[10]

It is not so difficult to image a poor and unsatisfactory management of medical wastewater in Vietnam. Even at central level hospitals wastewater system is not installed completely. Even the hospitals that have wastewater treatment system cannot operate it meeting with effluent standards by various reasons of both inherent and external factors. Situation of medical waste management at hospitals is also far below the satisfactory level.

3.1.2 Administrative structure for MWWSW management

As mentioned in Chapter 2, besides for MOH as a responsible ministry for MWWSW management, MONRE and MOC have a role for MWWSW management. Especially MONRE is a responsible ministry for the environmental monitoring and EIA on MWWSW management. On the other hand MOC has a responsibility for planning and development of infrastructure for MWWSW management, especially for off-site management of MWWSW. Similar management structure is seen at provincial levels as shown in Figure 3.1.

Although MWWSW management system in the healthcare facilities is not standardized, infection control department or infection control board (committee) together with administration department may have responsibility for MWWSW management. Under these organizations, each department assigns a chief staff in charge of MWWSW management.
Mandates of these major ministries and agencies for implementation of MWWSW management are illustrated in Figure 3.2.

[7] Ministry of Health: Statistical Year Book 2008.
[8] Ibid.
[9] Decision 1873-QD-BYT dated on 2009 on *Plan for Environmental Protection in Health Sector from 2009 to 2015*.
[10] JICA: The Study on Urban Environmental Management in Vietnam, Progress Report, August 2010.

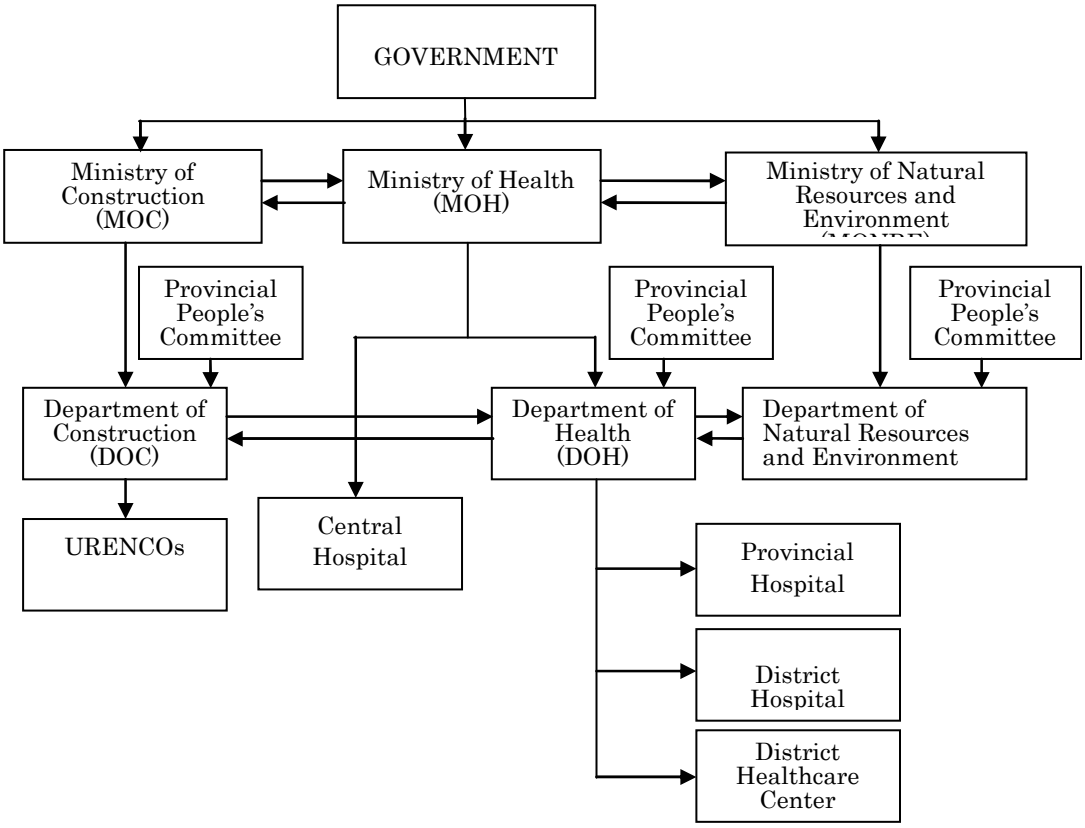


Figure 3.1 Administrative structures of MWWSW management at central and provincial levels.

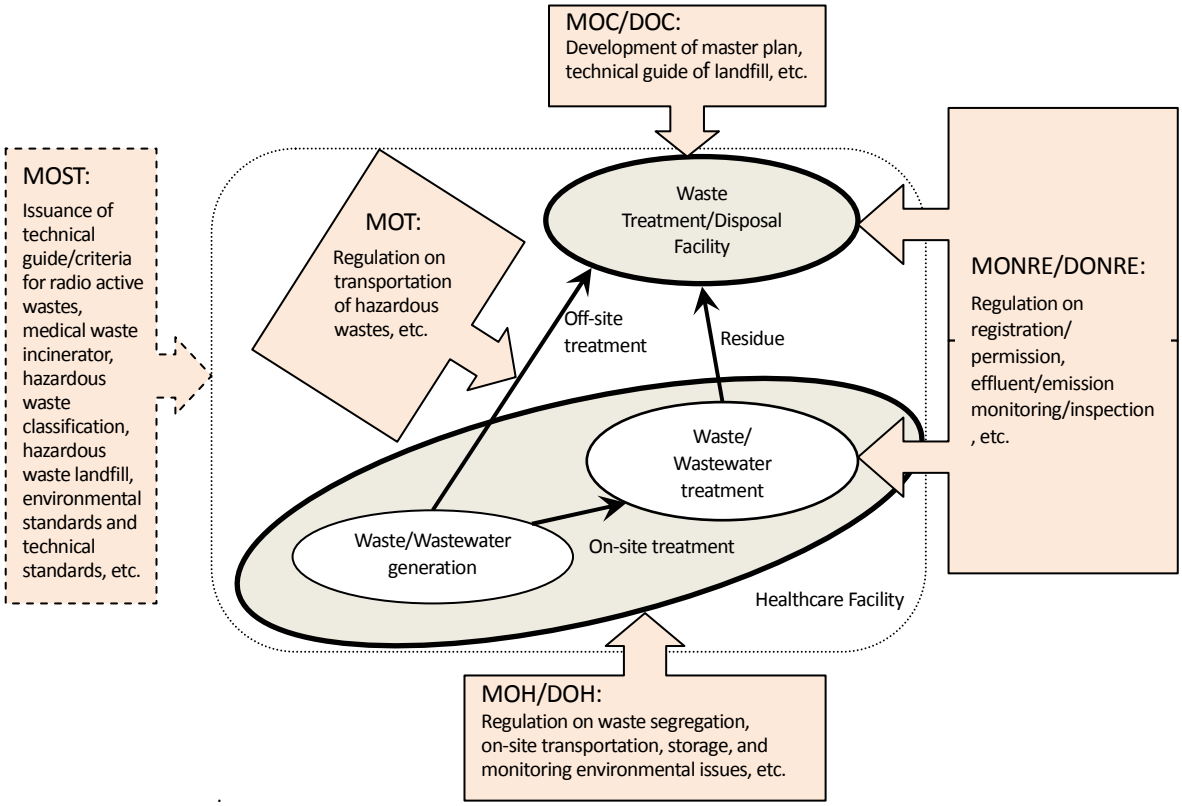


Figure 3.2 Major mandate of ministries on MWWSW management

3.1.3 Budget for MWWSW management

Major budget sources for MWWSW management for MOH-managed healthcare facilities are state budget, Environmental Career budget, donors' assistance, loan from the Vietnam Environmental Protection Fund, and other loans from credit organizations. The Environmental Career budget is a new mechanism recently established providing 1% of state budget for environmental protection projects of non-business sectors.

The budget for environmental protection at healthcare facilities including operation and maintenance costs for MWWSW management is not separately accounted in the budget of healthcare facilities. These costs are generally included in the budget of infection control as a lump sum. There seem to be various ideas how to cover the recurrent cost of MWWSW management including the state budget, increment of fee for healthcare service and so on. The decree regulating the "cost of service'' is now negotiated at the central level[11].

3.1.4 Environmental inspection and monitoring for healthcare facility

Environmental inspection and monitoring for healthcare facilities are a part of mandate of MONRE/DONRE. The target healthcare facilities for the administrative inspection are those that have submitted EIA and the environmental protection commitment for construction or operation of healthcare facilities. The administrative violations subject to penalty in the domain of environmental protection and possibly related to healthcare facilities are as follows[12]:

- Violation of regulation requiring to prepare EIA reports (EIA or environmental protection commitment)
- Pollution activity
- Violation of (health care) waste management regulation

The environmental police prosecute or investigate only when the environmental violation is suspected to any criminal involvement or when violators do not obey the administrative sanctions. This means the operation of the environmental police is different from those of environmental inspection conducted by MONRE/DONRE. Environmental inspection has to identify who, what, when to inspect and to whom it shall inform in advance. But the operation of the environmental police is limited to identify the violation, violator and date of violation, and they do not have to inform inspection targets in advance.

Beside those inspection done by MONRE/DONRE or the environmental police, MOH/DOH have their own programs for monitoring healthcare facilities[13]. One of them is a self-inspection system by healthcare facilities guided by Medical Examination and Treatment Management Agency (MSA), MOH. Besides this self-inspection program, VIHEMA, MOH, in a collaboration with relevant agencies and units, inspects, detects and recommends penalties or penalizes by themselves, according to the Agency's competence, law violated units in terms of environment protection, environmental health, occupational hygiene and health, etc.

3.1.5 On-going JICA's project related to MWWSW management

Currently the JICA has 2 on-going projects related to MWWSW management: (i) Project for Enhancing Capacity of Vietnamese Academy of Science and Technology in Water Environment Protection (2007.12~2011.11), and (ii) the Study on Urban Environmental Management in Vietnam (2010.3~2011.9). The study result is expected to serve a basic information to formulate the future JICA's assistance program in the environmental sector of Vietnam.

3.1.6 Donor's programs in MWWSW management sector

Several studies and projects have been implemented in this sector especially after 2000. These include capacity development of MWWSW management sectors at both central and provincial

[11] Hearing from the World Bank.
[12] Decree No. 117/2009/ND-CP dated on 31/12/2009 on *Handling of Law Violations in the Domain of Environmental Protection.*
[13] Official document No. 869/KCB-NV dated on 14/9/2010 on *Guidelines for Checking Hospitals in 2010.*

level hospitals and administrative organizations, development of master plan, procurement and installation of equipment and facilities for MWWSW treatment in some regions and provinces. Especially recent activities conducted or being conducted by the WHO, the UNDP and the World Bank.

3.2 MWWSW Management in Surveyed Hospitals

3.2.1 Outline of surveyed hospitals/institutes

The hospitals surveyed in this study are 8 central hospitals and 1 institute. 7 of them are located in Hanoi, while remaining 2 are in Hue and Ho Chi Minh City, respectively. Outline of these hospitals is summarized in Table 3.1 based on MOH's statistical information in 2008.

Table 3.1 Basic information of surveyed hospitals/institutes as of 2008

	Lung Hospital	Ophthalmology Hospital	Acupuncture Hospital	Endocrinology Hospital	Institute of Gerontology	Dermatology Hospital	Bach Mai Hospital	Hue Central Hospital	Cho Ray Hospital
Type	Specialty	Specialty	Specialty	Specialty	Specialty	Specialty	General	General	General
Bed number									
Planned bed	400	320	290	150	150	100	1,500	1,100	1,400
Actual bed	448	320	440	277	165	100	1,500	2,006	1,644
No/ of departments	0	0	17	0	11	6	36	44	52
No. of clinical department	0	0	12	0	8	4	28	33	40
No. of paramedical department	0	0	2	0	3	2	8	11	12
No. of examination	33,499	251,519	12,500	170,716	17,097	161,995	535,986	257,358	930,705
Total death case	81	0	0	1	31	0	460	228	3,110
No. of operation	409	34,959	200	2,928	0	1,432	9,855	18,341	35,952
No. of medical procedure	23,011	10,984	600	14,519	5,025	2,361	212,464	42,766	221,598
Total delivery case	0	0	0	0	0	0	5,969	6,738	32
No. of medical test									
Biochemical	329,923	77,747	11,105	1,401,995	12,508	35,070	3,233,65	628,983	6,147,830
Hematology	855,262	96,280	9,936	295,943	4,008	8.406	1,434,11	337,999	7,806,096
Microbiology	72,814	15,814	0	608	0	31,088	609,646	42,369	383,248
Pathology	28,034	3,282	0	14,087	0	3,959	43,759	43,653	37,640
X-ray	65,921	9,306	5,639	16,434	13,512	0	203,848	133,522	552,223
Ultrasound	11,538	33,080	2,506	55,403	24,113	0	152,386	90,352	192,368
Budget (unit = thousand VND)									
Revenue	67,007	58,342	—	135,116	37,500	36,406	789,569	374,073	1,157,831
Expenditure	84,679	48,463	18,703	114,536	37,840	39,054	792,000	293,231	1,147,759
No. of staff									
Medical	114	90	236	63	48	44	415	369	628
Pharmaceutical	17	30	8	5	9	17	42	62	77
Nurse	161	141	127	65	49	39	733	576	1,388
Technician	49	17	15	16	7	9	111	146	314
Orderly	55	59	15	13	9	20	187	541	111
Others	100	85	66	42	20	44	343	177	575
Total	496	422	340	204	142	173	1,847	2,016	3,095

3.2.2 Preliminary questionnaire survey on MWWSW management

This survey was conducted in September 2010 to obtain overall information regarding MWWSW management at these hospitals; practices of source separation, on-site transportation, and storage of medical wastes, amount of wastes and wastewater generation, treatment and disposal methods and on-site systems, cost and man power of MWWSW management, and activity for awareness raising or capacity development of staffs and workers.

Major findings of the survey are as follows:

a. General information

- The number of planned bed and actual bed are different especially in the general hospitals. The actual bed number at Bach Mai Hospital and Hue Central Hospital is significantly more than those of planned.
- Ophthalmology Hospital, Dermatology Hospital and Cho Ray Hospital have experienced a flooding in the hospitals premises in the last 10 years.
- ICD and Nurse Department under ICC are implemented waste management as the primary sector at most hospitals

b. Waste generation, segregation, storage and treatment

- Infectious waste generation rates (kg/bed/day) are grouped into 3 ranges: less than 0.1 kg/bed/day, 0.1~0.2 kg/bed/day and more than 0.2 kg/bed/day. Only Cho Ray Hospital reports higher amount of infectious waste generation rate, 0.84 kg/bed/day. In general waste generation rate at the general hospitals (more than 0.2 kg/bed/day) are more than at the specialty hospitals (less than 0.2 kg/bed/day) with exception of Institute of Gerontology (0.31 kg/bed/day) and Cho Ray Hospital (0.93 kg/bed/day).
- Generation rates of normal waste are grouped in 3 ranges, less than 1.0 kg/bed/day, 1.0~2.0 kg/bed/day and more than 2.0 kg/bed/day. 3 hospitals report the amount of waste in cubic meter, and thus these are not included in these groups. 2 general hospitals (Bach Mai Hospital and Cho Ray Hospital) report waste generation rate less than 1.0 kg/bed/day while 2 specialty hospitals (Lung Hospital and Dermatology Hospital) more than 2.0 kg/bed/day.
- Waste segregation at sources is well organized and conducted at most hospitals. Collared bags which are prescribed by the Regulation on Health Care Waste Management are used, especially for sharps, other hazardous medical wastes and normal waste. Segregation for recyclables is not clear at Acupuncture Hospital, Dermatology Hospital and Bach Mai Hospital.
- There are not storage facilities for hazardous medical wastes at Institute of Gerontology and Dermatology Hospital. Only Cho Ray Hospital has a storage room with air conditioning or ventilation system. Others have storage rooms without air conditioning or ventilation system.
- Only Hue Central Hospital (incinerator) and Ophthalmology Hospital (autoclave) have their own waste treatment facilities and treat some kinds of waste by themselves. However, other hospitals contract out waste treatment to the URENCO mostly. Normal waste is treated by the URENCO at all facilities.
- Treatment cost (charge) of hazardous medical waste is ranged 8.98~9.878 million VND/ton, while non-hazardous waste is 160,000 VND/m^3 or 157,000~437,000 VND/ton.
- Annual expenditure for waste discharge and storage is ranged 160,000~480,000 VND/actual bed (information from Bach Mai Hospital and Cho Ray Hospital is lacking). Only exception is the expenditure of Dermatology Hospital, 1,167,000 VND/actual bed/year. Annual expenditure for off-site waste treatment is ranged from 200,000 to 900,000 VND/actual bed (information from Endocrinology Hospital and Hue Central Hospital is lacking).

c. Wastewater treatment

- Lung Hospital, Acupuncture Hospital and 3 general hospitals have their own wastewater treatment facility. Dermatology Hospital and Institute of Gerontology send their wastewater to the wastewater treatment facility of Bach Mai Hospital. All the wastewater treatment systems were installed before 2000 and updated recently except for the system of Lung Hospitals of which system was installed in 1997.

- The amount of wastewater, however, exceeds the capacity of the wastewater treatment facility except at Lung Hospital and Hue Central Hospital. The amounts of wastewater at Acupuncture Hospital and Cho Ray Hospital are 6 times more than the nominal capacity of the wastewater treatment facility, while in Bach Mai Hospital 18 times more than the nominal capacity presumably because Bach Mai Hospital accepts wastewater from Dermatology Hospital and Institute of Gerontology.
- Annual operation and maintenance expenditure of wastewater treatment facilities is around 300,000VND/actual capacity (m^3/day) on average. Exceptions are at Bach Mai Hospital and Hue Central Hospital where operation and maintenance costs are 55,000 VND/actual capacity (m^3/day) and 165,000 VND/actual capacity (m^3/day), respectively.
- Only Bach Mai Hospital and Hue Central Hospital have a separate wastewater treatment system for some sorts of medical liquid waste. However, it is not clear which technologies are employed and what kinds of liquid wastes are separately treated.

d. Awareness raising and capacity development

- For awareness raising program for medical staff on MWWSW management, holding seminar or workshop on-site or participation in the seminar or workshop sponsored by other organizations, and having own training/educational program are the common means at surveyed hospitals.
- For capacity development program of non-medical staffs working for MWWSW management, periodical training of occupational safety, participation workshop/seminar outside hospital are most frequently used measures among surveyed hospitals.

3.2.3 In-depth survey on MWWSW management and the environmental issues at hospitals

Survey items by hospitals are shown as below.

Table 3.2 Survey items by hospitals

Hospitals	Awareness of staff	Waste and waste liquid treatment	Water quality	Soil quality	Awareness of resident	Remarks
National Lung Hospital	○	○	○*	○	○	*Water samples of unit processes were analyzed.
National Hospital of Ophthalmology	○	○	○	○	○	
National Hospital of Acupuncture	○	○	-	-	○**	**One awareness survey of residence for National Hospital of Acupuncture and National Hospital of Endocrinology.
National Hospital of Endocrinology	○	○	○	○	○**	
National Institute of Gerontology	○	○	○	○	○***	***One awareness survey of residence for National Institute of Gerontology, National Hospital of Dermatology and Bach Mai Hospital.
National Hospital of Dermatology	○	○	○	○	○***	
Bach Mai Hospital	○	○	○*	○	○***	* Water samples of unit processes were analyzed.
Hue Central Hospital	○	○	-	-	○	
Cho Ray Hospital	○	○	-	-	○	

3.2.4 Some findings of the survey and suggestion

(1) Medical waste management system

<u>Waste management body</u>

Though a few hospitals do not establish a firm organization specialized in waste management, most surveyed hospitals develop concrete management body following the indication of MOH in their hospitals. Especially monitoring system by departments nurses becomes widespread each department through the IC Network. All surveyed hospitals are located in the middle of the cities,

so that the all of them contract out the off-site treatment and those costs are accounted based on the same URENCO's procedure. There are different quantity and quality of pre-treatment policies of infectious waste in each hospital, and waste management costs that are accounted for other category such as medical consumables. This makes hard to estimate actual expenses of medical waste management, beside contract fees. Matter to be concerned is the training for waste management, and it is obvious that the budget is limited. Hospitals need not to just waiting budget allocation or training plan from MOH. The occupational accidents are daily possibly happened, therefore hospital's initiative is also important to launch training or promotion activities.

Medical waste management

The 4-kind segregation system of wastes is prescribed by the Regulation on Health Care Waste Management (Decision 43/2007/QĐ-BYT) and is adopted to all surveyed hospitals. Therefore, the risk of medical waste is notified to hospital staffs generally. The issue is broad definition of the 4-kind segregation categories. For instance, yellow bag is for infectious waste, such as gauze and sharps stained with blood, and sharps should be separated to yellow hard container to prevent from injury. When general waste is thrown into yellow bag, the quantity of medical waste becomes more to be pre-treated. This segregation definition is entrusted to each department even in the same hospital, and non-medical waste collectors are not informed the differences. The hospital may need to re-confirm how each department deems 4-kind segregation categories.

Besides the 4-kind segregation system of wastes, wastewater is less represented than solid wastes due to flashing into sink immediately. Most of the hospitals have only general drainage, so that pre-treatment is possible only when safety-minded staffs set the reservoir tank.

Pursuantly, when staffs are given the information about a total waste treatment system including off-site treatment, they can recognize what they have to do under their duties. To make staffs awake for their responsibilities and willingness, hospital should provide the latest and constant information by in-hospital training. It is obvious that the hospital is hard to organize and distribute budget for training, however, leadership and cost-effective and innovative approach will help to lead their staffs.

Staff awareness

Hospital staffs have general awareness for the segregation of wastes and risk management from occupational infection. However, there is a great gap between understanding and behavior. Many interviewees feel waste segregation is not followed always, and the sense of corporate liability is weak in the workplace.

(2) Technical issues on MWWSW treatment

Liquid waste treatment technology

All hospitals have only one wastewater drainage line, therefore, all wastewater including infectious wastewater are discharged into same line. However, liquid waste from laboratories is treated by using special reagents before discharge at most hospitals based on the Decision No. 43/2007QD-BYT.

Followings are suggested for medical wastewater management;

a. At least, wastewater from infectious disease department should be sterilized before discharging into general wastewater drainage line.

b. Hospitals and MOH should consider adopting low running cost technology for wastewater treatment like a sterilization using ozone.

c. Hospitals should have specialized staffs for maintenance of wastewater treatment facilities.

Medical waste treatment technology

Almost all hospitals have contracts with specialized company for waste collecting and disposal except for Radio Isotope (RI) waste. RI waste is stored until when RI reaches the half-life and then returned to equipment supplier. Regarding sharp wastes like needle, hospitals should have a

needle destroyer. A needle destroyer is good for sterilizing and destroying a needle tip. This equipment is very efficient to protect staffs from a danger of needle stick injury, and investment cost is not so high.

(3) Environmental issues

Performance of wastewater treatment system and effluent quality

According to the result of effluent analysis of wastewater treatment facilities, BOD_5, COD, S^{2-} and Total coli-forms exceed limit values at all hospitals. These parameters are typical indicators to show that water is polluted by organic substances. In general, levels of these parameters are higher in the afternoon than in the morning, which means healthcare activities of hospitals are more active in the afternoon. Especially in National Hospital of Endocrinology, the levels of BOD_5 and COD are extremely higher in the afternoon compared with other hospitals. As pH of the same sample was 8.9, the highest in all samples, it is suspected that some sort of liquid waste was mixed with ordinary wastewater.

In Figure 3.3, BOD_5 and COD are compared with other data reported in the past[14, 15, 16]. These data include analyses of effluents from general hospitals and specialty hospitals in both provincial and central levels. Apparently, none of them meets effluent standards of BOD_5 and COD and the values recorded in the sample of National Hospital of Endocrinology in this study are extremely high compared to others.

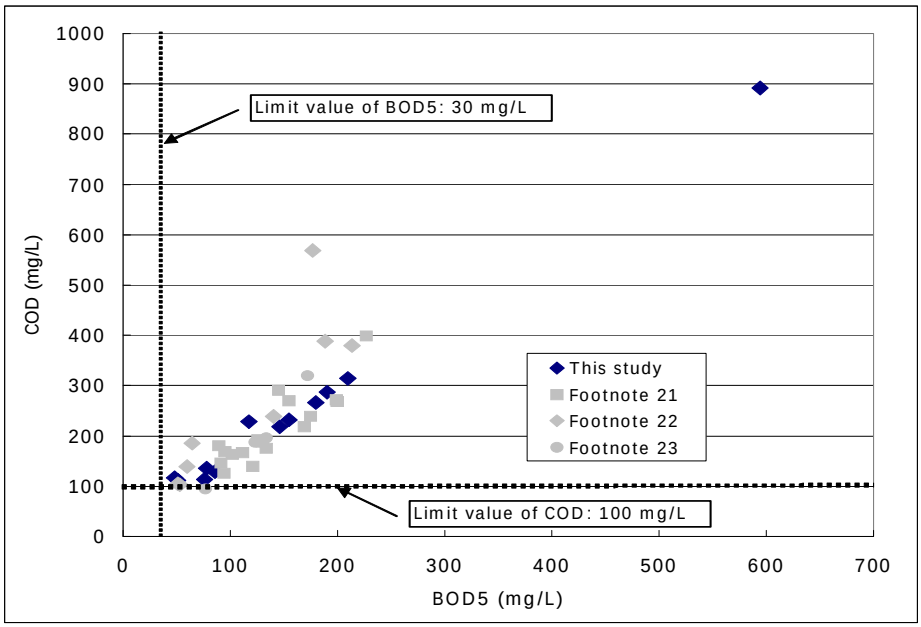


Figure 3.3 Comparison of BOD_5 and COD of this study with those reported by other studies

Figure 3.4 is a comparison of T-N and T-P. Effluent standard of T-N is not met at most hospitals in the previous reports but some data of this study are below the limit value. On the other hand, all data of this study meet the effluent standard of T-P, but 3 hospitals in the previous studies do not meet the standard of T-P.

[14] Report on Investment Project: Construct wastewater treatment plants for MOH's hospital and facilities, Center for Clean Water and Environmental Consultancy and Technology Transferring (CTC).

[15] Research Center for Environmental Technology and Sustainable Development (CETSD), Hanoi University of Science, Pollution Survey on Hospital Wastewater in Hanoi Area in the Project of Strengthening the Environmental Management Capacity for MONRE for the Implementation of the Decision 64, JICA, November 2005.

[16] Institute of Water Engineering and Environmental Technology (IWEET), Industrial Investigation for Preparation of Wastewater Treatment Guideline/Manual (for livestock, hospital and electroplating industries), Final Report, JICA, December 2009.

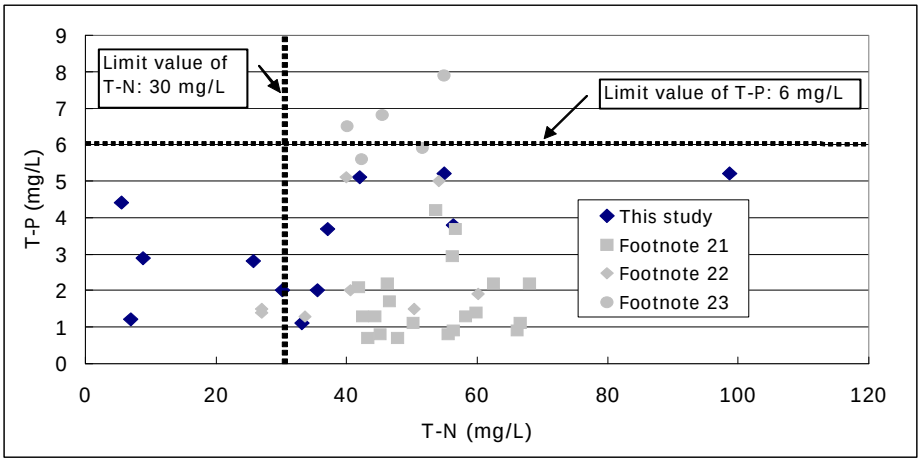


Figure 3.4 Comparison of T-N and T-P of this study with those reported by other studies

CN^- was detected in the levels above limit values in some samples. Cyanide compounds are commonly used for chemical reagents at laboratory or testing work and as disinfectant. Detection of CN^- above the limit value means liquid wastes of laboratory or testing rooms or used disinfectants are discharged into wastewater treatment facility without any pre-treatment or with incomplete treatment. Similarly, detection of the total beta radiation activity in exceeded limit value in the samples of National Hospital of Dermatology suggests that RI liquid waste was not treated in comply with the regulation of the Decision No. 43/2007QD-BYT.

Total coli-forms levels are extremely high compared to the limit value of 5,000 MPN/100mL for all samples, suggesting insufficient or no disinfection at the final stage of wastewater treatment. Total coli-forms are typical indicator to show the level of water contamination by bacteria including pathogenic microbes. Although all of the coli-forms are not always pathogenic, there is a possibility that enteric bacteria is included if the level of total coli-forms are higher than the limit value. In fact, *Shigella* was detected in all samples. Since *Shigella* is enteric bacteria of human and monkey, this suggests human wastes were not treated satisfactorily at surveyed hospitals.

<u>Medical waste storage</u>

Solid waste in temporal storage was not managed by hospital staffs appropriately. Some storage did not have enough structure to prevent outflow of medical waste when natural disaster such as floods occurred. Guideline against disaster or floods is not prepared, so it is difficult that hospitals take proper countermeasure to prevent outflow of medical waste.

<u>Soil contamination in the hospital premises</u>

4 parameters of QCVN03:2008/BTNMT, Cd, Cu, Pb and Zn, met limit values in all soil samples. However, As exceeded limit value of 12 mg/kg in 5 samples obtained at 3 hospitals. Since background levels of As at 4 points, BG Park 1, BG Park 2 and P Lake 1, P-Lake 2 were below the limit value, the reason of higher level of As at several soil samples was not clear. It is also said, however, soil in some regions in the northern Vietnam is contaminated by As in nature.

(4) Awareness of residents on environmental issues around hospitals

All survey hospitals are located in the areas affected by flooding, therefore, the risk of environmental pollution and spread of diseases caused by MWWSW is concerned problems. Followings are thus recommended for hospitals to manage environmental issues.

a. Hospitals should pay attention and give the instruction/notices to the residents to prevent spread of epidemics during the floods.
b. Hospitals should implement a strict monitoring on the collection and transportation of medical waste to ensure no spillage during transportation of waste.

CHAPTER 4 ISSUES AND CHALLENGES OF MWWSW MANAGEMENT

4.1 Necessity for Improvement of MWWSW Management System in Vietnam

The prime concerns of MWWSW management in Vietnam are included in problems related to two risks; (1) risk of environmental pollution and negative health effect, and (2) risk of nosocomial infection. Possible events/causes and their paths, mostly inherent to the health sectors, that may induce these risks are briefly drawn in Figure 4.1(a) and (b). The former is a case related to the risk of environmental pollution and health effect, while the later with the risk of nosocomial infection. These figures clearly illustrate the relationship or relevancy of the causes and subsequent results in MWWSWM that finally bring about the environmental pollution or a threat of nosocomial infection. Necessity for improvement of MWWSWM in Vietnam is thus to mitigate or avoid these risks.

The issues or causes to be challenged for that purpose can be selected from Figure 4.1 (a) and (b) taking into account of the survey results of this study as well as the existing survey repots in Vietnam. These issues are broadly categorized into legal issues, management issues, technical issues, and environmental issues as indicated in Section 4.2.

4.2 Issues and Challenges on MWWSW Management

The issues or challenges to mitigate or avoid the risks of environmental pollution and/or negative health effect and nosocomial infection are summarized in Table 4.1 in which major responsible agencies and priority to tackle with these issues are also included. These issues are broadly categorized as follows:

a. Issues and challenges on policy, legislation and regulation

- Lack of guide or direction to improve MWWSWM system (Issue 1 of Table 4.1)
- Insufficient or uncertain description in the Regulations on Healthcare Waste Management (Issue 2 in Table 4.1)
- Lack of practical and scientifically verified technical guide for MWWSWM (Issue 3 in Table 4.1)
- Insufficient budget for operation of medical wastewater/solid waste treatment (Issues 4 and 6 in Table 4.1)

b. Issues and challenges on management and operation

- Insufficient compliance with the Regulation (Issue 5 in Table 4.1)
- Insufficient management capability and its performance (Issues 5 and 6 in Table 4.1)
- Inadequate instruction and in-service training for staffs (Issue 6 in Table 4.1)
- Low priority of monitoring and reporting for waste management (Issues 5 and 6 in Table 4.1)
- Lack of liability sharing with contractor of waste dealer (Issue 5 in Table 4.1)
- Lack of promotion activities for patients/families and hospital staff (Issues 6 and 7 in Table 4.1)

c. Issues and challenges on medical wastewater/solid waste treatment

- Lack of adequate capacity and technology of treatment facilities and equipment (Issues 8 and 9 in Table 4.1)

d. Issues and challenges on environmental protection

- Risk of environmental pollution due to insufficient medical wastewater/solid waste treatment (Issue 9 in Table 4.1)
- Risk of environmental pollution during a flood and natural disaster (Issue 9 in Table 4.1)

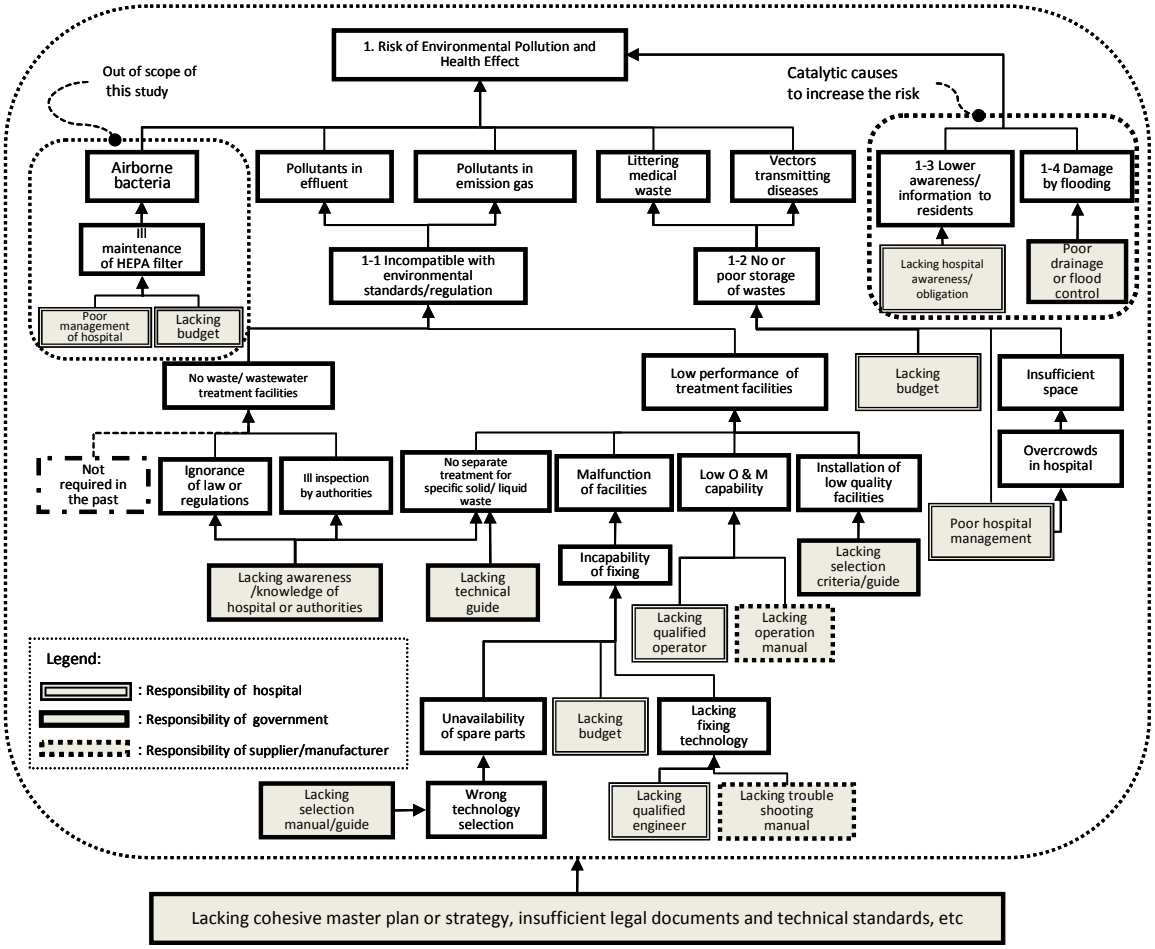


Figure 4.1 (a) Possible paths to trigger the risk of environmental pollution and health effect by inappropriate MWWSW management in Vietnam

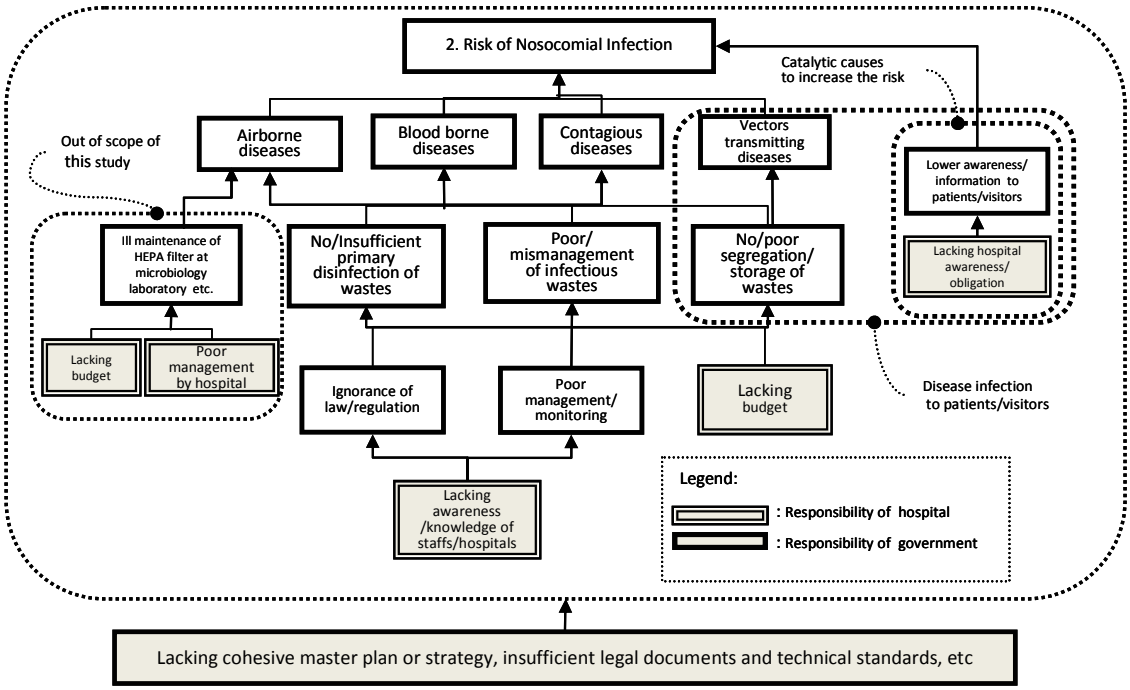


Figure 4.1 (b) Possible paths to trigger the risk of nosocomial infection by inappropriate MWWSW management in Vietnam

Table 4.1 Issues and improvement measures of MWWSW management system in Vietnam

Issues	Measures	Responsible agency	Selection priority
1 Lack of a master plan for MWWSW management	Establish a master plan for MWWSW management.	MOC(off-site system) in collaboration with MOH, MOH(on-site system)	Highest (MOC's master and MOH's master plan should be consolidated at early stage)
2. Inadequate description in the Regulation on Medical Waste Management	Review and amendment of the Regulation on Medical Waste Management to provide more detail regulations for: • Hazardous medical waste and liquid waste, • Regular education, training and PR activities on MWWSW management, and • Measures to prevent environmental impact by medical waste, • Measures to prevent spread of epidemics in case of flooding	MOH	Highest (Since Decision No.43 is the focal Regulation on healthcare wastes inadequacy and shortcomings should be improved quickly.
3. Lack of a technical guideline for MWWSW management	Establish a technical guideline for MWWSW management.	MOST MOH	High (Technical guideline is necessary but not in urgent)
4. Lack of a financial mechanism of the budget source for MWWSW management	Prepare a ministerial Circular between MOH and MOF on budget preparation and allocation for MWWSW management considering state support or increase of patient fee	MOH, MOF, MPI, National Assembly	High (O&M budget is requisite but, but creation of its funding mechanism takes long time)
5. Inadequate application and implementation of the Regulation	• Enhance supervision and monitoring activities in hospitals. • Enhance the role and responsibility of hospital leaders and staffs.	MOH Hospital leaders	Highest (Compliance of the Regulation is the highest requirement)
6. Insufficient human and financial resources for MWWSW management and responsibility of hospital leaders	• Capacity development (including awareness and concrete management skills) of leaders and staffs of concerned agencies and hospitals • Prepare a financial mechanism to support MWWSW management cost	MOH, MOF, MPI Hospitals	High (Human resources are already existed but development of them takes long time)
7. Lack of a proper MWWSW management model system (for others to follow)	• Establish model system of different type of MWWSW management and to introduce the good models to other hospitals • Technology development on MWWSW management system in collaboration with Vietnamese academics and/or institutions.	MOH(support and investment), MOST(technology) Universities/ Institutions	Low (Establishment model system is ranked lower priority compared with other measures)
8. Lack of separate treatment system for specific liquid wastes	Establish separate treatment system for specific liquid waste considering hospital characteristics and volume of such wastes as infectious liquid, RI liquid, hemodialysis liquid, laboratory liquid waste, and laundry wastewater.	MOH Hospital	High (Not all hospitals needs separate treatment system)
9. Lack of treatment system for medical wastewater and solid waste	• Utilize the current facilities and equipments in a manner to mitigate environmental impact • New buildings must install the MWWSW management.	MOH/PPC Hospital	Highest (Installation of facilities are prioritized among others)

4.3 Proposed Model System for MWWSW management in Hospitals

4.3.1 Medical wastewater treatment system and technology

(1) Principle and basic requirements

Followings are basic requirements and principle for a selection of system.

- A septic tank should be installed at each building wherever a piped water or utility water is supplied.
- Except where multiple healthcare facilities are located at near sites each other, wastewater treatment system should be installed at each healthcare facilities.
- Proximity regulation of wastewater treatment units to residential or public buildings should be met.
- Some liquid wastes should be separately treated, if necessary, in accordance with the Regulation on Medical Waste Management (Decision No.43/2007/QD-BYT).
- Storm water should be separately collected and discharged without mixing with medical wastewater.

(2) Medical wastewater treatment system

2 types of principal wastewater treatment systems are proposed. The first one is a system in which all wastewater is treated at the central wastewater treatment system. Wastewater is discharged into a septic tank firstly and then sent to the central wastewater treatment facility. The second one has a separate treatment system for specific liquid wastes in addition to the central wastewater treatment system. These liquid wastes are pre-treated with special technologies and discharged into a septic tank or a central wastewater treatment line. The criteria of the system selection are highly dependent on how much and what kinds of liquid wastes are discharged. It also needs to take into consideration whether the function of the central wastewater treatment system is hampered or effluent standards are met even by mixing such liquid wastes.

(3) Medical wastewater treatment technologies

In the Decision No.43 /2007/QD-BYT, requirements of medical wastewater treatment system are prescribed as follows:

- Technologies and processes employed must meet effluent standards,
- The system must have a suitable throughput capacity,
- Effluent outfall must facilitate inspection and supervision of water quality,
- Sludge from wastewater treatment system must be managed as healthcare solid waste, and
- Effluent should be periodically analyzed and the record of facility operation and related quality test results should be kept.

Considering these requirements, proposed wastewater treatment systems/technologies are drawn as follows for 4 typical conditions of hospital in Vietnam, which is shown in Table 4.2.

Table 4.2 Proposed medical wastewater treatment system/technology in Vietnam

Case		System/Technology	Remarks
I	In case general hospital with more than 300 beds or some specialty hospitals (depending on the specialty).	Centralized wastewater treatment facility + Stand alone liquid waste treatment systems (depending on the quality of liquid wastes).	Even general hospitals with less than 300 beds, a separate liquid wastes are required in some cases. Detail water quality survey by sources is needed before construction.
II	In case of hospitals without enough space for the central wastewater treatment facility.	Improved biological process or advanced process.	In case effluent standards are strengthened advanced systems are favorable than improved biological process.
III	In case of hospitals with enough space for the central wastewater treatment facility.	Conventional biological system (anaerobic or aerobic process).	Proximity requirements must be complied with.
IV	In case of hospitals with enough space capable to comply with proximity requirements, but having budgetary constraints.	Lagoon process or wet land method.	These technologies are generally cheap, but a performance is not so high.

4.3.2 Medical solid waste management system and technology

(1) Principle or basic requirements

Medical waste management systems and technologies should be selected based on the following principle and requirements.

- Separation of waste at source is necessary, especially for hazardous medical waste and recyclables.
- The direction mentioned in the Official letter of the Minister of Health (No. 7164/2008/BYT-KCB) should be followed, especially at the district hospitals.
- Treatment technologies are selected in accordance with the Regulation on Medical Waste Management (Decision No.43 /2007/QD-BYT).
- System and technologies should be selected in accordance with the master plan or relevant plan if available.

It is essential to segregate these wastes at generation sources to ensure safer and easier management. Source separation of recyclable wastes should be encouraged to reduce the amount of medical waste to be treated. It is also important to follow the regional plan of medical waste management system if available. The nation's master plan for medical waste management is reportedly prepared by MOC in cooperation with relevant ministries. The Official letter of the Minister of Health (No. 7164/2008/BYT-KCB) gives a direction to the medical waste treatment as follows:

- Government managed cities where density of hospitals and healthcare facilities is high, and traffic system is well developed may apply a centralized model for hazardous medical waste treatment; a key treatment facility in the city may treat all hazardous medical waste generated in the city in order to save investment and operational cost,
- Cluster model is applicable to provincial and city level hospitals; hazardous medical waste are transferred and treated at healthcare facilities located within or near the cities (within 30 km from the hospital), and
- On-site waste treatment is applicable to healthcare facilities located in a remote area, employing suitable technologies.

(2) Medical solid waste management system

Based on the direction of the Official letter of the Minister of Health (No. 7164/2008/BYT-KCB) and the requirements described in the Decision No.43 /2007/QD-BYT medical waste management systems are likely categorized from Type I to Type III as follows:

Type I is applicable to the hospitals that can own and manage waste treatment equipment by their own financial and technological capability. This system is also applied to hospitals located far from the center of city where regular waste collection services are less accessed, and Type II (a) and (b) systems are less applicable.

Type II is off-site treatment system at a centralized treatment facility. Such facility is owned by a private waste treatment companies (Type II (a)) or some key healthcare facilities in the region (Type II (b)). The Type II (a) system is arranged by hospitals and directly contracted with private companies. The Type II (b) system may be arranged by DOH and employed if only throughput capacity of the treatment facilities of key healthcare facilities is enough large to accept wastes from other hospitals. In both cases, wastes are stored at hospitals by the time of collection, and thus hospitals must have appropriate waste storage facility prescribed in the Decision No.43 /2007/QD-BYT.

Type III is applied for some specific hazardous medical wastes which are destined to suppliers or manufacturers. Pharmaceutical waste (expired medicine), cyto-toxic wastes, some chemical wastes, and pressurized container are among those treated by this system. Returning or

acceptance of such wastes by suppliers or manufacturers should be included in the terms and condition of purchase agreement of those products.

(3) Hazardous medical waste treatment technologies

Various technologies for hazardous medical waste treatment are available or being developed both in domestic and abroad. However, no single technology can treat all kinds of wastes. Hence, several kinds of technologies must be used for medical waste treatment in general. In the Official letter of the Minister of Health (No. 7164/2008/BYT-KCB), the technologies for medical waste management are directed as:

- The provinces, cities, and hospitals that have incinerators may continue to use, but must conduct flue gas analysis according to existing regulations,
- The provinces, cities, and hospitals that have not waste treatment facilities or have incinerators malfunctioned should apply new environmentally sound technologies such as disinfection or microwave technologies.
- When installing a new incinerator, it should be equipped with devices to prevent air pollution abatement.

Incineration is a common technology being used at healthcare facilities in Vietnam. In some hospitals, however, autoclaving and microwave irradiation technologies (combined with autoclaving technology) have been used recently. Technologies other than incineration are designed for sterilization or disinfection (of infectious waste) and leaving considerable amount of treatment residues compared with incineration. This means hospital requires additional measures and expenses for residue disposal, i.e. cost for sterilization/disinfection and cost for final disposal of residues. Taking consideration of these facts, proposed medical (hazardous) waste treatment systems/technologies are summarized in Table 4.3.

Table 4.3 Proposed medical waste treatment system/technology in Vietnam

Case		System/Technology	Remarks
I	There are key hospitals having waste treatment facility with excess throughput capacity.	Type II(a) system with a combination of Type III system if required.	Efficient waste collection plan is required in this system. Storage of waste is required for hospitals complying with the Regulation.
II	There are private waste management companies having medical waste treatment facility.	Type II(b) system with a combination of Type III if required	Currently such companies include URENCO on Hai Phong, Hanoi, Da Nang and Ho Chi Minh. Treatment fee is negotiated between companies and hospitals.
III	Hospitals located where Case I and II are inapplicable.	Type I system in combination with Type III system if required. Technologies are non-burning technologies or incineration.	Incinerator requires air pollution control devices to meet emission standards. Non-burning technologies are relatively costly and efficacy test may be periodically required.
IV	Hospitals located where Case I and II are inapplicable and having less than 50 beds.	Type I system in combination with Type III system if required. Technologies are a pit burial or cemetery burial.	Major hazardous medical wastes generated at these hospitals are likely sharps and anatomical waste (e.g. placenta) and thus can be treated by these technologies.

4.3.3 Operation of medical waste management

(1) Organizational framework

Human resource is a key factor in operational management. Under the organizational framework, top down approach, stemming from management's leadership and bottom up implementation by staff's individual involvement and willingness to participate is pivotal in resolving improper medical waste disposal at the hospitals. Figure 4.2 shows how to develop organizational framework to implement adequate waste management flow in a hospital.

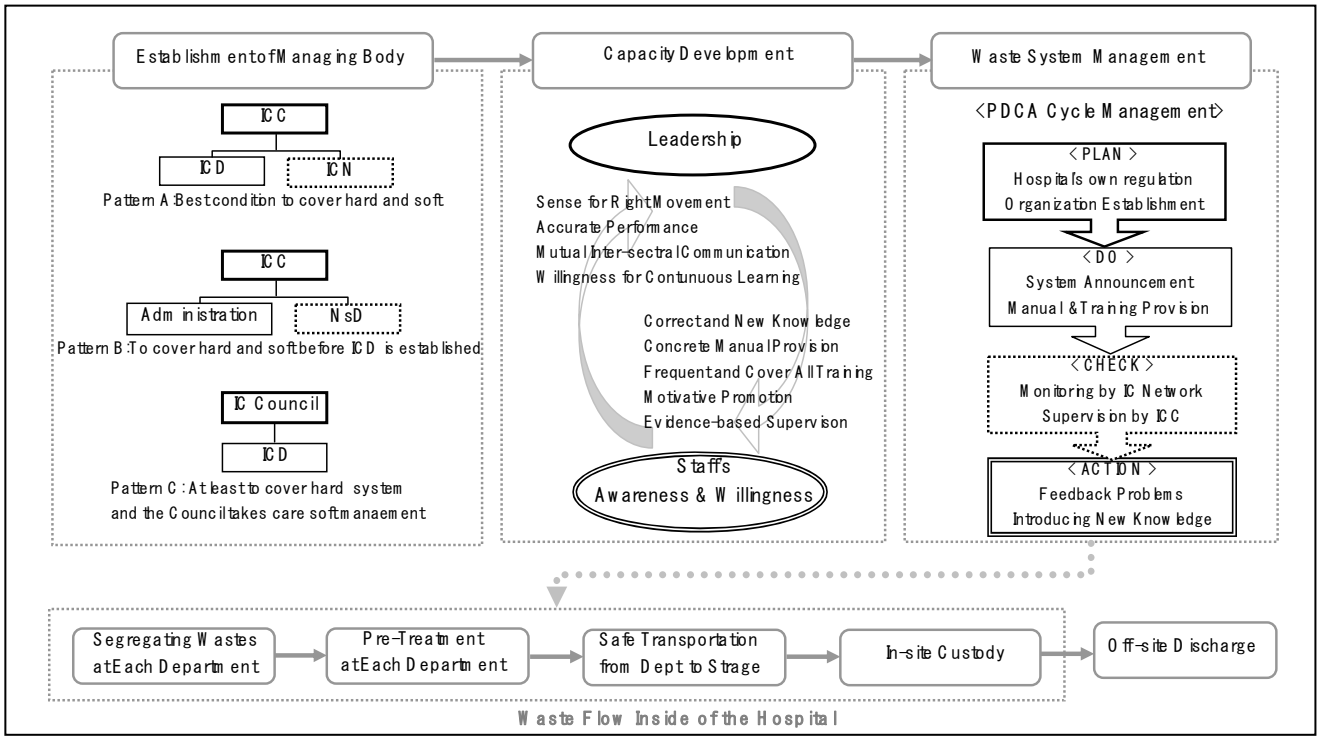


Figure 4.2 Proposed organization framework and flows

(2) Developing strategy to minimize medical waste in each hospital

There are several measures that can be institutionalized to achieve medical waste minimization including the following:

Process	Action to take
Waste prevention	Eliminating unnecessary medical waste generation
Source reduction	Reducing the amounts of medical waste generated
Reuse	Finding another use for a component so it does not become part of the medical waste
Recycling	Handling or treating the material so it can be used in another process

Other possible elements of the medical waste minimization strategy include:

Existing activities	Action to take
Staff training planning and follow-up monitoring	Create plan to confirm all staffs receiving training and achieve the established standards.
Monthly tracking mechanism for waste minimization	Create concrete checking list based on scientific and evidence based monitoring subjects.
Recognition or awards for achieving milestones in implementing the strategy.	Establish competition among departments towards reaching set goals with positive motivation/incentive
Formatting a team or council to oversee and coordinate the medical waste minimization strategy	Use ICC and ICN framework to coordinate and promote waste minimization strategy.
Tangible reports, graphs and feedback to communicate results	Communicate monthly progress to staff

It is important to collect good baseline data of the amount of waste generated prior to implementing the waste minimization program. Medical waste generation data from the various units in the hospital should be recorded on a Pareto Chart with the amounts of waste displayed in descending order. Pareto analyses can easily indicate the highest medical waste generating areas in which the minimization strategies should be initiated. This information should be displayed and communicated throughout the hospital.

CHAPTER 5 ROAD MAP AND PROPOSED JICA'S ASSISTANCE PROGRAM ON MWWSW MANAGEMENT IN VIETNAM

In developing the roadmap and JICA cooperation program, it is necessary to respect the ownership of the Vietnamese side lead by MOH and taking into account efficient sharing roles among donors. This chapter proposes possible models of assistance which are necessary to help the Vietnamese side to achieve the overall goals on MWWSW management.

5.1 Road Map on MWWSW Management in Vietnam

5.1.1 Outline of road map

Through the joint study activities by both Vietnamese C/P and JICA study team, such as stakeholder meetings and workshop, road map to introduce and realize the proper MWWSW management system in Vietnam was prepared.

The road map was prepared in order to achieve the following purposes.

(1) MWWSW management system in Vietnam is improved

(2) Infection threat and environmental pollution by MWWSW are reduced

The road map is consisted with 3 pillars: Policy, Laws and Regulations; Management and Operation; and Treatment System; and 8 tasks for these pillars as shown in Table 5.1.

Table 5.1 Outline of road map

No	Pillar	Task
1	Policy, Laws and Regulations	1-1 Establishment of the strategic plan on MWWSW management
		1-2 Improvement of regulations and standards on MWWSW management
		1-3 Establishment of guidelines for MWWSW management
2	Management and Operation	2-1 Establishment of MWWSW management system by medical and environmental administrative agencies in central and local governments
		2-2 Establishment of MWWSW management system and organization of MWWSW management in hospitals
3	Treatment System (Facilities)	3-1 Development of MWWSW treatment technology
		3-2 Installation of MWWSW treatment facilities
		3-3 Establishment of financing mechanism

The road map is summarized in Table 5.2 and outline of each task of the road map is described in Section 5.1.2.

Table 5.2 Road map to improve MWWSW management in Vietnam

Pillar	Task	Action	JICA assistance program applied	Responsible agencies	Goals	Tentative schedule 2011	2012	2013	2014	2015
Policy, Laws and Regulations	1-1 Establishment of the strategic plan on MWWSW management	1-1-1 Establish the national strategic plan on MWWSW management	✓	MOC(off-site), MOH(on-site)	Policy and strategy on MWWSW management are developed and disseminated.					
		1-1-2 Disseminate the strategic plan on MWWSW management nationwide		MOC(off-site), MOH(on-site)						
	1-2 Improvement of regulations and standards on MWWSW management	1-2-1 Review and update inadequate description in regulations/standards on MWWSW management	✓	MOH	Role and responsibility of each relevant agencies/departments on MWWSW management are clarified. MWWSW management in hospitals is improved and enhanced by new regulations/standards.					
		1-2-2 Develop new regulations/standards for strengthening on MWWSW management		MOH						
		1-2-3 Disseminate new regulations/standards to relevant agencies/departments and hospitals		MOH, DOH						
		1-2-4 Implement MWWSW management by hospitals under new regulations/standards		Hospitals						
	1-3 Establishment of guidelines for MWWSW management	1-3-1 Develop guidelines for MWWSW management	✓	MOST, MOH	MWWSW management in hospitals is carried out properly according to the guidelines.					
		1-3-2 Disseminate the guidelines for MWWSW management		MOH, DOH						
		1-3-3 Implement MWWSW management by hospitals based on the guidelines		Hospitals						
Management and operation	2-1 Establishment of MWWSW management system by medical and environmental administrative agencies in central and local governments	2-1-1 Develop and implement the plan of capacity development for medical administrative agencies in central and local governments	✓	MOH, DOH	MWWSW management is improved by medical and environmental administrative agencies in central and local government.		● ●	● ●	● ●	● ●
		2-1-2 Develop and implement the plan of capacity development for environmental administrative agencies in central and local governments	✓	MONRE, DONRE			● ●	● ●	● ●	● ●
		2-1-3 Implement supervision and monitoring by medical administrative agencies based on the developed MWWSW management system		MOH, DOH						
		2-1-4 I Implement supervision and monitoring by environmental administrative agencies based on the developed MWWSW management system		MONRE, DONRE						
	2-2 Establishment of MWWSW management system and organization of MWWSW management in hospitals	2-2-1 Develop and implement the plan of capacity development for heads/staffs of hospitals and administrator/operator of MWWSW treatment facilities	✓	MOH, DOH	MWWSW management in hospitals is improved by heads/staffs of hospitals. MWWSW treatment facilities are managed and operated properly by administrator/operator.		● ●	● ●	● ●	● ●
		2-2-2 Formulate management/operation system and organization for MWWSW management in hospitals	✓	Hospitals						
		2-2-3 Improve management/operation on MWWSW treatment facilities	✓	Hospitals						
		2-2-4 Implement supervision and monitoring by hospitals based on the established MWWSW management system		Hospitals						
Treatment system (facilities)	3-1 Development of MWWSW treatment technology	3-1-1 Study on MWWSW treatment technology and formulate coordination mechanism among concerned agencies and organizations		MOST, MOH, University & Institute	All hospitals apply the appropriate technology by reference to the developed technologies.					
		3-1-2 Implement the pilot/model project and verify MWWSW treatment technology	✓	MOST, MOH, University & Institute						
		3-1-3 Disseminate the verified MWWSW treatment technologies to hospitals nationwide		MOH, DOH						
	3-2 Installation of MWWSW treatment facilities	3-2-1 Establish the plan for installation of MWWSW treatment facilities in line with the strategic plan		MOH, MOC, PPC, Hospitals	All hospitals install appropriate MWWSW treatment facilities.					
		3-2-2 Promote installation of MWWSW treatment facilities in accordance with the plan	✓	MOH, MOC, PPC, Hospitals						
	3-3 Establishment of financing mechanism	3-3-1 Review and amend regulations to allocate and secure proper budget for MWWSW management		MOH, MOF, MPI, PPC	Necessary budget for MWWSW management is allocated and secured in all hospitals.					
		3-3-2 Allocate and secure proper budget for MWWSW management		MOH, PPC, DOH, Hospitals						

Note: MWWSW; medical waste water/ solid waste

●; It indicates the short-term implementation. It does not mean to be carried out continuously.

5.1.2 Outline of each task of road map

(1) Policy, Laws and Regulations

a. Task 1-1: Establishment of the strategic plan on MWWSW management

Background: In Vietnam, comprehensive and definite guide or direction to improve the MWWSW management system is lacking. The master plan related to MWWSW management is recently prepared by MOH and MOC and they are under the approval process by the prime minister. The strategic plan on MWWSW management is necessary to accomplish a medium and long term strategies, visions and plans.

Goal: Policy and strategy on MWWSW management are developed and disseminated.

Action: The master plan is verified and the national strategic plan on MWWSW management should be prepared, if necessary. MOH and MOC should disseminate the master plan and/or the national strategic plan to the related agencies such as DOH, DOC, hospitals etc. by implementing seminars and/or workshops.

b. Task 1-2: Improvement of regulations and standards on MWWSW management

Background: There are insufficient or uncertain descriptions in regulations on MWWSW management. It may cause confusion and misunderstanding in MWWSW management in healthcare facilities. It is required to review and update the regulations, to unify and to meet the current situation of the country.

Goal: Role and responsibility of each relevant agencies/departments on MWWSW management are clarified. MWWSW management in hospitals is improved and enhanced applying the improved regulations/standards.

Action: Inadequate description in regulations/standards on MWWSW management is reviewed and updated and regulations/standards for strengthening MWWSW management are developed by MOH. After improved regulations/standards is enacted and enforced, MOH and DOH should disseminate it to relevant agencies/departments and hospitals by implementing seminars and/or workshops. And then proper MWWSW management, in line with the improved regulations/standards, should be implemented by hospitals.

c. Task 1-3: Establishment of guidelines for MWWSW management

Background: Technical guide for MWWSW treatment technology or system is lacking and most of existing facilities/systems are not verified scientifically. It is a part of reasons for installation of inappropriate treatment facilities and thus resulting in ill-operation and poor maintenance. It is required to establish technical guideline or manual for MWWSW management, including treatment and operation/ maintenance.

Goal: MWWSW management in hospitals is carried out properly according to the guidelines.

Action: The guidelines for MWWSW management are to be developed by MOH and MOST to meet the requirement and/or standards in Vietnam. And then MOH and DOH should disseminate it to hospitals by implementing seminars and/or workshops. Based on the guidelines, MWWSW management should be implemented properly by hospitals.

(2) Management and Operation

a. Task 2-1: Establishment of MWWSW management system by medical and environmental administrative agencies in central and local governments

Background: Currently, medical and environmental administrative agencies in central and local government such as MOH, MONRE, DOH and DONRE might not lead an efficient and effective MWWSW management. One of the main reasons is insufficient number and capacity of human resources. Therefore, it is required to assign adequate number of staffs and develop capacity for

medical and environmental administrative agencies in central and local government to lead proper MWWSW management system in Vietnam.

Goal: MWWSW management is improved by the initiative of the medical and environmental administrative agencies in both central and local government.

Action: Capacity development program for medical and environmental administrative agencies in central and local governments should be developed and implemented. Based on the improved MWWSW management system, supervision and monitoring should be carried out in the proper manner by medical and environmental administrative agencies.

b. Task 2-2: Establishment of MWWSW management system and organization of MWWSW management in hospitals

Background: Heads/staffs of hospitals do not lead/provide efficient and effective MWWSW management in hospitals because of lack of capability. Administrator/operator of MWWSW treatment facilities do not have enough knowledge and experience so that they are facing difficulties to manage and operate MWWSW treatment facilities properly. It is required to develop capacity for heads/staffs of hospitals and administrator/operator of MWWSW treatment facilities to lead and provide proper MWWSW management system in hospitals.

Goal: MWWSW management in hospitals is improved by the initiative of heads and effort of staffs of hospitals. MWWSW treatment facilities are managed and operated properly by administrator/operator.

Action: Capacity development program for heads and/or staffs of hospitals and administrator/operator of MWWSW treatment facilities should be developed and implemented by MOH and DOH. Hospitals should formulate proper organization inside hospitals to manage proper MWWSW and improve management/operation on MWWSW treatment facilities. Based on the established MWWSW management system, supervision and monitoring should be carried out by hospitals.

(3) Treatment System

a. Task 3-1: Development of MWWSW treatment technology

Background: Proper treatment technology on MWWSW to fit current situation of the country and achieve standards of Vietnam is not verified sufficiently. Most hospitals do not have enough information about suitable technology and method of treatment of MWWSW. It is required to develop suitable treatment technology to meet the current situation of the country.

Goal: All hospitals apply the appropriate technology by reference to the developed technologies.

Action: MWWSW treatment technology should be studied in coordination with related agencies; such as MOST, MOH, universities and institutes, and coordination mechanism among concerned agencies and organizations should be formulated. The pilot/model project should be implemented and appropriate treatment technology/system should be verified. And then MOH and DOH should disseminate the verified technologies/system to hospitals nationwide.

b. Task 3-2: Installation of MWWSW treatment facilities

Background: Appropriate MWWSW treatment facilities are not installed at many hospitals across the country. Infectious waste itself, wastewater and/or exhaust gas from the facilities may cause unexpected environmental impact on the surroundings.

Goal: All hospitals install appropriate MWWSW treatment facilities.

Action: The plan for the installation of MWWSW treatment facilities should be established in line with the master plan and/or strategic plan mentioned in Task 1-1. And then MOH, MOC, PPC and hospitals should promote installation of MWWSW treatment facilities in accordance with the plan above mentioned. Calling donors assistance might be one of the measures to realize this task.

(4) Establishment of financing mechanism

Background: Insufficient budget for both installation and operation of MWWSW treatment facilities/system is one of the reasons that healthcare facilities cause environmental pollution. It is required to allocate adequate budget for the facility installation and routine operation and maintenance of the MWWSW treatment system.

Goal: Necessary budget for MWWSW management is allocated and secured in all hospitals.

Action: Regulations and financial mechanism to allocate proper budget for MWWSW management should be reviewed by the related agencies such as MOH, MOF, MPI and PPC, and amended to meet the requirement. And then, proper budget for MWWSW management should be allocated and secured.

5.2 Proposed JICA's Assistance Program on MWWSW Management

5.2.1 Outline of proposed JICA's assistance program

Considering the road map to improve MWWSW management system in Vietnam, other donor's activities in the sector and JICA's resources and assistance policy, possible assistance schemes by JICA are: (1) technical assistance, (2) financial assistance (grant aid and yen loan), (3) training, and (4) expert dispatch. As shown below, 5 projects/program are proposed for the future JICA's assistance program in MWWSW management sector in Vietnam.

Technical Assistance Project (1)

1. Project Title: Strengthening Capacity of Medical Waste Water and Solid Waste Management System in Vietnam
2. Implementation Agency: MOH, DOH of model provinces , model hospitals
3. Direct Beneficiaries: Staff of implementation agencies,
4. Indirect Beneficiaries: Residents of the target areas
5. Project Areas: Hanoi and the model provinces to be selected
6. Project Period: 3 years from 2011
7. Overall Goal
MWWSW management system is improved and implemented effectively and satisfactorily in Vietnam
8. Project Purpose
Capacity of MWWSW management is improved in both central and local levels
9. Outputs
- National strategic plan and guidelines for MWWSW management are prepared
- Implementation plan of the MWWSW management is developed
- Operation and maintenance system on the MWWSW treatment is established and/or strengthened.
- Appropriate technology/system of the MWWSW is developed

Technical Assistance Project (2)[17]

1. Project Title: Strengthening Capacity of Water Environmental Management in Vietnam
2. Implementation Agency: MONRE, DONRE of model provinces
3. Direct Beneficiaries: Staff of implementation agencies,
4. Indirect Beneficiaries: Residents of the target areas
5. Project Areas: Hanoi, Hai Phong, Hue, HCMC, Ba Ria Vung Tau
6. Project Period: 3 years from mid 2010
7. Overall Goal
Water environmental management system is improved and implemented in Vietnam
8. Project Purpose
Capacity of MONRE and target DONREs on water environment management is strengthened.
9. Output
- Strengthening MONRE's capacity of making policy & systems that are more effective & enforceable
- Strengthening enforcement capacity of target DONREs on basic water pollution control
- Strengthening target DONRE's capacity of making effective water pollution control measures
- Strengthening target DONRE's capacity of promoting awareness of public and industrial sectors on water environment
- Strengthening capacity of MONRE and DONREs on information management and utilization

[17] This project has started since August 2010.

Financial Assistance Project

1. Project Title: Investment for Medical Waste Water and Solid Waste Treatment System in Vietnam
2. Implementation Agency: MOF, MPI, MOH, PPC and DOH of the target hospitals
3. Project Period: 4 years from 2013
4. Target Hospitals:

a. Medical wastewater treatment facilities

- Hospitals managed by MOH: approx. 10 hospitals
- Hospitals managed by Provinces: approx. 20 hospitals

b. Medical solid waste treatment system

- Off-site treatment (centralized system): approx. 3 sites (3 PPCs)
- On-site treatment: approx. 10 hospitals managed by MOH and/or Provinces

Note: Target hospitals will be selected based on the "Implementation plan of the MWWSW management" mentioned in the above "Technical Assistance Project-1".

Training Program

1. Program Title: Training for Strengthening Capacity of Medical Waste Water and Solid Waste Management in Vietnam
2. Implementation Agency: JICA
3. Target groups: MOH, DOH, Hospitals, MONRE, DONRE etc.
4. Program Period: approx. 2 years from 2011
5. Target and Contents:

Target groups	Contents	Remarks (Frequency)
Staff of MOH, DOH, etc.	Implementation of policy, laws and regulations related to MWWSW management, supervising, monitoring and instruction on MWWSW to the hospitals by the government	1 time/year
Staff of Hospitals	Management, instruction and monitoring on MWWSW inside the hospitals	
Staff of MONRE, DONRE etc.	Management, supervision, monitoring and instruction on hazardous MWWSW inside the hospitals	1 times/year

Dispatch of JICA Expert

1. Title: Dispatch of JICA Expert in Medical Wastewater and Solid Waste Management
2. Implementation Agency: VIHEMA/MOH
3. Dispatch period: 1 year from mid 2011
4. Scope of Works of the Expert:

- Assistance and advice to VIHEMA in respect of MWWSW management
- Planning of JICA training program
- Preparation and enhancing of JICA technical assistance program and financial assistance project
- Others (Adjusting and coordinating with other donor projects)

These proposed projects/programs should be further discussed among related agencies and/or departments and finalized as detailed/concrete projects/programs considering the following points.

- It is reported that the following master plans are recently drafted and in the stage of final approval by the prime minister. A strategy and/or direction of some components described in proposed JICA' assistance program are stated in the master plans. Therefore, these master plans should be reviewed and proposed JICA's assistance program should be modified to meet the requirement of the master plans.
  - ✓ Master Plan of Medical Waste Management prepared by VIHEMA/MOH
  - ✓ Master Plan on Hazardous Solid Waste Treatment up to 2025 prepared by MOC
- The World Bank recently pledges budget for the improvement of medical wastewater management sector in Vietnam. However, detailed program will be decided based on the request from the Vietnamese side and requirement of the World Bank. In order to avoid an overlapping/ contradiction between 2 donors' activities, proposed JICA's assistance program should be adjusted considering the World Bank program.

- Program No. 5 "Dispatch of JICA Expert" is proposed to provide advice MOH to coordinate with other donor's activities, including the World Bank, and modify proposed JICA's assistance program.
- Program No.4 "Training Program" might be carried out as an individual program and/or combined with technical assistance program. So, this program can be combined with project No. 1 or No.2.
- Related project has already started since August 2010 with MONRE as a counterpart agency. In terms of water environmental management, MOH, DOH and hospitals should cooperate with this JICA on-going program.

5.2.2 Implementation plan of proposed JICA's assistance program

The viability, duration and implementation order of the proposed projects/programs are to be discussed. Tentative implementation plan of proposed JICA's assistance program for the next 5 years is shown in Table 5.3. Capacity development projects should be carried out in the early stage followed by the investment of facilities/equipment.

Table 5.3 Tentative implementation plan of proposed JICA's assistance program

Project	Scheme	2011	2012	2013	2014	2015
1. Strengthening Capacity of Medical Waste Water and Solid Waste Management System in Vietnam	Technical assistance	▬	▬	▬	▬	
2. Strengthening Capacity of Water Environmental Management in Vietnam (in progress)	Technical assistance	▬	▬	▬		
3. Investment for Medical Waste Water and Solid Waste Treatment System in Vietnam	Financial assistance			▬	▬	▬
4. Training for Strengthening Capacity of Medical Waste Water and Solid Waste Management in Vietnam	Training in Japan	●	●			
5. Dispatch of JICA Expert in the Medical Waste Water and Solid Waste Management	Expert dispatch	▬				

Note: ●; It indicates the short-term implementation. It does not mean to be carried out continuously.

CHAPTER 6 CONCLUSION

This study is to understand the situation about a wide range of issues related to the MWWSW management in Vietnam, and identify issues that hamper a proper MWWSW management, and then to propose the necessary measures to reduce MWWSW generation and to enhance proper treatment. The study area covers Hanoi City, Hue City and Ho Chi Minh City, target hospitals are 9 national hospitals/institutes, and relevant ministries and agencies to be studied are MOH, MONRE and relevant agencies.

Through the Study, whole picture on the MWWSW management in Vietnam has been clarified and the findings and proposals were served as a road map which shows measures to be taken by the related agencies and hospitals/institutes. Furthermore, recommendation for JICA to design a near future cooperation scheme in this sector was provided considering JICA's policy, cooperation direction and effectiveness of the program.

Major outputs of each Chapter are shown as follows.

In Chapter 2, administrative and legislative frame and policy and strategy on MWWSW management, organization structure and roles of related agencies/hospitals are stated.

In Chapter 3, current conditions and practices on MWWSW management has been studied through hearing survey to related agencies and other donors, fact finding survey at the target hospitals/institutes, output of the current JICA Study on Urban Environmental Management in Vietnam. In the central government level, relationship among related agencies and role of each agency has been clarified and, in the target hospitals/institutes, current conditions related to the management and operation, technology and environmental situation has been clarified.

In Chapter 4, based on the findings in Chapters 2 and 3, necessity of improvement or development of MWWSW management system in Vietnam has been clarified and issues and challenges on the aspect of "legislation, policy and regulation", "management and operation", "treatment technology" and "environmental protection" are compiled. Furthermore, model system for medical wastewater and solid waste treatment are proposed, and measures on proper operation and maintenance are also proposed.

In Chapter 5, in order to improve the MWWSW management system in Vietnam, road map composed of 3 pillars: "policy, laws and regulations", "management and operation" and "treatment system"; and 8 tasks together with their goals and actions are prepared. Target year of the road map is set in the year 2015 and main actor for each task is stated. And then, considering the variety of supporting scheme and capability of JICA, 5 items of JICA program are proposed.

In Vietnam, numbers of healthcare facilities in which MWWSW treatment facilities are installed are limited and, even installed, most of them are not meet current effluent standards. Therefore, hospitals are considered as a source of environmental pollution and outbreak of infectious diseases. In particular, if untreated MWWSW outflows during flooding, such risk will be heighten and widely spread. It is expected that by utilizing outputs of this study, proper measures have been taken and threat to outbreak of infectious diseases and environmental pollution will be minimized.