The Lao People's Democratic Republic
Ministry of Natural Resources and Environment

Data Collection Survey on Waste Management Sector in The Lao People's Democratic Republic

Final Report

February 2021

JAPAN INTERNATIONAL COOPERATION AGENCY

EX Research Institute Ltd.
CTI Engineering International Co., Ltd.
KOKUSAI KOGYO CO., LTD.

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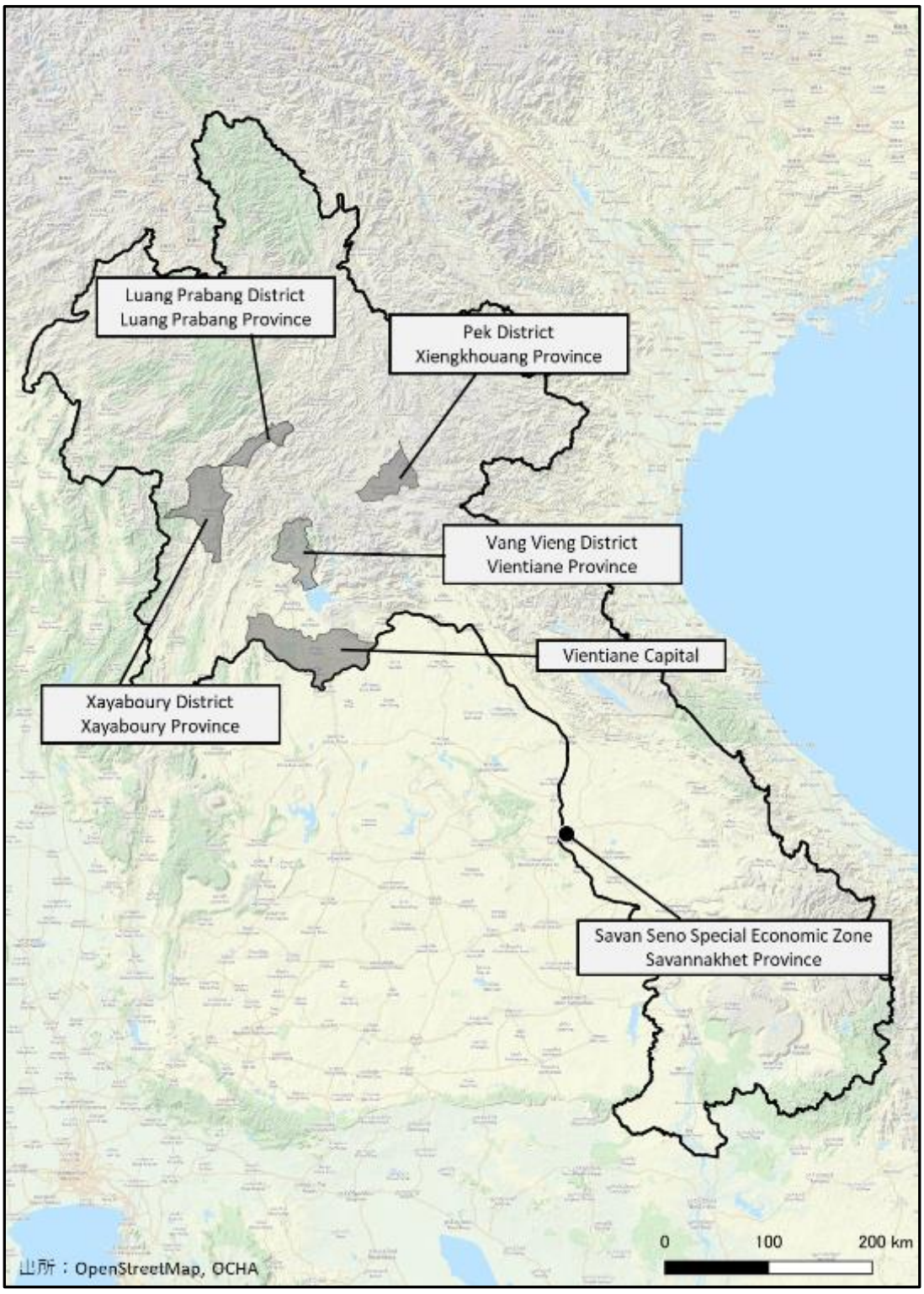

Locations of Survey Target Areas

1. Meeting at Transfer Station

2. Vang Vieng Landfill Site

3. Savannakhet UDAA

4. Online meeting with MONRE's Vice Minister

5. Outlook of Health-care Waste Incinerator, Luang Prabang District

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8. DFR Joint-Workshop (online)

Survey Photos

Executive Summary

1. Background and objective

In the Lao People's Democratic Republic (Laos), the remaining capacity of the final disposal site in cities is becoming insufficient due to the influence of the population increase and the progress of urbanization in recent years. The waste collection rate remains at a low level. In many cases, medical waste and hazardous waste are also dumped in municipal waste disposal sites and vacant lots without proper treatment. The Ministry of Natural Resources and Environment (MONRE) is in charge of formulating policies and plans for overall environmental measures, including waste management, and coordinating related ministries and agencies. On the other hand, the actual waste management work is under the jurisdiction of different ministries and agencies depending on the type of waste. In the central government, the Ministry of Public Works and Transport (MPWT) oversees general waste, the Ministry of Industry and Commerce (MOIC) is in charge of industrial waste, and the Ministry of Health (MOH) is in charge of medical waste. Specific standards and rules are prepared mainly based on the ministry ordinances created and promulgated by the relevant ministries and agencies for each type of waste. At the municipal level, the Urban Development Administration Authority (UDAA) within each municipality carries out solid waste management work (collection, transportation, intermediate treatment, and final disposal).

This survey was conducted with the aim of examining the future direction of cooperation with MONRE by confirming the current status of waste management in Laos.

2. Survey area and survey schedule

Study areas are Vientiane Capital, Van Vieng, Xiengkhouang, Luang Prabang, Xayaboury and Savan-Seno Special Economic Zone (SEZ).

The survey commenced in February 2020. It was interrupted by Coronavirus Disease 2019 (COVID-19) pandemic. Then, it resumed in July 2020, and was carried out remotely until December 2020.

3. Overview of the country

Laos has a total population of about 7 million (2018)[1], and although the economy is small, it has been growing at a high growth rate in recent years as in neighbouring countries, and its per capita GDP has reached about $2,600 (2018)[2]. The urban population rate is also increasing, reaching 35%. Since 2000, infrastructure development such as the East-West and North-South economic corridors connecting to neighbouring countries and bridges crossing the Mekong River to Thailand has progressed, and economic development has been accelerating. SEZs have been developed along with economic trends such as China-plus-one or Thailand-plus-one. These have also seen the participation of Japanese companies. The industrial structure of the Lao economy is agriculture 15%, industry 31%, service industry 42%, import tax, etc. 11 % (2019)[3].

4. Legal system for waste management

In Laos, there is no basic law on waste management that corresponds to the Japanese Waste Disposal Law (Wastes Disposal and Public Cleansing Act), but the Environmental Protection

[1] World Bank, https://data.worldbank.org/indicator/SP.POP.TOTL?locations=LA&name_desc=false (last viewed: December 14, 2020)
[2] World Bank, https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=LA (last viewed: December 14, 2020)
[3] Lao Statistics Bureau (2020). Statistical Yearbook 2019

Law stipulates basic matters, and the types of waste are classified into only two types, general waste and hazardous waste.

Laos is a party to various international environmental treaties such as the Basel Convention, and MONRE is the main government agency. The main department in charge within MONRE is the Department of Pollution Control and Monitoring (DPCM). While it is commendable that MONRE is developing laws and guidelines, it is hard to say that they are actually in operation due to limitation of number of staff, budget, capacity, etc. For example, there is no coordination with customs officers nor domestic legislation to comply with the Basel Convention.

5. Current status of municipal waste management

Vientiane is the capital of Laos and has a population of about 900,000[4]. Waste management is handled by the Vientiane City Office for Management and Service (VCOMS). The Vientiane Capital has built the current waste management system based on JICA's cooperation such as development research and grant aid in the 1990s, and technical cooperation projects and another grant aid in the 2010s. Waste collection is outsourced to 10 private collectors in addition to 2 VCOMS direct operators. Valuables are collected mainly by recycling companies (collection, purchase, sale). As for the method of collecting valuable resources by recycling companies, in addition to direct collection from markets and restaurants, there is a private recycling centre on the premises of KM32 which purchases valuables from waste-pickers. The collected municipal waste (about 400 tons a day, 2019) and medical waste (incineration-about 370 kg a day, landfill in a dedicated pit-about 630 kg a day, 2019) will be finally disposed of at the KM32 disposal site. The site is 100 ha, but there is an intermediate treatment facility construction and operation project with private capital (Thai and Laos joint capital), and a 45-year lease contract has been signed for 50 ha. At the disposal site, a small incinerator for medical waste was installed as a pilot project for improving medical waste management of LPPE. And a new JICA project to strengthen the system has installed a larger incinerator with excellent environmental performance.

Vang Vieng is a tourist destination located about 100 km north of the Vientiane Capital. The population is about 60,000[5], but about 600,000 tourists, ten times that number, visit (of these, more than 400,000 are foreigners)[6]. The executing agency for waste management is UDAA. UDAA was originally established at the prefectural capital, but since Vang Vieng is a tourist destination, it has been established in Vang Vieng. Waste collection is carried out by UDAA and private companies. For recycling, a licensed company collects, purchases, and sells valuable resources. A final disposal site has been constructed with the cooperation of Asian Development Bank (ADB). As it does not currently have landfill equipment, spreading and compacting waste is not conducted properly.

Xiengkhouang is located in the northern part of Laos, and the western part borders Vietnam. The prefectural capital is located in Pek District. With a population of about 76,000 (2015)[7], Pek District was registered as a World Heritage Site in 2019 as the "Plain of Jars Sites". Then, it has become a major tourist destination in the country. The executing agency for waste management is UDAA, and the collection and transportation are carried out by private collection companies (2 companies). At the time of the survey, a new disposal site was constructed, but it was not in service, and an adjacent temporary disposal site was used.

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4 National Statistics database, https://laosis.lsb.gov.la/tblInfo/TblInfoList.do;jsessionid=taPrP5JOCp5nKNn3J_y5FWWDdx0_OwTZ8ZeuyALP.laosis-web (last viewed: March 25, 2020)

5 Lao Statistics Bureau (2016), The 4th Population and Housing Census 2015

6 Tourism Administration Agency, Vang Vieng Office, 2019

7 Lao Statistics Bureau (2016), The 4th Population and Housing Census 2015

Luang Prabang District is located in the central part of Laos, with a population of about 90,000 (2015)[8], and the temples located in the centre are registered as World Cultural Heritage sites. The city is one of the major tourist destinations in the country. In 2018, about 760,000 tourists visited, of which about 580,000 were foreigners. The executing agency for waste management is Urban Service Office (USO, formerly UDAA). The collection is carried out by USO and private companies, and it is reported that the final disposal amount is 90 to 100 tons a day.

Xayaboury is located in the north-western part of Laos and is the prefectural capital of Xayaboury Province, which borders Thailand on the west side, and has a population of about 76,000 (2015)[9]. Waste management is carried out by UDAA. Waste collection is carried out by UDAA and private sector operators. The final disposal site is an open dump, and the disposal amount is about 40 tons a day.

6. JICA Cooperation in the field of waste management

JICA has given various cooperation in the field of waste management, mainly to Vientiane, conducting the "Study on the Solid Waste Management System Improvement in Vientiane (1991-1992)" in the early 1990s, the grant aid project " the Project for Improvement of the Solid Waste Management System in the Vientiane Urban Area in Lao PDR (1996)", LPPE (2011-2015) which was the environment component of the "Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration (LPP)" and another grant aid "The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities (2014-2016)" in parallel with LPPE. Even recently, "Citizen's collaborative waste effective utilization system construction cooperation project in Vientiane City (2015-2018)" targeting Vientiane City was conducted, and the "Feasibility Survey for Improvement of Medical and Other Hazardous Waste Management in Vientiane City (2018-2020)" is being implemented.

These series of cooperation have been developed in a relationship. For example, the "Study on the Solid Waste Management System Improvement in Vientiane (1991-1992)" was linked to the Grant Aid "the Project for Improvement of the Solid Waste Management System in the Vientiane Urban Area in Lao PDR (1996)". "LPPE (2011-2015)" was linked to the "The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities (2014-2016)". Also, pilot projects implemented at LPPE led to the "Citizen's collaborative waste effective utilization system construction cooperation project in the capital city of Vientiane (2015-2018)" and the "Feasibility Survey for Improvement of Medical and Other Hazardous Waste Management in Vientiane City (2018-2020)".

In addition, JICA plans to implement a community-type recyclables collection project by a Japanese NGO targeting the Vientiane City.

7. Current status of hazardous / industrial waste management

There are 3,139 factories in Vientiane, of which 167 large, 224 medium, 367 small and 2,382 family busines[10]. VDOIC has a role to conduct factory inspection at the time of issuance of operation license, also has to regularly monitor the management of chemicals and waste inside the factory based on the laws under the jurisdiction of MOIC. VDONRE carries out educational activities related to hazardous waste management in communities and schools. In addition, although it is supposed to monitor the management status of hazardous waste at the factory, only investment projects are being implemented due to budget constraints. VDPWT is not responsible for hazardous waste. However, in the event of an environmental problem, they may

[8] Results of population and housing census 2015 and Provisional Report, Population and housing census 2015
[9] Results of population and housing census 2015 and Provisional Report, Population and housing census 2015
[10] Information obtained from VDOIC in 2020.

join a special team for countermeasures. VCOMS is a provider of municipal waste collection and disposal services and does not handle hazardous waste.

The Savan-Seno SEZ is located on the Thai border of Savannakhet Province, and the East-West Corridor that runs from Da Nang, Vietnam, through Thailand to Mawlamyine, Myanmar. It is the first SEZ in Laos and was established in 2003. In the SEZ, an environmental management and pollution control service company (Svan EMC Company) is established by Special Economic Zone Authority (SEZA) and a private company (TML Alliance) to provide one-stop services from environmental surveys to waste disposal.

A survey of the import and export status of waste and items that are feared to be difficult to treat after disposal was conducted using the United Nations trade statistics site. It revealed that the import volume of waste plastic and waste paper has increased sharply since China's waste import restrictions. Also, sudden change of exporting countries was confirmed.

Although Laos is a party to the Basel Convention, there is no record of importing or exporting hazardous waste from neighbouring countries through prior notice and consent (PIC) based on the Convention, because the domestic legal system is not in place. In recent years, there have been cases of disputes between developed countries and Southeast Asian countries over the return of waste plastics. In those Southeast Asian countries, import of waste plastics is rapidly increasing. In the case of Laos, the legal system is not in place. Therefore, the concept of illegal trade does not exist at present, and even if it is discovered that imported waste causes pollution in the country, legal measures cannot be taken. Under these circumstances, MONRE also recognizes that dealing with waste plastics is a top priority. Therefore, it is necessary for Laos to improve the domestic legal system and to start a dialogue with the Thai and Vietnamese authorities to strengthen import and export control. Also, it is recommendable to investigate how waste plastics that have flowed into Laos are recycled and if environmental pollution occurs. Furthermore, the final destination of plastic primary product made from the waste plastic should be confirmed.

In Laos, it is considered that the foundation for introducing the production / import regulation and emission control of chemical substances has been prepared by the Chemical Substances Control Law and the instruction of the Minister of the Environment of Natural Resources concerning pollution prevention. On the other hand, some of the detailed regulations and guidelines are inadequate, and there are operational issues. In anticipation of an increase in the production and import of chemical substances in the future, chemical substances in factories can be prevented so that the sources of chemical substance emissions can be understood and the adverse effects of chemical substances on human health and the environment can be prevented. It is recommended to steadily grasp the handling status of substances. Furthermore, apart from grasping the situation on the factory side, grasping the pollution situation in the environment is also important as one of the menus in the field of environmental management, and the establishment of a monitoring system for the abundance (concentration) of pollutants and chemical substances capability improvement is also considered to be an issue that MONRE should focus on.

8. Trends of donors other than JICA

The World Bank is implementing LENS 2 (Lao Environment and Social Project 2) from 2014 to June 2021. The project covers the environment in general and includes cooperation for capacity building of MONRE / DPCM related to waste management. As a successor to this, the implementation of an environmental and waste management project is planned with the cooperation of Korea Environmental Industry & Technology Institute (KEITI), European Union (EU), Export-Import Bank of Korea (KEXIM), and Global Green Growth Institute (GGGI). The project focuses on plastic waste.

From the end of October to the beginning of November 2019, Asia Infrastructure Investment Bank (AIIB) has dispatched a research team to identify urban sector projects to Laos and is formulating a waste sector cooperation project limited to the capital city of Vientiane.

Asian Development Bank (ADB9 is constructing sanitary landfill sites in several local cities in the Greater Mekong Subregion (GMS, six countries bordering the Mekong River: Cambodia, China, Laos, Myanmar, Thailand and Vietnam).

In addition to the international organizations mentioned above, Korean donors such as Korea International Cooperation Agency (KOICA), GGGI, KEXIM, and KEITI are providing cooperation in the waste field, mainly in Vientiane. In addition, China is supporting MOIC to build a database of chemical substances.

9. Direction of future cooperation

9.1 Municipal waste management

In recent years, the amount of waste has been increasing along with economic growth. It is also speculated that changes in waste quality such as an increase in plastic waste are occurring due to changes in people's lifestyles and an increase in tourists. In 2020, when this survey was conducted, no serious waste problems were confirmed in the survey areas. It is speculated that this is due to the decrease in tourists and the slowdown of economic activity due to the COVID-19 pandemic, but after the end of the pandemic, the tendency of the increase in the amount of waste and the change in the quality of waste will return to the same as before. Therefore, it is recommendable to strategically prepare for such a situation; to prioritize major cities and tourist cities for improvement according to the severity of the waste problem, to consider the similarity of problems such as low collection rate and improper disposal, and applicability of countermeasures to the problems of other cities. The World Bank, ADB, and Korean donors are already or will be providing cooperation for this situation.

9.2 Hazardous / industrial waste management

The development of SEZs is progressing, but it seems that most SEZs have no disposal destination for hazardous waste. Some factory management is inspected only when a business license or environmental license is issued. Therefore, it is recommendable to develop factory database and to strengthen inspection system in order to establish management of point source of pollution.

The impact of China's embargo seems to be significant, and as mentioned above, imports of waste plastics and used paper are rapidly increasing. It is important to investigate whether the increase of plastics and used paper imports leads to any environmental problem at the site. Following the revision of the Basel Convention on Waste Plastics (Plastic waste amendments), which will come into effect in January 2021, MONRE is considering establishing a domestic law for the ban on waste plastics. This is desirable in itself, but there are technical difficulties in how to discriminate properties that are difficult to clarify, such as the crushing status of waste plastic and the adhesion of dirt, etc. The Basel Convention entrusts how to judge plastics to the country concerned. Even if such a domestic law can be established, it is necessary to promote cooperation with related organizations, such as disseminating the judgment method to customs, etc., in order to actually operate it.

Japan has put in place a system for implementing the Basel Convention and has endeavoured to comply with it for many years. In addition, as seen in "The Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes" established by the Ministry of the Environment of Japan, Japan has been supporting Asian countries to comply with the Basel Convention. It will be beneficial for both countries that Japan will support Laos in complying

with the Basel Convention utilizing Japan's experience and network. This will prevent the resources recovered for recycling such as plastics from causing environmental problems. Also, it will promote proper international material circulation.

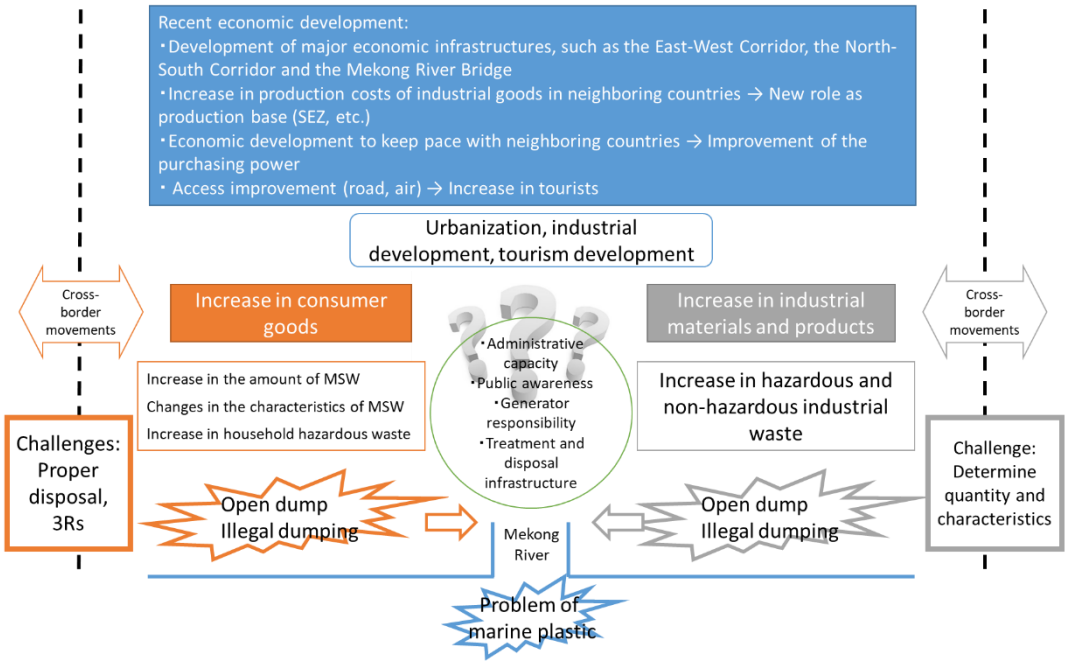

Figure: Current status and issues in the field of waste management in Laos

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Abbreviations

ADB	Asia Development Bank
AFD	Agence Française de Développement
AIIB	Asia Infrastructure Invest Bank
ASEAN	Association of South-East Asian Nations
ASGM	Artificial Small-scale and Gold Mining
AIESC	ASEAN Initiative on ESC
AP	Action Plan
AWGESC	ASEAN Working Group on ESC
CA	Capacity Assessment
CD	Capacity Development
CDIA	Cities Development Initiative for Asia
CDM	Clean Development Mechanism
COVID-19	Coronavirus Disease 2019
CSCL	Chemical Substances Control Law
C/P	Counterpart
DHHP	Department of Hygiene and Health Promotion (MOH)
DIW	Department of Industrial Works
DPWT	Department of Public Works and Transport
DOH	Department of Health
DONRE	Department of Natural Resources and Environment（=PONRE）
	District Office of Natural Resources and Environment
DPCM	Department of Pollution Control and Monitoring (formerly PCD)
ESC	Environmentally Sustainable Cities
EPF	Environment Protection Fund
GEF	Global Environment Facility
GGGI	Global Green Growth Institute
GRDP	Gross Regional Domestic Product
HCWM	Health-care Waste Management
IC/R	Inception Report
IDA	International Development Association
JICA	Japan International Cooperation Agency
KEITI	Korea Environmental Industry and Technology Institute
KEXIM	The Export-Import Bank of Korea
KOICA	Korea International Cooperation Agency
LPB	Luang Prabang District
LPP	Laos Pilot Project
LPPA	Agricultural Component of LPP
LPPE	Environmental Management/Component of LPP
LURAS	Lao Upland Rural Advisory Service Project
M/M	Minutes of Meetings
MAF	Ministry of Agriculture and Forestry
MBT	Mechanical Biological Treatment
MOH	Ministry of Health
MOIC	Ministry of Industry and Commerce
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment

MPWT	Ministry of Public Works and Transport
NREI	Natural Resources and Environment Institute
NSEDP	National Socio-Economic Development Plan
ONRE	(District) Office of Natural Resources and Environment
PONRE	Provincial Office of Natural Resources and Environment
PCD	Pollution Control Department
PIC	Prior Informed Consent
POPs	Persistent Organic Pollutants
P/R	Progress Report
PRTR	Pollutant Release and Transfer Register
RDF	Reuse Derived Fuel
RPF	Reuse Paper and Plastic Fuel
SAICM	Strategic Approach to International Chemicals Management
SEA	South East Asia
SEA	Strategic Environmental Assessment
SIDA	Swedish International Development Cooperation Agency
SWM	Solid Waste Management
UDAA	Urban Development Administration Authority
UEEE	Used Electrical and Electronic Equipment
UEM	Urban Environment Management
USO	Urban Service Office
VCOMS	Vientiane City Office for Management and Service
VDOIC	Vientiane Capital Department of Industry and Commerce
VDONRE	Vientiane Capital Department of Natural Resources and Environment
VDPWT	Vientiane Capital Department of Public Works and Transport
VTE	Vientiane Capital
VUDAA	Vientiane UDAA (Currently VCOMS)
XYB	Xayaboury District
3Rs	Reduce, Reuse and Recycle

1 Survey Outline

1.1 Background

In Laos, the remaining capacity of final disposal sites in cities is becoming insufficient due to the impact of population growth caused by the progress of urbanization in recent years. Waste collection rates remain low. Medical and hazardous waste are often dumped at municipal solid waste disposal sites and vacant lots without proper treatment. In Vientiane Prefecture and cities such as Luang Prabang, Vang Vieng, Xiengkhouang and Houaphanh, there are final disposal sites for waste, but due to lack of human resources, technology, equipment and budget, environmentally sound landfills are not possible, and problems such as fires, pest outbreaks and offensive odours have become apparent.

In order to improve the above-mentioned situation, Laos has identified "Effective conservation of the natural environment based on green economy and sustainability" as one of the three "priority objectives" in the 8th National Socio-economic Development Plan (2016-2020), and one of the results to be achieved in this objective is the "reduction of waste and hazardous substances".

Regarding the legal system, the "Environmental Protection Law" was established in 1999 to address environmental issues including waste management, and was revised in 2012. Under this law, MONRE is primarily in charge of the formulation of policies and plans for overall environmental measures, including waste management, and the coordination of related ministries and agencies.

The actual waste management work is assigned to different ministries depending on the type of waste. At the central government level, MPWT is responsible for municipal solid waste, MOIC is responsible for industrial waste, and MOH is responsible for medical waste. Specific standards, rules, etc. are determined by ministerial orders created and promulgated by each competent ministry for each type of waste. At the local government level, waste management services (collection, transport, intermediate treatment and final disposal) are conducted mainly by UDAA within each local government.

The basic role of MONRE is the "supervision and coordination" of the relevant authorities. However, the implementation systems and abilities of each staff for that purpose are not necessarily sufficient and need to be improved.

1.2 Objectives

Consider the direction of the future cooperation with MONRE based on the above and through the collection and analysis of information about MONRE's laws, regulations and plans related to waste management, and MONRE's waste management capacity (department in charge of waste management, personnel, etc.), the collection and analysis of laws and regulations, ministerial orders, guidelines, etc. of the relevant ministries and agencies related to the recycling of municipal, hazardous, and industrial waste and recyclable materials, the investigation of the current status of waste management in local governments, and the investigation of the feasibility to use Japanese technologies that contribute to waste management in Laos.

1.3 Survey Area

Vientiane Prefecture, Vang Vieng, Xiengkhouang, Luang Prabang, Xayaboury and Savan-Seno SEZ in Laos.

1.4 Survey Schedule

This survey was originally scheduled to start in February 2020 and end in late May. However, the spread of the COVID-19 pandemic from the end of March caused the postponement of the second field survey in May. After that, the survey team maintained communication with related organizations on the Lao side by utilizing local human resources while observing the situation, but since the end of the COVID-19 pandemic is unforeseeable, the work was resumed by remote investigation from October.

First work in Japan: Mid-February 2020

First work in Laos: 23 February to 21 March 2020

Second work in Japan: July-December 2020 (remote survey)

The detailed survey schedule is shown in Annex 1-1 and Annex 1-2.

2 Overview of Laos

2.1 Economic development and urbanization

The total population of Laos is about 7 million (2018)[11], and although the economy is small, it has been growing at a high growth rate in recent years as in neighbouring countries, and its per capita GDP is about 2,600 USD (2018)[12], which is on par with Vietnam. The urban population rate is also increasing, surpassing Myanmar and reaching 35%, which is almost the same as Vietnam.

Laos is a landlocked country, and its development was delayed due to an impasse in economic planning from 1975, but since economic reforms in 1986, the introduction of a market economy and an open economy policy have been promoted[13]. Furthermore, since 2000, in addition to the economic development of neighbouring countries, infrastructure development such as the East-West and North-South economic corridors connecting with neighbouring countries and bridges crossing the Mekong River and connecting to Thailand has progressed. This has resulted in an acceleration in economic development. SEZs have been developed amid economic trends such as China Plus One or Thailand Plus One, and Japanese companies are also entering the market in search of a competitive workforce.

Such economic development and urbanization are affecting the quantity and quality of waste, and problems such as lack of disposal site capacity in urban areas and an increase in difficult-to-treat waste including hazardous waste have emerged[14].

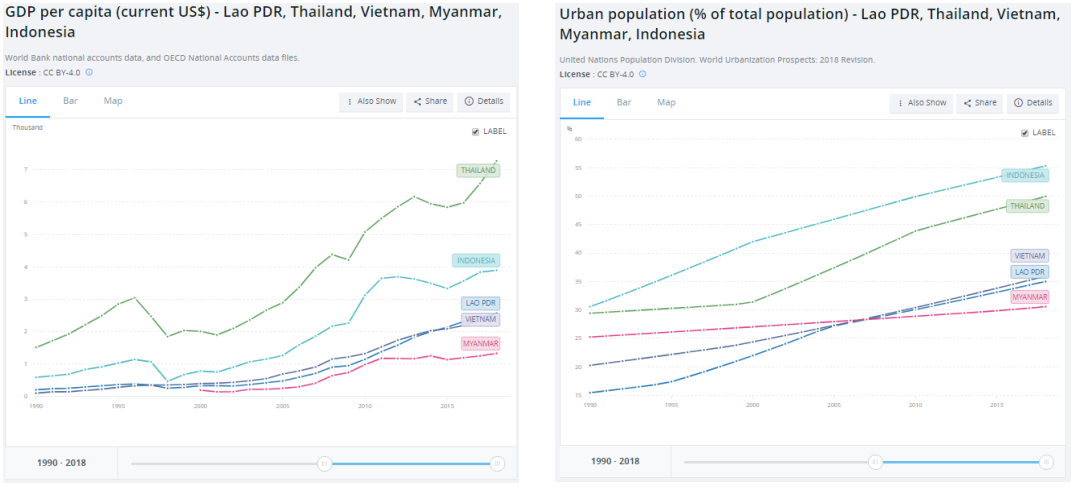


Figure 2-1: GDP per Capita and Urbanization

[11] World Bank, https://data.worldbank.org/indicator/SP.POP.TOTL?locations=LA&name_desc=false (last viewed: December 14, 2019)
[12] World Bank, https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=LA (last viewed: December 14, 2019)
[13] https://www.asean.or.jp/ja/asean/country/laos/ (last viewed: December 15, 2019)
[14] Ministry for Foreign Affairs of Finland, Hazardous waste generation in Lao PDR, 27 October 2014

2.2 Industrial structure of Laos

As shown in the table below, the industrial structure of Laos is 15% for agriculture, 31% for industry, 42% for service industry, and 11% for import tax, etc. in terms of nominal GDP (2019)[15]. In industry, the main fields are electricity, construction and mining. In such an industrial structure, improper use of pesticides in plantation agriculture and problems with toxic chemicals such as mercury and cyanide in small-scale mining were found in interviews with the people involved in this study. However, the heavy chemical industry has not yet developed, and no serious harmful or industrial waste problems have been confirmed in this survey.

Table 2-1: Industrial Structure of Laos

Activities	2018	2019	2018	2019
	Bill. kip		Percent	
Agricultural	**23,943**	**24,877**	**16%**	**15%**
Agricultural cropping	16,231	16,569	11%	10%
Livestock & livestock products	2,984	3,196	2%	2%
Forestry & logging	1,476	1,608	1%	1%
Fishing	3,252	3,504	2%	2%
Industry	**48,061**	**51,515**	**32%**	**31%**
Mining & Quarrying	9,160	9,253	6%	6%
Manufacture of Food Products	2,186	2,387	1%	1%
Manufacture of Beverages & Tabaco	1,942	2,101	1%	1%
Manufacture of Textiles, Clothing, Footwear & Leather Goods	1,748	1,843	1%	1%
Other Manufacturing	5,483	6,050	4%	4%
Electricity	16,530	16,205	11%	10%
Water Supply; Sewerage, Waste Management & Remediation Activities	393	420	0%	0%
Construction	10,619	13,256	7%	8%
Services	**63,417**	**69,446**	**42%**	**42%**
Wholesale & Retail Trade; Repair of Motor Vehicles & Motorcycles	18,672	21,100	12%	13%
Transportation & Storage	2,004	2,229	1%	1%
Accommodation & Food Service Activities	3,956	4,405	3%	3%
Information & Communications	2,436	2,676	2%	2%
Financial & Insurance Activities	4,663	5,198	3%	3%
Real Estate Activities	8,521	9,379	6%	6%
Professional, scientific & technical activities	1,946	2,184	1%	1%
Public Administration & Defence; Compulsory Social Security	14,078	14,747	9%	9%
Education	3,615	3,752	2%	2%
Human Health & Social Work	985	1,052	1%	1%
Activities Other Services	2,540	2,723	2%	2%
Totals (At Basic Prices)	135,421	145,837	89%	89%
Taxes on Products and Import Duties	**16,993**	**18,180**	**11%**	**11%**
Gross Domestic Product (GDP)	152,414	164,017	100%	100%

Source: Lao Statistics Bureau (2020). Statistical Yearbook 2019

[15] Lao Statistics Bureau (2020). Statistical Yearbook 2019

2.3 Special Economic Zone

As shown in the table below, SEZs have been developed for promoting economic growth in Laos since 2003[16]. Taking advantage of its borders with China, Thailand, Vietnam and Cambodia, SEZs focus on attracting domestic and foreign investment, and aim to establish 25 SEZs nationwide by 2020[17]. Approximately 380 domestic and foreign companies have entered the market. Major countries are China (181), Thailand (28), and Japan (30). SEZs offer new employment opportunities, with more than 20,000 jobs created across the 12 SEZs in operation between 2002 and March 2018. Since 2003, SEZs have attracted investment of $1,833 million, increased government revenues by more than $20 million and exports by more than $815 million[18].

No	SEZ	Establishment
1	Savan-Seno Special Economic Zone	2003
2	Boten Beautiful Land Specific Economic Zone	2003
3	Golden Triangle Special Economic Zone	2007
4	Vientiane Industrial and Trade Area	2011
5	Saysetha Development Zone	2010
6	Phoukhyo Specific Economic Zone	2010
7	Thatluang Lake Specific Economic Zone	2011
8	Longthanh- Vientiane Specific Economic Zone	2012
9	Dongphosy Specific Economic Zone	2012
10	Thakhek Specific Economic Zone	2012
11	Pakse - Japan SME Special Economic Zone	2015

Source: http://www.investlaos.gov.la/index.php/where-to-invest/special-economic-zone

Figure 2-2: Special Economic Zones (established by 2015)

[16] The SEZ is also positioned as a base for promoting investment from home and abroad in the "8th Five-year Socio-Economic Development Plan 2016-2020, p.103."

[17] 14 SEZs in total have been approved by December 2019. https://asia.nikkei.com/Spotlight/Belt-and-Road/China-digs-Laos-in-deeper-with-flurry-of-SEZs (last viewed: December 29, 2020)

[18] MPI website. http://www.investlaos. gov.la/index.php/where-to-invest/lao-pdr

3 Status of Waste Management in the Central Government

3.1 Laws and systems related to waste management

3.1.1 Legal system

According to the Law on Making Legislation (2012)[19], Lao law consists of:

1. The Constitution;

2. Laws;

3. Resolutions of the National Assembly;

4. Resolutions of the Standing Committee of the National Assembly;

5. Ordinances of the President of the Republic;

6. Decrees of the Government;

7. Resolutions of the Government;

8. Orders and Decisions of the Prime Minister;

9. Orders, Decisions and Instructions of the Minister and Head of a Government Authority;

10. Orders, Decisions and Instructions of the Provincial Governors and City Governors;

11. Orders, Decisions and Instructions of the District and Municipality Chiefs;

12. Village Regulations

As will be described later, laws, government ordinances, and ministerial instructions are found in legal documents concerning waste management at the national level. Therefore, these are described below quoting from Law on Making Legislation (2012).

Article 17. Law

A law is legislation that is developed by the authorized authority, adopted by the National Assembly and promulgated by the President of the Republic [and] that defines principles, regulations and measures governing social relationships in many areas or in a specific area, and is effective nationwide and is long lasting.

Article 66. Government Decree

A Government Decree is legislation of the government issued to:

1. Implement a resolution of the National Assembly, resolution of the Standing Committee of the National Assembly, social-economic development plan and a strategic plan;

2. Govern social relationships in a certain area to meet the needs for State management and social-economic management where conditions to make a law is lacking;

3. Establish the organization and activities of a ministry [and] a Government agency.

In addition, the Government may also issue a decree to instruct the implementation of a law by elaborating and providing detailed explanations to certain articles of the law to make it easier to understand and to ensure uniform implementation of the law or in case that the law required that specific regulations shall be developed.

[19] National Assembly (2012). Law on Making Legislation, No.19/NA

Article 74. Instruction

An Instruction is a legislation that is issued by the head of the relevant government authority to implement the National Social-Economic Development Plan, the State Budget Plan, a law, other legislation, a plan or certain activities by providing a general understanding, methods, procedures and the use of equipment, timeframe for the implementation, coordination and others.

3.1.2 Laws and systems related to waste management at the national level

3.1.2.1 Law on Waste Management in Laos

In Laos, there is no basic law related to waste management, which corresponds to the Japanese Waste Management Law (Waste Management and Public Cleansing Act). However, the laws and bylaws related to waste management are in place as shown in the table below.

Table 3-1: Laws and Bylaws related to Solid Waste Management

Title	Year
Environmental Protection Law (Revised Version)	2012
Law on Chemicals Management	2016
Decree on Waste Management from Health Care Facilities	2004
Decree on Environmental Impact Assessment	2019
Decree on Adaptation and Promulgation of National Environmental Standards	2017
Ministerial Instructions on Pollution Control	2015
Ministerial Instructions on Hazardous Waste Management	2015

The following is an overview of the laws in the table from the perspective of waste management.

a. Environmental Protection Law (Revised Version)

Part III Environmental Protection, Chapter 3 Toxic Chemical Control and Waste Disposal stipulates basic matters regarding the handling of these substances.

The types of garbage are classified into only two types: general wastes and hazardous wastes (Article 37). Municipal waste can be interpreted as non-hazardous municipal waste, and it is stipulated that separate discharge suitable for recycling and treatment stipulated by law must be carried out. On the other hand, it can be interpreted that hazardous waste includes those discharged from households, and it must be treated and disposed of by the method stipulated by law. Regarding hazardous waste, the ministerial ordinance to be described later is stipulated, but there is no ministerial ordinance concerning separated discharge.

b. Law on Chemicals Management

The law stipulates basic matters concerning chemical substance management. Chemical substances are classified into 4 groups according to their harmfulness (Article 9).

Articles 20, 21, 22, and 23 stipulate the handling of chemical waste. It is stipulated that the method of treatment and disposal must comply with the Environmental Protection Law and related laws.

There are decisions related to the law, such as the Decision No. 0555/IC. DOIH which stipulates management of waste in the industrial factories and the Decision No.0389/IC.DOIH which has list of chemicals.

c. Decree on Waste Management from Health Care Facilities

The law classifies waste generated in medical institutions into infectious, sharp, and general, and stipulates how to handle them[20].

d. Decree on Environmental Impact Assessment

Basically, EIA procedures are required for all development projects. Development projects are classified into Category 1 or 2 according to the list. Category 1 is required to carry out IEE, and Category 2 is required to carry out EIA. For projects that are not on the list, ask MONRE to decide.

The classification of waste-related projects is as shown in the table below.

Classification	Projects related to Solid Waste Management
Category 1 (IEE)	● Storage of solid waste not producing hazardous emissions (all) ● Solid domestic waste recycling plant project (all) ● Community solid waste management construction (≤ 50ha)
Category 2 (EIA	● Disposal of solid waste producing hazardous emissions (all) ● Solid waste treatments and environment management (all) ● Incinerator for domestic solid waste project (all) ● Incinerator for industrial solid waste project ● Community solid waste management construction (> 50ha) ● Solid waste management construction (all) ● Industrial solid waste landfill site project (all)

e. Decree on Adaptation and Promulgation of National Environmental Standards

In addition to environmental standards such as air and water quality, the government ordinance sets regulation values for exhaust gas, wastewater, noise, vibration, etc., which must be observed when operating waste treatment facilities.

f. Ministerial Instructions on Pollution Control

Under the ministerial instructions on pollution control, investment and development activities that discharge pollutants shall notify of the chemical substances to be used or produced in the IEE or EIA procedures prior to the start of their activities and operations, and a pollution load authorization shall be obtained.

MONRE-DPCM is the national level responsible agency for the enforcement of the instructions, and PONRE and DONRE are responsible for their respective jurisdictions.

g. Ministerial Instructions on Hazardous Waste Management

These ministerial instructions stipulate the management of hazardous waste. According to the Environmental Protection Law, waste is classified into general wastes and hazardous wastes. Hazardous waste basically refers to the waste covered by the Basel Convention. The import and export of these hazardous wastes is basically prohibited, but if the need arises, MONRE-DPCM will examine and issue a permit.

[20] CCAC, Solid Waste Management City Profile – Vientiane Capital, Lao Peoples Democratic Republic, p 15, https://www.waste.ccacoalition.org/sites/default/files/files/vientiane-_city_profile_vientiane_capital_lao.pdf （last viewed: March 27, 2020）

3.1.2.2 International Conventions related to Waste Management

The table below shows the status of the conclusion of international treaties related to waste management.

Table 3-2: Status of conclusion of international waste-related treaties

Title	Adoption	Effect	Conclusion
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	1989	1992	2010
The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC)	1998	2004	2010
Stockholm Convention on Persistent Organic Pollutants (POPs)	2001	2004	2006
Vienna Convention for the Protection of the Ozone Layer	1985	1988	1998
Montreal Protocol on Substances that Deplete the Ozone Layer	1987	1989	1998
Minamata Convention on Mercury	2013	2017	2017

Source: United Nations, Treaty Collection, 2020[21]

3.1.2.3 Waste-related policies

a. Laos 8th National Socio-Economic Development Plan (2016-2020)

The plan aims to graduate from the least developed countries by 2020 and become an upper middle income country by 2030. It shows three "priority achievements" to achieve this 2020 goal, one of which is "effective conservation of the natural environment based on the green economy and sustainability" (pp. 86-89).

As activities to be undertaken between 2016 and 2020 to achieve this result, the following items related to the reduction of waste and harmful substances are mentioned (pp. 138-142).

- Promote green and sustainable development by establishing systems for waste, chemical and toxic substance management and reduction, and integrated wastewater treatment in local governments and the capital of Vientiane.
- Apply mechanisms to manage, eliminate and reduce waste and hazardous substances while facilitating the application of the 3R Principles in at least five municipalities.
- Develop a complete environmental database to support monitoring and analysis of waste, chemicals, toxics, air pollution, noise pollution and wastewater nationwide, especially in cities along National Highway 13.
- Implement international treaties in which Laos participates effectively and in a timely manner under the framework of international and regional cooperation.

b. National Pollution Control Strategy and Action Plan (2018-2025)

The plan aims to achieve the "Effective Conservation of the Natural Environment based on the Green Economy and Sustainability" set forth in the 8th National Socio-Economic Development Plan of the government of Laos (2016-2020) (p. 6). The strategy consists of two pillars, pollution prevention and pollution control, and each has the following sub-strategies. Under the sub-strategy, activities are planned for areas such as institution, air, water, noise, soil and

[21] https://treaties.un.org/Pages/ParticipationStatus.aspx?clang=_en (last viewed: March 14, 2020)

waste. Activities have a short-term (2018-2020), medium-term (2021-2025), and long-term (2026-2030) timelines and implementation managers (main and support)[22].

SP 2-2 (comprehensive waste / pollutant management) and SP 2-5 (cross-border movement management of pollutants) are important in waste and chemical substance management. SP 2-2 is an activity mainly targeting general waste, and there are many activities in which MPWT is the main responsible organization at the national level, and local governments and villages are the main responsible organizations at the field level. In SP 2-5, there are many activities in which MONRE is the main responsible organization. In addition to these strategies, activities in the waste sector have been set up, including advanced ones such as the formulation of policies and decree on extended producer responsibility.

Table 3-3: Strategies of the National Pollution Control Strategy and Action Plan (2018-2025)

Strategic Pillar 1: Pollution Prevention Strategy
SP 1-1: Strengthening institutional mechanism
SP 1-2: Mainstreaming pollution prevention measures into all development efforts
SP 1-3: Minimisation/Reduction at source
SP 1-4: Raising public awareness
Strategic Pillar 2: Pollution Control Strategy
SP 2-1: Ensuring compliance to legal provisions
SP 2-2: Comprehensive waste (pollutants) management
SP 2-3: Enhancing accountability (through legal measures)
SP2-4: Making polluters pay
SP 2-5: Addressing trans-boundary pollution issues
SP 2-6: Enhancing government preparedness to respond environmental accidents
(National Pollution Control Strategy and Action Plan 2018-2025, with Vision to 2030)

3.2 Waste Management Implementation System at National Level

At the national level, MONRE basically plays the role of a regulator of general waste and hazardous waste, MPWT oversees general waste, and MOIC is in charge of managing industrial waste including hazardous waste.

3.2.1 MONRE

MONRE conducts integral management of natural resources and the environment, which consists of land, water, air, biodiversity, social and natural environments. Jurisdiction includes natural disasters due to climate change, meteorology, and hydrology.

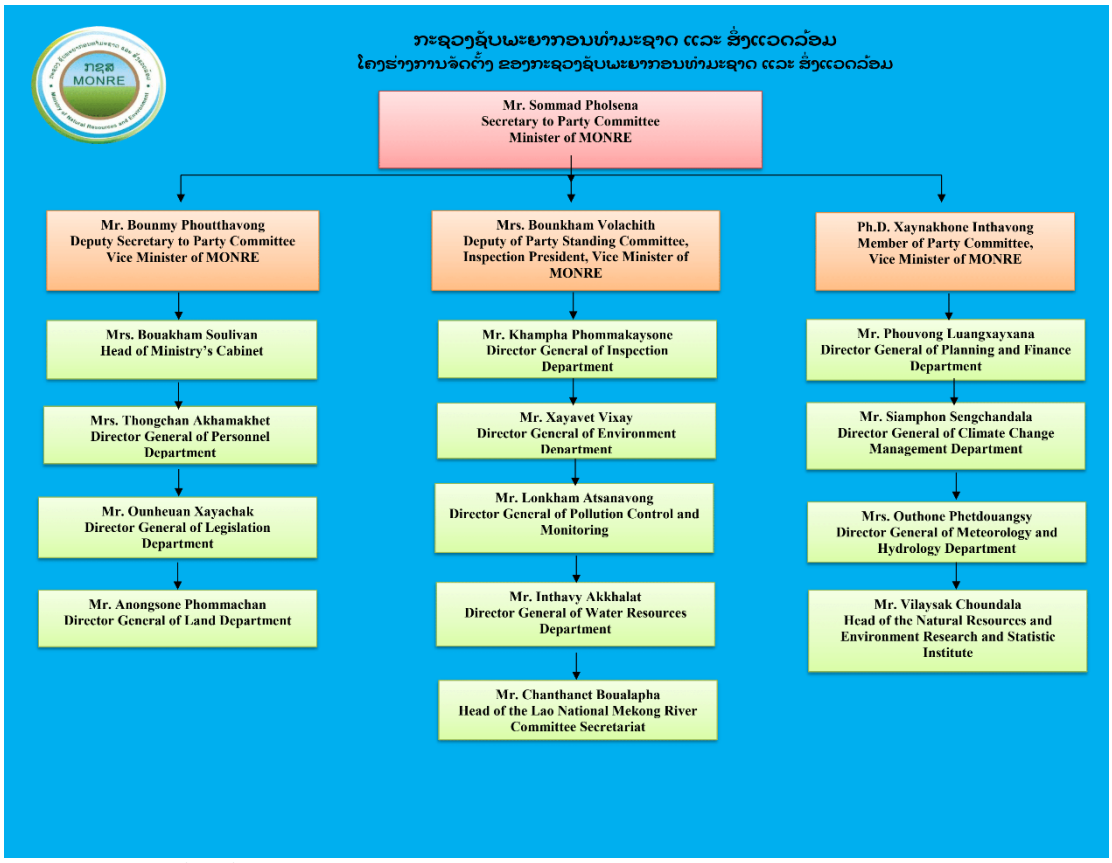
MONRE is composed of the following 13 departments.

Ministry's Cabinet; Personnel Dept.; Legislation Dept.; Land Dept.; Inspection Dept.; Environment Dept.; Dept. of Pollution Control and Monitoring; Water Resources Dept.; Lao National Mekong River Committee Secretariat; Planning and Finance Dept.; Climate Change

[22] See Appendix 3.

Management Dept.; Meteorology and Hydrology Dept. Natural Resources and Environment Research and Statistic Institute.

Of these, the Department of Pollution Control and Monitoring is in charge of waste and hazardous substance management.



Source: MONRE, in July 2020.

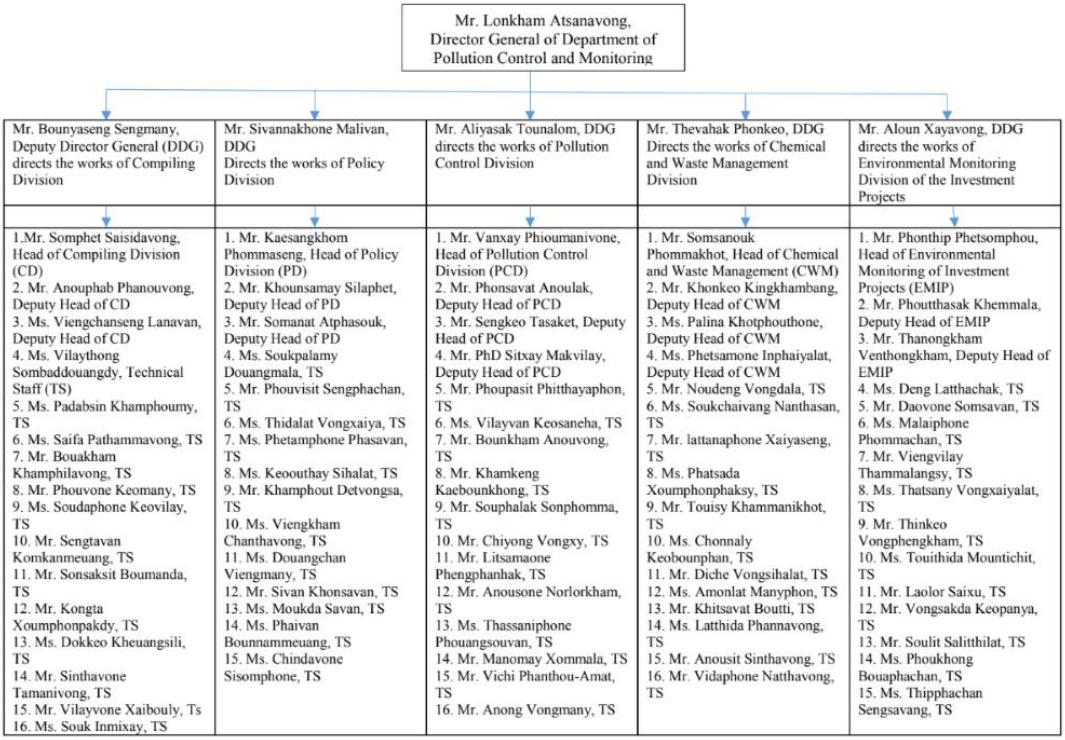
Figure 3-1: Organization Structure of MONRE

3.2.1.1 Department of Pollution Control and Monitoring

The Department of Pollution Control and Monitoring, which is in charge of waste and hazardous substance management, consists of the following five sections.

- Compiling Division
- Policy Division
- Pollution Control Division
- Chemicals and Waste Management Division
- Environmental Monitoring Division of Investment Projects

Five deputy directors are assigned under the director, and each oversees the section. A section chief is assigned to each section and consists of about 15 staff members.



Source: MONRE, in November 2020

Figure 3-2: Organization Structure of Department of Pollution Control and Monitoring

a. Laws and plans related to waste and chemical substance management

Waste and chemical substance management is basically carried out based on the "Environmental Protection Law (2012)", and under the law, ministerial instructions such as "Ministerial Instructions on Pollution Control (2015)" and "Ministerial Instructions on Hazardous Waste Management (2015)" have been prepared.

b. Duties of the Division of Chemical and Waste Management

The Division of Chemical and Waste Management is in charge of waste and chemical substance management. Their duties are shown below.

1. To be responsible for the implementation and expansion of policies, strategies, laws, regulations (including conventions, protocols to which the Lao PDR is a party) on the management of chemicals and wastes by turning them into detailed plans and projects, as well as researching and obtaining funding sources to be proposed to the higher authorities for consideration and for successful implementation in each period.

2. Research, propose to the higher authority to consider and formulate and improve policies, strategies, legislation, standards for the management of chemicals and wastes, the necessary instructions and manuals for the effective management of chemicals and wastes, and improve mechanisms and regulations in accordance with the actual situation and specialties in each period.

3. In collaboration with the Policy Division, disseminate policies, strategies, laws, regulations and technical manuals on chemical and waste management.

4. Develop plans, projects for the control of pollution at the sources, control, monitor and resolve environmental emergencies, plans for the management of chemicals and wastes in accordance with the actual situation and specialties in each period, and send to the Compiling

Division to do the research, allocation of funds, report to the Deputy Director General and submit to higher authority for approval.

5. To monitor, inspect, evaluate and report on the implementation of policies, strategies, and legislation on the management of chemicals and wastes to the Policy Division and the implementation of the plans, programs, projects and budgets of own division.

6. Encourage and build the professional capacity of the vertical sector to monitor and solve the problem of chemical and waste management, as well as to assess the environmental damage in the area where the incident occurred.

7. Coordinate the technical cooperation in the public sector, both central and local, and the private sector to participate in the management of chemicals and wastes.

8. Coordinate with the relevant sectors to set up an ad hoc committee to monitor and address the potential incidents of chemical and waste in the area where the incident occurred or contamination and to assess the environmental damage in the event of an emergency.

9. Research, propose to the higher authority to suspend permanently and to fine the violators that cause serious impact on the social and natural environment regarding the issues of toxic chemicals and wastes, based on the actual inspection of the Department of Natural Resources and Environment, Vientiane Capital.

10. Collect, create a database and report to the Compiling Division on the management of chemicals and wastes, including the results of emergency solutions for toxic chemicals and hazardous wastes.

11. Implement programs and projects set out in the obligations of the conventions, protocols, contracts and agreements on the management of chemicals and wastes to which the Lao PDR is a party.

12. Monitor the implementation of the rights, duties and responsibilities of employees under the jurisdiction of own division in order to prevent violations of government resolutions, orders, laws and regulations.

13. Manage the assets and documents of own division as well as make plans, budgets and summarize reports on the activities, the use of the budgets of own division to the Compiling Division to compile reports to the Director General on a regular basis.

c. Matters to be addressed in the Future

DPCM cites the following as matters to be addressed in the future.

- Decree preparation: a) Amendment of pollution control ministerial ordinance, b) PCB management included in the product, c) Hazardous chemical management, d) Hazardous waste management, e) Management of chemicals that deplete the ozone layer under the Montreal Convention, and f) Management of lead (Pb) in paint.
- Creating guidelines and visions: a) Manual for the management of PCB chemicals, b) Guidelines for toxic chemical and hazardous waste management, c) Guidelines for the management of lead-based chemicals in paints, d) Guidelines for waste management and waste treatment, e) Guidelines for air pollution control; f) Guidelines for water pollution control, and g) Vision to 2030, 10-year strategy (2018-2028) and National Pollution Control Action Plan.
- Collect data on lead-based (Pb) chemicals at paint plants in Savannakhet and Champasak.
- Preparing to collect data on residual chemicals and hazardous waste in Sandton District, Vientiane Province.

- Holding meetings related to the Minamata project.
- Collecting data on national water use and sewage sources in collaboration with agencies in the natural resources and environmental sector.
- Continue to develop data collection plans for sewage sources in the Vientiane capital.
- Continue to investigate and resolve issues related to air pollution, noise, soil pollution, water pollution, and toxic chemical management.
- Regional and international technical cooperation for new technology and grant aid.

3.2.1.2 International Environmental Treaties

The table below shows the persons in charge and the sections in charge of international environmental treaties.

Table 3-4: Person and Section in charge of International Environmental Treaties

Conventions	Competent Authority	National Focal Point	Responsible Division
Basel Convention on the transboundary movements of hazardous waste and their disposal	Mr. Lonkham Atsanavong, Director General, Department of Pollution Control and Monitoring	Mr. Aliyasak Tounalom, Deputy Director of DPCM	Pollution Control
Rotterdam Convention on the prior informed content procedure for certain hazardous chemicals and pesticides in international trade	Mr. Lonkham Atsanavong, Director General, Department of Pollution Control and Monitoring	-	Chemical and Waste Management
Stockholm Convention on persistent organic pollutants	Mr. Lonkham Atsanavong, Director General, Department of Pollution Control and Monitoring	Mr. Khonkeo Kingkhambang, Deputy Director of Chemical and waste management Division	Chemical and Waste Management
Minamata Convention on Mercury	-	Mr. Sivannakone Malivan, Deputy Director General of DPCM	Chemical and Waste Management
Montreal Protocol on substances that deplete the ozone layer	-	Mr. Thevahak Phonkeo, Deputy Director General of DPCM	Chemical and Waste Management
Vienna Convention for the protection of ozone layer	-	Mr. Thevahak Phonkeo, Deputy Director General of DPCM	Chemical and Waste Management
Strategic Approach to International Chemical Management	-	Mrs. Palina Khotphouthone, Deputy Director of Chemical and Waste Management Division	Chemical and Waste Management

Source: Prepared by the survey team based on information of MONRE[23], September 2020

3.2.1.3 Current status of MONRE's Waste Management Implementation System

Although various efforts have been made, it can be said that the responsibilities related to waste and hazardous chemical substance management are not fully fulfilled due to the restrictions on

[23] Decision on the Appointment of the National Coordinating Committee for ASEAN Cooperation, the Greater Mekong Subregion, International Conventions and Protocols in the Sector of Natural Resources and Environment of the Lao PDR, 28 October 2020

capacity such as insufficient budget and number of staff, based on interviews with the deputy director of the DPCM, the staffs of the Pollution Control Division and the Chemicals and Waste Management Division. Their challenges are as follows.

- Decrees and guidelines are being developed, but it is hard to say that they are actually applied. For example, the Environmental Protection Law has a clause on the management of hazardous chemical substances, but the list of chemical substances covered by this clause has not been formulated.
- It seems that the training and enlightenment of the staff of related organizations in the central and local areas is not sufficiently carried out. In particular, MONRE staff mentioned that PONRE and DONRE staff lacked abilities. On the other hand, some PONRE staff members said that the central government should better understand the actual situation in the region.
- Cross-border management of hazardous wastes and chemical substances is basically only a written examination. There is no coordination with customs officers.
- According to interviews with MONRE staff, data on hazardous wastes and chemicals have not been collected and cannot be reflected in policy making. The same was true for data on general waste (generation, discharge, collection, disposal, etc.). The National Pollution Control Strategy and Action Plan (2018-2025) also points out problems related to data shortages and reliability, and activities related to their improvement are planned.
- Activities to comply with international environmental treaties such as the Basel Convention have not been completed. For example, the Parties to the Basel Convention report to the Secretariat every year whether or not hazardous waste has crossed the border, but Laos has never reported it.

3.2.2 MPWT Waste Management Implementation System

MPWT consists of 18 departments, including the Minister's Secretariat and two research institutes.

Minister's Office; Personnel Dept.; Inspection Dept.; Law Dept.; Planning Cooperation Dept.; Ministry of Finance; Road Dept.; Transportation Dept.; Dept. of Housing and Urban Planning; Civil Aviation Dept.; Water Transport Dept.; Railway Dept.; Waterworks Dept.; Public Works Transport Institute; Public Works Transportation Training Centre; Railway Administration Dept.; Airport Administration Dept.; Air Traffic Administration Dept.

Of these, the Department of Housing and Urban Planning has jurisdiction over waste management.

3.2.2.1 Department of Housing and Urban Planning

The Department of Housing and Urban Planning is in charge of research, planning and macro management related to housing supply, urban planning and urban development nationwide. The bureau has 47 staff and consists of the following 7 sections.

Management / Personnel Division; Inspection Division; Planning / Cooperation Division: Housing Division; City Planning Division; Urban Development Division; Construction Management Division

Of these 7 sections, the Urban Development Section is in charge of waste management. The jurisdiction of this section is as follows.

- Management of construction work. Improving and maintaining infrastructure such as drainage channels, parks and recreation areas and the urban environment.

- Manage community development work, improve community infrastructure and equipment.
- Encouragement, promotion and technical cooperation for urban waste and urban pollution control.
- Investigate, comment and monitor the development of special economic zones, specific economic zones and industrial areas.
- Performing other duties assigned by the party committee and deans.

In addition, a ministerial decision on the management of waste disposal sites No.521 / CTPC, dated 23rd February 2007 has been prepared, and new disposal sites will be constructed and operated in accordance with this ministerial ordinance.

3.2.2.2 Current status of MPWT Waste Management Implementation System

The current status and issues of MPWT's waste management implementation system are described below based on interviews with the staff of the Department of Housing and Urban Planning, etc., and the results of peripheral surveys.

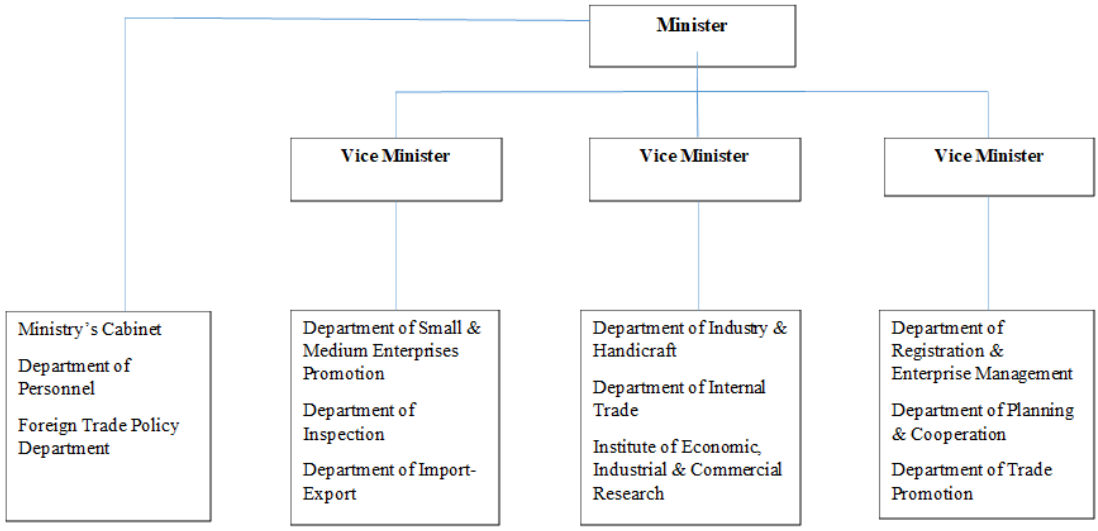
- With the cooperation of ADB, sanitary landfill sites are being developed in major cities. In addition to ADB, other counterparts are GGGI, the Korean government and AFD. It seems that they have not been able to allocate enough personnel to accommodate these donors.
- Although it is supposed to provide guidance and cooperation for waste management in cities, it seems that they have not been able to adequately deal with cities that are not covered by donor projects.
- Due to inadequate reports from each prefecture, the current state of waste management has not been fully grasped, and it seems that it is difficult to make plans and policies such as the next five-year plan.
- They would like to revise the “Ministerial Instructions on Disposal Site Management” created in 2007, but it seems difficult with MPWT alone, and JICA's cooperation was requested. No other legislation on waste management has been created.

3.2.3 MOIC Waste Management Implementation System

MOIC consists of the following 12 departments, including the Minister's Secretariat and one research institute.

Ministry’s Cabinet, Dept. of Personnel, Foreign Trade Policy Dept., Dept of SME Promotion, Dept. of Inspection, Dept. of Import - Export, Dept. of Industry and Handicraft, Dept. of Internal Trade, Institute of Economic, Industrial and Commercial Research, Dept. of Registration and Enterprise Management, Dept. of Planning and Cooperation, Dept. of Trade Promotion.

Of these, the Dept of Industry and Handicraft is in charge of managing chemical substances and industrial waste.



Source: MOIC in July 2020

Figure 3-3: Organization Structure of MOIC

3.2.3.1 Department of Industry and Handicrafts

The Department of Industry and Handicraft consists of 51 staff members. The composition consists of 1 director, 4 deputy directors, 8 section chiefs, 10 deputy section chiefs, and 28 technical staff.

The Environmental and Industrial Chemical Substances Division is in charge of managing chemical substances and industrial waste.

The jurisdiction of the division is as follows.

- Develop and implement strategic plans for environmental and industrial chemical management in the processing and handicraft industries in line with socio-economic development plans and government policies.
- Develop and improve legislation on environmental and industrial chemical management in the processing and handicraft industries.
- Manage the environment and chemicals of the processing and handicraft industries and develop manuals for technical management of such operations.
- Define methods for preventing environmental pollution, solving environmental problems, and planning environmental recovery for the processing and handicraft industries.
- Propose research, correction, suspension, relocation, and suspension of factories, processing industries, and handicrafts that have a serious impact on the social environment.
- Dissemination of regulations on environmental and chemical management for the processing and handicraft industries.
- Work with relevant sectors to identify and plan hazardous waste treatment and disposal areas from the processing and handicraft industries.

- Consider issuing and revoking certificates for pollution emissions and chemical waste from the processing and handicraft industries. Also consider importing, exporting, transporting and using chemicals.
- Investigate and consider the registration of chemical substances.
- Technical certification and control of imports of chemicals used in the processing and handicraft industries.
- Coordinate relevant national and international sectors and stakeholders with respect to environmental management and monitoring of the processing and handicraft industries and the use of chemicals.
- Receive petitions from people and organizations related to the environment, processing industry and handicrafts.
- Propose environmental protection policies that chemical industry managers should take, while identifying measures against legal and regulatory violators.
- Provide advice, suggestions, development and technical training on environmental work and the chemical industry to local staff and factory operators.
- Perform other duties agreed and assigned by the Director.

3.2.3.2 Current Status of MOIC Waste Management Implementation System

When the survey team asked the staff of the Department of Industry and Handicraft (DOIH) about the current problems, the following were mentioned.

- Insufficient budget needed to collect waste data and empower staff.
- Insufficient inspection equipment.
- Insufficient border inspection.
- Insufficient cooperation with MONRE regarding the implementation of international environmental agreements such as the Basel Convention.
- Insufficient compliance with related laws such as the Chemical Substances Law within special economic zones.
- Lack of hazardous industrial waste treatment facilities.

4 Current Status of Municipal Solid Waste Management

4.1 The Capital of Vientiane

4.1.1 Overview of Vientiane

The capital city of Vientiane extends to the left bank of the Mekong River, and the city area is formed in a natural lowland with an altitude of 160 to 180 m centred on the districts of Chanthaburi, Sisattanak, Sikhottabong, and Saysettha. The area is 3,920 km^2 and the population was 907,000 in 2018.[24] The population of Vientiane accounts for 13% of the total population of the country.

The capital of Vientiane is in line with the other 17 provinces and is an independent administrative unit. In other provinces, the chief is called the governor, but the chief of Vientiane is called the mayor. The capital is divided into 9 districts, and there are administrative units called villages under the districts.

4.1.2 Organizational/Institutional System

a. Implementation system

Vientiane City Office for Management and Service (VCOMS) has undertaken municipal solid waste management in the whole area of Vientiane. The organizational structure and jurisdiction of VCOMS is stipulated in the 2013, Agreement for the Mayor of Vientiane on Organization and Implementation of Vientiane Urban Development and Administration Authority (VUDAA).

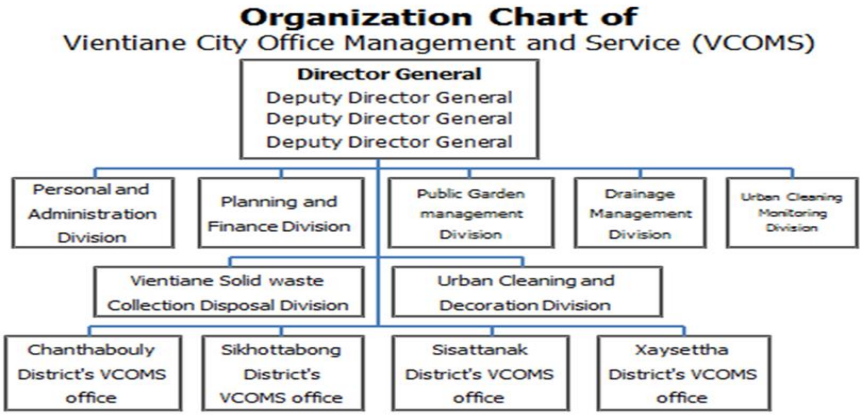
In November 2015, the "Beautiful Vientiane Project" was resolved, and various action plans are being implemented until 2020. The action plans include clean roads and living environment and VCOMS's business follows the plans.

Activities related to proper waste discharge and the 3Rs are also carried out by the Department of Natural Resources and Environment (DONRE). The "Beautiful Vientiane Project" is also being implemented by DONRE. According to DONRE's five-year plan (2016-2020), 21 waste disposal and separation campaigns, and 3R activities with 2,225 participants have been carried out in elementary schools, communities and markets. In January 2020, the Decision on the Organization and Operation of the Natural Resources and Environment Volunteers Unit (NREV) was issued. The decision established that "environmental volunteer units" are to be set up in all villages, and DONRE's nine district offices shall support and coordinate the installation of those units.

Unlike other provinces, the Vientiane Department of Public Works and Transportation (VDPWT) is not directly involved in municipal solid waste management itself, but may be a member of a committee related to infrastructure development of waste management, such as the designing, construction and monitoring of landfill.

The organization chart of VCOMS is as follows.

[24] National Statistics database, March 25, 2020
https://laosis.lsb.gov.la/tblInfo/TblInfoList.do;jsessionid=taPrP5JOCp5nKNn3J_y5FWWDdx0_OwTZ8ZeuyALP.laosis-web (Last viewed: 25 March 2020)



Source：Sustainable Solid Waste Management Strategy and Action Plan for Vientiane 2020-2030

Figure 4-1: Organization chart of VCOMS

b. Ordinance/Policies/Plans

The following laws and ordinances stipulate municipal solid waste management in Vientiane.

No. 177/PMO VT Dated: 22 Dec 1997	Decree on Implementation and Activities of Urban Development and Administration Authority (UDAA) UDAA has stipulated that it has the function of cross-cutting tasks related to urban development, which were carried out vertically by each local branch office such as central government ministries, under the guidance of the governor. The main tasks are (1) planning, implementing, operating and managing urban development projects (2) constructing, improving and maintaining the urban infrastructure and implementing services, such as roads, sewage canals, waste collection and transport, river embankment erosion and flood prevention, public health and environmental protection, street lighting, parks and gardens.[25]
Decree 014/PM Dated: 23 Feb 1999	Decree on the Organization and Implementation of Vientiane Urban Development and Administration Authority (VUDAA) This defines the organization and function of VUDDA (UDAA in Vientiane).
No. 0815/UDAA Dated: 9 May 2011	Modified and Amended Agreement of Land Concession Contract for Landfill to Establish a Waste-to-Energy Factory at KM32, Xaythany District Land lease agreement for private joint venture to use 50 ha of KM32 as land for waste treatment facilities.

[25] Ministry of Environment Japan, "Information Site for Low-Carbon Development in Asia: Environmental Administration in Vientiane Capital". https://www.env.go.jp/earth/coop/lowcarbon-asia/region/data/vientiane_environmental_administration_20140331.pdf . Last viewed: 10 December 2020.

No. 798/SWCT/VUDAA 23/11/2011	Rules and Measures for Users of KM32 Disposal Site: To establish rules for the users of KM32 disposal site and penalty of violators.
No. 3988/SWCT/VUDAA 01/08/2012	Rules and Measures of KM32 Disposal Site: To establish rules of the waste pickers working at KM32 disposal site and penalty of violators.
The Mayor of Vientiane Agreement No. 0849/vt.gov Dated: 18 June 2013	Agreement for the Mayor of Vientiane on Organization and Implementation of Vientiane Urban Development and Administration Authority (VUDAA) Amendment of Decree 014/PM dated on 23 Feb 1999.
No. 0420/VTCM Dated: 08 May 2015	Decree on the Establishment and Management of Waste Collection Service Business in Vientiane In collecting municipal waste, the requirements for collection service providers, business licenses, business registration, etc. are stipulated.
No. 002/vt.pa Dated: 18 May 2016	Resolution of the 1st meeting of the Vientiane People's Council on the Adoption of the Organizational Structure and Personnel of the Vientiane Administration This resolution changed the name from VUDDA to VCOMS (Vientiane City Office of Management Services). There is no change in jurisdiction.
No. 1175/VTCM Dated: 23 Nov 2015	Decree on Modification of Waste Collection Fee in Vientiane The waste collection service fee, payment of commission to UDDA, and obligation to submit a collection service implementation report have been stipulated.

The following plans, policy, and guideline related to solid waste management are being implemented or being formulated.

No. 03/VC 25 Sept 2015	Resolution of the Vientiane Administration on the Action Plan and measures for the implementation of the "Clean Vientiane Project" from 2015 and up to the year 2020
Under formulation	The Guideline on Urban Waste Management and Disposal One of the activities of the LENS2 (World Bank Cooperation) subproject. MONRE's DPCM is under development with the cooperation of the World Bank. It will be completed soon and 3500 copies will be printed.
Under formulation	Sustainable Solid Waste Management Strategy and Action Plan for Vientiane 2020-2030 VCOMS's 10-year strategy and action plan formulated with the cooperation of GGGI. It will be officially put into effect at the end of 2020 with the approval of the mayor.

4.1.3 Technical System

a. Waste generation amount and composition

The survey on the waste generation amount and composition of households was conducted in September 2011, in the JICA-ASEAN Collaboration Laos Pilot Project (LPPE), which was carried out from October 2010 to October 2015. No data acquisition survey has been conducted since then. According to the results of the LPPE survey in 2011, the waste generation amount of household waste was 691g/person/day, and organic waste accounted for 64% of the waste composition.[26] Based on the data at the time of LPPE, VCOMS estimates the amount in 2019 to be 842 g/person/day.[27]

b. Storage and discharge

Garbage is collected door to door. Each house stores and discharges garbage, but in areas where collection vehicles are difficult to access, there are common discharge points. Garbage collection is every day except Sundays. In the areas of VCOMS's collection service providers, household waste collection is done once a week. Most of the garbage collection service is done from 20:00 to 5:00 the next morning, and the garbage is supposed to be discharged before that.

c. Collection and transport

Garbage collection is outsourced to 2 of VCOMS's own collectors and 10 private collectors. VCOMS allocates the collection area/village for each collection company. These 12 companies hold monthly meetings at VCOMS headquarters regarding collection plans and programs.

Garbage collection is carried out based on contracts between collectors and customers (households, business establishments, various organizations and institutions), and the collectors collect fees from the customers. Garbage collection fees are stipulated by Ordinance of Vientiane. Currently, the rates are as shown in the table below based on the revision of November 2015.[28]

Table 4-1: Waste Collection Fees

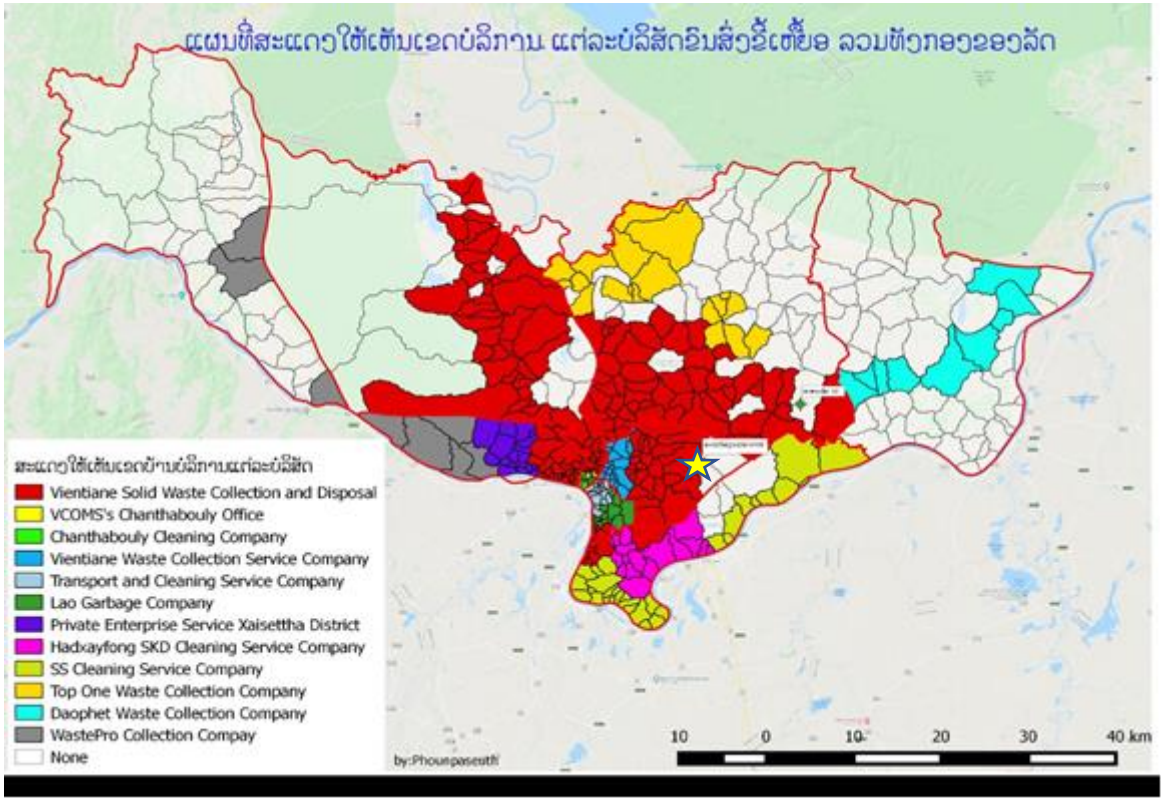
Container	Fee
Basket (size: 25 kg)	10.000 kip/basket (400/kip/kg)
Tank (size: 32.5 kg) or 60 L container	13.000 kip/kg (400/kip/kg)
Container (size: 2.500 kg)	500.000 kip/container

Garbage collection contracts are signed with each customer at the collection company, but the collection of fees is done by village. In the case of VCOMS's own waste collection companies, the Village Authority appoints a person to collect the fees from the customers in the village. The method of collecting fees by private companies varies from company to company, but all collection companies pay fees to both Village Authority and VCOMS. The fee paid to Village Authority is set at about 10% of the collected amount of the fee, while collection companies pay 5.000 kip per month to VCOMS for each contract.

Vientiane is divided into waste collection service areas and areas not covered by the collection service. The service areas are shown in the figure below. Areas that are not coloured are non-service areas. The red area and yellow area (the small area in the centre) are the collection areas directly managed by VCOMS, and the other areas are the collection areas of private collectors. Residents outside the collection areas and non-contracted customers in the service areas

[26] JICA (2015). Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration Environmental Management Component Project Completion Report Main Report.
[27] VCOMS (2020). Sustainable SWM Strategy and Action Plan for Vientiane 2020-2030 (Draft).
[28] The Capital of Vientiane (2015). Decree on Modified of Waste Collection Fee in Vientiane, No. 1175/VTCM (in Lao).

(described later) must self-treat/dispose the waste (incineration, landfill, compost, livestock feed, etc.).



Source: VCOMS

Figure 4-2: Map of waste collection area in Vientiane

The star in the centre of the above figure is the transfer station which began operation in January 2016 with Japan's grant aid. In 2019, of the final disposal amount of 147,836 tons, 15% of them, 22,114 tons went through the facility. At present, only the garbage trucks of VCOMS's own collection companies use it, and the tipping fee for using the facility is not collected. The reason for the limited use is that it is easy to manage the facility for VCOMS.

In the collection service area, some households and businesses do not make contracts for collection service. The figure below shows the contracted and non-contracted households in the collection service area and in the non-service area.

Table 4-2: Number and Percentage of Households with/without Contract in Each District

District	Total No. village	Total No. population	Total No. household[9]	Serviced area				Non-serviced areas		Collection rate (%)	
				Village	No. of Household	Contracted	Non contracted	No. of Village	No. of Household	HHs with Contract (%)	HHs without contract (%)
Chanthabouly	30	75,990	14,338	30	13,219	7,991	5,228	0	1,119	56	44
Saysettha	48	132,171	24,751	46	21,071	9,919	11,152	2	3,680	40	60
Sikhottabong	60	135,782	25,427	59	19,637	7,794	11,843	1	5,790	31	69
Sisattanak	37	72,342	13,547	37	11,588	7,186	4,402	0	1,959	53	47
Hadxayfong	60	108,955	20,404	56	18,518	5,475	13,043	4	1,886	27	73
Xaythany	104	228,367	42,765	71	28,036	6,866	21,170	33	14,729	16	84
Naxaythong	54	86,218	16,146	36	9,695	1,073	8,622	18	6,451	7	93
Sangthong	35	33,369	6,249	3	850	103	747	32	5,399	2	98
PakNguem	53	54,537	10,213	9	2,555	102	2,453	44	7,658	1	99
Total	**481**	**927,731**	**173,840**	**347**	**125,169**	**46,509**	**78,660**	**134**	**48,671**	**27**	**73**

Source: VCOMS (2020), Sustainable Solid Waste Management Strategy and Action Plan for Vientiane 2020-2030 （Draft）, p. 10.

According to the above table, the contracted household ratio is 27% of all households in Vientiane and 37% in the collection service area. At the time of LPPE in 2013, the contracted household rate for all households in Vientiane was 20.5%; the target for 2020 was 40%. VCOMS is actively engaged in public relations activities to increase the number of contracts.

Waste to be collected is General Waste, which is the definition of non-hazardous waste generated from households and business establishments; however, the waste may be discharged mixed with the hazardous waste. Oversized garbage such as furniture and sofas, household appliances such as refrigerators and E-waste, etc. are recycled or reused in some way and have not been a problem at present.[29]

d. Waste flow and collection rate

The household contract rate is as described above, and it differs from the collection rate. The collection rate can be calculated by "Waste collection amount/Waste generation amount", but these data have not been taken. In the above-mentioned Sustainable Solid Waste Management Strategy and Action Plan for Vientiane 2020-2030 (hereinafter, the “10-year Strategy and Action Plan”), estimated from the LPPE data, the amount of municipal waste generated as of 2019 is 1004 tons per day. Since the disposal amount at KM32 is 405 tons per day (2019 average value), the collection rate is about 40% if the disposal amount is regarded as being almost the total collection amount, but this is only an estimated value.

Based on the waste flow chart created by LPPE, the waste flow chart to which the estimated values shown in the 10-year Strategy and Action Plan are applied is shown below.

[29] Interview with the deputy head of VCOMS in March 2020.

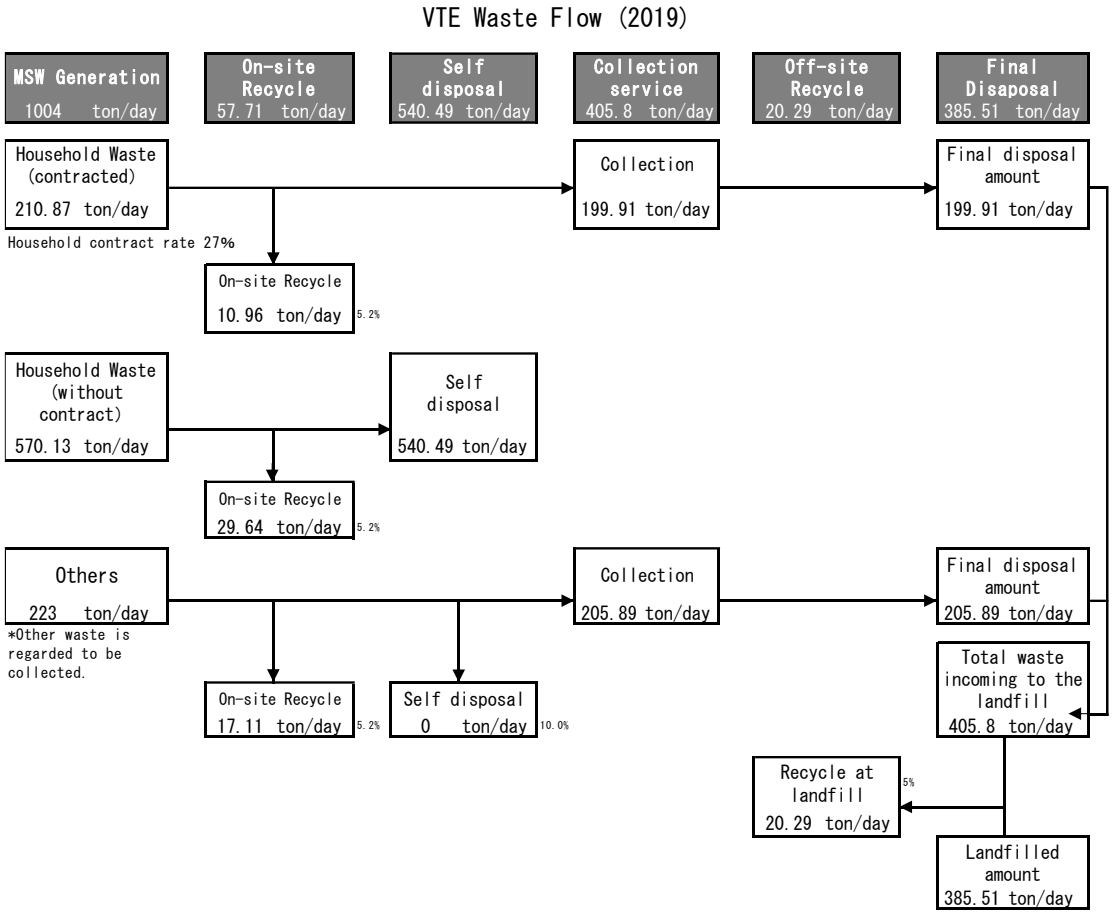


Figure 4-3: Waste flow in Vientiane

e. Recycling

e.1 Recyclable Items Collection

Recyclable items are collected mainly by recycling companies (collection, buying and selling). Recycling companies can collect the items directly from markets and restaurants or from waste pickers who bring them to the companies, or the companies themselves can buy the items from waste pickers at final disposal sites.

The final disposal site KM32 in Vientiane has 100 to 200 waste pickers. Many come to the site during the off-season for agriculture from early December to late May. The recyclable items collected by the waste pickers are traded at the recycling centre (described later). The trucks of the recycling centre patrolling at KM32 transport the collected items. If the waste pickers use the transportation of the recycling centre, the transportation cost (10,000 kip) is deducted from the purchase price. There is no registration or permission for the waste pickers to enter the disposal site. Accidents in which waste pickers are involved have not happened, but there are cases of injuries such as cuts. Before the recycling centre was located at KM32, items were taken back to waste pickers' hometown and sold.

e.2 Recycling Centre

There is a recycling centre (a recyclable items purchase place) on the premises of KM32. West pickers bring valuable resources. Purchase dates are Mondays and Saturdays only. The centre has been at the disposal site since it was in KM18, which was the previous site, and when the disposal site moved to KM32 in 2008, the centre also moved. The Japan Fund for Poverty Reduction and Asian Development Bank provided cooperation for the installation of the centre itself, the roof, bailing machines, chipping machines, etc. when the centre was relocated.

Figure 4-4: Recycling Centre in KM32

The items being collected are glass bottles, cans, and plastics. As for used paper, it has not been dealt with for the past few years due to a low selling price. There are two glass-recycling companies in Laos. One is Beer Lao, which only accepts empty bottles of its own products. The other is Lao Glass, which handles other bottles. Local companies in Vietnam and Laos come to buy cans.

Compressor for Valuables

Compressed plastic bottles

Compressed cans

Separation of plastic bottles

Crashing plastics

Truck with valuables

Figure 4-5: Working Process in the Recycling Centre

For plastics, there is a company (Green Environment, a Chinese-owned company) that imports waste plastics from Hong Kong and Thailand and buys plastics. Since PET bottles have a good

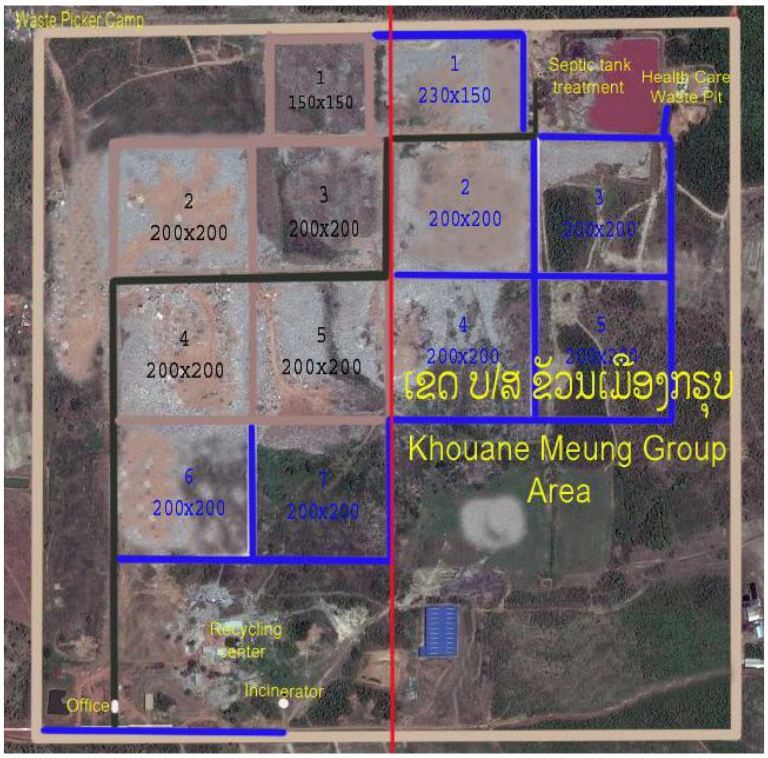
purchase price, the workers at the centre bail them after removing the labels. The price of polypropylene is not bad at present, so it is segregated and packed only with polypropylene. Others are classified as "Other Plastics".

e.3 Pilot Projects by GGGI

With the cooperation of GGGI, VCOMS is currently conducting a pilot project on glass bottle collection at schools and organic waste collection at the market for composting. See 4.1.5. Donor Cooperation.

f. Final Disposal

Currently, municipal solid waste and healthcare waste collected in Vientiane are finally disposed of at the KM32 disposal site. This had been at KM18, but was moved to KM32 in January 2008 due to the construction of facilities for the Southeast Asian Games. The site is 100 ha (see the figure below, the part surrounded by the beige-coloured line), and 46 ha of this is used as a disposal site. At the time of service, it was supposed to be used for 21 years until 2029. The LPPE pilot project improved the operation of the disposal site (described later). Currently, the soil is covered only in the dry season to prevent the scattering of dust due to the wind. There have been no serious accidents, except for a large-scale fire at KM32 which occurred in March 2018, from the dry season to the hot season.[30]

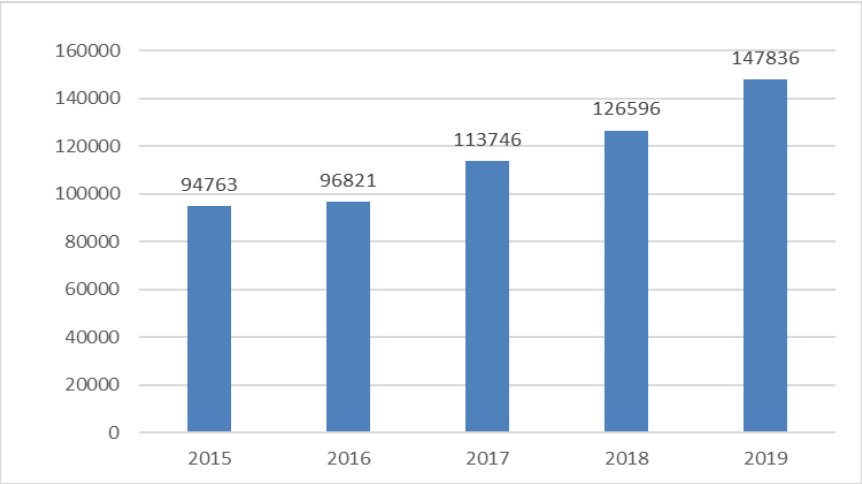


Source: VCOMS

Figure 4-6: KM32 final disposal site (satellite image)

The transition of the disposal amount to KM32 from 2015 to 2019 is as follows.[31]

[30] https://laotiantimes.com/2018/03/06/fire-vientianes-km32-landfill-site/. Last viewed: 22 November 2020.
[31] Interview with Mr. Bouakhan Phakasoumn (VCOMS, Deputy Director of Waste Collection Service) on 27 February 2020.



Source: VCOMS

Figure 4-7: Disposal amount to KM32

In Laos, after the first case of COVID-19 was confirmed in late March 2020, a strong lockdown was implemented in April, with a curfew and a suspension of factory operations. The cumulative number of infected people was kept low and, on June 10, Prime Minister Thongloun declared victory over the first wave. The table below shows the amount of waste disposed of at the KM32 disposal site from April to June compared to the previous year. It can be seen that the amount of garbage collected in April and May decreased significantly. From April to June, measures were taken to reduce the tipping fee by 50%.

Table 4-3: Monthly Disposal Amount to KM32 (Unit: Tons)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2019	10,950	10,505	12,018	11,878	12,900	12,497	13,511	14,213	12,702	12,838	12,091	11,733
2020	13,142	11,718	12,686	10,183	10,945	12,292	13,670	12,784	12,027	12,301	-	-

Source: VCOMS

f.1 Healthcare Waste

Regulations on healthcare waste management include the Revision of No 1706/MOH 20/07/2004: Ministerial Order on HCWM of Healthcare Facilities and the Decision on Healthcare Waste Management (November 2017). The latter stipulates the definition of healthcare waste, segregation methods, treatment/disposal method options, management systems, and reporting. In addition, there is No.0420/VTCP/08/05/2015: Regulation on establishment and management of waste collection service in Vientiane, in which it is stipulated that healthcare waste should be transported to the disposal site by a dedicated transportation truck and incinerated.

According to the interview with the Ministry of Health (MOH) by this survey, it is relatively easy to give direct guidance on the segregation of healthcare waste and other waste at national hospitals and private hospitals under the control of the MOH, but not at other medical facilities such as provincial hospitals and clinics.

Currently, the WASH (Water and Sanitation and Hygiene) program is underway with the cooperation of the WHO and UNICEF.[32] WASH includes the proper management of

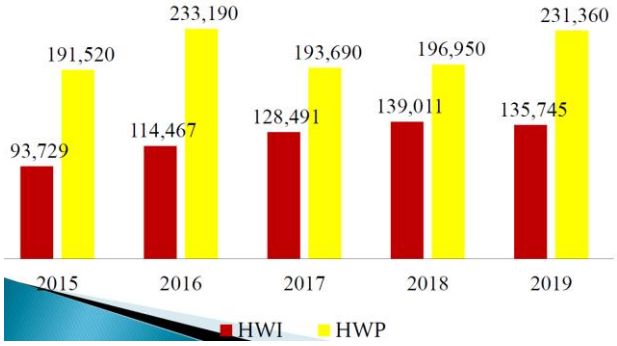
[32] One of the activities of the country program of UNICEF (2017-2021). See UNICEF (2016) Strategy Note for the Country Programme of Cooperation Between the Government of the Lao People's Democratic Republic and United Nations Children's Fund, 2017-2021. (http://files.unicef.org/transparency/documents/Lao_PDR_Strategy%20Note_12_July_2016.pdf). (Last viewed December 10, 2020.)

healthcare waste in hospitals for the purpose of reduction of nosocomial infection risks thorough hygiene management at medical facilities. Workshops and training are held for medical professionals as part of this program.

VCOMS contracts with 17 healthcare facilities for proper transport and disposal of healthcare waste. Dedicated VCOMS trucks collect the healthcare waste from those facilities and transport it to KM32; the waste is treated by incinerator and non-incinerated healthcare waste is disposed of in the special pit.

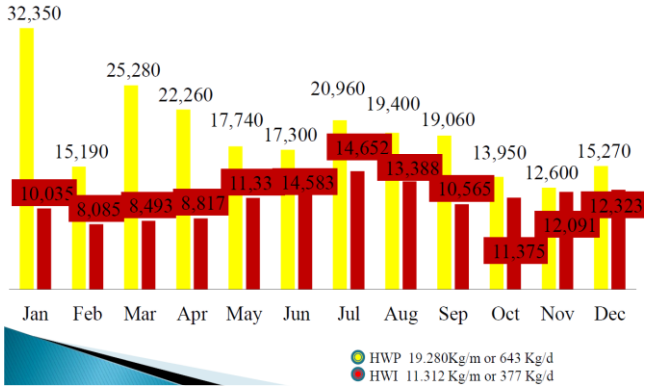
VCOMS has 2 incinerators. One is provided by LPPE with a processing capacity 76 kg/day. The other was installed and handed over to VCOMS in February 2020, by the part of "Verification Survey project for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos (Dec. 2018 - Aug. 2020)" by Kayama Kogyo Corporation. It has a processing capacity 800 kg/day. LPPE set up a dedicated disposal pit in addition to a dedicated healthcare waste collection truck and incinerator. Healthcare waste that cannot be incinerated is to be disposed of in the dedicated pit. The leachate has not been treated.

The following figures show the transition of the amount treated in the incinerator introduced by LPPE and the amount disposed into the dedicated pit from 2015 to 2019, and the monthly amount of incinerated and disposed into the pit in 2019.



Source: VCOMS

Figure 4-8: Healthcare waste incineration amount (HWI) and disposal into pit (HWP)



Source: VCOMS

Figure 4-9: Monthly waste treated and disposal amount in 2019

As shown in the above figures, until the introduction of a new incinerator by the verification survey, an average of 377 kg/day of waste, which greatly exceeds the processing capacity of 76 kg /day, is being treated. There is a concern that the waste was not be detoxified due to excessive use. There is also a possibility that more healthcare waste was disposed of untreated in dedicated pits than was incinerated. As of 2019, the amount of healthcare waste collected per day is 1020 kg, so with the introduction of a new incinerator, by operating two furnaces, most of the waste can be handled at present.

The fee for collection, transportation, incineration, and disposal of medical waste is 10,656 kip/ kg, but it is unclear whether this fee can cover the operation and maintenance costs of the two incinerators, the transportation costs by dedicated vehicles, and other costs.

In the Verification Survey, a special box for healthcare waste (see the picture below) was distributed to hospitals, and the waste was collected, transported, and incinerated in the same way as in Japan, but this special box cannot be procured in Laos and must be procured from Thailand or Vietnam. These containers are expensive; it is unlikely that new purchases will be made by hospitals themselves. In fact, some hospitals are putting a plastic bag on a cardboard box. It is necessary to reconsider with the MOH the waste segregation method and the container suitable for the situation in Lao.

Glass bottles such as ampoules and vials can be seen in the photograph of the incinerator residue in the figure below. In the above-mentioned Decision on Healthcare Waste Management (2017), if the glass is broken, it becomes sharp waste, and ampoules and vials that may contain blood, etc. become infectious waste. It is necessary to pay attention to the incineration process, because a temperature of 1200 ℃ or higher is required for glass and there is a risk of explosion.

Source: Kayama Kogyo Corporation (2020), "Verification Survey for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, 2nd progress report", p. 75 (in Japanese)

Figure 4-10: Boxes for healthcare waste and burnt residue after incineration

According to "Feasibility Survey for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos (Nov. 2016-Oct. 2017)", it was estimated that 136 tons to 368 tons/year of healthcare waste was generated in Vientiane alone in 2020.[33] The actual amount of the waste is unclear because it depends greatly on the degree of waste segregation in the hospital.

In addition, with the cooperation of the EU, autoclave treatment facilities have been installed in some medical facilities, and the waste is sterilized and discharged as General Waste (General Waste as defined in Laos). However, there are still concerns because there are many cases where sterilization by autoclaving cannot be confirmed.[34]

f.2 Waste Treatment Facility

At the KM32 final disposal site, there is a project to construct and operate intermediate treatment facilities wholly owned by a private company.[35] A 45-year lease agreement has been signed between Vientiane and Vientiane Waste Management (VWM) for 50 ha, which is half of the premises of KM32.[36] VWM is a joint venture between Laos and Thailand and has an English translation of the document, "The acquisition of assets of UAC Energy Co., Ltd. (Subsidiary) by investment in waste management project to produce renewable energy and process recycled product, in Vientiane, Lao PDR (Vientiane Waste Management: VWM)"[37] on the Stock Exchange of Thailand website. This gives an overview of the project. The summary is as follows.

VWM has a 50.01% stake in UAC Energy[38] (a Thai company), 29.99% in SBANG SE[39] (a Thai company), and 20.00% in KMG (Khouane Meung Group, a Lao company). It is a project totalling 30 million USD and is scheduled to start construction at the end of 2019. VMW will use the land and waste disposal site of KM32 under a 45-year contract with the Department of

[33] JICA, Kayama Kogyo Corporation, (2017), Feasibility Survey for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos, FINAL REPORT. (In Japanese.)

[34] Filtered water was required to operate the autoclave, and it was observed that there were many failures in the filtration processing and that the autoclave could not be operated at all times. (From an interview with Kayama Kogyo Corporation on 25 February 2020.)

[35] *Vientiane Times* newspaper Laos, 4 April 2019, "US$30m recycling plant to sprout renewable energy, commercial by-products".

[36] Vientiane Capital (2011), "Modified and Amended Agreement of Land Concession Contract for Landfill to Establish for Waste to Energy Factory at KM32, Xaythany District". No. 0815/UDAA 9 MAY 2011. Amendment is valid from April 2019.

[37] https://www.set.or.th/dat/news/201904/19033856.pdf. (Last viewed 25 April 2020)

[38] http://www.uac.co.th/business/subsidiary/uac_energy. (Last viewed 25 April 2020)

[39] https://www.sbang-group.com/. (Last viewed 25 April 2020)

Planning and Investment in Vientiane. VWM will produce the following three products from 400 tons of waste collected daily in Vientiane. (1) Power generation with a capacity of 6 MW, sales to the government. (2) The sale of recycled plastics to private companies. Annual sales volume is expected to be 13,200 tons. (3) The sale of chemical fertilizers to agricultural corporations in Laos. Annual sales volume is expected to be 30,000 tons.

In an interview with VCOMS as of November 2020, the progress of the project was unclear, and VCOMS was seeking to introduce another, such as Residue Derived Fuel plant.

4.1.4 Finance

The balance of VCOMS is as follows.

Table 4-4: Income and Expenses Related to Waste Management[40]

(Unit: Thousand Laos Kip)

Item		2012	2016	2017	2018	2019
					As of ex-post evaluation	
Income	Budget allocation from the Central Government	100,000	300,000	150,000	150,000	49,560
	Budget allocation from Vientiane	3,500,000				
	Income from waste collection and carried-in waste	6,365,016	11,937,900	13,637,817	16,401,726	18,171,524
	(% of income to total expenses)	*62 %*	*108 %*	*104 %*		
	Total income	9,965,016	12,237,900	13,787,817	16,401,726	18,221,084
Expense	Waste collection expense	5,343,109	6,921,900	8,933,819	9,983,120	14,755,201
	Road cleaning expense	3,500,000	3,131,500	3,000,848	4,657,457	1,835,751
	Final disposal site operation expense	652,376	555,842	667,879	956,952	1,800,000
	Administrative expenses	750,000	450,789	545,835	745,163	
	Total expenses	10,245,485	11,060,031	13,148,381	16,342,692	18,390,952
Surplus (deficit)		-280,469	1,177,869	639,436	209,034	-169,867
(% of surplus (deficit) to total expenses)		*-3 %*	*11 %*	*5 %*		

Source: JICA (2019) and VCOMS

From the beginning of 2020, the garbage collection fees collected by VCOMS own collection companies go directly to the financial department of Vientiane instead of the accounting department of VCOMS. If this trial is successful, it will also apply to collection fees collected by other private collection companies.

All expenditures on VCOMS's business are withdrawn from the financial department after approval by VCOMS headquarters, which makes it impossible to post-pay or post-report expenditures by each section (especially the collection unit) within VCOMS. The balance management has become more thorough.[41]

From April to June 2020, Vientiane reduced the garbage collection fee and the tipping fee at KM32 by 50% as a measure to respond to the spread of COVID-19 epidemic. People who used the service were satisfied with it. On the other hand, collection companies had to reduce the

[40] JICA (2019), FY2018 Ex-Post Evaluation of Japanese Grant Aid Project "The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities" and interview with VCOMS in November 2020.

[41] Interview with the director general of VCOMS (Mr. Bounchang) in November 2020.

collection fee, although the tipping fee was reduced. Due to the influence of the lockdown, the amount of waste collected, especially commercial/business waste, decreased. The income according to the amount of collection decreased sharply. The VCOMS collection services sector is borrowing from an emergency fund of the Capital of Vientiane to make up for the deficit.

4.1.5 Donor Cooperation

GGGI is currently supporting solid waste management in Vientiane. It is one of the components of the Wastewater and Solid Waste Treatment Capacity Building Project signed on July 29, 2019. Outcome 2 of the project is the activity in Vientiane as shown below.[42]

Outcome 2: Improved access to waste collection services and waste-to-resource opportunities in Vientiane

Global Green Growth Institute

Output 2.1: Implementation strategy for solid waste management in Vientiane.	Activities	1. Establish a working group for SWM strategy 2. Identify solid waste management challenges and conduct preparatory tasks for policy design 3. Stakeholder consultation workshops 4. Drafting and finalization of SWM strategy 5. Facilitate approval of the strategy and support implementation 6. Capacity building and south-south knowledge sharing for policy makers in the waste sector.
Output 2.2: Deployment of waste-to resource initiatives and facilities in Vientiane.	Activities	1. SWM pilot project preparation and feasibility study 2. Decentralized collection services piloted in three villages 3. Enhancing waste banks and waste pickers' groups 4. Setting up source separation mechanisms for organic waste composting 5. Project review and feasibility study for scale up of pilot projects 6. Waste-to resource projects scaled up at district level. 7. Awareness raising, education campaign and training.

Source: GGGI

Figure 4-11: GGGI's activities in Vientiane

Output 2.1 is the formulation of the above-mentioned 10-year Strategy and Action Plan (Sustainable Solid Waste Management Strategy and Action Plan for Vientiane 2020-2030), and this draft was announced at the Stakeholder Consultation Workshop Sustainable Solid Waste Management that was held on June 12, 2020. It is scheduled to become a formal document with the approval of the mayor in 2020, but that has not been confirmed at the time of submission of this report.

Output 2.2 consists of four pilot project activities. These are (1) Decentralized secondary waste collection points with the participation of micro-enterprises (Providing decentralized garbage collection services and controlling discharge waste by introducing pay-as-you-go designated garbage bags); (2) Waste Bank & Waste pickers (Promotion of resource recovery by improving the working environment of street waste pickers); (3) Organic waste segregation mechanisms and private composting companies (Composting of organic waste generated in the Lao Aussie market); and (4) Glass recycling (Collection of glass bottles at 10 elementary schools, purchase by recyclers)[43].

[42] Presentation material provided by GGGI (received 11 March 2020).
[43] The recyclers are Keo-Lao Company and Vongphanit Company. These companies collected 2400 kg of glass bottles (as of November 2020).

4.1.6 Current Status and Issues of Solid Waste Management

a. Improvement of waste collection rate

According to VCOMS's 10-year Strategy and Action Plan, there are mainly two waste management issues in Vientiane: a low household waste collection rate and a lack of formal waste-to-resource initiative.

The city of Vientiane is divided into waste collection service areas and non-service areas. The household contract rate in all households of Vientiane is 27%, which is 37% within the collection service area.

Residents outside the collection service areas and non-contracted households in the service areas must self-dispose the waste (incineration, landfill, compost, livestock feed, etc.). As the service area is mostly urbanized, it is difficult to do self-disposal and necessary for residents to receive the collection service. In this sense, to increase the household contract rate is necessary. The 10-year strategy and action plan aims to achieve a "100% collection rate" for all of Vientiane City, including the non-service areas by 2030. As mentioned above, VCOMS, with the cooperation of GGGI, started the pilot project of the decentralized collection service, and the introduction of the new collection fee system is under experiment to achieve it.

The collection rate is calculated by the ratio of the collected amount to the waste generated amount (collected amount/generated amount). The collection rate can be estimated as 40% from the estimated value of the generated amount based on the 10-year Strategy and Action Plan and the disposal amount that is measured at the disposal site. The household contract rate and the collection rate are not synonymous, but it is not specified whether the "collection rate" of the 10-year Strategy and Action Plan indicates the household contract rate. Regarding contracts other than households, in particular the area in charge of private collectors is unknown. The number and contract conditions (waste discharge amount/fee) might be underreported for business customers, while the number of households is accurately known. For this reason, the collection service contracts for household might be focused in the 10-year Strategy and Action Plan.

Even if the collection rate is low, that is not an immediate problem in itself. Although collection service by VCOMS is not provided, if other methods such as self-disposal or joint collection, treatment and disposal by neighbours or community are properly carried out, hygiene problems would not occur. Under the circumstances of this survey, the field survey cannot be sufficiently conducted; it was not possible to obtain information that hygiene problems such as scattering/ accumulation of garbage and illegal dumping have occurred due to inappropriate discharge and collection of waste.

The purpose of garbage collection is to maintain a sanitary environment; this needs to be done in a financially sustainable way. The decentralized waste collection service (a collection method that installs a communal waste collection point instead of door-to-door collection) is planned for non-serviced areas in the 10-year Strategy and Action Plan. However, the transportation of collected waste to the disposal site would be very expensive for those areas. In addition to considering the building of the transfer station to reduce transportation costs, consideration should also be given to the most cost-effective combination according to the characteristics of the area, such as VCOMS collecting only waste which is difficult to self-dispose by ensuring that it can be appropriately stored for regular collection in areas such as non-serviced areas. For that purpose, it is necessary to collect information and data based on the actual situation of each area and to formulate a collection and transportation plan based on cost analysis.

b. Securing a Final Disposal Site and Reducing the Amount of Disposal

It is assumed that the KM32 final disposal site is to be used until 2029, for another 9 years. It is necessary to secure the next final disposal site. At the same time, in order to prolong the

lifetime of KM32, the introduction of a Mechanical Biological Treatment (MBT) facility is being considered to reduce the amount of disposal. In the 10-year strategy and action plan, to maximize waste-to-resource opportunities, the setting up of citywide source separation mechanisms, an organic waste collection and treatment system, raising awareness and other activities are also planned.

The capital of Vientiane signed a contract in 2019 to lease half of the land of KM32 for 45 years. On the rented land, a Thai-Laos joint venture plans to build and operate a facility (a complex facility consisting of Waste-to-Energy, plastic recycling plant and chemical fertilizer manufacturing plant) to process waste collected in Vientiane. However, the land has not been created yet, and the plan is not progressing[44].

Regarding waste treatment facilities and disposal sites in Vientiane, there is also a co-financing plan for AIIB (50%) and World Bank (50%) of 100 million USD for the establishment of a waste disposal facility and the procurement of collection vehicles.[45] The plan includes the rehabilitation of the KM32 disposal site, construction of new sanitary landfill site, a compost plant, Residue Derived Fuel plant and Waste-to-Energy plant so that only 20% of the collected amount can be finally disposed of at the landfill site. However, as of November 2020, no progress information was available[46].

In waste treatment facilities such as compost plants, Residue Derived Fuel plant and Waste-to-Energy plant, detailed data on the composition and amount of waste to be treated is essential for designing the plants. No information was available that such data was being collected and analysed.

The Lao government is currently tightening approval for finance projects. Previously, a loan could be obtained through a Ministry of Finance review, but now it has to be reviewed by the Ministry of Planning before the Ministry of Finance. The Ministry of Planning scrutinizes and prioritizes application projects from each sector. It takes longer to get the approval.[47]

The above co-financing plan cannot determine the outlook at this time, but it is necessary to show the positive impact of the project clearly with data when receiving the project loan. The objective of waste management projects is to maintain a hygienic living environment for the people, especially urban residents. It is difficult to show the economic benefits, unlike with projects for electricity or road construction. Moreover, simply continuing to collect and dispose of the ever-increasing amount of waste not only increases the financial burden, but also increases the burden on the natural environment and resources, resulting in great social loss. It is necessary to collect baseline data from the current situation survey and show the effect of reducing the financial burden and the effect of reducing the burden on the natural environment and resources by implementing the project.

c. Obtaining Waste Data

Since the survey conducted by LPPE in September 2011, no comprehensive data acquisition survey on the waste amount and composition has been conducted.

In order to know the collection rate, it is necessary to calculate the amount of waste discharged per person. To create the above-mentioned waste flow chart, in addition to the amount of waste discharged per person, data on the amount of waste generated and collected by source that are households, commercial and road cleaning are required. However, these have not been

[44] Interview with the director general of VCOMS in November 2020.
[45] AIIB (2019), Lao PDR: Urban Sector Project Identification Mission, October 31 – November 1, 2019, Aide-Mémoire, 7 November 2019.
[46] On-line interview with Mr. Kaysone of World Bank in November 2020. They are waiting for the response from AIIB.
[47] Ibid, interview with Mr. Kaysone.

obtained. The available data on waste is for the amount carried into the transfer station and the final disposal amount, measured by the truck scale installed at the transfer station and KM32.

This survey could not obtain information on the details and utilization of truck scale data, and no analysis of the data was found in the 10-year Strategy and Action Plan. If utilizing truck scale data, there is a possibility of managing the waste collection companies through the data of collection amount in each collection area. The collector collects garbage from households and commercial customers in the area designated by VCOMS. When the collected garbage is brought into KM32, the truck scale indicates which area the collection vehicle collected from and how many tons of garbage were collected. Accumulating these data, the collected amount for each area can be grasped. By collating this collection amount with the contract data of the collection company (number of customers, customer type household/business, contractual collection amount of garbage), the collection company can be managed. If a gap is found, it is possible to analyse factors such as whether the truck brought in has garbage collected from customers in the area in charge, and improve the accuracy of grasping the actual state of collection and the amount of collection.

In order to grasp the collection rate of each collection company area, it is necessary to estimate the amount of waste generated per person, which can be obtained by conducting the waste amount and composition survey. Since the amount of waste generated per person and the composition of waste depends on lifestyle, it is better to conduct the survey separately in urbanized areas and suburbs, as in the case of LPPE.

With data on the amount of waste generated and collected in each area for each collector, and the amount of waste generated in areas not covered by the collection service, it will be possible to create the waste flow chart and show on maps such as GIS maps to be utilized for waste management. These data can be used not only for strategies to increase the number of contracts in households and businesses, but also for calculating collection and transportation costs and to make trial calculations when introducing waste treatment facilities. It will be possible to make a more accurate forecast based on the actual data, and to formulate a waste treatment facility plan and a collection plan that will be the most effective allocation of financial resources/budget and human resources.

The 10-year strategy and action plan sets the goal of 40% of the recycling rate and 80% of the final disposal waste to be properly treated by 2030, but it does not provide baseline data. By acquiring the actual data described above, a baseline can be established, the effects of the 10-year strategic plan and action plan can be measured, and the progress of it can be monitored.

Regarding the reduction of waste emissions and promotion of the 3Rs as a measure cannot be done only by raising awareness activities. As it goes beyond the framework of waste management and is closely related to the socio-economy of Laos, it is necessary to establish laws and regulations at the national level.

4.2 Vang Vieng District, Vientiane Province

4.2.1 Characteristics of Vang Vieng District

Vang Vieng is located about 100 km north of the Vientiane metropolitan area. Vientiane Province is composed of 11 districts and the provincial capital is Phonhong. Vang Vieng District is one of the 11 provincial districts and is composed of 63 villages. Its population in 2015 was about 55,000[48].

Local agencies of each ministry are located in Phonhong, where the provincial office is located, while Vang Vieng has local offices of these local agencies.

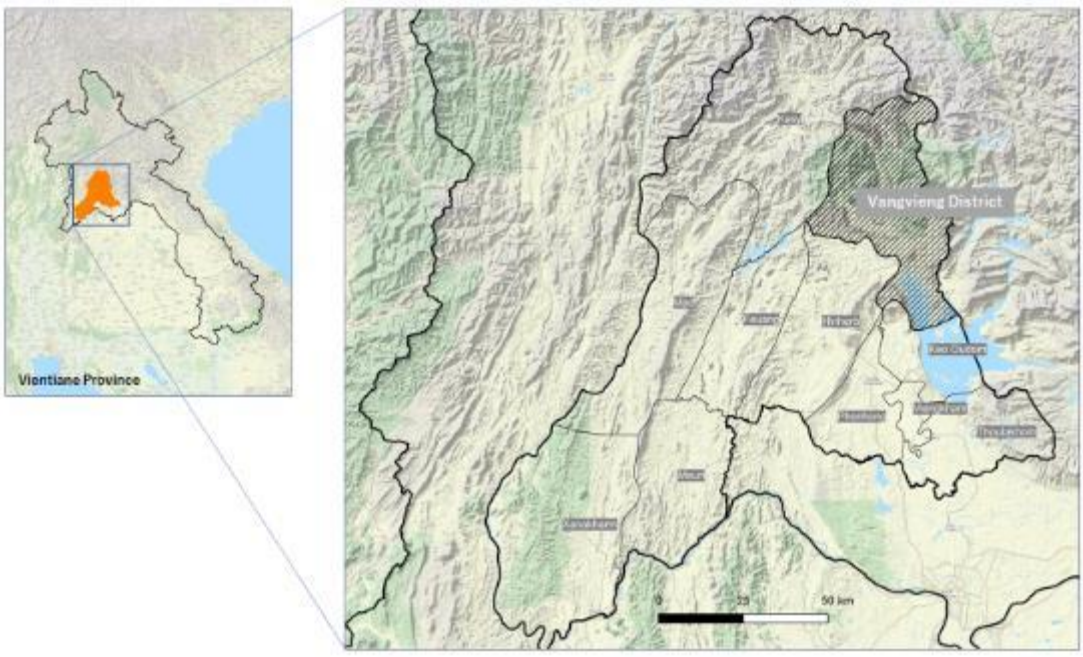
Vang Vieng District is located in the Nam Ngum River basin, which is one of the Mekong River basins. The Nam Song River, a tributary of the Nam Ngum River, flows north and south through Vang Vieng District. The elevation of the central area of Vang Vieng District is 296m[49]. Annual rainfall exceeds 3,000 mm, which is greater than that of Vientiane (1,500 mm)[50].

Table 4-5: Statistical data on the population of Vientiane Province

District	Total	Urban	Rural with road	Rural without road	Number of villages	Number of households
Phonhong	65,181	30,805	34,376	-	59	13,000
Thoulakhom	53,423	14,100	39,323	-	42	11,400
Keo oudom	17,786	8,972	8,166	648	26	3,700
Kasy	36,764	8,909	27,855	-	51	7,000
Vang Vieng	55,503	20,930	34,573	-	63	10,600
Feuang	41,253	11,556	29,697	-	44	7,500
Xanakharm	40,027	6,561	33,466	-	34	8,400
Mad	21,102	3,412	16,963	727	33	4,200
viengkham	18,526	17,696	830	-	17	4,000
Hinherb	29,244	2,562	26,682	-	43	5,700
Meun	40,281	14,320	25,961	-	22	6,300
Total	419,090	139,823	277,892	1,375	434	81,800

Source: Results of the Population and Housing Census 2015 and Provisional Report of the 4th Lao Population and Housing Census 2015

48 Lao Statistics Bureau (2016), The 4th Population and Housing Census 2015
49 Elevation of weather measurement stations. JICA(2001), Vol III, Master plan study on integrated agricultural development in Lao People's Democratic Republic, Vol III
50 Mean values between 1989 and 1998. JICA(2001), Vol III, Master plan study on integrated agricultural development in Lao People's Democratic Republic, Vol III



(Source: Open Street Map and The Humanitarian Data Exchange/ United Nations Office for the Coordination of Humanitarian Affairs)

Figure 4-12: Location of Vang Vieng District

Tourism is the main industry of Vang Vieng District. In 2019, the number of tourists visiting Vang Vieng was about 590,000 (including about 410,000 foreigners), which is 10 times the population. The Nam Son River, which flows through the centre of Vang Vieng, is the centre of tourism, and there are many restaurants and accommodation providers along the river. Korean tourists are said to make up a significant number of the foreign tourists visiting Vang Vieng, and many accommodation providers and restaurants display signs in Korean. However, since late January 2020, the number of foreign tourists, especially Chinese and Korean tourists, has dropped sharply due to the COVID-19 pandemic.

As for industry in Vang Vieng District, there are three cement factories because limestone is produced in the district. In these cement factories, clay and silica stone are mixed with the limestone and crushed, and then clinker is fired in a rotary kiln and crushed to produce cement.

Figure 4-13: Number of tourists visiting Vang Vieng[51]

51 Tourism Administration Agency

Tourist balloons landing on the Nam Song River

Restaurants on the river with no customers due to the spread of COVID-19

Figure 4-14: Photo of tourism industry in Vang Vieng

4.2.2 Method of the survey

The survey in Vang Vieng was conducted based on on-site hearings and a pre-distributed questionnaire. The results are shown below.

4.2.3 Organizations and institutions

The implementing agency for waste management in Vang Vieng is the UDAA (Urban Development and Administration Authority). This was originally overseen by the UDAA in the capital city, Vientiane. However, since Vang Vieng is a tourist destination and there is a need for proper waste management, an UDAA was established in Vang Vieng. The head of UDAA in Vang Vieng is the mayor of Vang Vieng District.

UDAA, together with private companies, is responsible for collection and transportation of waste in the town centre of Vang Vieng. It also operates the final disposal site. UDAA in Vang Vieng has 17 general staff and 14 workers. The private company that provides waste collection and transportation is headquartered in Vientiane and has direct contracts with the local residents for collection outside of UDAA's collection area.

Outside the collection area of the UDAA and private companies, the DPWT Vang Vieng office provides technical cooperation to villages on waste management.

The DONRE Vang Vieng Office conducts public awareness activities.

The regulations on waste management include the "Urban Control Regulation, waste management control". Waste management is also included in the Green Urban Development Plan of Vang Vieng District.

4.2.4 Technical System

Based on the interviews and the answers to the questionnaire, the waste generation, storage / discharge, collection / transportation, recycling, intermediate treatment, and final disposal were summarised as follows.

The main waste generation sources are general households, business establishments (restaurants, hotels, markets) and public facilities (government offices, hospitals), but there is no information on the amount of waste generated.


Waste collection point for a market


Waste collection point for households


A skip loader for waste containers


A dump truck for waste collection

Figure 4-15: Current situation of waste management in Vang Vieng

Regarding the discharged waste, it was confirmed that the households that have a collection and transportation contract have a collection trash can installed at the entrance to their homes. In markets, hotels, and restaurants with high generation volumes, containers for skip loaders are placed by UDAA. In the market, there are cases where the discharged waste has been sorted for recycling, but most is mixed waste.

UDAA is in charge of collecting and transporting of waste from 11 of the total 63 villages in Vang Vieng District. In the remaining villages, licensed collection and transportation companies make direct contracts with each household to collect and transport their waste. Both UDAA and private collectors collect door-to-door. UDAA has one dump truck, one skip loader, and eight containers for slip loaders. There are no transfer stations. The collection and transportation fee is 15,000 kip / month for ordinary households. The fee is collected by the community and paid to UDAA and collection companies. Business establishments (hotels, restaurants, hospitals, etc.) start at 30,000 kip / month, and the amount varies depending on the number of collections in that month. The frequency of collection for general households is once a week, and in rural villages it is once every two weeks. The market is daily collection, and the number of collections changes according to the volume of waste discharge from the business establishment.

The situation of collection services is grasped by the number of contracts. The table below shows the details of the number of contracts provided by UDAA. There was no information on road cleaning.

Table 4-6: Population and number of households contracted to waste collection services

Location/Village	UDAA	Private Company	Population	Number of households
Viengsavanh Village	○		1,002	109
Ethnicity school	○		760	5
Parkpae Village		○	795	152
Nakae Village		○	657	112
Phudindeng Village	○		1,723	275
Narduang Village		○	903	150
Heuaysagao Village	○		2,384	447
Vang Vieng Village	○		1,080	230
Phonepheng Village	○		1,654	340
Savarng Village		○	1,180	220
Viengkeo Village	○		1,122	217
Technical school	○		147	10
Meuangsong Village	○		1,521	272
Heuayyae Village		○	691	136
Viengsay Village	○		1,523	273
Heuayngarm Village	○		1,403	284
Phonezou Village		○	1,071	221
Vangsong Village	○		345	65
Phonesoung Village	○		1,183	228
Total			21,144	3,746

Source: UDAA, March 2020

As mentioned above, DPWT is involved in waste management outside the collection area, but the current status of generation and treatment methods is unknown.

Recycling is mainly divided by licensed recycling companies (collection, purchase, sales). There are three recycling companies in the district. Recycling companies collect by (1) collecting directly from markets and restaurants, (2) waste pickers bringing in recyclables they have collected in the city, and (3) purchasing from waste pickers at final disposal sites. The collected recycled materials are transported to Vientiane and sold to Vongphanth Company (a Thai company). The selling and buying prices of these recycling companies are as follows.

Table 4-7 Selling and buying prices of recycling materials

Type	selling (kip/kg)	buying (kip/kg)
Paper	50 – 100	300 - 350
Mixed Plastic	1,000	1,500
PET	1,000	1,600 – 1,700
Plastic bag	1,000	1,500
Aluminium can	5,000	6,500

Source: survey by survey team in March 2020

There are no hazardous waste treatment facilities for industrial waste or intermediate treatment facilities such as compost facilities.

The Phone Vieng final disposal site is located approximately 10 km southwest of the centre of Vang Vieng. The final disposal site was built in 2004 with the cooperation of ADB. The site area is 9 ha, of which 2.5 ha is currently used. The landfill has access roads, storage structures

(soil dams), and leachate collection and drainage channels. Although it is managed by UDAA, it is not possible to pile up garbage because it does not have heavy equipment for landfill maintenance.

At the disposal site, 11 households of waste pickers collect recyclables during the day. The recyclable items collected are the same as those mentioned above, and are sold to a recycling company that has a base at the entrance to the disposal site.

Disposal section

Rest space for waste pickers in the disposal site

Figure 4-16: Photos of Phone Vieng Landfill site

The main source of health-care waste (HCW) is the district hospital. At this hospital, although there are sorting and disposal rules, the incinerator is out of order, and infectious waste is collected and finally disposed of as mixed waste.

Unsorted infectious waste

The broken HCW incinerator

Figure 4-17: Status of HCW

The waste flow described here is summarized in the figure below.

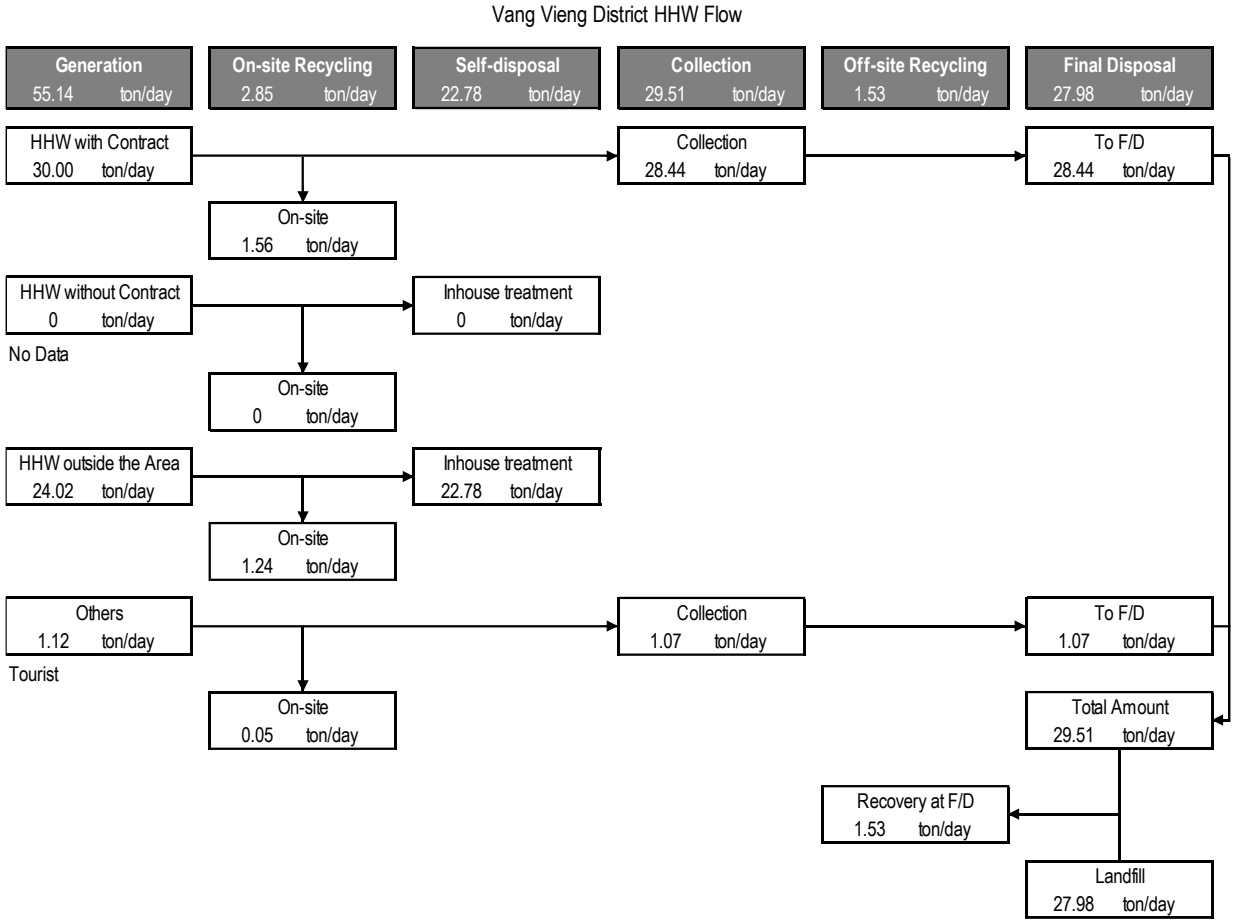


Figure 4-18: Waste flow in Vang Vieng[52]

Since the required data does not exist or is inaccurate, a waste flow was created under the following conditions.

- When the daily collection amount of 25 to 30 tons / day (data provided by UDAA) is applied to a population of 21,144, the waste generated per person per day is 1.18 to 1.42 kg. This is significantly larger than the amount generated at VTE (0.686 kg / person / day in the city and 0.695 kg / person / day in the suburbs) at the time of the LPPE survey. The reason is that the number of households (number of contracts) includes schools, markets, hospitals, restaurants, hotels, etc., and the accuracy of the information is insufficient. Therefore, it was decided to estimate the amount of general waste generated from the demographics (2015).
- The amount of (contracted) general waste collected is set as 14.36 tons / day by multiplying the urban population of 20,930 (2015) by the source unit of 0.686 kg / person / day.
- The amount of waste generated from the market is set as 1.5 ton / day (1.5 m3 container collected daily), based on values obtained by interview.

[52] On-site recycling refers to recycling at the source. An example is home garden composting. Off-site recycling refers to recycling outside the source. This includes, for example, the recycling of organic materials in composting yards, which are intermediate treatment facilities.

Waste discharge point at the market

Vang Vieng market

Figure 4-19: Status of waste management at the market

- The amount of waste generated from the hospital is set as 0.42 ton / day (1.5 m3 container collected twice a week), based on values obtained by interview.
- The collection amount from business establishments (hotels, restaurants) is set as the total collection amount of 30 tons / day minus the collection amount from general households, markets and hospitals.
- The amount of general waste (non-contract) is not considered because there is no data.
- General waste outside the collection area is calculated by multiplying the suburban population of 34,573 (2015) by 0.695 kg of waste generation per day per person to obtain 24.02 tons / day. In addition, all general waste generated will be treated in-house or recycled.
- Vang Vieng is one of the leading tourist destinations in Laos, with 598,072 visitors in 2019. The amount of waste discharged by these tourists is 1.12 tons / day by multiplying the number of visitors per day by 1,639 and the basic unit generated by 0.686 kg / person / day.
- Due to the lack of detailed data on the on-site recycling rate and the recovery rate in the final disposal site, the recycling rate of 5.2% for general households in the LPPE survey was applied.

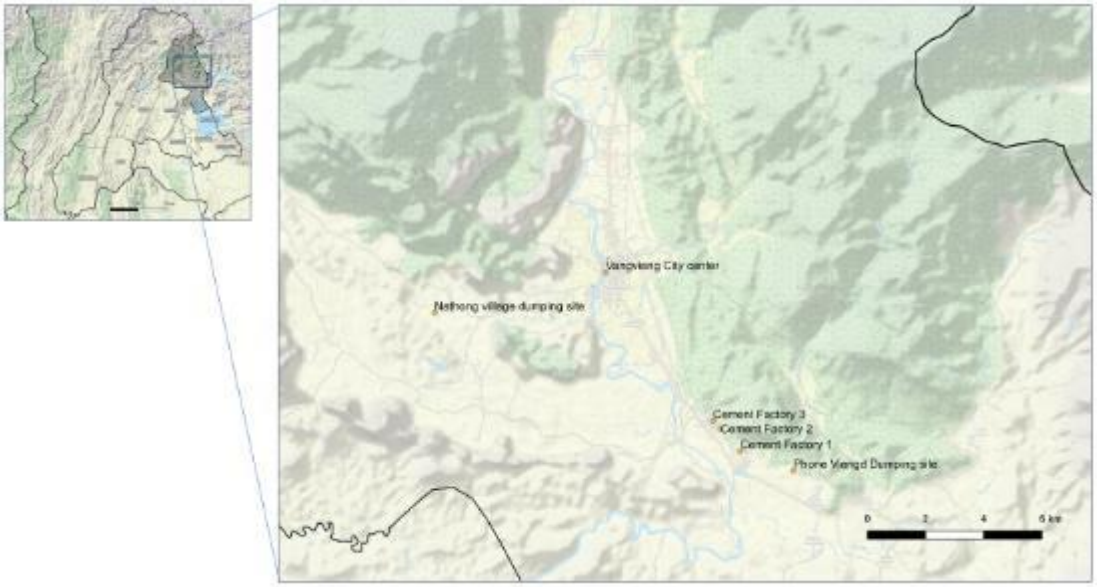
In villages where UDAA and private companies do not collect waste, waste is generally treated in-house, however there are cases where the village has its own waste management system. For example, in Nathong Village, which has a tourism resource, the Blue Lagoon, a household selected by lottery collects a fee of 10,000 kip / household / month, collects waste, and disposes it at a disposal site in the village. The profits from the tourism business are also used for waste management.

In addition, at the cement factory located in the south-eastern part of Vang Vieng, we tried to manufacture cement using RPF for a while, but the quality control of cement proved difficult, and it was not adopted.

RPF used in cement factory [53]

A kiln where RPF was used

Figure 4-20 A cement factory and RPF trialed in cement manufacture



(Source: Locations added by the authors on Open Street Map)

Figure 4-21: Location map of waste management related facilities

4.2.5 Finance of UDAA

UDAA's annual budget is 700,000,000 kip. Revenue is the income it receives from the waste collection fees of contracted household or business establishments.

The main expenditure is the salary of workers such as for collection and transportation. The salary of UDAA staff is paid by the government.

4.2.6 Cooperation of donors

ADB is supporting the expansion of the Phone Vieng final disposal site and the improvement of collection and transportation capacity. In 2018, the IEE was completed by the Lao People's Democratic Republic: Second Greater Mekong Subregion Tourism Infrastructure for Inclusive

[53] The photo was labelled as RDF. RDF (refuse derived fuel) is manufactured from mixed waste containing organic waste, but when the contents were checked, it was found to be RPF (refuse paper & plastic fuel) manufactured from plastic waste.

Growth Project. The beneficiaries of this project are shown to be 59,611 people and 143 hotels. The contents of this project are as follows.

- Preparatory work, construction of rainwater drainage
- Construction of impermeable equipment, leachate collection and drainage equipment, leachate treatment equipment, and gas recovery system
- Construction of a small-scale material recovery facility (MRF)
- Construction of medical waste treatment facility (storage)
- Construction of sorting facility (0.5 ha)
- Construction of field offices, toilets, off-limits fences, paving access roads
- Equipment procurement: 3 10 m3 dump trucks, 1 bulldozer, 2 vacuum trucks (sewage sludge recovery)
- Implementation of hygiene / waste management awareness programs

4.2.7 Waste management challenges in Vang Vieng

Vang Vieng is visited by more than 10 times the annual population and is heavily dependent on the tourism industry. Therefore, how to manage the business waste discharged from the tourism industry is a big theme.

In the centre of Vang Vieng, where the collection service is basically provided by the UDAA and private companies, waste is collected on a regular basis, although there is some illegal dumping. The collected waste is transported to the final disposal site for treatment. However, in February 2020, when the survey was carried out, the number of tourists had decreased significantly due to COVID-19 and it was not possible to observe how the tourism industry affected waste management.

Therefore, we tried to understand the waste flow using the data provided by UDAA, but as mentioned above, the data obtained was insufficient to capture the waste flow accurately. Therefore, we created a waste flow by setting data from other cities and estimated conditions. This waste flow is only a rough indication of the waste flow and does not capture the impact of the tourism industry on waste management.

In order to properly manage waste, it is necessary to understand the waste flow. By understanding this flow, problems from waste discharge to collection / transportation, treatment, and disposal will become clear. For that purpose, it is necessary to collect data and manage it appropriately at each stage.

In order to clarify the status of generation, it is necessary to determine generation amount per capita, waste generation amount and its characteristics by waste amount and composition surveys. For collection and transportation, it is effective to conduct a time-and-motion survey and at the disposal site to grasp the transported amount by introducing a weigh bridge. In cities such as Vang Vieng, which rely heavily on the tourism industry, it is difficult to cite data from other cities, so we believe that there is a great need for a waste quantity and quality survey. As mentioned above, if a weigh bridge is available at the disposal site, it is more efficient to determine the transportation amount, but if it is not, it can be roughly estimated from the operation of the collection vehicles, and its loaded capacity and load ratio. Furthermore, it is necessary to properly manage these data, but no mechanism has been established to do so.

DPWT's Vang Vieng office provides technical guidance in areas where waste collection services are not provided. In this survey, it was confirmed that waste in some villages was collected by residents and disposed of at the disposal site in the village. However, this case is reliant on profits from tourist facilities operated by the village, and it is difficult to disseminate it to other villages that do not have such facilities.

On the other hand, the status of waste management in many villages where collection services are not provided is not known. It is clear that modernization of lifestyles has led to the spread

of plastic products and the increase in plastic waste in all regions. Since the amount of waste discharged from such villages is smaller than that in urban areas, it is recognized that the impact on the environment is low. However, considering the characteristics of plastics that do not decompose and easily flow out due to rainfall, etc., and the recent criticism of plastic waste, it is necessary to understand the status of waste management in the surrounding area outside the collection area.

In addition, all HCW has been delivered to the final disposal site without being sorted because the HCW incinerator is out of order. There are many waste pickers working at the final disposal site, and it must be said that their risk of infection is high. Since there are many tourists and it is necessary to pay attention to infectious diseases brought in from abroad, it is necessary to manage HCW appropriately.

It is interesting that Vang Vieng has three cement factories. All factories have kilns, and the introduction of RPF as a combustion improver was once considered. Cement factories in Japan have many experiences in thermal recycling (alternative fuel) using waste plastic, waste tires, waste oil, waste wood, etc. as auxiliary materials as part of the fuel. If such a technology is introduced in Vang Vieng's cement plant, it may be possible to solve the problems caused by plastic waste in the region.

4.3 Xiengkhouang Province

4.3.1 Characteristics of Xiengkhouang Province

Xiengkhouang Province is located in the northern part of Laos and borders Vietnam in the western part. The eastern part of the prefecture is the Song Ca, Nam Mat and Nam Neun river basins, which flow into the South China Sea via Vietnam. The western part is the Nam Khan, Nam Ngum and Nam Nhiep / Nam Sane river basins, which flow into the Mekong River.

Xiengkhouang Province is composed of 7 districts. The provincial capital is located in, Pek District. The population of the province is 244,684. Many ethnic minorities such as Mon live in Xiengkhouang Province. Pek and Kuoune districts have Megalithic Jar Sites registered as World Heritage Sites, and Kham Kistrict has hot spring resort facilities, and the number of tourists has been increasing in recent years.

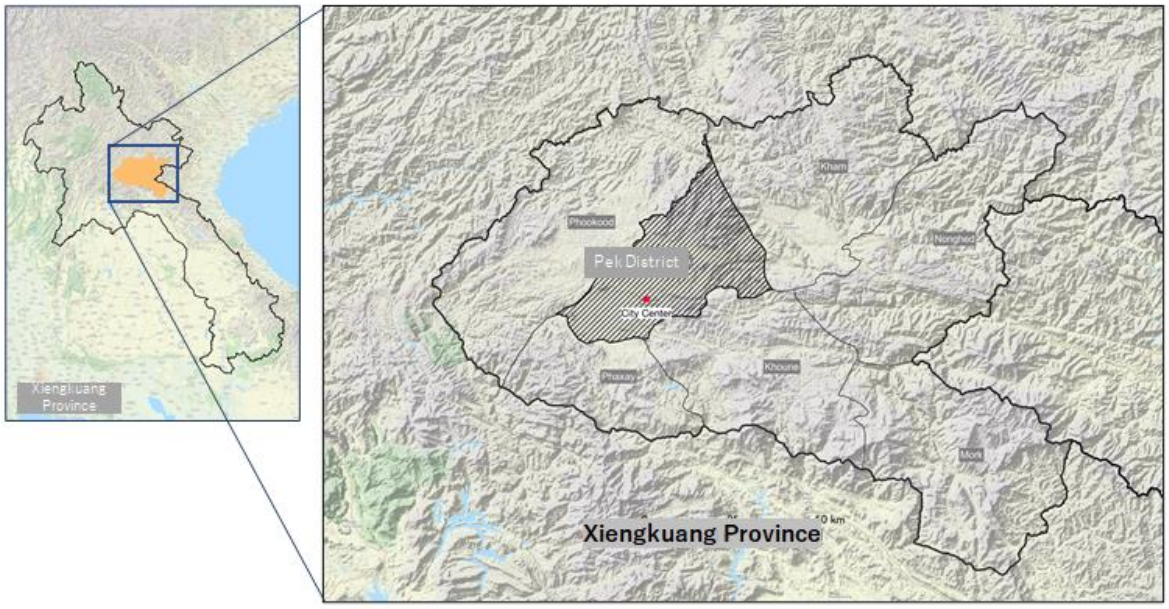
There is artisanal and small-scale gold mining (ASGM) in the mountains[54].

Table 4-8: Statistical data on the population of Xiengkhouang Province

District	Total	Urban	Rural with road	Rural without road	Number of villages	Number of households
Pek	75,566	48,643	25,804	1,119	108	14,500
Kham	47,512	8,556	32,600	6,356	90	8,500
Nonghed	37,613	2,301	34,207	1,105	106	6,100
Khoune	33,233	5,473	27,022	738	77	5,800
Mork	14,297	2,100	11,946	251	28	2,300
Phookood	25,017	1,614	11,973	11,430	44	4,700
Phaxay	11,446	2,096	9,350	-	32	2,200
Total	244,684	70,783	152,902	20,999	485	44,200

Source: Results of the Population and Housing Census 2015 and Provisional Report of the 4th Lao Population and Housing Census 2015

54 Daniele Moretti and Nicholas Garrett (2018), Artisanal and small-scale mining governance: The 'emerging issue' of 'unregulated mining' in Lao PDR, Between the Plough and the Pick KUNTALA LAHIRI-DUTT (Ed.), p311-p334, ANU Press, The Australian National University



(Source: Open Street Map and The Humanitarian Data Exchange/ United Nations Office for the Coordination of Humanitarian Affairs)

Figure 4-22: Location map of Xiengkhouang Province

4.3.2 Characteristics of Pek District

The population of Pek District is 75,566 as of 2015. It consists of 108 villages. Central Pek has an elevation of 1050 m[55] and annual rainfall of 1327 mm[56].

The main industries are livestock (especially grazing), agricultural production and processing, and tourism. There are megalithic jars everywhere in Pek District, which were registered as World Heritage Sites in 2019 as " Megalithic Jar Sites in Xiengkhouang – Plain of Jars ". These sites have become the main tourist destinations.

Xiengkhouang Airport is about 30 minutes from the city centre. There are daily flights to Vientiane. There are also flights to the tourist destination of LPB.

In addition, limestone is being mined.

Since it is the provincial capital, there are local agencies such as of DONRE and DPWT.

4.3.3 Method of the survey

In Xiengkhouang Province, waste management such as collection services is carried out in Pek District, the capital of the province. Therefore, the survey was conducted in Pek District. The survey was conducted by interviewing relevant parties based on the questionnaire distributed in advance. The results are shown below.

The current situation was also investigated in Kham District, which does not have a UDAA. The findings will be described after the situation in Pek District.

55 Elevation at a weather station in Xiengkhuang, JICA (2001), Vol III, Master plan study on integrated agricultural development in Lao People's Democratic Republic, Vol III
56 Average amount from Year 1988 to Year 1997, JICA (2001), Vol III, Master plan study on integrated agricultural development in Lao People's Democratic Republic, Vol III

4.3.4 Organizations and Institutions in Pek District

The executing agency for waste management is UDAA. The head of UDAA is the mayor of Pek District. The waste collection area is 27 villages designated as urban areas in Pek District. UDAA has 14 employees (including 7 managers). Outside the UDAA collection area, DPWT is in charge.

Collection and transportation of waste is carried out by two private companies. UDAA has the right to license private companies. Until 2019, UDAA directly managed some of the collection and transportation services, but from 2020, the collection work has been transferred to private companies. At the time, the vehicles owned by UDAA were sold to the company that took over.

The regulations on waste management are as follows:

- Regulation No. 1706/MNRE Waste management in Pek District, Public health, Green city

There are no plans for waste management.

4.3.5 Technical system in Pek District

Based on the interviews and the answers to the questionnaire, the waste generation, storage / discharge, collection / transportation, recycling, intermediate treatment, and final disposal were summarised as follows.

The main generation sources are general households, business establishments (restaurants, hotels, markets) and public facilities (government offices, hospitals), but there is no data on the generated amount.

Households with access to main roads are collected door-to-door, while households with access to roads not accessible by vehicles take their waste to the main roads. Containers for skip loaders have been placed at the market and hospital by a private company.

Collection vehicles and logos of private companies that have newly entered the collection business.

Collection vehicles owned by a private company (also used for construction works)

Household waste discharged by the roadside

Waste containers at the market

Figure 4-23: Photos of waste management current situation in Pek District

The collection service was provided by UDAA and a private company, but in 2020 the services were transferred to a private company. Currently, Vansay is in charge of 10 villages and GSP is in charge of 16 villages of the total 26 villages in the district. Vansay's collection and transportation vehicles are four dump trucks (10 m3) (of which two are in operation per day) and one dump truck (3 m3) for medical waste transportation. GSP's collection and transportation vehicles are one skip loader, five containers used with the skip loader, and two dump trucks (5 m3). These were purchased from UDAA in January.

Collection and transportation fees are 18,000 kip / month for ordinary households along the road, 15,000 kip / month for ordinary households off the road, 15,000 to 18,000 kip / month for hospitals, 30,000 kip / month for markets, and 50,000 to 100,000 kip / month for business establishments such as restaurants depending on the amount of waste.

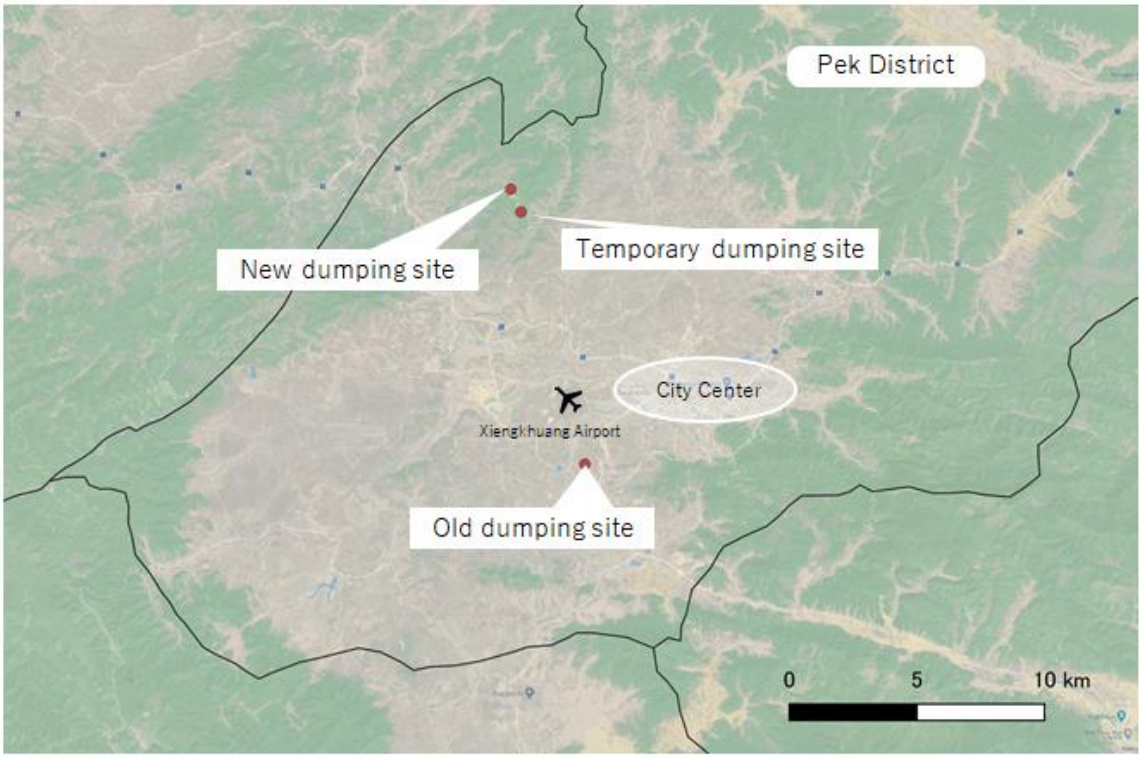
Information on road cleaning and waste management in the surrounding area was not available.

There are no transfer stations and intermediate treatment facilities such as for composting. The waste is directly delivered to the final disposal site.

The collected waste is delivered to a temporary disposal site adjacent to a new disposal site under construction (see below). This temporary site is located approximately 17 km from the city centre and has been in operation since 2017. A total of 243 tonnes of waste per week (approximately 35 tonnes per day) is being delivered to the site. 25 kip/kg of waste is being collected at the entrance to the site from this year, except for waste collected by Vansay and GSP. From this year, a visual record of delivery has been taken at the entrance of the disposal site. Soil covering is done by GSP as needed. 20 waste picker households are collecting recyclables. These are purchased by an unlicensed Vietnamese company and transferred to Vietnam, but details could not be investigated.

Before 2017, a disposal site located about 5 km from the city area (hereinafter referred to as the old disposal site) was used. The old landfill site went into operation in 2004. However, it was closed because it was close to the airport and the site of megalithic stone jars in a cultural heritage protected area. In particular, the smoke generated from fires at the disposal site also affected the operation of the airport. After the closure, illegal dumping has been seen, but the soil has been properly covered. There are no rivers nearby, and there are no problems such as waste runoff.

Construction of the new disposal site started in 2017, and construction work has been completed. Currently, the final inspection by DPWT is being conducted, but the operation start time is undecided. The construction cost is 23 billion kip (about 270 million yen), which is funded by the Ministry of Planning Industry (MPI). It has an access road, leachate collection and drainage facilities, and four leachate treatment ponds. Impermeable sheets are installed in the leachate pond to prevent underground infiltration. The leachate treatment pond also treats human waste sludge. No weigh bridge is installed at the new disposal site. For this construction, EIA was jointly carried out by UDAA, MONRE and MPI. EIA documents are kept by MPWT. The reasons for selection were that this area was a place where illegal logging was being carried out and that it was far from the city centre.



（Source: Google Earth and the survey team）

Figure 4-24: Location map of facilities for waste management in Pek

There is no treatment facility for hazardous industrial waste. The provincial hospital has sorting and disposal rules, and infectious waste is disposed of in incinerators. Although there is a problem of hazardous waste by ASGM, the actual situation could not be confirmed because the mining itself is illegal.

An incinerator at the hospital

Segregated infectious waste

Figure 4-25: Photos of HCW Management

Closed dumping site

Temporary dumping site

Constructed new dumping site

Drainage of the new dumping site

Figure 4-26: Photos of dumping sites in Pek District

The waste flow described here is summarized in the figure below.

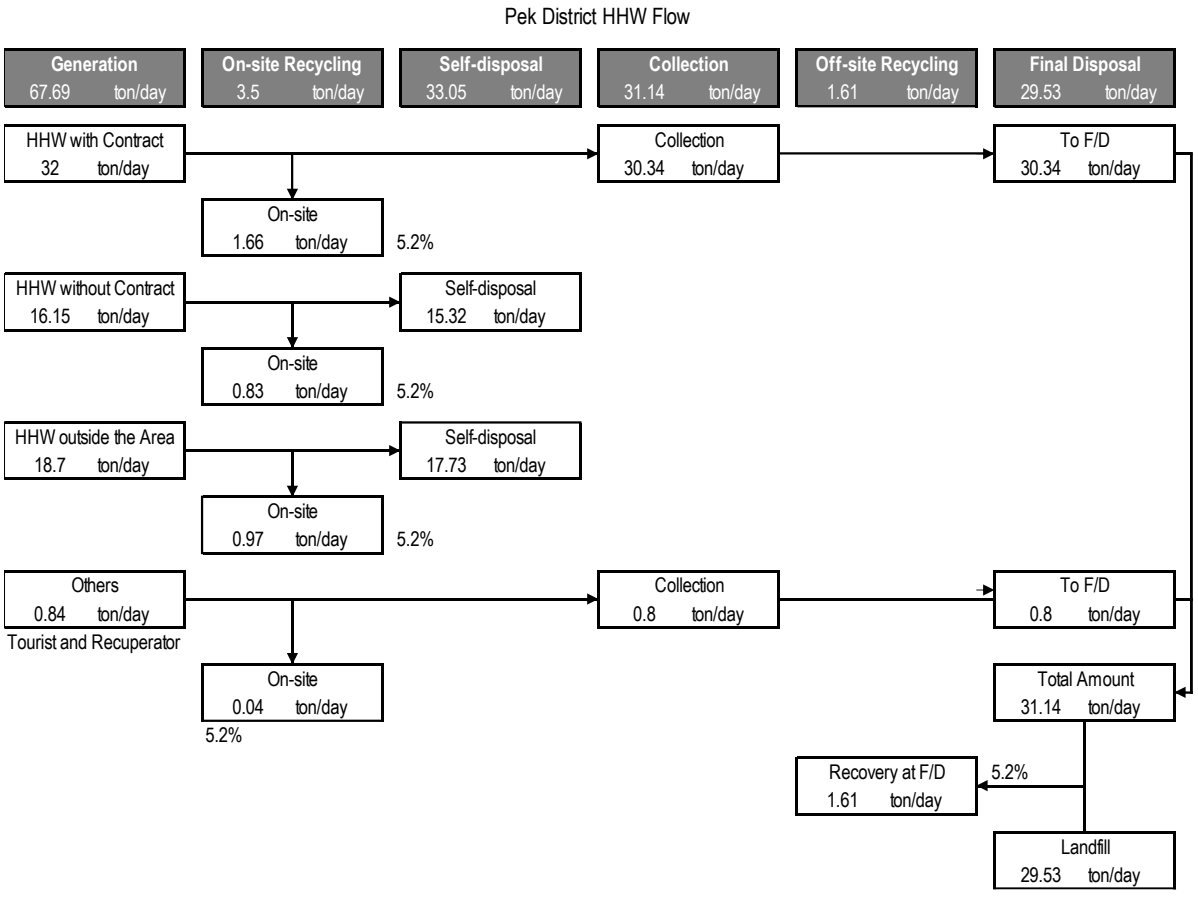


Figure 4-27: Waste flow in Pek District

Since the information is insufficient and the data are inconsistent in this survey, the waste flow was created under the following conditions.

Table 4-9: Population, number of households and contract status in Pek District

Name of Village	Census		Number of Contracts		Contracted （household / offices）			Collection ratio	Not contracted
	Household (1)	Population (2)	Contracted (3)	Not contracted (4)	Household (5)	Population (8)	Office, etc. (6)	Households (7)	Ppopulation (9)
					(1) – (4)	(2) x (7)	(3) – (5)	((5) / (1)) x 100	2 x (1 – (7))
UDAA collection									
Phonesavanneua Village	300	1,906	205	95	205	1,302	0	68.3%	603
Phonesavankang Village	153	705	165	63	90	414	75	58.8%	290
Phonesavansay Village	279	1,024	224	55	224	822	0	80.3%	201
Phonesavantai Village	214	1,066	160	54	160	797	0	74.8%	268
Syphonesay Village	332	2,030	112	220	112	684	0	33.7%	1,345
Tern Village	183	944	155	28	155	799	0	84.7%	144
Phonengarmneua Village	440	2,797	181	259	181	1,150	0	41.1%	1,646
Phonengarmtai Village	282	1,471	247	35	247	1,288	0	87.6%	182
Yuan Village	343	1,741	135	208	135	685	0	39.4%	1,055
Ngueay Village	490	2,717	146	326	164	909	0	33.5%	1,807
Lee Village	198	887	67	131	67	300	0	33.8%	586
Kungkai Village	521	2,698	138	383	138	714	0	26.5%	1,983
Nahoy Village	198	1,097	58	140	58	321	0	29.3%	775
Banvieng Village	72	360	27	45	27	135	0	37.5%	225
Sub Total	4,005	21,443	2,020	2,042	1,963	10,320	75	52.1%	10,016
Private collection									
Phonesavang Village	433	2,670	284	149	284	1,751	0	65.6%	918
Phonemysay Village	226	1,406	122	104	122	758	0	54.0%	647
Yon Village	414	2,316	121	293	121	676	0	29.2%	1,639
Phonekam Villgae	335	1,780	245	90	245	1,301	0	73.1%	478
Phonesaartneua Village	220	1,226	194	26	194	1,081	0	88.2%	144
Phonesaarttai Village	278	1,456	223	55	223	1,167	0	80.2%	288
Namngam Village	737	3,341	332	405	332	1,505	0	45.0%	1,835
Phonethong Village	533	2,573	214	319	214	1,033	0	40.2%	1,539
Na ao Village	341	1,961	19	322	19	109	0	5.6%	1,851
Saylom Village	477	2,385	243	234	243	1,215	0	50.9%	1,170
Thoungmysay Village	335	1,675	101	234	101	505	0	30.1%	1,170
Sub total	4,329	22,789	2,098	2,231	2,098	11,101	0	51.1%	11,679
Total	8,334	44,232	4,118	4,273	4,061	21,421	75	51.6%	22,789

Source UDAA and the survey team analysis result

- Applying the amount of waste 32 tons / day brought to the final disposal site (UDAA survey) to the contracted population of 21,421 shown in Table 4-9, waste generation amount per capita is set as 1.49 kg / person / day. This is significantly larger than the amounts in VTE (0.686 kg / person / day in the city and 0.695 kg / person / day in the suburbs) at the time of the LPPE survey. It can be assumed that the cause of this is that the number of households (number of contracts) includes schools, markets, hospitals, restaurants, hotels, etc., and it can be said that the data is inaccurate. For this reason, the collection rate was calculated using the figures obtained from the UDAA interview survey, and the amount of general waste generated was estimated from the demographics (2015).

- The amount of (contracted) general waste collected is set as 17.21 tons / day by multiplying the urban population of 48,643 (2015) by waste generation amount per capita of 0.686 kg / person / day and the collection rate of 51.6% (Data from UDAA interview). In addition, the amount of general waste generated (non-contract) is set as 16.15 tons / day in consideration of the non-collection rate of 48.4%.

- The amount of waste generated from the market is unknown, but it is assumed to be 1.5 ton / day with reference to Vang Vieng.

- The amount of waste generated from the hospital is unknown, but it is assumed to be 0.21 ton / day with reference to Vang Vieng.
- For business establishments (hotels and restaurants), the daily collection amount (32 ton / day) minus general households, markets, and hospitals.
- The amount of general waste from outside the collection area is 18.70 tons / day by multiplying 25,804 people in the suburbs (roadside) and 1,119 people in the suburbs (without roads) by waste generation amount per capita of 0.695 kg / person / day. In addition, all general waste generated will be treated in-house or recycled.
- The Pek District was be visited by 147,000 tourists in 2019. It is also known as a tourist destination for medical treatment, and about 300,000 people of domestic tourists visit there every year for medical treatment. The amount of waste generated by those visitors is set as 0.84 tons / day by multiplying waste generation amount per capita of 0.686 kg / person / day.
- There is a recycling company in the Pek District that collects recyclables. The collection methods are on-site recycling, which is purchased directly from the source, and off-site recycling, which is purchased recyclables collected by waste pickers at the disposal site. Due to the lack of detailed data on the amount collected, the recycling rate of general households of 5.2% in the LPPE survey will be adopted.
- The collection methods are on-site recycling, which is purchased directly from the source, and off-site recycling, which is carried out in the city or at a disposal site. Due to the lack of detailed data on the amount collected, the recycling rate of general households of 5.2% in the LPPE survey will be adopted.

4.3.6 Finance of UDAA in Pek District

The annual budget of the UDAA for 2019 is 3.3 billion kip. However, this is the situation before the transfer of all collection operations to the private sector and the budget for 2020 is not known.

4.3.7 Cooperation of donors in Pek District

Responses to the survey reported no cooperation from donors.

4.3.8 Waste management challenges in Pek District

Basically, in the central area where UDAA and private companies provide collection services, although there is some illegal dumping, waste is collected regularly, and a hygienic environment is maintained. In addition, the collected waste is transported to the final disposal site for disposal.

As in the case of Vang Vieng, we tried to grasp the waste flow at each stage and clarify the location of the problem, but the data obtained was insufficient to accurately grasp the waste flow. Therefore, we created a waste flow by setting data from other cities and estimated conditions. This waste flow is just a rough indication of the general flow. The need for data and its management is as indicated by the challenges faced by Vang Vieng.

UDAA, on the other hand, understands the importance of data and has attempted to properly measure the amount of waste delivered to the disposal site, as shown in the picture below. This delivery record was missing vehicle numbers and loads, and therefore did not provide adequate data to create a waste flow. However, by supporting and improving this activity, it will be possible to obtain and manage appropriate data.

Photo of record at the dumping site

Photo of recyclables (PET) sorted at a backyard of a shop

Figure 4-28: Solid Waste Management in Pek District

A characteristic issue of Pek District is the cross-border (Lao-Vietnamese) transport of recyclables. These recyclables are collected by waste pickers at the disposal site. It has also been confirmed that separate discharge of recyclables is being carried out in the backyard of restaurants. These are transported to Vietnam by Vietnamese companies. However, since it is not operated with official permission, it is difficult to grasp the data on the amount of recycling and check the status of their business. The situation in which recyclables move across national borders should be carefully observed from the perspective of the Basel Convention.

Regarding waste management in rural areas where UDAA does not exist, this survey revealed the situation in Kham District (see below). However, as with Vang Vieng, the situation in many rural areas is unclear. Considering the problems caused by plastic waste, it is necessary to understand the current situation.

4.3.9 Waste management in rural areas in Xiengkhouang

The situation of waste management in rural areas where UDAA does not exist is described below in the case of Kham District.

The population is 47,500, of which 8,500 are in urban areas (Urban). In the Kham District, private companies provide waste collection services in two municipalities (Nathong and Jomthong). Nathong Municipality consists of 5 villages (400 contracts) and Chomthong Municipality consists of 9 villages (900 contracts). The collection rate (contract rate) for the total number of households of each municipality is Nathong 20% and Chomthong 30%. The number of contracts includes not only general households but also markets and business establishments.

The collection service is provided three times a week. Approximately 15 tons / week are collected and delivered to the final disposal site. The collection vehicle is a 5 m^3 truck (one for each company), and the number of trips is 2 times / day.

The waste collection fee is as follows.

Table 4-10: Waste collection fee at Kham District

Contract	Collection fee （kip/month）
Household	10,000
Small scale business establishment	15,000
Medium scale business establishment	25,000
Large scale business establishment	50,000 - 100,000
Administrative organization	15,000
Hospital	500,000

DONRE manages and licenses collection and transportation companies. DONRE is also in charge of monitoring twice a month and enacting ordinances. In addition, it holds meetings with related organizations such as business establishments and residents' groups (women's associations, etc.) about once every three months to share information.

In addition, the urban area is cleaned about once a month in cooperation with residents and business establishments. There are no recycling companies or waste pickers operating in the area.

DPWT plans, designs and constructs final disposal sites. One of the final disposal sites, the Chomthong Municipality final disposal site, is located 14 km northeast of the centre and uses a valley of about 0.4 ha on the hillside. Due to the small scale of the landfill, IEE has not been implemented. There are no waste pickers. Management is carried out by a private collection and transportation company. Excavation for landfill and open burning for volume reduction were carried out. There are complaints from local residents that the inflow of garbage into nearby rivers is a problem.

Medical waste is transported to Pek by a dedicated vehicle. Agricultural hazardous waste such as pesticides are stored and managed separately. This is one of the areas of cooperation of The Lao Upland Rural Advisory Service (LURAS) project by Netherlands Development Organization.

A waste collection vehicle going to a dumping site

Chomthong Municipality final disposal site

Figure 4-29: Photo of waste management in Kham District

4.4 Luang Prabang District, Luang Prabang Province

4.4.1 Characteristics of Luang Prabang district and province

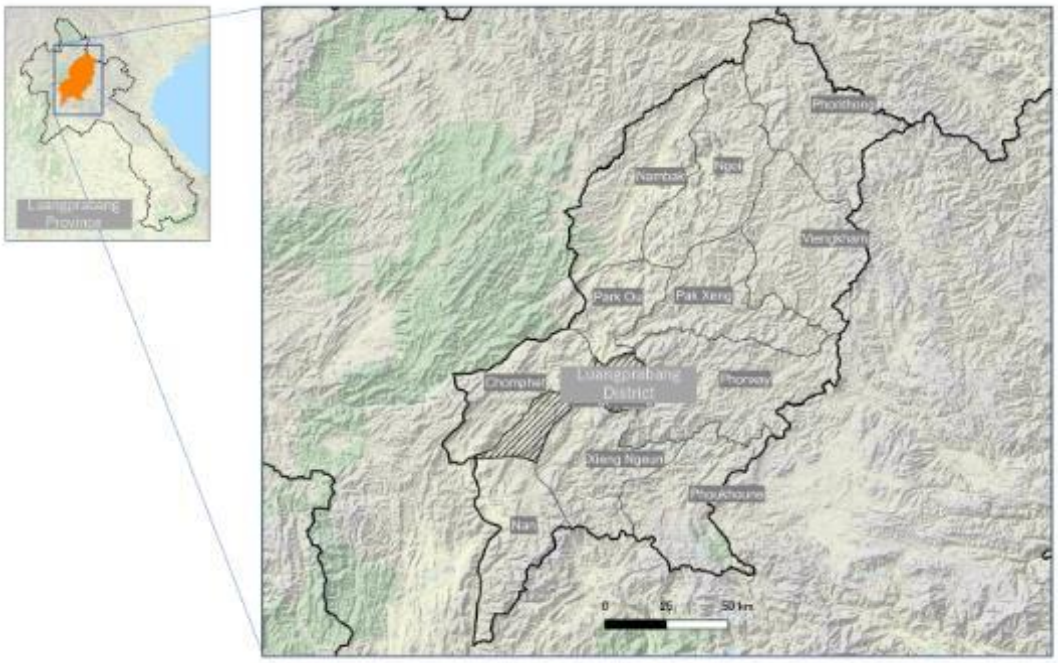
Luang Prabang Province, located in the northern part of Laos, has a population of about 430,000, and the northeastern part borders Vietnam.

Luang Prabang Province is composed of 11 counties, and Luang Prabang (LPB) is the provincial capital. This survey will be conducted in Luang Prabang District, where the Urban Service Organization (USO, formerly UDAA) is located. The population of Luang Prabang District is about 90,000.

Table 4-11:Population in LPB province (2015)

District	Total	Urban	Rural with road	Rural without road	Number of villages	Number of households
Luang Prabang	90,313	66,781	23,532	-	114	16,500
Xieng ngeun	33,395	7,764	23,259	2,372	49	6,600
Nan	28,130	11,104	14,875	2,151	51	5,900
Pak ou	25,823	2,548	21,590	1,685	51	5,300
Nambak	68,863	27,814	39,865	1,184	81	13,200
Ngoi	29,692	3,929	10,245	15,518	77	5,900
Pak xeng	22,159	1,290	13,949	6,920	54	4,300
Phonxay	32,577	3,366	23,069	6,142	60	6,100
Chomphet	30,076	5,173	15,820	9,083	69	5,800
Viengkham	28,557	2,729	22,711	3,117	69	5,200
Phoukhoune	23,211	5,090	13,470	4,651	38	4,100
Phonthong	19,093	2,107	16,182	804	40	3,300
Total	431,889	139,695	238,567	53,627	753	82,100

Source: Results of the Population and Housing Census 2015 and Provisional Report of the 4th Lao Population and Housing Census 2015



(Source: Open Street Map and The Humanitarian Data Exchange/ United Nations Office for the Coordination of Humanitarian Affairs)

Figure 4-30: Location map of LPB district and province

The temples located in the centre of Luang Prabang were registered as a World Cultural Heritage site in 1995 as "the town of Luang Prabang". Since then, it has been one of the major tourist destinations in Laos. Therefore, there are many facilities for tourists such as hotels and guest house accommodations, restaurants and souvenir shops in the city. In addition, the Mekong River runs through the city, making it a base for cruise sightseeing around tourist spots.

Luang Prabang Airport is located about 5 km northwest of the centre of Luang Prabang. There are several flights a day from Vientiane, as well as direct flights from neighbouring countries.

The statistical data shows that about 760,000 people visited the city in 2018, including domestic and foreign visitors. The table below shows the change in the number of tourists.

Table 4-12: Changes of Number of visitors in LPB

Year	Lao	Foreigners	Total
2014	152,328	378,999	531,327
2015	161,712	445,872	607,584
2016	173,733	469,586	643,319
2017	182,470	472,942	655,412
2018	178,409	576,610	755,019

Source: Statistical Report on Tourism in Laos (2018)

4.4.2 Survey method for waste management

In this study, a questionnaire was used to investigate the current situation of waste management. The questionnaire consists of two parts. The first part is aimed at collecting general information on waste management and the second part is related to the progress of the LPPE implemented between 2011 and 2015, the grant aid project implemented in 2014 and the impact of the recent COVID-19 pandemic. Sections 4.4.3 to 4.4.8 below summarise the responses received to Part 1 of the questionnaire.

4.4.3 Organizations and institutions

The implementing agency for waste management is the USO, which is responsible for the planning, construction, management and operation of urban development works, including roads, waste, waterways, sewers, environmental protection, streets, river erosion control and parks.

PONRE works with the USO to carry out awareness-raising activities on waste management.

The organisational structure of waste management at the USO as of October 2020 is as follows

- Head of USO
- Head for the disposal site
- Number of workers: 6 (permanent staff)
- Specialist technician: 1 (permanent staff)
- Technicians: 4 (permanent staff)
- Collection and transport drivers: 9 (non-permanent)
- Collection and transport workers: 22 (non-permanent)

The plan is the Action Plan for Improved Waste Management developed by the LPPE. The following ordinances have been enacted by the LPPE.

- 302/UDAA OFF 22/01/2013: Announcement on Prohibition to Outsider for Entering KM8 Disposal Site：
- No 27/LPB.Pro.Gov 17/01/2013: Luang Prabang Province Governor's
- Agreement on Committees and Secretary Nomination regarding tasks and roles for implementation of Health Care Waste Incinerator：

- No 575 /LPB.Dis.Gov 30/07/2013: Regulation of the Governor of Luang Prabang District on Transportation fee and Disposal fee for Infectious Waste from Hospital and Public Health Places in Luang Prabang District：
- No.159/DOH.LPB 05/01/2014: Regulation on HCWM from Healthcare Facilities in LPB

4.4.4 Technical system

Based on the answers to the questionnaire, the waste generation, storage / discharge, collection / transportation, recycling, intermediate treatment, and final disposal were summarised as follows.

The answers to the questionnaire on waste generation and composition are taken from the LPPE survey (conducted in 2013-14), and no new survey has been conducted since the LPPE. The daily waste generation per capita given in the LPPE is 0.7 kg/day/person. The waste composition is as follows.

- Organic matter: 39%
- Textiles: 4%
- Wood: 30%
- Metal: 1%
- Paper: 6%
- Rubber: 1%
- Plastics: 8%
- Fibre reinforced concrete: 4%
- Glass: 2%
- Others: 5%

Regarding storage and discharge, general waste is basically collected door-to-door, although some containers provided by the LPPE pilot project are used. Sorting at source may also be carried out for recycling under the LPPE pilot project. Items to be sorted include plastic bottles, glass bottles, metals, paper and cans, which are temporarily stored in separate collection yards.

Figure 4-31: Photo of waste bins in the city, separated into recyclables and general waste

Regarding collection and transportation, according to the answers to the questionnaire, the waste collection services in LPB collects 8,885 households by private contractors and 4,391 households by the USO. Although the population and area of collection were not answered, it is stated that collection is carried out in 84 villages. The USO has three types of waste collection

vehicles (compactor trucks): 5 m^3, 8 m^3 and 10 m^3. Waste collection in LPB is carried out during the night (from 21:00) in urban areas and during the day in rural areas. The fee of waste collection service for households is 20,000 kip/month, and for hotels and restaurants it is 100,000-200,000 kip/month. There are no transfer stations and the waste is taken directly to the final disposal site. There is no information available on street cleaning.

In LPB, there is one recycler of waste paper in Namthuam Village, Nambak District. The collected paper is used as a raw material to be added to fibre cement, which is used to make roofing sheets. As this company was not registered, data on the volume of waste paper handled was not available.

As an intermediate treatment, off-site composting has been implemented continuously since LPPE, but no data on the amount of waste treated or produced is available.

LPB's final disposal site is KM8 Disposal site located in Ban Lakped Village. The construction of the open dumping final disposal site was funded by NORAD in 2001 and extended and upgraded by LPPE in 2011-2012. The final disposal plant includes a sewage sludge storage pit. A weigh bridge has been installed in the final disposal site and is currently being used. According to the interview, USO answered that the daily delivery volume is 90-100 ton/day. The fee of acceptance at the final disposal site is 60 kip/kg for the public and 20 kip/kg for companies.

There are currently 25 waste pickers at the disposal site, who are registered. Waste pickers collect items such as plastic bottles, glass bottles, metal and paper.

Regarding the amount of hazardous waste generated, the records of the provincial hospital give an indication of waste originating from hospitals, which was 30 kg/month in 2015 and 90 kg/month in 2019. Medical waste was previously incinerated, but due to a breakdown of the incinerator, it is now being delivered to the final disposal site without treatment. No data are available for industrial waste and waste of industrial origin.

USO answered that illegal dumping often takes place along roads in the suburbs. If USO identifies the illegal dumper, a fine of between 100,000 and 1,000,000 kip can be imposed. The dumpers are also responsible for the clean-up.

They also answered that there were no problems with cross-border waste.

The waste flow described here is summarized in the figure below.

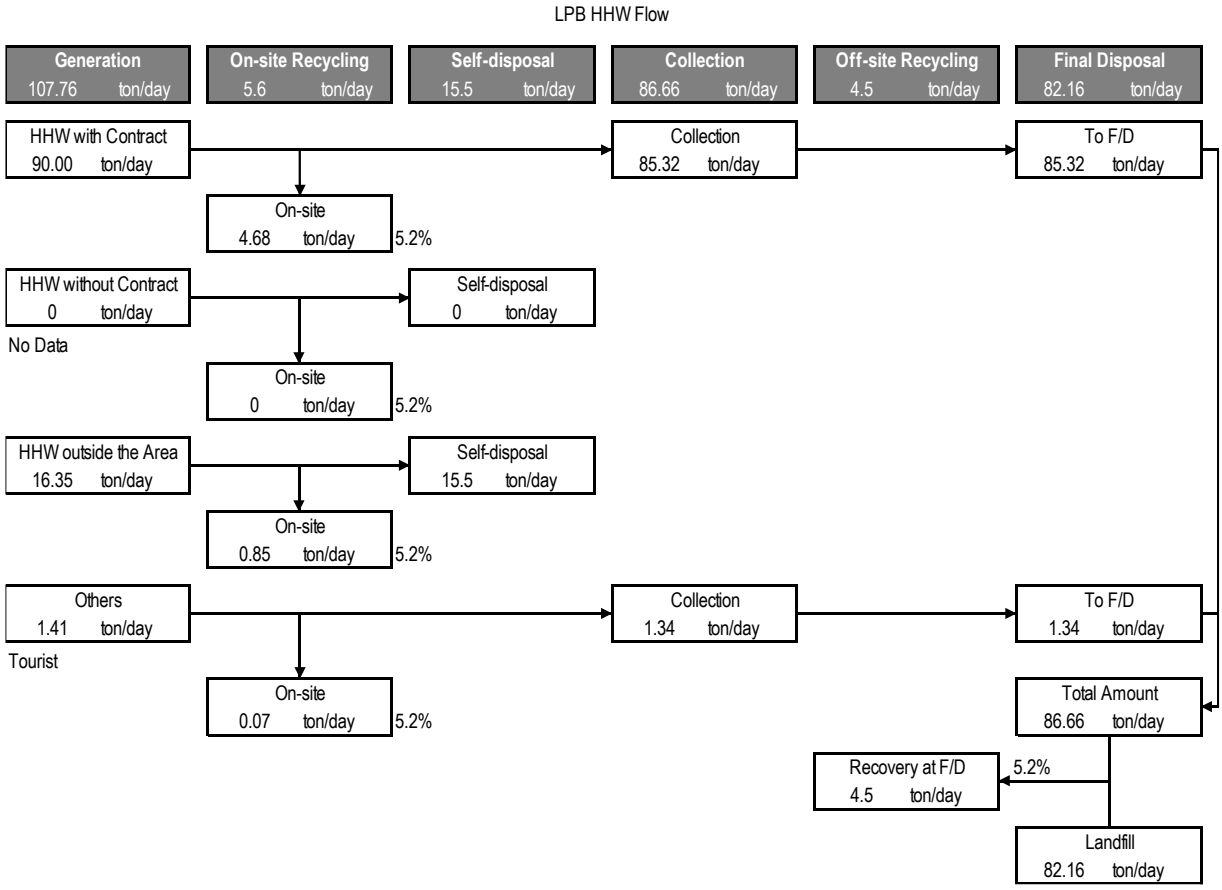


Figure 4-32: Waste flow in LPB

Since the information is insufficient and the data are inconsistent, the waste flow was created under the following conditions.

- The amount of general waste contracted is 45.81 tons / day by multiplying the urban population of 66,781 (2015) by waste generation per capita of 0.686 kg / person / day.
- The amount of waste generated from the hospital is unknown, but it is set to 0.21 ton / day, referring to the case of Vang Vieng.
- General waste from outside the collection area s set as 16.35 tons / day by multiplying 23,532 people (2015) in the suburbs (roadside) by waste generation amount per capita of 0.695 kg / person / day. In addition, all general waste generated shall be treated in-house or recycled.
- The LPB was visited by 755,019 tourists in 2018. The amount of waste for visitors is set as 1.41 tons / day by multiplying waste generation per capita of 0.686 kg / person / day.
- Due to lack of data on the amount of waste recycled in LPB, the recycling rate of general households of 5.2% in the LPPE survey will be adopted.

4.4.5 Finance of USO

The budget for waste management to the USO is 130,000,000 kip/month (approx. 1.5 million yen). The income comes mainly from collection fees from contractors. Under normal circumstances, the income is expected to be between 130,000,000 and 140,000,000 kip/month, but due to the impact of COVID-19, the income is around 50,000,000 kip/month.

According to interviews with USO staff, expenditure is equal to income and there is a chronic shortfall in the budget. The operation is financed on a self-financing basis, with no central government funding.

4.4.6 Environmental education and activities

The volunteer group "Trash Idol LPB" organises monthly clean-ups, with the help of USO and PONRE. They post their activities on Facebook[57].

4.4.7 Cooperation of donors

Currently, no donor activities are being undertaken. In the past, donor cooperation for waste management capacity building has been provided by ADB, JICA and GIZ. JICA's LPPE is described later in Chapter 5; GIZ cooperation has been to establish a pilot school for waste segregation.

Under the ADB-supported Livable Cities Project (Lao Livable Cities Program), a waste amount quantity survey was conducted. Details are given in Section 7.3.2.

4.4.8 Impact of COVID-19

As of October 2020, due to COVID-19, there are no more international visitors and many hotels and restaurants are temporarily closed.

For general and medical waste, masks and medical clothing with a risk of COVID-19 infection are collected separately in yellow plastic containers and incinerated.

4.4.9 Waste management challenges

Basically, the areas where the USO and private companies provide collection services are regularly collected to ensure a hygienic environment. The collected waste is transported to a final disposal site for treatment.

A unique feature of waste management in LPB is that weigh bridges, which the other three regional cities do not have, have been installed and are in operation by LPPE. However, it was not possible to produce an accurate waste flow using the data available in this study. The reasons for this are given below.

We first examined the various figures given in the responses: the USO answered that the population was 97,000 and that the per capita waste generation amount was 0.7 kg/day/person. In that case, the daily generation will be about 68 tons. On the other hand, the amount of waste brought into the final disposal site is 80 to 90 tons per day. This means that more waste than has been discharged has been brought into the disposal site. If we assume that the amount of waste brought in is 80 tons, the generation per capita would be 0.824 kg, which is within the expected range when compared to 0.7 kg. In this case, however, the collection rate would be 100% of the population. The response states that the collection area is 84 out of 114 villages and the number of households contracted by all private sector and the USO is 13,276. In both figures, the collection rate is not 100%. A weigh bridge has been installed at the final disposal site through grant aid. In the questionnaire, the respondents stated that the weigh bridge is in good condition, and we believe that the equipment itself has not broken down. However, it is difficult to think that waste exceeding the population size has been brought into the final disposal site, and the collection rate is not 100%, so we think that there is a problem in data management.

As mentioned above, regarding information on collection, there is no data on the collection area or the collection population. On the other hand, they have data on the number of contracts collected. This is highly reliable data, considering that fees are collected for each household. However, as was observed in other local cities described below, households, markets and shops are counted as one contract, regardless of the amount of waste they produce. Therefore, it was

[57] https://www.facebook.com/165318674289453/posts/737022217119093/ (Accessed on 30th Nov. 2020)

difficult to quantify the current situation of waste management by the number of contracts alone.

Therefore, in this study, as mentioned earlier, the waste flow was created by setting up data and estimated conditions from other cities, but it is only a rough indication of the waste flow.

With regard to data, data on generation are based on a waste quantity and quality survey conducted in 2012. As tourism is one of the major industries in LPB, as in Vang Vieng, the figures obtained in 2012 reflect this situation. Therefore, if there is no significant change in the industrial pattern and social structure, it is unlikely that there is a need to conduct another waste quality and quality survey and update the data. On the other hand, regarding the management of data obtained from the weigh bridge of the final disposal site, it is necessary to verify the management method because it is inconsistent in creating the waste flow. If the ability to manage weigh bridge data can be improved, it will be possible to grasp the waste flow and appropriately improve the problems.

Next, regarding medical waste, according to the responses, they do not own proper treatment methods for medical waste and many hospitals and clinics manage medical waste inappropriately. A pilot project for the separate collection and treatment of medical waste has been implemented in LPP, as described below. Details are given in the next chapter, but the lack of functioning incinerators is thought to be one of the reasons for this.

It is also clear that, as in other regional cities, the modernisation of lifestyles has led to the widespread use of plastic products, which has led to an increase in plastic waste in all areas. It is necessary to understand the current state of waste management not only in collected areas but also in uncollected areas.

4.5 Xayaboury District, Xayaboury Province

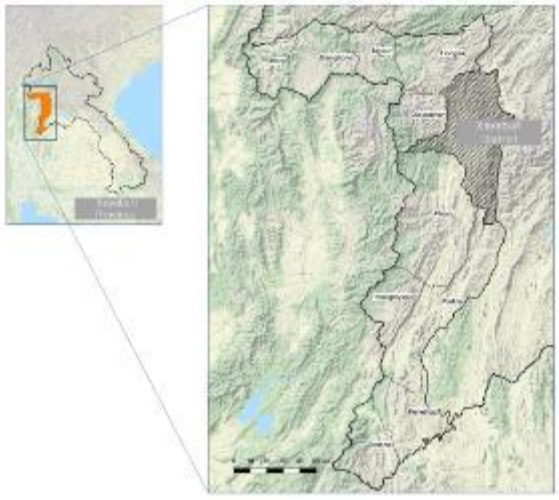
4.5.1 Characteristics of Xayaboury District and province

The population of Xayaboury Province is about 380,000 and it consists of 11 districts, and the capital of the province is Xayaboury in Xayaboury District (XYB).

Table 4-13: Statistical population data in XYB in 2015

District	Total	Urban	Rural with road	Rural without road	Number of villages	Number of households
Xayaboury	75,737	31,842	43,309	586	77	14,200
Khop	20,546	5,054	15,492	-	27	4,100
Hongsa	28,048	17,481	10,227	340	34	5,600
Ngeun	17,589	8,259	9,330	-	22	3,500
Xienghone	32,562	12,479	20,083	-	42	6,500
Phiang	57,433	34,442	22,653	338	51	11,000
Paklai	68,215	23,039	44,039	1,137	69	14,500
Kenethao	39,900	10,858	29,042	-	47	8,600
Botene	17,539	5,388	12,151		29	3,600
Thongmyxay	8,572	2,242	6,330		13	2,100
Xaysathan	15,235	1,074	14,161		21	2,800
Total	381,376	152,158	226,817	2,401	432	76700

(Source: Results of the Population and Housing Census 2015 and Provisional Report of the 4th Lao Population and Housing Census 2015)



(Source: Open Street Map and The Humanitarian Data Exchange/ United Nations Office for the Coordination of Humanitarian Affairs)

Figure 4-33: Location map of XYB

According to the tourism statistics data shown in the table below, 160,409 domestic and foreign tourists visited the city in 2018.

Table 4-14: Changes of number of tourists in XYB

Year	Laos	Foreigners	Total
2014	85,598	96,131	181,729
2015	86,150	99,928	186,078
2016	9,892	197,628	207,520
2017	15,928	218,995	234,923
2018	42,229	118,180	160,409
合計	239,797	730,862	970,659

(Source：Statistical Report on Tourism in Laos (2018))

4.5.2 Method of the survey

In this survey, a questionnaire was used to investigate the current status of waste management. As with the LPB, the questionnaire consists of two parts (see 4.4.2 for details)

4.5.3 Organizations and institutions

Waste management at XYB is carried out by UDAA.

According to the interviews, the organisational structure of waste management in the UDAA as of October 2020 is as follows.

- Head of UDAA
- Office supervisor
- Person in charge of the disposal site
- Number of workers: 4 (permanent staff)
- Specialist technician: not available
- Technicians: 2 (permanent staff)
- Collection and transport drivers: 9 (non-permanent)
- Collection and transport workers: 10 (non-permanent)

The XYB has the following regulations on waste management.

- Decree from Provincial Governor (Agreement on the City Management and Administration in Xayaboury) (Admitted on 10 December 2018)
- No. 1059/XYB.Pro.Gov 02/08/2013: Provision on Revenue and Fund to be used by Urban Development and Administration Authority (UDAA) of Xayaboury District (Established by LPPE)
- 121/UDAA 08/05/2013: Temporary Regulation on Management and Monitoring KM9 Disposal Site (Established by LPPE)
- No. 299 /XYB.PH 13/08/2013: Minutes of Meeting on HCWM at Provincial Hospital (Established by LPPE)

In addition to the action plans set out in the LPPE, the following plans for waste management have been developed.

- Regarding Provincial Social and Economic Development Plan: Particularly in City Management and Administration in Xayaboury and Promoting the Social Management (Admitted on 10 December 2018)

PONRE XYB is a branch organization of MONRE, which monitors various developments in accordance with the regulations established by MONRE. PONRE plans to formulate a waste management plan for each district, but there is no information on the timing and content of the formulation.

Illegal dumping occurs frequently along the roads in the suburbs, but there are no rules on penalties. In addition, PONRE organises a monthly awareness campaign to encourage residents to participate in waste collection activities.

4.5.4 Technical system

Based on the answers to the questionnaire, the waste generation, storage / discharge, collection / transportation, recycling, intermediate treatment, and final disposal were summarised as follows.

First, regarding the amount of waste generated, the response quotes the data from the LPPE survey (conducted in 2013), and the daily amount of waste generated per person is 0.6 kg. Since then, the data has not been updated. In addition, composting at home, which was one of the LPPE pilot projects, is no longer being implemented. The reason for this is that households often use kitchen food as livestock feed.

Regarding storage and discharge, some plastic bottles, glass bottles, metals, papers, and cans are separately discharged by the pilot project of LPPE. In addition, while containers are being installed, waste is still being discharged to the curb side.

The population of waste collection services at XYB is 45,165, but no information was available on the collection area in this survey. Waste collection is carried out daily by UDAA and private operators. There are two types of collection and transport vehicles: compactor trucks (10 m^3) and dump trucks (10 m3). The collection fee is 10,000 kip per capita per month. The collected waste is taken directly to the final disposal site.

With regard to recycling, there is no official recycling project in XYB. In addition, no information on recycling companies was available during this survey.

The final disposal site is the state-owned KM9 disposal site (Ban Nonesavang), built in 2005, which is an open dumping landfill. The final disposal site has a sewage sludge treatment tank, an HCW pit and an incineration facility for HCW on site. However, neither of these facilities is currently in use, as the HCW pit is leaking and the incineration facility is out of order. No weigh bridges have been installed. In terms of the amount of waste brought in, the company

quoted a 2017 survey and answered 39 tons/day. The disposal fee is 300,000 kip / month for household waste collected by private companies and 3,000,000 kip / month for sewage. There are 10 waste pickers in the disposal site, all of whom are registered. Items collected by waste pickers are plastic bottles, glass bottles, metals, papers, cans, etc.

In addition, hazardous waste is carried into the final disposal site in the same way as general waste and is not properly managed. Statistical information on hazardous waste has not been collected, and the amount generated is unknown.

Medical waste is also not properly managed and is being delivered untreated to final disposal sites.

The waste flow described here is summarized in the figure below.

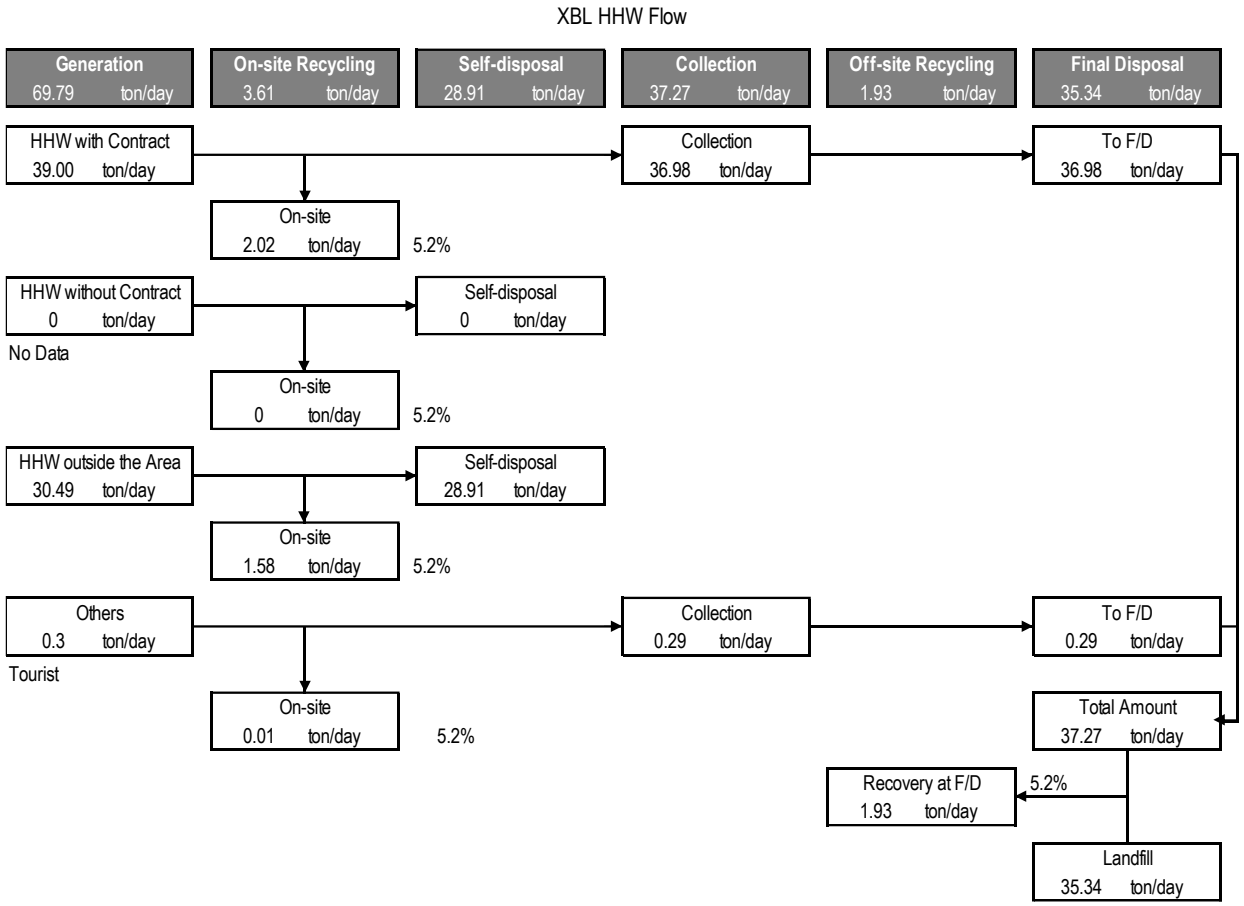


Figure 4-34: Waste flow in XYB

Since the information is insufficient and the data are inconsistent, the waste flow was created under the following conditions.

- The contracted general waste collection amount is 21.84 tons/day, which is calculated by multiplying the urban population of 31,842 (2015) by waste generation per capita of 0.686 kg/person/day.
- The amount of garbage generated from markets, hotels and restaurants is unknown. Therefore, the amount of these wastes is set as the total amount collected 39 tons / day minus the amount collected from ordinary households and hospitals.
- The amount of waste generated from the hospital is unknown. Therefore, this was assumed to be 0.21 ton / day in reference to Vang Vieng.
- General waste from outside the collection area shall be multiplied by 43,309 suburban (roadside) and 586 suburban (without road) people (2015) multiplied by waste

generation amount per capita of 0.695 kg/person/day, which is 30.49 ton/day. In addition, all general waste generated is deemed self-treated or recycled.

- XYB was visited by 160,409 tourists in 2018. Their waste generation is assumed to be 0.3 ton/day by multiplying the number of tourists by the waste generation amount per capita of 0.686 kg/person/day.
- Due to the lack of data on the amount of recycling collected for XYB, we adopt the recycling rate of 5.2% for general households in the LPPE survey.

4.5.5 Finance of UDAA

The budget for UDAA 2019 at XYB was 1,057,425,925 kip (approximately 12 million yen). Of this, the income from waste management is 1,057,325,925 kip, and the expenditure is 1,068,900,000 kip (about 12.1 million yen), which is a deficit balance.

The operation is financed on a self-financing basis, with no central government funding.

4.5.6 Impact of COVID-19

School sorting activities had been conducted in only four schools, but due to the impact of COVID-19, they have been temporarily suspended because the recycling companies are no longer buying them.

COVID-19 related wastes are increasing. Both general and medical wastes are collected separately and treated in the final disposal site.

4.5.7 Cooperation of donors

Donor cooperation activities are only for LPPE.

4.5.8 Waste management challenges

First, we examine the figures presented in the responses to the questionnaire. The collection rate is 57% of the population. This is reasonable because the rate was 43.5% in 2013, when the grant aid project plan was formulated, and 58% in 2018, when the evaluation survey was conducted. On the other hand, the generation amount is about 48 tons, assuming that the generation amount per person per day is 0.6 kg and the population is 79,189. The amount of waste collected is about 27 tons, based on a population of 45,165. However, the amount of waste delivered to the disposal site is reported to be 39 tons per day. It means that 12 tons of waste per day, separate from the collection service, is being delivered to the final disposal site. This amount is roughly half of the total amount collected. It is unlikely that this amount of waste is brought in by means other than collection services. Therefore, it is highly likely that the data on the amount of waste delivered to the final disposal site is inaccurate. It is not possible to accurately understand the waste flow using such data. In this study, as mentioned above, we created a waste flow by setting data from other cities and estimated conditions. Therefore, this is only a rough indication of the waste flow and cannot be a tool for proper waste management.

According to the responses to the questionnaire, the KM9 final disposal site in XYB is nearing the end of its estimated lifespan and it is necessary to expand or build a new disposal facility. It is necessary to know the exact amount of landfill to be carried into the disposal site in order to accurately calculate the remaining years and to formulate plans for expansion and new disposal sites.

As in Vang Vieng, the introduction of a weigh bridge is an efficient way of collecting data to determine the amount of waste delivered to the final disposal site. However, estimates can also be made from the collection vehicles and their operation status. The establishment of such a data collection and management system will be the subject of cooperation.

The response to the questionnaire states that the management of HCW is a problem. Since HCW is not properly disposed of at the hospital and are delivered to the disposal site, there is a need for improvement.

As in other cities, we believe it is necessary to understand the current status of waste management in uncollected areas.

5 Projects Cooperated by JICA in the Field of Solid Waste Management

This chapter summarizes the following past projects cooperated by JICA: a technical cooperation project the " Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration Environmental Management Component (LPPE)" (August 2011-October 2015), which was carried out by MONRE as the main counterpart; a grant aid project of " The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities" (April 2014-January 2016); a private collaboration project (healthcare waste treatment) in Vientiane and grassroots cooperation in recycling.

5.1 LPPE

LPPE was conducted for four years from August 2011 to October 2015. The evaluation at the end of the project was carried out in March 2015. This time, we conducted a survey on the status of environmental management after 2015 in the project cites of Vientiane, Luang Prabang, and Xayaboury.

First Year: August 2011-March 2012

Second Year: April 2012-September 2013

Third Year: October-February 2015

Fourth year: March 2015-October 2015

5.1.1 Vientiane (VTE)

In Vientiane, the four strategies aimed at by the LPPE, which are (1) “3Rs” are promoted, (2) Waste collection system is improved, (3) Final disposal system is improved, and (4) healthcare waste management (HCWM). The current situation as of March 2020 is summarized as follows. As each of LPPE’s pilot project has the numbers (VTE 1.1.1, etc.)[58], it is also used in this report. project completion report. Vientiane is referred to as VTE, Luang Prabang as LPB, and Xayaboury as SYB.

a. Promotion of 3R

VTE1.1.1 Reduction of kitchen waste and garden waste at households

Project Purpose and Summary	To reduce household’s organic waste such as kitchen and garden waste at generation sources To promote home composting at the pilot households in the pilot villages (Nonesavang, Hongsupharp, Nonesavanh, Amone) and to reduce the amount of discharged waste
Evaluation and Achievement as of March 2015	79% of the households continued on-site composting. Activities have been monitored by C/P continuously.
Current situation as of March 2020	The main CP of this pilot project was VDONRE (currently DONRE/ PONRE). Activities related to waste separation and recyclable item collection were carried out by Kyoto City and the Global Environment Centre (GEC). This was JICA grassroots technical cooperation project "Citizen's collaborative waste effective utilization system construction

[58] Also see JICA (2015) *the Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration Environmental Management Component Project Completion Report Main Report.* (https://openjicareport.jica.go.jp/pdf/12245338.pdf)

	cooperation project in the capital Vientiane City" (2015) From November 2018 to March 2018 (see 5.5 below for details). It was conducted in 1 Village each in the Chanthabury, Xaysetha, Sikhotabong and Sisatanak districts.

VTE1.1.3 Avoidance of the use of excess packages such as plastic shopping bags

Project Purpose and Summary	To promote households and stalls not to use unnecessary plastic bags and reduce the number of plastic bags discharged as waste. To deliver eco-baskets to the residents in pilot villages (Nonesavang, Hongsupharp, Nonesavanh, Amone) and promote their use instead of plastic bags when they go shopping. In addition, stall staff at the pilot market (Houakhua) is encouraged not to excessively give plastic bags to their customers.
Evaluation and Achievement as of March 2015	79% of the households tried to reduce plastic bag use. 67% of the stalls tried to reduce plastic bag use.
Current situation as of March 2020	The main CP of this pilot project was VDONRE (currently DONRE/ PONRE). As a "Clean Vientiane" project, DONRE/PONRE monitors plastic shopping bag reduction activities in supermarkets once a week.

b. Waste collection system is improved.

VTE 2.1.1/2.1.2 Primary collection system

Project Purpose and Summary	To provide an opportunity for the households to sign contracts of waste collection service. To make waste collection service more efficient. To make a waste discharge rule more convenient for people. To prevent garbage from being littered and to keep the collection points clean. To divert recyclables from the waste collection system. Target Villages: 4 villages in Xaysettha district, 2 villages in Sisathanak district
Evaluation and Achievement as of March 2015	It was implemented with VUDAA's initiative in existing 4 villages in Xaysetta because the PP could not get cooperation from new 2 villages in Sisathanak district.
Current situation as of March 2020	VCOMS is leveraging the insights gained from this pilot project.

VTE 2.2.1 Waste collection service planning

Project Purpose and Summary	To clarify the situation of existing waste collection service in 2013 □ Based on the situation in 2013, the plan for waste collection service in 2020 is formulated.
Evaluation and Achievement as of March 2015	The draft future plan proposed in this project was used as basic data by the grant aid project when they made a plan for provision of equipment for waste collection. A GIS software called "QGIS" was used. As this is free, it was downloaded to the computers of VUDAA. Therefore, some VUDAA staff was willing to learn more about GIS.
Current situation as of March 2020	VCOMS is continuously using GIS and updates the information from time to time. As of 2019, out of 173,840 households in Vientiane, 49,509 contracted households (27%).

VTE 2.2.1/2.2.2 Waste collection service planning/ Increase of collection service contract rate

Project Purpose and Summary	To clarify the situation of existing waste collection service in 2013. Based on the situation in 2013, the plan for waste collection service in 2020 was formulated. To increase the households with collection service contracts.
Evaluation and Achievement as of March 2015	The draft future plan proposed in this project was used as basic data by the grant aid project when they made a plan for provision of equipment for waste collection. A GIS software called "QGIS" was used. As this is free, it was downloaded to the computers of VUDAA. Therefore, some VUDAA staff was willing to learn more about GIS. Private companies continued to play central role and try to increase the contract rate cooperating with the villages
Current situation as of March 2020	VCOMS is continuously using GIS and updates the information from time to time. As of 2019, out of 173,840 households in Vientiane, 49,509 contracted households (27%).

c. Final disposal system is improved.

VTE 3.1.1 Proper management of existing final disposal site

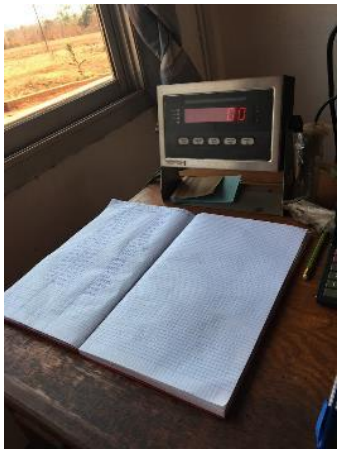
Project Purpose and Summary	The final disposal system was improved to mitigate adverse impacts on the surrounding area, and the final disposal site is managed properly to dispose of waste.
Evaluation and Achievement as of March 2015	Waste disposal and data management are properly operated. VUDAA has been making every effort to appropriately operate the site. UDAA has been securing budget from the capital to operate the heavy equipment that is used for soil covering. The draft operation plan was continuously implemented and examined at the improved KM32 final disposal site since 2012. The operation plan was finalized in August 2015 by VUDAA
Current situation as of March 2020	VCOMS is leveraging the insights gained from this pilot project.


Interview at KM32


Trucks at KM32


Truck scale/weigh bridge at KM32


Record and data of collection vehicle


Weigh scale and record book


KM32 disposal site (1)


KM32 disposal site (2)

Figure 5-1: Operation of KM32 Final Disposal Site

VTE 3.1.2 Proper management of waste pickers and improvement of their working conditions

Project Purpose and Summary	The proper management system of the waste pickers is established to improve their working conditions.
Evaluation and Achievement as of March 2015	A management plan of waste pickers was formulated. The waste pickers working conditions was improved in accordance with the management plan. The management of waste pickers is monitored by waste pickers meeting
Current situation as of March 2020	VCOMS is leveraging the insights gained from this pilot project.

A operation vehicle is doing landfill work near the waste picker collecting recyclable items at KM32.

Collected materials at KM32(1)

Collected materials at KM32(2)

Collected PET bottles at KM32 Recycling centre

Weighing the collected items at KM32 Recycling centre

Caluclating the value of collected materials

Figure 5-2: Waste Pickers' Activities at KM32

VTE 3.2.1 Development and management of the treatment facility for the sludge from septic tanks

Project Purpose and Summary	The proper management system of the sludge from septic tanks is developed to mitigate impacts to surrounding aquatic environment.
Evaluation and Achievement as of March 2015	PP purpose was achieved.
Current situation as of March 2020	This treatment facility is not currently in use as a new treatment facility has been installed near the transfer station in Nabai village. VCOMS is leveraging the insights gained from this pilot project for the new facility.

d. Health care waste management is improved.

VTE4.1.1/4.2.1 HCW collection system establishment/ HCW treatment and disposal system establishment

Project Purpose and Summary	The PP for HCW Collection System Establishment aims to establish a separate collection and transportation system for HCW generated in main hospitals in VTE and its monitoring system. The PP for HCW Treatment and Disposal System Establishment aims to establish a treatment and disposal system for the separately collected HCW generated from main hospitals in VTE and its monitoring system. Through these projects, infectious HCW discharged from seven main hospitals in VTE is separately collected and incinerated.
Evaluation and Achievement as of March 2015	Instruction, monitoring and control of MOH/DHHP have been established to improve HCWM in VTE. Legal tools necessary for the improvement of HCWM in VTE have been developing with a lead of the MOH. In addition to the target seven hospitals VUDAA is providing infectious HCWM separate collection, incineration and disposal services to other six medical institutions which were out of the scope of PP. This means the HCWM Plan has been implemented more than the targets of year 2015.
Current situation as of March 2020	VCOMS is continuing its activities. The number of healthcare institutions is 17. Healthcare waste that cannot be incinerated is disposed of in the pit. The leachate is not treated. New incinerator was installed adjacent to the one by this PP as a JICA's verification survey project. Currently, two units incinerators are in operation (Photos 5.16 and 5.17).

Incinerator for healthcare waste provided by LPPE

Incinerator for healthcare waste installed as a JICA's verification survey project.

Healthcare waste to be incinerated

Dustbox in the premises of insinerators.

Figure 5-3: Healthcare Waste Treatment at KM32

VTE 5.1.1 Consensus building among stakeholders

Project Purpose and Summary	To improve SWM in VTE Capital a lot of pilot projects (PPs) have been conducted based on the strategies of the A/P, i.e. Promotion of 3Rs, Improvement of Collection System, Improvement of Final Disposal System and Improvement of Healthcare Waste Management. The purpose of this PP is to codify the responsibilities of each stakeholder regarding the PPs for SWM conducted in VTE Capital and build consensus among them. The PP has clarified the responsibilities of each stakeholder necessary for the PPs implementation and built consensus among them. When consensus was made, the PP tried to codify the contents of the consensus as much as possible in various forms from legislative documents to leaflets for distribution.
Evaluation and Achievement as of March 2015	Through the implementation of various PPs coordination system among MONRE, MOH and MPWT of central government and VTE Capital, District and Village of local government, and Residents have been established. It was recommended that “Basic Laws on SWM” should be established as soon as possible by the lead of MONRE. The coordination system among relevant organizations was established to enforce the regulations on the improvement of HCWM.
Current situation as of March 2020	The MOH Ministerial decision on HCWM came into effect. The Basic law for waste disposal has not been enacted.

VTE 5.2.1 Financial system improvement

Project Purpose and Summary	The purpose of this PP is to improve the financial system necessary for SWM improvement through the implementation of the PPs under the strategies of the A/P, i.e. Promotion of 3Rs, Improvement of Collection System, Improvement of Final Disposal System and Improvement of Healthcare Waste Management.
Evaluation and Achievement as of March 2015	Through the implementation of various PPs, needs of financial system improvement plan with fair financial burden for each stakeholder on improvement of SWM became clear.
Current situation as of March 2020	VCOMS is leveraging the insights gained from this pilot project.

5.1.2 Luang Prabang (LPB)

The interview survey was conducted to know the current waste management. （Listed in 4.4 LPB） This chapter, summarizes the answers regarding the Pilot Projects (PPs) implemented in LPPE to understand the problem.

a. 3Rs Promotion

The answers to the 3Rs Promotion PPs are as follows.

LPB1.1.1 Reduction of organic waste at households

Project content and goal	Domestic disposal of organic waste by introducing household compost and reduction of household waste emissions at PP target villages (Vat Thaat, B. Pong Vane, B. Pakham)
Evaluation result at the end of the project	As of March 2015, 66% of households continued.
After October 2020	Still continue the activity.

	Earthworm compost is being implemented in three households. （The compost method using earthworms does not easily generate stench and can feed earthworms and liquid fertilizer to livestock） Plan to continue to carry out activities in the future. Need cooperation for equipment provision.

LPB1.1.2 Recyclable waste separation at generation sources（School recycling）

Project content and goal	Separate the discharged recyclable waste by the source and promote recycling at PPs target school (combined junior high and high school, Pongkham junior high and high school)
Evaluation result at the end of the project	As of June 2015, 100% of classes are doing separating activities.
After October 2020	Still continue the activity. Activities are being carried out at 2 schools. Plan to continue to carry out activities in the future. Hope Japan to support PP to establish green school activity.

LPB1.1.3 Avoidance of the use of excess packages such as plastic shopping bags

Eco basket promotion

Project content and goal	Households and shops refrain from using plastic shopping bags and reduce the amount of waste in plastic shopping bags. Distribute eco baskets and carried out activities to call for refraining from using plastic shopping bags at PPs target villages (VatThaat village, Pakham village, TaHeua market)
Evaluation result at the end of the project	As of March 2015, 55% of households tried to reduce plastic shopping bags and 81% of shops tried to reduce plastic shopping bags.
After October 2020	Still continue activity. Paper bags and baskets are widespread. Plan to carry out continuous activities in the future. Hope Japan to support paper bag promotion activities.

Eco bag promotion

Project content and goal	Tourists refrain from using plastic shopping bags and reduce the amount of waste in plastic shopping bags. Distribute eco bags and conducted activities to teach people how to use eco bags at PPs target place (LPB's hotel and guest house)
Evaluation result at the end of the project	As of March 2015, 21hotels and 9 guest houses participated in the activity.
After October 2020	Still continue the activity. Activities continue at all hotels and guest houses. Plan to carry out continuous activities in the future. Hope Japan to support paper bag promotion activities.

LPB1.1.4　Reduction of organic waste at hotels and restaurants

Project content and goal	Separate collection of kitchen waste discharged from hotels and restaurants and composted at the disposal site.
Evaluation result at the end of the project	As of March 2015, 8 restaurants and 22 hotels participated in the activity.
After October 2020	Still continue the activity. No data on currently active restaurants and hotels. Plan to carry out continuous activities in the future. Hope to support the promotion of PPs activities.

LPB1.1.1 Reduction of organic waste at households. As of March 2015, 66% of households used compost distributed to reduce the amount of waste.[59] In LPB1.1.1, 53 sets of compost barrels and earthworm compost equipment were distributed so as of March 2015, it was implemented in 35 households. In this survey, 3 households responded, so it is being implemented continuously, but it can be said that it is shrinking.

LPB1.1.2 Recyclable waste separation at generation sources（School recycling. There were two schools at the beginning, but it can be said that the project is being implemented continuously.

LPB1.1.3 Avoidance of the use of excess packages such as plastic shopping bags and LPB1.1.4 Reduction of organic waste at hotels and restaurants is continuing, but there are no data. These are targeted at commercial facilities, and many facilities are closed due to the impact of COVID-19, so data may not be available.

b.　Improvement of Collection System

The answers to the "improvement of collection system" PPs are as follows.

LPB2.1.1/2.1.2　Primary collection system

Project content and goal	Increase in collection contract rate and the efficiency of waste collection services. For the households who live along streets inaccessible for the waste collection vehicles, distribute waste containers, organize a waste management group for each household and managed by the residents. In these groups, recyclable wastes were separate collection and sold to broker. Phase I: B. Huaxieng, B. Thadbosoth, B. Apay Phase II: B. Viengmay, B. Naviengkham, B. Viengsay, B. Thadbosoth
Season results and evaluation	As of April 2015, there was 90% cooperation rate of target households of the primary collection system and 89% of households separated recyclable waste.
After October 2020	Two groups increased to work on improvement. The current cooperating household rate is 71% and the household rate of separating recyclable waste is unknown. The provided waste container on casters(240L) is not currently in use. The reason is that the container is damaged and is too big and heavy. The activities of the primary collection system will continue. Each household needs a collection box. And hope to help provide lightweight containers.

[59] Japan International Cooperation Agency (JICA), Kokusai Kogyou Co., Ltd., CTI Engineering International Co., Ltd. (2015)" Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration Environmental Management Component Project Completion Report Supplement Book

LPB2.2.1 Waste collection service plan formulation

Project content and goal	Understand the current state of waste collection services at the time of 2013 and plan for waste collection services in 2020.
Evaluation result at the end of the project	Collection service provided in 69 out of 117 villages in 2013 and village-based coverage was 59%. The goal for 2020 is to provide collection services to 80 out of 117 villages and plan to increase village-based coverage to 68%.
After October 2020	Currently, there are 84 out of 117 villages and the village-based coverage was 72%. In the future, expand the waste collection facilities and improve the final disposal site. Request financial cooperation to improve the final disposal site.

LPB2.2.2 Waste collection with 5m3 container

Project content and goal	The conventional dump truck collection and 5m3 container were placed to expand the collection range. 10 5m3 containers, container production workshop, 1 lifting crane
Evaluation result at the end of the project	All 10 5m3 containers produced were installed in a large discharge engine.
After October 2020	All 10 containers are in operation. Plan to prepare the land to increase the number of containers. Request financial cooperation for this land creation.

LPB2.1.1/2.1.2 Primary collection system for the households who live along streets inaccessible by the waste collection vehicles. Provided 80 waste containers on casters(240L) are not currently in use. Like the answer, the problem is that the containers are too big. On the other hand, the containers are to be managed by a household group. If how to manage the containers in this group can be verified, an improvement can be found. In addition, it was reported that there is no data on separated emissions, and it is not possible to determine the current situation.

LPB2.2.1 Waste collection service plan formulation, the compactor truck provided by grant aid project is used to build a collection system in 84 villages that exceed the plan. And LPB2.2.2 Waste collection with $5m^3$ container, all as many containers as donated are in operation. Containers are repaired and manufactured at the provided container manufacturing workshops from time to time.

5m3 container in operation

Donated waste truck（grant aid project）

Figure 5-4: Waste Collection Equipment (LPB)

c. Improvement of final disposal system

The answers to the "improvement of final disposal system" PPs are as follows.

LPB3.1.1 Improvement of operation of final disposal site

Project content and goal	Implementation of improvement work on the existing KM8 final disposal site, formulation of operation plan, implementation of operation and maintenance, implementation of annual monitoring by MONRE・DONRE. Procurement of final disposal site maintenance equipment : 1 Excavator, 1 dump truck.
Evaluation result at the end of the project	The final disposal site operation plan was formulated, and was operated in accordance with the operational reforms, and monitoring was carried out once a year by the monitoring committee.
After October 2020	The activities are being carried out as planned. There was no record of the number of work environment monitoring conducted. It will maintain the final disposal site in future to be based on environmental regulation. Request financial cooperation for this project.

LPB3.1.2 Proper management of waste picker and improvement of work situation

Project content and goal	A management system was conducted to improve the working environment of waste picker at the existing final disposal site.
Evaluation result at the end of the project	The waste picker management and regulation plan were formulated in the final disposal site operation plan, and the working environment was improved. Regular meetings with waste pickers and work environment monitoring were conducted by UDAA.
After October 2020	The activities are being carried out as planned. There was no record of the number of work environment monitoring conducted. It will maintain the final disposal site in future to be based on environmental regulation. Request financial cooperation for this project.

LPB3.2.1 Development and management of the treatment facility for the sludge from septic tanks

Project content and goal	The goal was to establish an appropriate processing system and operation management system to properly dispose of collected sludge from septic tank.
Evaluation result at the end of the project	An operation plan for the sludge from septic tank was formulated, and the operation carried out according to the plan. And monitoring was carried out once a year by the monitoring committee.
After October 2020	The activities are being carried out as planned. There was no record of the number of monitoring conducted. Introduce a human waste treatment system like Thailand, which is environmentally and drivingly superior. Request business support for that purpose.

LPB3.1.1 Improvement of operation of final disposal site, there was no record of the number of work environment monitoring conducted. In the operation plan, the amount of waste carried in is to be measured on a truck scale, and it is necessary to confirm it together with these records.

LPB3.2.1 Development and management of the treatment facility for the sludge from septic tanks. It was reported that this was proceeding as planned, but did not specify the number of monitoring times. In the operation plan, the amount of waste is measured on a truck scale as well as the amount of waste, and it is necessary to check these records together.

Current status of truck scale

Current status of night-soil treatment facility

Figure 5-5: Current State of the Weighbridge and Night-soil Treatment Facility (LPB)

d. HCWM

The answers to the “HCWM” PPs are as follows.

LPB4.1.1 HCW collection system establishment
LPB4.2.1 HCW treatment and disposal system establishment

Project content and goal	Establish a separate collection and transportation system for HCW generated in major LPB medical institutions and its management system. PP target hospital （Provincial Hospital, Military Hospital, Chinese Hospital, International Chinese Hospital）
Evaluation result at the end of the project	HCW plan was formulated. Of the 4 target hospitals, separate collection, incineration, and disposal of infectious medical waste from International Chinese Hospital have not been realized.

After October 2020	Although it is being implemented, the incineration facility is out of order and has been suspended due to waiting for parts replacement. Of the 4 target hospitals, only Provincial Hospital is active. There is a plan to relocate the incineration facility to the final disposal site in the future, and request Japan for cooperation.

LPB4.1.1 HCW collection system establishment. It became clear that only Provincial Hospital is performing separate collection (Figure5-6, Top left). In addition, from the end of the PP, it was recognized that the cooperation with International Chinese Hospital was insufficient, but it was found that cooperation was not obtained even at this stage.

LPB4.2.1 HCW treatment and disposal system establishment. The provided incineration facility (Figure5-6, Top right) is out of order and is being improperly disposed of at the disposal site (Figure5-6, Bottom left). Since the provided HCW collection vehicle is in good condition, it is necessary to re-cooperate with the target hospitals, rebuild the separate collection system, and make the incineration facility operational.

HCW collection site at Provincial Hospital

HCW incinerator installed at Provincial Hospital is out of order

Inappropriate HCW management status at final disposal site

HCW collection vehicle provided by PP

Figure 5-6: Health-care Waste Treatment (LPB)

e. Construction of an institutional system that supports the above policies

The answers to the "Construction of an institutional system that supports the above policies" PPs are as follows.

LPB5.1.1 Consensus building among stakeholders

Project content and goal	The clarification of roles and responsibilities of the stakeholders of the PPs for four strategies of Action Plan (A/P) ①Promotion of 3Rs ②Improvement of collection system ③Improvement of final disposal site ④Improvement of healthcare Waste Management
Evaluation result at the end of the project	It was codified about the roles and responsibilities of the parties involved.
After October 2020	Expand the role and scope of activities of educational institutions such as schools regarding green education and waste separation activities. Request cooperation for equipment and knowledge necessary for activities.

LPB5.2.1 Financial System Improvement

Project content and goal	Make a financial improvement plan needed to improve LPB waste treatment.
Evaluation result at the end of the project	Financial improvement proposal was formulated and became a legal document.
After October 2020	Therefore, it carries out legal document. Request cooperation for equipment and software to promote the electronic system of financial management.

LPB5.1.1 Consensus building among stakeholders, the role is codified at the end of the PP. However, regarding the effectiveness, especially the items related to HCWM, the problems mentioned above have occurred, and a structure that can guarantee effectiveness is required. On the other hand, it has not been confirmed whether the documents have been changed due to the conversion of UDAA to USO.

LPB5.2.1 Financial System Improvement, as stated in 4.4.5 finance, the budget is insufficient, although it is well-balanced with spending, and the collection area has expanded beyond the plan, that there is no problem with the operation. USO is basically a self-supporting organization, the issue is how to secure the budget to cover new capital investment, such as expansion of disposal sites, further expansion of collection areas, and response to HCW issues.

5.1.3 Xayaboury (XYB)

An interview survey was carried out to know the current waste management. （Listed in 4.5 XYB） In this chapter, summarize the answers regarding the Pilot Project (PP) implemented in LPPE and understand the problem.

a. 3Rs Promotion

The answers to the 3Rs Promotion PPs are as follows.

XYB1.1.1 Reduction of organic waste at households

Project content and goal	Domestic disposal of organic waste by introducing household compost and reduction of household waste emissions at PP target villages (Natonoi, Thin, Phapoon, Boung)
Evaluation result at the end of the project	As of March 2015, 52% of households continued.
After October 2020	Stop the activity. Kitchen waste is used as food for livestock, and odor is a problem. There are no plans for the future.

XYB 1.1.2 Recyclable waste separation at generation sources（School recycling）

Project content and goal	Separate the discharged recyclable waste by the source and promote recycling at PP target school (Xaiyaboury junior high and high school, Mittaphab junior high school)
Evaluation result at the end of the project	As of June 2015, 100% of classes are doing separating activities.
After October 2020	The activity is being carried out at 3 schools, but it is currently suspended due to the impact of COVID-19. The plan is to expand stock yard at schools and develop to other schools and sectors. Request financial cooperation for this activity.

XYB 1.1.3 Avoidance of the use of excess packages such as plastic shopping bags

Project content and goal	Households and shops refrain from using plastic shopping bags and reduce the amount of waste in plastic shopping bags. Distribute eco baskets and carried out activities to call for refraining from using plastic shopping bags at PP target villages (VatThaat village, Pakham village, TaHeua market)
Evaluation result at the end of the project	As of March 2015, 79% of households and 40% of shops tried to reduce plastic shopping bags.
After October 2020	The activity has been suspended. The reason for the cancellation is the inconvenience of not being able to use the plastic bag, and a point that they do not always carry a basket. UDAA is conducting dissemination and enlightenment activities on the radio, and requests financial cooperation.

XYB1.1.1 Reduction of organic waste at households, on-site compost equipment was provided to 394 households. As of March 2015, continued in about 180 households, but is now suspended. One of the reasons is the generation of odour and the priority of using it as feed for livestock. It is unlikely that the odour of kitchen waste will be a problem in an environment where livestock can be bred, so organic waste generated from the kitchen may have been used as food for livestock even before the project started. It has described the sorting of food waste behind restaurants in Pek District, but it is possible that kitchen waste is already somehow widely used in local cities. On-site compost is one means of reducing the amount of organic waste at the source, but competition with other uses should be carefully considered.

Figure 5-7: Example of Separation of Organic Waste

XYB 1.1.2 Recyclable waste separation at generation sources（School recycling）is being carried out continuously, but XYB 1.1.3 Avoidance of the use of excess packages such as plastic shopping bags is being suspended because the customer's understanding has not been acquired.

b. Improvement of Collection System

The answers to the improvement of collection system PPs are as follows.

XYB 2.1.1/2.1.2 Primary collection system

Project content and goal	Increase in collection contract rate and the efficiency of waste collection services. For the households who live along streets inaccessible for the waste collection vehicles, distribute waste containers, organize a waste management group for each household and managed by the residents. In these groups, recyclable wastes were separately collected and sold to broker. Phase I: B. Boung, B. Keng, B. Semuaeng Phase II: B. Donemai, B. Natonoy, B. Boung
Evaluation result at the end of the project	As of April 2015, 99% cooperation rate of target households of the primary collection system and 68% of households separated recyclable waste.
After October 2020	The number of temporary collection and sharing groups are 63, so continue promoting it. Request a collection truck that can pass through the narrow streets of the village. ・Separate collection and transportation of waste has been temporarily suspended due to COVID-19. The separate collection rate has been reduced to 0.22%. Request cooperation due to lack of collection containers, trucks and budget.

XYB 2.2.1 Waste collection service plan formulation

Project content and goal	Understand the current state of waste collection services at the time of 2013 and plan for waste collection services in 2020.
Evaluation result at the end of the project	Collection service provided in 32 out of 89 villages in 2013 and village-based coverage was 39%. The goal for 2020 is to provide collection services to 42 out of 83 villages and plan to increase village-based coverage to 51%.

After October 2020	The current collection service is 32 out of 83 villages, which is the same as in 2013. It would like to expand the collection service in the future. Therefore, request financial cooperation for expansion or construction of the disposal site and cooperation for collection facilities.

XYB 2.2.2 Waste collection with 5m^3 container

Project content and goal	The conventional dump truck collection and 5m3 container were placed to expand the collection range. 10 5m3 containers, container production workshop, 1 lifting crane
Evaluation result at the end of the project	9 5m3 containers were installed, and 1 was reserved.
After October 2020	There are 5 5m3 units currently in operation. Request cooperation for the installation of 25 more units.

XYB 2.1.1/2.1.2 Primary collection system. 155 120L caster containers have been provided and activities are continuing. On the other hand, the size of the container provided by LPB is 240L, but its size is a problem and is no longer used. This is one of the lessons of the project. There is almost no activity on separated emissions because of COVID-19, but the situation before the impact is unknown.

XYB 2.2.1 Waste collection service plan formulation, no progress has been made since 2013, and the 2020 goal of 42 villages has not been achieved.

XYB 2.2.2 Waste collection with 5m3 container, 10 containers were provided, but 5 are currently in operation. According to the answer, request cooperation for the installation of 25 containers, but in the PPs, the workshop for making containers was conducted and the condition of the containers made is also known to be good. Also, trained to make containers, it is possible for UDAA to make a container.

Container production workshop

Inside of container workshop（the crane in the back is also provided equipment）

Figure 5-8: Current State of Workshop (XYB)

c. Improvement of final disposal system

The answers to the “improvement of final disposal system” PPs are as follows.

XYB 3.1.1 Improvement of operation of final disposal site

Project content and goal	Implementation of improvement work on the existing KM8 final disposal site, formulation of operation plan, implementation of operation and maintenance, implementation of annual monitoring by MONRE・DONRE. Procurement of final disposal site maintenance equipment： 1 Excavator, 1 dump truck.

Evaluation result at the end of the project	The final disposal site operation plan was formulated, and was operated in accordance with the operational reforms, and monitoring was carried out once a year by the monitoring committee.
After October 2020	The activities are being carried out as planned. Request financial cooperation for expansion of landfill capacity, preparation of medical waste treatment site, introduction of incineration facilities for medical waste treatment, and construction of new final disposal site. The monitoring committee is not in operation. Only monitoring by UDAA. It is necessary to establish a committee by PONRE、DoH、UDAA.

XYB 3.1.2 Proper management of waste picker and improvement of work situation

Project content and goal	A management system was conducted to improve the working environment of waste picker at the existing final disposal site.
Evaluation result at the end of the project	The waste picker management and regulation plan were formulated in the final disposal site operation plan, and the working environment was improved. Regular meetings with waste pickers and work environment monitoring were conducted by UDAA.
After October 2020	The activities are being carried out as planned. Waste picker is a registration system, and health checks are conducted once a year. Discussions with the waste picker are held 10 times a year. Request financial cooperation for this project.

XYB 3.2.1 Development and management of the treatment facility for the sludge from septic tanks

Project content and goal	The goal was to establish an appropriate processing system and operation management system to properly dispose collected sludge from septic tank.
Evaluation result at the end of the project	An operation plan for the sludge from septic tank was formulated, and the operation carried out according to the plan. And monitoring was carried out once a year by the monitoring committee.
After October 2020	The activities are being carried out as planned. Request financial cooperation for improving the facility. Monitoring committee is not in operation. Only monitoring by UDAA. It is necessary to establish a committee by PONRE, DoH, UDAA.

XYB 3.1.1 Improvement of operation of final disposal site and XYB 3.2.1 Development and management of the treatment facility for the sludge from septic tanks. It was reported that this is operating according to the plan formulation in the PPs. During the implementation of the PPs, the monitoring committee was held with the participation of academic experts, government agencies and social organizations (trade unions, women's federations), but it is not currently held. And it is not possible to confirm the validity of the operation status, including grasping the amount of collection. The answer that it is necessary to establish a committee by PONRE, DoH, UDAA.

From the answer about XYB 3.1.2 Proper management of waste picker and improvement of work situation, it is considered that the PPs is continuing properly.

d. HCWM

The answers to the "HCWM" PPs are as follows.

XYB 4.1.1 HCW collection system establishment
XYB 4.2.1 HCW treatment and disposal system establishment

Project content and goal	Establish a separate collection and transportation system for HCW generated in major LPB medical institutions and its management system. PP target hospital（Provincial Hospital and Military Hospital）
Evaluation result at the end of the project	HCW treatment plan was formulated. Of the 2 target hospitals, separate collection, incineration, and disposal of infectious medical waste from Military Hospital have not been realized. In terms of quantity, it has achieved the separate collection and disposal of 85% of infectious HCW
After October 2020	Of the 2 target hospitals, only Provincial Hospital is active. Request financial cooperation to carry out this activity at all hospitals and clinics in the future. Currently, infectious HCW is not being treated. Request financial cooperation for the introduction of incineration facilities.

XYB 4.1.1 HCW collection system establishment as of 2013, separate collection from Military Hospital was an issue, but it turned out that cooperation has not been obtained even at present. And XYB 4.2.1 HCW treatment and disposal system establishment, A dedicated treatment pit was set up in the disposal site, but it has become unusable due to a leak of groundwater. Instead, LPB provided incineration facility of the same type, but it is not in operation. According to the answers to the questionnaire, there are no vehicles to carry the separated HCW. However, in the PPs, the collection vehicles provided by grant aid project has been modified to carry containers for HCW, and their condition has been found to be good. The separate collection and treatment plan is formulated in the pilot project, and since the condition of the vehicles for separate collection is good, so it is necessary to re-establish consensus among the parties concerned and repair the incineration facility.


HCW container


Collection vehicle capable of transporting HCW containers（provided by grant aid project）


HCW temporary storage at Provincial Hospital


Incineration facility at Provincial Hospital, which is not currently use


HCW storage facility is currently unavailable due to a leak of groundwater


Incineration facility at final disposal site

Figure 5-9: Health-care Waste Treatment (XYB)

e. Construction of an institutional system that supports the above policies

The answers to the “Construction of an institutional system that supports the above policies” PPs are as follows.

XYB 5.1.1 Consensus building among stakeholders

Project content and goal	The clarification of roles and responsibilities of the stakeholders of the PPs for four strategies of Action Plan (A/P) ①Promotion of 3Rs ②Improvement of collection system ③Improvement of final disposal site ④Improvement of healthcare Waste Management
Evaluation result at the end of the project	It was codified about the roles and responsibilities of the parties involved.
After October 2020	Division of roles has been decided. UDAA builds cooperation with all hospitals and DoH for infectious HCW. Request financial cooperation for this activity.

XYB 5.2.1 Financial System Improvement

Project content and goal	Make a financial improvement plan needed to improve LPB waste treatment.
Evaluation result at the end of the project	The financial improvement proposal was formulated and became a legal document to carry out the financial burden required to implement the Waste Management Improvement PP.
After October 2020	No answer

XYB 5.1.1 Consensus building among stakeholders, there is a possibility that the activity is not commensurate with the role. Because the roles of each are clearly stated when the PP is implemented, but the disposal site is not monitored and the separate collection of HCW is delayed.

XYB 5.2.1 Financial System Improvement, there was no answer regarding the progress of the project, but the above-mentioned, UDAA is an independently profitable system, income and expenditure is not balanced, and administration of the deficit. Although it has been pointed out when the PP is implemented, the beneficiary will bear the burden of operating expenses in principle to improve the income and expenditure, also Regarding the renewal of facilities and equipment, it is necessary for financial cooperation from related organizations.

5.2 Grand Aid "The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities" (2014 G/A signed)

5.2.1 Vientiane

This Grant Aid project was planned with the aim of realizing an "environmentally sustainable city" through synergistic effects with LPPE, a related project that had previously been implemented. This project and LPPE were mutually complementary. Specifically, these synergistic effects are the strengthening of human resources through LPPE and the improvement of the waste management capacities of operations and management (O&M) agencies (VUDDA, currently VCOMS) by expanding physical resources, such as solid waste transfer stations and waste collection vehicles, through this project. In particular, it was necessary to establish a solid waste transfer station and take measures to efficiently transport waste collected in Vientiane, since the final disposal site was 32 km away from the urban area.

For the purpose of improving waste collection capacity and transportation efficiency, the construction of a waste transfer station in Vientiane, procurement of equipment such as waste collection vehicles, consulting services related to their design and construction of the waste

transportation, and technical cooperation (soft components) related to the operation of the transfer station were provided.

According to the ex-post evaluation report[60] of this project, the O&M of the transfer station constructed in Vientiane and the vehicles and heavy machines provided are being properly carried out and in good condition. The O&M of this project itself had no problems, including the institutional system, technology, finance, and management status, the effects produced by this project were highly sustainable.

According to interviews with personnel at the transfer station in November 2020, collection vehicles and equipment are frequently out of order. The reason for this is that the purchase of equipment and spare parts for repair and maintenance tends to be delayed due to a change in the budget disbursement system of the Finance Department of Vientiane. As of November 2020, one of the two rotary drums at the transfer station is currently out of order. The parts[61] need to be replaced, but currently there is a wait for approval of the purchase.

In the ex-post evaluation, cooperation between the central and local governments was recommended for the development of the next final disposal site, but as of November 2020, there have been no concrete moves such as the consideration of candidate sites.

5.2.2 Luang Prabang (LPB)

The equipment provided in this project is as follows.

Table 5-1 LPB Equipment List

Equipment type	Amount
Compactor truck(6m3)	4
Dump truck(10m3)	3
Skip loader（5m3）	1
Bulldozer (10t)	1
Sprinkler	1
Car wash machine	1

As a result of the investigation, it was confirmed that all the provided equipment was in operation.

[60] JICA (2019), FY2018 Ex-Post Evaluation of Japanese Grant Aid Project. “The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities”.
[61] The price of the parts is approximately 1,500 USD.


Interview survey


Provided compactor truck


Provided skip loader


Provided dump truck


Provided bulldozer


Provided Sprinkler

Figure 5-10: Equipment procured by the Project (LPB)

5.2.3 Xayaboury (XYB)

The equipment provided in this project is as follows.

Table 5-2 XYB Equipment List

Equipment type	Amount
Compactor truck(6m3)	2
Dump truck(10m3)	1
Skip loader（5m3）	1
Excavator (0.6m3)	1
Sprinkler	1
Car wash machine	1

As a result of the investigation, it was confirmed that all the provided equipment was in operation. However, it turned out that the provided vehicle was not registered. The reason

provided through the interview survey is that the documents required for registration were not prepared.


Interview survey（XYB）


Provided compactor truck


Provided skip loader


Provided dump truck


Provided excavator


Provided car wash machine

Figure 5-11: Equipment procured by the Project (XYB)

5.3 Private Sector Partnership Project (1)

5.3.1 Outline of the Project

a. Name of the Project

"Survey to Determine Potential Project Application for Medical and Other Hazardous Waste Management in Vientiane City" (November 2016 ~ September 2017)

b. Purpose of the Project

The amount of hazardous waste, mainly medical waste, is rapidly increasing in Laos due to population growth and rising income levels of the people. We aim to detoxify and reduce the amount of hazardous waste, enhance the foundation for sustainable economic growth, establish ODA projects, and to implement business rollout by making use of proper processing technologies that Japan can be proud of for the incineration of hazardous waste mainly with

medical waste. For that purpose, we collect information on medical institutions, chemical factories, waste oil handling producers, collection and transportation, intermediate treatment, and final treatment, etc. and promote proper treatment and business development through market research and acceptance activities in Japan[62].

c. Description of the Project

Information gathering on types of medical waste, collection and transportation, intermediate treatment and final disposal, market research on hazardous waste including waste used, and creation of business development plans through ODA[63].

(1) Collecting information on medical waste

(2) Collecting information on the collection and transportation of hazardous waste, intermediate treatment, and final disposal

(3) Market research on hazardous waste including medical waste

(4) Developing view on the potential local use of proposed products through ODA, creation of business rollout plan

d. Technology Transfer

The proposing company, Kayama Kogyo Co., Ltd. (Toyokawa City, Aichi Prefecture) operates an "integrated waste treatment system" and is engaged in thorough processing and recycling of industrial waste.

The integrated waste treatment system consolidates the following five systems. For this project, we have introduced "(3) incineration / drying facility" in the treatment plant in the capital city of Vientiane, and carried out the proper transportation, incineration, and transfer of management technology of hazardous waste discharged from the medical facility including medical waste[64].

(1) Cushing / sorting facility

(2) Solid fuel RPF plant

(3) Incineration / drying facility

(4) Rubber recycling plant

(5) Fluorescent tube regeneration plant

5.3.2 ODA Proposal Projects

The specific plans for the dissemination / demonstration project were proposed as follows[65].

(1) Objective of the project

Install an incinerator through the dissemination / demonstration project to make current processing more efficient using the know-how in Japan. The proposing company raises understanding on the segregation management, which is implemented in Japan, and aims to increase the efficiency in processes, reduce the burden on workers, and to improve the working

[62] JICA (2017) "Completion report of survey for determining potential project application of hazardous waste management mainly on medical waste in Vientiane City, Laos" https://libopac.jica.go.jp/images/report/12292942_01.pdf (Last viewed on March 10, 2020)

[63] Same as above.

[64] Same as Note 62.

[65] Same as above

environment. Aim to penetrate the method to other regions by giving presentations using a demonstration machine.

(2) Duration of the project

24 months

(3) Counterpart

Employees of VUDAA (Present: VCOMS) and the Ministry of Health

(4) Target area

A site adjacent to the location of incinerator in the KM32 final disposal site, which is operated and managed by VUDAA. Setthathirath Hospital in Vientiane City (providing medical services to 530,000 people).

(5) Achievement of the activities

Results 1. Enable proper management and detoxification of hazardous waste (injection needles and waste oil)

Results 2. Reduces load on the landfill site by 90% in volume[66].

Results 3. Able to build a system for proper treatment of hazardous waste and penetrate it in other regions in Laos.

5.3.3 Business Rollout Plan

(1) Result of market analysis[67]

- The major medical institutions in the surveyed area outsource the processing to VUDAA. Due to the high processing cost, however, they hope that more processing distributors enter the market, and the price will be reduced in the future.
- Japanese companies expanding in Vientiane Capital have issues in proper disposal of waste generated from their own production process. The proposing company, therefore, aims to address the waste disposal issues of these Japanese companies by rolling out (1) the treatment of hazardous waste, (2) treatment and recycling business for other general industrial waste, using its processing technologies.
- Hazardous waste treatment in Savannakhet Province is underdeveloped compared with that in Vientiane. We explore the possibility of horizontal expansion by comparing the trends in Savannakhet at the time of dissemination and demonstration.
- There was a strong request from the provincial governor to improve waste treatment. The prefecture recognizes that the hazardous waste generated by foreign companies operating in SEZ has no process destination, causing a problem by storing them at their own facility. The province is discussing not only the storage of industrial waste but also the introduction of facilities for incineration and energy-producing purposes.
- Business development is expected in mixed firing with medical waste, centreing around the treatment of hazardous waste discharged from factories in the SEZ. From the viewpoint of the calories burned in the incinerator, waste oil could be used mainly.

(2) Target market and technologies[68]

[66] Same as above (p.72).
[67] Same as above. (p.82)
[68] Same as above. (p.82-83)

The target market is Japanese companies based in Vientiane. We will study the potential establishment of two bases in Vientiane and Savannakhet while observing the situation at the time of dissemination and demonstration. We are also discussing the horizontal expansion of the hazardous waste treatment business in Pakse and the commercialization of waste plastic fuel, besides the hazardous waste, using the waste treatment technology possessed by the proposing company besides the hazardous waste.

5.4 Private Sector Partnership Project (2)

5.4.1 Outline of the Project

a. Name of the Project

The Verification Survey with the Private Sector for Disseminating Japanese technologies for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos

b. Objective of the Project

To contribute to safer streamlining of the public management of hazardous waste treatment such as medical waste in Vientiane City, demonstrate the effectiveness and superiority of the proposed technology "operation technology for proper disposal of hazardous waste" and reorganize methods and issues for penetrating the proposal techniques[69].

c. Description of the Project

Demonstrate the following "Japanese proper disposal process (operation) of hazardous waste" in collaboration with counterparts at Setthathirath Hospital and KM32 final disposal site, and transfer technologies for each of the separation / management, transportation, and intermediate treatment of hazardous waste treatment[70].

(1) Separation, storage

Technologies for separating medical waste in hospitals and for storing and transporting separated waste using highly safe containers.

(2) Incineration

Technology for detoxifying and reducing the volume of hazardous waste using high-performance incinerators that do not generate air pollution.

d. Executing Agency at Partner Country

Vientiane City Office for Management and Service (VCOMS)

e. Business Site

Setthathirath Hospital and KM32 landfill processing site

f. Name of Product / Technology

Hazardous waste incinerator (1 unit with capacity: 80 kg/h), sorting management box (2,000 in cardboard, 500 in plastic, and 400 in disposable boxes)

[69] JICA (2020) The Second Progress Report on the Verification Survey with the Private Sector for Disseminating Japanese Technologies for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos" (Unfinished)
[70] Same as above. (p.ix)

5.4.2 Expected Achievement

The following achievements are expected to be realized[71].

Results 1. Proper separation / management of medical waste at Setthathirath Hospital and the proper loading of separated / managed waste on the transport vehicle will be demonstrated.

Results 2. Proper disposal of hazardous waste transported to the KM32 landfill processing site with a high-performance incinerator and proper disposal of incineration ash will be demonstrated.

Results 3. The demonstration results of this project and issues in potential future outsourcing to the private sector will be shared with private companies and the government.

Results 4. The contractor's business development plan in Laos will be created.

Exterior of incinerator facilities for HCW (Right: Installed by Verification Survey, Left: Installed by LPPE)

Exterior of incinerator facility for HCW installed by Verification Survey

Incinerator for HCW

Whole incinerator

Figure 5-12: Incinerator procured by the Private Partnership Project at KM32

5.4.3 Current state and outlook

The status and outlook of the demonstration project as of January 2020 are as follows.[72]

[Current state]

- Proper treatment technology of medical waste is not widely recognized in Laos and has not been demonstrated to business operators generating waste.

[71] Same as above. (p.x)
[72] Same as above.

- It is necessary to thoroughly discuss items and cost of disposal for waste collected from private business operators generating hazardous waste, in addition to medical institutions that established their own bases for proper treatment.

[Future outlook] (As of Jan. 2020)

- Detoxification data of medical waste and hazardous waste can be obtained by conducting demonstrations.
- The usefulness of the proposed technologies can be disseminated through penetration activities.
- Appropriate treatment bases for medical waste and hazardous waste will be established, customers will be generated and sales routes for waste plastic fuel will be established.

5.4.4 Development after business rollout

Business rollout after the development is scheduled as follows (As of Jan. 2020)[73].

- Operate the incineration business in Vientiane City as a business consignment from the counterpart (international competitive bidding).
- Operate own processing plant in Vientiane. Collect treatment costs from medical institutions and private business operators generating waste, using the same business model as in Japan. In addition, aim for creating two bases of Savannakhet and Pakse to operate own processing plants within the SEZ.
- In the future, engage in the manufacturing of waste plastic fuel, which is conducted in Japan, in addition to hazardous waste, assuming cement companies as the biggest customer.

5.4.5 Business development plan /schedule

The business rollout schedule is as follows.[74]

Table 5-1: Commercialization schedule

Phase	Timing of start	Description
Research	As of Jan., 2020	Penetration / demonstration project（2018-2020）
Discussion / preparation	2020~2021	Determining the entry style / investment scale, develop business plans, negotiate with partner companies, establish the company, conduct procedures with the government agencies, secure / train human resource, construct factory, introduce machinery and equipment, develop market
Operation (Introduction phase)	After Dec., 2020	Manage operation, expand contractors / sales destinations, build business management structure, conduct labour management, enhance capabilities of local staff members

(Source: JICA (2020) The Second Progress Report on the Verification Survey with the Private Sector for Disseminating Japanese Technologies for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos" (Unpublished, p.116)

As described in the table below, regarding human resource development to enhance the plan, we are planning up to the fifth year of operation to enhance the human resource cultivation plan.

[73] Same as above. (p.112)
[74] Same as above. (p.116)

Table 5-2: Personnel Training Plan

Phase	Duration / number of employees dispatchment	Recruitment of local workers	Staff training
Local cooperation establishment preparation period	3 months, 1-2 people	Start hiring facility workers	Create work manuals for facility workers. Start recruitment based on the recruitment manual.
Facility construction period ~ 1st year of operation	6 months, 1 person (Resident) 3 people (Business trip)	5-10 people	Carry out recruitment. Start technical guidance and training programs for people hired. Dispatch instructors from the headquarters and give guidance
2nd of year of operation	Resident: 1 person	5-10 people	Initial staff members give guidance to successors, operate training programs, implementation of training in Japan
After 5th year of operation	Operated by local stiffeners	6-12 people	Operation and training programs conducted by local staff members

Source: JICA (2020) pp.116-117

5.5 Grassroots cooperation

Grassroots cooperation is one of JICA's business schemes, in which Japanese NGOs, local governments, universities, private companies, and other organizations carry out international cooperation under a contract with JICA. In Laos, we have a track record of activities in various fields, not limited to waste management.

5.5.1 Project for establishing a system for effectively utilizing waste through citizen collaboration in Vientiane City[75]

From 2015 to 2018, a cooperation project in the waste field was carried out with Vientiane as the main counterpart. The outline is described below.

a. Project goal

In the urbanized area of the capital city of Vientiane, a waste management system will be constructed that enables the effective use of resources ("resource recycling") in collaboration with citizens by understanding and acquiring the correct knowledge of waste treatment.

b. Target area

Vientiane City, the capital of Laos

c. Beneficiary class

VCOMS, DONRE, Vientiane Education and Sports Bureau, Residents of Pilot Area

[75] JICA, https://www.jica.go.jp/partner/kusanone/country/ku57pq00001nf9vy-att/lao_07_t.pdf (last viewed: December 21, 2020)

d. Output

In the urbanized area of the capital city of Vientiane;

1. 1. Separate collection through collaboration between citizens and businesses will start as a pilot project, and a system to continue will be established.

2. 2. An administrative support policy for promoting voluntary waste reduction and sorting activities by citizens is prepared.

e. Activities

Regarding output 1,

1.1. Organize a separate collection project team with VCOMS and DONRE.

1.2. Conduct a basic survey on garbage collection and transportation in the central part of the city (urbanized area). (Basic statistical survey)

1.3. Conduct lecture and training on collection and transportation for project team members, VCOMS, DONRE staff, and stakeholders.

1.4. Select a pilot area and consider effective and efficient separate collection and transportation methods.

1.5. For waste that can be effectively used, start a pilot project related to the construction of a separate collection and transportation system by citizens and businesses, and continue to implement it.

1.6. Monitor and improve pilot projects.

1.7. Analyse and evaluate the results of the pilot project and compile it as a proposal document to Vientiane City, “Separation Pilot Project 3-Year Implementation Plan”.

1.8. Propose business continuity and expansion to Vientiane City.

Regarding output 2,

2.1. Organize a dissemination / enlightenment activity project team for the city / educational field by VCOMS, DONRE, DOES and stakeholders.

2.2. Provide education and training on dissemination and enlightenment for project team members and VCOMS, DONRE, and DOES.

2.3. Implement dissemination and enlightenment activities centred on small junior high schools in the separate discharge pilot area.

2.4. Establish a study group consisting of residents and the government and hold a study group.

2.5. Conduct resident participation-type activities (flyer distribution, resident briefing sessions, campaigns using mascot characters, etc.) planned by the members of the study group in the pilot area.

2.6. Prepare for environmental education activities at school (preparation of guidelines and teaching materials, guidance to teachers).

2.7. Conduct a pilot effort at a model school.

2.8. Analyse and evaluate the results of the project and compile it as a proposal document to Vientiane City "Vientiane City Waste Reduction and Separation Guideline (Draft)".

f. Implementation period

From November 2015 to March 2018

g. Project implementation system

[Japanese side]

・ Kyoto City Environmental Policy Bureau (Environmental Education / Dissemination / Enlightenment / Waste Collection / Transportation Improvement / Waste Reduction / Resource Recycling

・Global Environment Centre Foundation

[Lao side]

Vientiane City Administration Bureau / Vientiane City Natural Resources and Environment Bureau / Vientiane City Education and Sports Bureau

5.5.2 Cooperation for Recycling Activities in Vientiane

Currently, preparations for a new grassroots cooperation project are in progress. With VCOMS as the main counterpart, the Chubu Recycling Movement Citizens' Association, a Japanese NGO, will utilize the experience of waste reduction in Nagoya City to support the creation of a collective resource recovery system by the community, using eight villages in Vientiane as a model.

It was scheduled to be implemented in 2020, but the start has been delayed due to the COVID-19 pandemic. It will restart in future when the pandemic ends.

5.5.3 Waste Management Advisor

From April 2018 to June 2019, JICA dispatched a waste management advisor (Mr. Yamauchi) to Laos. The advisor was dispatched to MONRE, and its main purpose was to improve MONRE's waste management capacity, but it expanded its activities to Vientiane, Luang Prabang, Xayaboury, etc., and provided a wide range of cooperation. The main cooperation was as follows.

- Understanding the current status of waste management in Laos (LPPE follow-up survey in Vientiane, Luang Prabang, Xayaboury)
- Examination of waste power generation
- Examination of disaster waste management
- Participation in the 3R Forum (Bangkok)
- Cooperation for building a model community for VCOMS
- Awareness-raising activities related to proper waste management

6 Current Status of Hazardous / Industrial Waste Management

6.1 Current Status of Hazardous and Industrial Waste Management in Vientiane

In order to understand the current status of hazardous and industrial waste management in Vientiane, we conducted interviews with related organizations and factory visits.

6.1.1 Organizations related to Hazardous / Industrial Waste Management in Vientiane

The subjects of the interview survey were VDOIC, VDONRE, VDPWT, and VCOMS. According to VDOIC, there are 3,139 factories in Vientiane, of which 167 are large, 224 are medium, 367 are small, and 2,382 are family businesses. When issuing a factory license, VOIC conducts factory inspections based on the laws under the jurisdiction of MOIC. At that time, VOIC instructs factories to classify waste into three categories: general, hazardous, and recycled waste. A system for recording data on the quantity and quality of industrial waste has not been established due to restrictions on the number of staff, vehicles, and budget. In addition, it is necessary to strengthen the capacity of district and village staff.

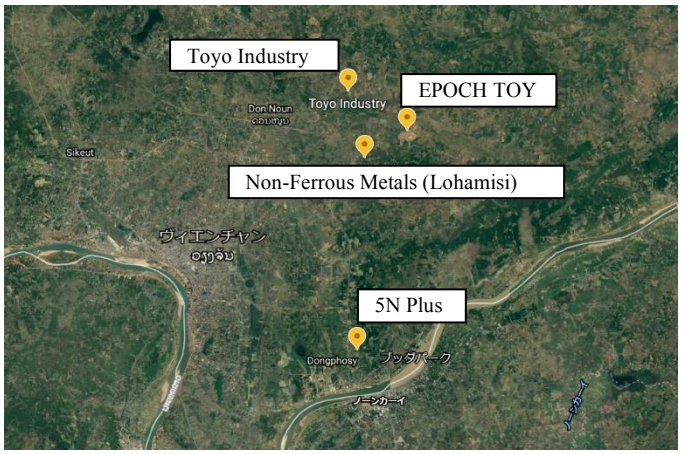
One of the jurisdictions of VDONRE is enlightenment activities related to hazardous waste management in communities and schools. In addition, although it is supposed to monitor the management status of hazardous waste at the factory, only investment projects are being implemented due to budget constraints. In order to strengthen the monitoring system, they want to involve district and village staff, enhance analytical equipment, and strengthen the capacity of VDONRE staff.

VDPWT does not take charge of hazardous waste. However, in the event of an environmental problem, they may join a special team for countermeasures.

VCOMS is a provider of municipal waste collection and disposal services and does not handle hazardous waste. Of the waste from the factory, general waste is collected, but hazardous waste is to be stored by the factory and treated appropriately. As with VDPWT, in the event of an environmental problem, they may join a special team for countermeasures.

6.1.2 Factory Visit Survey

To research the situation of hazardous and industrial waste management in Vientiane Capital, MOIC staff as well as a survey assistant locally hired by the survey team visited the following four factories. In selecting factories, the criterion was based on the use of chemical substances in the manufacturing process of products as a benchmark and targeted both domestic and foreign-capital companies in the private sector. The factory visits were conducted on November 10, 2020, under the selection and coordination by DOIH-MOIC.



(Source: Created by survey team using Google Earth imagery)

Figure 6-1: Location of the Factories Visited

6.1.2.1 Overview of Target Factories

The table below shows an overview of the four factories visited.

Table 6-1: Summary of Four Factories

No.	Company Name	Location	Industry	Owner	No. of employees
1	Toyo Industry Lao Factory Sole CO., LTD (Toyo Industry)	Km 18, 13th South Road, Phokham Village, Xaythany District, Vientiane Capital	Pipe manufacturing	Domestic private sector (Japan)	Approx. 100
2	Epoch Toys Lao CO., LTD (Epoch Toys)	Vientiane Industry and Trade Area (VITA) Park, Nonthong Village, Xaythany District, Vientiane Capital	Toy manufacturing	Foreign private sector (Japan)	280
3	5N Plus Industrial Resources CO., LTD (5N Plus)	Dongphonhae Village, Hadxayfong District, Vientiane Capital	Tellurium dioxide, bismuth and needle manufacturing	Foreign private sector (U.S.)	Approx. 80
4	Non-Ferrous Metals (Lohamisi) CO., LTD	Saphangkhanong Village, Xaythany District, Vientiane Capital, Lao PDR	Non-ferrous metal treatment	Foreign private sector (China)	45

(Source: created by the survey team, November 10, 2020)

6.1.2.2 Status of chemical substance management

Each factory manages chemical substances in accordance with the Lao chemical substance management standards. Observations by the locally-hired staff as well as the photographs of the factory premise reveal that the factories are cleaned and organized. None of the four companies seem to have obtained an environmental license. Each company's response to the survey is summarized as follows.

a. Toyo Industry

The company is a pipe manufacturing company and a local subsidiary of a Japanese parent company. It has obtained ISO9001-2015 (2018). Since the company does not use chemical substances, no harmful waste, wastewater or harmful exhaust is discharged. Industrial waste is stored separately, and valuable resources are sold. There have been no complaints from local residents. At the time of the site visit, our local staff reported that the environmental management, especially waste management, was properly performed at the factory. It was also confirmed that only food waste is treated at KM32 landfill and that the waste in the factory is properly separated.

Hearing with Factory Manager

Plastic pellets (materials)

Types of pipes explained by President of Xaignavong Group

Explanation of factory processing line

Figure 6-2: Toyo Industry

b. EPOCH

The company is a foreign-owned (Japan) toy manufacturer that started operations in June 2018. Regular environmental audits (chemical substances, air, noise, odours, wastewater) are carried out by MONRE, Lao UAE Laboratory, and Environmental Service Company Limited. The storage safety data for all raw materials are recorded and translated. The company has a facility for treating factory wastewater as well as a container for making isolated storage of hazardous waste on the premises. Valuable resources are managed separately. There have been no complaints from local residents. An issue of the company is the absence of a clear department to manage the treatment of hazardous waste. At the time of the site visit, it was confirmed that environmental management, especially waste management, is performed

properly. Waste is separated and collected for recycling or to be disposed of by a private company based in the VITA Park.

Briefing by Administration Head

General waste storage

Segregated valuables

Safely stored hazardous wastes

Figure 6-3: EPOCH

c. 5N Plus

The 5N Plus manufactures tellurium dioxide, bismuth and needles, and is a foreign-owned (US) company. The Company separates chemicals / harmful waste from other waste using large bags, which costs approx. 30,000-35,000 (USD) a year. The company pays LAK500,000 a month for the disposal of general waste. Regarding the environmental quality criteria, the Company requests a Thai environmental research lab in Laos for a survey and receives results within one month. Industrial waste is separated and stored awaiting sale. The Company maintains positive relationships with local residents. The factory has received complaints about odours and noise in the past. The Company has several issues including, 1) it records Safety Data Sheet (SDS) but its local suppliers do not have SDS, and 2) it does not have sufficient facilities to properly store, treat and process hazardous waste. As other issues, the Company highlighted past cases of illegal dumping of construction waste (debris) from outsiders in a vacant lot on its premise.

Interview with External Affairs Manager

Figure 6-4: 5N Plus

d. Non-Ferrous Metal (Lohamisi)

The company manufactures minerals such as lead, copper, tin and zinc. We could not receive an answer on the questionnaire regarding the management of factory effluent, exhaust, and toxic substances at the time of the visit. Our local staff who was allowed to tour the factory received an impression of poor environmental management compared with the other three above-stated factories.

Inside the Lohamisi factory

Sample mineral

Figure 6-5: Non-Ferrous Metal (Lohamisi)

6.2 Current Status of Hazardous and Industrial Waste Management in Savan-Seno Special Economic Zone

6.2.1 Savan-Seno SEZ

The Savan-Seno SEZ is located on the Thai border of Savannakhet Province, and is located on the East-West Corridor that runs from Da Nang, Vietnam, through Thailand to Mawlamyine, Myanmar. The district was the first SEZ in Laos and was established in 2003. Currently (as of March 2020), the SEZ has 4 areas (Zone A, B, C, D) and trading areas, with 139 companies operating (39 factories, 12 trading companies, 88 service companies). Among Japanese companies, Nikon and Toyota Boshoku are making inroads.

The SEZ is managed by the Savannakhet Special Economic Zone Agency (SEZA), which is a subordinate organization of the Ministry of Planning and Investment. SEZA consists of four departments (Planning and Finance Department, General Affairs / Labour Management Department, Investment Promotion / Legal Department, Facility / Construction / Environmental Management Department).

Source: The survey team based on JICA news[76]

Figure 6-6: Savan-Seno Special Economic Zone

6.2.2 Current status of hazardous / industrial waste management

In the Savan-Seno SEZ, an environmental management and pollution control service company (Svan EMC Company) has been established by SEZA and a private company (TML Alliance) to provide one-stop services from environmental surveys to waste disposal. The company is positioned as a part of SEZA's organization.

Until the company was established, there was no disposal destination for hazardous industrial waste, and it was kept in each factory, but now that problem has been resolved.

The company has been established under the "Agreement on the Establishment of Environmental Management and Pollution Control Units in Savan-Seno Special Economic Zone, No.696 / MPI. SaSEZ, May 23, 2019" and "Guidelines for Environmental Management

[76] https://www.jica.go.jp/english/news/field/2017/170731_01.html
(Last viewed: December 6, 2020)

in Savan-Seno Special Economic Zone", No.175 / SaSEZ, January 31, 2019. The following seven are the core services provided by the company.

1. Consulting on industrial waste management.

2. Treatment and disposal of hazardous waste.

3. Industrial waste transportation.

4. Environmental survey.

5. Recycling of non-toxic industrial waste.

6. Processing of highly confidential documents.

7. Consulting on environmental management and pollution control planning, reporting and monitoring under the supervision of SEZA.

In providing the above services, the company is affiliated with research institutes and specialized companies in each field. The company works with Khonkaen University (Northern Thailand) for the analysis of hazardous substances, Wongpanit International Company Limited (Thailand) for recycling non-hazardous waste, and KCL (Khammouane Cement Limited) for the transportation and treatment of hazardous waste.

There are currently no companies in other special economic zones that provide such services. At the moment, the company is developing its business as a model.

According to the interviews with the companies that have entered the market, it was complicated to communicate with the Lao government agencies regarding environmental audits, but this has been improved.

6.3 Collection and Analysis of Data on Cross-border Movement of Waste

Laos is a signatory to the Basel Convention, but no reports have been made on the cross-border movement of hazardous waste. The problem of environmental pollution was caused by imported E-waste in the past. The widespread use of electrical appliances and automobiles due to economic development may cause problem in the future. Therefore, the import and export status of such waste and goods which will be difficult to treat after disposal were investigated using the UN trade statistics website (UN Comtrade). The following are the subject items.

Import / export survey items
Waste plastic, plastic tableware, kitchen utensils and other household items and cosmetics, waste paper, glass scrap, steel scrap, copper scrap, aluminium scrap, lead scrap, air conditioners, refrigerators and freezers , household machines include commercial washing machines (including those that also serve as water removal machines), automatic data processing machines (PCs), storage batteries (lead-acid batteries), mobile phones and other wireless network phones, television receivers, motorcycles, passenger cars and other cars

Of particular note in the survey results was the rapid increase in waste plastic and waste paper imports and the rapid change in import sources, since China's waste import regulations at the end of 2017. Imports of electrical appliances and automobiles have been growing along with recent economic growth.

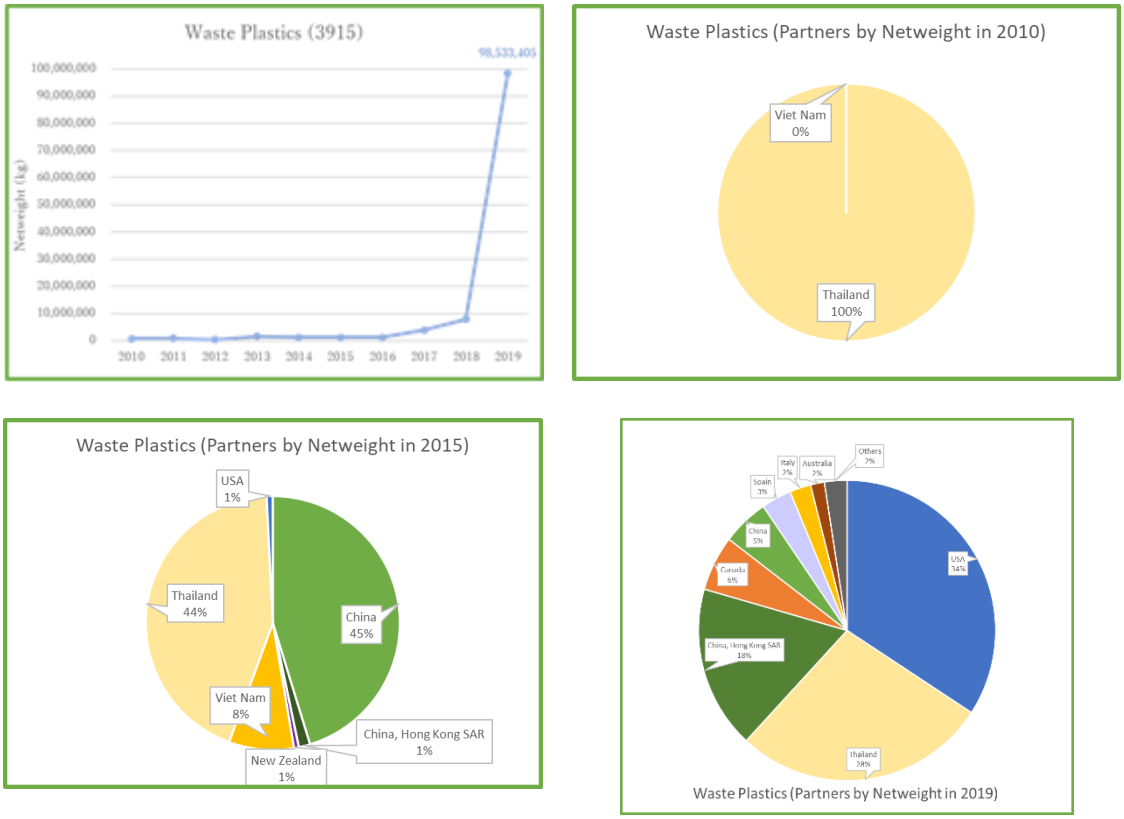
In trade statistics, reports by exporting countries and reports by importing countries may differ significantly due to various factors such as differences in aggregation methods. Even in the data shown here, there was a big difference between the reports by Laos and the reports by other countries. The individual items will be described below, but please note this point.

a. Waste plastic

Figure 6-7 shows changes in the import volume of waste plastics and changes in export countries. It was hardly imported until 2016, but increased to 10,000 tons in 2017 and 2018. In 2019, it surged to almost 100,000 tons. As for the country of origin of the imported waste plastics, Thailand accounted for 100% in 2010, and in 2015 China (45%) and Thailand (44%) were the major exporters, while Vietnam was also prominent with 8%. In 2019, this exporter composition changed dramatically. The United States is ranked first (34%), Thailand (28%), and Hong Kong (18%), followed by European countries. It can be seen that waste plastic, which has lost its destination due to China's import restrictions and the import restrictions of neighbouring countries, has flowed into Laos. According to the data reported by exporting nations, the amount of waste plastic in 2019 was 8,400 tons. While this figure is only a fraction of the reality, this data shows the same trends in changes to volumes and country of origin (as the UN Comtrade data shown in the figures below).

On the other hand, looking at the exports of plastic products from Laos, most of them are primary products. Table 6-2 shows the export destinations of the main primary products, polyethylene and polypropylene. The total of both is about 80,000 tons, which is equivalent to 80% of 100,000 tons of waste plastic. Since no plastic resin manufacturing industry has been confirmed in Laos, it seems that imported waste plastics are processed into primary products. And most of them goes to China, which regulates the import of waste plastics.

When comparing the import volume of waste plastics of Laos to neighbouring countries (in 2019, Thailand imported about 140,000 tons, Vietnam imported about 280,000 tons, UN Comtrade), the volumes are at a similar level. Moreover, there is concern of environmental pollution problems arising at sites where primary plastic products are processed.



Source: UN Comtrade, reported by Laos

Figure 6-7: Changes in the amount of waste plastic imported and changes in export countries

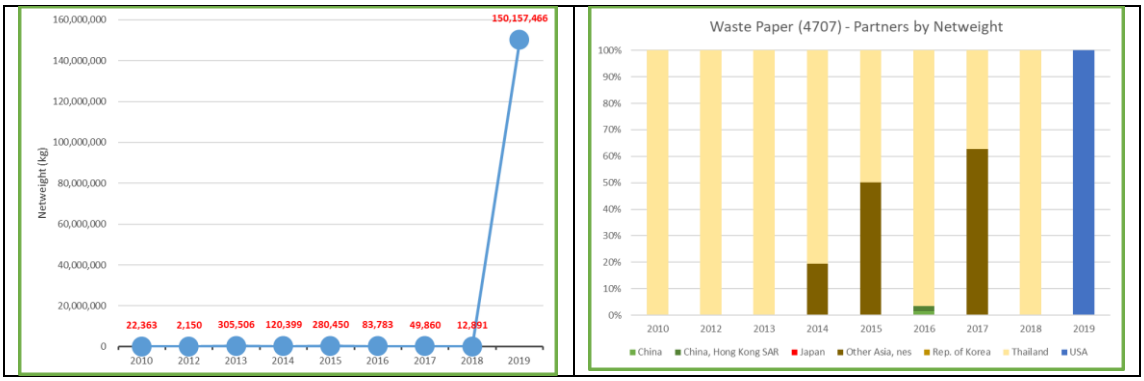
Table 6-2: Export destination of primary plastic products (2019)

Country	Commodity	Net weight (ton)	Portion
China	Polyethylene	57,957	73%
Viet Nam	Polyethylene	5,708	7%
Thailand	Polyethylene	735	1%
China	Polypropylene	8,864	11%
Viet Nam	Polypropylene	6,610	8%
Total	-	79,874	100%

Source: UN Comtrade, reported by Laos

b. Waste paper

As shown in Figure 6-8, imports of waste paper also increased sharply in 2019, most of which came from the United States. On the other hand, Table 6-3 shows that waste paper pulp, which exceeds the amount of waste paper imported, is heading for China. It can be seen that American waste paper is processed in Laos and is flowing to China as a raw material for papermaking.



Source: UN Comtrade, reported by Laos

Figure 6-8: Changes in the amount of waste paper imported and changes in export countries

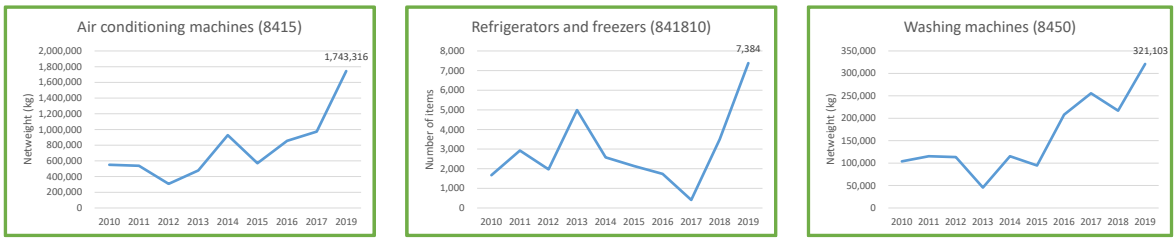
Table 6-3: Waste paper import volume and waste paper pulp export volume (2019)

Import/Export	Country	Net weight (ton)
Import of Waste paper	China, Hong Kong SAR	205
	Rep. of Korea	221
	Thailand	19
	USA	149,713
	Total	150,157
Export of Waste paper pulp	China	185,725
	Total	185,725

Source: UN Comtrade, reported by Laos

c. Large appliances

Imports of air conditioners, refrigerators and washing machines have been increasing along with economic growth for 10 years from 2010 to 2019. The main exporters are China and Thailand. In the future, it is expected that needs will emerge such as the establishment of a disposal system and proper management of the second-hand goods market when these products are discarded at the end of their service life. Regarding air conditioners and refrigerators, it will be necessary to take measures against CFCs and alternative CFCs.

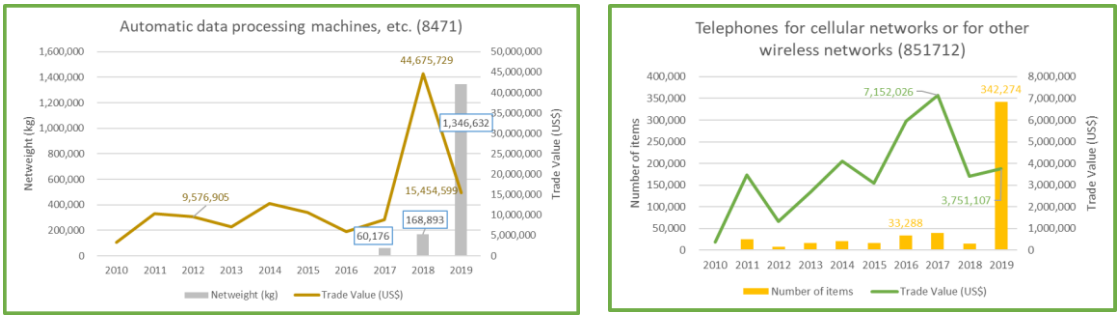


Source: UN Comtrade, reported by Laos

Figure 6-9: Changes in imports of air conditioners, refrigerators and washing machines

d. Small appliances

Imports of computers and mobile phones have increased in the last 10 years, just like large home appliances, but both have increased sharply in 2019. From the trade value and quantity, we can see that the unit price in 2019 is falling. This may indicate an increase in imports of second-hand goods, and some of these second-hand goods may not be usable due to breakdowns, so it is advisable to investigate in detail.

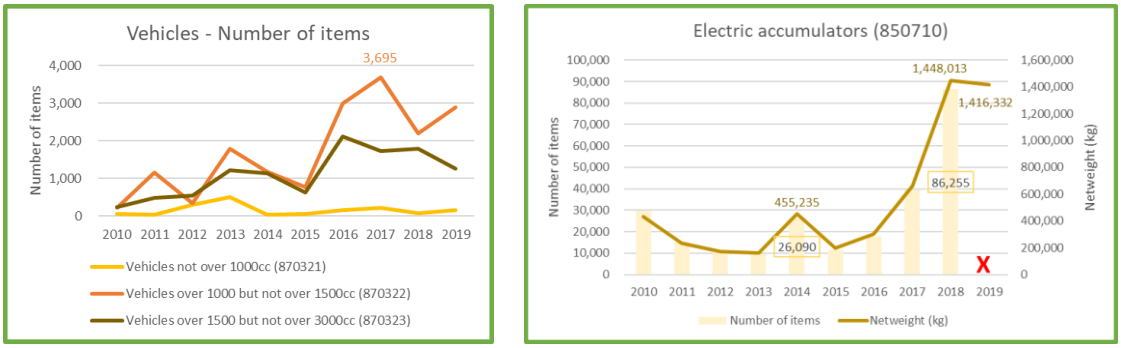


Source: UN Comtrade, reported by Laos

Figure 6-10: Changes in the import volume and value of computers and mobile phones

e. Automobiles and batteries

Imports of automobiles, like home appliances, have increased over the last 10 years. Imports of medium-sized and larger vehicles (displacement of 1000cc or more) are larger than those of small vehicles (displacement of less than 1000cc). Looking at the changes in the import volume of lead-acid batteries, which are mainly used in automobiles, it has shown a rapid increase since 2017, and it is estimated that there is demand different from replacement demand.



Source: UN Comtrade, reported by Laos

Figure 6-11: Changes in imports of Vehicles and Batteries

6.4 Consideration of development of framework for hazardous waste management

6.4.1 Reviewing the status of import/export control of hazardous waste in ASEAN countries (Thailand, Vietnam) and questionnaire survey

6.4.1.1 Overview of provisions of the Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is a multilateral environmental agreement with the main objective to restrict the import and export of hazardous wastes and other wastes. It was adopted in 1989, and entered into force in May 1992. The Convention was approved due to the growing recognition in the 1980s of the problem of transboundary movements of hazardous wastes, and frequent illegitimate export of hazardous wastes from developed countries to developing countries with lax environmental regulations. When exporting or importing hazardous wastes subject to control under the Convention, Prior Informed Consent (PIC) is needed between Competent Authorities.

6.4.1.2 Domestic measures on the implementation of the Basel Convention in Japan

a.1 Legislative Framework

In order to implement the Basel Convention, the following items must be determined in domestic legislation.

- National definition of waste for the purpose of transboundary movement (TBM)
- National definition of hazardous waste
- Additional waste to be regulated or controlled pursuant to Article 1(1)(b)
- Restriction of import & export of wastes for final disposal (Annex IV A)
- Restriction of import & export of wastes for recovery (Annex IV A)
- Restriction on transit of waste

The Japanese Government ratified the Basel Convention on December 16th 1993, and enacted the Act on the Control of Export, Import & Others of Specified Hazardous Wastes and Other Wastes (Japanese Basel Act) in 1992. This act determines hazardous wastes and other wastes that are subject to control under the Basel Convention. The Focal Point for the Basel Convention is Ministry of Foreign Affairs (MOFA), and the Competent Authority is Ministry of the Environment (MOE). The framework of domestic legislation regarding the Basel Convention is shown in the figure below.

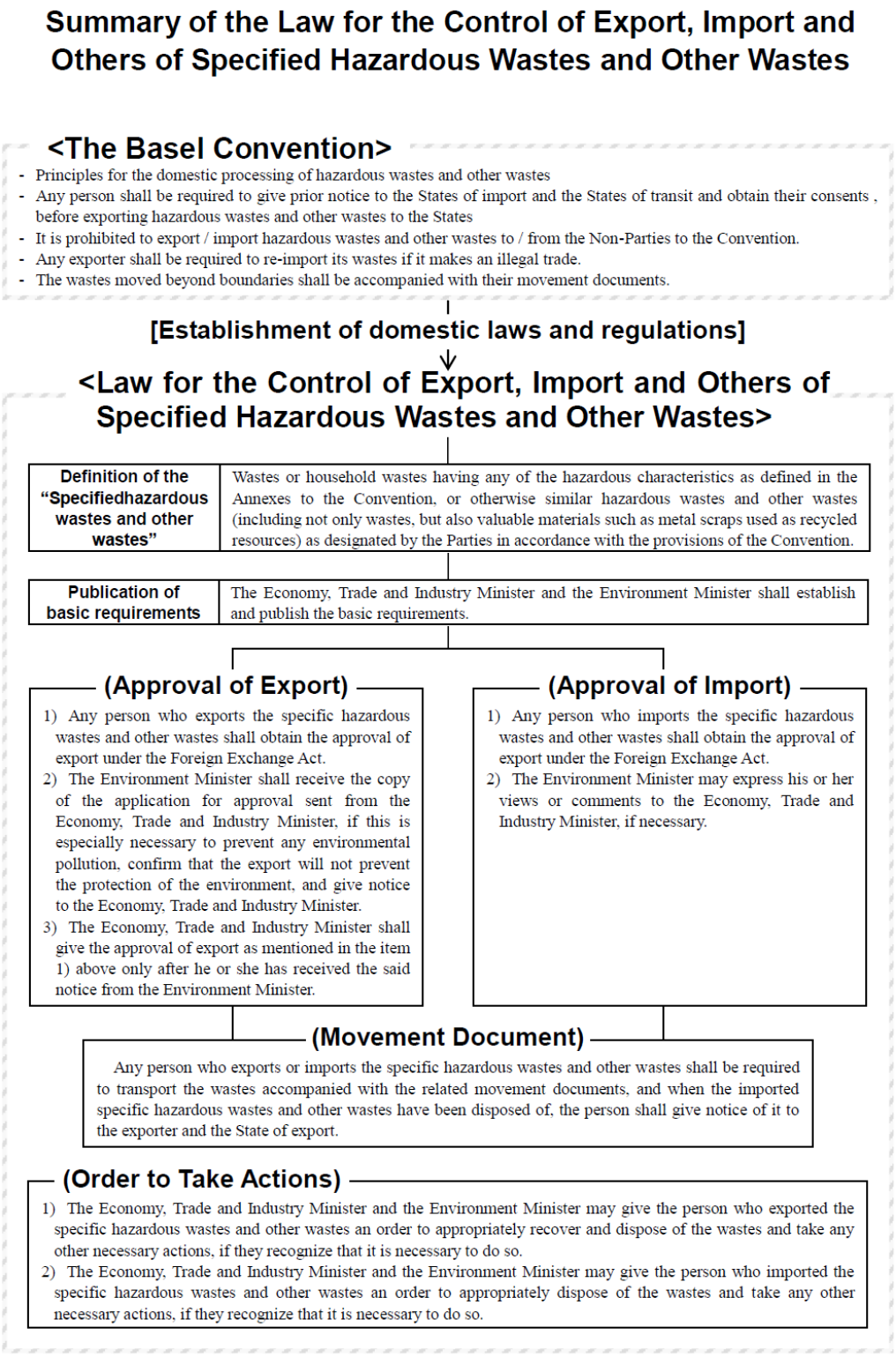


Figure 6-12: Overview of the restrictions on export and import of hazardous wastes and other wastes in Japan[77]

[77] Ministry of the Environment, Japan "Japan's Activities for the Basel Convention" http://www.env.go.jp/en/recycle/basel_conv/files/Summary_of_the_Basel_Law.pdf (Last viewed: 4 Dec 2020)

In Japan, the Ministry of Economy, Trade and Industry (METI) and MOE have jurisdiction over the Basel Act; METI is the contact point for exporter and importer business submissions, whereas MOE is responsible for notification through PIC with Competent Authorities of other countries.

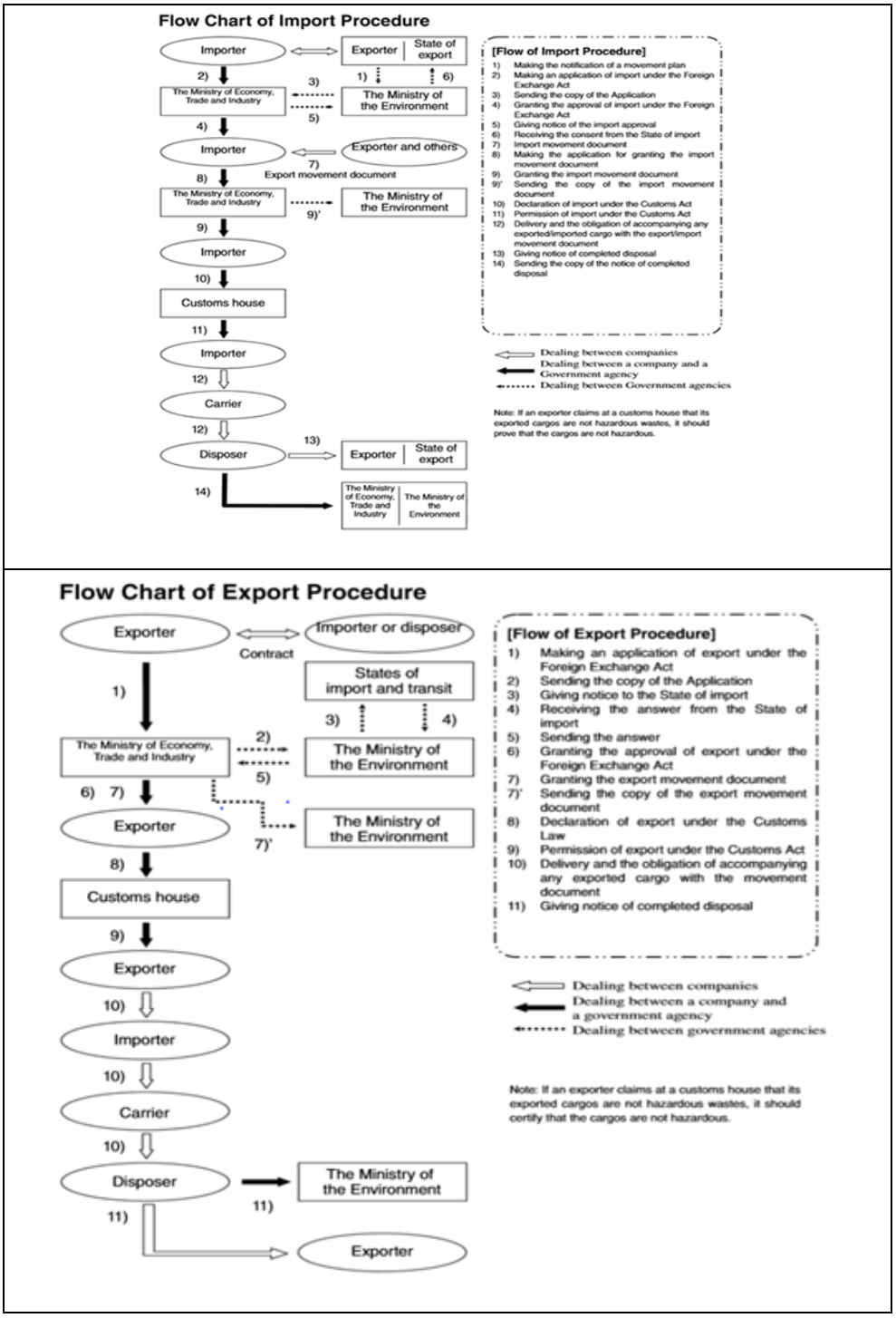


Figure 6-13: Procedures of import and export of hazardous wastes in Japan

a.2 Activities for the effective implementation of the Basel Convention

MOE has carried out the following activities to implement the Basel Act in an effective manner within Japan.

Table 6-4: Major activities implemented by MOE Japan for the effective implementation of the Basel Convention in Japan

Activity	Main activities
Dissemination of information via website	Creation/update of a website that can act as a one-stop service for importers and exporters regarding information on Japanese legislation and procedures, etc.[78]
Development of awareness-raising materials for business operators	Development of pamphlets and/or other materials targeting businesses that conduct export and import[79]
Hosting of information sharing seminar	Holding nationwide information sessions on the Basel Act in over 10 locations every year (around 100 participants per session)
Preliminary consultation	Provision of preliminary consultation services for importers and exporters on whether items to be imported/exported are subject to control under the Basel Convention
Cooperation with other enforcement agencies such as customs	Regular information exchange meetings with customs and other agencies to strengthen protection measures, joint inspection at ports

6.4.1.3 National legislation on the implementation of the Basel Convention in Thailand and Vietnam

Thailand and Vietnam ratified the Basel Convention on February 22nd 1998 and June 11th 1995, respectively. Compared to Lao PDR which ratified on December 20th 2010, both countries have over 10-years of additional experience regarding policy formulation and implementation.

Under the Basel Convention, Parties are obligated under Article 13 to submit national reports, which includes definition of waste and hazardous waste, waste subject to export and import control, and trade statistics of hazardous waste. The national legislation for the implementation of the Basel Convention in Thailand and Vietnam is summarized in the table below, based on information available from national reports of two countries.[80,81] Laos has not submitted a national report yet, and there is no information on the Basel Convention website regarding its national legislation and export or import of hazardous wastes controlled under the Basel Convention.

[78] MOE Japan "Export and Import of Wastes/Specified Hazardous Wastes and other wastes" https://www.env.go.jp/recycle/yugai/index.html (Last viewed: 4 Dec 2020)

[79] For example, "Summary of export and import management of wastes and others" has been created http://www.env.go.jp/recycle/yugai/pdf/gaiyou_H30.pdf (Same as above)

[80] http://www.basel.int/Countries/NationalDefinitions/NationalDefinitionsofHazardousWastes/tabid/1480/Default.aspx (Same as above)

[81] http://www.basel.int/Countries/ImportExportRestrictions/tabid/4835/Default.aspx (Same as above)

Table 6-5: Summary of national legislation for the implementation of the Basel Convention in Thailand and Vietnam

	Thailand	Viet Nam
National definition of waste used for the purpose of transboundary movements (TBMs)	● Thailand does not have a national definition of waste.	● Law on Environmental Protection (LEP) in 2014 (has been in force since 1 January 2015) generally defines that: ✓ Wastes are **substances discharged from production, business, services, living or other activities.** ✓ Hazardous wastes mean **wastes containing elements that are toxic, radioactive, contagious, flammable, explosive, abrasive, poisonous or otherwise harmful.** ● Decree No.38/2015/ND-CP dated 24 April 2015 of the of the Government on the management of waste and scrap. ● Circular No.36/2015/TT-BTNMT dated 30 June.2015 of the Minister of Natural Resources and Environment regulates on hazardous waste management, attached with the list of hazardous waste (Annex 1). ● Vietnam National Technical regulation on hazardous waste thresholds QCVN 07:2009/BTNMT dated 16 November 2009.
Definition of hazardous waste (HW) in the national legislation	● Hazardous wastes to be controlled for the import and export are defined in the List of Hazardous Substances Item: chemical wastes in the "Notification of Ministry of Industry on List of hazardous substances B.E. 2546 (2003) and Notification of Ministry of Industry on List of hazardous substances" (no. 4) B.E. 2549 (2006)" issued under the Hazardous Substance Act. B.E. 2535 (1992) in accordance with the wastes listed in Annex VIII of the Basel Convention (List A).	● LEP 2014 generally defines that hazardous wastes means **wastes containing elements that are toxic, radioactive, contagious, flammable, explosive, abrasive, poisonous or otherwise harmful.** ● Decree No.38/2015/ND-CP dated 24 April 2015 of the of the Government on the management of waste and scrap. ● Circular No.36/2015/TT-BTNMT dated 30 June 2015 of the Minister of Natural Resources and Environment regulates on hazardous waste management, attached with the list of hazardous waste (Annex 1).

	Thailand	Viet Nam
		● Vietnam National Technical regulation on hazardous waste thresholds QCVN 07:2009/BTNMT dated 16 November 2009.
Additional wastes regulated or controlled as hazardous pursuant to Article 1(1)(b)	● Thailand has defined the list of hazardous waste for the purpose pursuant to Art. (1) b in the Notification of Ministry of Industry B.E. 2548 (2005) issued pursuant to the provisions in the Factory Act B.E. 2535 (1992) on Disposal of Wastes or Unusable Materials. The categories of industrial hazardous wastes were defined and listed in 4 items as follows: ➢ Item 1 Hazardous wastes: Ignitable, corrosive, reactive, toxic and leachable substances; ➢ Item 2 Hazardous wastes from non-specific sources; ➢ Item 3 Hazardous wastes: discarded commercial chemical products, off-specification species, container residues, and spill residues (acute hazardous and toxic hazardous chemicals); and ➢ Item 4 Hazardous wastes: chemical wastes. ● According to the Notification of the Ministry of Industry No.1 B.E. 2541 (1998) issued pursuant to the provisions in the Factory Act B.E. 2535 (1992) on Disposal of Wastes or Unusable Materials, the categories of industrial wastes were defined and listed in 2 sections as follows: ➢ Section 1 Industrial Non-Hazardous Wastes; and ➢ Section 2 Wastes and Unusable Materials from Specific Industrial Processes. ● Thailand has also defined used electrical and electronic equipment (UEEE) and their parts and components as hazardous substances type 3 to be controlled for the import into the Kingdom of Thailand in accordance with the "Notification of	● Viet Nam controls additional hazardous waste pursuant to Article 1(1)(b). Those wastes are: ✓ The List of Hazardous Waste issued with Circular 36/2015/TT-BTNMT dated 30 June 2016 of Ministry of Natural Resources and Environment is setup with different approach from Annex 1 and Annex 8 (List A) of the Basel Convention. ✓ Vietnam National Technical regulation on hazardous waste thresholds QCVN 07:2009/BTNMT dated November 16, 2009.

	Thailand	Viet Nam
	Ministry of Industry on List of hazardous substances" B.E. 2546 (2003) issued pursuant to the Hazardous Substance Act B.E. 2535 (1992). In case of import of such equipment, the importer/consignee/factory shall follow procedures under the Notification of the Department of Industrial Works on the Criteria for the approval of the import of used electrical and electronic equipment into the Kingdom of Thailand, issued on 13 September B.E. 2550 (2007).	
Wastes covered other than those in annexes I, II and VIII of Basel Convention	● Thailand has not notified that any wastes are covered other than those in annexes I, II and VIII of the Basel Convention	● The list or lists containing such wastes can be found in the List of Hazardous Waste is issued with Circular 36/2015/TT-BTNMT dated 30 June 2015 of Ministry of Natural Resources and Environment.
Wastes other than those identified above that require special consideration when subjected to TBM	● Thailand has notified that the same requirements (procedures) concerning transboundary movements are applicable to the wastes listed above.	● Viet Nam notified that other requirements (procedures) concerning TBMs are applicable to the wastes listed above (See details in the Circular 36/2015/TT-BTNMT dated 30 June 2015 of Ministry of Natural Resources and Environment)
Implementation of the Ban Amendment	● Thailand has not implemented the ban amendment.	N/A
Restrictions on export of wastes for final disposal (Annex IV A)	● Thailand does not restrict the export of hazardous wastes and other wastes for final disposal (Annex IV A)	● Viet Nam does not restrict the export of hazardous wastes and other wastes for final disposal (Annex IV A)
Restrictions on export of wastes for recovery (Annex IV B)	● The production, import, export and possession of the hazardous substances as well as hazardous wastes within Thailand shall follow the procedures under the Ministerial Regulations B.E.2537 (1994) (and its amendments) and the Ministerial Regulations B.E.2555 (2012) issued under the Hazardous	● Viet Nam does not restrict the export of hazardous wastes and other wastes for recovery (Annex IV B))

	Thailand	Viet Nam
	Substance Act B.E.2535 (1992) which has entered into force since 1994 and 2012, respectively. ● Export of hazardous wastes and other wastes is allowed for environmentally sound management only.	
Restrictions on import of wastes for final disposal (Annex IV A)	**(i) Nature of the restrictions:** ● Total prohibition **(ii) Country or region covered by restrictions:** ● All countries **(iii) Wastes covered by the restrictions:** ● All wastes covered by BC	**(i) Specific relevant legislation and its entry into force:** ● Waste is prohibited from importing for any purpose by LEP 2014 **(ii) Country or region and/or wastes that would be covered by this restriction:** ● The prohibition covers all countries and all wastes under the law. The state prohibits importation of waste for final disposal. However, the state allows importation of certain categories of scrap materials for production (or recovery) as secondary materials for industrial production (see Decision No. 73/2014/QD-TTg in Item 3e (iii) below).
Restrictions on import of wastes for recovery (Annex IV B)	**(i) Nature of the restrictions:** ● Partial restriction **(ii) Country or region covered by restrictions:** ● All countries **(iii) Wastes covered by the restrictions:** ● All wastes covered by BC **(iv) Specify relevant legislation and its entry into force:** ● For import of hazardous waste and UEEE, importer/consignee shall comply with the Notification of the Department of Industrial Works on Criteria for Import of Chemical Wastes into Thailand, issued on 14 May B.E. 2539 (1996) and 26 May B.E. 2543 (2000) and the Notification of the Department of Industrial	**(i) Specific relevant legislation and its entry into force:** ● Waste is prohibited from import for any purpose by LEP 2014 ● Decision No. 73/2014/QD-TTg of the Prime Minister on stipulating the list of import scrap for production (has been in force since 5th February 2015). ● Circular No. 41/2015/TT-BTNMT of the Minister of Natural Resources and Environment on environmental protection in scrap importing for production (has been in force since 27 October 2015). **(ii) Country or region and/or wastes that would be covered by this restriction:**

	Thailand	Viet Nam
	Works on Criteria for Import of UEEE into Thailand, issued on 13 September B.E. 2550 (2007). ● Import of plastic scrap, importer/consignee shall comply with the Notification of Ministry of Commerce on Import of Goods No.112 B.E.2539 (1996) and the Notification of Ministry of Industry on Criteria for Import of Scarp and Used Material Made of Used Plastic & Unused Plastic B.E. 2551 (2008), issued on 21 January B.E. 2551 (2008). ● In May 2011, the National Environment Board ban import of 5 types of hazardous waste, including 1) Waste substances and articles containing/contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs); 2) Waste glass from cathode-ray tubes & other activated glass; 3) Used Lead-Acid Batteries; 4) Waste asbestos or waste containing/contaminated with any type of asbestos; and 5) Wastes containing/consisting of/contaminated with any congener of polychlorinated dibenzo-furan or polychlorinated dibenzo-dioxin. ● Import of hazardous wastes and other wastes into the Kingdom of Thailand is allowed for environmentally sound recovery/recycle only.	● The prohibition covers all countries and all wastes under the law. The state prohibits importation of waste for final disposal. However, the state allows importation of certain categories of scrap materials for production (or recovery) as secondary materials for industrial production (see Decision No. 73/2014/QD-TTg in Item 3e (iii) below). ● Vietnam differentiates between wastes and scrap. Law on Environmental Protection in 2014 generally defines scrap as materials recovered, sorted, or selected from materials and products discarded during the process of production or consumption for use as materials for another production process.
Restrictions on transit of wastes through this country	**(i) Nature of the restrictions:** ● Partial restriction **(ii) Country or region covered by restrictions:** ● All countries **(iii) Wastes covered by the restrictions:**	**(i) Specific relevant legislation and its entry into force:** ● LEP 2014 prohibit the transit of wastes (excepting scrap as defined by this Law). ● Decree No. 187/2013/ND-CP dated 20th November 2013 of the Government providing guidelines on implementation of the

	Thailand	Viet Nam
	● All wastes covered by BC **(iv) Specify relevant legislation and its entry into force:** ➢ Hazardous Substance Act B.E. 2535 (1992); ➢ Hazardous Substance Act (No.4) B.E. 2562 (2019); and ➢ Notification of Department of Industrial Works (DIW): rules and conditions regarding the notification and licensing of the transit of hazardous substance under the responsibility of Thai DIW B.E. 2562 (2019) ● Please note: The main chemical legislation in Thailand is the Hazardous Substances Act, BE 2535 (1992). The latest amendment, Hazardous Substances (No 4) BE 2562 (2019), was published in the Official Gazette on 30 April and has been in force since 27 October 2019. The revised Act includes criteria on transit, re-import, re-export and revises the criteria on advertising of hazardous substances for more efficient control of hazardous substances. ➢ Transit of hazardous wastes and other wastes through Thailand is allowed only for environmentally sound management at final facilities (recycle/treatment/disposal). ➢ Transit of type 3 hazardous substance shall apply for licensing from the Department of Industrial Works and have approval from the Customs for crossing the border, or transit or trans-shipment. ➢ Consent for TBM from importing country should be provided when submitting a request of transit consent of hazardous wastes and other wastes through the Kingdom of	Trade Law's regulations on international commodities buying and selling activities stipulates that the temporary import for re-export of commodities (including used commodities) should have been permitted from the Ministry of Industry and Trade (has been in force since 20th February 2014). ● Regulations on management of businesses on temporary import for re-export and transit of commodities prohibited or suspended from import issued by Circular No. 05/2013/TT-BCT of the Minister of Ministry of Industry and Trade (has been in force since 4th April 2013). ● Circular No. 05/2014/TT-BCT dated 27th January 2014 of the Minister of Ministry of Industry and Trade provides regulations on temporary import for re-export and temporary export for re-import, transfer and export of commodities (has been in force since 20th February 2014). **(ii) Country or region and/or wastes that would be covered by this restriction:** ● The prohibition covers all countries and all wastes under the law.

	Thailand	Viet Nam
	Thailand to ensure that the waste is allowed to be imported to final destination. ➢ Applicant shall have the insurance for any expense which may occur regarding the disposal or handling of the hazardous substance. The minimum guarantee limit is 100000 THB. Transit of hazardous substance sub-list 5.2 shall have the minimum guarantee limit of 500000 THB.	
Prior written consent for transit TBM of HWs or other wastes	● Thailand does not to require prior written consent, either generally or under specific conditions, for transit transboundary movements (TBMs) of hazardous wastes or other wastes	N/A

6.4.1.4 Status of import controls on specific waste streams in Asian countries

a.1 Import Control of Used Electrical and Electronic Equipment (UEEE)

A large amount of UEEE is being exported to South East Asian (SEA) countries under the pretext of reuse or repair/refurbishment, and it has become an issue where some equipment does not actually function and becomes E-waste. In response, many SEA countries have introduced import conditions for only accepting imports of UEEE where direct reuse is possible, and measures restricting the import of equipment for repair and refurbishment purposes.

MOE Japan established "the Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes" (hereafter, "Asian Network") in 2003, with the aim to facilitate information exchange amongst Competent Authorities of the Basel Convention in Asia. The Asian Network conducts a questionnaire survey every year of the participating countries, and summarizes the results on import restrictions of UEEE.[82] As of March 2020, many countries have introduced import restriction on UEEE, while Lao PDR has not introduced import controls of UEEE.

a.2 Import controls of plastic wastes

In July 2017, the Chinese Government amended the "Catalog of Import-Banned Solid Wastes", and the export of plastic wastes to China was banned from January 2018. Thereafter, destination of global plastic waste has been shifted to SEA countries such as Malaysia, Thailand, and Vietnam. To respond to the rapid increase of plastic waste imports, currently many SEA countries have introduced measures to control the imports of plastic wastes that are not suited for recycling.

In addition, at the 14th Conference of Parties (COP14) to the Basel Convention held from April to May 2019, the Convention's Annexes were amended, and it was decided to control plastic wastes that are not clean nor homogeneous and have the potential to cause pollution. These amendments will enter into force on January 1st, 2021 and currently many parties are establishing regulations and guidelines to determine plastic wastes that are subject to control under the Basel Convention. Therefore, it is expected that restrictions on plastic waste imports will become even stricter globally.

The Asian Network led by MOE Japan has carried out a questionnaire survey targeting member countries, and compiles the results on import controls of plastic wastes.[83] As of March 2020, many countries in Asia have introduced import controls on plastic waste, while Lao PDR has not introduced such restrictions.

6.4.1.5 Implementation of the questionnaire survey

A questionnaire is conducted to collect information regarding the current status of the implementation of the Basel Convention in Laos and related challenges from the Competent Authority of the Basel Convention in Laos, namely, MONRE. An overview of the questions is shown in the table below.

82 https://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/2019_PDF/Summary_of_import_regulation_on_UEEE.PDF (Last viewed: 14 Nov 2020)

83 https://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/2019_PDF/Summary_of_import_regulation_on_plastic_waste.pdf (same as above)

Table 6-6: Overview of the questionnaire for MONRE

Category	Questions
1. National legislation and regulations	- Status of development of national regulations and challenges - Definition of hazardous wastes, and overview of import/export control measures - Future plans for introducing restrictions
2. Export and import of wastes under the Basel Convention in the past	- Past record of export and import of wastes under the Basel Convention - Status of measures against specific waste streams with high concern
3. Enforcement	- Existence of domestic coordination mechanisms among related ministries and organizations - Awareness-raising activities towards domestic stakeholders - Cooperation with Competent Authorities at international level - Cases of illegal traffic - Challenges for domestic implementation
4. Technical cooperation needs	- Identification of cooperation needs for enhancing capacity for the implementation of the Basel Convention

6.4.2 Assessment of the current status of import and export control of hazardous wastes in Lao PDR

The current status of import and export control of hazardous wastes in Laos is summarized based on the response of MONRE to the questionnaire.

6.4.2.1 Development of domestic legislations for the implementation of the Basel Convention

Lao PDR ratified the Basel Convention on December 20th 2010; however, the country has not formulated domestic legislation for the implementation of the Basel Convention, nor has it began specific activities towards establishing legislations. In the questionnaire response, the following are raised as barriers for introduction of domestic legislations.

- Lack of human resources that are necessary for formulating domestic legislations
- Lack of coordination mechanisms between related ministries that are responsible for export and import restrictions (coordination between MONRE and other ministries, including Ministry of Industry and Commerce (MOIC), Ministry of Agriculture and Forestry, and Ministry of Finance, is insufficient)
- Unclear roles and responsibilities of the Department of Pollution Control and Monitoring (DPCM) under MONRE that should be the competent authority of the Basel Convention in Laos

Additional information is collected through online interviews with MONRE-DPCM regarding the future plans for formulating legislations.

- MONRE-DPCM will draft a regulation on waste management that is to determine the detailed implementation rule of the Basel Convention
- Based on the guidance document of MONRE from November 3rd 2020, MONRE and MOIC will issue a decision to prohibit the import of dirty plastic wastes with the exception of plastic that is sorted/clean and does not release bad odours. MONRE-DPCM is the one which will draft this regulation.
- Regarding the above plans, no clear schedule has been decided, however MONRE perceives it as a priority issue, and DPCM would like to finalize these regulations by 2021.

6.4.2.2 Status of import and export control of hazardous wastes and other wastes

Since there are no domestic legislations for the implementation of the Basel Convention, Lao PDR has no past record of importing or exporting hazardous wastes and other wastes from other countries through Prior Informed Consent (PIC). In addition, there have been cases of disputes with developed countries regarding the repatriation to the State of Origin of rapidly increasing import of plastic waste to SEA countries. Due to lack of national legislation, when illegal traffic has occurred, the Government of Laos cannot take appropriate measures (e.g., repatriation (or "take-back") of hazardous wastes to the State of Origin, re-export to a third country, or domestic disposal) nor take legal action (e.g., penalties or lawsuits towards illegal exporters/importers or consignees).

MONRE also perceives the response to plastic waste as a priority issue. According to the questionnaire, these plastic wastes are being imported into Laos from China passing through Thailand and Vietnam. In the future, in addition to formulating national legislations, the following activities are necessary.

- ✓ To begin dialogue with competent authorities in key neighbouring countries, (i.e., Thailand and Vietnam) in order to strengthen border controls
- ✓ To improve understanding of status of recycling of plastic waste in Laos (if it causes environmental pollution)
- ✓ To have better understanding of flow of plastic waste and final destination (domestic consumption/disposal or re-export to China or other countries)

6.4.2.3 Technical Cooperation Needs

The questionnaire inquired about future technical cooperation needs of MONRE-DPCM. Its response is summarized below.

a.1 Priority Issues

The questionnaire asked MONRE to select 5 priority issues that Lao PDR would especially require technical cooperation to implement the Basel Convention. The results are as follows:

Development of national coordination
- ✓ Development of legal and institutional framework
- ✓ Cooperation with other Competent Authorities or Focal Points at the international level
- ✓ National reporting
- ✓ Control procedure for the transboundary movement of hazardous and other wastes
- ✓ Prevention and control of illegal traffic

Accidents, liability and compensation
Environmental sound management of hazardous and other wastes
Waste prevention and minimization
Others

Regarding the 5 priority issues chosen above, the questionnaire asked them to select the 4 types of technical cooperation that would be needed. The results are as follows:

- ✓ Face-to-face training (workshop or "train-the-trainers")

Online training/webinars (i.e. where trainer support is available)
- ✓ Development of tools and materials

E-learning tools (such as online course without trainer support, or toolkit)
Videos
- ✓ Support for project proposal development
- ✓ Implementation of specific projects. (Capacity development of management of hazardous waste especially E-waste)

a.2 Implementation framework of the Basel Convention

The questionnaire asked MONRE to select 3 activities with high priority from below, regarding challenges they face to establish an implementation framework for the Basel Convention domestically or at an international level, and the technical cooperation needed. The results are as follows:

National coordination for the development of policies and legislation implementing the Convention
- ✓ National coordination for enforcing the provisions of the Convention (between enforcement authorities such as police, port authorities, customs, prosecutors, etc.)
- ✓ National coordination to implement the 3 Conventions (Basel, Rotterdam and Stockholm): synergies at the national level
- ✓ Fostering cooperation between Competent Authorities at the international level

Others

a.3 National Reports

Lao PDR has not submitted an annual National Report, which is an obligation of Basel Convention Parties. The questionnaire asked MONRE to select 3 issues of high priority from below, regarding the challenges they face, or technical cooperation needed for preparation of the National Report. The results are as follows:

To collect data for inventories of hazardous wastes and other wastes
- ✓ To collect data on import and export of hazardous wastes and other wastes
- ✓ To match national waste classification codes with Basel codes

To fill out the online questionnaire under the Basel Convention
- ✓ Other (lack of budget for collection of waste data)

a.4 Procedure for import and export of hazardous wastes and other wastes

The questionnaire asked MONRE to select 4 issues of high priority from below, regarding the challenges they face, or technical cooperation needed for carrying out export and import procedures of hazardous wastes and other wastes. The results are as follows:

- ✓ Review and drafting of legal texts
- ✓ Awareness-raising

Use of the notification and movement documents: To fill in the waste identification code
Use of the notification and movement documents: To identify the composition of some of the waste, when mixed constituents
Use of the notification and movement documents: To identify the custom code
Use of the notification and movement documents: To understand the documents (problems with foreign language/translation)
- ✓ Coordination at the national level, including with the generator, exporter, importer and disposer

Communication with the other Parties / within the region
- ✓ Cooperation at the international level: Difficulties in communicating with other Competent Authorities

Contract specifying environmentally sound management in relation to import/export

Insurance, bond or guarantee
Other

a.5 Response to illegal traffic or accidents

We asked MONRE to select 2 issues of high priority from below, regarding the challenges they face or technical cooperation needed for responding to and controlling illegal trafficking of hazardous wastes and other wastes. The results are as follows:

Coordination at the national level
- ✓ Identification of cases of illegal traffic
- ✓ Review and drafting of legal texts

International cooperation to address the consequences of illegal traffic (e.g. take back)
Developing a basis or mandate to investigate, prevent and combat illegal traffic
Awareness-raising
Other

6.4.3 Challenges towards the development of import and export control mechanism

In order to establish import and export control mechanism of hazardous wastes and other wastes in Laos, the top priority issue is formulating domestic legislation. Without legislation, import and export control, PIC procedures, and appropriate legal actions against illegal traffic cannot be implemented, so immediate actions are necessary.

Moreover, since DPCM is aware that the response to rapidly increasing exports of plastic wastes and E-waste to SEA countries is a high priority issue, development of import control mechanisms is an urgent issue. The following items are recommendable actions to be taken by MONRE-DPCM and these would need short-term and long-term technical cooperation.

- Formulating domestic legislations and regulations (Regulations for the implementation of the Basel Convention, restrictions on plastic waste import, etc.)
- Awareness-raising of domestic stakeholders (especially exporters and importers)
- Establishing a coordination system (sharing of intelligence for risk profiles) with related enforcement agencies (customs and police, etc.)
- Identifying the flow of specific waste streams into Laos, especially plastic wastes and E-wastes (identifying main entry points into Laos)
- Identifying the status of domestic recycling and environmental pollution
- Quantifying above information (development of an inventory that can be utilized for National Reports under the Basel Convention)
- Establishment of dialogue with key neighbouring countries such as Thailand and Vietnam to strengthening border controls

6.5 Consideration of Development of Framework for Chemicals Management System

6.5.1 Reviewing the status of chemicals management system in neighbouring countries and preparing a questionnaire on its status in Laos

6.5.1.1 Overview of chemicals management system

Sound management of chemicals is one of the global key issues since the overall objective of the Strategic Approach to International Chemicals Management (SAICM) is set out as “the achievement of the sound management of chemicals throughout their life cycle so that by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health.”, which the Target 12.4 of the Sustainable Development Goals (SDGs) is aligned with.

Depending on the development status, a chemicals management system in a country may advance from the strict control of hazardous chemicals/pollutants to the risk-based management of various chemicals in collecting hazard and exposure information.

For example, Japan has implemented two key regulations on the risk-based chemicals management.

One is the Chemical Substances Control Law (CSCL) to control manufacturing and import of industrial chemicals. The CSCL Inventory divides existing chemicals which have been manufactured in or imported to Japan and new chemicals which have not been handled in Japan. For new chemicals not on the CSCL Inventory, a notification to and evaluation by the government are required before manufacturing or import. For existing chemicals on the CSCL Inventory, at first the government conducts a screening assessment using manufacturing and import amounts notified by business operators and available hazard information. Then they conduct a risk assessment for chemicals prioritized by the screening assessment collecting detailed exposure and hazard information. Regarding hazard information, they may request additional toxicity information to business operators if necessary. Based on the result of risk assessment, they may take measures to control risks associated with the chemical.

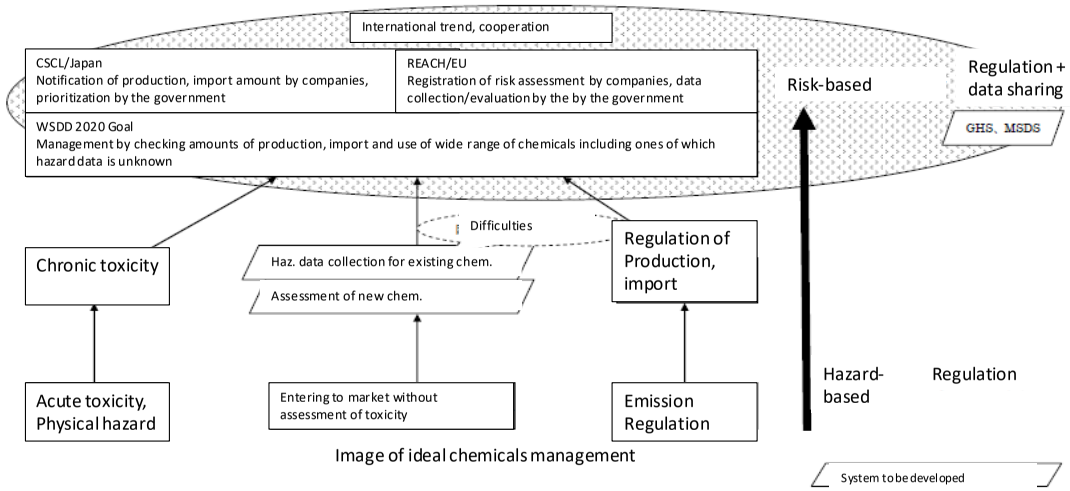


Image of ideal chemicals management

Figure 6-14: Image of ideal chemicals management system[84]

[84] National Institute of Technology and Evaluation (NITE) (2011). Report on chemicals management system in foreign countries https://www.nite.go.jp/chem/kanren/asia_kanren/asia_kanren_h22-02.html (Last viewed: Nov. 30, 2020)

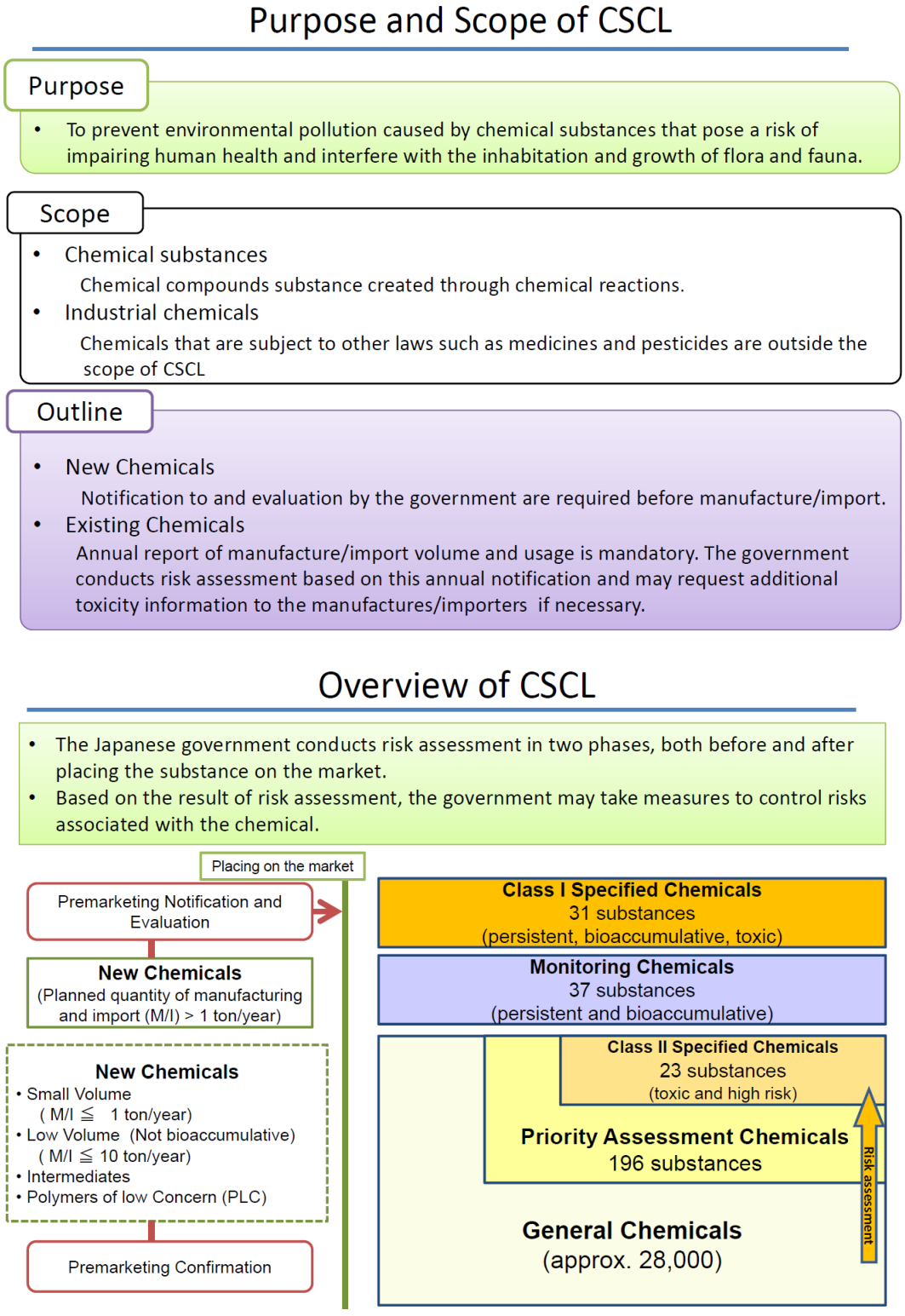


Figure 6-15: Overview of CSCL[85]

[85] CSCL homepage https://www.meti.go.jp/policy/chemical_management/english/cscl/files/about/01CSCL.pdf (Last viewed: Nov. 30, 2020)

Another is the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof. Under the law, the Pollutant Release and Transfer Register (PRTR) system has been implemented. Differing from the command-and-control regulation of traditional air or water pollutants, PRTR is a system that (i) requires businesses handling chemicals potentially hazardous to the environment to estimate the amounts of chemicals released and transferred in waste, and to report the data to their local governments, and that (ii) the national government then compiles data submitted and makes the results public.

PRTR aims to establish the common background of risk communication among the government, the business operators and the public by providing data about releases of chemicals to the environment. These data also help the business operators to manage their own amount of releases. In consequence, it can contribute to reduce the environmental risks from chemicals.

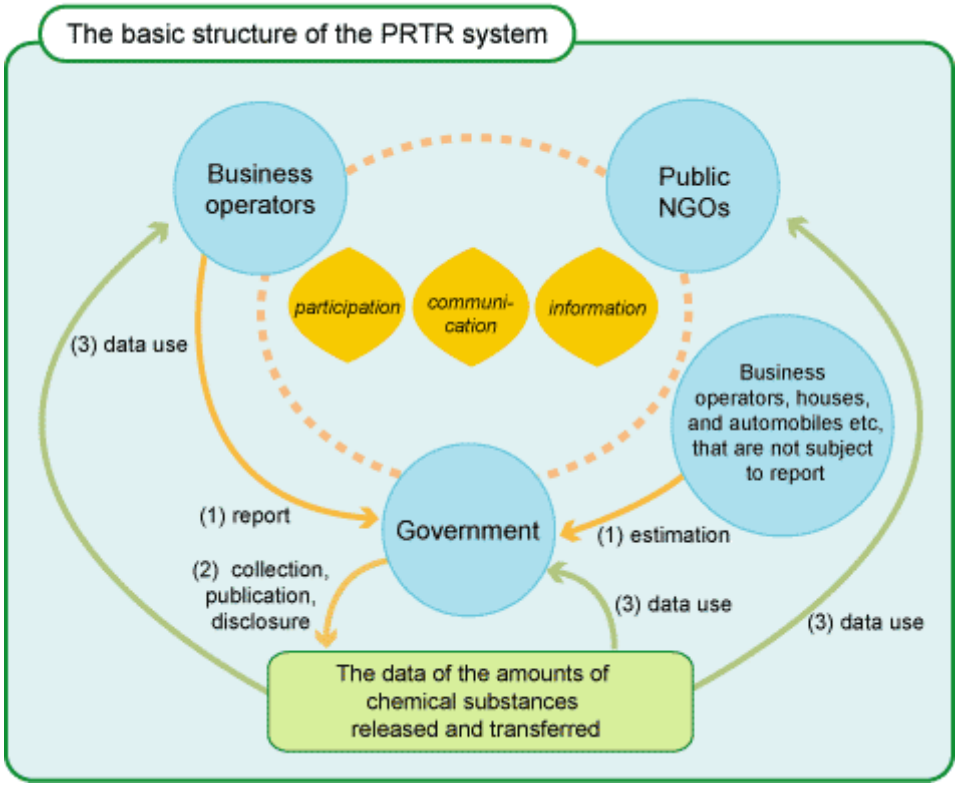


Figure 6-16: Overview of PRTR Law[86]

As developed countries including Japan have advanced their chemicals management systems, ASEAN member states such as Thailand, Vietnam have started establishing a risk-based management system with industrialization.

6.5.1.2 Overview of chemicals management system in Thailand

In Thailand, there is a law to control manufacturing, import, etc. of chemicals, namely the Hazardous Substance Act, and JICA implemented the Project for Development of Basic Schemes of PRTR system in Kingdom of Thailand from 2011 to 2016. Following the project, JICA has been implementing a technical cooperation for Development of New Pollution

[86] PRTR homepage http://www.env.go.jp/en/chemi/prtr/about/overview.html (Last viewed: Nov. 30, 2020)

Management Model Using PRTR and Public Participation Principles for Eco Industrial Town since 2019.

a. Hazardous Substance Act

The Hazardous Substance Act is a legislation to control manufacturing, import, etc. of hazardous substances under the supervision of 6 departments under 4 ministries, namely Department of Industrial Works (DIW) of Ministry of Industry (MOI), Food and Drug Administration of Ministry of Public Health, Department of Agriculture, Department of Fisheries, Department of Livestock Development of Ministry of Agriculture and Cooperative, and Department of Energy Business of Ministry of Energy. Each department has their own lists of hazardous substances.

Hazardous substances are categorized in 4 types and DIW controls 6 sub lists of hazardous substances.

Table 6-7: Types of hazardous substances under the Hazardous Substance Act in Thailand

Type of hazardous substances	Outline of regulations
Type I	Procedures such as import / export declaration are required to the authority.
Type II	Registration and notification are required to the authority.
Type III	Registration and application for license are required to the authority.
Type IV	Prohibited.

Table 6-8: Sub lists of hazardous substances controlled by DIW

Sub list No.	Type of hazardous substances controlled by DIW
Sub list 5.1	Chemical substance
Sub list 5.2	Chemical wastes
Sub list 5.3	Used electrical and electronic equipment
Sub list 5.4	Group of chemicals
Sub list 5.5	Chemical weapons
Sub list 5.6	Substances and mixtures classified by property

The sub list 5.6 does not designate individual hazardous chemicals, and DIW asks business operators to register any chemicals having any of 10 types of hazard properties if they manufacture or import such chemicals or mixtures containing such chemicals exceeding 1 ton/yr. DIW published the First Chemicals Inventory[87] in July 2020 with approximately 11,500 substances registered to DIW by 2017.

DIW is categorizing those chemicals on the inventory using hazard information and manufacturing and import amounts, but detailed regulations including methods for risk assessment and measures taken based on the degree of risk for existing chemicals on the inventory and new chemicals evaluation scheme are under consideration.

b. JICA's Technical Cooperation Project for the Development of Basic Schemes for PRTR System in Kingdom of Thailand

[87] First Thailand Chemicals Inventory http://inventory.diw.go.th/hazardous61/ (Last viewed: Nov. 30, 2020)

As a countermeasure for Volatile Organic Compounds (VOCs) as an air pollutant, JICA had implemented the Project for Development of Environmental and Emission Standards of VOCs in the Kingdom of Thailand from February 2006 to February 2008. Following the success of the project to control VOCs, JICA implemented a technical cooperation project from March 2011 to March 2016 in order to develop a PRTR system aiming to introduce a comprehensive management of chemical risks and to disseminate environmental information. The project conducted a pilot PRTR implementation in Rayong province where the largest petrochemical complex in the country, Map Ta Phut area is located to collect and compile PRTR reports from factories and other point sources, to estimate emission from non-point sources such as a mobile source, and to conduct risk communication activities with communities using PRTR information.

Table 6-9: Outline of Project for the Development of Basic Schemes for PRTR System in Kingdom of Thailand[88]

(1) Project Purpose
Capacity of PCD, DIW and IEAT's staff for implementation of PRTR pilot project is strengthened.
(2) Overall Goal
Model of PRTR system for Thailand is established.
(3) Project Period
March 2011 – March 2016
(4) Implementing Agency
Pollution Control Department, Ministry of Natural Resources and Environment
Department of Industrial Works, Ministry of Industry
Industrial Estate Authority of Thailand, Ministry of Industry
(5) Outputs
1. Basic design of PRTR system in Thailand is established.
2. Emission reporting scheme of industry is developed.
3. Capacity of estimation of emission and transfer for point source is strengthened.
4. Capacity of emission estimation for non-point source is strengthened.
5. Importance of use of PRTR data including initial assessment is understood.
6. Implementation structure of risk communication is developed in the pilot area.

After the completion of the project, the Thai government has been continuously conducting the pilot PRTR and publishing compiled PRTR data on the web[89], and legalization of the PRTR system is under consideration[90].

JICA is implementing a technical cooperation for Development of New Pollution Management Model Using PRTR and Public Participation Principles for Eco Industrial Town as individual

[88] JICA (2016). Final report on Project for the Development of Basic Schemes for PRTR System in Kingdom of Thailand https://openjicareport.jica.go.jp/pdf/12251039.pdf (Last viewed: Nov. 30, 2020)
[89] PCD's PRTR homepage http://prtr.pcd.go.th:8080/prtr/search/form (Last viewed: Nov. 30, 2020)
[90] DIW's PRTR homepage http://www2.diw.go.th/prtr/Home.aspx (Last viewed: Nov. 30, 2020)

expert assignment since 2019 to expand and utilize a concept of PRTR "information disclosure, public participation, and promotion of voluntary management".

6.5.1.3 Overview of chemicals management system in Vietnam

In Vietnam, the Law on Chemicals regulates manufacturing, import, etc. of chemicals. The JICA's technical cooperation project for Strengthening Chemicals Management in Vietnam was implemented to support implementation of the law by establishing the National Chemicals Inventory (NCI), developing the National Chemicals Database System (NCDBS), etc. Regarding the PRTR system, UNDP's Vietnam POPS and Sound Harmful Chemicals Management Project covered some PRTR related activities such as establishing a draft Circular on PRTR, conducting a pilot PRTR trial, etc.

a. Law on Chemicals

The Law on Chemicals is a comprehensive law to control chemicals in Vietnam supervised by Vietnam Chemicals Agency (VINACHEMIA) of Ministry of Industry and Trade (MOIT). The law has 5 lists of regulated chemicals.

Table 6-10: Lists of regulated chemicals under Law on Chemicals in Vietnam

List of regulated chemicals	Procedure required
Annex I Chemicals conditional manufacture and trading	Application for certification for manufacturing and trading is required to the local authority.
Annex II Chemicals restricted from production and trading	Application for license for production and trading is required to MOIT.
Annex III Prohibited chemicals	Permission for production, import and use from MOIT is required,
Annex IV Hazardous chemicals	Approval of plan on incidents by evaluation council is required by MOIT or line ministries.
Annex V Chemicals subject to declaration	Declaration on manufacturing to the local authority is required on annual reporting.
	Declaration on import to MOIT is required upon importation via National Single Window system by Customs.

In addition, the law has articles relating to establishment of the NCI and development of the NCDBS. JICA implemented the Project for Strengthening Chemicals Management in Vietnam[91] from April 2015 to March 2019 to develop such tools as key outputs of the project.

Table 6-11: Outline of Project for Strengthening Chemicals Management in Vietnam

(1) Project Purpose Industrial chemical management system, which adopted risk-based assessment and reflects the status of the industry, is endorsed by Vietnamese authorities.。 (2) Outputs

[91] JICA (2019). Final report on Project for Strengthening Chemicals Management in Vietnam https://openjicareport.jica.go.jp/619/619/619_123_12333951.html (Last viewed: Nov. 30, 2020)

1) Short and middle term of action plans of VINACHEMIA is established. 2) The situation survey on the industrial chemicals is implemented. 3) The national chemical inventory is developed. 4) The national chemical database is developed. 5) The risk-based chemicals management system is developed. 6) Manuals for officials of the risk-based chemicals management system are prepared. 7) Trainings to develop human resources for the risk-based chemicals management system are conducted. 8) Awareness seminars for governmental officials and public-private companies are conducted. (3) Project Sites Industrial areas mainly in Hanoi and Ho Chi Minh City (HCMC) (4) Implementation Agency Vietnam Chemicals Agency (VINACHEMIA), Ministry of Industry and Trade (5) Project Period April 2015 – March 2019 (6) Relevant Cooperation Memorandum of Cooperation between the Ministry of Economy, Trade and Industry of Japan and the Ministry of Industry and Trade of the Socialist Republic of Viet Nam on Strengthening of Risk-based Chemical Management System in Vietnam, singed in July 2012 and renewed in July 2015

The draft NCI is published on the NCDBS[92] developed under the project. After the completion of the project VINACHEMIA has been continuously collecting additional chemical information from business operators to update the draft NCI which covers approximately 39,000 chemicals at this moment.

On the other hand, detailed regulations including implementation of risk assessment and measures taken based on the degree of risk for existing chemicals on the NCI and new chemicals evaluation scheme are under consideration.

b. PRTR related activities under the UNDP project

According to the project document, the project included PRTR related activities such as establishment of a draft PRTR regulation, a pilot PRTR trial in Binh Doung Province in southern Vietnam covering 20% of industries there, but results are not disclosed.

Table 6-12: Outline of PRTR related activities under the UNDP project (extracted from the project document)[93]

(1) Project Goal, Objective, Outcomes and Outputs/activities

[92] National Chemicals Database http://chemicaldata.gov.vn/cms.xc (Last viewed: Nov. 30, 2020)
[93] Project homepage https://www.thegef.org/project/vietnam-pops-and-sound-harmful-chemicals-management-project (Last viewed: Nov. 30, 2020)

The project Objective is to continue the reduction of environmental and health risks through POPs and harmful chemicals release reduction.

The project intends to achieve this objective by provision of an integrated institutional and regulatory framework for better enforcement of the Stockholm Convention provisions, and covering the development of pilot PRTR system covering at least 20% of the industrial sources in an industrial province, for the management and reporting of POPs and Mercury. The project intends to work toward the creation of a national sound chemicals management framework and targeted development of POPs contaminated sites management capacity that builds on experience from GEF-4 projects.

(2) Output / Activity 1.1.5. Establishment and enforcement of the regulatory framework for POPs/ PTS tracking tool and a PRTR system through support in drafting the PRTR regulation, by establishment of an inter-ministerial coordinating group on PRTR regulation, Integrating POPs / PTS requirement in the database design, drafting guidelines for PRTR enforcement and implementation.

(3) Output / Activity 2.2.3 A POPs/PTS database developed at provincial level and PRTR reporting system operational and linked to the POPs tracking tool and data submitted to Convention Secretariat.

The following table shows summary of the implementation status of chemicals management system in Japan, Thailand, and Vietnam.

Table 6-13: Summary of implementation status of chemicals management system in Japan, Thailand, and Vietnam

Type of regulations		Japan	Thailand	Vietnam
Regulation on manufacturing and importing of (industrial) chemicals	Chemical Inventory to define exiting chemicals	Available (CSCL Inventory)	Drafting (First Inventory has been published.) by collecting information from industries	Drafting (Chemicals Database developed under JICA project) by collecting information from industries
	Risk assessment of existing chemicals	Implemented by prioritizing	To be considered after/with development of Chemical Inventory	To be considered after/with development of Chemical Inventory
	New chemicals evaluation	Implemented		
Regulation on emission of (industrial) chemicals	PRTR (Pollutant Release and Transfer Register)	Implemented under the PRTR Law	Pilot PRTR under JICA project, Under development of legal instruments	Pilot PRTR under UNDP project

In Laos, there is the Law on Chemicals Management supervised by MOIC and MONRE's Ministerial Instructions on Pollution Control which includes articles relating to chemical emissions. In order to grasp the implementation status of those regulations and issues and challenges they are facing, a questionnaire on the status of chemicals management system in Laos to MOIC and MONRE was prepared. An outline of the questionnaire is as follows.

Table 6-14: Outline of questionnaire on status of chemicals management system in Laos to MOIC and MONRE

■ Implementation status of Law on Chemicals Management - Division in charge - Lists of regulated chemicals - Chemical registration system - Technical cooperation needs
■ Implementation status of Ministerial Instructions on Pollution Control - Division in charge - National Environmental Standards - Detailed regulations such as lists of pollutants and toxic chemicals, target industries, etc. - License and registration of pollution loads - Technical cooperation needs

6.5.2 Current status of chemicals management in Laos

Based on answers to the questionnaire from MOIC and MONRE, the current status of chemicals management in Laos are summarized as follows.

6.5.2.1 Implementation status of Law on Chemicals Management by MOIC

a. Division in charge

Deputy Director General of DOIH and 7 staff members of Division of Environment and Chemistry of DOIH are in charge of implementation of the Law on Chemicals Management.

b. Implementation status

b.1 Lists of regulated chemicals

Regulated chemicals are categorized in Types I – IV of Hazardous chemicals on the Decision No. 0389/MOIC/DIH. Review of the regulated chemicals specified under the Chemical Weapon Convention (CWC) is necessary.

Table 6-15: Types of hazardous chemicals under Law on Chemicals Management in Laos

Type of hazardous chemicals	Outline of regulations	No. of hazardous chemicals
Type I – toxic and extremely dangerous	Prohibited	- 64 chemicals - 3 chemical groups - 6 chemicals controlled by Chemical Weapons Convention (CWC) - 16 Chlorofluorocarbons (CFCs), 7 Hydrochlorofluorocarbons (HCFCs), 1 Hydrobromofluorocarbon, and 7 Halons controlled by Montreal Protocol (MP)

Type of hazardous chemicals	Outline of regulations	No. of hazardous chemicals
Type II – toxic and very dangerous	Permission required by MOIC	- 276 chemicals - 4 chemical groups - 6 chemicals controlled by CWC - 2 HCFCs, 9 Hydrofluorocarbons (HFCs), 5 halogen-free refrigerants controlled by MP - 6 groups of chemical wastes - 2 groups of used electrical and electronic appliances
Type III – toxic and moderately dangerous	Permission required by MOIC	- 38 chemicals
Type IV – toxic and slightly dangerous	Notification required to MOIC	- 107 chemicals

b.2 Chemical registration system

All chemicals handled in Laos must be registered. A form for chemical registration is available. Approximately 160 companies have already registered chemicals, but information of registered chemicals are being summarized.

c. Technical cooperation needs

Lancang-Mekong Cooperation Special Fund, a Chinese cooperation scheme provides MOIC with a financial cooperation to develop a chemical database system from June 2020 to January 2021 with 327,500 USD (See Section 7.8 for details)[94]. MOIC has an idea to have functions to view regulatory information and lists of regulated chemicals and an online reporting system on the database. To realize this, MOIC expects cooperation activities such as dispatching of Japanese experts to Laos and study tours to Japan.

6.5.2.2 Implementation status of Ministerial Instructions on Pollution Control by MONRE

a. Division in charge

DPCM of MONRE and Vientiane Department of Natural Resources and Environment are focal points to coordinate with relevant ministries and local departments in implementing the instructions. Division of Chemicals and Waste Management is the main division in charge in DPCM.

There is no coordinating mechanism to coordinate with MOIC on emission regulations from industries, and MONRE does not have authority to control import and export of Toxic chemicals.

b. Implementation status

b.1 National Environmental Standards

Environmental Quality Standards for ambient air, water, soil and emission standards for air and water are set out on the Agreement on National Environmental Standards dated March 2017. Standards in neighbouring countries such as China, Thailand, Vietnam, etc. are referred to.

b.2 Detailed regulations

[94] Lancang-Mekong Cooperation Special Fund (2019). Project Proposal on Creating National Chemicals Database

The Ministerial Decision on Pollution Control specifying target emission sources or industries for license and registration of pollution loads has been drafted, and a consultation meeting on the draft with the Vice Minister was planned in 2020.

The Ministerial Decision on Toxic Chemicals is to be drafted after 2021, but details such as introducing a reporting scheme for industries, developing a database, etc. have not been discussed yet. MONRE recognizes the importance of cooperation with MOIC in order to establish the regulation. So, MONRE also thinks that a steering committee consisting of MONRE and MOIC, information sharing on factories and chemicals which MOIC has would be necessary.

b.3 License and registration of pollution loads

As mentioned above, detailed regulations on license and registration of pollution control are under consideration. MONRE has issued licenses on wastewater discharge to 3 companies meeting national environmental standards, but registration of pollution loads has not been started.

c. Technical cooperation needs

As mentioned above, details on pollution control or chemical emission including an emission reporting scheme have not been discussed yet.

On the other hand, Natural Resources and Environment Institute under MONRE has a plan to cooperation environmental monitoring to local departments in the country. So, there is a technical cooperation need on capacity development to the institute and local departments.

6.5.3 Issues and challenges towards development of framework for chemicals management system in Laos

It can be said that Laos is at the early stage to introduce a comprehensive chemicals management system to control or manage manufacturing and import, or emission of chemicals because the Law on Chemicals Management and the Ministerial Instructions on Pollution Control are established, but those regulations have not been fully implemented due to lack of detailed guidance.

Since DOIH and DPCM have various roles and responsibilities in waste or environmental management besides chemicals management, it would be necessary to prioritize policies or regulations among them, especially waste management which this survey more focused on, considering the situation in Thailand and Vietnam; Both countries are more industrialized and trade chemicals in higher volumes than Laos in the ASEAN region, and have started implementing the risk-based management of manufacture and import of chemicals with listing up existing chemicals, but it may take time to fully implement more detailed and technical regulations such as risk assessment of existing chemicals, new chemicals evaluation scheme, etc.

Table 6-16: Import and export amounts of organic chemicals (Commodity code: 29) in Japan, Laos, Thailand, and Vietnam from 2015 to 2019[95]

(Unit: million US$)

Year	Import				Export			
	Japan	Lao PDR	Thailand	Vietnam	Japan	Lao PDR	Thailand	Vietnam
2015	14,194	6.2	4,065	2,534	17,901	1.7	4,162	172
2016	14,414	9.4	3,698	2,580	15,938	2.4	3,779	178

[95] UN Comtrade https://comtrade.un.org/ (Last viewed: Nov. 30, 2020)

2017	15,879	18.7	4,287	3,162	17,884	3.1	4,809	192
2018	18,206	13.9	5,028	3,925	18,930	2.6	6,188	512
2019	16,106	18.4	3,962	3,807	17,853	1.9	4,614	627

Towards development of a framework of chemicals management system in Laos, as it may be foreseen that manufacturing and import of chemicals in the country will increase with further industrialization in the future, it would be necessary to start grasping the situation of handling of chemicals from the view point of control of manufacturing and import as well as emissions in order to prevent adverse effects caused by chemicals to human and the environment.

MOIC is developing a factory database based on factory information collected under the Law on Industrial Processing, has a chemical registration system, and has started considering development of a chemicals database under the Law on Chemicals Management. So, MOIC can be a leading agency to collect and compile chemical information in the country. For this purpose, it would be effective to develop the chemical database with a pilot implementation of the chemical registration system in some big industrial zones, which would enable MOIC to raise awareness about the chemical registration to and communicate with factories located there. Then they may prepare user-friendly guidelines and an online system for chemical registration.

In addition, as MONRE pointed out, it would be important to develop and maintain a cooperative framework between MOIC and MONRE to consider effective measures for pollution control and toxic chemicals under the Law on Environmental Protection because factory and chemical information are necessary.

Besides the issues mentioned above, environmental monitoring is also one of key activities in environmental management field. So, in parallel, MONRE should consider development of framework and capacity for monitoring of pollutants and chemicals in the environment.

7 Trends of Development Partners

7.1 World Bank

7.1.1 MONRE

The World Bank implemented an environment and social project (Lao Environment and Social Project) from 2005 to 2013 aimed at improving MONRE's capabilities to manage natural resources and to address environmental and social challenges. Currently, LENS Phase II (LENS 2) is being implemented from 2014 to June 2021, however, due to the impact of COVID-19 and MONRE's organizational restructuring which was conducted in March 2020, some sub projects were delayed. Therefore, the project is expected to be extended for one year until June 2022 without additional budget allocation. Cooperation for the project that is equivalent to Phase III is planned for five years from July 2022 until June 2027.

1) LENS, 2005-2013, 4.8mil USD

The project was implemented aiming to improve capabilities of managing environmental and social challenges in association with the sustainable usage of natural resource in Laos.

2) LENS 2, 2014-2021, 41.83 mil USD (both schemes of grant aid and loan)

The project is supported by the World Bank through Environment Protection Fund ((EPF) and consists of three components (Table 7-1 below). The project covers eleven nature reserves (1.29 million hectares) across seven locations (Vientiane Capital, Vientiane Province, Khammouane Province, Savannakhet Province, Xiengkouang Province, Luang Prabang province, Hoaphanh Province). LENS 2 is funded for a total of 41.83 mil USD, including funding from the World Bank Group (International Development Association, IDA) of 14.4 mil USD, Global Environment Facility (GEF) (grant) of 6.83 mil USD, and the Lao government of 3 mil USD.

Table 7-1: Outline of LENS 2

Activity	Description	Fund size
Component 1	Improve capabilities of policies central / local governments in planning and monitoring natural resources / environmental / social policies	USD 14.4 million
Component 2	Improve the management capabilities of wild animals and protected areas, managing protected areas of local governments / citizens / communities, and enforce the Wildlife Conservation Law	USD 20.6 million
Component 3	Improve project administration capabilities and abilities to improve as a financial cooperation organization for EPF environmental projects	USD 6.83 million

(Source: World Bank (2015)'LENS II Fact Sheet[96])

Eight sub projects of LENS2 conducted by DPCM are as follows. (Nov 2020)

[96] http://www.worldbank.org/content/dam/Worldbank/document/EAP/lao-pdr/la_lens_factsheet_June_2015.pdf (Last viewed: Mar 12, 2020)

Table 7-2: Sub projects conducted by DPCM

Component 1: Strengthening PCD capacity to establish national legislations and guidelines and source inventory on pollution control and management of toxic chemicals and wastes
1.1 To develop national legislations on pollution control and management of toxic chemicals and wastes
1.2 To develop the guidelines on pollution control and management of toxic chemicals and wastes
1.3 Develop the National State of Pollution Report and Database Installation
1.4 Identify criteria for Priority Pollution Watch Sites (PPWS) and reduce exposure to lead poisoning to support the Green Growth -Development Policy Operation (DPF3, 2019 and 2020)
1.5 Capacity building of relevant provincial and national staff on pollution prevention, control, and hazardous waste management regulations (ensure 20% of women participation)
Component 2: Capacity building of PONREs, DONREs and VONREs for implementing pollution control, toxic chemicals and wastes management.
2.1 Capacity building of PONREs, DONREs and VONREs for implementing pollution control, toxic chemicals and wastes management.
2.2 Support preparation and implementation of 3R action plans of pilot area
2.3 Conduct case study on pollution control and toxic chemical management

Source: Extracted by the survey team based on DPCM materials, November 2020

3) Environmental and Waste Management Project (Equivalent to LENS 3)

The Project is planned to aim to improve the management of environmental waste and pollution. The scheduled project period is from 2022 to 2027 (5 years), and the budget is planned to be 30 mil USD loan (IDA Laos of 10 mil USD, regional IDA of 20 mil USD). The allocation to each component is planned to be 10 mil USD (Component 1) and 20 mil USD (components 2&3). A cooperative provision of support is planned with KEITI, EU, KEXIM, and GGGI[97]. The targets of cooperation for each component include MONRE / PONREs, MPWT / PPWTs, and EPF. The Project, a successor of LENS II, supports the development of plastic waste action plan including plastics from Laos, which is a landlocked country but covers 75% of the Mekong River basin[98], following the global trend of plastic waste that has a significant impact on the environment.

[97] Result of interview with World Bank (March 12, 2020)

[98] World Bank (Oct 2019) Aide-Memoire, World Bank resilient Green Growth Advisory Program (P171011), Joint mission by World Bank, KEITI and KEXIM on support to Lao PDR on solid waste, plastic and environmental management, September 30 – October 8, 2019. (p.17)

Table 7-3: Proposed Components of Environmental and Waste Management Project

Composition	Description	Implementing agency
Component 1	Enhance environmental and pollution control and monitoring	MONRE/PONREs *Provincial
	1.1 Enhancement of environmental and pollution control and monitoring 1.2 Development of policies and systems 1.3 Air, water, and waste pollution monitoring 1.4 Support facilities to enhance environmental and financial measures 1.5 Strategic communication and public support for behavioral change 1.6 Innovative information technology for pollution monitoring and reduction 1.7 International coordination on the environment: air, plastic, chemicals, water, climate change 1.8 Support for ESIA (Environmental and Social Impact Assessment) and SEA (Strategic Environmental Assessment) processes 1.9 Subprojects implementation unit	
Component 2	Sustainable solid waste and plastic management and infrastructure	MPWT/PPWTs
	2.1 Enhancement of policies, institutions, and local governments in solid waste management 2.2 Priority investment in collection, transportation, and disposal (undecided sites based on national evaluation) 2.3 Integrated plastic waste management 2.4 Climate change 2.5 Support for ESIA (Environmental and Social Impact Assessment) and SEA (Strategic Environmental Assessment) processes	
Component 3	Multi-sector project implementation unit	EPF
	3.1 Monitoring and evaluation 3.2 Support for partnership platforms for pollution behavior among stakeholders Financing	

(Source: The World Bank project materials, as of March 2020)

7.1.2 MPWT

MPWT is the implementing agency for 'Component 2: Sustainable Solid Waste and Plastic Management and Infrastructure (MPWT/PPWTs)' of the Environment and Waste Management Project (Table 7-3), which is planned from 2022 to 2027. Moreover, the solid waste management analysis, Road Map 2040—supported by KEXIM, as outlined in section 7.6 below—is part of the World Bank's flagship Joint Summary Report: Priorities for Lao PDR on SWM.

7.2 AIIB

7.2.1 Integrated Solid Waste Management Improvement Project

AIIB dispatched a research team to Laos from the end of October to early November 2019 to identify urban sector projects. A meeting with the Government of Laos (MONRE, MPWT, MOIC, VCOMS, MOF) and the Lao Office of the World Bank, and KEITI, KEXIM discussed the urban portfolio and pipeline projects of Laos.

A waste sector cooperation project is currently planned to limit the target to Vientiane Prefecture, based on cooperation with other donors. MOF and MONRE were scheduled to submit both loan and grant to AIIB, however, according to the hearing from MONRE, the loan part is taking time for internal coordination and the application has not been submitted (as of October 2020).

AIIB defines its focused areas as; (1) Solid waste management, (2) Wastewater management, (3) Drainage and disaster risk management, and (4) Improvement of public space (undergrounding of electric wires, etc.). Among the areas, the Integrated Solid Waste Management Improvement Project was proposed. The budget is 100 mil USD with 50 mil USD covered by AIIB and another 50 mil USD by the World Bank. Further progress was not confirmed at an additional interview in November 2020.

The Project aims for "improving the waste management system in Vientiane Prefecture," and its expected achievement includes the following 6 areas[99];

(1) Reduce the exposure to pollutants and disease vectors by funding the closure of illegal dumping sites.
(2) Encourage commercial and operational modernization of the waste sector by optimizing the landfill construction, and collection, transportation, and intermediate processing of waste at Vientiane urban area.
(3) Enable the "private sector" model of waste management in the country
(4) Enhance the regulatory framework of the sector, and appropriately improve the capabilities of national, regional, and local stakeholders
(5) Promote commercialization of waste reduction, recycle, and resource separation for commercialization
(6) Alleviate poverty and vulnerability of waste pickers through development of appropriate social inclusion and economic transition program

The activities in the plan are described as follows.

[99] AIIB(2019)「Lao PDR: Urban Sector Project Identification Mission October 31 – November 1, 2019 Aide-Memoire」. pp.12-13

Table 7-4: Proposed components of solid waste management improvement project

Composition	Activity	Description
Component 1	Waste collection and transformation infrastructure	Enhance individual waste collection and transportation infrastructure (technical equipment, vehicles, relay stations)
Component 2	Waste processing infrastructure	● Construct newly designed sanitary landfill facility (SLF), renovate existing waste processing facility ● Develop new SLF (ensure that less than 20% of residue is sent to SLF) ● Compost, RDF, WtE ● Resettlement and compensation costs for property loss in case of adverse effects due to sub-projecting
Component 3	Project management	● Facilitate Clean Development Mechanism (CDM) initiatives in SWM ● Support project management, monitoring evaluation, survey, financial management, and implementation of environmental and social safeguards ● Supervise infrastructure investment / support infrastructure maintenance ● Support strategic investment planning and preparatory research for future urban investment

(Source: Created by the survey team based on AIIB materials[100])

7.3 ADB

Four urban management / infrastructure development-related projects are underway in Laos, in addition two projects are at the formative stage of projects (the details of one is as yet undisclosed)[101]

7.3.1 Greater Mekong Subregion Phase 1-4

ADB is implementing an infrastructure development project involving MPWT, namely the Greater Mekong Subregion Economic Cooperation Program (GMS Program). This program encompasses six countries along the Mekong River: Cambodia, China, Laos, Myanmar, Thailand, and Vietnam. The program has constructed a landfill in Kaixon City. Under GMS 2 (2016 – 2020), disposal sites are under construction in Luangnamtha Province and Bokeo Province. There is no GMS 3 project. Under GMS 4 (scheduled for 2020-2026), construction of disposal sites is planned as a grant in Bolikhamxay Province and Khammouane Province.

[100] AIIB (2019). p.13
[101] Result of interviews with ADB (November 6, 2020)

Table 7-5: Urban Environment Projects supported by ADB

No.	Duration	Name / description of Project	Budget (mil USD)
1	2012.07-2018.12 (Postponed until 2020.12)	Pakse Urban Environmental Improvement Project[102] 1. Citywide improvement, SWM, flood protection and drainage, riverbank protection. 2. Community-driven urban: on SW, HHs sanitation. 3. Strengthened capacity for provincial urban planning and services support agencies in Pakse. 4. Strengthened capacity for project management and implementation	31.74 (ADB loan 24.25) (ADB Grant aid 3.22) (Lao gov. 3.65) (Borne by residents 0.59)
2	2013.01-2018.12 (Postponed until 2020.12)	Greater Mekong Subregion East-West Economic Corridor Towns development Project (Savannakhet Province)[103] Kaysone City, Phine Town and Danesavang along the Rd No.9. -Kaysone City: Urban road, SWM, Mekong river embankment protection and MRF at waste disposal centre. -Phine Town: Urban Road improvement. -Danesavanh: Urban Rd. improvement.	47.73 (ADB loan 26.60) (ADB Grand aid 14.23) (Urban environment fund 0.64) (Lao gov. 6.26) (Borne by residents 0.59)
3	2016.01-2020.12 (or 2021.03)	Second Greater Mekong subregion Corridor Towns Development Project[104] (Bokeo and Luang Namtha) Target: 2 towns. -Houayxay: SWM, Urban road and drainage, riverbank protection, river side road and walkway, river port rehabilitation and recreation park area. -Luangnamtha: SWM, Urban drainage, urban village upgrade, urban recreation facilities and construction of a bridge.	52.0 (ADB Loan special fund 37.0) ASEAN infrastructure fund 10.0) Lao gov. 5.0)
4	2020– 2026 (Tentative)	Fourth Greater Mekong Subregion Corridor towns development project (Thakhek Town in Khammouane Province and Paksan in Bolikhamxay Province)[105] 2 towns: Thakhek Town in Khammouane Province and Paksan in Bolikhamxay Province. The Component project consists of urban citywide improvement, SWM, capacity building etc.	48.0 (Asian Development Fund)

(Source: Created by the survey team based on interviews, as of November 2020)

7.3.2 Lao Livable Cities Program

Another ADB project currently in the preparatory stage, ”Lao Livable Cities Program”, currently targets general waste and hazardous waste (medical waste), with the construction of disposal sites planned in Luang Prabang Province (Luang Prabang City, Savannakhet Province (Kaysone-Phomvihane City), and Champasak Province (Pakse City). The program is undergoing a preparatory survey of the project with the support of CDIA (Cities Development

[102] https://www.adb.org/projects/43316-022/main#project-pds (Last viewed: October 15, 2020)
[103] https://www.adb.org/projects/50099-001/main#project-pds (Same as above)
[104] https://www.adb.org/sites/default/files/project-documents/46443/46443-003-iee-en_0.pdf (Last viewed: October 15, 2020)
[105] https://www.adb.org/projects/50099-003/main#project-pds (Same as above)

Initiative for Asia) which is executed by ADB and AFD (French Development Agency)[106]. The project preparation workshop (first stage) of the program is conducted at three cities (Pakse, Luang Prabang, Kaysone-Phomvihane) between August 3 – 7 2020. This preparation survey is scheduled to be completed by the end of 2020.

7.3.3 Urban Environmental Improvement Investment Program (UEIIP)

Urban Environmental Improvement Investment Program (UEIIP), the successor of Lao Livable Cities Program, is targeted to start in 2021.[107]

7.4 KOICA

KOICA in its support plan for Laos (Country Partnership Strategy) 2016－2020, defines its focused areas as (1) water and health, (2) energy, (3) education, and (4) rural development; and it is providing support in these areas. This support plan is also aligned with the 8th National Socio-economic Development Plan (8th NSEDP).[108]

KOICA has two schemes to implement projects[109];

1) Bilateral cooperation: KOICA and partner country implement a project in collaboration with ministries and agencies of the target field
2) Multi-lateral / bilateral cooperation: KOICA supports (financially) UN agencies and other international agencies to implement projects in collaboration with ministries and agencies of the target field.

7.4.1 Bilateral Cooperation

As a waste-related project, KOICA conducted a feasibility study between 2015 – 2016 for the disposal of hazardous waste at KM32 disposal site. MOIC proposed a project to MPI, which was not adopted in the end.[110]

[106] Based on the interview from MPWT (March 2020) and CDIA website. https://cdia.asia/2020/08/28/cdia-holds-interim-workshops-in-lao-pdr-under-the-new-normal/ (Last viewed: October 15, 2020)
[107] Same as above
[108] Government of Republic of Korea (Mar 2017)'The Republic of Korea's Country Partnership Strategy for the Lao People's Democratic Republic 2016-2020', p.3 http://www.odakorea.go.kr/eng.policy.CountryPartnershipStrategy.do (last viewed: October 19,2020)
[109] Results from interviews (November 2020)
[110] Same as above.

Table 7-6: KOICA cooperation project

	Name of Project	Target area	Duration / budget
Health			
1	Integrated Maternal, Neonatal and Child health Care with the Health Care Project on Pediatric Education in Vientiane City, Oudomxai and Luang Prabang provinces	Vientiane City	2013-2018 9.5 mil USD
2	Project for Capacity Development of Ha Mesa Hospital (police hospital) in Vientiane City	Vientiane City	2014-2021(tentative) 5.0 mil USD
3	Establishing Master Plan of Integrated Water Resource Management for Nam Ngum River Basin in Vientiane province	Vientiane Province	2016-2018 2.68 mil USD
Industry and Energy			
4	Project for Digital Topographic Mapping and Capacity Building in Vientiane City	Vientiane City	2014-2017 3.5 mil USD
5	Establishment of Geospatial Data Infrastructure and Capacity Building for Developing Special Economic Zone in Savannakhet Province	Savannakhet Province	2018-2020 (tentative) 6.0 mil USD
6	Detailed Feasibility Study for Upgrading National road No.8 on Asian Highway (AH 15) Network project in Bolikhamxai Province	Bolikhamxai Province	2016-2018 3.5 mil USD
7	Feasibility Study for a railway link from Vientiane City in Lao PDR to Wung Ang in Vietnam	Vientiane-Bolikhamxai-Khammouane-Vietnam	2015-2017 3.0 mil USD
Education			
8	Project for Capacity Building of IT Centre of Lao Youth Union in Vientiane City	Vientiane City	2016-2018 3.0 mil USD
9	2. Improvement of Lao Korea Skills Development Institute (LAKSDI) in Vientiane City	Vientiane City	(2017-2020/ 5.5 mil USD)
10	Empowerment and Capacity Building Project of Souphanouvong University in Luang Prabang	Luang Prabang	(2014-2017/ 3.0 mil USD)
Public Administration			
11	Project for Capacity Development of Immigration System in Vientiane City.	Vientiane City	2017-2019 8.0 mil USD
12	Project for support UXO Sector in Houaphanh Province	Houaphanh Province	(2014-2017 3.0 mil USD
Rural and Agricultural Development			
13	Integrated Rural Development Project in Vientiane City, in Vientiane Province and Savannakhet Province	Vientiane Province and Savannakhet Province	2014-2020 14.55 mil USD

(Source: Created by the survey team based on KOICA website[111], November 2020)

[111] http://www.koica.go.kr/sites/lao_en/contents/images/000001/%ED%8E%98%EC%9D%B4%EC%A7%80_%EB%B2%94%EC%9C%84_%EA%B5%AD%EB%B3%84%ED%98%91%EB%A0%A5%EC%82%AC%EC%97%85_%EC%82%AC%EC%97%85%EC%A7%80%EC%97%AD_Project_Map.pdf_page_1.jpg (Last viewed: October 18, 2020)

7.4.2 Multilateral and Bilateral Cooperation

a. Project for Wastewater and Solid Waste Treatment Capacity Building Project for City Environment Improvement in Lao PDR

There is one project currently in progress, which is implemented by KOICA supporting GGGI with the "Project for Wastewater and Solid Waste Treatment Capacity Building for City Environment Improvement in Lao PDR " (2019－2024, 6.5mil USD) targeting Vientiane[112] (Refer to 7.5). Two phases are planned for the project as follows;

- First phase (first-second year): Green City action plan, piloting, and coordination of key interventions for the solid waste and wastewater sector (Budget: 4.2 mil USD)
- Second phase (third year): Implementation and scale up (Budget: 2.3 mil USD)

7.5 GGGI

GGGI supports member countries with the aim of contributing to green growth and a low-carbon society. Laos GGGI office was opened in 2017. The main contributors to GGGI are Norway, Denmark, U.K., and South Korea, and there are over 30 over contribution allocation organizations / countries including ADB, EU, GCF, France, Belgium, and Bill & Melinda Gates Foundation.

As mentioned in 7.4 above, the results of the preparatory survey—listed as No. 1 in the table below, "Wastewater and Solid Waste Treatment Capacity Building Project for City Environment in Lao PDR (LA09)"—has led to KOICA projects, and KOICA is currently implementing a 3-year project.

The past GGGI projects are summarized in the below table.

Table 7-7: Urban Environment Project by GGGI

No.	Duration	Name / description of project	Budget (USD)
1	2019.07-2024.12 (Plan)	Wastewater and Solid Waste Treatment Capacity Building Project for City Environment in Lao PDR (LA09) Wastewater and Solid Waste Treatment Capacity Improvement Project for Urban Environment in Laos	660,963 (Supported by KOICA)
		Target: MPWT Expected impact of the project include; 1) enhancement of capabilities to manage green urban development, and 2) Improvement of access to sustainable solid waste and waste water management service Project activities: 1） Develop Green City vision and action plan for Vientiane and Pakse 2） Develop an implementation strategy of solid waste management in Vientiane 3） Launch an initiative from waste to resource as well as facilities in Vientiane 4） Develop implementation strategies of waste management in Pakse	

[112] Same as above.

		5） Launch waste management facilities (DEWATS and FSM) in Pakse, Improve national urban hygiene strategy	
2	2019.01- 2019.07	Preparatory work for the KOICA project on wastewater and solid waste management (LA05)	48,562
		Target: MPWT water bureau Description: Conduct pre-F/S P related to the establishment of systems for distributed wastewater treatment (DEWATs) and sludge treatment in Pakse 1） Cost analysis and site selection for the distributed waste treatment system (DEWATs) and sludge treatment plant (FTSTP) at Pakse 2） Cost analysis and site selection for the distributed waste collection points at Vientiane 3） Develop an implementation plan for KOICA project scheduled to start from 2019, Q3	
3	2019.07- 2121.12 (Plan)	Waste energy recovery program at industrial facilities (LA11) Waste heat recovery program at industrial facilities	22,599
		Target: Department of Industry and Handicraft (MOIC), Department of Housing and Urban Planning (MPWT) Project Objective: 1) Promote investment in the development of energy efficiency measures in large, medium, and small-scale industrial enterprises, and 2)extend the investment to the construction field Expected Outcomes: ● Identify opportunities for fundable projects ● Conduct relevant technical / financial research and create memorandum of information ● Remove market barriers on financial development for energy efficiency through the organization of investor forums	
4	2019.01- 2020.12 (tentative)	Green Growth Mainstreaming (LA07)	40,305
		Target: Department of Planning (MPI), Department of Climate Change (MONRE) Objective of the project: Provision of technical support in the creation of the 9th National Socio-Economic Development Plan (NSEDP), Monitoring Reporting & Verification (MRV), and Nationally Determined Contribution (NDC)	
5	2018	Readiness support to enhance green finance in the areas of green cities in Lao PDR (LA02) Support preparation for enhancing green finance in the green city field in Laos	524,629
		Objective of the project: 1） Improve capabilities to coordinate among key stakeholders in urban development and to manage green climate cities 2） Identify priority projects / programs related to the green climate cities 3） Identify financing options to implement identified priority projects / programs, and to mobilize private	

		sector to contribute to the national priority matters of the Lao PDR 4） Enhance capabilities of private sector engaged in Lao PDR's priority program fields Outcomes of the project: Green investment proposals: Created concept notes for four Green Climate Funds (GCF), conducted comparative study on diesel buses and low-carbon buses (electric buses) (After the project, Laos government requested the project team to design electric buses for BRT) Effect of the project: Workshops aligned to the above four purposes of the project have been conducted 8 times.	
6	2017-2018	National and Sub-national planning, financing, and budgeting for Green Growth Description of support: ● Evaluate Green Growth potential in Laos ● Submit national Green Growth strategy to the Cabinet ● Create recommendations for integrating Green Growth into national urban development strategies and conduct Green urban development pilot project in Vientiane. ● Provide three capability development initiatives related to green urban development and green financial means. Outcomes of the project: ● Adoption of "National Green Growth Strategy" by the Lao government ● Integration of "Lessons from Green Growth and Green Urban Development Pilot" into "National Urban Development Strategy" by the Lao government	NA

(Source: Created by the survey team based on GGGI website[113], November 2020)

7.6 KEXIM

KEXIM oversees the loans to partner countries. The project loan is contributed from the Economic Development Cooperation Fund (EDCD) with the approval of the Ministry of Economy and Finance of the Korean government.

The Knowledge Sharing Program (KSP) is a platform to share South Korea's development experience with partner countries and to develop a foundation for expanding financial and political cooperation. KSP is operated by the Ministry of Economy and Finance with 87 partner countries.[114] The KSP provides research / consultation, policy recommendations and project financing.

The KSP conducted in Laos was "Sustainable Solid Waste Management in Laos"[115], and a survey was conducted from February to September 2020 to reorganize waste management-related issues. The survey project aims to improve the SWM system and capabilities in Laos

[113] https://gggi.org/country/lao-pdr/ (last viewed: November 5, 2020)
[114] www.ksp.go.kr (last viewed: November 5, 2020)
[115] Professor Seungdo Kim, Hallym University, Sustainable Solid Waste Management in Lao PDR-Final Reporting Workshop (September 23, 2020)" (Presentation materials)

leveraging the experiences and knowledge of South Korea, consisting of two parts; (1) survey analysis part, and (2) capability improvement part.

a. Survey analysis part

1) Diagnostic analysis (Status of SWM system in Laos)
2) Introduction of successful practices and experiences in South Korea
3) Policy recommendations to improve SMW
4) Pilot project to create guidelines on the landfill management at Pakse and Kayson

b. Capability improvement part

5) Hold an interim result seminar and host capability improvement workshops
6) Result presentation

(N.B. The capability improvement part was cancelled due to COVID-19)

The project points out that the issues in Laos's solid waste are 1) shortage of collection equipment and manpower, 2) inefficient management of the ministries in charge, 3) lack of public awareness, 4) limited waste collection and disposal service area, and 5) illegal dumping and incineration.

Next, "Road Map 2040" is presented to show three areas of sustainability (Managemental, Financial, Technical Sustainability) required to make sustainable waste management, suggesting the yearly goal in 2020, 2030 and 2040 of discharge, collection, transportation, recycling, and disposal. Assuming 4 phases every 5 years until 2040, the goal was set to reduce the amount of waste discharged per person to 0.63kg, waste collection rate to 100%, waste separation to 70%, incineration to 5%, and open dumping to 0%.

To achieve the goals of Road Map 2040, "Waste Control Act, Laws Related to Food Waste to Compost, Recycling Law (Regarding Compost)" and "National Waste management plan (5-year plan)" formulating policies regarding compost and recycling, and presentation of guidelines for sanitary treatment were proposed.

Based on the results of this project, there is a possibility of project with MPWT in the future going through examination by the Ministry of Economy and Finance.

The output report of this project is included as a component of the Flagship Joint Summary Report: Priorities for Lao PDR on SWM of the World Bank.

7.7 KEITI

KEITI (Korea Environmental Industry and Technology Institute), under the Ministry of Environment in South Korea, supports the development of environmental technology to transform the environmental industry into a new growth engine and export industry, and to solve pressing issues.

The international environment cooperation has three pillars of 1) Environmental management master plan, 2) Global environmental feasibility Study, and 3) Localization of environmental technologies. For Laos, the report "Solid waste assessment Vientiane and Luang Prabang" has been summarized as a component of "the Flagship Joint Summary Report: Priorities for Lao PDR on SWM" (From June – December 2019) In the report, an analysis will be conducted on the current state of Laos, and evaluation on the operation of waste treatment, evaluation of disposal site in Vientiane and Luang Prabang, and recommendations for the future will be put

together[116]. The survey is similar to the information gathering survey, and it is in the drafting stage as of November 2020[117].

7.8 Lancang-Mekong Cooperation

In March 2016, Lancang-Mekong Cooperation (LMC) is an organization established for bilateral cooperation of the Mekong River basin countries (Myanmar, Laos, Thailand, Cambodia, Vietnam), and includes the Chinese name for the Mekong River, Lancang.[118]

7.8.1 Creating National Chemicals Database

As mentioned in "6.5.2.1 b. Support Needs for Chemical Substance Management", financial cooperation was started by the LMC Special Fund with the cooperation period from June 2020 to January 2022, with MOIC-DOIH as the implementer.

a. Objectives of the Project:

1) To create national chemicals database

2) To have the proper chemicals information and situation for formulating laws, policies; strategic plan in relation with chemicals management in each time period

3) To have a computerized system for chemicals database

4) To implement the international conventions and protocols Lao PDR has ratified

b. Project budget

Amount budgeted for the project is 327,500 USD.[119]

The outline of the project activities is shown in the table below. [120]

Table 7-8: Outline of Chemical Database Development Project Funded by LMC

1. Main outputs: 1) There will be a computerized system for chemicals database; 2) Enhancing capacity of the official staff on collecting and inputting the information into chemical database system; 3) There will be the national chemicals database; 4) There will be the true and efficient information sharing and distributing system. 2. Main activities - Procurement of a car, computers and other administrative equipment; - Survey and data collection; - Developing the computerized system for chemicals database with consultation expert(s); - Study visits in overseas for exchanging experience and lesson learned from China or some Asian country in term of creating national chemicals database; - Holding training courses for Enhancing capacity of the government staff on collecting and inputting the information into chemicals database system; - workshop on Project implementation Evaluation.

[116] Seung-Joon Yoon, Institute of Green Bio Science and Technology, Seoul National University (2019) 'KEITI-World Bank Joint Project on Solid Waste Management-Analysis of Solid Waste Management in Lao PDR (DRAFT)'

[117] Based on the interviews from MONRE (October 2020)

[118] On the Chinese side, it is called the Langcang River, and after leaving Yunnan, it is the Mekong River.

[119] According to information from DOIH, there was a budget change from 350,000 USD. (December 9, 2020)

[120] Lancang-Mekong Cooperation Special Fund (2019). Project Proposal on Creating National Chemicals Database. pp2-3

3. Personnel
The team to implement the project will be consist of:
- Director General of the Department of Industry and Handicraft; Team leader.
- Director of Industrial Environment and Chemical Division; Vice Leader;
- Director of Division, Ministry of Public Health; Committee.
- Director of Division, Ministry of Agriculture and Forestry; Committee.
- Director of Division, National University; Committee.
- Staffs of Department of Industry and Handicraft; Committee.
- Staffs of Office of Industry and Commerce Provinces and Vientiane Capital; Committee.

7.9 EU

EU, in the World Bank's Flagship Joint Summary Report: Priorities for Lao PDR on SWM, supports the analysis / report preparation for "Supporting single-use plastics reduction" through Switch-Asia, under the topic of "Supporting Sustainable Consumption and Production." With the financial cooperation from EU, Switch-Asia supports pilot projects of the various fields through a grant aid program[121].

7.10 Finland

An environmental cooperation program supported by Finland, Environmental Management Support Programme (EMSP), was conducted between 2010 and 2015 targeting present-day MONRE (Water Resources and Environment Authority (WREA) when the project started)[122]. The Program was conducted by the Ministry of Foreign Affairs in Finland as a successor case of the environmental management enhancement program of the Swedish International Development Cooperation Agency (SIDA), Strengthening Environmental Management (SEM) Programme[123], after Phase I (2001 – 2005) and Phase II (2005 – 2010). The goal of the program was "to achieve clean environment and environmental health, to secure livelihoods of people affected by large-scale development projects and strategic plans, and to build institutional capabilities to adapt to the climate change in Laos". The Program received technical cooperation mainly from the Finnish Environment Institute. The project has the following 6 components.

Table 7-9: Component of EMSP program

Component 1	DEQP- DEQP - Department of Environmental Quality Promotion: Building capacity for Strategic Environmental Assessment and National Environmental Action Plans
Component 2	DESIA- Department of Environmental and Social Impact Assessment: Building capacity in licensing and inspection
Component 3	Provincial Departments of Natural Resources and Environment: Strengthening
Component 4	DEQP and Natural Resources and Environment Data Information Centre: Capacity building for high quality information services

[121] https://www.switch-asia.eu/grants-projects/about-grants/ (last viewed: November 23, 2020)
[122] Finnish Ministry of Foreign Affairs (2015) "Environmental Management Support Programme In Lao PDR, Phase I, Final Evaluation Report" and https://um.fi/documents/384998/0/EMSP_Lao_Final_eval%2BTOR_2015.pdf/ed9ebe30-2abc-ee87-b592-024aae9c1225 (last viewed: April 10, 2020)
[123] https://www.sida.se/contentassets/e4b4784d185e4627b73da27086bbeaf6/program-med-texter-laos.pdf (last viewed: November 23, 2020)

Component 5	NREI: The Natural Resources and Environment Institute: Environmental laboratory services
Component 6	Programme Management and Administration

7.11 Environment Protection Fund (EPF)

EPF was founded in 2005 as a financially independent organization to enhance environmental protection, sustainable natural resource management, biodiversity conservation, and community development, and consists of the Board of Directors, and EPF Office. The board has 11 members who are appointed by the Prime Minister with the term of 5 years.

The sources of funds for EPF are national budgets, grants or loan assistance from home and abroad, environmental recovery fees from development projects / activities, fines and compensation for environmental destruction, donations from private companies or individuals.

There are a total of 52 projects as of March 2020. The following are some of the projects by key donors.

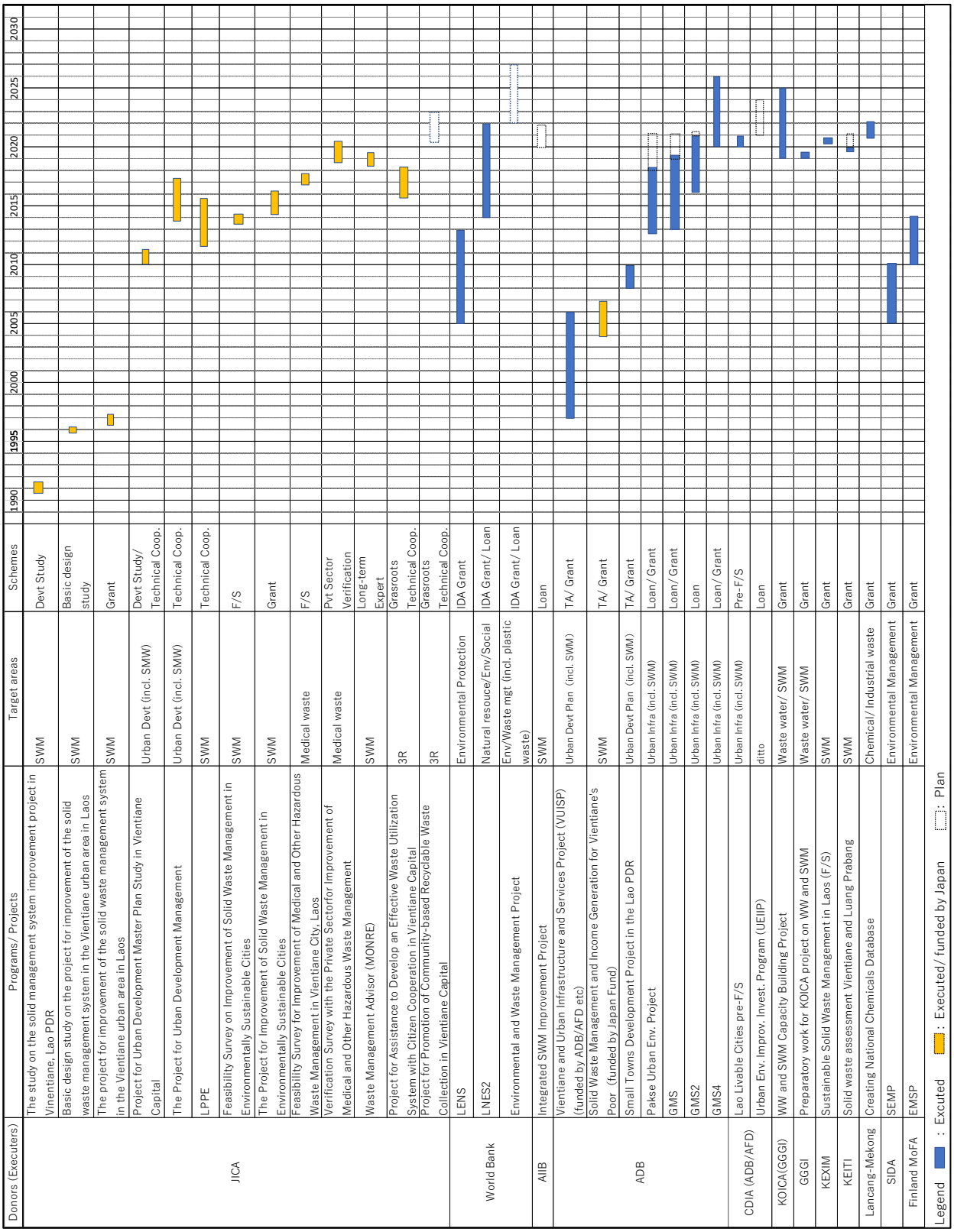
- GIZ conducted climate change-related projects at Green Climate Fund (GCF)
- UNEP also conducted climate change-related support.
- Conducted a project in the Department of Environmental Studies, National University of Laos with the loan by KEITI
- The successor project of LENS2 supported by the World Bank was at the scale of 30 mil USD and will proceed from MONRE to MOF (Ministry of Finance), and to the approval of the World Bank.

7.12 Summary of waste management-related projects

An urban development plan including waste management has been developed since the 1990's by funds of JICA as "The Study on The Solid Waste Management System Improvement in Vientiane, Lao PDR) (1991-1992)" and "Project for Improvement of Solid Waste Management System in Vientiane Urban Area in Lao PDR (1996)"and "The Project for Urban Development Master Plan Study in Vientiane Capital (2010-2011)". "LPPE (2011-2015)" was conducted as urban environmental component of JICA's "Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration (LPP)". In parallel with LPPE, "The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities" (2014-2016), a grant aid for equipment provision, was conducted. Most recently, "The Verification Survey with the Private Sector for Disseminating Japanese technologies for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos" (2018-2020) has been conducted targeting Vientiane City. For descriptions of other private partnership projects, NGO recycling activities in Laos and Waste Management Advisor (Long-term expert) see 5.3 to 5.5.

The projects related to waste management sector in the past and under planning by the development partners are as follows.

Table 7-10: Executed and Planned Waste Management-Related Programs / Projects



(Sources: Created by the survey team based on the literature search / results of interviews, November 2020)

8 Japanese Technology that Contributes to Improvement of Waste Management in Laos

8.1 Japanese waste management technology

The main waste management technologies in Japan are shown below.

<table>
<tr><td colspan="2">Collection and Transport</td></tr>
<tr><td>Collection and transportation vehicles
● Japanese small packer vehicles are suitable for narrow alleys in Asian countries.
● Low CO2 emission vehicles such as hybrid vehicles and electric waste compactors have been developed.</td><td> 
Source: ①</td></tr>
<tr><td>Transfer station
● The efficiency of collection and transportation can be improved.
● It is possible to reduce the congestion of garbage trucks at the disposal site.</td><td> 
Source: ①</td></tr>
<tr><td colspan="2">Incineration of Municipal Solid Waste</td></tr>
<tr><td>Waste incinerator with power generation
● The volume of waste can be reduced by incineration.
● Garbage can be treated hygienically by incineration.
● Power can be generated using the heat of garbage.</td><td> 
Source: ①</td></tr>
<tr><td>Solid fuel
● Garbage can be used as fuel.
● Solidification makes it easier to handle garbage.</td><td> 
Source: ②</td></tr>
<tr><td colspan="2">Treatment of Healthcare Waste</td></tr>
<tr><td>Dedicated container
● Prevent infection accidents caused by infectious waste.</td><td> 
Source: ①</td></tr>
</table>

Incinerator ● Dispose of infectious waste hygienically by incineration. ● Although it is small, it complies with Japan's strict dioxin standards.	 Source: ③
Waste Plastic Recycling	
● There are three types of waste plastic recycling: material recycling, chemical recycling, and thermal recovery. ● Material recycling is a technology that is used by converting it into plastic products again. ● Chemical recycling is a method of returning to petroleum products, which are the raw materials, or further decomposing them and using them as basic chemical substances such as carbon monoxide and hydrogen. ● Thermal recovery is to use plastic as energy.124	 Source: ①
E-waste Recycling	
Large appliances ● The four items of TVs, refrigerators, air conditioners, and washing machines are subject to the Home Appliance Recycling Law. Dischargers pay recycling fees, and manufacturers recycle.	 Source: ④
Small appliances ● A collection box will be set up at the store, or the local government will collect it and hand over the small household appliances to the recycler. ● Metal resources are regenerated.	 Source: ⑤
Biomass utilization	
Power generation by incineration ● Incinerate organic waste such as wood chips to generate electricity. ● Biomass-fuelled carbon-neutral technology (although some argue that woody biomass power generation is not carbon-neutral).	 Source: ⑥

[124] National Institute for Environmental Studies, https://tenbou.nies.go.jp/science/description/detail.php?id=64, (last viewed: December 19, 2020)

Methane gas fermentation ● Methane gas is generated by anaerobic decomposition of food waste and organic sludge. ● The generated methane can be used as it is or converted into electricity.	 Source: ⑦
Composting ● Aerobic decomposition of organic waste such as food waste to obtain compost. ● Compost is used in green areas such as farmlands and parks.	 Source: ⑧
Landfilling	
Sanitary landfill ● Impermeable liner, leachate treatment facility, gas emission facility, etc. are installed to prevent groundwater pollution due to leachate, and the impact on the surrounding environment is suppressed.	 Source: ⑨
Strictly controlled landfill for hazardous waste ● Dispose of hazardous waste such as metals. It will be surrounded by reinforced concrete to isolate harmful substances from nature, and a roof will be installed to prevent rainwater inflow.	 Source: ⑩
Treatment of various types of waste	
Waste treatment in the cement industry ● Cement kilns can utilize various wastes such as tires, waste oil, waste plastics, and sludge as raw materials and detoxify them.	 Source: ⑪

Source:

① Ministry of the Environment (2013). Japanese waste treatment / recycling technology

② Northern Ishikawa RDF Centre, http://www.scnet.tv/~rdf/Fwhatrdf.html (last viewed: December 19, 2020)

③ Kayama Kogyou, https://www.kayama-k.co.jp/media/5025 (last viewed: December 19, 2020)

④ Shiojiri City, https://www.city.shiojiri.lg.jp/kurashi/recycle/kadenshori.html (last viewed: December 20, 2020)

⑤ Re-Tem Eco Times, https://www.re-tem.com/ecotimes/column/small-appliance_2/ (last viewed: December 20, 2020)

⑥ Japan Woody Biomass Energy Association, https://www.jwba.or.jp/introduction-guidebook/ (last viewed: December 20, 2020)

⑦ Ministry of the Environment, http://www.env.go.jp/recycle/waste/biomass/technical.html (last viewed December 20, 2020)

⑧ Ministry of the Environment, https://www.env.go.jp/air/akusyu_jirei_taihi_5_1-5_201810.pdf (last viewed: December 20, 2020)

⑨ Kajima Construction, https://www.kajima.co.jp/tech/indust_waste/works/index.html (last viewed: December 20, 2020)

⑩ Ministry of the Environment, https://www.env.go.jp/policy/hakusyo/h19/html/hj07020102.html (last viewed: December 20, 2020)

⑪ Mitsubishi Materials Trading, http://www.mmtc.co.jp/ja/products/recycle-cement.html (last viewed: December 20, 2020)

8.2 Technology to be applied in Laos

Collection and transportation

In Vientiane, collection vehicles made in Japan were introduced by Japanese grant aid in 1996 and have been used for many years. Furthermore, in 2016, a transfer station was set up and utilized in addition to the collection vehicles by another Japanese grant aid project. In this way, the applicability of Japanese technology related to collection and transportation has been fully confirmed.

Recycling

In Laos, where economic development is progressing, imports of home appliances are also on the rise, and if they are discarded in the near future, measures to treat them will be required. First of all, it is recommended to gradually promote dialogue with importers and start discussions on the development of a legal system that covers everything from collection routes to recycling.

Composting can reduce the amount of organic waste at a low cost. However, since there are many cases in Laos where food residues are used as livestock feed, it is recommended to carefully examine the actual state of organic waste discharge.

Treatment / Disposal

Municipal waste incineration technology can significantly reduce waste volumes, however, the cost is high. Considering the urbanization situation in Laos, the construction and operation of a sanitary landfill will be prioritized even in Vientiane.

As for medical waste, a small incinerator capable of suppressing the generation of dioxins has been developed, and its application is desired. In fact, in a JICA project, a Japanese company, Kayama Kogyo, has installed a small incinerator in KM32. VCOMS as a counterpart is operating it. Due to the COVID-19 pandemic, it is thought that the use and disposal of personal protective equipment is increasing, and the incinerator can be used for its treatment.

At this time, there is no facility in Laos to dispose of hazardous waste. Only the 2014 Finnish-supported survey was conducted. Since then, the development of SEZs has also progressed, and it is recommended that first a fact-finding survey and awareness-raising regarding the responsibility of dischargers be conducted to create a market for proper treatment of hazardous waste. The Savan-Seno SEZ has begun to provide environmental management services, including hazardous waste treatment. Here, it means that hazardous waste treatment is carried out in cooperation with the cement industry, and it is thought that it will be useful for other special economic zones.

9 Findings and Recommendations

9.1 Findings

a. Municipal waste management

The amount of waste is on the rise. In Vientiane, disposal volume increased by about 50% from 2015 to 2019. On the other hand, the population has increased by only about 10% from about 850,000 to about 930,000. It is presumed that this high growth rate of waste disposal is due to changes in people's consumption activities due to economic growth, an increase in tourists, and industrial development.

In Vang Vieng, the number of tourists in 2015 increased from about 250,000 to about 600,000 in 2019 (including 400,000 foreigners). At the time of the field survey in February 2020, the outbreak of the novel COVID-19 was beginning, the number of tourists was small, and no significant waste problems were confirmed. However, in the local tourist cities such as Vang Vieng, Xiengkhouang, and Luang Prabang, which were the subjects of this survey, it is estimated that the impact of waste discharged from the tourism industry is not small.

In Vientiane, a good waste management system has been established with the cooperation of Japan for many years. Not only the services directly managed by VCOMS but also the private sector is entering, and it seems that the waste management service market is being formed. In the local cities, waste collection service is provided at a certain level, and serious problems such as waste scattering in those cities were not observed. However, disposal sites of all cities are open dumping sites. There is still a lot of room for improvement in local cities.

Japan is supporting the general waste field, centring on the capital of Vientiane, and has achieved some results. On the other hand, in recent years, World Bank, ADB, and Korean donors have been actively providing cooperation, and further cooperation is expected in the future.

b. Hazardous / industrial waste management

It seems that the amount of industrial waste generated is increasing, but it was not possible to grasp it quantitatively due to lack of data. Since non-hazardous industrial waste seems to be collected as general waste, it is recommendable to try to grasp the amount of non-hazardous industrial waste, and to analyse its impact on general waste management. The result of the analysis should be utilized in future planning.

Information on the disposal destination of hazardous waste was obtained in the Savan-Seno SEZ. It was not confirmed in other special economic zones. The Savan-Seno SEZ has begun to provide environmental management services, and as part of this, the cement industry is utilized to treat hazardous waste. It will be useful for other SEZs as a reference.

To see the impact of China's embargo, a survey of import and export trends using UN trade statistics data confirmed that imports of waste plastics and used paper have increased sharply since 2018. Since there is concern that environmental pollution is occurring in these processes, it is recommended for MONRE to check it on-site.

Laos is gradually developing laws and regulations related to the management of hazardous wastes and chemical substances, and has ratified major international environmental treaties. However, it cannot be said that it has been properly implemented, as no report has been made to the Basel Convention Secretariat so far. Therefore, regarding the Basel Convention, it is recommended to establish domestic laws and regulations such as implementation rules and waste plastic import restrictions, to raise awareness of domestic stakeholders such as importers and exporters, to build a system of cooperation with related enforcement agencies such as customs, police and port bureaus, to grasp the actual situation of waste plastic imports, to grasp

the situation of domestic recycling and environmental pollution, and to build cooperative relations with neighbouring countries (Thailand and Vietnam), which have a lot of imports and exports.

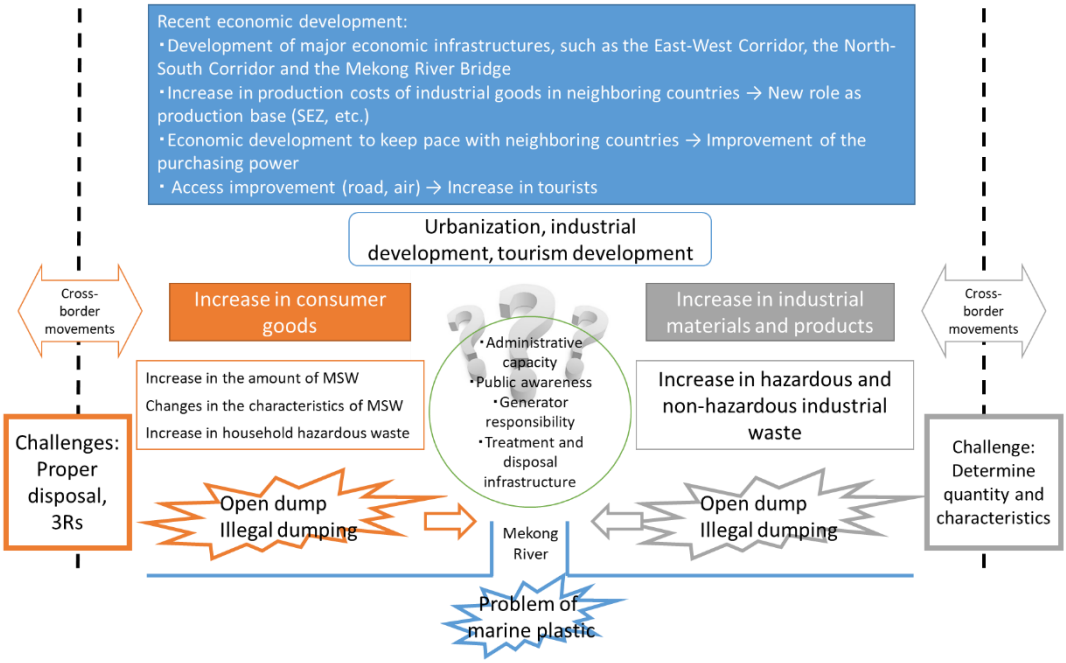


Figure 9-1: Current status and issues in the field of waste management in Laos

9.2 Recommendations

a. Municipal waste management

In recent years, the amount of waste has been increasing along with economic growth. It is also speculated that changes in waste quality such as an increase in plastic waste are occurring due to changes in people's lifestyles and an increase in tourists. In 2020, when this survey was conducted, no serious waste problems were confirmed in the survey areas. It is speculated that this is due to the decrease in tourists and the slowdown of economic activity due to the COVID-19 pandemic, but after the end of the pandemic, the tendency of the increase in the amount of waste and the change in the quality of waste will return to the same as before. Therefore, it is recommendable to strategically prepare for such a situation; to prioritize major cities and tourist cities for improvement according to the severity of the waste problem, to consider the similarity of problems such as low collection rate and improper disposal, and applicability of countermeasures to the problems for other cities. The World Bank, ADB, and Korean donors are already or will be providing cooperation for this situation.

b. Hazardous / industrial waste management

The development of SEZs is progressing, but it seems that most SEZs have no disposal destination for hazardous waste. Some factory management is inspected just only when a business license or environmental license is issued. Therefore, it is recommendable to develop factory database and to strengthen inspection system in order to establish management of point source of pollution.

The impact of China's embargo seems to be significant, and as mentioned above, imports of waste plastics and used paper are rapidly increasing. It is important to investigate whether the increase of plastics and used paper imports leads to any environmental problem at the site. Following the revision of the Basel Convention on Waste Plastics (Plastic waste amendments),

which will come into effect in January 2021, MONRE is considering establishing a domestic law for the ban on waste plastics. This is desirable in itself, but there are technical difficulties in how to discriminate properties that are difficult to clarify, such as the crushing status of waste plastic and the adhesion of dirt, etc. The Basel Convention entrusts how to judge plastics to the country concerned. Even if such a domestic law can be established, it is necessary to promote cooperation with related organizations, such as disseminating the judgment method to customs, etc., in order to actually operate it.

Japan has put in place a system for implementing the Basel Convention and has endeavoured to comply with it for many years. In addition, as seen in "The Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes" established by the Ministry of the Environment of Japan, Japan has been supporting Asian countries to comply with the Basel Convention. It will be beneficial for both countries that Japan will support Laos in complying with the Basel Convention utilizing Japan’s experience and network. This will prevent the resources recovered for recycling such as plastics from causing environmental problems. Also, it will promote proper international material circulation.

Annex

Data Collection Survey on Waste Management Sector in Laos
Survey Schedule

	Date			Consultant					MONRE
				Team Leader/ General Waste/ Collection and Transfer 1 (Ikuo Mori)	Valuables/ Recycling/ Industrial and Toxic Waste (Risako Imai)	Intermediate/ Final Disposal Management (Yuko Aoki)	Collection and Transfer 2/ Final Disposal Management 2 (Ryoichi Ogawa)	Recycling 2 (Hirofumi Miyoshi)	Pollution Control Department (Ms.Palina Khotphouthone)
1		23	Sun	Travel (NRT-BKK-VTE)					
2		24	Mon	Team Meeting, Discussions on ICR (MONRE,MOIC,MPWT,JICA Laos Office Ms.Sanada and Ms.Matsui)					
3		25	Tue	Meeting (JICA Laos Office : Ms.Sanada and Ms.Matsui) /Kayama Kogyo					
4	Feb	26	Wed	Team Meeting/ Data collection					
5		27	Thu	Dispoal Sites/Transfer Station (VCOMS)					
6		28	Fri	JETRO (with JICA Ms.Matsui)		Data collection/ Survey arrangement			
7		29	Sat	Preparation					
8		1	Sun	Preparation			Travel to Vangvieng		
9		2	Mon	MONRE(PCD)		Survey Office	DONRE/DC/UDAA/Landfill site		
10		3	Tue	MOIC (with PCD Mr.Vanhxai)		Data collection	DPWT/Tourism Administration Agency		
11		4	Wed	MPI/MPWT (with PCD Mr.Vanhxai)			DOH/DOIC/Landfill site (with Ms Matsui of JICA Laos)		
12		5	Thu	MOH			Private Recycling Company		
13		6	Fri	MPI(SEZ Authority)/ Travel to Vangvieng/ Team Meeting			Team Meeting		
14		7	Sat	Landfill site/Community Disposal Site/ Travel to VTE			Landfill site/Community Disposal Site		
15		8	Sun	Data Analysis/ Preparation			Travel to Xiengkhoang		
16		9	Mon	Travel to Savannakhet		Data Analysis	Survey Preparation		
17		10	Tue	DONRE/UDAA/Landfill site		Data Analysis	DONRE/DC/UDAA/Landfill site		
18		11	Wed	SaSEZ/ Travel to VTE		VCOMS/GGGI	DPWT/DOIC/DOH		
19	Mar	12	Thu	LENS II/UNIDO	World Bank	Report writing	P/R preparation		UDDA/DPWT/DOH
20		13	Fri	MOIC(DDG)/EPF		Report writing/ Travel (VTE-BKK-NRT)	Governor Office/Waste collection companies		
21		14	Sat	Travel to Xiengkhoang/	P/R preparation		Landfill sites		
22		15	Sun	Travel to VTE	P/R preparation		P/R preparation		Data check
23	P/R▲	16	Mon	Submission of P/R			Private Recycling Company		
24		17	Tue	Meeting with PCD	PLCD(MONRE)		Review data collected and visit organizations		
25		18	Wed	KOLAO			Travel (Xiengkhoang to Vientiane)		
26		19	Thu	Report to JICA Office,Team Meeting			Report to JICA Office,Team Meeting		
27		20	Fri	Travel (VTE-BKK-NRT)			Travel (VTE-BKK-NRT)		
28		21	Sat						

Annex 1-2-1

Annex 1-2: 2nd Survey Schedule (Remote)

Data Collection Survey on Waste Management Sector in Laos

Remote Survey Schedule

No.	Date			Consultant										MONRE	MOIC
				Team Leader/ General Waste/ Collection and Transfer 1 (Ikuo Mori)	Valuables/ Recycling/ Industrial and Toxic Waste (Risako Imai)	Transboundary Industrial and Toxic Waste Management (Osamu Sakamaoto)	Chemical Waste Management (Makoto Takahashi)	Survey Assistant Leader (Bounthong Keohanam)	Intermediate/ Final Disposal Management (Yuko Aoki)	Survey Assitant (Sayamang Nanthanavone)	Collection and Transfer 2/ Final Disposal Management 2 (Ryoichi Ogawa)	Recycling 2 (Hirofumi Miyoshi)	Survey Assitant (Phetmoominh Chanthaboneuang)	DPCM (Mr. Noudeng Vongdala and/or Dr.Sidxay)	Dep of Industry and Handicraft (Ms. Siamphone Keochampa)
1		1	Thu	6th JP Team mtg				Translation	6th Team mtg		6th JP Team mtg				
2		2	Fri	Preparation	Preparation	Literature review	(other PJ)	Translation	Preparation		Preparation	Preparation			
3		3	Sat					Translation							
4		4	Sun												
5		5	Mo	Data collection	Data collection	Literature review	Literature review	Translation	Data collection		Data collection	Data collection			
6		6	Tue	Data collection	Interview list	Data collection	(other PJ)	Coordination	Data collection		Data collection	Data collection			
7		7	We	Interviewee List Deadline		Data collection	Data collection	DPCM-mtg	Interviewee list		Interviewee list Deadline			DPCM-mtg	
8		8	Thu	Q's devt	Q's devt			Coordination	Q's devt	Literature review	Q's devt	Q's devt			
9		9	Fri	Q's devt	Q's devt			Coordination	Q's devt	Literature review	Q's devt	Q's devt	Literature review		
10		10	Sat					Quotation		Translation			Literature review		
11		11	Sun												
12		12	Mo	Qs Devt Deadline				Coordination	Q's Deadline	Translation	Qs Devt Deadline		Literature review		
13		13	Tue	Q's review	Q's review			Coordination	Data collection	Data collection	Data collection	Data collection	Survey prep		
14		14	We	Q's review	Q's review			Translation	Data collection	Coordination	Data collection	Data collection	Survey prep		
15	Oct	15	Thu	7th JP Team mtg				Translation	7th Team mtg	Coordination	7th JP Team mtg		Survey prep		
16		16	Fri	EXRI meeting				Translation	Sub-team meeting		Sub-team meeting				
17		17	Sat					Q's check		Q's check			Q's check		
18		18	Sun												
19		19	Mo	Overall superv.	Prepation			Prepation	Superv.&analysis	VCOMS prep	Preparation	Preparation	Coordination	(LENS2-LPB)	
20		20	Tue	Data analysis	Donor prep			Meeting record	Superv.&analysis	VCOMS prep	Preparation	Preparation	Coordination	(LENS2-LPB)	
21		21	We	Data analysis	Donor prep			Meeting record	Superv.&analysis	VCOMS prep	Superv.&analysis	Data analysis	Survey prep	(LENS2-LPB)	
22		22	Thu	Data analysis	Donor prep			Meeting record	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Survey prep	(LENS2-LPB)	
23		23	Fri	Overall superv.	Data analysis			Coordination	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Q's check	(LENS2-LPB)	
24		24	Sat					Translation		Translation				(LENS2-LPB)	
25		25	Sun										VTE-LPB	VTE-LPB	
26		26	Mo	EXRI meeting				Coordination	Sub-team meeting		Sub-team meeting		LPB	LPB	
27		27	Tue	Q's review	Donor/LPB FU			Meeting record	Data analysis	Coordination	Superv.&analysis	Data analysis	LPB	LPB	
28		28	We	Data analysis	Donor/LPB FU	Questionnaire development		Meeting record	Data analysis	Coordination	Superv.&analysis	Data analysis	LPB/XYB	LPB/XYB	
29		29	Thu	Data analysis	Donor/SYB FU	Questionnaire development		Meeting record	Data analysis	Coordination	Superv.&analysis	Data analysis	XYB	XYB	Factory arrg.
30		30	Fri	Data analysis	Donor/SYB FU	Qs Devt Deadline		Prepation	Data analysis	Translation	Superv.&analysis	Data analysis	XYB	XYB	Factory arrg.
31		31	Sat					Translation		Translation	Superv.&analysis	Data analysis	XYB-VTE		
32		1	Sun						DFR writing						
33		2	Mo	Overall superv.	ADB			ADB	Superv.&analysis	Coordination	Sub-team meeting			Follow-up	Factory arrg.
34		3	Tue	Overall superv.	Donor prep			Coordination	Superv.&analysis	VCOMS interview	Superv.&analysis	Data analysis	Data check	Follow-up	Factory arrg.
35		4	We	Overall superv.	Data collection			Coordination	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Data check		Factory arrg.
36		5	Thu	Overall superv.	Data collection			DOIH prep.	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Data check		Answering Q's
37		6	Fri	Overall superv.	Data analysis			DOIH prep.	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Data check		Answering Q's
38		7	Sat					Analysis		Analysis			Analysis		
39		8	Sun												
40		9	Mo	Overall superv.	Data analysis				Superv.&analysis	Coordination	Superv.&analysis		Follow-up	Answering Q's	Answering Q's
41		10	Tue	Factory backsupport				Factory visit	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Follow-up	Answering Q's	Factory visit
42		11	We	Overall superv.	Data analysis	Data collection	Data collection	DOIH	Superv.&analysis	Data analysis	Superv.&analysis	Data analysis	Follow-up	Answering Q's	Answering Q's
43		12	Thu	Overall superv.	Data analysis	Data collection	Data collection	DOIH	Superv.&analysis	Data analysis	Superv.&analysis	Data analysis	Reporting	Questionnaire Deadline	
44		13	Fri	EXRI meeting				DOIH	Superv.&analysis	Coordination	Superv.&analysis	Data analysis	Reporting		Answering Q's
45		14	Sat					Translation		Data analysis			Reporting		
46	Nov	15	Sun												
47		16	Mo					Data check	DFR writing	Data analysis	DFR writing	DFR writing	Coordination		Answering Q's
48		17	Tue	8th JP Team mtg	8th mtg/ GGGI			Data check	8th mtg/ GGGI	Data analysis	8th JP Team mtg		Data check		Answering Q's
49		18	We	Overall superv.	DFR writing	Data analysis	Data analysis	Data check	DFR writing	Data analysis	DFR writing	DFR writing	Data check		
50		19	Thu	DFR writing	DFR writing	Data analysis	Data analysis	Translation	DFR writing	Data analysis	DFR writing	DFR writing	Data check		
51		20	Fri	DFR writing	DFR writing	Data analysis	Data analysis	Translation	DFR writing	Data analysis	DFR writing	DFR writing	Coordination		
52		21	Sat					Translation		Data analysis			Follow-up		
53		22	Sun												
54		23	Mo	DFR writing	DFR writing	DFR writing	DFR writing	Coordination	DFR writing	Data analysis	DFR writing	DFR writing	Coordination		
55		24	Tue	EXRI meeting				Coordination	DFR writing	Data analysis	DFR writing	DFR writing	Follow-up		
56		25	We	DFR writing	DFR writing	DFR writing	DFR writing	Coordination	DFR writing	Data analysis	DFR writing	DFR writing	Follow-up		
57		26	Thu	DFR writing	DFR writing	DFR writing	DFR writing	Coordination	DFR writing	Data analysis	DFR writing	DFR writing	Follow-up		
58		27	Fri	Joint-mtg	KEXIM/ Joint-mtg	MONRE-MOIC-Survey tem Joint-meeting			DFR writing	Follow-up	DFR writing	DFR writing	Coordination	Joint-Meeting	
59		28	Sat					Translation		Follow-up			Reporting		
60		29	Sun												
61		30	Mo	DFR writing	DFR writing	DFR writing	DFR writing	Coordination		Follow-up			Reporting	Coordination	
62		1	Tue	9th Team mtg	KSP Consultant/T-mtg	9th Team mtg		Coordination	9th Team mtg	Follow-up	9th Team mtg		Follow-up	Coordination	
63		2	We	DFR writing	DFR writing	DFR writing	DFR writing	DPCM-mtg		VDONRE/VCOMS			Follow-up	DPCM-mtg	
64		3	Thu	DFR writing	DFR writing	DFR writing	DFR writing	VDOIC		Follow-up			Follow-up	Follow-up	
65	Dec	4	Fri	DFR writing	DFR writing	DFR writing	(other PJ)	PONRE						Follow-up	
66		5	Sat												
67		6	Sun												
68		7	Mo	DFR Submission (Japanese) to JICA				Coordination							

List of Interviewees

1. Ministry of Natural Resources and Environment (MONRE)

Mr. Sivannakone Malivan	Deputy Director General, Pollution Control Department (PCD)
Mr. Vanhxay Phiomanyvone	Director of Division, PCD
Ms. Palina Khotphouthone	Deputy Director of Division, PCD
Mr. Anouphab Phanouvong	Deputy Director of Administration Division, PCD
Ms. Phatsada Sumphonphukdy	Administration Division, PCD
Mr. Phonsavath Anourak	Deputy Director of Waste Management Division, PCD
Mr. Khounsamay Silapheth	Deputy Director of Waste Management Division, PCD
Mr. Noudeng Vongdala	Technical Staff, Waste Management Division, PCD
Mr. Orlahanh BounGnaPhalom,	Deputy Director General, Department of Natural Resources and Environmental Policy (DNEP)
Mr. Virana Sonnasinh	Deputy Director General, Department of Planning and Cooperation
Ms. Malaithong Keonhothi	Deputy Director, Division of Planning
Mr. Anousack Maitrychith	Technical Staff, Division of Planning

**As of 13 March 2020, before re-structuring.

2. Ministry of Industry and Commerce (MOIC)

Mr. Somphone Soulivan	Director General, Department of Industry and Handicraft
Ms. Phoutsavanh Nepophasy	Technician, Department of Industry and Handicraft
Ms. Souyanny Keothanongkhan	Deputy Director, Industrial Environment and Chemistry Division, Department of Industry and Handicraft
Ms. Syamphone Keosampa	Technician, Industrial Environment and Chemistry Division, Department of Industry and Handicraft
Ms. Phoutsavanh Nepophasy	Technician, Industrial Environment and Chemistry Division, Department of Industry and Handicraft

3. Ministry of Public Works and Transportation (MPWT)

Mr. Phouthasom Inthavong	Deputy Director of Division, Housing and Urban Planning Department
Mr. Chittavong Keomanivong	Urban Development Division, Department of Housing and Urban Planning (Livable Cites Project Coordinator)

4. Ministry of Planning and Investment (MPI)

Ms. Pany Vorachith	Deputy Director, Economic Development Planning

	Division, Department of Planning
Mr Somekiet Sihalath	Deputy of Economic Zone Authority

5. Ministry of Health (MOH)

Dr. Bouakeo Souvanthong	Deputy Director General, Division of Hygiene and Health Promotion (DHHP)
Dr. Khampasith Phommachack	Technical Staff, DHHP

6. Vientiane Capital

Mr Phoudone Meksavan	Head Deputy of Vientiane City Office of Management and Services (VCOMS)
Mr Boukham Phakasoum	Deputy Director of Waste Collection Service
Ms Khamfong	Deputy Director of Division, VOCMS
Mr. Bounseng Xayasombath	Head of Disposal Unit, KM32
Mr. Kongchay	Head of Recycling Center

7. Vangvieng District, Vientiane Province

Mr. Misay Thuntavong	Director, Office of Natural Resources and Environment (ONRE)
Mr. Vongjampha	Deputy Mayor of Vangvieng District
Mr. Bounma Namvilay	Deputy Director, Office of Natural Resources and Environment (ONRE)
Mr. Bountay Sipaserth	Head of Monitoring Environmental Sector of ONRE
Ms. Hadsady	Deputy Director, UDAA
Mr. Ounsy Chanlavong	Director, Director, Office of Industry and Commerce (OOIC)
Mr. Sengthong Sirivong	Technical Staff, OOIC
Mr. Sengsackda	Deputy Director, OPWT
Mr. Kotami Siriboriban	Deputy Director, Information, Culture and Tourism Office, Tourism Administration Agency (TAA)
Dr. Khammanyvone Vongsombath	Deputy Director of Vang Vieng Hospital, Office of Health (OOH)
Mr. Kheninsan	President of Kheninsan Recycling Company （Vangvieng）
Mr. Vichith Souvannarath	Deputy Plant Manager , Lao Cement Company Limited Vangvieng
Mr. Nantha	Deputy Plant Manager, Lao Cement Company Limited Vangvieng

8. Svannakhet Province

Mr. Phouthone Yotbounheuang,	Director General of Department, DONRE
Mrs. Soulikone Malavong	Deputy Head of Kaysone-Phomvihane City Office of Management, Development and Services, UDAA
Mr. Phetsamone	Deputy Head of Administration Unit, UDAA
Mr. Thipphakhanxay	Deputy Head of Unit, UDAA
Ms. Daonin Akhamonty	Deputy Head of Unit, UDAA
Mr. Xaipanya Luangnikone	Technical Staff, UDAA
Mr. Banxa Seumxap	Director of Asset , Construction and Environmental Management, Savannakhet SEZ Authority (SaSEZA)
Mr. LamkeoKeomixay	Head of Environmental Officer, SaSEZA
Mr. PhouxaysanaPhasava	Environmental Officer, SaSEZA
Mr. ThidaphoneNanthasen	Environmental Officer, SaSEZA
Mr. Montri Sophonputtaporn	Director, Factory Manager, GM of Administration Division, Nikon Lao Company Limited

9. Xiengkhoang Province

Mr. Bouasone Synouanethong	Vice Governor
Mr. Sivone Boutdachan	Director, DONRE
Mr. Saykham Nuanthasing	Deputy Director, DONRE
Mr. Songphong Phouthamisay	Director, DPWT
Mr. Bonuchan Kantiphoutharvong	Deputy Director, UDAA
Mr. Bounzou Aoutthachak	Head of UDAA Sector, UDAA
Mr. Thongsavah Mungnormek	Director, DOIC
Mr. Vanharkhom Yoummavongsa	Deputy Director, DOIC
Dr. Khamsavang	Director, Public Health Department, DOH
Dr. Sinnavong	Deputy Director, DOH
Mr. Thongleen Chittalath	Director, Department of Energy and Mining (DEM)
Ms. Nathanong Sivilay	CEO, GSP clean
Mr. Syvilay OUDOMSOUK	Deputy Director, Information, Culture and Tourism Office of Tourism Administration Agency (TAA)

10. World Bank Laos

Mr. Viengkeo Phetnavongxay	Senior Environmental Specialist
Mr. Kaysone Vongthavilay	Environmental Specialist

11. United Nations Industrial Development Organization (UNIDO)

Mr. Somemai FAMMING	UNIDO Country Representative, Lao PDR

12. Environment Protection Fund (EPF)

Ms. Bounphama Phothisane	Deputy Executive Director
Mr. Khonesavanh Zoumphonphakdy	Admin and Procurement Division Head

13. Global Green Growth Institute (GGGI)

Ms. Shomi Kim	Project Leader
Ms. Souksaveuy Keotiamchanh	Project Staff

14. Department of Planning and Cooperation, MONRE

Mr Virana SONNASINH	Deputy Director General

15. Mekong Environmental Consulting CO.,LTD

Mr. Peter Gammelgaard Jennsen	Senior Environmental Specialist

16. JICA Laos Office

Ms. Akiko Sanada	Senior Representative
Ms. Reiko Matsui	Program Formulation Advisor
Mr. Kingsada Siphanthong	Program Officer

17. JETRO Vientiane Office

Mr. Kenichiro Yamada	Representative

18. The Verification Survey with the Private Sector for Disseminating Japanese Technologies for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos

Mr. Junichiro Kayama	President, Kayama Kogyo Co., Ltd.
Mr. Shinichi Tabata	Planning Manager, Kayama Kogyo Co., Ltd.
Mr. Hisashi Komoda	Thermal Plant Manager, Kayama Kogyo Co., Ltd.
Mr. Phengpaseuth Souksavanh	Planning Division, Environmental Solution, Kayama Kogyo Co., Ltd.

List of Interviewees

1. Ministry of Natural Resources and Environment (MONRE)

Dr. Xainakhone Inthavong	Vice Minister
Mr. Lonkham Atsanavong	Director General, Department of Pollution Control and Monitoring (DPCM) (former Pollution Control Dep.)
Dr. Leevameng Bouapao	Deputy Permanent Secretary, MONRE's Cabinet
Mr. Thevarack Phonekeo	Deputy Director, DPCM
Dr. Sitxay Makvilay	Deputy Director, Chemical and Waste Management Division, DPCM
Mr. Noudeng Vongdala	Technical Staff, Chemical and Waste Management Division, DPCM
Mr. Sounadeth Soukchaleun	Deputy Director General, Department of Planning and Finance (DPF) (former Dep of Planning and Cooperation)
Mr. Nakkhalin Volasan	Technical Staff, DPF

2. Ministry of Industry and Commerce (MOIC)

Mr. Somphone Soulivan	Director General, Department of Industry and Handicraft (DOIH)
Mr. Phetmixay Kaseumsouk	Deputy Director of Environment and Industrial Chemical Division, DOIH
Ms. Syamphone Keosampa	Technical staff, Industrial Environment and Chemistry Division, DOIH

3. Ministry of Public Works and Transportation (MPWT)

Mr. Chittavong Keomanivong	Urban Development Division, DHUP (Livable Cites Project Coordinator)

4. Vientiane Capital

Mr. Bounchanh Keosithamma	Director, Vientiane City Office of Management and Services (VCOMS)
Mr. Bounpakob	Deputy Director of VCOMS in charge of Cleanliness of City and Storm Water Drainage system
Dr. Engphone Phengsouvan	Director General, Department of Natural Resources and Environment, Vientiane Capital (VDONRE)
Mr. Soulivanh Phommahaxay	Director of DPWT, Vientiane Capital (VDPWT)
Mr. Vongphet Rajbouth	Deputy Head, Industry and Handicraft Section, Department of Industry and Commerce, Vientiane Capital (VDOIC)

5. Luang Prabang District

Mr. Thiengkham Thammavong	Deputy Director of PONRE
Mr. Sakdaphone Keophachanh	Technical Staff, PONRE
Mrs. Kaysone Kousonsavath	Director, Urban Service Office(USO) (Former UDAA)
Mr. Somvang Phanthavong	Head of Solid Waste Management Unit, USO
Mr. Khamsavanh Thongsouk	Deputy Head of Solid Waste Management Unit, USO
Mr. Thongchanh	Head of Nursing, Provincial Hospital-LPB
Mr. Khamfeua Phalyvanh	Deputy Head of Hygience and Health Promotion Unit, DOH

6. Xayabouri District

Mr. Veophet Sysouphanh	Deputy Director, PONRE
Mr. Thonglan Pheuaphom	Deputy Director, UDAA
Ms. Saysamone Sonephanh	Head of Planning and Finance Unit, UDAA
Mr. Phatthanong Sonephan	Head of Urban Management Unit, UDAA
Dr. Chanpaseuth Khamphanhpheng	Deputy Head of Adminitration Office, DOH
Dr. Khounsavanh Senaphanh	Director of Provincial hospital-Xayabouri

7. World Bank Laos

Mr. Kaysone Vongthavilay	Environmental Specialist

8. ADB

Ms. Soudalay Souannavong	Project Officer, Laos Resident Mission (LRM)

9. KOICA

Mr. Yongjeong Kim	Deputy Resident Representative
Ms. Pavina Insisiengmay	Program Assistant

10. KEXIM Bank

Ms. Seeun Park	Knowledge Sharing Program (KSP) Specialist

11. KSP 'Sustainable Solid Waste Management in Laos' Project

Dr. Seungdo Kim	Principle Investigator of KSP/ Professor/Director, Department of Environment Science and Biotechnology, Hallym University
Mr. Sungkap Cho	Professor, Hallym University
Mr. Popli Kanchan	Researcher, Hallym University
Mr. Youngwoo Park	Director, Dohwa ENG

Ms. Sukyeong Yang	Team Manager, Environment Strategy Development Institute

12. Environment Protection Fund (EPF)

Ms. Chanthamany Siliya	Deputy Director, Administration Division

13. Global Green Growth Institute (GGGI)

Ms. Shomi Kim	Project Leader

14. Toyo Industry Lao Factory Sole CO., LTD

Mr. Langkone Xaignavong	President of Xaignavong Group
Mr. Phonesouk Panyathong,	Factory Manager

15. EPOCH TOYS (LAO) CO., LTD

Ms. Phonekeo Vongsoulin	Administration Head

16. 5N Plus Industrial Resources Sole CO., LTD

Mr. Litthideth	External Affairs Manager

17. Lao Non-Ferrous Metals Export-Import Sole Company Limited

Ms. Phimmasone Luanglath	External Manager

18. JICA Laos Office

Ms. Akiko Sanada	Senior Representative
Ms. Reiko Matsui	Program Formulation Advisor
Mr. Kingsada Siphanthong	Program Officer

Strategy and Activities related to Waste and Chemical Management

from National Pollution Control Strategy and Action Plan 2018-2025, with Vision to 2030

Strategy and Activities	Indicators	Term	Responsibilities	
			Principal agency	Supporting agency/ies
Strategic Pillar 1: Pollution Prevention Strategy				
SP 1-1: Strengthening institutional mechanism				
Develop necessary policy and legislation on Extended Producer Responsibility (EPRs) for national and multinational industries who produces/imports goods/products that bear environmental	Policy and legislation on EPR will be developed	S, M	PCD	MONRE, LNCCI, Chamber of Commerce, concerned stakeholders
Strengthen local institutions through establishment of separate unit on SWM in local bodies with necessary human resources at provinces and local level	Increase in number of established units with human resources	M , L	MOPWT, Municipalities and VDCs	concerned stakeholders, private sectors
Build capacity and infrastructure for preparing strategy and action plan, SWM segregation, collection and transportation, processing and final disposals	Capacity and Infrastructure for SWM will be developed	S, M, L	Municipalities and VDCs	MOPWT, MONRE, lines agencies /stake holders, private sectors
Generate revenue from establishment of material recovery facilities (MRF) and recycling business	improved in revenue generation through MRF and recycling business	S, M, L	Municipalities/VDCs, private sectors	MOPWT, PCD, MOPWT, LNCCI, Chamber of Commerce, private sectors, NGOs/INGOs
SP 1-2: Mainstreaming pollution prevention measures in all development efforts				
Coordinate with to ensure the inclusion of solid waste management (Municipal waste, Industrial waste, E- waste, hazardous waste, disaster waste, construction and demolition waste etc.) component in forth coming SWM National Policy, Strategy and Action Plan	National strategy and action plan on SWM will be prepared and updated	S	MONRE	MOPWT, PCD, Municipalities and other stakeholders
Prepare baseline data of various wastes (like municipal waste, health care waste, industrial waste, e-waste, household hazardous waste, agriculture waste, construction and demolition waste, disaster waste)	Baselines data on various types of wastes	S, M	MONRE	HCI, MOPWT, MOAF, lines agencies, NGOs, Municipalities /VDCs, and stakeholders
Prepare and update solid waste management strategy and action plan at local level and allocate necessary budget for timely implementation	Local level solid waste management strategy and action plan	S, M, L	MOPWT	Municipalities /VDCs, MOAF, MONRE, HCI, lines agencies, NGOs, and stakeholders
SP 1-3: Minimization/Reduction at the source				
Design and implement capacity building programme to raise awareness level at national, regional and local level on waste segregation (into various category of General and Hazardous waste) and waste minimization	Number of people Participated in the capacity building programme	S, M, L	Municipalities /VDCs and concerned stakeholders	CBOs, NGOs, private sectors, associations

Strategy and Activities	Indicators	Term	Responsibilities	
			Principal agency	Supporting agency/ies
Monitor to ensure that all households, institutions and commercial and industrial sectors mandatorily follow waste segregation and minimization practices	No. of waste segregation practices at source in all sectors	S, L	Line ministries	District offices, Municipalities /VDCs, concerned stakeholders, HCIs, Industries
SP 1-4: Raising public awareness and environmental education				
Raise awareness through cleaning campaigns at national, provincial and local level with community participation and social mobilization	people will be aware of not to dispose waste in public or private places	S, M, L	DDC, Municipalities /VDCs,	Concerned stakeholders including CBOs, NGOs, civil society
Conduct programmes to raise awareness on impacts of open burning of waste including prohibition of open burning of waste	Percentage of households practicing open burning of wastes	S, M, L	DDC, Municipalities /VDCs,	Concerned stakeholders including CBOs, NGOs, civil society
Awareness raising on hazardous waste (e-waste, pesticides, nuclear waste, radioactive waste, industrial waste) at national , regional and local level	Percentage of people trained on hazardous waste management	S, M, L	PCD,	MOPWT, MOAF LNCCI, Local Chamber of Commerce, Municipalities, VDCs, civil society
Strategic Pillar 2: Pollution Control Strategy				
SP 2-1: Ensuring compliance to legal provisions				
Monitor and ensure to compliance of SWM Act and regulation; policy, strategy and action plan	Monitoring reports	S, M L	MOPWT	Municipalities, ECCDA, VDCs, industries, HCI, NGOs
Monitor and ensure to compliance of Health Care Waste Management guidelines	Monitoring reports	S, M, L	MOH,	HCIs, DPHO, Laboratory, Pharmaceutical companies
SP2-2: Comprehensive waste (pollutants) management.				
Institution				
Develop exclusion criteria and detail design manual of sanitary landfill site suitable for low land, mountain, hill and terrain regions	Criteria and manuals developed	S		MOPWT, MPI, ECCDA, Municipalities, private sectors, professional experts
Develop policy and program on construction and operation of regional sanitary landfill site where more than one municipalities /VDCs can jointly use facilities	policy and program on regional sanitary landfill site will be developed and prioritized	S, M	MOPWT,	MPI, Municipalities, MONRE, ECCDA
Develop necessary procedural guidelines on municipal solid waste management	Guidelines will be developed	S & M		MOPWT, Municipalities, VDCs, private sectors, ECCDA
Develop necessary standard of leachate generated from Sanitary landfill site	Standard will be developed and enforced	S	DoE	MOPWT, MoE, Municipalities, ECCDA, VDCs, private sectors

Strategy and Activities	Indicators	Term	Responsibilities	
			Principal agency	Supporting agency/ies
Develop and enforce necessary policy and legislation on Extended Producer Responsibility (EPRs) for national and multinational industries who produces/imports goods/products that bear environmental cost	Policy and legislation on EPR will be developed	S, M	PCD	MONRE, LNCCI, Chamber of Commerce, concerned stakeholders
Infrastructure				
Develop infrastructure with suitable means of collection and transportation for SWM in Municipalities and VDCs in mountain, hill and terrain regions	Number of collection and transportation infrastructure	M, L	Municipalities and VDCs	MOPWT, MONRE, Provinces/Districts, ECCDA, Private Sectors, development partners
Establish infrastructure such as sorting station including Material Recovery Facilities (MRF) and its implementation with PPP approach or franchise system in municipalities	Number of waste processing facilities	S, M, L	Municipalities	MOPWT, PCD, Provinces/Districts, ECCDA, Private Sectors, development partners
Construct and operate environment friendly and cost effective sanitary landfill site suitable for mountain, hill and terrain regions	Numbers of sanitary landfill sites	S, L, M,	Municipalities/ VDCs	MOPWT, PCD, ECCDA, Provinces/Districts, Private Sectors, development partners
Construct and operate regional sanitary landfill site with facilities for industrial and hazardous waste	Number of regional sanitary landfill sites	M, L	Municipalities/ VDCs	MOPWT, PCD, ECCDA, Provinces/Districts, Private
Develop exclusion criteria and detail design manual of drainage and wastewater treatment system suitable for low land, mountain, hill and terrain regions	Criteria and manuals developed	S		MOPWT, MPI, PCD, ECCDA, Municipalities, private sectors, professional experts
Construct and operate environment friendly and cost effective drainage and wastewater treatment plans suitable for mountain, hill and terrain regions	Numbers of sanitary landfill sites	S, L, M,	Municipalities/ VDCs	MOPWT, PCD, ECCDA, Provinces/Districts, Private
Technology and system				
Develop suitable solid waste collection and processing system based on regions (mountains, hills, terrain) by local bodies	Improvement of waste collection system at local level	M, L	Municipalities and VDCs	MOPWT, MPI, PCD, ECCDA, private sectors, professional experts
Establish medium/ large scale central health care waste management system facilities at local level through promotion of private sector participation	numbers of central health care waste management system facilities established	M, L	MoH	Concerned Ministries, Municipalities departments, local bodies, ECCDA

Strategy and Activities	Indicators	Term	Responsibilities	
			Principal agency	Supporting agency/ies
Develop suitable wastewater treatment technologies (on site/off site) for different treatment levels (household, village, community, municipality, town, city) by local bodies	numbers of wastewater treatment facilities established in major towns, cities, village and sanitary toilet at household	S,M	Municipalities/ VDCs	PCD, private sectors, professional experts
Develop effective monitoring mechanism with participation of environment committee and community representatives for waste collection and transportation	Monitoring mechanism in place	M, L	Municipalities and VDCs	ECCDA, private sectors, ward level committee
Private sector participation				
Develop effective monitoring mechanism with participation of environment committee and community representatives for waste collection and transportation	Monitoring mechanism in place	M, L	Municipalities and VDCs	ECCDA, private sectors, ward level committee
Establish infrastructure for effective waste collection and transportation services through private sectors participation (CBOs / NGOs / Companies)	Number of private sectors involved in SWM infrastructure	S, M, L	Municipalities and VDCs	MOPWT, MPI, Provinces/Districts, ECCDA, Private sectors, development
Establish small and medium scale environmental friendly technologies for organic waste management (composting/ biogas production/electricity generation)	No. of plants established	S, M, L	Municipalities	MOPWT, ECCDA, private sectors, development
Strengthen household and community level organic waste management (composting/ biogas production/bio-briquette production) in VDCs	Percentage of HH, and communities	S, M, L	VDCs	ECCDA, Districts, Private Sectors, communities, NGOs, development partners
Establish recycling plants through PPP approach (glass, plastic, paper, textile, rubber and leather, metal)	numbers of recycling plants will be established	M , L	MOPWT	MOIH, LNCCI, ECCDA, Chamber of Commerce, MOPWT, Municipalities, Private sectors, development partners
Solid Waste-based enterprise				
Strengthen household and community level organic waste management (composting /biogas production /bio-briquette production) in VDCs	Percentage of HH and communities	S, M, L	VDCs	Districts, Private Sectors, communities, ECCDA, NGOs, development partners
Establish recycling plants through PPP Approach (glass, plastic, paper, textile, rubber and leather, metal)	Numbers of recycling plants will be established	M , L	MOPWT	MOIH, LNCCI, Chamber of Commerce, MOPWT, ECCDA, Municipalities, Private sectors, development

Strategy and Activities	Indicators	Term	Responsibilities	
			Principal agency	Supporting agency/ies
				partners
Develop and increase green belt areas and start greenery development programs in the bare ground and open spaces	Percentage of green cover (especially in urban areas)	M	Municipalities	MOPWT, Municipalities, Private sectors, development partners
SP 2-3: Enhancing accountability				
Develop the standard for leachates from SLF site	Standard in place	S	MoPWT	MONRE, MoH
SP 2-4: Making polluters pay.				
Extensively expand the waste collection by private sector participation at household level	No. of private entities involved No. of households participating in the programme and paying fees	S, L, M,	Municipalities and VDCs	MOPWT, private sectors, civil society, associations
Expand waste collection from enterprises scheme	No. of enterprises participating and paying fees	S	MOPWT	MOIH, MONRE
SP 2-5: Addressing trans-boundary pollution issues.				
Compile and share Baseline information on air and water quality Monitoring and Management in the participating countries.	Baseline information on ambient air quality compiled	S	MONRE	MOPWT, MOFA, INGOs, Development Partners
Support with expertise, equipment and information, needed for the quantitative monitoring	Equipment and expertise identified and procured and experts engaged.	S	MONRE MPI	MOIH, MOH, MOAF
Formulate policy for transboundary prevention/control of air and water pollution and hazardous waste	Policy developed	S	MONRE	MOFA, INGO, Development Partners
Collect reliable baseline data jointly and share information	Guidelines prepared	L	WECS	Line agencies
Design and implement joint programme to reduce the air and water pollution	Percentage of pollution decreased	L	Basin Authority	Line agencies
Develop inventory of hazardous waste in line with international Conventions (MEAs) to address trans-boundary pollution	Inventory of hazardous waste	M	MONRE	MOIH, MOPWT, MOFA concerned ministries, NGOs/INGOs

Joint Workshop Agenda

For Draft Final Report on Data Collection Survey on Waste Management Sector in Laos

Date: 26th January 2021 Time: 9:00 AM (Laotian time) Venue: online

No	Time	Description	Presenter	Remark
1	9:00-9:05	Opening speech by Director General of DPCM	Mr. Lonekham Atsanavong	5 minutes
2	9:05-9:10	Welcome remarks by the JICA Laos Office	Ms. Akiko SANADA	5 minutes
3	9:10-9:35	Presentation on Draft Final Report	Mr. Ikuo Mori	25 minutes
4	9:35-9:50	Presentation on chemical and industrial waste management	Mr. Somphong Soulivanh	15 minutes
5	9:50-10:00	i) Presentation on solid and hazardous waste management ii) Technical demands of solid waste and hazardous waste management	Mr. Noudeng Vongdala	10 minutes
6	10:00-10:25	General discussion and Q & A	-Mr. Ikuo Mori -Mr. Lonekham Atsanavong	25 minutes
7	10:25-10:30	Closing speech by Director General of DPCM	Mr. Lonekham Atsanavong	5 minutes

List of Attendance

No	Name	Title	Institution
1	Mr. Somphong Soulivanh	Deputy Director General	Department of Industry and Handicraft (DOIH), MOIC
2	Mr. Phetvixay Kaseumsouk	Deputy Director of Environmental and Chemical Industrial Division, DOIH	
3	Ms. Siamphone Keochampa	Technical Staff of Environmental and Chemical Industrial Division, DOIH	
4	Mr. Lonekham Atsanavong	Director General	Department of Pollution Control and Monitoring (DPCM), MONRE
5	Mr. Thevarack Phonekeo	Deputy Director General	
6	Dr. Sidxay Makvilay	Deputy Director of Chemical and Waste management Division (CWMD)	
7	Mr. Noudeng Vongdala	Technical Staff of CWMD	
8	Mr. Hideaki Matsuoka	Director, Environmental management Team 1, Environmental management Group, Global Environmental Department	JICA Headquarters
	Mr. Shunsuke Nakamura	Environmental Management Team 1, Environmental management Group, Global Environmental Department	
9	Ms. Akiko Sanada	Senior Representative	JICA Laos Office
10	Ms. Reiko Matsui	Project Formulation Advisor	
11	Mr. Kingsada Sipanthong	Program Officer	
12	Mr. Ikuo Mori	Team Leader, General Waste/ Collection and Transfer 1	JIpCA Survey Team
13	Dr. Ryoichi Ogawa	Collection and Transfer 2/ Final Disposal Management 2 Expert	
14	Dr. Yuko Aoki	Intermediate/Final Disposal Management Expert	
15	Ms. Risako Imai	Valuables/ Recycling/ Industrial and Toxic waste Expert	
16	Mr. Miyoshi Hirofumi	Recycling 2 Expert	
17	Mr. Makoto Takahashi	Chemical Waste management Expert	
18	Mr. Osamu Sakamoto	Industrial and Toxic Waste Transboundary management Expert	
19	Mr. Bounthong Keohanam	Survey Assistant Leader	
20	Dr. Sayamang Nanthanavone	Survey Assistant	
21	Mr. Phetphoominh Chanthabouneuang	Survey Assistant	

Record of Draft Final Report Workshop between DPCM, MONRE; DOIH, MOIC, and Data Collection Survey Team on Waste Management Sector in Laos	
1.Organizations	JICA Headquarter, JICA Laos Office, Department of Pollution Control and Monitoring (DPCM), MONRE, and Department of Industry and Handicraft (DOIH), MOIC
2. Purpose of video meeting	To share the findings of the Draft Final Report (DFR) of the Data Collection Survey on Waste Management Sector in the Lao PDR
3. Date/ Time	January 26th, 2021; From 9:00 – 10:30 Laotian time
4. Venue	Webex online meeting
5. Attendance	[DOIH] - Mr. Somphong Soulivanh, Deputy Director General, DOIH - Mr. Phetvixay Kaseumsouk, Deputy Director of Environment and Chemical Industrial Division (ECID), DOIH, MOIC - Ms. Siamphone Keochampa, Technical Staff, ECID, DOIH [DPCM] - Mr. Lonkham Atsanavong, Director General of Department of Pollution Control and Monitoring (DPCM), MONRE - Mr. Thevarak Phonekeo, Deputy DG, DPCM, MONRE - Dr. Sidxay Makvilay, Deputy Director of Chemical and Waste Management Division (CWMD), DPCM, MONRE - Mr. Noudeng Vongdala, Technical Staff, (CWMD), DPCM [JICA Headquarter] - Mr. Hideaki Matsuoka, Director, Environmental Management Team 1, Environmental Management Group, Global Environmental Department - Mr. Shunsuke Nakamura, Environmental Management Team 1, Environmental Management Group, Global Environmental Department [JICA Laos Office] - Ms. Akiko Sanada, Senior Representative - Ms. Reiko Matsui, Project Formulation Advisor - Mr. Kingsada Siphanthong, Program Officer [JICA Survey Team] - Mr. Ikuo MORI, Team Leader/General Waste /Collection and Transfer 1 Expert - Dr. Ryoichi Ogawa, Collection and Transfer 2/Final disposal Management 2 Expert - Dr. Yuko Aoki, Intermediate/Final Disposal Management Expert - Ms. Risako Imai, Valuables/ Recycling/ Industrial and Toxic Waste Expert - Mr. Miyoshi Hirofumi, Recycling 2 Expert - Mr. Makoto Takahashi, Chemical Waste Management Expert - Mr. Osamu Sakamoto, Industrial and Toxic Waste Transboundary Management Expert - Mr. Bounthong Keohanam, Survey Assistant Leader - Dr. Sayamang Nanthanavone, Survey Assistant - Mr. Phetphoominh Chanthabouneuang, Survey Assistant
<Contents> 1. Mr. Lonkham Atsanavong, Director General of Department of Pollution Control and Monitoring delivered the speech to the Draft Final Report Workshop and welcomed all the participants.	

2. Ms. Akiko Sanada, Senior Representative from JICA Laos Office addressed her welcome remarks to the participants to Draft Final Report Workshop.

3. Mr. Ikuo Mori, Team Leader of the data Collection Survey on Solid waste Management Sector in the Lao People's Democratic Republic briefed to the participants of DFR Workshop that initially the survey began in February 2020 and is scheduled to be completed in June 2020, but the survey was suspended due to the outbreak of COVID-19 pandemic. The survey was resumed in October 2020, but the JICA Survey Team was unable to visit Laos again, then the survey was remotely conducted so on behalf of the Survey Team he would like to express his deep gratitude to all the people in Lao PDR, especially MONRE, MOIC, MPWT, MOH, Vientiane, Vangvieng, Xiengkhouang, Luangprabang, Xayaboury and others for their fruitful cooperation in continuing the survey in a difficult situation and then he invited Ms. Yuko Aoki to present her findings to the DFR Workshop.

3.1 Municipal Solid Waste Management in Vientiane

Dr. Aoki explained to the participants that there are two issues in Vientiane , 1. waste collection (low collection rate) and 2. demand of final disposal site. Regarding the waste collection, VCOMS have the 10 year strategy and action plan for the waste management 2020-2030, there is a target to achieve a "100% collection rate" for all of Vientiane City by 2030. However, description of the collection rate and household contract rate are mixed in the strategy that makes confused the understanding of waste collection. The purpose of waste collection is to maintain a sanitary environment. To increase the collection rate itself is just one of the several ways to maintain the sanitary environment. The most cost-effective ways should be considered according to the characteristics of the area to maintain a sanitary environment of Vientiane.

Second issue is the demand of final disposal site. In Vientiane, there is only one final disposal site at KM32, KM32 final disposal site is to be used until 2029, for another 8 years. Since the disposal amount increased 1.5 times, by about 50% from 2015 to 2019, more waste to be collected and disposed, more financial burden, not only that more burden on natural environment and wasting natural recourses. It's not the matter of life-time of disposal site but it's the matter of huge loss to our society, economy and environment. We need to reduce the amount waste to be disposed. At the moment, there are 2 projects to construct the waste treatment facilities at KM32. To operate all those waste treatment plants, such as RDF, incinerator/Waste to Energy, and compost plant. it is very important to acquire data continuously, detail data of waste amount and composition, from the planning and designing stage of the plant. As a position(such as VCOMS and other government agency) to monitor or supervise the operation of those facilities, It is necessary to collect baseline data from the current situation survey and analyze to know the effect of reducing the burdens on financial, natural environment and resources by implementing the project.

Obtaining the waste data is essential to tackle with those 2 issues, waste collection and disposal. The waste data that are generation amount, composition of the waste, collecting amount, recycling or composting amount, disposal amount. Drawing the waste flow is also the part of waste data and is essential. How much of the waste generated from WHERE and WHERE those waste go, how much collected and disposed of, or recycled. VCOMS is already taking some waste data by weighbridges at the transfer station and final disposal site since the LPPE project. In addition to those data, they should take some more data and analyze it for the most effective allocation of financial resources/budget and human resources of the solid waste management. And VCOMS should create the system to continue taking the waste data

This is the recommendation for VCOMS and it's also good to all UDDA in Laos. Those waste data is also very essential to MONRE/DPCM as a position to supervise the solid waste management conducted by UDDA. By getting and analyzing the waste data, MONRE is able to know the actual situation of municipal solid waste management in Lao.

3.2 Municipal Solid Waste Management in Provincial Cities

Mr. Mori, the Team Leader allowed Mr. Ogawa to make a presentation on his findings to the the workshop, Mr. Ogawa informed the participants to the DFR Workshop that he and his survey

team members had conducted the survey in Vangvieng, Xiengkhouang, Xayaboury and Luangprabang and found three challenges as follows:

Challenge 1: data is not managed properly, because in some cities there is no data on the amount generated, collected or final disposed of, the accuracy of data is low, and the data is being collected in an inappropriate way

Challenge 2: Healthcare waste (HCW) is not properly managed, because HCW is not separately discharged or collected, the incineration facility is out of order and is not in operation in Luangprabang, and no agreement has been reached with some hospitals for separate discharge / collection

Challenge 3 : Plastic waste is not properly managed, due to lifestyle modernization, plastic products have penetrated and are being disposed of in areas outside the collection area, but the situation regarding the waste management outside the collection area is unknown, and an unlicensed Vietnamese company transports the collected plastic waste to Vietnam. This waste crossing boarder is a situation that needs to be monitored closely in terms of the Basel Convention.

3.3 Hazardous and Chemical Waste Management

Mr. Mori made the presentation to the DFR Workshop as follows:

Industrial Waste: the amount of industrial waste seems to be increasing, but there was no data and it could be grasped quantitatively, appropriate means of hazardous waste treatment/ disposal exists for Savan-Seno Special Economic Zone, but could not be confirmed in other SEZs, and the imports of waste plastics and used paper have increased sharply since 2018. This may be the impact from China's import ban.

Current Status of cross-border movement management for hazardous waste: since Lao PDR ratified the Basel Convention in 2010, the laws and regulations related to the implementation of the Basel Convention have not yet been put in place. Due to lack of data on the amount of hazardous waste generated, imported and exported, Lao PDR has never submitted the annual National Report, which is the obligation of the parties to the Basel Convention.

Challenges for building a cross-border movement management system: development of domestic laws and regulations, awareness raising for domestic stakeholders (import/ export traders, etc.), building a collaborative system with related executive agencies such as customs, police, port bureau, etc.

Current status and challenges related to building a chemical substance management system: it is necessary to prioritize the issue of chemical management among other related issues such as industrial waste management, in order not to cause problems such as pollution in the future, it is important to grasp the current status. For example, utilization of MOIC factory database and chemical substance registration system; building and maintaining a collaborative relationship between MOIC and MONRE for studying measures under the Environmental Protection Law.

Development Partners' Cooperation: Mr. Mori showed the executed and planned waste management-related programs/ projects supported by JICA

Recommendations:

i) *For Municipal Waste* - it is recommendable to strategically prioritize major cities and tourist cities for improvement according to the severity of waste problem, and enact a basic law on waste management in the country and an ordinance of waste disposal in Vientiane Prefecture to clarify the roles and responsibilities of the parties concerned;

ii) ii) *For Industrial Waste* - it is recommendable to grasp the status of chemical substances management in factories, it is important to investigate whether the increase of plastics and used paper imports lead to any environmental problem at the site, and it is necessary to establish domestic regulations and to promote cooperation with related organizations to comply with the Basel Convention.

4. Presentation by DOIH

Mr. Somphong Soulivanh, Deputy Director General of DOIH made the presentation to the DFR Workshop as follows: i) Current status of chemical management – in order to manage the chemicals throughout the country, the DOIH has developed some laws/ regulations such as Law on the chemicals management No. 07/NA, dated 10th November 2016; Decision on waste

management of the processing industrial factories No.0555/IC, dated 20th March 2012; Decision on the list of chemicals No.389/IC.DOIH, dated 3rd April 2018; and etc. ii) Application Form for Chemical Registration showed the conditions required for import/ export of type II and Type III chemicals; iii) the color of bin for each type of waste; iv) Challenges: laws/ regulations are not sufficient and not centralized; v) Assistance needed: lessons learned and information on chemical and waste management from other ASEAN countries, there is a need to receive the technical support from JICA.

5. Presentation by DPCM

Mr. Noudeng Vongdala, a Technical Staff of Department of Pollution Control and Monitoring presented to the DFR Workshop as follows: i) Roles and responsibilities of MONRE – establish regulatory frameworks, develop and implement strategies, policies and guidelines, manage plastic waste, be a national focal point for Basel Convention, promote 3Rs principle and implement pilot projects; ii) Legislation on solid and hazardous waste management – Environmental Protection Law (no. 29/MONRE, 2012), Decision on PCB management (No.5927/MONRE, 2020), Ministerial Instruction on hazardous waste management (No.0744/MONRE, 2015), Guideline for environmentally sustainable cities of Lao PDR, Guideline on solid waste management (No.0233/MONRE, 2020); iii) Challenges for solid and hazardous waste management – Inadequate legal framework and unclear institutional responsibilities, lack of facilities and infrastructure for solid and hazardous waste management such as sanitary landfill, treatment facilities, collection-transportation service, a considerable amount of solid and hazardous waste is illegally dumped onto land, drainage canals, and rivers, public education system and participation programs are not effective yet, lack of specific research and education on solid and hazardous waste impacts; iv) Way forward for solid and hazardous waste management of DPCM – Promote 3Rs principle to central and local levels, increase awareness on solid and hazardous waste management in household, community, public/ private sector and local people; monitor, motivate, guide and strengthen the natural resources and environment sectors of provinces and districts for collection, evaluation and analyzing the solid and hazardous waste management data as well as writing report to be submitted to the central level (short term); develop the strategy for waste management, develop the decree on waste management according to the Environmental Protection law, develop the specific regulations for solid and hazardous waste management to be participated and owned by communities, local people, public/ private sectors, monitor and support for activities implementation of solid and hazardous waste management in community, public and private sectors; v) Technical assistance required – development of the national strategy for waste management, issuance of the law/ decree on waste management, development of regulation on solid and hazardous waste management, development of economic instrument for solid and hazardous waste management, development of action plan for solid and hazardous waste management, determination of a potential pilot project for solid and hazardous waste management, development of facilities and infrastructures for solid and hazardous waste management (long-term).

6. Questions and Answers

Mr. Lonkham opened floor for general discussion, and questions and answers session

i) Mr. Mori asked if the DOIH investigates the recycling factory that causes environmental problem

ii) Mr. Somphong replied that according to the Processing Industrial Law, each factory should have a treatment facility, DOIH tries to improve the situation by developing new Decision to urge the factory to follow the Processing Industrial Law strictly or if not follow DOIH can order the factory to close it activities immediately

iii) Mr. Phetvixay raised two issues: 1) The status of hazardous waste management, the report mentioned that the Provincial Department of Industry and Commerce does not inspect the factory, 2) Law/ regulation on industrial waste management, for which reason MOIC should develop new law/ regulation on industrial waste management because MOIC already has a regulation on waste management for processing industrial factories and handicraft (types and methods of disposal), DOIH has also a Decision on the list of industrial chemicals and organization structure

iv) Mr. Mori asked DOIH to submit the questions in writing and then the survey team will answer to these questions

v) Mr. Somphong explained that according to the Processing Industrial Law, the storage of industrial waste should not longer than 90 days, but due to lack of treatment facility the factory needs to store waste longer than the period specified in the law so how to resolve this problem in the future, and how to improve the cooperation between sectors concerned as well as the roles and responsibilities of each sector because they are not clear and he agreed upon the recommendations of the survey team

vi) Mr. Hideaki Mastuoka from JICA Headquarter mentioned that he was assigned to be responsible for the data collection survey on solid waste management sector not long ago and he found that there are many issues on hazardous and chemical waste management from generation to final disposal, Mr. Mori did the situation analysis in Lao PDR so in the next survey we can cooperate well by improving the cooperation mechanism

vii) Mr. Phetvixay suggested that MONRE should develop laws/regulations related to international conventions and those should be translated into Lao language

viii) Ms. Akiko Sanada said that she is very happy to attend the Draft Final Report Workshop, JICA Laos Office would like to know the priority issues, comments and recommendations from all participants

ix) Mr. Thevarack raised two issues: 1) There are no data on hazardous waste in the Draft Final Report so how to add these data in the Final Report, and how to cooperate with DOIH about this issue, and 2) we should focus more on plastic and hazardous wastes

x) Mr. Somphong mentioned that he supports the comment of Mr. Phetvixay that we should translate the laws/ regulations related to international conventions that are to be developed into Lao language to avoid misunderstanding and each ministry should know it well.

7. Mr. Lonkham thanked all the participants and closed the Draft Final Report Workshop at 10:30 AM.

-end-

The Lao People's Democratic Republic
Ministry of Natural Resources and Environment

Data Collection Survey on Waste Management Sector in The Lao People's Democratic Republic

Draft Final Report

26 January 2021

JAPAN INTERNATIONAL COOPERATION AGENCY

EX Research Institute Ltd.
CTI Engineering International Co., Ltd.
KOKUSAI KOGYO CO., LTD.

Acknowledgements

The survey began in February 2020. Initially, the survey was scheduled to be completed in June, but the survey was suspended due to the epidemic of the Novel coronavirus. The survey was resumed in October, but the JICA Survey Team was unable to visit Laos again. Then, the survey was remotely conducted. We would like to express our deep gratitude to all the people in Laos, MONRE, MOIC, MPWT, MOH, Vientiane Capital, Vang Vieng, Xiengkhouang, Luang Prabang, Xayaboury and others, for their cooperation in continuing the survey in such a difficult situation. We are very pleased to share the findings of the survey with you today.

Contents

1. Municipal Solid Waste Management

Vientiane Capital

Municipal Solid Waste Management (Vientiane)

1. Improvement of waste collection rate

The household contract rate ≠ the collection rate

→The household contract rate in all households of Vientiane is 27%, which is 37% within the collection service area. While, the collection rate can be estimated as 40%.

The purpose of waste collection is to maintain a sanitary environment and the waste collection needs to be done in a financially sustainable way.

→The most cost-effective combination should be considered according to the characteristics of the area. For that purpose, it is necessary to collect information and data based on the actual situation of each area and to formulate a collection and transportation plan based on cost analysis.

2. Securing a final disposal site and reducing the amount of disposal

• 2 plans to construct the waste treatment facilities at KM32

①A Thai-Laos joint venture plans to build and operate facilities
（WTE, plastic recycling plant and chemical fertilizer manufacturing plant）

②Co-financing plan by AIIB and WB（Compost, WTE and RDF）

→detailed data on the composition and amount of waste to be treated is essential for designing those facilities.

It is necessary to collect baseline data from the current situation survey and show the effect of reducing the burdens on financial, natural environment and resources by implementing the project.

3. Obtaining the waste data

- **Utilization of Weighbridge/truck scale data, waste amount and composition data is essential.**

For

- strategies to increase the number of contracts in households and businesses,
- estimation of calculating collection and transportation costs to introduce waste treatment facilities.
- planning to formulate a waste treatment facility plan and a collection plan

For the most effective allocation of financial resources/budget and human resources.

1. **Municipal Solid Waste Management**

in Provincial Cities

Current status of waste management in local area

The area managed by UDAA is generally in good condition and has a good hygienic environment.

The challenges are the following three items.

Data is not managed properly.	HCW is not properly managed.	Plastic waste is not properly managed.

Challenge 1 Data is not managed properly.

- In some cities, there is no data on the amount generated, collected, or final disposal site.
- The accuracy of the data is low. For example, the amount of waste brought into the final disposal site exceeds the amount of waste generated.
- Data is being collected in an inappropriate way.

It is not possible to create a waste flow, and it is not possible to grasp how to improve collection, transportation, and disposal in the future.

It is necessary to improve the ability to acquire and manage data in order to formulate future plans using data.

Challenge 2 HCW is not properly managed.

- HCW is not separately discharged or collected.
- The incineration facility is out of order and is not in operation in Luang Prabang.
- No agreement has been reached with some hospitals for separate discharge / collection

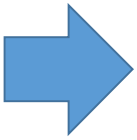
There is a high risk of health damage to collection workers and waste pickers at disposal sites.

Rebuild the pilot project on medical waste carried out at LPP-E.

Challenge 3 Plastic waste is not properly managed.

- Due to lifestyle modernization, plastic products have penetrated and are being disposed of in areas outside the collection area, but the situation regarding waste management outside the collection area is not known.
- An unlicensed Vietnamese company transports the collected plastic waste to Vietnam.

The Mekong River basin, which occupies most of Laos, is considered to be one of the sources of marine plastic pollution.

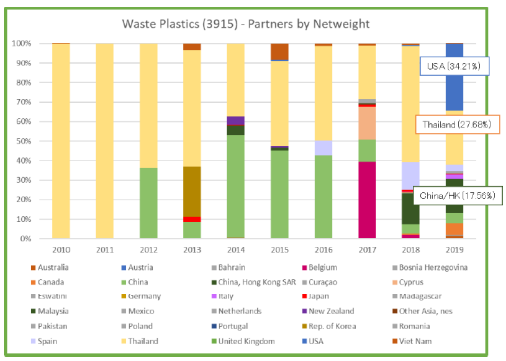


Investigate the situation of waste management outside the collection area.
Investigate ways to make better use of plastic waste within Laos (e.g. Utilization as a combustion improver in cement factories)

2. Hazardous and Chemical Waste Management

Industrial Waste

- The amount of industrial waste seems to be increasing, but there was no data and it could not be grasped quantitatively.
- Appropriate means of hazardous waste treatment/disposal exists for the Savan Seno Special Economic Zone, but could not be confirmed in other SEZs.
- Imports of waste plastics and used paper have increased sharply since 2018. This may be the impact of China's import ban.



Current status of a cross-border movement management for hazardous waste (1)

- Laos ratified the Basel Convention later than other ASEAN countries.
- Ten years have passed since Laos ratified it in 2010, but the domestic laws and regulations related to the implementation of the Basel Convention have not yet been put in place.
- MONRE-DPCM plans to develop waste management rules that will be the implementation rules of the Basel Convention (although there is no clear schedule, it is recognized as a priority within MONRE and wants to be finalized by 2021).

Country	Date of ratification
China	5 May 1992
Japan	16 December 1993
Indonesia	19 December 1993
Malaysia	6 January 1994
Philippines	19 January 1994
Korea	29 May 1994
Vietnam	11 June 1995
Singapore	1 April 1996
Thailand	22 February 1998
Cambodia	31 May 2001
Brunei	16 March 2003
Laos	**20 December 2010**
Myanmar	6 April 2015

Current status of a cross-border movement management for hazardous waste (2)

- Due to the lack of a domestic legal system, there is no experience of implementing Prior Informed Consent (PIC) under the Basel Convention, and no legal action can be taken against illegal traffic under the Convention.
- Due to the lack of data on the amount of hazardous waste generated, imported and exported, Laos has never submitted the annual National Report, which is the obligation of the Parties to the Basel Convention.
- MONRE recognizes that tackling to the rapidly increasing import of waste plastics in recent years is a priority issue. It is first necessary to grasp the actual state.
- Based on MONRE's guidance dated November 3, 2020, MONRE and MOIC will issue a decision banning the import of dirty plastic waste. MONRE-DPCM will draft the rule.

Challenges for building a cross-border movement management system

Necessary efforts in the future to build a cross-border movement management system

- Development of domestic laws and regulations (Basel Convention implementation rules, plastic waste import regulations, etc.)
- Awareness raising for domestic stakeholders (import / export traders, etc.)
- Building a collaborative system with related executive agencies (customs, police, port bureau, etc.)
- Understanding the actual situation of importing plastic waste and other problematic waste (identifying major entry points to Laos)
- Understanding the status of recycling and environmental pollution
- Building cooperative relationships with neighboring countries (Thailand and Vietnam), which have a particularly large number of imports and exports.

Main support needs raised by the Lao government

- Support for creating domestic legal systems and guidelines
- Collection of data required for country reporting
- Face-to-face training (Training of trainers, etc.)
- Development of tools and teaching materials for capacity building

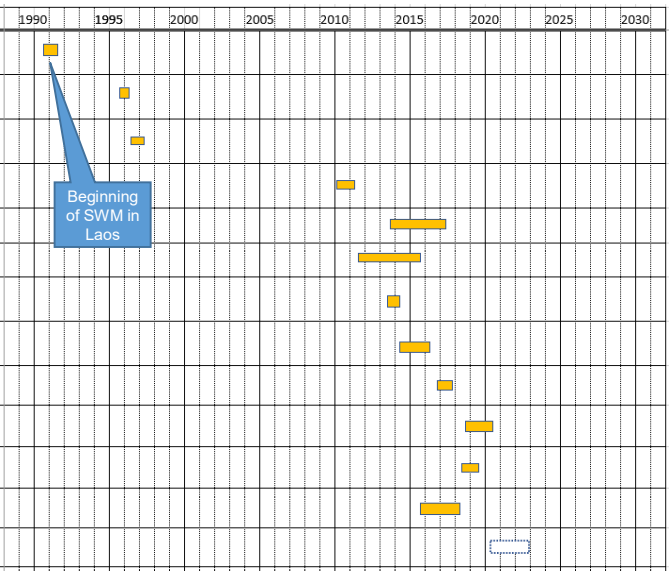
Current status and challenges related to building a chemical substance management system

- Although the laws and regulations are in place, their enforcement has not started or just started.
- It is necessary to prioritize the issue of chemical management among other related issues such as industrial waste management.
- In order not to cause problems such as pollution in the future, it is important to grasp the current status. For example:
  - Utilization of MOIC factory database and chemical substance registration system.
  - Creating easy-to-operate systems and tools (manuals, DBs) while promoting and communicating with the industrial complexes.
- Building and maintaining a collaborative relationship between MOIC and MONRE for studying measures under the Environmental Protection Law.
- At the same time, capacity development of an environmental monitoring system by MONRE to grasp the pollution situation.

3. Development Partners' Cooperation

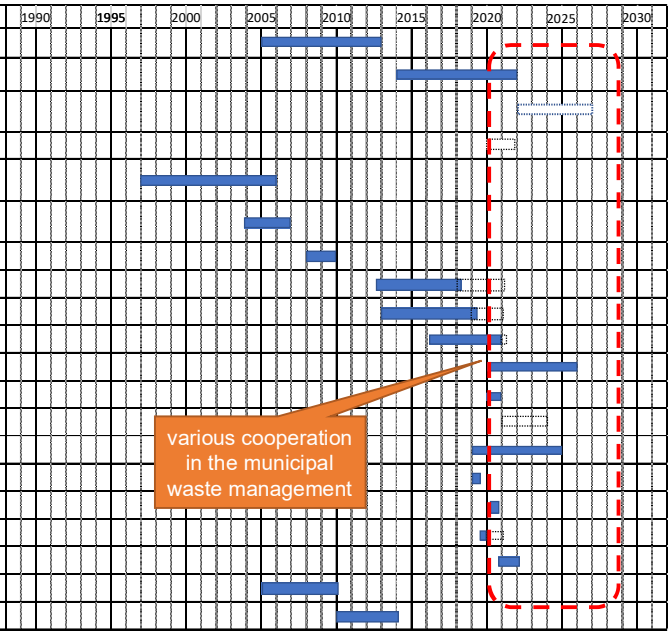
Executed and Planned Waste Management-Related Programs / Projects supported by JICA

Donors (Executers)	Programs/ Projects
JICA	The study on the solid management system improvement project in Vinentiane, Lao PDR
	Basic design study on the project for improvement of the solid waste management system in the Vientiane urban area in Laos
	The project for improvement of the solid waste management system in the Vientiane urban area in Laos
	Project for Urban Development Master Plan Study in Vientiane Capital
	The Project for Urban Development Management
	LPPE
	Feasibility Survey on Improvement of Solid Waste Management in Environmentally Sustainable Cities
	The Project for Improvement of Solid Waste Management in Environmentally Sustainable Cities
	Feasibility Survey for Improvement of Medical and Other Hazardous Waste Management in Vientiane City, Laos
	Verification Survey with the Private Sectorfor Improvement of Medical and Other Hazardous Waste Management
	Waste Management Advisor (MONRE)
	Project for Assistance to Develop an Effective Waste Utilization System with Citizen Cooperation in Vientiane Capital
	Project for Promotion of Community-based Recyclable Waste Collection in Vientiane Capital



Executed and Planned Waste Management-Related Programs/Projects by other Donors

Donors (Executers)	Programs/ Projects
World Bank	LENS
	LNES2
	Environmental and Waste Management Project
AIIB	Integrated SWM Improvement Project
ADB	Vientiane and Urban Infrastructure and Services Project (VUISP) (funded by ADB/AFD etc)
	Solid Waste Management and Income Generation for Vientiane's Poor (funded by Japan Fund)
	Small Towns Development Project in the Lao PDR
	Pakse Urban Env. Project
	GMS
	GMS2
	GMS4
CDIA (ADB/AFD)	Lao Livable Cities pre-F/S
	Urban Env. Improv. Invest. Program (UEIIP)
KOICA(GGGI)	WW and SWM Capacity Building Project
GGGI	Preparatory work for KOICA project on WW and SWM
KEXIM	Sustainable Solid Waste Management in Laos (F/S)
KEITI	Solid waste assessment Vientiane and Luang Prabang
Lancang-Mekong	Creating National Chemicals Database
SIDA	SEMP
Finland MoFA	EMSP



4. Recommendations

Recommendations

Municipal Waste

- It is recommendable to strategically prioritize major cities and tourist cities for improvement according to the severity of the waste problem.
- Enact a basic law on waste management in the country and an ordinance of waste disposal in Vientiane Prefecture to clarify the roles and responsibilities of the parties concerned.

Industrial Waste

- In anticipation of an increase in production and import of chemical substances in the future, it is recommendable to grasp the status of chemical substances management in factories.
- The impact of China's embargo seems to be significant. It is important to investigate whether the increase of plastics and used paper imports leads to any environmental problem at the site.
- it is necessary to establish domestic regulations and to promote cooperation with related organizations to comply with the Basel Convention. It will prevent environmental problems and promote proper international material circulation.

Thank you for your attention.

Meeting on the Draft Final Report on Data Collection Survey on SWM Sector in Laos
Jan 26, 2021

Chemical and Waste Management

Presented by Mr. Somphong SOULIVANH,
Deputy Director General of Department of Industry and Handicraft,
Ministry of Industry and Commerce,
Lao PDR

Outline

I. Current status of Chemical Management
II. Current status of Industrial Waste Management
III. Challenges
IV. Assistant needed

I. Current status of Chemical Management

❑**Laws and Regulations in relation with the Chemicals management**

1) Law on Chemicals Management No 07/NA, Date Nov 10, 2016.
2) Decree on Pesticide Management No 258/GO, date Aug 24, 2017.
3) Ministerial Decision on Industrial Chemicals Type No 0389/MoIC.DIH. Date Apr 3, 2018.
4) Ministerial Decision on the Registration, Import-Export and Transit of Chemicals No 1204/MOIC.DIH, Date Dec 24, 2020.
5) Ministerial Decision on management of drugs and precursors No 456/MoH, Date Apr 19, 2006.
6) Other related Laws and Regulations.

I. Current status of Chemical Management (Cont.)

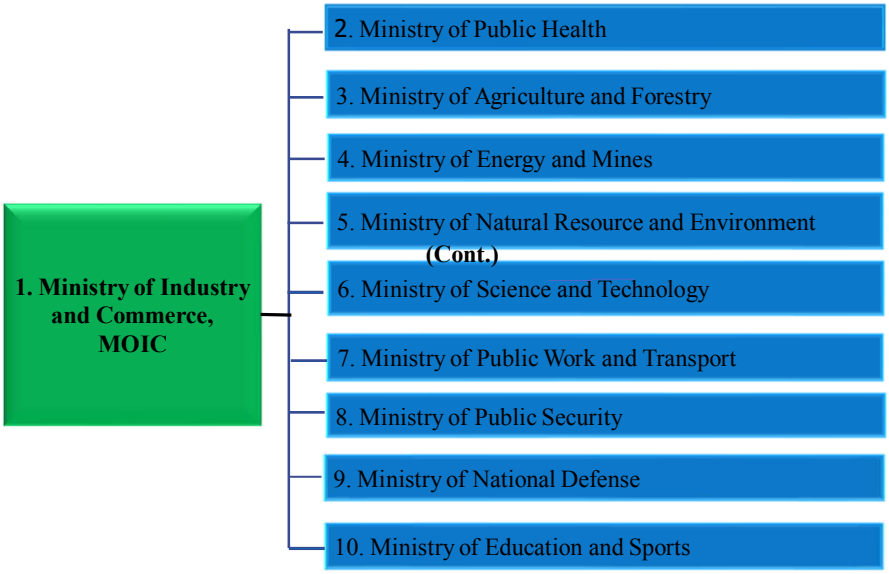
The Chemicals Management approach

Pursuant to Article 63 of Law on the Chemicals Management

❑ The Government manages chemical in a centralized approach and uniformly throughout the country by assigning the MoIC to be directly responsible and to allocate responsibilities to the relevant ministries and coordinate with other sectors and local authorities in the management of Chemicals

❑ For the management of chemicals in a centralized approach the MoIC take responsibility on approval of the Registration, Import, Export and Transit of chemicals and chemical waste. The key line Ministries will take responsibility on controlling and management of utilization, treatment and disposal of Chemicals and chemicals waste in their sector

I. Current status of Chemical Management (Cont.)



I. Current status of Chemical Management (Cont.)

❑ **Article 9 Chemicals Types**

The classification of the Chemicals is based on the characteristics and hazardousness of the chemicals, and can be divided into 4 categories as follows:

1. Hazardous Chemical Type I is a Chemical, characterized as toxic and extremely dangerous to health, life, property or environment. Chemical Type I is prohibited to conduct the business operation or use in the country, except for the activities relating to the research, technology development, prevention, impeding, disposal and mitigation of danger which may arise against health, life, property or environment and use in the national defense and public security activities, but must be approved by the Government

2. Hazardous Chemical Type II is a Chemical, characterized as toxic and very dangerous to health, life, property and environment. Hazardous Chemical Type II can be manufactured, imported, exported or possessed and used according to the permission of the Ministry of Industry and Commerce and shall be strictly under management of the relevant ministries, equivalent organizations.

I. Current status of Chemical Management (Cont.)

3. Hazardous Chemical Type III is a Chemical, characterized as toxic and moderately dangerous to health, life, property or environment. Hazardous Chemical Type III can be manufactured, imported, exported or possessed and used according to the permission of but it shall be approved by the MoIC and shall be strictly under the management of the relevant Ministries and equivalent organizations.

4. Hazardous Chemical Type IV is a Chemical, characterized as toxic and slightly dangerous to health, life, property or environment. Hazardous Chemical Type IV can be manufactured, imported, exported, possessed and used without any approval required, but it shall be notified to the IC Sector at the provincial level, and strictly complied with regulations issued by relevant sectors

I. Current status of Chemical Management (Cont.)

Registration, Import, Export and Transit of Chemicals and Chemical wastes

I. Current status of Chemical Management (Cont.)

Application for Registration of Chemical	Timing for Consideration and Approval
The undertaking of chemical business desiring to Registration of Chemicals shall submit an application to the DIH. **The application form shall consist of:** 1. Copy of the Enterprise Registration Certificate; 2. Risk Assessment Report; 3. Material safety data sheet 4. Analysis certificate in case of Mixture (Lao or English Version)	• After received the completed application and supporting documents the DIH shall consider issuance of Chemical Registration Certificate in 15 working days. • If the application and supporting documents are inaccurate or incomplete, the IH authority shall notify the applicant in writing within 5 working days from the date of the receipt of the application for resolving. • In case of an application is rejected, the IH authority shall notify the reason for the rejection in writing to the applicant within 5 working days from the date of the receipt of the application.

I. Current status of Chemical Management (Cont.)

The principle for Import, Export and transit chemicals

Import, Export, and transit chemical shall compliance with article 22 and article 45 of the law on chemicals management as follows:

❑ **Import and Export Chemicals**

1) Chemical type I shall be permitted by the government and Comply with international principles.
2) Chemical Type II and III shall be permitted by DIH, and prior confirmations are required from export country ~~at relevant sector~~??
3) Chemical Type IV and other chemicals can be imported and exported without permission, but must be notified to the DIC at the Provincial where import is taking place.

❑ **Transit chemicals**

1) Chemical type I shall be permitted by the government and Comply with international principles.
2) Chemical Type II, III, IV and other chemicals shall be permitted by DIH and prior confirmations are required from export and import countries ~~that relevant sector~~??

I. Current status of Chemical Management (Cont.)

The condition for Import and Export of Chemical type II and III

The Import and Export chemical type II and III shall meet the following the condition and measure:

1. Shall be legal entity that received an enterprise registration certificate and chemical business license;
2. Ensuring the sufficient techniques, container and equipment;
3. Use of standard transportation vehicle.
4. Import and export through the international border checkpoint

I. Current status of Chemical Management (Cont.)

Application for Import and Export hazardous chemical type II and III	Timing for consideration and issuance of Import and Export Chemical license
Import and Export hazardous chemical type II and III shall submit an application form to the DIH for issuance license. The application shall consist of: 1) The proposal for Import or Export hazardous chemical type II and III. 2) Copy of the Enterprise Registration Certificate, Chemical business license, and Investment license; 3) Copy of the chemical registration certificate; 4) Invoice and purchase order; 5) Copy of annual demand plan in case of import; Annual production plan and distribution plan in case of export; 6) Sales contact between importer and end user in case of the importer delivery directly to end user; 7) Import license from destination country in case of export.	After received the completed application and supporting documents the DIH shall consider issuance license in 5 working days from the date of the receipt of the application . If the application and supporting documents are inaccurate or incomplete, the IH authority shall notify the applicant in writing within 3 working days from the date of the receipt of the application for resolving. In case of an application is rejected, the IH authority shall notify the reason for the rejection in writing to the applicant within 5 working days from the date of the receipt of the application.

I. Current status of Chemical Management (Cont.)

Notification for Import and Export hazardous chemical type IV and other chemicals

Import and Export hazardous chemical type IV and other general chemicals shall be notified in advance to the DIC Provincial where the import and export will be taking place. The notification document shall consist of:

1) Brief report on the chemical desiring to import or export;
2) Copy of the Enterprise Registration Certificate, Chemical business license, and Investment license;
3) Copy of the chemical registration certificate;
4) Invoice and purchase order;
5) Copy of annual demand plan in case of import; Annual production plan and distribution plan in case of export;
6) Sales contact between importer and end user in case of the importer delivery directly to end user;
7) Import license from destination country in case of export.

•After received the completed notification documents the D IC Provincial shall check and record to ensuring the number of import or export chemicals are not exceeded as approved in annual demand plan and distribution plan.

•After checking the DIC Provincial shall be notified to Customs officers at the border checkpoint??

I. Current status of Chemical Management (Cont.)

The condition for transit hazardous chemical type II, III, IV and Other general chemicals

The transit chemical type II, III, IV and other general chemicals shall meet the following the condition:

1. Shall be legal entity that received an enterprise registration certificate and chemical business license;
2. Ensuring the sufficient techniques, container and equipment;
3. Has an appropriate accident Prevention and Resolving Plan;
4. Has an transportation insurance;
5. Has export license from origin country and import license from destination country
6. Shall be permitted by the department of Industry and Handicraft;
7. Use of standard transportation vehicle.
8. Import and export through the international border checkpoint.

I. Current status of Chemical Management(Cont.)

Application for transit hazardous chemical type II, III, IV and Other general chemicals

To transit hazardous chemical type II, III, IV and other general chemicals shall submit an application to the DIH for issuance import or export license. The application shall consist of:

1) The proposal for transit chemical;
2) Copy export license from origin country;
3) Copy import license from destination country;
4) accident Prevention and Resolving Plan;
5) Material safety data sheet in Lao or English;
6) Copy transportation license;
7) Copy transportation insurance.

I. Current status of Chemical Management (Cont.)

Timing for …?consideration and approval

• After received the completed application and supporting documents the DIH shall consider issuance of transit license in 15 working days from the date of the receipt of the application.

• If the application and supporting documents are inaccurate or incomplete, the IH authority shall notify the applicant in writing within 5 working days from the date of the receipt of the application for resolving.

• In case of an application is rejected, the IH authority shall notify the reason for the rejection in writing to the applicant within 5 working days from the date of the receipt of the application.

II. Current status of Industrial waste Management (Cont.)

Industrial waste type

Industrial waste can be divided into 2 type as follows:

1. Hazardous waste
- Chemicals waste and chemical container
- Radioactive waste
- Sludge contaminated with chemicals

2. Non hazardous waste

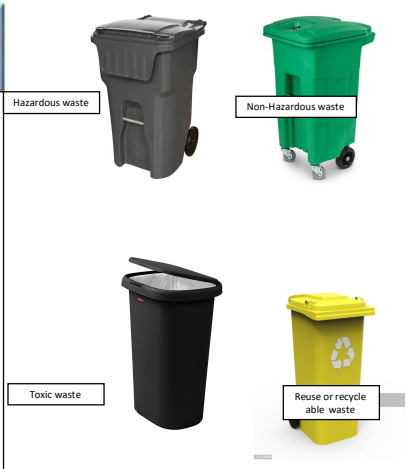
General waste generated in factory, office, dormitory and other.

II. Current status of Industrial waste Management (Cont.)

Trash bins

The factories shall be separating the type of wastes, containing in special trash bins as follows:

- Grey bin for hazardous waste
- Black bin for toxic waste
- Green bin for non-hazardous waste or general waste
- Yellow bin for reuse and recycle able waste



II. Current status of Industrial waste Management(Cont.)

Waste storage

The wastes shall be stored in compliance with the safety measures, for instance wastes shall be kept specific warehouse in accordance to the technical standard as follows:

- Separated type of waste
- Containing in special containers
- Warehouse shall be flooring and walling with cement
- Warehouse shall be roofing
- And prepared for emergency case

II. Current status of Industrial waste Management (Cont.)

Treatment and Disposal of Industrial Waste and Chemical Waste

- Non-hazardous waste generated from factory can be disposal as household waste in the land field.
- The hazardous waste generated from factory can be kept for no longer than 90 days from the date that the waste has been generated and shall be notified to the Industry and Commerce Sector.

III. Challenges

Chemicals Management

1) Law and regulations enforcement is not efficient particularly registration, import, export, and transit of chemicals still not centralized as defined in the law on chemicals management;
2) development of sub-laws on chemical management has been delayed (the regulations related to chemicals storage, label and labelling, transportation, laboratory standard are under drafting process);
3) Limited budget for chemicals activities such as development of sub-laws, disseminate of laws and regulations, conduct chemicals inventory, capacity building and etc.
4) limited laboratory and testing equipment to identify the chemicals;
5) There is no chemical data base
6) Low awareness on chemicals safety management.
7) Limited chemist staffs and less experiences

III. Challenges

Industrial waste Management

1) Law and regulations enforcement is not efficient, some factories still not separate wastes appropriately, and there is no specific warehouse for storing waste;
2) Illegal dumping and improperly treatment and disposal;
3) There are no specific facility ~~land field~~ for hazardous waste;
4) Limited budget for industrial waste management activities such as awareness raising, capacity building, disseminate of laws and regulations and etc.
5) Low awareness on waste management.

IV. Assistant needed

1) Lesson learn and information sharing on chemicals and waste management among Asian countries and Japan;

2) Long term and short term expertise support for chemicals and waste management particularly policy, strategy, action plan and regulations development;

3) Capacity building on chemicals and waste management such as training, seminar, education and equipment.

4) Budget and expert for conducting chemicals inventory.

5) Budget and technical support on hazardous land field development

Thank You
For your attention

Lao People's Democratic Republic

Solid and Hazardous Waste Management by MONRE

(Meeting for Draft Report on Data Collection Survey on SWM Sector in Laos)

Presented by Thevarack PHONEKEO
Department of Pollution Control and Monitoring (DPCM)
Ministry of Natural Resources and Environment (MONRE)

Online Meeting, Vientiane Capital
January 26, 2021

Contents

1. Current Situation of S&H Waste Management

1.1 MSW Management

Classifications	Source	Collection	Carry-in facilities
General waste	Household, business, other	VCOM or UDAA &Private company	Landfill, 3R
Hazardous waste	Household, business, other	VCOM or UDAA &Private company	Landfill, 3R
Health-care waste	Hospital and clinics	VCOM or UDAA &Private company	Incinerator, Landfill, 3R

1. Collected the MSW in the household, shops, markets, offices, and other (Separated at generation source such as plastic, metal, paper.);
2. Collect and transport to transfer station/disposal in the landfill, there are waste pickers in the dump area for separating solid waste such as plastic, metal, paper, other;
3. There is operating the soil covering occasionally.

1. Current Situation of S&H Waste Management (Con..)

Lao PDR consist of 17 provinces and one city (Vientiane Capital), The situation of solid waste management in Lao PDR:

- In 2018 there were 130 landfill site (Open dump) of 148 Districts in Laos;
- The total of landfill areas is 709,17 ha, the areas has been used amounts 267,3 ha;
- The total of solid waste amounts was disposed in landfill about 1,216.33 t/d

Fig.1 Illustrations of the landfill (open dump) in some provinces of Laos

1. Current Situation of S&H Waste Management (Con..)

Waste generation and composition

The waste generation rate in Lao PDR is rapidly increasing, especially in the larger cities, as shown in the Table 1. From 2000 to 2015 the waste generation in the major cities has increased by 40-60% (MoNRE, 2017). With economic development and changes in consumption patterns, under a business as usual scenario, waste generation in Lao PDR is expected to reach 0.18 kg/capita/day in 2030 and 0.22 kg/capita/day in 2050 (WB, 2018).

Table 1 Summary of waste generation in major cities in the period 2000-2015

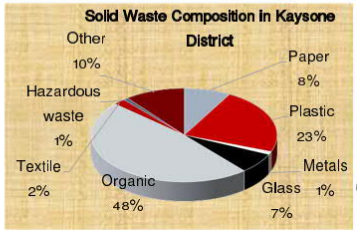
Cities	Waste generation in the years of			
	2000 (ton)	2005 (ton)	2010 (ton)	2015 (ton)
Vientiane Capital (9 District)	141,876	165,676	193,608	214,905
Kaisone/Savannakhet	24,134	26,789	35,978	39,575
Thakek/Khammouan	17,945	19,919	21,145	26,593
Luangprabang	16,934	18,628	21,752	23,927
Xayabury	16,075	17,247	20,742	22,919
Pakse	16,967	18,664	21,794	23,974

Source: Vientiane UDAA, Provincial UADAA, Statistic Department, LPP- 2017

1. Current Situation of S&H Waste Management (Con..)

Waste generation and composition

- Vientiane Capital has the land area of 3,920 km^2, is including 09 districts. In 2018, Vientiane has 481 villages, 168,922 households, and the population of approximately 819,466 people;
- Amount of wastes in Vientiane Capital are generated approximately 650 tons per day, the generation rate is 0.75 kg/person/day;
- Only half of the municipal wastes are collected and disposed in the 32 km landfill. The wastes collected and disposed in the 32 km landfill has been increasing significantly, from 40,471 tons in 2007 to 127,076 tons in 2018.
- In turn of hazardous waste in households, such as battery, electrical and electronic wastes is not separated at generation source and combined with municipal solid waste and disposed in the 32 landfills.



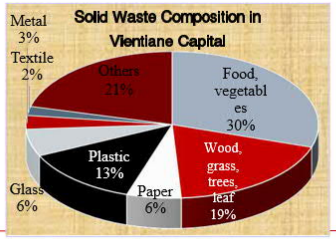


Chart 1. Waste composition in two cities

1. Current Situation of S&H Waste Management (Con..)

Waste generation and composition

Year	T/d	T/y
2016	329	120 085
2017	373	136 145
2018	422	154 030
2019	477	174 105
2020	536	195 640
2021	568	207 320
2022	602	219 730
2023	649	236 885
2024	700	255 500
2025	753	274 845
2026	809	295 285
2027	870	317 550
2028	933	340 545
2029	1 000	365 000
2030	1 073	390 915

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1. Current Situation of S&H Waste Management (Con..)

Waste generation and composition

Fig.2 Illustration of solid waste discharge areas of the landfill site , 2019.

Fig.3 Illustrations of the wetlands or big pond for receiving the leachate of the landfill site, 2019.

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1.2 Current Situation of plastic waste

Land-based surveys

Import and production of plastic packaging and products

Product category	Plastic content estimate	Estimate of import in 2018 (tons)
Animal & Animal Products	5%	4,270
Vegetable Products	5%	9,447
Foodstuffs	5%	31,462
Plastics / Rubbers	100%	127,590
Total		172,769

Product category	Export	Import
Plastic pellets (granules)	18,302	11,672
Plastic bags	18,409	-
Rubber products	-	153,827
Other products (e.g. PVC tubes, construction material)	89,660	4,764
Total	126,372	170,263

- Main Market: Thailand, China and Vietnam
- Japan and Europe increasing
- Limited domestic production

Source: World Bank, 2020

1.2 Current Situation of plastic waste (con..)

Land-based surveys

Import and export of plastic waste and secondary materials

tons	2015	2016	2017	2018	2019	Source
Import of plastic waste	-	-	3,909	7,881	9,605	UN Comtrade
Export of plastic waste	862	1,919	1,353	822	1,833	
Import of secondary raw plastic materials	5,092	1,064	1,543	3,366	18,361	Raw data from Department of Custom at Ministry of Finance.
Export of secondary raw plastic materials	4,537	4,585	4,903	1,797	130	Data summarised by department of import and export at Ministry of Industry and Commerce

Product category	Export	Import
Plastic pellets (granules)	18,302	11,672
Plastic bags	18,409	-
Rubber products	-	153,827
Other products (e.g. PVC tubes, construction material)	89,660	4,764
Total	126,372	170,263

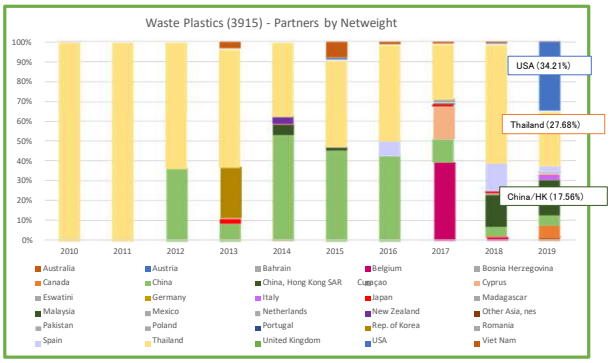
- Increase 2017-2019
- Origin of imported plastic waste: Awaiting data

There are at least 17 production facilities in Lao LPR with a production capacity of approximately 51,000 tons based on interviews

Source: World Bank, 2020

1.2 Current Situation of plastic waste (con..)

Waste, parings and scrap, of plastics



Source (both graphs): UN Comtrade (data retrieved on 2020/07/21)
Trade flow: Import, Reporter: Lao People's Dem. Rep., Partner: All

1.3 Responsible for S&H waste management

Role and Responsibility by MONRE

Ministry	Role and Responsibility
MONRE	- Establish regulatory framework; - Develop and implement strategies, policies and guidelines; - Manage plastic waste; - National focal point of Basel Convention; - 3Rs promotion and pilot project implementation.

1.4 Legislation on S&H waste management

- Environmental Protection Law (No. 29/MONRE, 2012);
- Law on Hygiene, Disease Prevention and Health Promotion (No. 01/NA, 2001);
- Decree on Waste Mag't from Healthcare Facilities (No. 1706/MOH, 2004);
- Decision on the Waste Management for Industrial Processing and Handicraft (No.0555/MOIC, 2012);
- Decision on Disposal Site Management (No 521/TCPC, dated 23 Feb 2007);
- Decision on Health-Care Waste Management (No 1373/MOH) 23 November 2017;
- Decree on Pesticide Management (No 258/GOV), 2017;
- Industrial Waste Discharge Regulation (No. 180/MOIC, 1994);
- Ministerial Instruction on Plastic Waste Processing Factory (No.0682/MOIC, 2020);
- Decision on PCB Management (No. 5927/MONRE, 2020)
- Ministerial Instruction on Hazardous Waste Mag't (No. 0744/MONRE, 2015);
- Guidelines for Environmentally Sustainable Cities of Lao PDR;
- Guidelines on Solid Waste Management (No. 0233/MONRE, 2020.

2. Challenges for S&H Management

Areas of work to be carried out to overcome S&H waste management challenges are legislation, capacity building, and awareness raising.

There are currently difficult challenges of the S&H waste management sector as below:

1. Inadequate legal framework and unclear institutional responsibilities;
2. Lack of the facilities and infrastructure for S&H waste management such as sanitary landfill, treatment facilities, collect-transport service;
3. A considerable amount of S&H waste is illegally dumped to the land, drainage channels, and rivers;
4. Public education system and participation programs are not effective yet;
5. Lack of specific the research and education of S&H waste impact.

3. A way forward for S&H Waste Management of DPCM

Short-term

- Promote the 3Rs principle to central and local levels;
- Increasing awareness on S&H waste management in household, community to the public, private sector, and local people;
- Monitor, motivate, guide, and strengthen the natural resources and environment sectors of provinces and districts for collection, evaluation, and analyzing of S&H waste management data as well as writing report in order to submit to center level.

Long-term

- Develop the strategy on waste management;
- Develop the decree on waste management according to the Environmental Protection Law;
- Develop the specific regulations for S&H wastes management of community by participation from ownership of local people, communities, public, and private sectors;
- Promote the 3Rs principle to central, local, and private sectors levels;
- Monitor and support for activities implementation of S&H waste management in community, public and private.

4. Technical Demands of S&H Waste Management

Technical Assistance Requirement:

The technical assistance required to take projects forward are as follows:

- Development of the national strategy for waste management;
- Issuance of the law/decree on waste management;
- Development of the regulation on S&H waste management;
- Development of economic instrument for S&H waste management;
- Development of action plan for S&H waste management;
- Determination of a potential pilot project for S&H waste recycling;
- Development of the facilities and infrastructure for S&H waste management.

Thank you for your time
and attention !