FY2023 Commissioned Project

FY2023
City-to-City Collaboration for Zero-Carbon Society (Promotion of Eco-Industrial Parks Toward Carbon Neutrality in Hai Phong City, Vietnam) Commissioned Report

March 2024

Institute for Global Environmental Strategies

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1. Purpose and Outline of the Project

1.1. Purpose

This study aims to establish a zero-emission industrial park to reduce GHG emissions, mitigate environmental impacts and promote resource recycling through city-to-city collaboration between Hai Phong, a centrally-controlled city (along with Hanoi and Ho Chi Minh) that is the largest port city in northern Vietnam, and Hai Phong's sister city of Kitakyushu in Japan, by promoting the concept of an Eco-Industrial Park (a certification system promoted by UNIDO and the Ministry of Planning and Investment of Vietnam).[1]

1.2. Outline

Specifically, this project aims to transfer Kitakyushu's expertise in the fields of renewable energy and eco-towns to Hai Phong. Home to one of the largest eco-towns in Japan, Kitakyushu declared its aspirations of creating a decarbonised society by 2050 with an expressed commitment to becoming a Zero-Carbon City in 2020. In this project, feasibility studies are conducted on exceptional decarbonisation and low-carbon technologies, such as energy efficiency, renewable energy, energy recovery from waste, smart energy and other areas, to achieve both decarbonisation and advanced resource recycling systems through the formation of actual projects (Fig. 1.2.1).

In this final year of the project proposed and adopted as a three-year plan in fiscal 2021, the outcomes of both new surveys and those from the past two years were compiled.

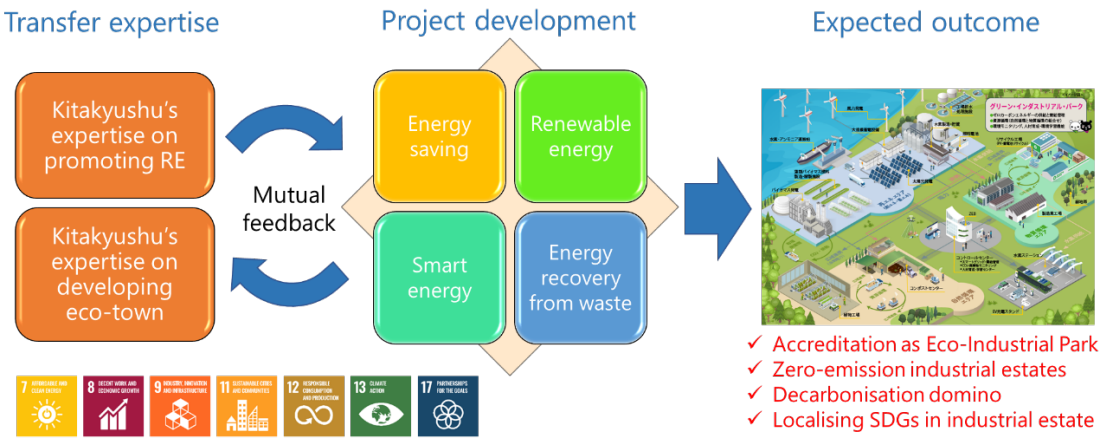


Fig. 1.2.1. Project concept (Source: prepared by the survey team)

1.3. Background

1.3.1. Relevant trends in Vietnam

Vietnam has continued to enjoy high, stable economic growth, recording real GDP growth rates in the 5% to 7% range every year from 2010 to 2019.[2] GDP growth in 2020 and 2021 remained in the 2% range due to the global spread of the novel coronavirus, but real GDP growth reached 8.0% in 2022.

In 2020 and 2021, GDP growth remained in the 2% range due to the ongoing global impacts of COVID-19. However, since the latter half of 2022, the Vietnamese economy has grown at a slower pace due to a slowdown in exports caused by sluggish external demand and a downturn in the real

[1] UNIDO, "Eco-industrial parks": https://www.unido.org/our-focus-safeguarding-environment-resource-efficient-and-low-carbon-industrial-production/eco-industrial-parks

[2] JETRO, "GDP Growth to be 7.0% in 2019, High Growth Following Previous Year (Vietnam)" (14 January 2020): https://www.jetro.go.jp/biznews/2020/01/85734062c3577ea8.html

estate industry, as well as concerns about power shortage problems and the political situation.[3] Among ASEAN nations, Vietnam is particularly dependent on export demand, meaning that impacts from a slump in this area are significant

Prime Minister Pham Minh Chinh declared Vietnam's intention to achieve net zero greenhouse gas emissions (carbon neutrality) by 2050 at the 26th Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (Glasgow, UK, November 1, 2021). This declaration served as the basis for revisions to the National Strategy for Climate Change for 2050 (Decision No. 896/2022/QD-TTg) in July 2022. Furthermore, Vietnam also revised its Nationally Determined Contributions (NDC) under the Paris Agreement in October 2022. The aim of achieving carbon neutrality by 2050 was included in both cases, with significantly higher greenhouse gas reduction targets through 2030 (Table 1.3.1.1).

Table 1.3.1.1. Comparison between the Vietnamese government's 2020 and 2022 revisions to its 2030 GHG reduction targets in the Nationally Determined Contributions (NDC) under the Paris Agreement (unit: %, 1 million tonnes CO2eq)
(Source: prepared by the survey team based on the revised Vietnam NDC)

Item	Domestic efforts only		Inclusion of international aid	
	Reduction rate (%)	Reduction (Mt CO2eq)	Reduction rate (%)	Reduction (Mt CO2eq)
NDC (September 2015)	8	62.7	25	198.2
Revised NDC (July 2020)	9	83.9	27	250.8
Revised NDC (October 2022)	15.8	146.3	43.5	403.7

In May 2023, the Vietnamese government promulgated the Eighth National Power Development Plan (PDP8), which provides guidelines for electricity development from 2021 to 2030. PDP8 set a target of 150,489 MW of installed power generation capacity by 2030. This is 1.9 times greater than the installed capacity of 80,704 MW in 2022.[4]

A breakdown of changes to Vietnam's power source mix in the PDP8 shows that coal-fired power, which accounted for 32.3% in 2022, will be reduced to 20.0% in 2030 by promoting a shift to co-firing with biomass and ammonia. The plan calls for the elimination of new coal-fired power plants after 2030 and the cessation of coal use by 2050. On the other hand, by 2030, the country expects to see a significant increase in hydropower (31,746 MW capacity) as well as liquefied natural gas (LNG) (22,400 MW capacity) and wind power (27,880 MW capacity). Although the capacity for photovoltaic (PV) power to be developed in 2030 will be lower than that in 2020 and 2022, the government plans to promote self-consumption, aiming to install roof-top solar power in 50% of office buildings and residences by 2030 (Figure 1.3.1.1). [4] Thus, Vietnam is moving toward a power supply configuration that curbs CO2 emissions in anticipation of further increases in electricity demand in the future.

[3] Institute for International Monetary Affairs, "Vietnam's Economic Situation and Outlook" (2 October 2023): https://www.iima.or.jp/docs/newsletter/2023/nl2023.33.pdf

[4] JETRO, "Delayed Electricity Development, Struggling to Balance Decarbonization and Power Security (Vietnam)" (5 December 2023): https://www.jetro.go.jp/biz/areareports/2023/a6d8b3ec17697194.html

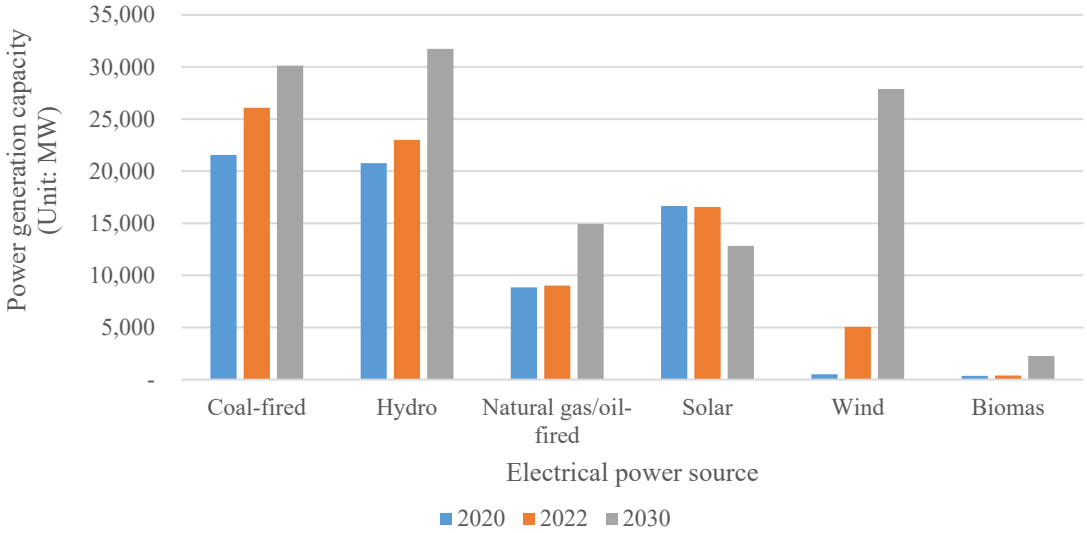


Figure 1.3.1.1. Electricity generation installed capacity in Vietnam by power source (2020 and 2022) and development plan for 2030
(Source: Prepared by the survey team based on JETRO, 2022[4])

1.3.2. Changes in collaboration on decarbonization between the governments of Japan and Vietnam

The Ministry of Environment of Japan (MOEJ) and the Ministry of Natural Resources and Environment of Vietnam (MONRE) have held regular policy dialogues since signing the "Memorandum of Understanding on Environmental Cooperation between MOEJ and MONRE" in 2013 to promote comprehensive environmental cooperation. The MOU signed in 2013 was renewed at the 8th Japan-Vietnam Environmental Policy Dialogue held on 12 January 2024, where the two countries reiterated their continued commitment to cooperation on climate change mitigation measures through the JCM and the Paris Agreement Article 6 Implementation Partnership. Progress and future areas of cooperation toward the realisation of carbon neutrality in Vietnam by 2050, including environmental cooperation between Japanese and Vietnamese cities, human resources development for the formulation of long-term strategies formulation, and guidelines for transparency in various sectors, were discussed at the Third Joint Working Group Meeting under the Japan-Vietnam Joint Cooperation Plan toward Carbon Neutrality in 2050, held in conjunction with the bilateral policy dialogue. [5]

The Ministry of Economy, Trade and Industry of Japan (METI) and the Ministry of Planning and Investment of Vietnam (MPI) agreed on 26 July 2023 to launch the AZEC/GX Promotion Working Team[6] as a framework for both countries to discuss green growth and energy transition in Vietnam through a public-private partnership.[7] On 3 November 2023, METI and the Ministry of Industry and Trade of Vietnam (MOIT) held the 6th Japan-Vietnam Committee on Industry, Trade and Energy Cooperation, which included a joint statement recognising the importance of decarbonising industries at the supply chain and industrial park level and joint support for industry actions in the move toward carbon neutrality.[8]

[5] Ministry of the Environment, "Results of the 8th Japan-Vietnam Environmental Policy Dialogue and the 3rd Joint Working Group Meeting under the Japan-Vietnam Joint Cooperation Plan toward Carbon Neutrality in 2050 and the Completion Ceremony of Waste Power Generation in Bac Ninh Province" (23 January 2024): https://www.env.go.jp/press/press_02637.html

[6] AZEC: Asian Zero Emission Community (https://asiazeroemission.com/); GX: Green Transformation

[7] Ministry of Economy, Trade and Industry, "Vietnam Agrees to Launch AZEC/GX Promotion Working Team" (26 July 2023): https://www.meti.go.jp/press/2023/07/20230726001/20230726001.html

[8] Ministry of Economy, Trade and Industry, "Joint Ministerial Statement for the 6th Japan-Vietnam Industry, Trade and Energy Cooperation Committee Meeting between the Ministry of Commerce and Industry of Vietnam and the Ministry of Economy, Trade and Industry of Japan" (tentative translation): https://www.meti.go.jp/press/2023/11/20231103003/20231103003-b.pdf

Thus, decarbonisation in the industrial sector, with a focus on linkages between cities and industrial parks in Vietnam and Japan, has been recognised as an important issue by the governments of the two countries.

1.3.3. Economic and decarbonisation trends in Hai Phong City

Hai Phong is the third largest city in Vietnam after Ho Chi Minh City and Hanoi City, and as the largest port city in northern Vietnam, it is one of the country's most important industrial centres. Hai Phong's gross regional domestic product (GRDP) grew an average of 15.26% for the five years in 2017-2021, 2.9 times the national average.[9] Hai Phong's GRDP growth rate in 2021 was lower than that between 2017 and 2019 due to the impact of COVID-19 but remained at Vietnam's top rate of 12.38%.[10] The city continues to maintain one of the highest economic growth rates in the country, with a GRDP growth rate of 10.34% in 2023, placing it fifth among the nation's municipalities.

In December 2023, the "Hai Phong City Urban Plan from 2021 to 2030, Vision to 2050" was approved by Prime Minister Decision No. 1516/QĐ-TTg.[11] The decision estimates that by 2030, Hai Phong's GRDP contribution to the national economy will reach about 6.8%, and the average economic growth rate of GRDP from 2021 to 2030 will be about 13.5% annually. Thus, Hai Phong City is expected to play a leading role in driving the economic development of the northern region and the country as a whole.

Hai Phong People's Committee issued the "Implementation Plan of the National Strategy on Climate Change for 2050 in Hai Phong City (No. 222/KH-UBND)" in September 2022, which is being implemented by relevant departments.

1.3.4. Background of city-to-city collaboration between Kitakyushu and Hai Phong

Since signing a friendship and cooperation agreement in 2009, Kitakyushu and Hai Phong have engaged in technical (mainly in the field of water supply and sewerage), cultural, and economic exchange. The two cities also signed a sister city agreement in 2014 and have engaged in a comprehensive set of exchanges, both traditional and new, in the water supply and sewerage sectors, as well as in the waste and low-carbon technology fields. This collaborative relationship has matured over the past 15 years into a solid partnership.

Selected to take part in a city-to-city collaboration programme over six years from 2014 to 2019, Kitakyushu and Hai Phong have engaged in institutional building and conducted project formation studies. Notably, the two cities formulated the "Hai Phong City Green Growth Promotion Plan" in fiscal 2014, the first year of the project. Out of the 15 pilot projects identified in the plan, project formation studies have been conducted since fiscal 2015 in the energy and waste sectors and on conservation on Cat Ba Island, including the implementation of a project identified through the city-to-city collaboration programme. As one specific example, a study was conducted on the feasibility of introducing an EV bus on Cut Ba Island, and based on the study results, a demonstration test was conducted in FY2017 using the "Low-carbon Technology Innovation for Further Deployment in Developing Countries" (FY 2017) (Figure 1.3.4.1).

Besides the city-to-city collaboration programme, in the field of waste treatment, experts were dispatched to provide technical guidance on improvements to the composting facility at the Trang Cat Landfill owned by URENCO Hai Phong, which succeeded in increasing throughput to 100 t/d (as of July 2023) and selling all the compost produced to fertiliser companies (Figure 1.3.4.1). In the water and wastewater field, the Kitakyushu City Water and Sewerage Bureau has introduced an up-flow biological contact filtration (U-BCF) system in two water treatment plants in Hai Phong, which was originally researched and developed by the Bureau, in 2013 (Vinh Bao Water Treatment Plant;

[9] Vietnam Briefing "Vietnam's Hai Phong: An Industrial Gateway and Port City" (8 July 2022): https://www.vietnam-briefing.com/news/vietnams-hai-phong-industrial-gateway-and-port-city.html/

[10] VnEconomy "Hai Phong attracts $3.4bln in FDI in 2023" (30 December 2023): https://en.vneconomy.vn/hai-phong-attracts-3-4bln-in-fdi-in-2023.htm

[11] Prime Minister's Decision No. 1516/QĐ-TTg "Hai Phong City Urban Plan from 2021 to 2030, Vision to 2050": https://vanban.chinhphu.vn/?pageid=27160&docid=209078

treatment capacity of 5,000 m3/day; Hai Phong municipal budget) and 2022 (An Duong Water Treatment Plant; treatment capacity of 100,000 m3/day; Japanese ODA) (Figure 1.3.4.1).

Since fiscal 2021, the two cities have concentrated on the development of low-carbon scenarios based on the Asia-Pacific Integrated Model (AIM) with support from the Ministry of the Environment of Japan, with updates to the scenario reflecting Hai Phong's aim to achieve decarbonisation by 2050. The results of the analysis will be submitted to the Hai Phong People's Committee and be reflected in the next update of the Hai Phong Climate Change Action Plan (CCAP) in 2025.

Figure 1.3.4.1: EV bus for a demonstration test in Cat Ba Island (left), composting facility at Trang Cat landfill site (middle), and U-BCF facility at An Duong Water Treatment Plant[12] (right)
(Source: Kitakyushu City)

The promotion of eco-industrial parks addressed in this study is a new way for these two industrial cities to work together to create a decarbonised society while building on previous efforts to implement the 15 pilot projects in the 2014 Green Growth Promotion Plan.

1.3.5. Outcomes of the fiscal 2022 survey and plans for the fiscal 2023 survey

The fiscal 2022 survey investigated the feasibility of introducing systems and facilities that contribute to reducing CO2 emissions and promoting resource recycling in industrial estates (including some initiatives outside of industrial estates) in four major areas. This survey continued in fiscal 2023, eliminating less-feasible options and adding new elements (Table 1.3.5.1).

[12] Source: Kitakyushu City Water and Sewer Bureau: https://kitaq-water-intl.jp/2021interview/

Table 1.3.5.1. Table 1.3.5.1. Survey items, overview, results, and issues identified in fiscal 2022, and implementation plans for conducting surveys in fiscal 2023
(Source: prepared by the survey team)

Survey results for fiscal 2022 survey			Implementation plans for fiscal 2023
Survey items	Overview	Survey results and Issues	
1. Survey on the introduction of solar power	Installation of solar power and regenerative batteries on Cat Ba Island	A field survey was conducted on Cat Ba Island, including interviews with relevant agencies. Needs for the introduction of a small-scale stand-alone power supply unit were identified.	One small-scale stand-alone power unit will be installed and monitored on Cat Ba Island on a trial basis.
	Installation of solar power systems in cooperation with Japanese tenant companies	The two industrial parks that were interviewed had received numerous investment inquiries for roof-top solar power systems. No needs were identified that could be addressed under a JCM Model Project.	This study will be discontinued.
	Large-scale solar power generation project at landfill site	Din Vu landfill was selected as a candidate site for a waste-to-energy project. Since the landfill has not yet reached capacity, landfilling is expected to continue for the foreseeable future, and therefore, the solar power generation project will not be carried out.	This study will be discontinued.
			The survey in fiscal 2023 will investigate the need to store power from existing wind power facilities, an issue identified in the fiscal 2022 survey.
2. Survey on the utilisation of liquid and solid waste energy	Use of energy from waste liquid	Although there was considerable interest in the conversion of liquid waste to fuel, the survey was unable to ascertain available resources and actual treatment status.	The survey in fiscal 2023 will continue to investigate available resources and the actual treatment status of liquid waste.
		EPR for waste lubricating oil will start in January 2024, but more clarity is needed on some legal issues.	An in-depth study will be conducted to examine the feasibility of commercialisation in response to the lubricant EPR.
	Use of energy from solid waste	Although there was considerable interest and a need to convert solid waste into raw cement fuel, the fiscal 2022 survey found that two cement plants in Hai Phong City have not been granted	This study will be discontinued to focus on the lubricant EPR.

		permission to co-fire waste due to their proximity to heritage parks.	
3. Survey on the introduction of energy-saving and high-efficiency equipment	Large blower and inverter	Designs for installed equipment were modified after measurements were taken, and the potential for reducing GHG emissions was recalculated.	The fiscal 2023 survey will focus on plans to apply for the JCM Model Project.
	Installation of energy-saving equipment for large energy-consuming companies	A proposal was made to upgrade the dust collector and inverter control system in a foundry with an electric furnace, but the recommendations did not meet their needs.	This study will be discontinued.
4. Promotion of eco-industrial parks to achieve carbon neutrality in Hai Phong City	Support for the development of a Green Growth Action Plan for Hai Phong City	Consultations were held with the Hai Phong Department of Planning and Investment (DPI), and relevant policy documents from Kitakyushu were shared for reference.	This survey is complete.
	Survey on DX issues and needs and sharing know-how	Interviews on DX identified a need for a monitoring system with a stand-alone power supply unit for wide-area monitoring of the industrial park and Lan Ha Bay.	Following the installation of a small-scale stand-alone power supply unit on Cat Ba Island, the feasibility of installing an off-grid monitoring system will be studied.
	Identification of specific projects in collaboration with the AIM scenario analysis and JPRSI	Feedback was provided on considerations in the project as a reference for using AIM in the development of 2050 decarbonisation scenarios. An online seminar was also held in collaboration with the JPRSI secretariat.	The fiscal 2023 survey will continue to identify specific projects in cooperation with the AIM scenario analysis work and JPRSI.

1.4. Methodology

1.4.1. Implementation structure

The representative proponent of this study (IGES) was responsible for the overall coordination of the entire project and providing support for each survey under the coordination of the representative offices of both cities (Hai Phong Department of Foreign Affairs and the International Environmental Strategies Division, Environment Bureau of Kitakyushu). Depending on the theme of each survey, teams included the participation of appropriate companies and organisations in both Japan and Vietnam (Figure 1.4.1.1).

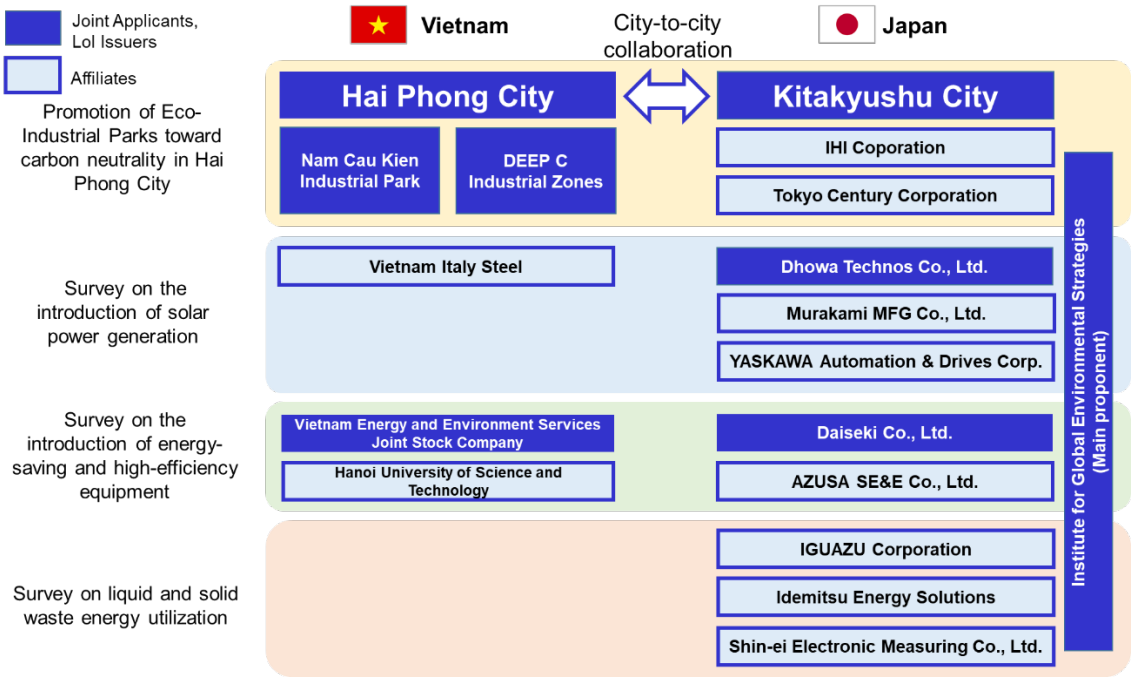


Figure 1.4.1.1. Project implementation structure (Source: prepared by the survey team)

1.4.2. Survey methods and timeline

Teams were formed for each research theme to conduct field surveys. During the field surveys, Hai Phong City and other related organisations assisted in setting up appointments with local companies and organisations, and information was collected through interviews and site visits. In parallel with the field survey, the teams conducted literature surveys, exchanged information through online meetings and email, and evaluated, reviewed and compiled survey results.

These results were reported and discussed at a workshop with local stakeholders in Hai Phong held on 28 November 2023 (see “3.1. Stakeholder workshop”), which included the participation of related departments in Hai Phong City and other organisations that cooperated in the survey.

Table 1.4.2.1 shows the timeline for the 2023 survey.

Table 1.4.2.1. Overall timetable (Gantt chart) of the study in FY2023
(Source: prepared by the survey team)

Implementation items	2023						2024		
	7	8	9	10	11	12	1	2	3
3-1. Renewable energy/storage battery introduction survey									
(1) Solar power generation and regenerated storage battery survey on Cat Ba Island.									
1) Coordination with related parties and procedures for exporting demo machines									
(2) Survey on introducing renewable energy in industrial parks									
1) Coordination with related parties									
3-2. Waste liquid/solid waste energy utilisation survey									
(1) Survey on converting waste liquid and solid waste into alternative materials and fuel for cement									
1) Field survey, information collection									
(2) Waste lubricating oil recycling survey									
1) Field survey									
2) Information gathering and follow-up									
3) Site visit to Japan									
3-3. Survey on introduction of energy-saving and high-efficiency equipment									
(1) Survey on introduction of high-efficiency blower and inverter									
1) Follow-up									
2) Preparation for JCM model project application									
(2) Discovery and investigation of new projects for energy-saving and high-efficiency equipment									
1) Field survey									
3-4. Know-how sharing and new project identification survey for decarbonisation in Hai Phong City									
(1) AIM scenario, project identification survey in collaboration with JPRSI									
1) Discussions regarding waste treatment with Hai Phong City									
2) Other new project identification survey									
4-5. Holding meetings, presentations, and writing reports									
(1) Monthly progress report									
(2) Progress report meeting with the Ministry of the Environment									
(3) Workshop with local stakeholders									
(4) Presentations at related meetings, coordination, etc.									
(5) Preparation of comissioned report									

2. Implementation of the study

2.1. Survey on the introduction of renewable energy and storage batteries

2.1.1. Survey on a solar PV and regenerative storage battery system on Cat Ba Island

2.1.1.1. Survey background and objectives

This study conducted last fiscal year investigated the feasibility of introducing a stand-alone power supply system for residents living in floating villages in Lan Ha Bay (off-grid areas) using solar PV power and regenerative storage batteries. A field survey in October 2022 provided insight into the local situation, and an agreement was reached to introduce a small-scale, stand-alone power supply unit (demonstration unit) equipped with used solar power modules and regenerated storage batteries on a trial basis following discussions with the Hai Phong City Department of Foreign Affairs (DOFA), Department of Natural Resources and Environment (DONRE), Cat Hai District People's Committee, and a local solar power generation installation company (Company A). In this year's survey, a demo unit will be transported and installed on-site for trial testing and monitoring.

2.1.1.2. Survey subjects and methods

The demo unit was developed with a simple design to keep initial costs low and to allow for flexibility in modifications depending on local conditions. The unit is equipped with a second-hand solar PV module (600 Wh), regenerated lead-acid battery (24V) and inverter (Figure 2.1.1.2). The unit was assembled in December 2022, and its operation was verified through test runs in Japan from January to February 2023.

Plans called for the demo unit to be installed in a floating village (off-grid area with no grid power supply) in the waters around Cat Ba Island (Lan Ha Bay) in Hai Phong City, subject to selection and approval by the Cat Hai District People's Committee. Under the plan, the demo unit would be put into operation for about six months to monitor the system's durability, convenience, and usage. Interviews with local stakeholders examined ways to promote and market the system, with particular focus on determining whether the system could be priced lower than the cost of grid electricity provided by Vietnam Electricity (EVN) through subscriptions (instalment sales), where equipment costs are recovered through monthly rental payments.

Figure 2.1.1.2. Small-scale, stand-alone power supply unit (Source: IGUAZU Corporation)

2.1.1.3. Survey results

While conducting the survey, the team contacted a Vietnamese customs agent to confirm and inquire about the procedures for exporting the demo unit to Vietnam. The equipment to be exported to Vietnam was to be sent to a solar PV installation company (Company A), with which discussions were held the

previous year. As part of the work to be outsourced to them through this study, the company would temporarily store, transport, and install the equipment on Cat Ba Island, and conduct a test run to check that it was operating properly.

Discussions with Hai Phong's Department of Foreign Affairs (DOFA) noted the need to conclude a memorandum of understanding (MOU) with the local company to clarify roles and responsibilities, so a draft MOU outlining specifications and responsibilities for the outsourced work was prepared in English and shared with DOFA and Company A. A concept note was also prepared to explain the plan to the Cat Hai District People's Committee for their approval, which was shared through DOFA. Cat Hai District People's Committee indicated that they could not grant permission for the installation of the demo unit in the floating village in Lan Ha Bay, but that the unit could be installed at a dispatch station on a small island in Lan Ha Bay.

Since Lan Ha Bay, which is dotted with aquaculture rafts, was included in the UNESCO World Heritage application area of the Ha Long Bay-Cat Ba Archipelago, all rafts located there will be relocated to one designated water area near the Cai Beo ferry terminal for environmental and landscape conservation reasons. One potential reason for the committee's reluctance to grant permission for the installation of the demo unit may be that they want to avoid any safety or negative environmental impacts in preparation for the archipelago's listing as a World Natural Heritage site, in addition to the fact that all the floating rafts on which the demo unit would be installed will be relocated to a grid area and will therefore no longer be off-grid.

No response was received from the Cat Hai People's Committee to requests for detailed information about the small island dispatch station where the installation was approved (in particular, electricity needs, how the unit may be utilised, and the number of personnel stationed there). With no other suitable alternative locations where the demo unit could be installed and tested, it was not advisable to export the unit, so plans were abandoned to export and install the equipment. Accordingly, two planned field visits to install and monitor the equipment were also cancelled. The chronology of the review and coordination process is summarised in Table 2.1.1.3.

Subsequently, the Ha Long Bay-Cat Ba Archipelago was approved for inclusion as a UNESCO World Natural Heritage site at the 45th session of the UNESCO World Heritage Committee (16 September 2023, in Saudi Arabia).[13] The stand-alone power supply unit was originally intended to be both an environmentally friendly option for the UNESCO World Natural Heritage site and a tourist attraction. Unfortunately, timing and other factors prevented this unit from being installed at this time.

[13] Ha Long Bay – Cat Ba Archipelago recognised as UNESCO World Heritage: https://vietnam.travel/things-to-do/ha-long-bay-cat-ba-archipelago-recognised-unesco%E2%80%99s-world-natural-heritage

Table 2.1.1.3.1. Background of considerations on the introduction and installation of a small-scale, stand-alone power supply unit (demo unit)
(Source: prepared by the survey team)

Date	Activities
October 2022	Field survey Explanation to Cat Hai District People's Committee and DOFA Meeting with solar PV installation company (Company A)
December 2022	Development of demo unit
January 2023	Testing and verification of the unit's operation in Japan
February 2023	Direction from DOFA that an MOU should be concluded with a local partner
May 2023	Preparation of draft terms of reference, MOU, and concept note
June 2023	Sharing of the draft MOU and concept note with Cat Hai People's Committee via DOFA Inquiries about import/export procedures with customs agent
July 2023	Response from the Cat Hai People's Committee that the unit could be installed at a dispatch station (on one of the small islands) in the Cat Ba Archipelago
August 2023	The decision to discontinue the export and installation of the demo unit and travel to the site
September 2023	Approval of the addition of the Ha Long Bay-Cat Ba Archipelago to the World Natural Heritage list at UNESCO's 45th World Heritage Committee Meeting

The results from the original plan to conduct a demonstration test with the demo unit on Cat Ba Island were to be used to investigate and study other business models utilising lead-acid battery regeneration technology, such as a regeneration service for lead-acid batteries for mobile base stations in cooperation with telecom companies and for lead-acid batteries for electric forklifts (see commissioned report from fiscal 2022). However, the potential difficulty in gaining understanding from relevant companies on utilising lead-acid battery regeneration technology without the outcomes from the demonstration test on Cat Ba Island, which was the foundation of the project, posed an obstacle to the ability to continue to investigate and study other business models, and a decision was made to terminate this survey.

2.1.2. Survey on the introduction of renewable energy in industrial estates

2.1.2.1. Survey background and objectives

DEEP C Industrial Zones is the first industrial estate in Vietnam to install a large wind power facility (2.3 MW) on site. The facility has been in operation on a test basis, which has confirmed that the wind turbine is capable of generating a specific amount of electricity due to its location along the coastline and excellent wind conditions. However, factories in the industrial estate operate at lower rates at night when the wind is strong and power generation is high. Since there is a need to store electricity generated at night and discharge it during the day when many factories are in operation, DEEP C consulted with the team about appropriate energy storage solutions that could expand the size and capacity of the wind power facility in the future.

DEEP C is located next to VinFast, an automobile and motorcycle manufacturer under the Vinh Group, Vietnam's largest conglomerate. VinFast produces electric vehicles (EVs), and automotive battery packs (lithium-ion batteries) are also manufactured by a group company (VinES). Increasingly, these high-capacity battery packs for EVs are being used both in and outside of Vietnam, either as new or secondhand batteries, to store electricity generated by large-scale solar and wind power systems. Since large-scale lithium-ion batteries are generally expensive, the availability of new or inexpensive used battery packs manufactured by VinFast for energy storage in DEEP C would be an excellent example of collaboration between neighbouring industrial estates and would be beneficial to both parties, as it would provide opportunities to publicise their decarbonisation efforts.

DEEP C Green Energy, a power distribution company located in the industrial park, receives grid power from the state-run Electricity of Vietnam Corporation (EVN) and wind and solar power generation facilities in the park, which they then distribute to factories in the park. Therefore, power generated by wind power facilities at night could be stored in large-scale storage batteries and distributed to factories during the day via DEEP C Green Energy (Figure 2.1.2.1.1).

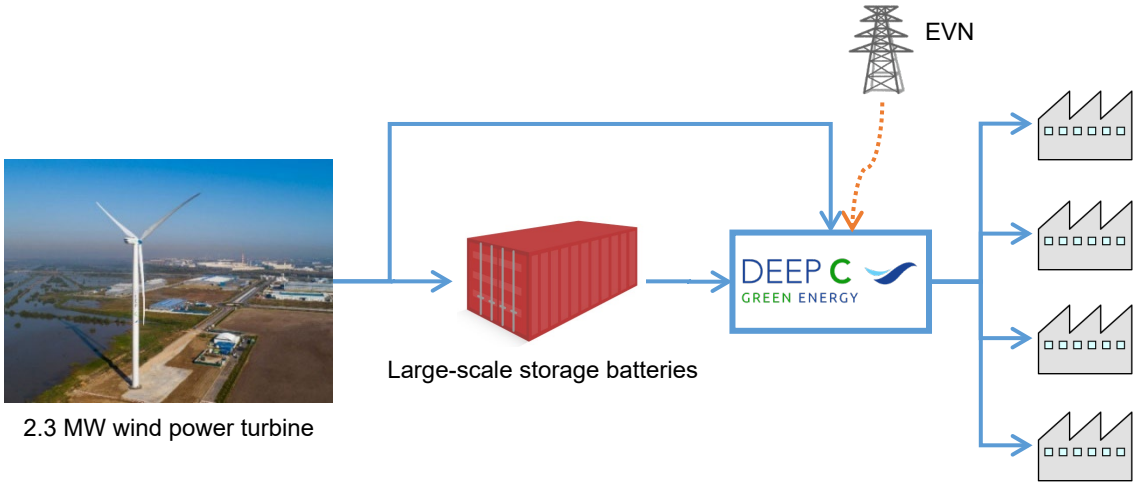


Figure 2.1.2.1.1. Conceptual diagram of the wind power and storage battery project at DEEP C Industrial Zones (Source: prepared by the survey team)

2.1.2.2. Survey subjects and methods

A concept note was prepared and meetings were held with DEEP C Industrial Zones and VinFast to discuss the feasibility of this project. Discussions were also held with other related companies.

2.1.2.3. Survey results

DEEP C Industrial Zones indicated in discussions that they would like to conduct demonstration tests first through subsidised projects as it would be premature to make a sudden capital investment.

In response to an inquiry to the Global Environment Centre (GEC) (through another company), the team determined that the requirements for a JCM Model Project would not be met because simply installing storage batteries in existing wind power generation facilities would not reduce CO2 emissions unless there was an actual operational situation where power generated at night had previously been discarded, or operations stopped because the power would be wasted. After checking these conditions with DEEP C Industrial Zones, the team confirmed that electricity generated at night can be consumed within the park and is not being wasted, so the decision was made to terminate the application for the JCM Model Project. The team also investigated the potential use of subsidies that could be used to install storage batteries in existing renewable energy facilities, other than the JCM Model Project, but was unable to identify other schemes that would be applicable in Vietnam. Therefore, the decision was made to suspend additional investigations on this project.

Energy storage solutions are becoming an essential part of the landscape. They are expected to be introduced in conjunction with energy management systems in the future as more wind power generation facilities are added and more roof-top solar PV power generation facilities are installed in the DEEP C Industrial Zones, and as demand for renewable energy and supply collide, making it impossible to consume the renewable energy produced. In addition, the development of solar power systems has outpaced the development of the power grid in the south-central region of Vietnam, where sunshine conditions are favourable, requiring output to be curtailed.[14] Therefore, the outcomes from this survey are expected to be utilised to meet the demand for storage of renewable electricity in the south-central region of the country. In particular, the use of battery packs produced domestically in Vietnam (by VinES), instead of ones imported from overseas, are expected to be more affordable.

[14] JEPIC, Electricity utilities in each country (Vietnam) 2023 (as of May 2023): https://www.jepic.or.jp/data/asia06vtnm.html

2.2. Survey on the energy use of liquid and solid wastes

2.2.1. Background and objectives

(1) Survey background

The Russian invasion of Ukraine that took place in April 2022 showed no signs of a ceasefire until now in February 2024. In addition, geopolitical instability is increasing in various regions, including the destabilisation of shipping in the Red Sea over the Houthis due to the clash between Hamas and Israel and conflicts over the abundant oil resources of Venezuela and Guyana in South America. As a result of these effects, energy prices, including coal and crude oil, have not returned to previous price levels, although they have calmed down from their peaks after spiking in 2022 (Figures 2.2.1.1 and 2.2.1.2).

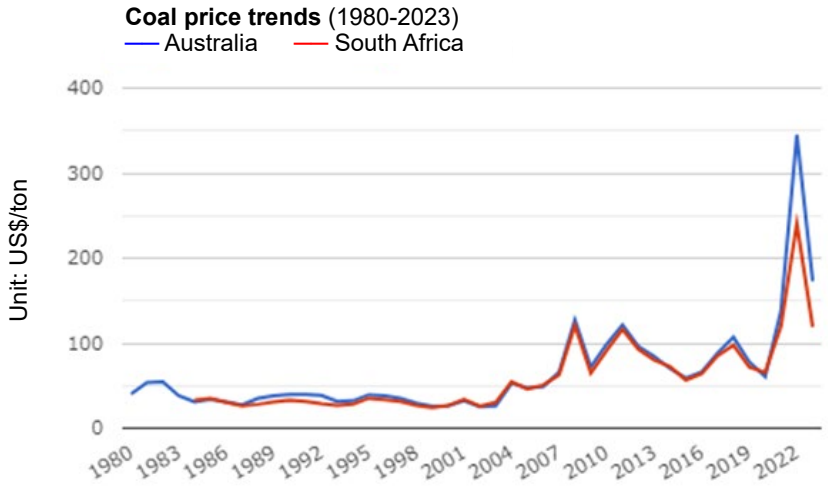


Figure 2.2.1.1 Coal price trends in Australia and South Africa
(Source: World Economic Netbook[15])

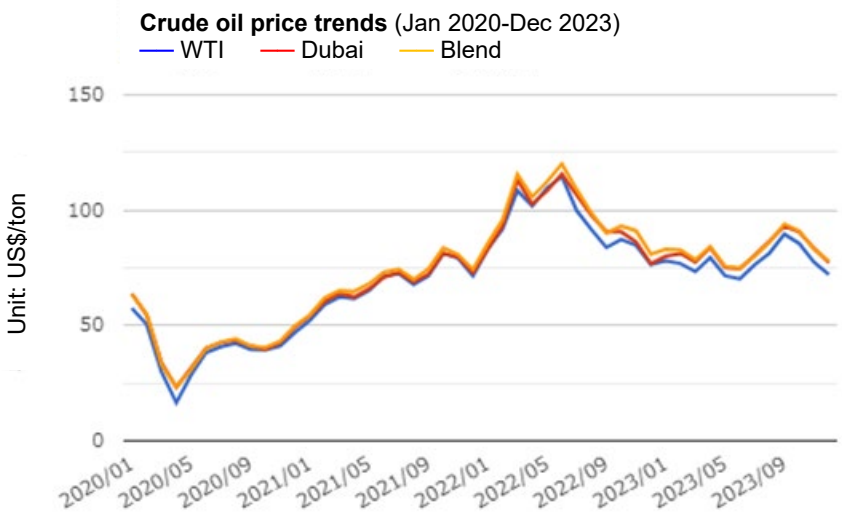


Figure 2.2.1.1 Crude oil price trends
(Source: World Economic Netbook[16])

[15] World Economic Netbook: https://ecodb.net/commodity/group_coal.html

[16] World Economic Netbook: https://ecodb.net/commodity/group_oil.html

This global situation has led to a growing interest in and demand for alternative fuels in Vietnam, which is experiencing remarkable economic development and strong energy demand, as confirmed through the previous (fiscal 2022) survey. In particular, solid wastes such as textile scraps and cutting scraps generated during footwear manufacturing, which are easy to use as alternative fuels, are being aggressively introduced by cement plants, which consume large amounts of coal, and a "war for waste" is unfolding. This situation has led to a growing interest in technologies for processing more difficult wastes into alternative fuels and in the introduction of facilities that can utilise such alternative fuels for combustion.

In this context, waste oil is a suitable material for alternative fuels because of its high resource volume and calorie content, but because it is classified as hazardous waste under Vietnam's legal system, which is strictly regulated by law, the conversion to alternative fuels has not progressed much publicly (although it is progressing on the black market). The survey confirmed the need for a policy environment that allows users to use alternative fuels from waste oil with confidence, as there are no standards or guidelines on how waste oil can be treated or processed before it can be used as a "product" of alternative fuels.

In Vietnam, Decree No. 08/2022/ND-CP was promulgated as the detailed regulations for implementing the revised Law on Environmental Protection (Law No. 72/2020/QH14) which was enacted in 2020. In the Decree, the "Extended Producer Responsibility (EPR)" system was introduced, which mandates a certain percentage of post-sale recycling for 38 products in six sectors, including packaging containers and electrical products, to transition to a circular economy. Collection and recycling of some of these items, such as engine lubricants, batteries, and tyres, began in January 2024. As a result, manufacturers and importers of the subject items will be obliged to collect and recycle used products or pay a donation.

(2) Survey objectives

In the fiscal 2022 study, among the recycling technologies for industrial wastes such as waste oil, waste solvents, and sludge that Daiseki Co., Ltd. (hereafter, Daiseki) possesses, the main focus of the study was placed on the alternative fuel conversion technologies for the cement industry, and extensively examined the feasibility of introducing these technologies in Vietnam. In the course of the study, it was anticipated that the demand for recycling waste lubricating oil would increase in the future as EPR for engine lubricating oil would begin in January 2024.

Since the recycling of waste lubricating oil is Daiseki's main business in Japan and has technological advantages that make it relatively easy to commercialise, the fiscal 2023 study focused on the recycling of waste lubricating oil and was conducted to evaluate the feasibility of introducing this technology in Vietnam.

(3) Expected effects

Promoting the collection and recycling of waste lubricants and providing a stable supply to the market will not only provide benefits to Vietnamese industry, which has a strong energy demand, but will also help solve some of the administrative issues related to waste disposal and contribute to international and domestic issues such as global warming. Specifically, the benefits (co-benefits) include: (1) reduced fossil fuel use, (2) reduced CO2 emissions, (3) reduced feedstock costs, (4) stable feedstock availability, (5) reduced fuel costs, (6) stable fuel availability, and (7) reduced electricity usage fees.

(4) Proposed technologies and advantages

Daiseki has been in business since 1945, and without landfill and incineration facilities, has always viewed waste as a resource and worked to recycle as much of it as possible, accumulating technology and expertise along the way. At its six plants in Japan, Daiseki collects industrial waste such as waste oil, solvents, and sludge for intermediate treatment, and plans to begin operations at its seventh site in Hiroshima in the spring of 2024.

There are three main treatment methods: (1) waste oil treatment/recycling, (2) wastewater

treatment/recycling, and (3) sludge treatment/recycling. Of these, waste oil treatment and recycling is Daiseki's main business.

In waste oil treatment and recycling, used lubricating oil, cutting oil, paint, and other solvents are collected and treated differently according to their various properties. Oil that is not mixed with water, such as used lubricating oil and cutting oil, is refined by removing impurities and reused as recycled lubricating oil. Oil with high water content is used as recycled heavy oil as boiler fuel, etc. after removing the water content. Furthermore, waste oil and solvents that are also difficult to convert into recycled heavy oil are used as alternative fuels in cement plants as auxiliary fuels (Figure 2.2.1.3).

By thoroughly and effectively utilising waste according to its properties, Daiseki has achieved a recycling rate of approximately 90% and a reduction in CO2 emissions of approximately 90% compared to simple incineration, thus contributing to the creation of a recycling-oriented society by adding high value to waste.

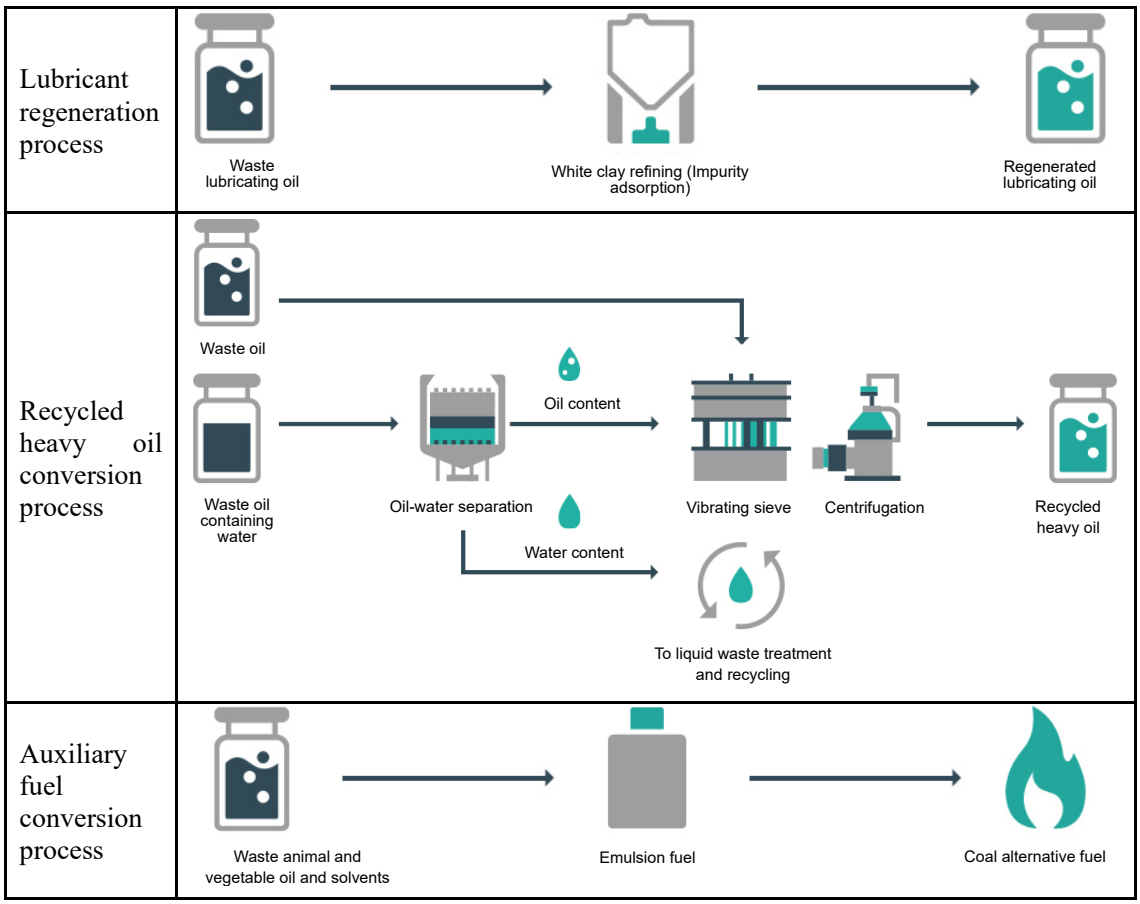


Figure 2.2.1.2 Conceptual diagram of the lubricant regeneration process (top), recycled heavy oil conversion process (middle), and auxiliary fuel conversion process (bottom) at Daiseki (Source: Daiseki[17])

(5) Results of previous years' surveys

This study was proposed and adopted as a three-year plan in 2021 and has been continued in fiscal 2021 and fiscal 2022. This year is the final year of the three years term. In fiscal 2021, the team was unable to travel to Vietnam due to the global spread of the COVID-19 pandemic and was only able to conduct an indirect survey through local consultants. In fiscal 2022, the team conducted a full-scale

[17] Daiseki's website: https://www.daiseki.co.jp/business/recycle/waste_oil.html

field survey. The main points of the surveys in previous years are summarized below.

The survey in the fiscal 2021

- The survey sought to investigate the feasibility of a project to collect highly concentrated liquid waste and sludge discharged from industrial estates and utilise them as alternative fuels to fossil fuels in cement plants and boilers through proper treatment and processing.
- Interviews were conducted with Nam Cau Kien Industrial Park and DEEP C Industrial Zones regarding the generation of hazardous waste such as waste oil and solvents. It revealed that industrial estates are not aware of that information because the individual factories in the industrial estates are signing contracts directly with a licensed hazardous waste treatment contractor to treat the waste. It was also found that the amount of waste oil and sludge generated from the industrial estates was too small to be used as raw material for alternative fuel for the cement company.
- Interviews were conducted with a cement factory in Hai Phong city regarding the use of alternative fuels such as waste and liquid waste. It was found that although there is a high interest in the introduction of alternative fuels, the use of alternative fuel has not progressed due to the lack of laws and regulations regarding the classification and licensing of waste for use as fuel. The company was considering the use of solid waste as fuel, but due to the need to prioritise the construction work to upgrade old pre-heaters, the introduction of alternative fuels could only be addressed after that work was completed.
- When the team interviewed lubricant manufacturers and distributors, it was found that not only lubricant manufacturers and distributors but also many other businesses will need to comply with EPRs, since EPRs are planned to be introduced for lubricants from January 2024.
- With travelling to the site being restricted, it was not possible to fully grasp the actual amount of waste oil and liquid waste generated and how they were treated. In addition, since it was considered that the amount of industrial waste that could be collected in Hai Phong city alone was limited, it was confirmed that the scope of the survey needed to be expanded to include provinces surrounding Hai Phong city.

The survey in the fiscal 2022

- In the fiscal 2022 survey, based on the issues raised in the fiscal 2021 survey, the scope of the survey was expanded to include Hai Phong city as well as the surrounding provinces in the northern part of the country, with an emphasis on waste oil and waste liquids, assuming a response to the EPR for engine lubricating oil. Interviews were conducted with four companies, three cement companies in northern Vietnam and one in central Vietnam, regarding their waste utilisation records, needs, and challenges. In addition, to understand the actual status of hazardous waste treatment, the team conducted site visits and interviews with two waste treatment companies and related administrative agencies.
- Two field surveys were conducted. The first survey focused on confirming legal compliance and surveying the current status of cement plants that could become future users. In the second survey, the team visited six manufacturers and conducted interviews to investigate the status of the generation and treatment of waste oil, waste liquids, and solid waste which are materials for alternative fuels.
- Cement companies are required to obtain a hazardous waste treatment license if they wish to use alternative fuels derived from hazardous waste. According to data from the Vietnam Cement Association (VNCA), four cement plants have already received hazardous waste treatment licenses from the Vietnam Environment Administration (VEA). Through interviews with the cement companies, the team understood that in addition to obtaining the licenses, it is important to reduce costs and secure alternative fuel quantities.
- In Vietnam, environmental considerations dictate that hazardous waste should not be handled within 5 km of important points, such as historical heritage sites and tourist resources. Cement plants in such locations have also found it difficult to obtain an Environmental Impact Assessment (EIA) when obtaining a hazardous waste license.

- Many of the manufacturers the team visited and interviewed generated only small amounts of waste oil and liquid waste, and in many cases, these companies did not know where and how the waste was disposed of after it was collected by a treatment company. In particular, when the management company of the industrial estate in which the company resides designates or introduces a waste oil treatment company, the company does not conduct its research to select a treatment company, which may have led to a lack of understanding of the fate of the waste oil they disposed of. During the interviews, several companies were found to be selling waste oil to processors for value.
- In many cases, the hazardous waste disposers visited and interviewed incinerated the collected waste oil in an incinerator after dehydration. It was also found that in many cases, waste oil was collected and processed by unlicensed businesses and resold to third parties.
- It was found that waste oil is filtered and reused as lubricating oil for agricultural tractors and ships if they are of high quality; low-grade waste oil that is heavily contaminated is used as fuel; and even lower-grade waste oil that is mixed with water is used as an alternative fuel. The team was also able to confirm the fact that waste oil collected by some treatment businesses is passed through intermediate traders and then into the hands of other treatment businesses. Therefore, the team considered two ways to obtain raw materials such as waste oil: (1) from existing intermediate traders in each region, or (2) directly from large-scale businesses (source of the waste oil). In the case of (2), there was a concern that one would need to compete with hazardous waste licensees who currently collect waste oil and other materials from those companies.
- Regarding the recycling of waste oil and liquid waste, the team found several businesses that produce DO (fuel equivalent to diesel oil) partly by distillation, but could not identify any businesses that produce recycled heavy oil or auxiliary fuel, and thus considered that Daiseki could enjoy technological superiority.
- Hai Phong city is a port city with the largest trade port in the northern part of the country, so ships come and go frequently, and the needs for recycled lubricating oil for ship engines were anticipated. In addition, there is already a large concentration of Japanese motorcycle and automobile manufacturers that handle a large volume of engine lubricants, as well as manufacturers and distributors of lubricants in the northern region of Vietnam. Therefore, the team anticipated business needs for the recycling of used lubricants and supply of recycled heavy oil in cooperation with these Japanese companies. Therefore, the team confirmed the need to continue collecting information on used lubricants, especially in Hai Phong city and other provinces in Northern Vietnam.
- It was felt that it would be difficult to have people understand the effectiveness of the technology in promoting the project of converting recycled heavy oil and auxiliary fuel in Vietnam, as there are no good examples of such projects in the country. To make it possible to commercialise these technologies in Vietnam, it is essential to improve the institutional environment, and it is necessary to deepen the understanding of relevant government agencies and potential local partner companies. To this end, it was felt necessary to invite these parties to Japan to directly observe how recycled heavy oil and auxiliary fuels are processed and manufactured at Daiseki's facilities and how they are used as alternative fuels in cement plants, and to provide opportunities to exchange opinions.

2.2.2. Subjects and methods of the survey

(1) Targets and methodology

[Surveyed area]

The target area for this fiscal year's survey was, as in the previous year's survey, focused in Hai Phong City, the suburbs of Hanoi, and other areas in northern Vietnam.

[Surveyed targets]

This fiscal year, continuing from the previous fiscal year's survey, the team tried to understand the market size of the waste oil and liquid waste as materials for the production of recycled heavy oil and auxiliary fuels, as well as the expected demand for recycled heavy oil and other products. Once the recycled heavy oil business is on track, Daiseki also expects to expand the business to the auxiliary fuel conversion and alternative fuel conversion for the cement industry that it has been conducting in Japan. Therefore, the team continued to communicate with cement companies and government-affiliated research institutes with which we had established relationships in previous years about the possibility of such business while keeping in mind the development of the business after the recycled heavy oil business.

Specifically, the following organizations were surveyed.

- Lubricant manufacturers and suppliers: Lubricant manufacturers and distributors, OEM product distributors, importers and distributors
- Dischargers of waste lubricants and other waste oils: motorcycle and automobile manufacturers (and their distributors), automobile repair shops, Japanese-affiliated manufacturers, and large non-Japanese emitter companies
- Users of recycled heavy oil and auxiliary fuels: Cement companies and Japanese-affiliated companies that use a lot of energy.
- Understanding of waste lubricant treatment: Hazardous waste licensees
- Legal, environmental, and organizational development: EPR-related government agencies, government-affiliated research institutes, Japan International Cooperation Agency (JICA), Embassy of Japan in Vietnam.

[Information dissemination and lobbying activities]

In addition to the surveys and interviews, activities for commercialisation included appealing to government agencies, industry associations, trading companies, and banks to publicise the merits of the recycled heavy oil conversion project. In particular, as an approach to position recycled heavy oil conversion as an authorized recycling method for engine lubricant EPR, dissemination of information to relevant administrative agencies and lobbying activities were conducted.

Specifically, Daiseki was invited to participate in some of the industrial subcommittees of the Japanese Chamber of Commerce and Industry in Vietnam (JCCI), where it gave a lecture on the importance of recycled heavy oil conversion and disseminated information, and conducted a questionnaire regarding issues related to waste management and other topics. In addition, the EPR office and potential business partners were invited to Japan for a plant visit and exchange of opinions. The intention was to promote an understanding of the effectiveness of Daiseki's recycled heavy oil business for the engine lubricant EPR and the need to improve the environment through policy to commercialise recycled heavy oil conversion.

[Survey methods]

Interviews, site visits, and online meetings were conducted with the above survey. Secondary information was also obtained from related websites, newspapers, and magazines. In addition to conducting its research, the team also received cooperation from Vietnam Energy and Environment Services Joint Stock Company (SEE Vietnam), which is engaged in the intermediate treatment of waste in Vietnam, and an expert from the Hanoi University of Technology.

(2) Field survey

The field survey was conducted on three separate occasions (two weeks each).

[First survey]

- Period: July 23 (Sun) - August 5 (Sat), 2023
- Participants:
  - Daiseki Co., Ltd.: 1 person
  - Institute for Global Environmental Strategies (IGES): 1 person
  - Azusa SE&E: 1 person
  - International Environmental Strategies Division, Environment Bureau, Kitakyushu City: 2 persons
    (July 23 - July 29: 1 person; July 30 - August 5: 1 person)
- Survey outlines:
  - With the cooperation of the Science Technology Development and Innovation Centre (ISC), companies interested in Daiseki's business in Hai Phong City and neighbouring provinces (8 companies in total) were invited for a briefing session and business matching. In addition, Daiseki visited the factories of hazardous waste treatment companies and a cement company (7 companies in total) to conduct on-site inspections and exchange opinions.
  - The team visited Hai Phong City's Department of Natural Resources and Environment (DONRE), Department of Foreign Affairs (DOFA), and URENCO Hai Phong to exchange views.
  - The team visited industry associations and government-affiliated research institutes of the cement industry in Vietnam to exchange views.
    - Vietnam Institute for Building Materials (VIBM)
    - Vietnam Association for Building Materials (VABM)
    - The Vietnam National Cement Association (VNCA)
  - The team visited and interviewed four Japanese motorcycle and automobile manufacturers, two Japanese trading companies, one Japanese parts manufacturing and sales company, one Japanese civil engineering and construction company, and one Japanese transportation machinery manufacturing and sales company.
  - Discussions were held with JICA Vietnam (Japan Desk) and JICA experts (MONRE advisors).

[Second survey]

- Period: September 24 (Sun) - October 7 (Sat), 2023
- Participants:
  - Daiseki Co., Ltd.: 1 person
  - Azusa SE&E: 1 person
- Survey outlines:
  - The team visited and discussed with three hazardous waste disposal businesses and one lubricant import and sales company as potential local partners.
  - The team visited and discussed with one aluminium secondary refining company, one ceramic product manufacturing company, and one cement company as potential users of recycled heavy oil and auxiliary fuel.
  - The team visited and discussed with one parts manufacturing and selling company, one OA equipment manufacturing and selling company, and one chemical product manufacturing and selling company as waste oil emitters.
  - With a view to commercialisation, discussions were held with one construction company, one trading company, one logistics company, and one bank.
  - The team also visited the Ministry of Science and Technology (Examination Bureau) to gain a better understanding of the examination of permits and licenses.

[Third survey]

- Period: November 26 (Sun) - December 9 (Sat), 2023
- Participants:
  - Daiseki Co., Ltd.: 1 person
  - Azusa SE&E: 1 person
  - Institute for Global Environmental Strategies (IGES): 1 person (November 26 - December 2)
  - International Environmental Strategies Division, Environment Bureau, Kitakyushu City: 1 person (November 26 - December 2)
- Survey outlines:
  - A workshop was held with Hai Phong City on November 28 to report the results of the survey and exchange opinions with relevant authorities in Hai Phong City (see "3.1. Workshop with relevant stakeholders").
  - Participated in the relevant subcommittees (Industrial Hai Phong Subcommittee, Industrial Northern Subcommittee, and Industrial Western Subcommittee) of the Japan Chamber of Commerce and Industry (JCCI) to give a lecture for disseminating information and exchange views on the current status and issues of engine lubricant EPRs.
  - Participated in the joint workshop on "EPR policy and regulation" co-hosted by the Embassy of Japan in Vietnam and JICA Vietnam to gather information (see "3.2. Relevant international conferences").
  - Visited MONRE's EPR office to exchange views on EPR legislation.
  - Visited lubricant manufacturers and distributors (4 companies) and Japanese motorcycle and automobile manufacturers (3 companies) to interview about engine lubricant EPR compliance.
  - The team visited one distribution company, one office automation equipment manufacturing and selling company, and one tyre manufacturing and selling company as businesses that discharge lubricating oil and other waste oil.
  - Visited one hazardous waste company, one investment company, one trading company, and one bank to discuss the feasibility of a recycled heavy oil conversion project.

[Surveyed targets]

Through three on-site field visits this fiscal year, a wide range of relevant organizations were visited for interviews and discussions. The cumulative number of subjects reached 82. The largest number of subjects was 21 from government and research institutions, followed by 14 from waste collection and processing companies (Table 2.2.2.1). By the number of institutions, companies, and organizations interviewed, a total of 64 institutions were interviewed. Again, government and research institutions accounted for the largest number of interviews (15 institutions), followed by waste collection and processing companies (13 institutions) (Table 2.2.2.2).

Table 2.2.2.1 Cumulative number of subjects by sector surveyed in the three field surveys conducted in fiscal 2023
(Source: Prepared by the survey team based on survey results)

Surveyed sectors	First survey	Second survey	Third survey	Sub-total
Cement manufacturing and sales		1		1
Government and research institutions	8	2	11	21
Waste collection and treatment companies	10	3	1	14
Lubricating oil production and sales	1	1	3	5
Lubricant import and sales	2	1	1	4
Japanese motorcycle manufacturing and sales	2		2	4
Japanese automobile manufacturing and sales	3		2	5
Parts manufacturing and sales	2	1		3
Industry Associations	1			1
Japan Chamber of Commerce and Industry, Industry Division			3	3
Civil engineering and construction	1	1		2
Manufacture and sale of transport machinery	1			1
Trading company	1	1	1	3
Engineering	1			1
Manufacturing and sales of OA equipment		1		1
Manufacturing and sales of OA equipment parts			1	1
Banking		1	1	2
Manufacture and sales of chemical products		1		1
Manufacturing and sales of ceramic products		1		1
Secondary aluminium smelting		1		1
Investment		1	1	2
Industrial park management			1	1
Tire manufacturing and sales			1	1
Logistics		1	1	2
Analysis	1			1
Total	34	18	30	82

Table 2.2.2.2 Number of institutions, companies and organizations interviewed in the three field surveys conducted in fiscal 2023
(Source: Survey team based on survey results)

Government and research institutions	15	Trading company	2	Engineering	1
Waste collection and disposal	13	Logistics	2	Industry Associations	1
Lubricant manufacturing and sales	3	Manufacturing and sales of OA equipment	1	Secondary aluminium smelting	1
Lubricating oil importers and distributors	3	Manufacturing and sales of OA equipment parts	1	Investment	1
Japanese Chamber of Commerce and Industry	3	Banking	1	Manufacture and sale of transportation equipment	1
Japanese automobile manufacturers and distributors	3	Chemical products manufacturing and sales	1	Tire manufacturer and distributor	1
Japanese motorcycle manufacturing and sales	2	Ceramic products manufacturing and sales	1	Industrial park management	1
Cement manufacturing and sales	2	Analysis	1		
Manufacture and sale of parts	2	Civil engineering and construction	1	Total	64

2.2.3. Results of the survey

2.2.3.1. Manufacture and sale of lubricants

(1) Manufacture of lubricants

Lubricant production process

The current Vietnamese EPR describes two methods for recycling used lubricating oil: 1) distillation into base oil and other oils, and 2) distillation of fractional oil, both of which specify distillation only. On the other hand, there is no mention or consideration of the quality of the distilled base oil, its uses or demand.

Lubricating oil is formulated by combining base oil and various additives according to the intended use. [18] Base oil is obtained by blowing crude oil into an atmospheric distillation unit and separating it into various petroleum fractions such as LP gas, naphtha, kerosene, diesel oil, and heavy oil according to differences in boiling points. The heavy oil components obtained here are further distilled under reduced pressure to extract the components effectively as lubricating oil and then refined under high temperature and high-pressure conditions (Figure 2.2.3.1.1).[19]

[18] Idemitsu: “Naturals of Lubricants”. https://www.idemitsu.com/jp/business/lube/about/understand/history01.html

[19] Petroleum Association of Japan: “Refining Processes in Refineries” https://www.paj.gr.jp/statis/faq/67

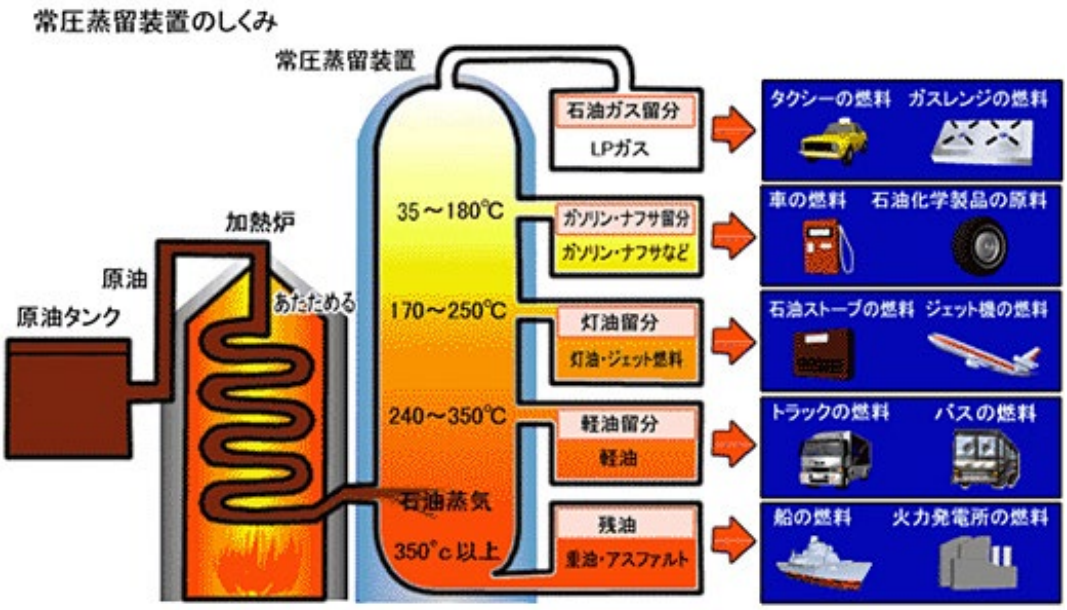


Figure 2.2.3.1.1 Conceptual diagram of atmospheric distillation unit
(Source: Petroleum Information Centre[20])

Extracting base oil from used lubricating oil requires considerable energy. In addition, used lubricating oil also contains many metals as additives, and it is doubtful that a stable base oil can be obtained by distillation alone.

Lubricating oil production and imports in Vietnam

ASEAN's demand for lubricants increased from about 2.5 billion L in 2015 to about 3.2 billion L in 2020. The top five countries of Indonesia, Thailand, Vietnam, Malaysia, and the Philippines account for most of the demand, of which Vietnam's demand will reach about 470 million L in 2020, with a compound annual growth rate (CAGR) of 4.5%, one of the highest (Figure 2.2.3.1.2). [21]

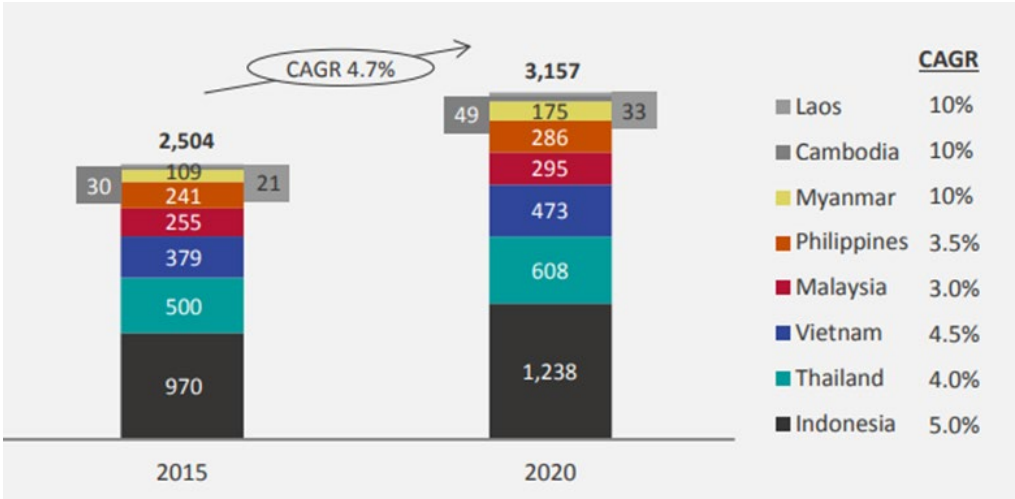


Figure 2.2.3.1.2. Comparison of lubricant consumption in ASEAN countries in 2015 and 2020 (in million L) (Source: Ipsos Business Consulting[22])

[20] Petroleum Information Centre: https://oil-info.ieej.or.jp/whats_sekiyu/1-11.html

[21] Ipsos Business Consulting: https://www.ipsos.com/sites/default/files/2016-08/The-new-lubricant-trade-in-ASEAN.pdf

[22] Ipsos Business Consulting: https://www.ipsos.com/sites/default/files/2016-08/The-new-lubricant-trade-in-ASEAN.pdf

The Vietnamese lubricants market is expected to steadily increase to approximately 310 million L in 2024 and 340 million L in 2026. When considering specific users (automotive, heavy machinery, metalworking, and power generation equipment) and products (engine oil, grease, hydraulic oil, machining oil, and gear oil), demand for automotive engines was by far the largest, accounting for 81% of total demand in 2020, followed by heavy machinery at 4.4%. The top five suppliers (BP, Mekon Petrochemical, Petrolimex, Royal Dutch Shell, and TotalEnergies) account for 65.03% of the lubricants market. [23]

Vietnam's automotive engine oil market (commercial vehicles, motorcycles, and passenger cars) is expected to be about 240 million L in 2024 and is projected to further increase to about 270 million L by 2026. The share of motorcycles in total automotive engine oil consumption in 2020 is the highest at 71.38%, followed by commercial vehicles at 21.27%, and passenger cars at 7.35%. With an estimated CAGR of 4.85% from 2021 to 2026 for the motorcycle market, the market for lubricants for motorcycles is expected to continue to grow at an ever-increasing rate. The top five suppliers of automotive engine oil, the same as the overall lubricant market above, account for 57.68% of the market. [24]

The above information is summarized in Table 2.2.3.1.1. Volumes for commercial vehicles, motorcycles, and passenger cars were calculated by multiplying the ratios based on actual results in 2022 by the projected volumes for 2024.

Table 2.2.3.1.1 Size of the Vietnamese lubricants market
(Source: Prepared by the survey team based on Mordor Intelligence)

Vietnam lubricants market size	Quantity	Unit	Applicable year	Remarks
Lubricants for specific users	277,407	t/y	2024 forecast	For automobiles, heavy machinery, metal processing and power generation equipment
Engine oils for automobiles	220,050	t/y	2024 forecast	Commercial vehicles, motorcycles, passenger cars
Engine oil for motorcycles	157,072	t/y	2024 forecast	71.38%
Engine oil for commercial vehicles	46,805	t/y	2024 forecast	21.27%
Engine oil for passenger cars	16,174	t/y	2024 forecast	7.35%

(Converted at 1 liter = 0.9 kg)

Vietnam's demand for lubricants is growing steadily, in addition to a lack of domestic base oil supply capacity. In addition, the Vietnamese market has become an important base oil destination for Asian refineries due to sluggish demand for base oil in China.

In particular, it is the most important market for refineries in Korea and Singapore, with these two countries accounting for 90% of the 23,000 tons imported in November 2023. [25]

The largest importer of this base oil was Chevron in July 2022. This represented 23% of Vietnam's total base oil imports for the same month. Chevron imported less than 5% of total imports in 2020-2021, 18% in June 2022, and was the largest importer amongst the total Vietnamese imports in July 2022. The second largest importer of base oil as of July 2022 was Castrol BP Petco, accounting for

[23] Mordor Intelligence: https://www.mordorintelligence.com/industry-reports/vietnam-automotive-engine-oils-market

[24] Mordor Intelligence: https://www.mordorintelligence.com/ja/industry-reports/vietnam-automotive-lubricants-market

[25] Baseoilnews.com: https://www.baseoilnews.com/se-asia/vietnam/vietnam-base-oil-imports-nov2023

21% of total imports. The company was the largest importer of base oil into Vietnam until the previous month. TotalEnergies Marketing Vietnam and Shell Vietnam followed after the top two importers. Previously, Petrolimex Petrochemical was among the top four base oil importers (Figure 2.2.3.1.3). [26]

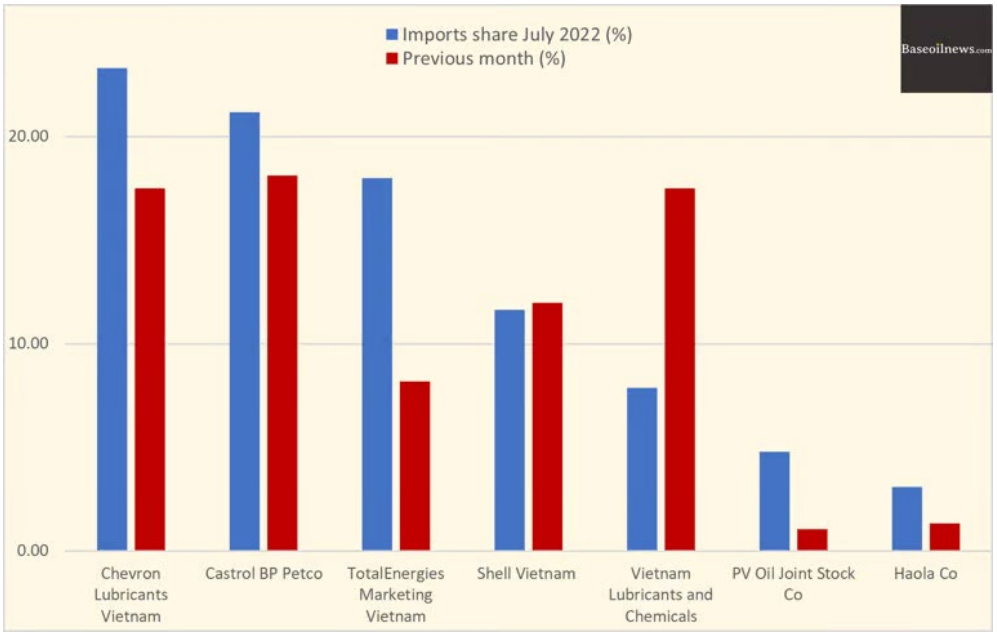


Figure 2.2.3.1.3. Comparison of base oil imports by companies in July 2022
(Source: Baseoilnews.com)

Lubricant manufacturer's position

In this study, the team interviewed six companies: three local companies that import and sell engine lubricants covered by the EPR, two Japanese lubricant manufacturers and distributors, and one U.S. lubricant manufacturer and distributor, regarding their policies and challenges in responding to the engine lubricant EPR.

As a result, the team found that lubricants are mainly supplied through three distribution channels: (1) direct sales from lubricant manufacturers to motorcycle and automobile manufacturers, (2) OEM supply under a different brand from automobile manufacturers, and (3) retail sales either directly from lubricant manufacturers or through distributors.

It was pointed out that the EPR stipulates collection and recycling obligations for producers and importers/sellers of engine lubricants, which makes it unclear where the responsibility lies, especially in the case of OEM products. The view of MONRE's EPR Office was that for OEM products, the EPR responsibility should be clearly stated in the purchase agreement between the original lubricant manufacturer and the entity purchasing the product for its brand and on the product packaging.

[Summary of survey results on lubricant suppliers]

Recognition

- Under the current situation where unlicensed operators are handling used lubricants without being policed, it is difficult to collect waste lubricants.
- OEM suppliers of lubricants have indicated that lubricant manufacturers and distributors need to assume responsibility under the EPR.

EPR response policy

[26] Baseoilnews.com: https://www.baseoilnews.com/company-news/vietnam-baseoil-imports-chevron-july2022

- The contributions to the EPR Fund need to be passed on to the selling price of lubricants, but it is not that easy.
- Many lubricant manufacturers are considering contributing to the EPR Fund for the time being.

Challenges

- Some companies may try to avoid liability to meet the exemption requirements, such as selling products through multiple small companies, which could be a disincentive to proper recycling activities.
- Discharger liability should also be questioned at the same time.
- The definition of "manufacturer" in OEM products is unclear. Although certain views have been expressed by the authorities, the views differ depending on the person in charge.
- It is doubtful whether they will certify anything other than distillation as an EPR methodology. In particular, they are concerned about whether thermal recycling will be certified.

(2) Sales of lubricants

As mentioned earlier, based on the 2020 actual figures, the largest share of the lubricant market in Vietnam is for automotive engines, at about 81% of the market. Among these, motorcycles have the highest share at about 71%, and commercial vehicles and passenger cars together account for about 29%.

In this study, the team visited and interviewed two Japanese motorcycle manufacturers and three Japanese commercial vehicle and automobile manufacturers. In addition, interviews were also conducted with two Japanese lubricant manufacturers and distributors, one U.S. lubricant manufacturer and distributor, and three local lubricant import and sales businesses. This section summarises the lubricant sales channels in Vietnam based on the content of the interviews.

Lubricants may be sold to motorcycle and automobile assembly plants, supplied to motorcycle and automobile manufacturers on an OEM basis, or sold to motorcycle and automobile distributors and repair stores in the market. In business-to-business (B2B) transactions, lubricants are sold through distributors of lubricant distributors or directly to customers.

In the case of business-to-consumer (B2C) transactions between companies and consumers, most products are sold through distributors or retailers. Japanese lubricant manufacturers and distributors supply three to four times more products on an OEM basis than their brands, and almost no products are retailed under their brands. On the other hand, about 15% of the U.S.-based lubricant manufacturers and distributors were found to be OEM suppliers, with their main focus on sales under their brands, indicating that different lubricant manufacturers and distributors have different ways of accessing the market.

Figure 2.2.3.1.3 shows the market channels for engine lubricants in Vietnam, from production to disposal, as identified through interviews with related businesses.

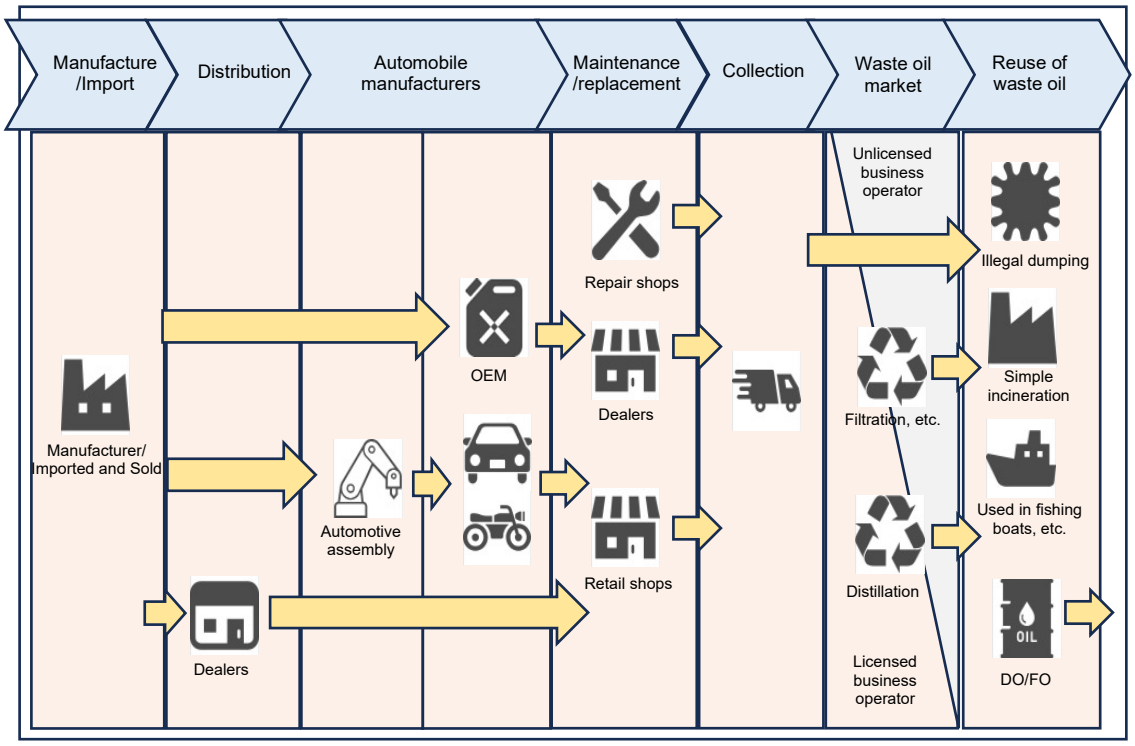


Figure 2.2.3.1.3 Market channels for engine lubricants in Vietnam from production to disposal as identified through interviews with relevant businesses (Source: Prepared by the survey team)

[Summary of survey results on lubricant sales]

Recognition

- It was understood that the responsibility for lubricant EPR lies with the lubricant manufacturing and distributing companies.
- Following Decree 43/2017/NO-CP, the OEM product itself, its container, or the sales contract, must clearly state where the EPR responsibility lies.
- The team have confirmed the existence of recyclers who do distillation, although there were not many of them.

EPR response policy

- The responsibility for the lubricants supplied for OEM and to be filled at the time of new car manufacturing are already specified in the contract with the lubricant producer and distributor and containers of OEM products.
- The Vietnam Association of Motorcycle Manufacturers (VAMA) and the Vietnam Association of Motorcycle Manufacturers (VAMM) have established a Producer Responsibility Organization (PRO) to manage the collection and recycling of lubricants and products subject to EPR. The PRO will manage the waste rather than having its recycling plant.

Challenges

- In addition to the lack of capital ties with dealers, used lubricants are currently sold to waste collection companies, which limits the ability of makers to encourage dealers to collect used lubricants. In particular, there is no power against multi-dealers (stores that carry more than one brand).
- It is difficult to enforce the collection of used lubricants because ownership of the product is transferred to the distributor upon the sale of the lubricant.
- The cost of collecting used lubricants would be in comparison to the sales price at which the distributor is currently selling the used lubricants.

- It is difficult to collect used lubricants from repair shops and other sources in the city.
- There is a reality that unlicensed companies are collecting waste lubricants.
- Concerns that the EPR recycling methodology is only distillation were heard.
- Discharger responsibility is unclear and collection of waste oil is difficult without cooperation with the consumers.

Although each company's situation was different, the fact that they were negotiating and sharing information with the EPR office through VAMA and VAMM indicated that there were no major gaps in their perceptions. In addition, each company faces similar challenges in terms of collecting used lubricants, and they all agreed that it would be difficult to collect used lubricants unless the responsibility of consumers and waste lubricant dischargers is simultaneously addressed.

2.2.3.2. Collection and recycling of used lubricants

(1) Legal treatment of used lubricants

[Vietnam's legal system]

As shown in Figure 2.2.3.2.1, the Constitution is the highest level of basic law in Vietnam's legal system, and Laws are legislated by the National Assembly following the Constitution. The Cabinet prepares and issues Decrees that stipulate the specific implementation of the above-mentioned laws. The ministries and agencies will issue Circular detailing procedures and guidelines for implementing the laws and cabinet orders following the cabinet's instructions. If, in the implementation of these laws and ordinances or other regulations, questions arise regarding specific events that are unclear, it is permissible to submit questions to government agencies to obtain specific guidance. The official written response from the government to these questions is the Official Letter.

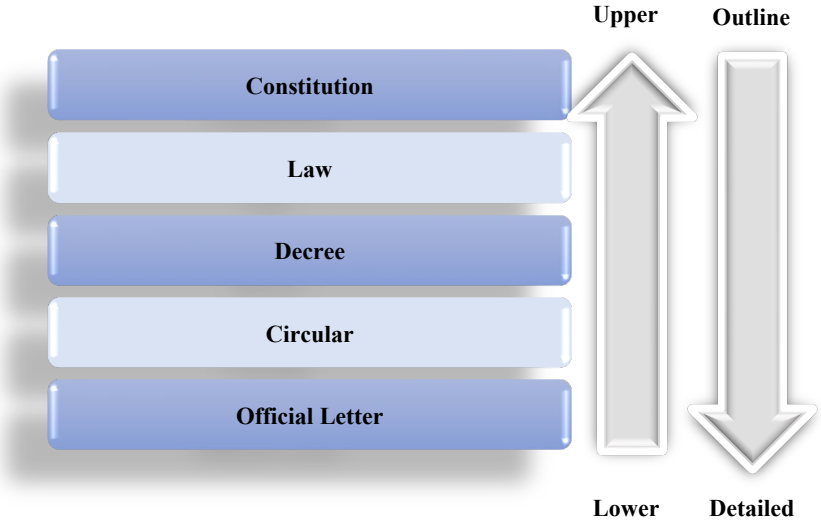


Figure 2.2.3.2.1 Legal system in Vietnam
(Source: Prepared by the survey team based on Manabox Vietnam[27])

In addition, from the header of Vietnamese legal documents, it is possible to understand their issuing authority, additional number, and date information (Figure 2.2.3.2.2).

[27] Manabox Vietnam：https://manabox-global.com/2017/11/vietnamregulation/

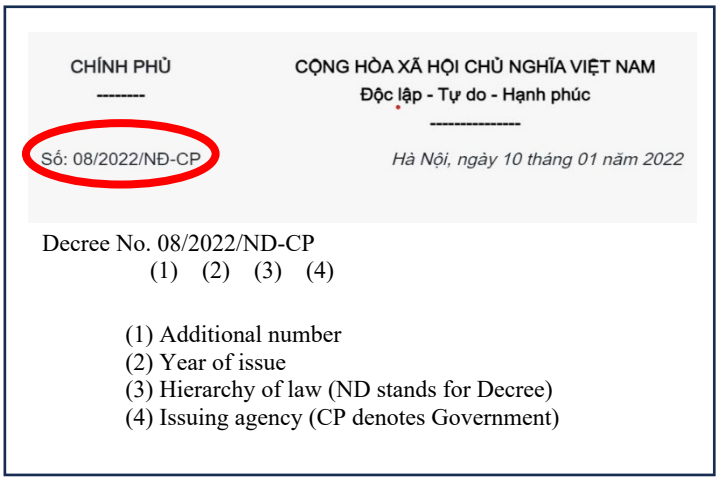


Figure 2.2.3.2.2: Information on Vietnam legal documents
(Source: Prepared by survey team based on Manabox Vietnam[28])

[Classification of wastes and hazardous wastes]

In Vietnam, the revised Law on Environmental Protection (Law No. 72/2020/QH14) came into effect on January 1, 2022, and its subordinate laws and regulations, such as Decree No. 08/2022/ND-CP and Circular No. 02/2022/TT-BTNMT, were also revised. In them, wastes are broadly classified and defined as municipal solid waste, general industrial solid waste, hazardous waste, and medical waste (Figure 2.2.3.2.3).

Figure 2.2.3.2.3 Classification of waste in Vietnam
(Source: Prepared by the survey team based on Law No. 72/2020/QH14, Decree No. 08/2022/ND-CP, and Circular No. 02/2022/TT-BTNMT)

Hazardous waste is listed in the Appendix of Circular No. 12/2011/TT-BTNMT[29] and Circular No. 36/2015/TT-BTNMT and includes fluorescent lamps, used lubricant oil, batteries, accumulators, lubricants, chemicals, paint, ink containers generated in business and service activities. The

[28] Manabox Vietnam：https://manabox-global.com/2017/11/vietnamregulation/

[29] Press release of VN Oil JSC：http://www.ceptechnology.com/pdf/Press-release-EN.pdf

management of these items, from classification to storage, transportation, and disposal, is stipulated under strict regulations. In particular, only hazardous waste license-holding businesses are allowed to handle the transportation and disposal of hazardous waste and are required to operate a manifest (Figure 2.2.3.2.4).

Outline of the operation of manifest in Vietnam (Decision No.1555/1999/QD-TTg)

Hazardous Waste Management Ordinance (Decision No.1555/1999/QD-TTg) defines hazardous waste, responsibilities of related ministries and agencies, responsibilities of waste generators, collection, transportation, treatment, final disposal and emergency It stipulates countermeasures, a business operator certification system, detailed classification of hazardous waste, treatment standards for various types of waste, treatment and disposal methods, as well as a manifest system.

Chapter I, Article 3
17. HW-related documents are dossiers accompanying HW when such HW is collected and transported from discharge sources to the keeping, treatment or disposal places or establishments.

Chapter III, Article 12
2. To complete the procedures related to the HW documents: filling and signing on part II of HW documents, requesting the keeper, treater and disposer to sign on part III of the HW documents; the HW collector and transporter shall keep 01 copy and send other 03 copies to the keeper, treater and disposer;

Chapter IV, Article 15
4. To finalize HW documents, then keep 01 copy and send one copy to the HW source generator and another to the HW collector/transporter;

According to MONRE, the Korea International Cooperation Agency (KOICA) assisted MONRE in 2010 to establish an electronic manifest system for the integrated management of hazardous waste in Vietnam with budget of US$ 3 million, of which US$ 2.5 million funded by the Korean and the rest from Vietnam's counterpart funds. It was expected end in 2013, but was extended to 2014. For the moment, it has not seen in current hazardous waste management practice.

Figure 2.2.3.2.4 Outline of the operation of manifests in Vietnam
(Source: Prepared by the survey team based on Decision No. 1555/1999/QD-TTg)

According to data published online by the Vietnam Environment Administration (VEA), a total of 119 facilities in Vietnam held hazardous waste treatment licenses as of July 2020. There are 60 facilities in the northern region centred on Hanoi, 6 in the central region, and 53 in the southern region centred on Ho Chi Minh City. [30]

In Hai Phong City, seven companies held hazardous waste handling licenses as of 2020 and are authorised by the Hai Phong People's Committee to collect, transport, treat, and recycle hazardous waste within the scope of their hazardous waste codes and permitted quantities (Table 2.2.3.2.1).

Table 2.2.3.2.1 List of companies holding licenses to handle hazardous waste in Hai Phong City (as of 2020) (Source: Haiphong City Document No. 42/BC-STNMT)

1	Tan Thuan Phong Company Limited
2	Hai Dang Trading Joint Stock Company
3	Dai Thang Trading and Production Development Company Limited
4	Toan Thang Trading and Services Company Limited
5	Hoa Anh Joint Stock Company
6	Phu Hung Logistics Trading and Services Joint Stock Company
7	Hai Phong Urban Environment Company Limited

(2) Used lubricant resource volume

The primary target feedstock for the production of recycled heavy oil is used lubricating oil, but it is important to know how much is discharged and where it is discharged from when assuming its collection. This can be roughly estimated from Table 2.2.3.1.1 "Size of the Vietnamese lubricants market". In addition, information from lubricant manufacturers, importers, and distributors interviewed for this report, including the results of a portion of the survey conducted in 2022, can also be used as a reference.

Table 2.2.3.2.2 summarises the volume of lubricant production and imports by lubricant manufacturers, importers and distributors in the northern region where interviews were conducted. After these lubricants are sold, used lubricants are expected to be used as feedstock for recycled heavy oil.

For Chevron, known as the Caltex brand, there is information published by NMK LLC[31] (Table 2.2.3.2.3). Chevron operates a B2C business in the North and South selling directly to consumers through retailers, mainly supplying engine lubricants (MCO, PCMO) and industrial oils to SMEs. In the B2B business, the company sells lubricants directly to users as well as through distributors throughout Vietnam for industrial and marine applications.

According to the 2018 report, the Caltex brand market share is estimated at 6.2 to 6.4% in 2017. The main product is engine lubricants, accounting for 75% of total sales. From 2018 onward, the market share of the company has been decreasing due to new market entrants such as JX Nippon Oil & Energy Vietnam Consulting and Holdings and Idemitsu Lube Vietnam.

[30] VEA（2020/07/26）List of hazardous waste disposal facilities: http://vea.gov.vn/detail?$id=910

[31] NMK LCC (Market Research @ Vietnam: Chevron Caltex Lubricant Vietnam updated): https://www.nmkin.com/blogs/invest-in-vietnam/market-research-vietnam-chevron-caltex-lubricant

Table 2.2.3.2.2 Interview results on lubricant production and imports
(Source: Prepared by the survey team based on interviews)

Lubricants manufacturer/importer	Production /Import	Unit	Remarks
Local lubricant importer and manufacturer A	2,750	t/y	Import raw materials for production
	3,000	t/y	Import recycled lubricants from Australia
Local lubricant importer and manufacturer B	1,350	t/y	Forecast for 2024
Local lubricant importer and manufacturer C	7,500	t/y	Expecting 60,000 tons/year as Vietnamese market for lubricating oil
Foreign lubricant manufacturer A	18,000	t/y	Actual results in 2022
Foreign lubricant manufacturer B	28,500	t/y	From the 2022 interview. 95% of the market is in Vietnam
Foreign lubricant manufacturer C	32,400	t/y	From the 2023 interview.
Total	93,500	t/y	

(Converted at 1 liter = 0.9 kg)

Table 2.2.3.2.3 Lubricant sales by Chevron Lubricants Vietnam Ltd.
(Source: Prepared by the survey team based on NMK LLC)

Fiscal year	Sales results (unit: t/year)			
	Total	Engine (75%)	Industrial (15%)	Marine (10%)
2016	32,500	24,375	4,875	3,250
2017	29,500	22,125	4,425	2,950

According to Polaris Market Research and Consulting, the marine lubricants market is expected to grow at a compound annual growth rate (CAGR) of 2.4% during the period 2018-2030. Noteworthy among these is the market expansion in the Asia-Pacific region (Figure 2.2.3.2.5).[32]

Chevron also sells marine lubricants, and since this research project is being conducted under the city-to-city collaboration programme between Hai Phong city and Kitakyushu city, it is necessary to consider the recovery measures for used lubricants discharged after ship maintenance at Hai Phong Port.

[32] Polaris Market Research and Consulting：https://www.polarismarketresearch.com/industry-analysis/marine-lubricants-market

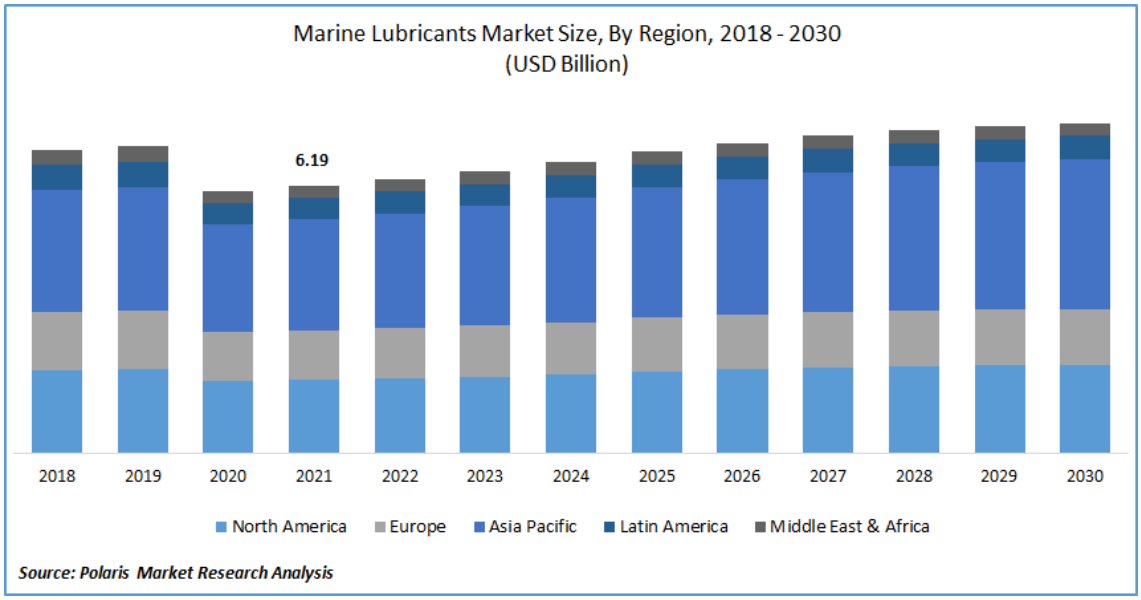


Figure 2.2.3.2.5 Regional Comparison of Marine Lubricants Market Trends (Forecast)
(Source: Polaris Market Research and Consulting)

At Chevron, 10% of total lubricant sales (about 3,000 tons/year) are for marine use. In addition, local lubricant importer and manufacturer A (Table 2.2.3.2.2), with whom we conducted interviews this time, collects 3,000-5,000 t/year of waste oil containing water (bilge) discharged from ships and estimated that about 50 times that amount (150,000-250,000 t/year) may be generated from ships Although the specific estimated amount needs to be further examined, it was thought that bilge from ships could be one of the targets for raw material collection.

(3) Collection of used lubricants

Recoverable amount of used lubricating oil

According to the Japan Lubricants Association, of the 1.55 million kL of lubricant sold in Japan, 820,000 kL is lost due to use, resulting in the generation of 730,000 kL (47%) of used lubricant. Of this amount, 600,000 kL of used lubricants are recovered, or about 36% of the total lubricant sales volume (Figure 2.2.3.4.6).

As shown in Table 2.2.3.1.1, assuming that Vietnam's lubricant sales of automotive engines in 2024 are expected to be about 220,050 t/year and that the same recovery rate as in Japan (about 36%) is achieved, the recoverable volume of used lubricating oil from the Vietnamese automotive sector is expected to be about 79,000 t/year.

In addition to the automotive sector, industrial and marine lubricants can also be expected as raw materials. However, as Vietnam is longitudinal, extending approximately 1,650 km from north to south, it is necessary to estimate the generation of used lubricants considering the characteristics of the industrial distribution in each region. For this reason, this section only estimated the amount of used lubricant expected to be generated from the automobile sector.

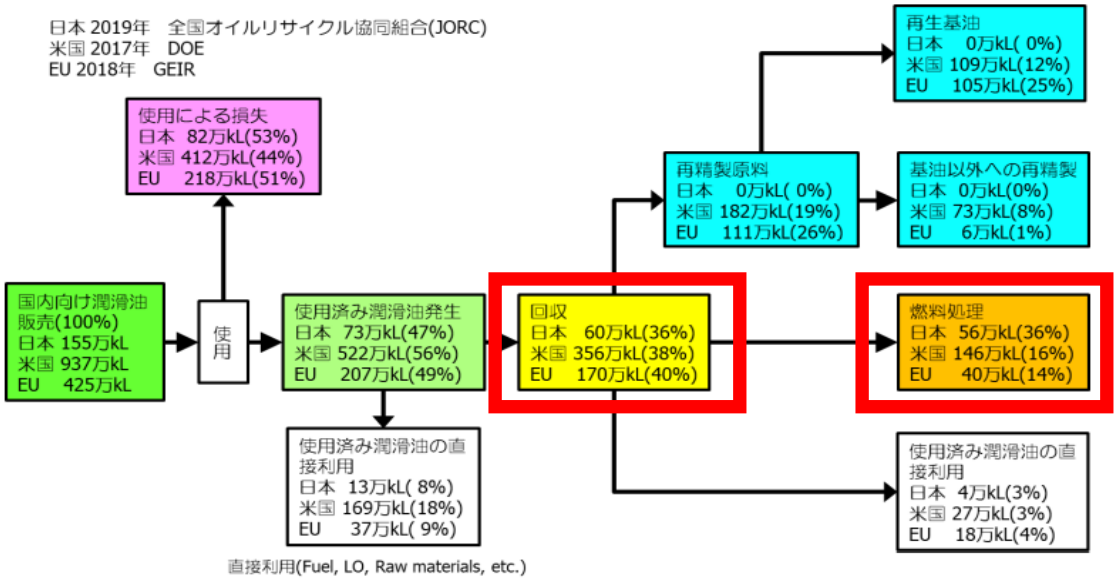


Figure 2.2.3.4.6 Comparison of lubricant recycling flow in Japan, the U.S., and the EU
(Source: Japan Lubricants Association[33])

Conditions for recovery of used lubricating oil

Waste oil and used lubricants generated at manufacturing plants are picked up by contracted hazardous waste disposal companies in a manner that corresponds to the agreed-upon packing method.

On the other hand, to fulfil the collection obligations stipulated in the EPR, lubricant manufacturing and sales companies, importers and distributors, and motorcycle and automobile manufacturers must establish a collection network, and each company is in the study phase. However, although sales networks such as distributors and repair shops have been established, no venous network for the collection of waste oil and used lubricants seems to have been constructed. The survey team often heard that when they asked distributors to collect used lubricating oil, the distributors did not cooperate. The main reason seems to be that there are only a few sales agents directly managed by the manufacturer, and since they have no capital relationship with the agents, they are unable to thoroughly manage waste handling.

In addition, many distributors sell used lubricating oil to collectors as valuable resources, and the drums that are their containers are also valued, so unless they are offered better terms (purchase price) than what they are currently selling, there is no incentive for manufacturer-led collection of used lubricating oil. It is expected to be even more difficult to increase the used lubricant recovery rate by involving multiple distributors who handle multiple brands. Although there were scattered cases where some companies paid a processing fee and outsourced the processing, there were many cases where the oil was sold as valuable resources (Table 2.2.3.2.4).

[33] Lubricants Association of Japan: Survey and Analysis Project on Measures for Stable Fuel Supply in FY2021 (Survey and Analysis Project on Diversification of Raw Material Security for Stable Supply of Lubricants) Survey Report (For Publication) (March 2022)

Table 2.2.3.2.4 Results of interviews regarding conditions for collecting used lubricants
(Source: Prepared by the survey team based on the results of interviews)

No	Industry	Waste oil recovery conditions		Remarks
		Sell for value	processing fee	
1	Waste collection/processing companies	○		If there are many impurities, a processing fee will be charged.
2	Waste collection/processing companies	○		Waste engine oil purchase price: VND3,000~5,000/kg
3	Waste collection/processing companies		○	Waste lubricating oil processing fee: VND1,000~6,000/ℓ
4	Waste collection/processing companies	○		VND8,000/kg (The price of waste oil varies depending on the fuel price)
5	Waste collection/processing companies	△	△	If the quality is low, we will charge a processing fee/If it is beautiful, we will purchase it.
6	Waste collection/processing companies			Purchase of waste lubricating oil: VD8,000/ℓ
7	Lubricating oil import and sales	○		Purchase price of waste lubricating oil: VND10,500~11,000/ℓ (bilge)
8	Japanese motorcycle manufacturing and sales	○		Dealers sell used lubricating oil at a bargain price.
9	Japanese motorcycle manufacturing and sales	○		VND8,000/kg to 10,000/kg
10	Japanese motorcycle manufacturing and sales	○		Sell used oil
11	administrative agency	○		VND7,000~8,000/ℓ
12	Cement manufacturing and sales		○	Waste liquid is accepted at a processing fee and used without processing.
13	OA equipment manufacturing and sales		○	Pay a disposal fee for waste oil (processing unit price varies depending on composition)
14	Chemical manufacturing and sales		○	Incineration after paying the disposal fee
15	Waste collection/processing companies	○		Car dealers sell used oil
16	Lubricating oil manufacturing and sales	○		Car dealers sell used oil
17	Lubricating oil manufacturing and sales	○		Buy used lubricating oil
18	Lubricating oil import and sales	○		Purchased at VND8,000/ℓ

Operation and proper disposal of manifests

Since lubricating oil is hazardous waste, the law states that only businesses holding a hazardous waste license can handle it. However, since the responsibility of waste generators is not clearly defined, this seems to be the cause of allowing inappropriate disposal and rampant unlicensed operators.

Regarding the operation of hazardous waste manifests (Figure 2.2.3.2.4), most Japanese companies

seemed to be operating relatively properly. On the other hand, the reality is that unlicensed companies are rampant, and even hazardous waste licensees were found to be making false reports to increase the amount of hazardous waste handled beyond their own permitted quantities (Table 2.2.3.2.5).

Table 2.2.3.2.5 Interview results regarding hazardous waste manifest operation and proper treatment
(Source: Prepared by the study team based on the results of interviews)

No	Industry	Manifest operation	Remarks
1	Waste collection/processing companies	×	Although it is not their company, they knew that false reporting is rampant (more than 3 tons will be punished)
2	Waste collection/processing companies	―	In Vietnam, it is common to be asked to collect various types of waste in bulk from the waste generator. Therefore, if you do not take over the work even if you do not have permission, the work will be taken over by another company.
3	Waste collection/processing companies	×	Although it is not their company, they know that some dealers falsify manifest. A black market for waste oil is being created. Even if they do not have recycling facilities, many underground businesses purchase waste oil and resell it as a product.
4	Waste collection/processing companies	×	Many underground businesses do not have a license.
5	Lubricating oil import and sales	―	In the waste oil market, there are 10% licensed operators and 90% illegal traders.
6	Japanese motorcycle manufacturing and sales	―	There is a reality that the collection is not carried out by the company itself, but by an unauthorized company.
7	Parts manufacturing and sales	○	The company uses manifests thoroughly.
8	Japanese motorcycle manufacturing and sales	○	The company operates a manifest.
9	Japanese automobile manufacturing and sales	△	The respondent did not know much about manifests
10	Engineering	×	The reality is that only Japanese companies are seriously implementing manifest.
11	Administrative agency	―	The respondent was aware that underground traders are actively conducting transactions.
12	Logistics	―	There is a black market for raw materials.
13	Lubricating oil manufacturing and sales	―	The respondent is concerned about the dark side of waste collection companies.
14	Tire manufacturing and sales	○	There was a problem when changing the waste collection company.

(4) Disposal of used lubricating oil

Status of used lubricating oil disposal

According to the results of an interview with a hazardous waste licensee, in Vietnam, it does not matter whether the licensee has obtained a hazardous waste handling license or not; after water and foreign substances are removed from used lubricating oil with filters, etc., it is widely reused as lubricating oil for diesel engines of ships and agricultural tractors. According to the JETRO report, a black market has formed in which waste lubricating oil is collected by unauthorised operators and

used as raw materials for counterfeit products. [34] Table 2.2.3.2.6 summarises the actual disposal of specified lubricants obtained directly from the interviews in this study.

Table 2.2.3.2.6 Interview results regarding waste liquid treatment methods
(Source: Prepared by the study team based on the results of interviews)

	Industry	Facility		Remarks
1	Waste collection/processing companies	distillation	○	Produce DO 70%/FO 10% using distillation equipment, heated at normal pressure 350-450℃
		incineration	○	Remove only impurities and incinerate them to prevent pipes from clogging
2	Waste collection/processing companies	distillation	―	
		incineration	○	The collected waste oil is used as fuel in the incinerator.
3	Waste collection/processing companies	distillation	△	Producing FO using tyre oil conversion equipment
		incineration	○	Incineration capacity 500kg/h
4	Waste collection/processing companies	distillation	○	Capacity is 25t/day based on raw materials, oil is used in our incinerator
		incineration	○	Incineration capacity 500kg/h
5	Waste collection/processing companies	distillation	―	(filter?) Impurity removal device
		incineration	○	incinerated after removing impurities
6	Japanese motorcycle manufacturing and sales	distillation	―	
		incineration	●	The outsourced company incinerates it
7	Waste collection/processing companies	distillation	○	Normal pressure 350℃, 5t/day, using the produced FO for their consumption at the incinerator
		incineration	○	Waste to energy facility (180t/day)
8	Cement manufacturing and sales	distillation	―	
		incineration	●	The respondent knew a company that uses it in an incinerator after simple processing
9	Chemical manufacturing and sales	distillation	―	
		incineration	●	Incineration after paying the disposal fee
10	Waste collection/processing companies	distillation	○	120℃ vacuum distillers (5,000kg/day) used in in-house secondary aluminium smelting
		incineration	○	Incineration capacity 3t/h (total of 2 units)
11	Waste collection/processing companies	distillation	○	New processing machine under construction: tyre oil converting equipment (60t/4 units will produce FO)
		incineration	○	Incineration capacity 10t/h (total of 3 units)

● Situation at the outsourcing company

*FO: Fuel oil. Generally speaking, gasoline, diesel oil, and heavy oil are used for ships. Diesel oil is sometimes expressed as GO and heavy oil is sometimes expressed as DO.[35]
In Vietnam, it generally refers to diesel oil (DO) and fuel oil (FO).

[34] JETRO, Hanoi Office: 2015 "Survey on Distribution of Counterfeit Goods and Intellectual Property Rights Infringing Goods in Vietnam".
[35] Institutional glossary: https://www.jmets.ac.jp/miyako/news/o8vhbj0000000h6v-att/o8vhbj0000000h8y.pdf

Hazardous waste licensees

In many cases, used lubricants collected by hazardous waste licensees were soaked in fibre scraps and other materials collected separately and incinerated after the moisture was removed by filters and other means. In other cases, the oil was distilled in an atmospheric distillation facility and then used as fuel for their incinerators (Table 2.2.3.2.6).

In the FY2022 survey, most of the incinerators owned by the waste management companies visited were small, with a capacity of about 200 kg/h. Combined with the results of this year's survey, this suggests that relatively small incinerators with treatment capacities of 200-500 kg/h are commonly used.

Bottom ash and other materials from incinerators are used to make blocks in the company's facilities, and some treatment businesses said that their employees take them home to use, but there are concerns about health hazards, such as leaching of heavy metals.

Unlicensed contractors

The first step in the proper treatment and recycling of used lubricants is the collection of used lubricants. However, its effectiveness is questionable in a situation where improper trade by unauthorised vendors is not regulated.

According to the results of interviews with one government-affiliated organization, they were aware of the existence of companies that collect used lubricants regardless of their licenses, process them, and sell them as fuel for torches and kitchen stoves, among other things.

As a specific example of improper disposal, a case of illegal trade in Dong Nai Province was reported. Used lubricating oil generated from motorcycle repair stores was purchased by an unauthorized small-lot collector for VND 4,000/ℓ, purchased by another unauthorized collector at the transhipment point for VND 6,000/ℓ, transhipped into drums, and delivered by truck to an illegal processing facility (If the small-lot collectors brought the material directly to the illegal processing facility, they paid VND 6,500/ℓ.) At the illegal processing facility, the fuel was distilled in a simple distillation facility and then sold as a low-grade fuel. [36]

Decree 155/2016/ND-CP stipulates penalties ranging from VND 10,000,000 (approximately JPY 60,000,000) to VND 250,000,000 (approximately JPY 150,000,000) for the collection of hazardous waste by unlicensed operators and transportation to unlicensed facilities. On the other hand, penalties ranging from VND 200,000,000 (approximately 120,000 yen) to VND 250,000,000 (approximately 150,000 yen) are prescribed for the unauthorised disposal of hazardous waste.

If improper trade and disposal are not properly supervised and regulated, not only will the environmental impact and safety risks increase, but also businesses that have properly applied for and obtained hazardous waste licenses will not be able to recover hazardous waste, which will prevent the development of a healthy venous industry and make it impossible to properly evaluate EPR measures themselves.

(5) Recycling of used lubricants

Actual condition of used lubricating oil recycling

As summarized in Table 2.2.3.2.6, five of the eight waste recovery and processing companies interviewed had distillation facilities. Few operators owned decompression distillation facilities, and it was estimated that atmospheric distillation facilities with a processing capacity of 5 to 30 t/day were common. In many cases, DO was produced in the distillation unit and used as fuel for the company's incinerator, although it is questionable how much advantage there is in producing DO using energy at about 350°C and using it as fuel for the company's incinerator. However, there did not seem to be any intention to aggressively market DO externally, perhaps because the company does not have much production capacity.

Challenges in recycling used lubricants

Through this study, it became clear that the trade in waste oil and used lubricants is mixed, with the arterial and venous markets unorganized. One lubricant importer and distributor commented that in

[36] VIETNAM.VN：https://www.vietnam.vn/en/theo-chan-ret-thu-gom-nhot-thai/

the Vietnamese market for waste oil, the trade is intermingled with 90% unlicensed operators for 10% license holders. If this is true, then the waste oil market is a dominant market for unlicensed operators.

Several hazardous waste licensees commented that the handling of used lubricating oil is difficult to make it a viable business because there are many areas where rules have not been established, and ultimately, they end up competing with unlicensed businesses for the waste oil, making it difficult to compete properly with unlicensed businesses that do not care about capital investment and management costs.

On the other hand, there seems to be a lack of willingness on the part of those using alternative fuels. Several cement companies expressed hesitation to use alternative fuels due to the lack of Vietnamese national standards (QCVN and TCVN) for such fuels.

Since QCVN is a process standard and TCVN is a product standard, VIBM thought that it would be appropriate to standardise a standard equivalent to the Japanese recycled heavy oil (JIS K 2170) in TCVN. There was information that MONRE is moving toward the revision of QCVN:56/2013 on waste oil recycling, but MONRE commented that it will inevitably take time because many departments are involved. Although it may not be easy to achieve early realisation, it is necessary to urge the authorities to standardise recycled heavy oil in TCVN and to include the process of recycled heavy oil conversion in the revised version of QCVN:56/2013.

A common issue among the companies related to EPR for used engine lubricants was the fact that the presence of unlicensed operators is a major obstacle for motorcycle and automobile manufacturers in establishing used lubricant collection channels. Since distributors and multi-dealers currently sell used lubricants to unlicensed operators, it seems difficult for them to establish used lubricant collection channels unless they are offered more attractive incentives than they are currently offered or unless they are subject to stricter enforcement.

(6) Lubricant recycling in Japan and other developed countries

As shown in Figure 2.2.3.4.6, there are differences in the way lubricating oil is reused in different countries.

In Japan, more than 90% of recovered used lubricating oil is re-refined (converted to recycled heavy oil). In the U.S., about half is re-refined and about 41% is converted to recycled heavy oil. EU has the highest re-refining rate at about 65% but also has about 24% (about 1/4) that is converted to recycled heavy oil.

In the U.S., the main method of utilisation was to convert to recycled heavy oil until 2007, but the ratio of recycled base oil has increased due to soaring crude oil prices and other factors, and now conversion to recycled base oil is the main method of recycling. In the EU, the use of recycled heavy oil is being guided to be reduced to reduce CO2 emissions, and this seems to be the background for the development of re-refining in quantity and quality compared to the other two countries (Japan and the U.S.). [37] Although there are differences in the circumstances in each country, it is clear that there is demand for recycled heavy oil conversion in developed countries other than Japan, and that it accounts for a certain amount of recycling of used lubricating oil.

As shown in Figure 2.2.3.1.1, extracting base oil from used lubricants requires a considerable amount of energy, and there are concerns about CO2 emissions and increased costs. At the same time, the economic perspective of how to meet market needs cannot be ignored.

As shown in Figures 2.2.1.1 and 2.2.1.2, coal and crude oil prices have not returned to their pre-invasion peaks, although they are calmer than at the time of Russia's invasion of Ukraine, and remain high, indicating strong demand for alternative fuels. We confirmed that demand for alternative fuels is as high among Vietnamese cement companies and secondary aluminium smelters as it is in Japan.

As clarified in the previous section, "Challenges in recycling used lubricants", it is important to meet the high demand by satisfying three "security" requirements:

- The first security is quality. This is because the development of a processing process standard (QCVN) and product standard (TCVN) for recycled heavy oil will enable both the buyer and

[37] Lubricants Association of Japan: FY2020 Survey on Measures for Stable Fuel Supply (Survey and Analysis Project on Diversification of Raw Material Security for Stable Supply of Lubricants) Survey Report (2021) (in Japanese).

the producer (seller) to confirm the uniform quality of the product. Standardisation of these recycled products will also add a legal endorsement.

- The second security would be the traceability of hazardous waste. Waste oil, including used lubricants, is regulated as hazardous waste in Circular No. 36/2015/TT-BTNMT. It is expected that the traceability of hazardous waste will increase and the effectiveness of EPR will be enhanced by creating an environment that makes it easier for hazardous waste licensees to operate, such as by more strictly operating Decree 155/2016/ND-CP.
- The third security may be paraphrased as "stability". It means that quality, quantity, price, etc. are maintained stably. Daiseki's recycled heavy oil conversion process shown in Figure 2.2.1.2 uses heat of about 100°C, but the main process is a simple one, such as the removal of foreign matter and moisture, which reduces energy consumption compared to the distillation process. Therefore, it is possible to produce a large number of outputs stably while keeping processing costs lower than distillation. This is expected to provide continuous benefits to both the supplier and purchaser.

2.2.3.3. Demand for recycled used lubricants

As shown in Table 2.2.3.2.6, fuel oil alternatives (FO) are already in use in Vietnam. Most of them are made from used tyres converted to oil. Some of the companies interviewed in this study also use FO as fuel for their incinerators and boilers. It is rated to have a similar calorific value as heavy fuel oil (FO-TCVN 6239:2019) and appears to be used in brick mills, incinerators, steel mills, and cement plants. [38] One cement company has confirmed the use of HFO (Heavy FO) in their kiln starter.

In some cases, waste oil was distilled to produce diesel oil (DO). In some cases, such as one hazardous waste licensee, DO was sold as an alternative diesel fuel for trucks, but much of it appeared to be consumed in-house.

For waste oil recycling, QCVN 56:2013/BTNMT specifies the components of waste oil that can be handled and their processes. Regarding the method, it specifies (1) physical/mechanical methods, (2) non-distillation (physicochemical), and (3) distillation. Daiseki's recycled heavy oil conversion process is considered to fall under (1) the physical/mechanical method, but it is necessary to confirm that the process is complying.

Table 2.2.3.3.1 shows the types and prices of recycled oil identified in the interviews.

[38] DAI：https://ngocentre.org.vn/files/20230425-sow-oil-and-carbon-black-from-rubber-through-pyrolysis.pdf

Table 2.2.3.3.1 Results of interviews on recycled oil prices
(Source: Survey team based on interview results)

No	Industry	Types of recycled oil	Recycled oil price	Remarks (where to use, etc.)
1	Waste collection/processing companies			Glass factories, ceramic factories, brick factories, agricultural product drying facilities, ships, etc.
2	Waste collection/processing companies			Sales to glass factories
3	Waste collection/processing companies			Fuel for boilers in ceramic factories, glass factories, etc.
4	Waste collection/processing companies	Lubricant	VND16,000/ℓ	
5	Cement manufacturing and sales	HFO	VND13,000-15,000/ℓ	Blowing from the burner
6	Lubricating oil import and sales	Lubricant	VND15,000-17,000/ℓ	Application of recycled lubricant: for agricultural machinery Difference between DO and FO is about VD 5,000 to 7,000/ℓ
7	Aluminium secondary smelting	FO	VND12,200/kg	FO derived from tires (purchased 70-80t/month)

[Reference: new price] Price determined by the Ministry of Commerce and Industry and the Ministry of Finance on April 4, 2023[39]

- Diesel oil (light oil): VND 19,430/ℓ
- Heavy oil: VND 14,429/kg

2.2.3.4. EPR system

(1) EPR system overview

Extended Producer Responsibility (EPR) has been spreading since around the 1990s, especially among developed countries, and has been incorporated into environmental policies in many countries since the Organization for Economic Cooperation and Development (OECD) published its guidelines in 2016. The OECD defines EPR as “an environmental policy approach that extends the responsibility of producers for their products to the post-life cycle phase of the product.” In other words, rather than placing the responsibility for post-disposal treatment of products on the consumer or the local government, producers should consider the product's design and manufacturing stages as well as disposal and treatment, and be involved responsibly to optimise resource recycling and reduce negative environmental impacts throughout the product’s life cycle. This is to optimise resource recycling and reduce negative environmental impacts throughout the product lifecycle.[40]

Vietnam became a pioneer adopter of EPR within the ASEAN region with the enactment of the Law on Environmental Protection (Law No. 72/2020/QH14) in January 2022. Under the Law, producers and importers are now required to take responsibility for the recycling and disposal of their products and packaging. The enactment of the law has helped to clarify the trend toward reducing pollution, promoting sustainable behaviour, and building a circular economy model in Vietnam. [41]

Vietnam’s legal framework for EPR is laid out in the Law on Environmental Protection, which outlines the basic principles, and Decree No. 08/2022/ND-CP, which outlines the detailed rules and

[39] Poste Company Limited: https://poste-vn.com/news/2023-04-04-14546

[40] OECD：https://www.oecd.org/environment/extended-producer-responsibility.htm

[41] CHEMLINKED (Vietnam Extended Producer Responsibility (EPR) Regulations): http://tinyurl.com/yqw5ep83

regulations for implementation. Articles 77-86 of the Decree provide detailed provisions on the EPR system stipulated in Articles 54 and 55 of the Law, including the list of regulated items, recycling rate, environmental protection fund, formulation of recycling plan, obligation to disclose product information, and reporting of recycling results.

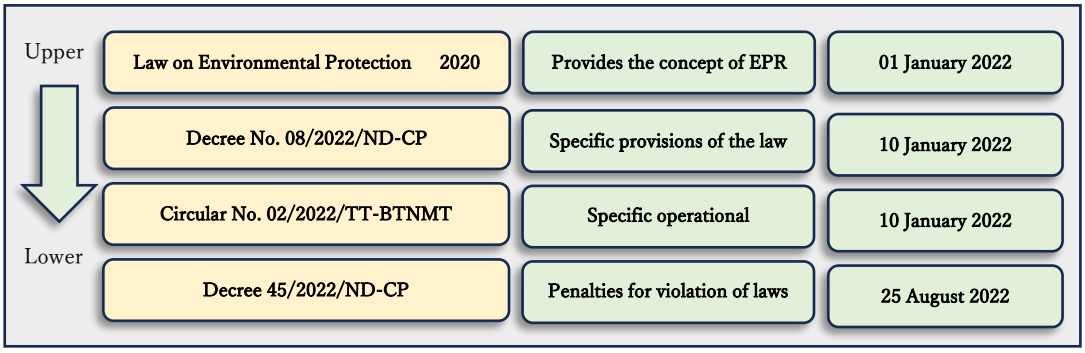


Figure 2.2.3.4.1 Legal framework for EPR in Vietnam
(Source: Prepared by the study team based on CHEMLINKED)

The EPR system stipulates that producers and importers are obligated to either (1) recycle or (2) donate to the Vietnam Environmental Protection Fund (VEPF). Those who choose to (1) recycle must submit and register a recycling plan to MONRE every year and report the actual recycling results. If they choose to recycle, they can also choose to recycle in-house or outsource recycling to other companies. (2) Regarding financial contributions to the VEPF, the government ordinance stipulates that the rate is based on the quantity and number of products and packaging, that the money received by the VEPF is to be used solely for recycling, that the amount and use of the money is to be made public, and that transparency is to be ensured. In addition, the authorities have established an EPR office as an organization responsible for various support services, including consultation services related to EPR, and have put in place a system to deal with this issue (Figure 2.2.3.4.2).

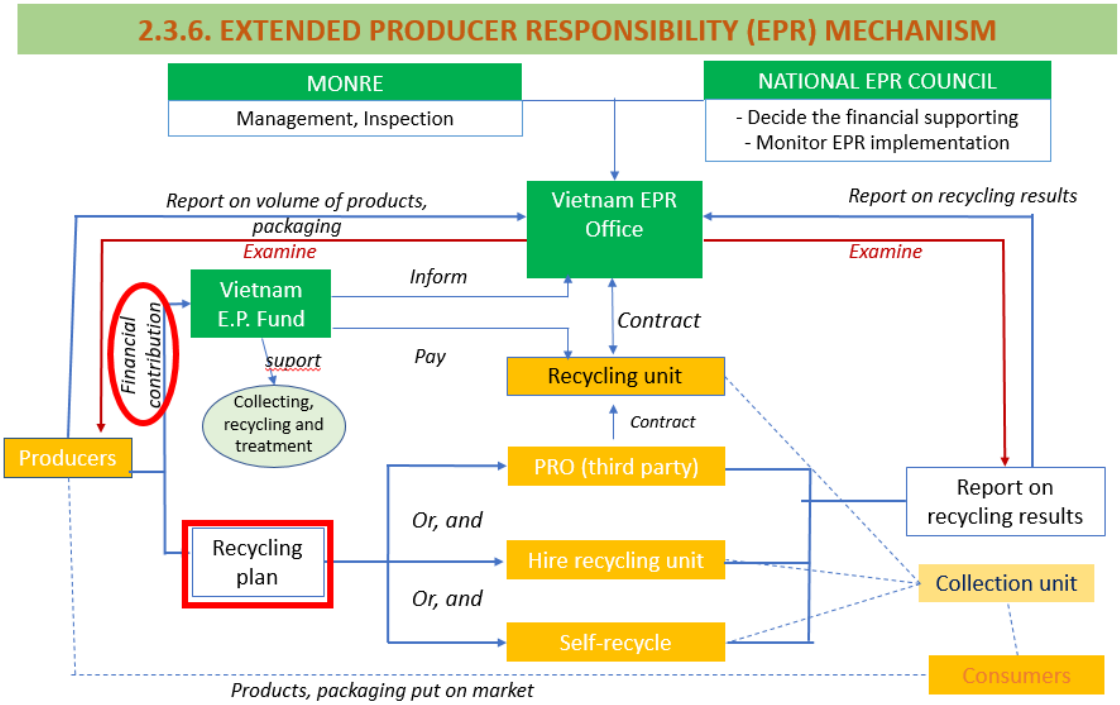


Figure 2.2.3.4.2 Conceptual Diagram of the EPR System in Vietnam
(Source: EPR Office)

The EPR has different enforcement start years depending on the items covered, with some items, including engine lubricants, starting in January 2024 (Figure 2.2.3.4.3).

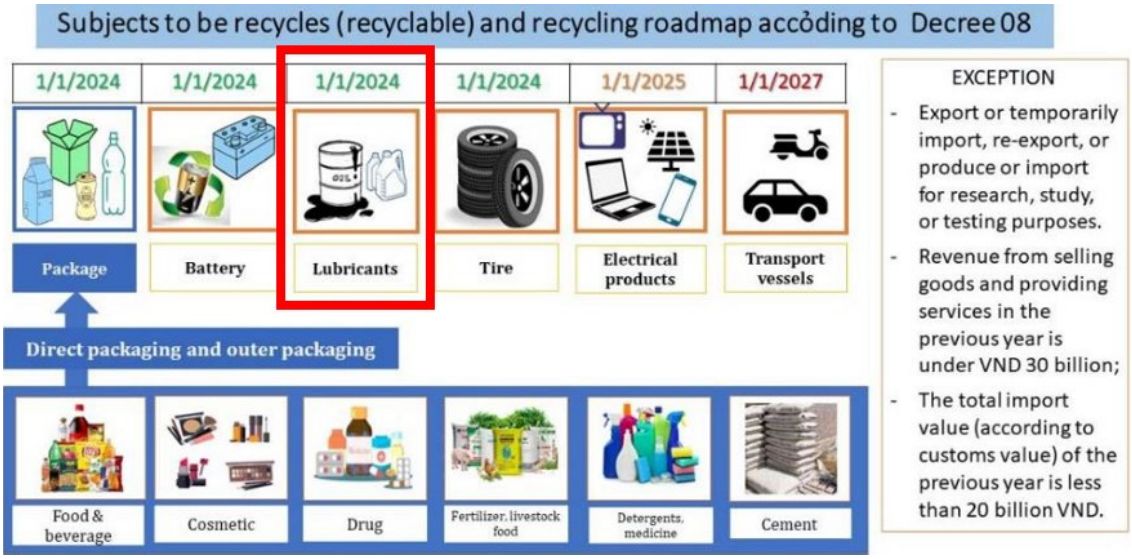


Figure 2.2.3.4.3 EPR target items and their enforcement starting time
(Source: National EPR Office)

(2) Overview of EPR lubricant for engines

Concerning EPRs for engine lubricants, the target is that 15% of the annual sales and imports will be collected and sent for recycling for the immediate three-year period starting in January 2024, with at least 40% of that amount specified as the yield rate that must become recycled products (Figure 2.2.3.4). These recovery and yield rates are subject to review after three years and may be revised upward.

TT (1)	Product subgroup (2)	Product list (3)	Recycling rate for the first 3 years (4)	Mandatory recycling specifications (recovery of at least 40% of volume of product and packaging materials collected for recycling in accordance with the mandatory recycling rate) (5)
C. OIL (LUBRICANT)				
17	C.1. Lubricants for engines	C.1.1 Engine oil	15%	Selected recycling solution: 1. Distillation of base oil or other oils. 2. Fractional oil recovery distillation.

Figure 2.2.3.4.4 Recovery and recycling rates and methodology in EPRs for engine lubricant (Source: Department of Legal Affairs, MONRE)

(3) EPR methodology for engine lubricant

A concern with EPR for engine lubricant is that distillation is the only recycling method specified (Figure 2.2.3.4.4). Two methods are specified for distillation: (1) distillation to extract base oil and other oils, and (2) distillation for oil fraction distillation.

In addition, there are no guidelines regarding the quality of the base oil after distillation or its intended use. Since lubricating oils are usually contaminated with additives, it is generally said that they will not meet the requirements for reusable base oils unless the impurities are removed by decompression re-distillation or other means.

The distillation process requires a lot of energy, which not only results in high CO2 emissions and costs, but also the yield of recycled oil is not high. Given the market situation in Vietnam, where demand for fuels is strong, there should be an option for re-fuelling (recycled heavy oil conversion). During the discussion with the EPR office, they expressed their understanding on this point and mentioned that they will consider adding this as one of the methodologies for engine lubricant EPR at the next opportunity to amend Decree No. 8.

(4) Subjects of the engine lubricant EPR (responsible entities)

As mentioned earlier, the subject of the EPR is defined as the manufacturer or importer of the relevant product. However, in the case of OEM products, the parties are concerned that the definition of “manufacturer” is unclear as to whether it is only the original lubricant manufacturer that is responsible for the product or whether it also includes the OEM supplier.

Guidelines have already been issued by MONRE based on Decree 43/2017/NO-CP to clearly state the responsibility in the sales contract and to clarify the responsibility of the EPR on the product package. However, among the interviewees interviewed for this study, a certain number of opinions were heard, such as that different MONRE officers have different views.

In addition, the EPR stipulates responsibility on the part of manufacturers and importers but does not stipulate responsibility on the part of waste generators (users). As for used lubricating oil, it is currently sold as a valuable resource, so the possibility of illegal dumping is expected to be low. However, few people in the interview said that supervision or crackdowns are being conducted on activities such as selling to unlicensed businesses that improperly dispose of used lubricants. Since used lubricants are inherently designated as hazardous waste, the operation of manifests is mandatory, but it appears that this is not thoroughly enforced (Table 2.2.3.2.5).

(5) Amount paid by the responsible party assumed in the engine lubricant EPR

The team have estimated the amount that would be due if lubricant manufacturers or importers paid contributions to the VEPF, based on data collected from interviews with relevant organizations (Figure 2.2.3.4.5). Since the coefficients used have not yet been officially released by MONRE, this is only a reference value that the survey team estimated on its own.

If a lubricant manufacturer manufactures and sells 1,000 tons of engine lubricant per year, its contribution to VEPF will be VND12,978,000,000, which is converted to JPY 11,894,337 (VND 1 = JPY 0.00611).

Product grouping, packaging	Category	Recycling cost (VND/kg)		Administrative expenses(VND/kg)	Fs(VND/kg)
		Cost of collection, transportation, recycling(VND/kg)	Adjustment factor		
(2)	(3)	(4)	(5)	(6) = (4) x (5) x3%	(7) = (4) x (5) +(6)
C.1. Engine oil	C.1.1. Engine oil	18,000	0.7	378	12,978

Fs(VND/kg)	Estimated sales volume (t/y)	JPY Conversion of Funds	Assumed amount of fund (obligation to collect)
	1,000	0.00611	15%
(7) = (4) x (5) +(6)	VND/year	JPY/year	JPY/year
12,978	12,978,000,000	79,295,580	11,894,337

Figure 2.2.3.4.5 Estimated contribution amounts required to be paid to VEPF by businesses producing and selling 1,000 t/year of lubricating oil
(Source: Own estimates based on data collected by the survey team in interviews)

The coefficients used in the estimation in Figure 2.2.3.4.5 are not yet definite values, so it is necessary to monitor future decisions closely, but it suggests that the contribution to the VEPF is not a negligible amount.

Due to the high cost of contributions to the VEPF, industry associations such as VAMM are beginning to establish their recycling loops in the industry to collect and recycle. In the future, each company will likely accelerate its efforts to recycle. In addition, lubricant manufacturers and distributors may be forced to pass on the price of lubricant to OEM products due to the increased burden of the VEPF contribution.

In any case, these costs must ultimately be borne by Vietnamese consumers. If a large amount of resources, including funds, are to be spent on the EPR, it is desirable to spend resources on creating an environment in which the venous industry can grow in a cost-effective, technologically and operationally appropriate manner.

(6) Amendments to the regulation on engine lubricant EPR

MONRE, led by the Department of Legal Affairs and the EPR Office, have held several briefing meetings on EPR in major cities such as Hanoi and Ho Chi Minh City and has received various inquiries and suggestions. The Japanese Chamber of Commerce and Industry of Vietnam (JCCI) and other industry organizations have also compiled various inquiries received from member companies and submitted proposals to MONRE. Through this survey, Daiseki, with the cooperation of the JCCI secretariat, was also able to ask questions and make recommendations to MONRE through the said chamber.

On December 1, 2023, the Embassy of Japan in Vietnam and JICA Vietnam co-hosted the “Joint Workshop on EPR Policy and Regulations” (see 3.2. Relevant International Conferences) where the team was able to participate and ask questions to the EPR Office. On December 6, 2023, the team visited the EPR office and exchanged opinions directly with the EPR office. On these occasions, a

statement was made that the EPR Office would consider adding methods other than distillation to the recycling methodology for engine lubricant EPR on the occasion of the revision of the law in Decree No. 8.

MONRE is in the process of revising Decree No. 8, and a draft revision will be submitted and discussed by early 2024. However, it is necessary to obtain the confirmation and approval of ministries other than MONRE to add new methodologies to the revised law, and it will take a reasonable amount of time.

2.2.3.6. Information gathering, lobbying and dissemination

The administrative response regarding the EPR, including the implementation of the EPR from January 2024 and the enforcement of the revised law, was practically handled by only three officers in the EPR office, and the situation had become normalised where it was difficult to contact them due to the large number of inquiries handled from outside the office.

Since there are many unclear points and questions regarding the current Decree No. 8, companies with industry associations such as VAMM and VAMA have been collecting, lobbying, and disseminating information through their industry associations, and companies without industry associations have been collecting, lobbying, and disseminating information through JCCI, the Embassy of Japan in Vietnam, JICA Vietnam, and others.

Since the beginning of this study, the team have made numerous attempts to contact MONRE to ask questions and provide information on the engine lubricants EPR, but the opportunity did not materialise. However, with the support of JICA Vietnam, the Embassy of Japan in Vietnam, and JCCI, the following questions and suggestions were made to MONRE.

- Questions and suggestions regarding provisions for recycling methodologies (methods other than distillation)
- Questions and suggestions on how to calculate recycling performance
- Questions regarding the scope of extended producer responsibility
- Suggestions on regulation of activities of unauthorised operators in the used lubricants market and thorough implementation of manifest operations

In addition, Daiseki gave lectures at industrial meetings of some JCCI branches (Hai Phong Division, Northern Division, and Western Division), which provided an opportunity to share information and deepen understanding of the recycled heavy oil conversion business model (Figure 2.2.4.5.1) in which an alliance of Japanese companies works together to solve problems.

During the lecture, the team conducted a questionnaire survey of the participating companies. In addition to their impressions of the lecture, the team was able to ask them about their challenges and needs in terms of waste management.

On December 1, 2023, a “Joint Workshop on EPR Policy and Regulations” was co-organised by the Embassy of Japan in Vietnam and JICA Vietnam, which the team had the opportunity to attend (see 3.2. Relevant International Conferences). At the workshop, the MONRE’s Department of Legal Affairs and the EPR Office, which have jurisdiction over the EPR system, participated in the explanation of the EPR, and participants were able to obtain answers to their questions directly from MONRE. Daiseki also had the opportunity to ask questions. The questions and the answers from the head of the Department of Legal Affairs or the officer of the EPR Office were as follows.

[Question 1] There is no provision for engine lubricant recycling, such as where to use the products after distillation. In addition, only distillation is specified as the methodology. If recycling does not proceed by distillation alone, will a new method be added?

[Answer 1] Only two methods for recycling engine lubricating oil are currently allowed (both distillation), but consideration will be made to reflect other methods in the revised version of Decree No. 8.

Question 2: Who will determine how recycled products will be used after distillation?

[Answer 2] It will be determined if the recycled materials can be used as a product. If it can be proven that it can be used as a resource, we would like to have it proven. It is not stipulated who has the right to decide it.

2.2.3.7. Japan visits

To commercialise the conversion of recycled heavy oil and auxiliary fuel in Vietnam in the future, it is important to deepen understanding of the effectiveness, safety, and economic efficiency of these technologies among the government agencies that issue licenses and the companies that will become local partners. The team believes that the most effective way to do this is to have the relevant partners visit processing plants and factories that use recycled products directly and listen to what they have to say on the ground, so the team organized a visit to Japan by the parties concerned.

To this end, five participants were invited to Japan, two from MONRE's EPR office and three from Daiseki's potential business partner company in Vietnam and its affiliated companies. In addition to inspections of facilities related to recycled heavy oil conversion, the tour also included a visit to an auxiliary fuel production plant and the cement factory that uses them, to gain an understanding of auxiliary fuels that are mainly used in cement factories, with a view to business development after the recycled heavy oil conversion project. In addition, since the automotive EPR will become mandatory in Vietnam in 2027, and recycling of motorcycles and car bodies will start, an automobile recycling plant was also included in the tour.

Schedule

Date: January 16 (Fire) to January 20 (Earth), 2024

Date and time	Destination	Location
January 16 (Tue)	Hanoi-Nagoya	
January 17 (Wed)	Head office & Nagoya plant, Daiseki Co., Ltd.	Nagoya
January 18 (Thu)	Kyushumetal Industry Co., Ltd.	Kitakyushu
	Kyushu plant, Daiseki Co., Ltd.	Kitakyushu
January 19 (Fri)	Kyushu factory, Mitsubishi UBE Cement Corporation	Kanda
	Miike Smelting Co., Ltd.	Omuta
January 20 (Sat)	Fukuoka - Hanoi	

Invitees

Organizations	Affiliations	Name
Ministry of Natural Resources and Environment (MONRE)	EPR Office	Mr. Nguyen Van Phan
	EPR Office	Mr. Do Xuan Thuan
Thuan Thanh Environment Joint Stock Company	General Director	Mr. Vũ Mạnh Tiến
	Deputy General Director	Mr. Đoàn Văn Hữu
VSD Holdings Joint Stock Company	Business Development Division (also served as a translator)	Mr. Vũ Ngọc Minh

Outline

- At Daiseki's head office and Nagoya plant, the participants mainly observed the treatment process of recycled heavy oil conversion, followed by an exchange of opinions at the head office on the advantages of recycled heavy oil conversion, issues to be addressed in its widespread use in Vietnam, and data collection necessary for its commercialisation in the future.
- The participants observed the automobile recycling and home appliance recycling processes at Kyushumetal Industry. During the exchange of opinions after the visit, questions were mainly raised about the legal framework for automobile and home appliance recycling in Japan. It was pointed out that in Vietnam, laws are not yet in place and there are few end-of-life vehicles to be used as raw materials, but it is necessary to prepare for the introduction of automobile EPR in the future.
- At the Daiseki' Kyushu plant, the participants observed the treatment process for making auxiliary fuel for cement plants from waste liquids, waste acids, waste solvents, and other materials. They observed the latest equipment and tanks that have been added to meet the increasing demand for auxiliary fuels and exchanged opinions on the potential of auxiliary fuels.
- Mitsubishi UBE Cement Corporation's Kyushu factory is one of the largest cement plants in Japan, equipped with five kilns and 6 million tons of clinker is produced per year, and uses auxiliary fuel produced at the Daiseki's Kyushu plant as an alternative to coal. During the exchange of opinions after the plant visit, participants were able to hear the opinions of the users, such as the advantage of using auxiliary fuels as they are of more stable quality than RDF and other fuels, and can be used reliably.
- At Miike Smelting, the participants visited the smelting plant and observed the process of smelting zinc oxide where they accept incinerated ash from a general waste incinerator. Here, recycled heavy oil produced at Daiseki's Kyushu plant is used as fuel for the dryers. In an exchange of opinions after the visit, the participants noted the advantages of recycled heavy oil, including zero-counting of CO2 emissions and the fact that recycled heavy oil has low sulphur content, so there is no need to remove sulphur from the exhaust gas.

Fig. 2.2.3.7.1 Site visit tour at Daiseki's Nagoya plant (upper left and upper right), and group photo (lower left) and meeting (lower right) at Daiseki's headquarters (Source: taken by the survey team)

2.2.4. Feasibility and future development potential

2.2.4.1. Issues for commercialisation

Through this study, the team obtained an overview of the market in Vietnam, including the demand potential for alternative fuels, but it has also become clear that it is difficult to commercialise the conversion of used lubricating oil into recycled heavy oil on its own. The issues that need to be resolved to realise the project can be summarised into the following four categories.

- Recycling Methodology: Since distillation alone, which is the only method specified for engine lubricant EPR, is not considered to be sufficient to promote recycling, more realistic options such as recycled heavy oil conversion should also be increased to facilitate recycling.
- Crackdown on unlicensed operators: The trade of waste lubricants by unlicensed operators is so rampant that operators with hazardous waste licenses are unable to collect, recycle, and sell them at a fair price, preventing a healthy cycle market from developing.
- Clarify the responsibility of waste generators: In addition to manufacturer responsibility, it is difficult to promote the recovery of waste lubricants unless businesses (users) that discharge waste lubricants are given certain responsibilities, are asked to join the recycling loop, and have greater traceability of waste materials.
- Shortening the time to obtain permits: The demand for waste lubricant recycling is rapidly increasing with the implementation of the EPR, and if the opportunity is not seized now to commercialise the business as soon as possible, the business opportunity will likely be missed. To achieve early commercialisation, it is necessary to shorten the duration of permitting procedures such as hazardous waste disposal licenses and environmental impact assessments (EIAs).

2.2.4.2. Requirements for commercialisation

The main issues that must be overcome for commercialisation are those related to laws and regulations and the EPR mechanism, and these are mainly those that require collaboration with government agencies. In addition to resolving these issues first, it is necessary to collect more information and coordinate with related parties to increase the accuracy of the information to determine the feasibility of the project.

(1) Possibility of establishing a collection network for used lubricating oil and the amount of used lubricating oil collected

With the launch of EPR for engine lubricants in January 2024, industry associations such as VAMM and VAMA, as well as lubricant manufacturers and distributors, have already begun their moves toward collecting used lubricants. While cooperation with these industry associations will be most effective, there is also a need to confirm at an early stage the volume of used lubricants that can be collected independently, in case there is a discrepancy between the progress of this project and the speed at which each company or association is moving forward. In addition to motorcycle and automobile lubricants, the team leaned that there is a certain amount of market for marine lubricants. The team interviewed one company that collects used marine lubricants, but further investigation is needed.

(2) Off-takers (Terms of sale)

Interviews were conducted with one secondary aluminium smelting company and one ceramic manufacturer as potential customers for recycled heavy oil. The team was able to confirm the demand for recycled heavy oil and the possibility of shipping it to the secondary aluminium smelting company. On the other hand, the expected ceramic manufacturer was still using gas and had no plans to convert the fuel to recycled heavy oil.

Thus, even in industries where recycled heavy oil is expected to be used, the actual situation may differ from what is assumed. Therefore, in addition to the above two industries, surveys also should be conducted with paper companies (Figure 2.2.4.2.1) and glass manufacturers (Figure 2.2.4.2.2). Collaboration with large local capital firms and non-Japanese foreign firms should also be considered.

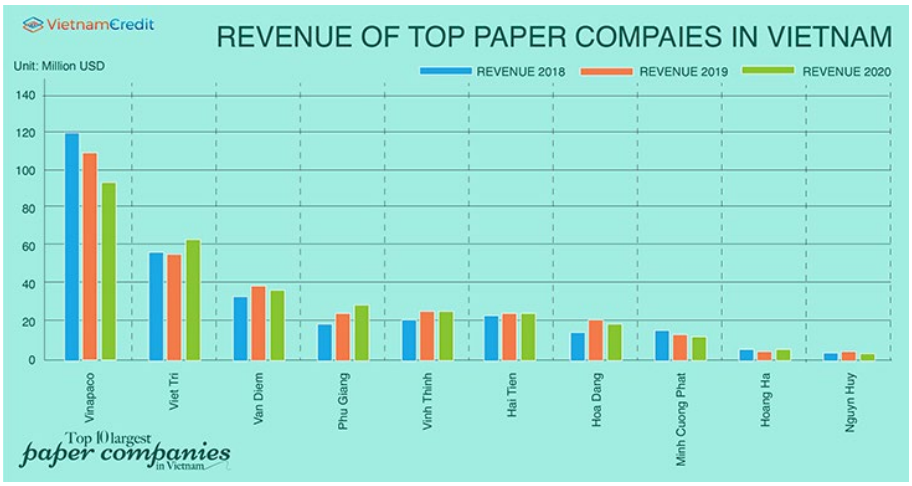


Figure 2.2.4.2.1 Top 10 paper companies in Vietnam by sales
(Source: VIETNAMCREDIT[42])

42 VIETNAMCREDIT：https://vietnamcredit.com.vn/news/top-10-largest-paper-companies-in-vietnam_14627

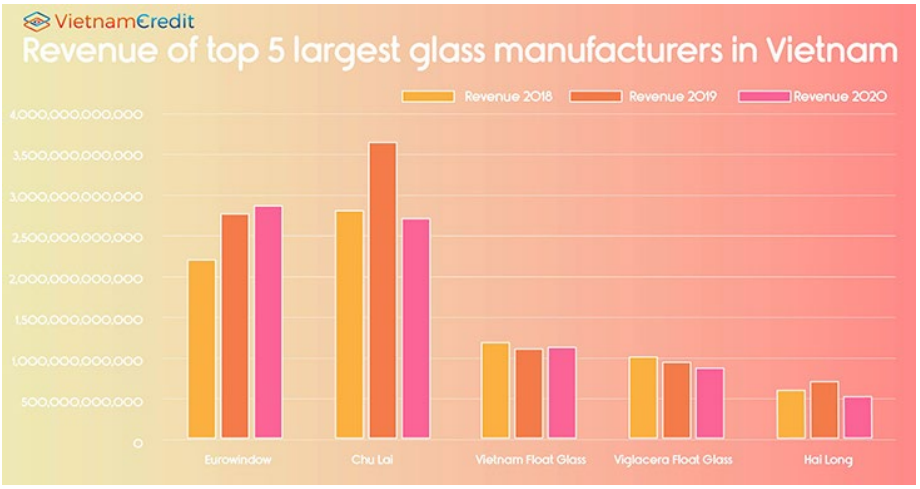


Figure 2.2.4.2.2 Top five glass manufacturers in Vietnam by sales
(Source: VIETNAMCREDIT[43])

(3) Collection costs

The variable cost of collection is expected to vary depending on the extent of cooperation with VAMM, VAMA, and other lubricant manufacturers and distributors, or whether the company will work with local partners to target small-lot collection from auto repair shops on its own. In addition to securing collection volume, cooperation with existing dealer networks and relay base networks will help to reduce collection costs, so closer communication with industry associations and lubricant manufacturers and distributors is needed.

(4) Partner companies

The hazardous waste treatment business in Vietnam is a hurdle for foreign companies to go it alone from the standpoint of license acquisition and risk. Through this survey, Daiseki has narrowed down the list of potential local partner companies, but early confirmation of capital strength, sales force, relationship with government, business style, contents of existing licenses and the volume of permits, location of existing facilities, availability of usable land, compatibility, etc. is necessary. It is then necessary to ascertain how much time and resources will be required if any changes to the current license or EIA are necessary.

At the same time, it is also effective to collaborate on the research described in (1) to (3) above to determine the other party's marketing and sales capabilities. Since the market changes more quickly than legal revisions and administrative procedures, the team would like to consider establishing a system to constantly update market information, such as by considering the launch of a pilot project.

(5) Cooperation with Japanese companies and industry associations in Vietnam

Japanese industry associations and lubricant manufacturers and distributors in Vietnam are beginning to build collection routes and recycle used lubricants to comply with the engine lubricant EPR. If Japanese companies can cooperate with this movement to establish a lubricant recycling loop that can serve as a pioneering model in Vietnam, it will not only solve problems among Japanese companies but also contribute to the promotion of Vietnam's environmental policies.

For example, it can be assumed that Daiseki collects and processes waste lubricating oil collected by Japanese motorcycle and automobile manufacturers at their dealers and ships it as recycled heavy oil to secondary aluminium refining plants, thereby returning the aluminium components that used recycled heavy oil as fuel to Japanese motorcycle and automobile manufacturers. In addition, while ensuring traceability from collection to transportation, treatment, and reuse, the EPR can also explicitly demonstrate the social contribution of each company and fulfil its social

[43] VIETNAMCREDIT：https://vietnamcredit.com.vn/news/top-5-largest-glass-manufacturing-companies-in-vietnam_14677

responsibility through EPR by providing feedback data such as the amount of waste oil collected from each company and the CO2 emission reduction effect of converting to recycled heavy oil. By providing such added value, companies that request processing from Daiseki can focus on their core business of manufacturing with peace of mind that they are working with trustworthy Japanese companies.

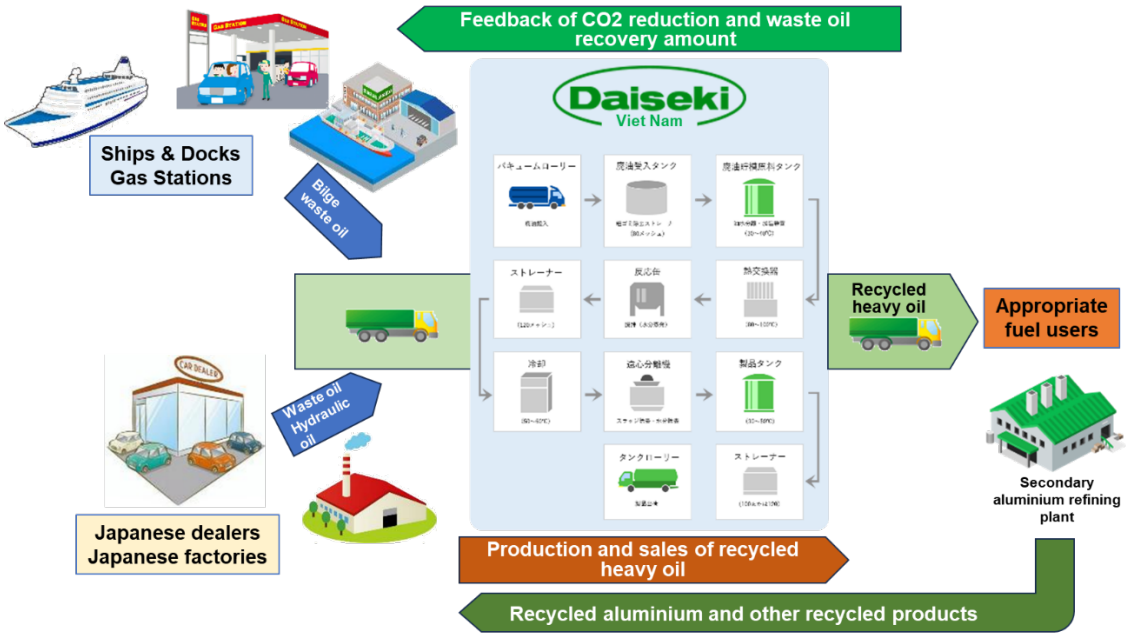


Figure 2.2.4.2.3 Image of lubricant recycling loop in collaboration with Japanese companies
(Source: Prepared by the survey team)

2.2.4.3. Anticipated business overview

(1) Business scale

The market size of automotive lubricants in Vietnam in 2024 is projected to be 220,050 t/year. Assuming that a collection rate similar to that in Japan (36%) is achieved for recycling, the potential for collecting waste lubricants is about 79,000 t/year. Assuming that 15% collection and recycling, which is the target set by the EPR for engine lubricants for the next three years, is achieved, the potential is approximately 33,000 t/year. On the other hand, Vietnam is long and narrow from north to south, with the largest market in the southern region near Ho Chi Minh City, and a market of a certain scale in the central region near Da Nang City. Therefore, the amount that can be collected in the northern region alone is considered to be 1/3 to at most less than half of this amount. The total production and sales volume of the lubricant manufacturers and importers interviewed in the northern region in this study was 93,500 t/year (Table 2.2.3.2.2). So, assuming that 15% of this volume is recovered, the total volume would be 14,025 t/year.

Of course, it is unrealistic to collect all automotive lubricating oil from the entire northern region. But assuming that industrial and marine waste lubricating oil and bilge are also collected, about 10,000 t/year could be collected. This is close to the processing capacity of one Daiseki plant for recycled heavy oil in Japan and is a realistic scale to ensure business viability.

(2) Installed equipment

The configuration, equipment, and site area of the recycled heavy oil conversion plant to be installed are expected to have the same specifications as those of Daiseki's recycled heavy oil conversion plant in Japan. The plant is expected to consist of a manufacturing plant building, a set

of processing equipment, an outdoor tank and oil embankment for storing the received waste oil and produced recycled heavy oil, and a filling station for filling tank trucks.

(3) Implementation structure

Since it is said that it takes at least three years to apply for and obtain a new hazardous waste treatment license, the project is expected to work with existing hazardous waste treatment companies that already have a hazardous waste treatment license in Vietnam and a certain amount of waste oil treatment permits.

Under the current situation in which waste lubricating oil is purchased for value, it is difficult to establish a business based solely on profits from the sale of recycled heavy oil. Therefore, a business model is needed in which waste lubricating oil is recovered at a reasonable processing cost in return for providing added value in terms of trust and security (see previous section "Cooperation with Japanese companies and industry associations in Vietnam"), in cooperation with Japanese lubricating oil manufacturing and sales companies and industry organizations of motorcycle and automobile manufacturers that need to respond to EPR and ensure the business potential.

2.2.4.4. Expected effects of project implementation

The following effects are expected to result from the realisation of this project.

(1) Proper disposal and recycling

Directly, the company will be able to supply alternative fuels (recycled heavy oil) of stable quality and quantity of recycled products to the booming alternative fuel market in Vietnam. This is expected to improve users' production costs.

Indirectly, it will prevent illegal dumping and promote proper disposal as an alternative to simple incineration. By actively promoting the use of alternative fuels derived from waste, the project is expected to contribute to improving the value of all companies involved, including emitters, intermediate treatment companies, and users.

(2) CO2 emission reduction

In addition to its business and social contributions, this project contributes greatly to the environment by reducing greenhouse gas emissions (GHG). When 1 ton of waste oil is converted into fuel using Daiseki's technology, it reduces GHG by 99.1% compared to the simple incineration process. Although emission coefficients vary by country, if 10,000 t/year of used lubricating oil were recycled in Vietnam, it would contribute to a reduction of approximately 29,000 t-CO2. In addition, in Japan, recycled heavy oil is not counted as fossil energy use and has the advantage of being counted as zero CO2 emissions.

In 2023, Vietnam's real GDP growth rate was 5.05% year-on-year, although it fell short of the initial target of 6.5%; for 2024, the Vietnamese National Assembly has set a GDP growth rate target of 6.0-6.5%, and the country is expected to continue to experience high economic growth. [44] In general, economic growth is often accompanied by an increase in environmental burden, including an increase in CO2 emissions. However, the introduction of this project is expected to play a role in offsetting the increase in environmental burden.

[44] JETRO, 2023 GDP growth rate misses government target of 5.05%, but accelerates to 6.72% in Q4 (Vietnam) (11 January 2024): https://www.jetro.go.jp/biznews/2024/01/e0551490d4b6f8e4.html

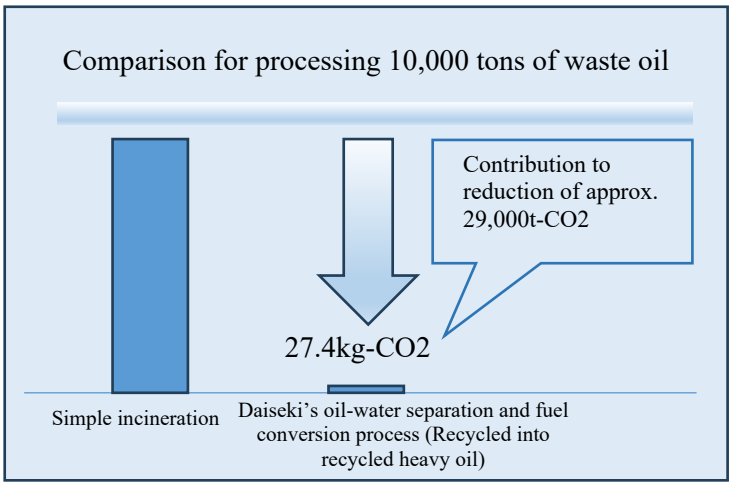


Figure 2.2.4.4.1 CO2 reduction by conversion of waste oil to fuel
(Source: Daiseki ESG Information 2023, p. 30)

2.2.4.5. Potential next steps

There are two possible approaches to the challenges to be overcome. One approach is to solve the problem by strengthening cooperation with government agencies. The other is to overcome the concerns by building a cooperative framework among the private sector, including potential local partners, industry associations, and companies that manufacture and sell lubricating oil.

(1) Establish and develop cooperative systems with government agencies

- Addition of a methodology for engine lubricant EPR: If MONRE's comments are correct, the opportunity of the amendment of Decree No. 8 will be used to consider the addition of a new methodology. The team expects that eventually a wording of "recycled heavy oil conversion" will be added to the detailed regulations of Circular 36/ 2015/TT-BTNMT. However, since the amendment of the law will require coordination with relevant ministries other than MONRE, additional explanatory materials and other information are expected to be required. Thus, it is essential to establish a relationship with MONRE and the EPR office to share necessary materials and exchange opinions promptly. To this end, it would be helpful to establish a cooperative relationship with Japanese research institutions that can work with MONRE from a neutral standpoint, which would facilitate a smooth response.
- Establishment of a cooperative framework between Japanese and Vietnamese research institutions: MONRE, taking the opportunity of the EPR enforcement, has concluded MOUs with government-affiliated research institutions in Korea and Taiwan to establish a framework for cooperation in knowledge sharing and capacity building regarding EPR. Japan has long experience in recycling, including EPR, not only in terms of recycling technology but also in terms of institutions and mechanisms. It is suggested to coordinate with related research institutions to meet the EPR Office's request.
- QCVN and TCVN Registration: Even if recycled alternative fuels are usable in terms of quality, users are likely to require that quality be guaranteed by national standards, etc. since they are derived from waste products. This is one of the reasons why alternative fuels derived from waste are unlikely to be widely used based on economic principles alone. By standardising the process of "recycled heavy oil conversion" under the QCVN and the product "recycled heavy oil" under the TCVN, respectively, it is expected to facilitate the acquisition of licenses and permits for commercialisation, and endorsement will be granted for the sale of recycled products as a commodity. However, both cases are expected to be time-consuming as the process of registering standards requires the approval of multiple relevant ministries and agencies.

- Confirmation of foreign investment permit: In Vietnam, the amended Law on Investment 61/2020/QH14 stipulates sectors where foreign investment and management are prohibited. [45] In addition, Decree 60/2016/ND-CP stipulates conditions for investment in the natural resources and environment sector. [46] Under these legal systems, it is necessary to confirm that the business of recycling heavy oil to treat hazardous waste is not subject to foreign investment restrictions and that foreign investment licenses can be granted. At this point, the team have not received any information, including interviews with related parties, that investment permits for the conversion to recycled heavy oil are not granted, but further information gathering is needed to confirm this. In addition, since there is a possibility that a petroleum tax will be imposed on recycled heavy oil, it is necessary to confirm this with the relevant ministries and agencies as well. It is also necessary to check with the relevant ministries and agencies regarding investment licenses and taxation and to make related efforts as necessary.
- Lobbying Activities: The crackdown on unauthorized operators, clarification of emitter responsibility, and shortening of the period for obtaining permits, as indicated in "2.2.4.1 Issues for commercialisation", will require lobbying to the relevant ministries and agencies. From this perspective, it is essential to establish and maintain close communication channels with the EPR Office.
- Demonstration pilot project: While it is important to scrutinise and resolve issues and concerns one by one and assess risks, these are expected to take a lot of time. In addition, since the engine lubricant EPR has already started in January 2024, the market is likely to be lost if we wait for all conditions to be met. Under such circumstances, launching a demonstration pilot project is considered to be an effective option as a means of more active preparation. At the interview with MONRE last fiscal year, it was confirmed that waste handling is possible in the demonstration pilot project and that it is possible to generate sales during the demonstration period. In this regard, since the hazardous waste licensees (potential partner companies) interviewed this year also have experience in obtaining hazardous waste licenses through the demonstration pilot operation, it would be effective to conduct further interviews regarding procedures related to the demonstration pilot project. Another advantage of the demonstration pilot project is that by accepting plant visits from regulatory authorities, it will be easier for them to understand the effectiveness, safety, and quality of the treatment process and outputs. It will also make it possible to provide the relevant authorities with data for obtaining the QCVN and TCVN standards, which is expected to lead to early standardisation. The demonstration pilot project is expected to take advantage of the Japanese government's support scheme.

(2) Establishment and development of cooperation among private companies

The necessity and concept of cooperation among private companies is described in "Cooperation with Japanese companies and industry associations in Vietnam" in "2.2.4.2. Requirements for commercialisation". Japanese industry associations and lubricant manufacturers and distributors have already begun to build collection routes and recycle used lubricant to comply with the engine lubricant EPR, and because the engine lubricant EPR has already started in January 2024, it is expected that they will move quickly. It is necessary to continue to communicate closely with these industry associations and related companies to seek collaboration and materialise the collaboration concept.

[45] JETRO, Regulations Concerning Foreign Capital (7 July 2023): https://www.jetro.go.jp/world/asia/vn/invest_02.html

[46] BUSINESS LAWYERS, The latest trends in environmental laws and regulations in Vietnam and investment considerations for Japanese companies: https://www.businesslawyers.jp/articles/703

2.3. Survey on the introduction of energy-saving and high-efficiency equipment

2.3.1. Survey on the installation of a high-efficiency blower and inverter system

2.3.1.1. Background and objectives

Dhowa Technos Co., Ltd. has been in discussions with Vietnam-Italy Steel (VIS), a steelmaking company in Hai Phong City in which Kyoei Steel Ltd. holds an approximate 70% stake, on the installation of a high-efficiency blower and high-voltage inverter system through the JCM Model Project. In the fiscal 2019 study, calculations were performed for energy consumption and other factors based on measurements conducted on VIS's dust collection equipment, assuming the installation of a system with a new blower design by Murakami MFG. Co., Ltd. is controlled by a high-voltage inverter from Yaskawa Automation & Drives Corp. The study found that if a high-efficiency blower and high-voltage inverter system was installed in the existing dust collection facility with two fans, an energy saving effect of 3,604,800 kWh/year and GHG emission reduction effect of 2,939 tCO2/year could be expected.

Since the introduction of such equipment required the installation of a high-voltage transformer, priority was given to the high-voltage transformer, but the global spread of COVID-19 delayed installation. VIS also presented plans to increase the production capacity of its steelmaking plant to nearly double the current level (target production of 600,000 tonnes in 2026) and was considering the construction of an additional rolling mill for steelmaking. Since a larger facility would require changes to the proposed facility and require GHG emission reductions and other benefits to be recalculated, actual measurements were reworked on-site and the blower design was updated in fiscal 2022. With this, the requirements for applying for the JCM Model Project were met, and in this fiscal year's survey, preparations began to start the application process for the JCM Model Project in FY2023.

2.3.1.2. Survey subjects and methods

In preparation for applying to the JCM Model Project, VIS sent relevant materials, which were used as the basis for calculations. The cost-effectiveness of the project was also discussed, including the subsidy that could be expected if the project was adopted.

2.3.1.3. Survey results

Calculations were performed on the difference between the amount of energy and costs saved when the high-efficiency blower and high-voltage inverter system is installed at VIS. In initial calculations, the comparison was made by replacing the damper control with inverter control, but the comparison was re-evaluated based on the assumption that the actual existing control method (combination of changing the rotation speed at fluid coupling and damper adjustment) would be replaced with inverter control.

If damper control is replaced with an inverter control

	Air volume (m3/min)	Amount of energy saved (Kw/unit)	Cost saved (2 units)
Usually MIN	342,640	280	15.42 million yen
Usually MAX	364,880	374	20.60 million yen

If the combined use of speed change and damper adjustment with fluid couplings is replaced with an inverter control

	Air volume (m3/min)	Amount of energy saved (Kw/unit)	Cost saved (2 units)
Usually MIN	342,640	114	6.26 million yen
Usually MAX	364,880	92	5.06 million yen

Following a review by VIS on the results of the above reassessment, it was determined that even if the JCM Model Project was adopted (assuming a 50% equipment subsidy rate), the project would not meet the conditions for the payback period required for capital investment, and therefore, the JCM could not be used to introduce equipment. Accordingly, the proposal for this project was dismissed.

2.3.2. Survey to identify new projects for energy-saving and high-efficiency equipment

2.3.2.1. Survey background and objectives

In this survey on the identification of new projects for energy-saving and high-efficiency equipment, a decision was made to investigate and study vacuum pumps, plant equipment technology handled by Dhowa Technos Co., Ltd. that is considered to be particularly energy-efficient (cost-effective in helping reduce CO2 emissions).

There is a process in the production of high-grade steel to remove dissolved gas components from molten steel (vacuum degassing) to increase the strength of the steel. Conventional ejectors used in this process have an advantage due to their simple structures and low initial cost, but they consume large amounts of energy and have high running costs because they use steam from a boiler. In contrast, vacuum pumps, which have been increasingly introduced in recent years, are expected to significantly reduce energy costs (i.e., CO2 emissions) and running costs because they do not require a boiler. Therefore, by updating equipment to replace ejectors with vacuum pumps, steelmakers can expect to reduce running costs and improve productivity (Figure 2.3.2.1.1). This technology is considered to be promising as a JCM Model Project because it is not yet widely used in Vietnam, is cost-effective in reducing CO2 emissions, and has not yet been introduced in any JCM Model Project. Therefore, the feasibility of this project was investigated.

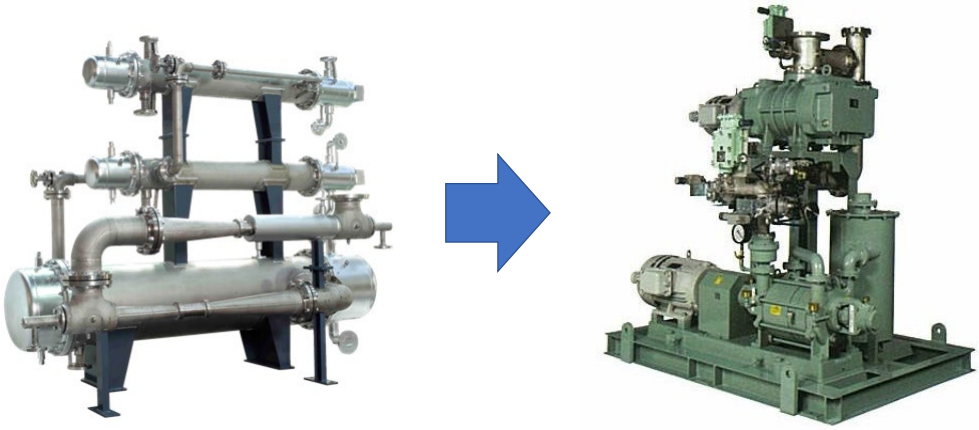


Figure 2.3.2.1.1: Example of an ejector (left) and vacuum pump (right) used in the steelmaking process

2.3.2.2. Survey subjects and methods

First, the team compiled a list of major steel mills, both in Hai Phong City and in other locations throughout Vietnam, to identify relatively outdated steel mills that had not yet installed vacuum pumps in their facilities. The short-listed companies were then contacted to confirm their interest in introducing vacuum pumps, and meetings were set up with those who expressed interest. Since the team had no direct contact with many of the candidate companies, they outsourced the liaison and coordination work to the Science Technology Development and Innovation Centre (ISC) in Hai Phong City.

As a result of these investigations, the team was put into contact with one steel company (Company B) in Vietnam that had expressed interest in introducing vacuum pumps and visited their headquarters in Hanoi City on 19 November 2023 (9:00-10:30 am) during an on-site survey to hold discussions.

2.3.2.3. Survey results

The main points of discussion with the steel company (Company B) are as follows.

- Company B already introduced vacuum pumps in the degassing process at one steel plant, but would like to know how the technology of the proposed product is better. What is the difference between Japanese and foreign-made products?
  - It is difficult to say at this point what the detailed specifications will be, as they will need to be designed based on the details of Company B's facilities, but there does not appear to be a major difference between Japanese and foreign-made products.
- Company B understood that they may be able to use the JCM subsidy to replace steam ejectors with vacuum pumps. Would installing the vacuum pump at other plants affect their eligibility to apply for another subsidy?
  - The team provided an overview of the JCM Model Project and explained key points.
  - Although a project's applicability to the JCM must be investigated in detail to determine its applicability to the JCM, if there are no cases of a project to upgrade equipment from steam ejectors to vacuum pumps adopted under the JCM adoption in Vietnam, the subsidy rate of up to 50% may be applied even if the pumps have already been installed in other factories.
- Company B would like data comparing the general performance ratio of conventional technology (ejectors) and the proposed vacuum pump, as well as the CO2 emission reduction effect.
  - The team would like to receive detailed information on Company B's existing facilities to determine what is needed on the company's facilities and required processing capacity.
  - With the vacuum pump, it seems that CO2 emissions can be reduced by up to 50%.
- During discussions, it was agreed that Company B would review the materials from Dhowa Technos on general performance ratios, and, if there was interest, proceed to discuss detailed specifications at a later date.

Dhowa Technos spoke with an equipment manufacturer (Company C) and found that they did not have any documents comparing the performance with that of other companies. In addition, since the specifications that could be proposed would vary depending on the conditions, Company C wished to create a proposal with clear specifications, rather than a general comparison.

The proposal was dismissed because the required information from the steel company (Company B) could not be provided.

2.4. Survey on sharing know-how and identifying projects for decarbonisation in Hai Phong City

2.4.1. Policy Dialogue on Waste Management between Kitakyushu City and Hai Phong City

2.4.1.1. Study background and objectives

Commemorative events are being planned for fiscal 2025 to mark the tenth anniversary of the sister city agreement signed between Kitakyushu and Hai Phong. Taking advantage of this opportunity to identify a new direction for cooperation in the environment field between the two cities and create new collaborative projects, officials from Kitakyushu visited relevant institutions and facilities in Hai Phong to engage in policy dialogue, with a special focus on the field of waste management.

2.4.1.2. Survey subjects and methods

City officials from Kitakyushu travelled to Hai Phong City in September 2023 to visit related institutions and facilities and learn more about the current situation, issues and needs related to waste management. The contents of these discussions were used to compile proposals for different projects. In January 2024, a delegation of officials returned to Hai Phong (utilising the municipal budget for the second visit) to discuss and reach a consensus on proposed activities. Given the particularly unique characteristics of Hai Phong City, officials determined that a three-pronged approach should be adopted by dividing the city into three sectors – urban, rural, and Cat Ba Island – and identifying issues and solutions for each.

Dates 11-16 September 2023
Participant Environmental Strategies Division, Environment Bureau, Kitakyushu City (1 person)

Schedule

Date	Locations
9/12 (Tue)	URENCO Hai Phong Trang Cat Landfill Department of Agriculture and Rural Development (DARD), Hai Phong City
9/13 (Wed)	Hai Phong Center for Environmental Monitoring (HACEM) Department of Natural Resources and Environment (DONRE), Hai Phong City Science Technology Development and Innovation Centre (ISC) Department of Science and Technology (DOST), Hai Phong City
9/14 (Thu)	Cat Hai People's Committee Ang Cha Cha Landfill Department of Foreign Affairs (DOFA), Hai Phong City

2.4.1.3. Survey results

The following is a summary of the main discussions from the field survey.

(1) URENCO Hai Phong, Trang Cat Landfill

- URENCO Hai Phong is Hai Phong's municipal waste management corporation, which processes about 3/4 of all waste generated in Hai Phong.
- Garbage collected from households (650 tonnes/day) is sorted, intermediate processed, and recycled into four groups (food residue, bulky waste, plastics, and coconut shells) at the centre. The remaining waste (about 80%) is landfilled at a final disposal site.
- 100 tonnes/day of food residue and coconut shells have been composted at a compost centre and sold to a fertiliser manufacturing company since 2016 with technical guidance provided by experts from Kitakyushu City. Waste plastics (about 3 tonnes/day) are compacted and sold, and bulky waste (wood) is crushed and sold as boiler fuel. As a result, approximately 20% of

waste is recycled. In addition, all medical waste from Hai Phong City is collected and incinerated in the centre, and there are currently no major problems with processing.

- In urban areas, efforts are being made to separate waste at the source. About 20% of the waste collected by URNCO is separated by workers at the time of collection, and packer trucks are separated to prevent mixing during transportation. The remaining 80% is not being collected separately, which is an issue for the future.
- URENCO Hai Phong would like Kitakyushu City to share their expertise on efficient waste collection, transportation and separation in future cooperation activities.

Meeting with URENCO Hai Phong

Composting facility

Medical waste incineration facility

Crushed wood waste

(2) Department of Agriculture and Rural Development (DARD)

- Before October 2021, construction waste was managed by the Construction Bureau and rural waste by DARD. However, since October 2021, both construction and rural waste have been managed by DONRE. DARD is now responsible for reform under the Vietnamese national government's plans for rural areas, which includes items related to the environment, such as drainage and waste.
- One problem in rural areas is that garbage is not collected by URENCO. Since the distance to the Din Vu landfill is located too far away, waste has been transported and landfilled at a site determined by each district for the past 10 years. There are a total of 50 temporary landfill sites, each with an area of about 1 ha. However, due to negative effects on the environment and sanitation, the Hai Phong municipal plan is calling for their closure by 2025.
- A waste-to-energy incineration facility will be operational at the Din Vu landfill site in 2025. Until then, the only option available is to continue the current approach with simplified treatment. Small-scale incinerators were installed 10 years ago in three districts, but they are

too small to process all the waste and do not meet emission standards. There are also incinerator ash disposal issues.

- a large amount of organic waste (agricultural and livestock) is generated in rural areas. These areas are trying to separate waste, but are experiencing difficulties at this time.
- Wastewater treatment also poses challenges. The wastewater treatment plant in Tien Lang district (designed capacity of 1,000 m3/day) is operational, but treatment is not effective. Domestic wastewater is collected and treated in one place, but only 700 m3/day is being treated. Although there are plans to construct a new wastewater treatment plant, a new facility may not be built if the existing one is not operating effectively.
- The official from Kitakyushu also visited a landfill facility in An Lao district, one of 50 temporary landfill sites. Collected waste is sorted, and organic waste is fermented and used as fertiliser for the fields. Other waste is transported to different locations and either incinerated or landfilled. The facility also had an incinerator, but it is no longer in use due to problems with incomplete combustion.

Meeting with DARD


Temporary landfill site in An Lao District


Sorting facility


Organic waste after sorting

(3) Department of Natural Resources and Environment (DONRE)

- In Vietnam, the concept of waste separation was introduced by the Environmental Protection Law in 2020. Waste must be separated from 2024, after which penalties will be imposed for failure to comply.
- Hai Phong City has been working on its own on source separation and plans to inform more than 20% of the total area about waste separation by the end of this year; of the eight districts, the Ngo Quyen district (central area) has almost completed the process of informing the public. Hai Phong City has decided to separate garbage into five categories: hazardous waste, recyclables, food waste, bulky waste, and others, and has informed each household.

- DONRE proposed the construction of a waste-to-energy incineration facility to the People's Committee to handle waste treatment in Hai Phong. Since Hai Phong currently generates 2,000 tonnes/day of waste, two waste-to-energy plants (capacity: 1,000 tonnes/day, 60 MW in total) are planned. The project is running behind schedule. The installation and operation of the waste-to-energy plants, as well as the disposal of incinerated ash, will be handled by a private company.
- Incineration will be carried out only at the two waste-to-energy plants. The city plans no new installations of the small types of incinerators currently installed in rural areas, except for Cat Ba Island.
- DONRE would like to focus on the following areas of cooperation with Kitakyushu City: 1) separation of waste at source, 2) efficient waste collection and transportation methods, 3) waste disposal methods on Cat Ba Island, and 4) on-site waste disposal methods in rural areas (During the January visit, DONRE indicated that it did not intend to conduct on-site processing in rural areas).
- Considering the status of the sister city agreement between Hai Phong and Kitakyushu, the officials agreed to conduct technical exchanges on waste management without time limits. The contents of the technical exchange will be finalised by March 2024, and the MOU between the Environment Bureau and DONRE will be signed from April to September. Time-specific MOUs will be concluded for individual projects (e.g., JICA projects).

Meeting with DONRE

(4) Cat Hai People's Committee, Ang Cha Cha Landfill

- Cat Hai District manages Cat Ba Island and the Cat Hai area, with waste from Cat Ba Island landfilled at the Ang Cha Cha final disposal site and waste from the Cat Hai area landfilled at the Din Vu final disposal site.
- The Ang Cha Cha landfill site was established and began operation in December 2022. It is a landfill site using the Fukuoka Method with an area of 1.3ha (4ha if leachate treatment facilities are included). In the future, the landfill can be expanded to a total of 12 ha with the addition of an 8ha facility adjacent to the site.
- The amount of waste generated on Cat Ba Island fluctuates depending on the season, ranging from 20 tonnes/day during the off-season to 100 tonnes/day during the tourist season. During the off-season, waste is collected once a day and twice a day during the tourist season.
- The population of Cat Ba Island is about 18,000, but during the tourist season, the population increases to about 30,000. The tourist season is characterised by an increase in the amount of organic waste, not only because of the higher occupancy rates of hotels, restaurants, and tourist boats but also because of the increase in the number of people visiting the island, even among residents.

- Some food waste is used to feed livestock (pigs and chickens), but there are so few animals on the island that they consume less than 10% of food waste. The rest is landfilled.
- The only waste that is sorted is plastic bottles. Most of the other waste is landfilled as is (except for construction waste). With a 20-year landfill period, the landfill will likely reach capacity sooner than expected if landfilling continues at this rate, so an intermediate treatment facility is being considered in the future.
- The People's Committee is instructing households to separate waste, and to some extent, they can do so. However, at this point, separating waste at the source does not make sense because waste is combined at the time of collection. A better option would be if packer trucks could be used to transport waste separately, but it has been difficult to increase the number of packer trucks because it is both procedurally and practically time-consuming.
- The People's Committee is working with women's federations, youth groups, farmers' groups, and others to inform the public about separating garbage at source. They are also focusing on teaching classes on the environment at schools.
- With the area designated as a World Natural Heritage site, aquaculture rafts (for shrimp and shellfish farming) around Lan Ha Bay were grouped in one location. Since garbage washes in from Ha Long Bay on fine days, the People's Committee is working with the Ha Long Bay Management Committee to collect marine litter. Efforts are also being made to reduce plastic waste by prohibiting tourist boats from bringing in plastic. Every Sunday, the city organises "Green Sunday" events, in which the local government and residents carry out activities to keep the area clean.
- The People's Committee has no plans to install small incinerators, due to exhaust gas and operational management issues. On the other hand, there is interest in introducing an oil conversion unit.
- The People's Committee would like Kitakyushu City to provide total solutions and expertise in waste management, from waste separation, collection and transportation to treatment processes on Cat Ba Island. So far, they have received various proposals from overseas, but many of them are not suitable for Cat Ba Island, and they have not been able to implement them. If possible, they would like to turn the waste treatment facility into a tourist attraction as well.
- The official from Kitakyushu also visited the Ang Cha Cha landfill site. The bottom of the site is covered with seepage barrier sheets, and the collected wastewater is pumped up to a regulating tank and then sent by natural flow to the wastewater facility for treatment. The wastewater treatment facility uses the general activated sludge method and is equipped with an aeration tank and pH adjustment tank. The discussions indicated that there were some issues with wastewater treatment, but according to on-site interviews, the wastewater treatment system complies with effluent standards (B standard) and there are no major problems.
- The Ang Cha Cha landfill site does not have truck scales or other weighing equipment, so the amount of material brought in per day is approximated. Five companies collect and sell valuable materials such as plastic bags and PET bottles from the landfill site. These informal activities are tolerated and not policed by the government.

Meeting with Cat Hai People's Committee

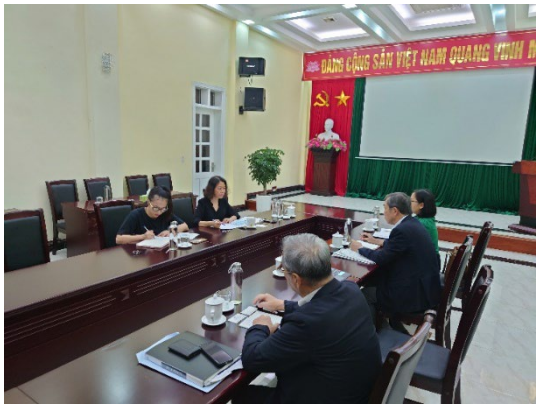
Ang Cha Cha landfill site

Sorted PET bottles, etc.

Leachate treatment facilities (aeration tanks)

(5) Department of Foreign Affairs (DOFA)

- The environment is a priority area for Vietnam, and with source separation regulations coming into effect in 2024 under the Environmental Protection Law, there must be no delay in encouraging the government and citizens to cooperate. The project proposal is well-timed as DOFA is considering what projects should be implemented to mark the 10th anniversary of the sister city relationship between Hai Phong and Kitakyushu.
- According to the administrative procedures in Hai Phong, the department that signed the MOU is required to report annually to the People's Committee on the progress of the project. For example, since the DONRE and the Kat Hai County People's Committee are in the same position, there is a concern that the progress of the project may be affected if a system is set up in which the Kat Hai People's Committee cannot move without the DONRE's direction. Therefore, it is advisable to clarify the division of roles of each department participating in the activities, and then consider with which department it would be best to conclude an MOU.
- The participants confirmed the schedule for the coming months. The details of the collaborative project will be finalised by March 2024, after which an MOU will be signed. Then, applications will be submitted for JICA and other subsidised projects to start activities in 2025.
- First, a draft of the MOU will be prepared, and the contents will be discussed by all parties.



Meeting with DOFA

2.4.1.4. Potential opportunities for future development

Through two field surveys in September 2023 and January 2024 to Hai Phong, Kitakyushu was able to collect a wide range of information on the current status, roles and relationships, issues, and needs of the relevant departments and on-site initiatives related to waste management. Hai Phong City is one of the most successful cities in Vietnam in waste management, but the separate collection and recycling of waste has only just begun. Although urban areas have already taken the first steps in this area, rural areas and Cat Ba Island are still dependent on landfill disposal and face several challenges in basic collection, transportation, and disposal. Since urban areas, rural areas, and Cat Ba Island each have their unique challenges, it is necessary to find solutions suited to each and work on them over the medium-to-long term.

Based on this policy dialogue, the two cities came to a basic agreement on a comprehensive MOU on technical exchange in waste management with no defined timeframe to work together in the medium-to-long term and to conclude time-bound MOUs on individual-specific subsidised projects on a case-by-case basis. As a result, the two cities, which will celebrate the 10th anniversary of their sister-city ties in 2024, will focus on technical exchange in waste management as a new direction for the future.

Although this initiative will not be used to apply for the JCM Model Project scheme, these activities are expected to contribute to the reduction of CO2 emissions by preventing the release of methane gas from landfill sites through sorted collection and composting of organic waste, which accounts for a large proportion of waste, and lower fuel consumption by packer trucks with more efficient collection and transportation.

2.4.1. Project identification survey in collaboration with the AIM scenario and JPRSI

In addition to the city-to-city collaboration between Hai Phong and Kitakyushu, several government-subsidised projects are also being implemented. Projects subsidised by the Ministry of the Environment include "Institutional development support for dissemination and deployment of superior decarbonisation and low carbon technologies in developing countries in FY2023" (hereinafter referred to as the "AIM Project") implemented in fiscal 2023, and the "Operation and management of an overseas development platform for environmental infrastructure in FY2022" (hereinafter referred to as the "JPRSI Project"), which was implemented in fiscal 2022. Activities were implemented in collaboration with these projects to avoid duplication.

2.4.1.1. Links with the AIM scenario analysis for Hai Phong

The Asia-Pacific Integrated Model (AIM) is a large-scale simulation model jointly developed with the National Institute for Environmental Studies (NIES), Kyoto University, Mizuho Research & Technologies and other organisations, in cooperation with several research institutes in the Asia-Pacific region, that functions as an assisting tool for developing long-term policies focused on reducing GHGs and avoiding climate change impacts.[47] Since 2015, capacity-building programmes have been conducted on the AIM scenario analysis, workshops, and other scenario analyses for Hai Phong through the AIM project. This fiscal year, the final compilation of the 2050 net-zero scenario for Hai Phong was completed, a continuation of activities from fiscal 2021 and 2022.

This year's workshop was held jointly with the AIM project to help organisations involved in the AIM scenario analysis understand the specific infrastructure projects being investigated under the city-to-city collaboration programme (See "3.1. Workshop with relevant stakeholders").

Of the seven actions in the AIM scenario, the infrastructure installation projects in this study correspond to Action 1. Green industry, Action 3. Clean energy, and Action 5. Green waste management (Table 2.4.1.1). The workshop was intended to make the difficult-to-imagine 2050 decarbonisation scenario more accessible to participants by presenting an overview of the studies conducted over the past three years and their results. However, as a result, many of the projects had to be abandoned because they were not feasible, which may have given participants a negative impression that implementing the scenarios would be more difficult than expected. Attempts were also made to identify new projects concerning the AIM project, but none were tagged.

Table 2.4.1.1.1. Action items in the 2050 net-zero scenario for Hai Phong and relevant infrastructure installation projects in this survey

Actions in the AIM scenario	Relevant projects studied in this survey
Action 1. Green industry	• Energy saving at the waste treatment plant • High-efficiency blower and inverter system • High-efficiency equipment for steel mills
Action 3. Clean energy	• Renewable energy promotion system • Smart power plant • Cost-effective renewable energy installation in Cat Ba Island • Battery storage for wind power generation • Solar PV project at Dinh Vu landfill
Action 5. Green waste management	• Converting solid waste into raw fuel for cement • Waste lubricant recycling

[47] Asia-Pacific Integrated Model (AIM): https://www-iam.nies.go.jp/aim/index_j.html

2.4.1.2. Links with JPRSI for Hai Phong City

As part of JPRSI's work in fiscal 2022, an online seminar was organised for JPRSI members on 8 March 2023, "Environmental Technology Needs and Opportunities in Hai Phong, Vietnam" (6th seminar in fiscal 2022), to provide information to members on advanced environmental initiatives with a focus on Hai Phong City.[48]

At the beginning of this fiscal year, the JPRSI secretariat received an inquiry from a participating company (Japanese manufacturing company D) that had attended the 6th seminar, asking for an introduction to one of the speakers. One of the panellists, the Science Technology Development and Innovation Centre (ISC), was introduced to the JPRSI secretariat, and an interview was held at the ISC office in Hai Phong City. At the time of this writing, no consensus has been reached on concrete collaboration.

Although not through JPRSI, a Japanese chemical company E learned about the city-to-city collaboration program from the Ministry of the Environment's website and submitted a direct inquiry to IGES. The company was highly interested in decarbonisation initiatives, had already invested in an affiliated company in Vietnam established a local sales office, and was considering business development in the northern region, including Hai Phong City. Two online meetings were held to discuss the possibility of collaboration. At this time, no specific areas of collaboration have been identified.

[48] 6th Seminar in FY 2022: https://www.jprsi.go.jp/ja/static/seminar#event_2023

3. Workshops and international meetings

3.1. Stakeholder workshop

A face-to-face workshop was organised to share the results of this study with relevant authorities in Hai Phong City and exchange opinions. The joint workshop was held with the workshop on Hai Phong's 2050 decarbonisation scenario, which was prepared in collaboration between Kitakyushu City and Hai Phong City as part of the Ministry of the Environment's "Institutional development support for dissemination and deployment of superior decarbonisation and low carbon technologies in developing countries in FY2023" because of the common themes and organisations involved in decarbonisation. Presentations slides are attached in the Annex.

Date: Monday, 28 November 2023, 09:00 - 12:00 (Vietnam time) Place: Conference Room, Department of Foreign Affairs, Hai Phong City Language: Japanese and Vietnamese (consecutive interpretation) Format: Hybrid (face-to-face/online) Participants: 25	
Hai Phong City	• Department of Foreign Affairs (DOFA): 2 persons • Department of Natural Resources and Environment (DONRE): 2 persons • Department of Agriculture and Rural Development (DARD): 6 persons • Department of Planning and Investment (DPI): Ho Thi Yen Ngoc、Do Thi Trang • Department of Industry and Trade (DOIT): 2 persons • Department of Construction (DOC): 1 person • Bureau of Statistics: 1 person • Department of Transportation (DOT): 1 person
Relevant organisations	• DEEP C Industrial Zones: 1 person • Nam Cau Kien Industrial Park (online)
Survey team	• International Environmental Strategies Division, Environment Bureau, Kitakyushu City: 1 person • Daiseki Co., Ltd.: 2 persons • Azusa SE&E: 1 person • Institute for Global Environmental Strategies: 3 persons (1 online)
Interpreter	1 person

(1) Welcome remarks by the organisers

Hai Phong Department of Foreign Affairs (Nguyen Thi Bich Dung)

We are grateful for the cooperation of Kitakyushu City in moving forward with the project. Hai Phong City has also been implementing environmental measures and has promoted many projects based on the sister city's relationship with Kitakyushu, especially the creation of the Green Growth Promotion Plan. After the presentation on case studies, we would like to have a meaningful exchange of opinions with the authorities in Hai Phong City.

Kitakyushu City Environment Bureau (Junichi Yamane)

I would like to thank the Hai Phong City DOFA and all other related departments for their cooperation under the sister city agreement between Hai Phong City and Kitakyushu City, and their participation today. Today's workshop will focus on two themes: 1) scenarios for decarbonisation in Hai Phong City, and 2) the final report on the city-to-city collaboration project that has been implemented for three years. We look forward to a lively exchange of

ideas.

(2) Decarbonisation efforts of Hai Phong City (Nguyen Thi Hong Phuong)

Hai Phong's decarbonisation efforts will be implemented following the implementation plan of the National Strategy on Climate Change for 2050 in Hai Phong City (No. 222/KH-UBND) issued in September 2022. Hai Phong City will focus on GHG reduction efforts, particularly in energy conservation, agriculture, and forestry. Sixty-eight businesses in Hai Phong with large GHG emissions were selected by business category. DONRE has prepared a GHG emission reduction proposal for Hai Phong following the Environmental Law. DONRE organised seminars and workshops on the climate change impact of general waste and waste segregation.

(3) Decarbonisation efforts of Kitakyushu City (Junichi Yamane)

Kitakyushu City is working to reduce GHG emissions by at least 47% from fiscal 2013 levels by 2030, to achieve zero carbon by 2050. Recent trends in GHG emissions show that reductions have been achieved steadily through 2020. Kitakyushu City and 18 surrounding cities and towns have been selected as a leading decarbonisation region by the Ministry of the Environment, and are aiming to increase renewable energy to a maximum of 37 MW through a third-party ownership scheme. As a result, by 2022, Kitakyushu alone will have installed solar panels on 17 public facilities and 586 facilities will be powered by 100% renewable energy.

(4) The net-zero scenario of Hai Phong City (Nguyen Thai Hoa, IGES)

The Asia-Pacific Integrated Model (AIM) is a large-scale GHG emission reduction scenario analysis tool, and low-carbon scenario analysis efforts have been conducted by researchers in the Asian region in various countries and major cities. In Vietnam, the analysis efforts began in October 2010 in collaboration with ISPONRE. Human resources development for scenario analysis methods was conducted, and low-carbon scenarios up to 2030 were created and presented in each country and major city. In 2016, a low-carbon scenario for Hai Phong was completed and presented at COP22 held in the same year; in 2021, the scenario was updated to a 45% reduction from the BAU scenario in line with national GHG emission reduction targets. Since 2022, we have been working in collaboration with Hai Phong City and Kitakyushu City on analysing and updating scenarios to achieve decarbonisation by 2050 using the EXSS model. In conducting the analysis, we collected relevant data with the cooperation of relevant agencies of Hai Phong City and analysed it in line with relevant Hai Phong city policies.

The 2050 decarbonisation scenario presented here today uses 2015 as the base year and adds to the analysis of the industrial, transportation, and residential energy sectors conducted in previous years, as well as non-energy sectors such as waste, agriculture, livestock, and forestry. The scenario identified seven actions and 34 projects to reduce GHG emissions. It is estimated that this will reduce CO2 emissions by 59 million tonnes (99%) from 2015 levels by 2050; an additional reduction of 530 tonnes of CO2 emissions is needed to achieve net-zero emissions by 2050.

(5) Q&As on the Hai Phong net-zero scenario

- (DOFA) Data was provided by various departments from Hai Phong City for the scenario preparation. Scenarios up to 2030 were created not only for Hai Phong but also for other cities, but the scenario up to 2050 is only for Hai Phong, so it cannot be compared with other cities. Each department was asked to provide feedback regarding the draft scenarios.
- (DOT) DOT agrees with the scenario and would like to help implement it. As for data, we will share the number of container trucks, buses, and other vehicles so please refer to these figures when calculating the scenario. The number of vehicles is expected to decrease in the future due to the spread of rail and water systems. In addition, we cannot

ignore the aspect that the introduction of smart transportation will not be effective without a higher level of public awareness. It will be necessary to add cost to the scenario. In terms of buses, the reality is that there are 100 buses in Hai Phong City, but few riders. Out of the 3,000 taxis in the city, there are several dozen EVs, recharging stations must be installed to increase use.

  - (IGES) It could be reduced by 2050 by taking advantage of smart transportation.

- (Bureau of Statistics) There are several areas where data seems to require corrections. For example, the number of sector classifications differs from year to year. In addition, the number of people living with their parents after marriage is decreasing, so it may be necessary to revise the population figures. Hai Phong City has been designated as a priority city for development, so the agricultural area is expected to decrease by 2050.
- (DARD) The 2015 data is out of date, so please use 2020 data. For example, the demand for food is increasing with population growth. Compared to industry, the ratio of agriculture to GDP is expected to decrease. Hai Phong has 85,000 ha of agricultural products, and the recycling rate of rice husks and corn stalks in 2015 was only 20%, but new statistics show that these recycling rates have increased to 50%. In Hai Phong City, pesticide packaging is designated as hazardous waste and collection sites have been set up, but the collection and disposal of pesticides have not progressed due to the lack of awareness among farmers. Concerning the agricultural sector, consideration should be given not only to the area under cultivation but also to the recycling of rice husks and other recyclable items. Disposal of chemical bottles and cans should also be considered.
  - (IGES) The year 2015 was set as a base year and does not affect the 2050 scenario.
  - (DARD) For the agricultural sector, we have used older figures in calculations and would like you to use the figures from the new decision. The agricultural area is expected to decrease by 2050, and the number of buffalo, cattle, and other animals is also expected to decrease. Hai Phong City is making efforts to protect its forests and has plans for new afforestation, so the forest area is expected to increase. The number of buffalo and cows will be agreed upon, but no agreement can be reached on pigs. In 1993, the pig manure utilisation model was in widespread use, but the number of households using biogas has been decreasing. Therefore, GHG emissions will increase. It would be good if pig manure could be collected and utilised. In Hai Phong City, pig manure has become a problem.
- (Forestry Department) The forest area increased by 226 ha from 2010 to 2020 due to the creation of mangrove forests along the coast. Climate change is affecting the forest area. Efforts are being made to protect the existing area.
- (DOIT) The scenario that was shared with us contains a new proposal for Hai Phong City and Vietnam. Decision No. 500 on electricity parcels for the commercial and industrial sectors was issued in May 2023. Hai Phong City has plans for a 40-MW and 20-MW waste-to-energy plant. The number of solar PV installations will be shared.
- (DONRE) There was data on GHG emission reductions from landfill disposal and recycling, but we have a question regarding the source. The data on waste utilisation has been updated, so new data will be sent at a later date.
- (DOFA) We will send new data later.
- (DPI) The Green Growth Promotion Plan was very helpful.

(6) Report on the results of the city-to-city collaboration program (Kohei Hibino, IGES)

This survey has been conducted since FY2021 as part of a three-year plan. Although the survey is still underway, we are sharing a summary of the progress made. The concept of the survey is to contribute to the construction of an "Eco-Industrial Park" with low CO2 emissions and resource recycling by sharing Kitakyushu City's expertise on eco-towns and the study on the introduction of a wide range of technologies. Through these efforts, we aimed to formulate projects for the JCM Model Project. The following is an overview of the projects and results of the investigations and studies conducted: many studies have been conducted, but unfortunately, they have not yet led to concrete results. Concerning the decarbonisation

scenario, we introduced projects related to Action 1, Action 3, and Action 5, but found that it is not easy to put these into motion. Investigations will continue.

(7) Waste lubricant recycling (Mitsuhiro Kusano, Daiseki)

Since Vietnam will start the EPR for lubricants in January 2024, we took advantage of this opportunity to investigate the feasibility of commercialising lubricant recycling. Hai Phong generates a lot of waste oil from ships as well as engine oil from motorcycles. Issues found in the lubricant EPR included unclear operational details, impractical recycling methodologies, and concerns about increased burdens on consumers due to the cost to the EPR fund. Another issue is that non-licensed companies are illegally trading waste oil, making it difficult for licensed companies to proceed with their businesses. While working to resolve these issues, the project aims to establish a circulation model for the collection, recycling, and reuse of waste lubricating oil from Japanese-affiliated companies. We would like to thank ISC for its cooperation in this study, which enabled us to exchange views with related companies in Hai Phong and obtain useful information.

(8) Wrap-up comments

(DOFA) I think the contents of Daiseki's report are under the jurisdiction of the DOIT and DONRE, but we were also able to share the contents with the DARD and DOT. We believe that the contents discussed in this scenario will contribute to Hai Phong City's green growth plan, but we also learned that there are many difficulties in introducing equipment. However, we would like to ask for continued consideration. Since there are participants from the DPI, we would like to offer our opinions to the People's Committee of Hai Phong City, concerning the experience of Kitakyushu City. If there are no EPR guidelines, we would like to ask them to submit their opinions through the management associations and other organisations. We have also received reports on matters to be taken forward, and we would like to continue our support for the smooth implementation of the plan.

(Kitakyushu) We received valuable opinions from the relevant departments of Hai Phong City. Although there were many disappointing results in terms of the city-to-city collaboration programme, we believe that Daiseki's project has great potential, and we would like to continue to support it. We would like to continue to collaborate with Hai Phong City on any projects that we can work on, regardless of their relation to decarbonisation.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3.2. International conferences

The Ministry of the Environment, Japan has not provided any specific instructions regarding opportunities to make presentations at international conferences in Vietnam concerning this study. Therefore, the results from the "Joint Workshop on the EPR Policy and Regulation" which the survey team of lubricant recycling participated in to gather information for the study on EPR for lubricants will be reported here.

(1) Background and objectives

The 2020 Environmental Protection Law has paved the way for the introduction of an EPR system in Vietnam, with the system going into effect in January 2024 (the year of introduction differs depending on the item). While many Japanese companies operating in Vietnam in the manufacturing industry are considerably interested in the impact of the introduction of the EPR system, many questions and doubts have been voiced about the ambiguity of legalities. To address these concerns, the Embassy of Japan in Vietnam and JICA Vietnam jointly organised a workshop on the EPR system. MONRE's Department of Legal Affairs and the EPR Office, which have jurisdiction over the EPR system, spoke at the workshop to provide explanations and answer questions.

(2) Outline of the event

Date: 1st December 2023, 8:30 - 12:00 Place: Conference Room, 1st Floor, Techno Centre, Thang Long Industrial Park No. 1 Participation: Hybrid (face-to-face and online) Organisers: Embassy of Japan in Vietnam, JICA Vietnam, Co-organizers: JCCI (Japanese Chamber of Commerce and Industry in Vietnam)
Agenda: 1. Opening remarks Dr Phan Tuan Hung (Department of Legal Affairs, MONRE) Mr. Kubo Yoshitomo (JICA Vietnam) 2. Regulations on responsibility for recycling and waste treatment of producers and importers (EPR) Mr. Do Xuan Thuan (EPR Office officer) 3. Policies and initiatives to enhance circular businesses in Japan Mr. Kou Matsuura (Ministry of the Environment) 4. Questions and Discussion 5. Closing remarks Mr. Akira Hiroi (Embassy of Japan)

(3) Explanation and Q&A on Lubricant EPR

Excerpts from the explanation by MONRE and the answers to the questions and answers are summarised below and are mainly related to the Lubricants EPR.

<u>Consumer responsibility</u>

- The current law does not include consumer responsibility, but consideration will be given to including it in the future. It is conceivable that the cost of treatment could be included in the price of a product when purchased by consumers, and the money could be used to fund recovery and treatment by the producer when the product is disposed of.

<u>Definition of producer and scope of responsibility</u>

- In the case of automobiles (four-wheeler and two-wheeler), batteries, tyres, and lubricating oil are each an item subject to EPR. When batteries, tyres, and lubricating oil are sold as individual products, the respective manufacturers are responsible for their production. On the other hand, if an automobile manufacturer purchases batteries, tyres, and lubricating oil,

assembles them at its factory, and sells them as its brand of automobile, the automobile manufacturer is responsible for recycling the entire automobile. However, no calculation is made as to how much lubricating oil is in the car.

- If an automobile manufacturer produces and sells lubricants produced by a lubricant manufacturer on an OEM basis under its brand trademark, the automobile manufacturer is liable.
- If a lubricant manufacturer sells lubricant under its brand, the lubricant manufacturer is liable, even if the automaker sells it as a distributor.
- In cases where lubricants are produced and sold on an OEM basis, the scope of responsibility should be clearly stated in the contract. Also, the packaging of the lubricating oil should clearly state who is responsible and where the responsibility lies. The responsibility of the EPR needs to be clearly stated.
- The law requires that the manufacturer and seller, and who is responsible for the product be stated.

Selection of how to handle responsibility for EPR

- Companies responsible for EPR must choose one of the following methods: either recycle in-house, outsource recycling to another company, or contribute to the EPR Fund. They cannot attempt to recycle in-house and then switch to other methods in the middle of the process.
- Companies responsible for items for which EPRs will begin in January 2024 will have until 31 March 2024 to decide which method they will choose.

Amount of contribution to EPR Fund on lubricants

- For lubricants, the basis for calculation is the recycling cost norm (Fs) based on Decree No. 8. The costs include transportation, sorting, recycling, and administrative costs. In reality, the recycling unit cost is calculated by visiting and surveying 72 recycling plants. The calculations are based on current electricity costs and prices. The coefficient is low for items that are easy to recycle and environmentally friendly. Conversely, producers are asked to pay the full cost for items that are difficult to recycle.
- The operating rules for the EPR Fund, including Fs, have already been submitted to the Prime Minister and are expected to take effect by the end of 2023. The Fund also includes some administrative costs for the EPR Office.

Registration and selection of recycling companies

- Recycling companies can recycle without registering with MONRE as long as they can recycle following the law and have a contract with the manufacturer. Manufacturers do not need to obtain permission from MONRE each time they recycle. In principle, strict compliance with the law is a priority, and failure to comply by March 2024 will result in fines.
- No provision in Decree No. 8 requires recycling companies to be on the MONRE list. The Enforcement Bylaw No. 79 of the Environmental Protection Law states that manufacturers may or may not be selected from the MONRE list.

Support from the EPR Foundation

- Criteria for applying for the recycling support grant will be announced in September 2024. Recycling companies and in-house recycling are eligible for the support grant.
- Once a recycling company applies, there is a provision for MONRE to review the application. Recycling companies that pass the review receive support directly from the EPR Fund. The funding they receive varies according to volume.
- If a recycling company does not meet the criteria, it cannot receive support from the EPR Fund. If they do not meet the criteria, they cannot recycle and will not receive support.
- The recycling company enters into a contract with the manufacturer to recycle and MONRE determines if it can receive support from the EPR Fund based on performance. This is not a mechanism whereby MONRE reimburses the manufacturer.
- If a recycling company carries out recycling for a manufacturer, the recycling company may also receive funds from the manufacturer other than a support grant. Recycling companies may outsource recycling to third parties, but may not receive duplicate support funds.

- Only domestic waste is eligible for aid; imported waste is not.
- If companies receive support from the government, they are under obligation to the government. If a company is selected to receive a grant, its activities will be managed through a monitoring organisation.

Lubricant recycling methodology

- Currently, there are only two methods permitted for recycling lubricating oil, but other methods will be considered and reflected in the revised version of Decree No. 8.

Use of recycled products

- The law does not stipulate who has the right to determine if a recycled product can be used as a commodity. If it can be proven that the product can be used as a resource, it should be proven.

EPR Portal

- An online EPR Portal will be set up and opened as soon as possible so that applications and registrations can be made online.

Figure 3.2.1. Joint workshop on the EPR policy and regulation.

3.3. Related meetings in Tokyo

At the Seminar on City-to-City Collaboration for Zero Carbon Society hosted by the Ministry of the Environment (in Tokyo, 26-27 February 2024), stakeholders from this fiscal year's city-to-city collaboration projects gathered to share achievements and challenges, learn from each other, and network. For this seminar, one person from each of the overseas partner cities in this year's adopted projects could be invited; therefore, after contacting and coordinating with Hai Phong City, an invitation letter was sent to the People's Committee of Hai Phong City to obtain the selection of the invitees. It was decided that Ms Bui Thi Phuong Thao of the Solid Waste Management Division of the Department of Natural Resources and Environment (DONRE) would participate from Hai Phong City. Although Ms. Thao did not have the opportunity to give a presentation at the seminar, her participation and discussion in the seminar were supported.

Kitakyushu City has been engaged in policy dialogue with Hai Phong City regarding future joint collaborative efforts (see "2.4.1. Policy dialogue on waste management between Kitakyushu City and Hai Phong City") and plans to focus on the field of waste management in the future. Therefore, Kitakyushu City took this opportunity to arrange for DONRE's solid waste management representative (Ms Thao) to extend her travels to Kitakyushu City after the seminar to deepen her understanding through a site visit to waste-related facilities in the city.

Since Hai Phong City plans to introduce two waste-to-energy facilities in the future, sites were selected so that the participants could learn how Kitakyushu City sorts, collects, transports, and performs the intermediate treatment of waste. A draft schedule of site visits in Kitakyushu City is shown in Table 3.3.1. The results of the implementation of the site visit will not be described here because the activity will be completed after the deadline for the delivery of this report.

Table 3.3.1. A draft schedule of the site visits to waste-related facilities in Kitakyushu City

Date	Activities
26 February (Mon)	Haneda Airport - Kitakyushu Airport
27 February (Tue)	General waste collection site visit Hiagari Cans & Bottles Recycling Centre
	Kogasaki Waste-to-energy plant Beetle Engineering SRC plant Hibikinada Landfill
28 February (Wed)	Kanda Eco Plant Ube Mitsubishi Kyushu Cement plant Kitakyushu Airport - Haneda Airport

ỦY BAN NHÂN DÂN THÀNH PHỐ HẢI PHÒNG
SỞ TÀI NGUYÊN VÀ MÔI TRƯỜNG

NỖ LỰC TRONG VIỆC LOẠI BỎ CÁC BON HƯỚNG TỚI MỤC TIÊU PHÁT THẢI RÒNG BẰNG 0 VÀO NĂM 2050

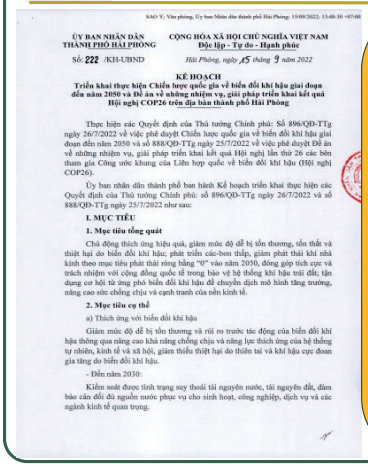
Hải Phòng, ngày 28/11/2023

Nguyễn Thị Hồng Phượng
Trưởng phòng Hành chính Tổng hợp
Khí tượng thủy văn và Biến đổi khí hậu

NỘI DUNG CHÍNH

- ĐỊNH HƯỚNG, MỤC TIÊU
- NỖ LỰC LOẠI BỎ CAC-BON CỦA THÀNH PHỐ HẢI PHÒNG

KẾ HOẠCH SỐ 222/KH-UBND NGÀY 15/9/2022 CỦA UBND THÀNH PHỐ



ỦY BAN NHÂN DÂN
THÀNH PHỐ HẢI PHÒNG
Số: 222 /KH-UBND

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc
Hải Phòng, ngày 15 tháng 9 năm 2022

KẾ HOẠCH
Triển khai thực hiện Chiến lược quốc gia về biến đổi khí hậu giai đoạn đến năm 2050 và Đề án về những nhiệm vụ, giải pháp triển khai kết quả Hội nghị COP26 trên địa bàn thành phố Hải Phòng

Thực hiện các Quyết định của Thủ tướng Chính phủ: Số 896/QĐ-TTg ngày 26/7/2022 về việc phê duyệt Chiến lược quốc gia về biến đổi khí hậu giai đoạn đến năm 2050 và số 888/QĐ-TTg ngày 25/7/2022 về việc phê duyệt Đề án về những nhiệm vụ, giải pháp triển khai kết quả Hội nghị lần thứ 26 các bên tham gia Công ước khung của Liên hợp quốc về biến đổi khí hậu (Hội nghị COP26).

Ủy ban nhân dân thành phố ban hành Kế hoạch triển khai thực hiện các Quyết định của Thủ tướng Chính phủ: số 896/QĐ-TTg ngày 26/7/2022 và số 888/QĐ-TTg ngày 25/7/2022 như sau:

I. MỤC TIÊU

1. Mục tiêu tổng quát

Chủ động thích ứng hiệu quả, giảm mức độ dễ bị tổn thương, tổn thất và thiệt hại do biến đổi khí hậu; phát triển các-bon thấp, giảm phát thải khí nhà kính theo mục tiêu phát thải ròng bằng "0" vào năm 2050, đóng góp tích cực và trách nhiệm với cộng đồng quốc tế trong bảo vệ hệ thống khí hậu trái đất; tận dụng cơ hội từ ứng phó biến đổi khí hậu để chuyển dịch mô hình tăng trưởng, nâng cao sức chống chịu và cạnh tranh của nền kinh tế.

2. Mục tiêu cụ thể

a) Thích ứng với biến đổi khí hậu

Giảm mức độ dễ bị tổn thương và rủi ro trước tác động của biến đổi khí hậu thông qua nâng cao khả năng chống chịu và năng lực thích ứng của hệ thống tự nhiên, kinh tế và xã hội, giảm thiểu thiệt hại do thiên tai và khí hậu cực đoan gia tăng do biến đổi khí hậu.

- Đến năm 2030:

Kiểm soát được tình trạng suy thoái tài nguyên nước, tài nguyên đất, đảm bảo cân đối đủ nguồn nước phục vụ cho sinh hoạt, công nghiệp, dịch vụ và các ngành kinh tế quan trọng.

KẾ HOẠCH TRIỂN KHAI THỰC HIỆN CHIẾN LƯỢC QUỐC GIA VỀ BIẾN ĐỔI KHÍ HẬU GIAI ĐOẠN ĐẾN NĂM 2050 VÀ ĐỀ ÁN VỀ NHỮNG NHIỆM VỤ, GIẢI PHÁP TRIỂN KHAI KẾT QUẢ HỘI NGHỊ COP 26 TRÊN ĐỊA BÀN THÀNH PHỐ HẢI PHÒNG

1. Định hướng, mục tiêu

Chủ động thích ứng hiệu quả, giảm mức độ dễ bị tổn thương, tổn thất và thiệt hại do biến đổi khí hậu; giảm phát thải khí nhà kính theo mục tiêu phát thải ròng bằng "0" vào năm 2050, đóng góp tích cực và trách nhiệm với cộng đồng quốc tế trong bảo vệ hệ thống khí hậu trái đất; tận dụng cơ hội từ ứng phó biến đổi khí hậu để chuyển dịch mô hình tăng trưởng, nâng cao sức chống chịu và cạnh tranh của nền kinh tế.

1. Định hướng, mục tiêu

1. MỤC TIÊU ĐẾN NĂM 2030

GIẢM PHÁT THẢI KHÍ NHÀ KÍNH

- Xây dựng Kịch bản các-bon thấp cho thành phố Hải Phòng cho các lĩnh vực: Sử dụng năng lượng, Chất thải, Nông, lâm nghiệp và sử dụng đất.

- Bảo đảm tổng lượng phát thải khí nhà kính của thành phố giảm ít nhất 43,5% so với kịch bản phát triển thông thường (BaU).

- Các cơ sở có mức phát thải khí nhà kính hằng năm từ 2.000 tấn CO2tđ trở lên phải thực hiện giảm phát thải khí nhà kính.

1. Định hướng, mục tiêu

2. MỤC TIÊU ĐẾN NĂM 2050

GIẢM PHÁT THẢI KHÍ NHÀ KÍNH

- Cập nhật Kịch bản các-bon thấp cho thành phố Hải Phòng.

- Bảo đảm tổng lượng phát thải khí nhà kính của thành phố hướng tới mức phát thải ròng bằng "0".

- Các cơ sở có mức phát thải khí nhà kính hằng năm từ 200 tấn CO2tđ trở lên phải thực hiện giảm phát thải khí nhà kính.

II. Nỗ lực loại bỏ các-bon của thành phố Hải Phòng

Triển khai các quy định về giảm nhẹ phát thải khí nhà kính theo Luật Bảo vệ Môi trường 2020

Rà soát, cập nhật điều chỉnh danh mục các cơ sở phát thải KNK phải thực hiện kiểm kê KNK trên địa bàn thành phố

- Giữ nguyên 68 cơ sở phát thải KNK phải thực hiện kiểm kê KNK tại Quyết định số 01/2022/QĐ-TTg

- Bổ sung 50 cơ sở thuộc đối tượng phải thực hiện kiểm kê KNK trên địa bàn thành phố, trong đó có 43 cơ sở thuộc ngành Công thương, 04 cơ sở thuộc ngành GTVT, 01 cơ sở thuộc ngành Xây dựng và 02 cơ sở thuộc ngành Tài nguyên và Môi trường

II. Nỗ lực loại bỏ các-bon thành phố Hải Phòng

Triển khai các quy định về giảm nhẹ phát thải khí nhà kính theo Luật Bảo vệ Môi trường 2020

Yêu cầu 68 cơ sở phải thực hiện kiểm kê KNK trên địa bàn thành phố theo Quyết định số 01/2022/QĐ-TTg gửi báo cáo về việc cung cấp thông tin, dữ liệu liên quan phục vụ kiểm kiểm KNK

Tổ chức thẩm định kết quả kiểm kê KNK cấp cơ sở năm 2024 trở đi đối với các cơ sở thuộc đối tượng phải thực hiện kiểm kê khí nhà kính trên địa bàn thành phố

II. Nỗ lực loại bỏ các-bon của thành phố Hải Phòng

Xây dựng Đề án Kiểm kê KNK và đề xuất giải pháp quản lý giảm nhẹ phát thải KNK trên địa bàn thành phố Hải Phòng.

Sản phẩm của Đề án là kết quả thống kê và đánh giá hoạt động phát thải KNK của TP Hải Phòng

Đây cũng là tài liệu phản ánh thực tế về hoạt động phát thải KNK, là cơ sở xây dựng kịch bản phát thải KNK trên địa bàn TP; là căn cứ để thực hiện các điều chỉnh, lập quy hoạch, kế hoạch phát triển bền vững, chuyển đổi mô hình từ nâu sang xanh, góp phần giảm phát thải KNK trong giai đoạn tới.

II. Nỗ lực loại bỏ các-bon thành phố Hải Phòng

Tổ chức Hội nghị, Hội thảo tuyên truyền, phổ biến giáo dục pháp luật về ứng phó với BĐKH theo Luật BVMT cho các cơ sở phải thực hiện kiểm kê KNK trên địa bàn thành phố

II. Nỗ lực loại bỏ các-bon thành phố Hải Phòng

Tổ chức Hội nghị, Hội thảo tuyên truyền, phổ biến giáo dục pháp luật về ứng phó với BĐKH trong Luật BVMT cho các cơ sở phải thực hiện kiểm kê KNK trên địa bàn TP

NỖ LỰC HƯỚNG TỚI THÀNH PHỐ ZERO CACBON CỦA TP KITAKYUSHU

1 Thách thức để trở thành thành phố Zero carbon của Thành phố Kitakyushu

2 Chuyển đổi lượng phát thải khí gây hiệu ứng nhà trong những năm gần đây ở TP Kitakyushu

3 Phân tích các yếu tố góp phần làm tăng, giảm phát thải khí nhà kính

4 Ví dụ về các sáng kiến trong những gần đây - Các sáng kiến liên quan đến các khu vực khử cacbon tiêu biểu

- Khu vực khử cacbon tiêu biểu
- Nội dung đề xuất của Thành phố Kitakyushu
- Hoạt động cho năm 2022

Ngày 28 tháng 11 năm 2023
Thành phố Kitakyushu

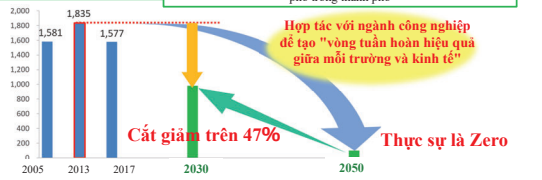
Thành phố Kitakyushu đang hỗ trợ các Mục tiêu Phát triển Bền vững (SDGs).

Thách thức để trở thành thành phố Zero carbon của Thành phố Kitakyushu

Năm 2030（Mục tiêu đạt được: TARGET）
Giảm hơn 47% so với năm 2013

Năm 2050（Điều bắt buộc phải hướng tới: GOAL）
Hướng tới mức phát thải khí nhà kính bằng Zero trong thành phố trong thành phố

Hình ảnh thể hiện được mục tiêu cắt giảm



5 trụ cột thực hiện xây dựng TP Zero Cacbon

I Khử cacbon lĩnh vực năng lượng
II Đẩy mạnh đổi mới
III Thay đổi lối sống
IV Thành phố tăng cường thích ứng với biến đổi khí hậu
V Đóng góp quốc tế

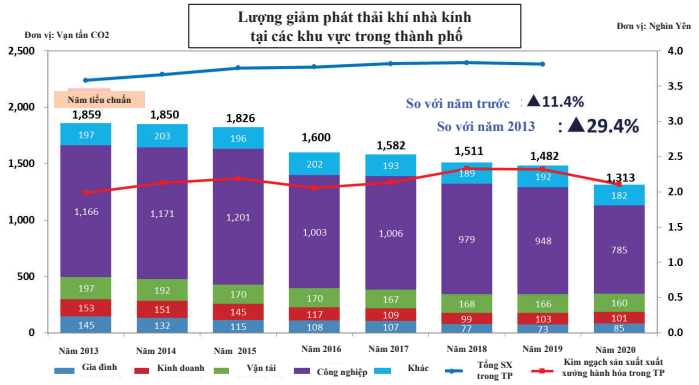
「Chiến lược tăng trưởng xanh TP Kitakyushu」

（1） Bảo đảm chiến lược năng lượng đã khử cacbon
①Điện gió ②Pin dự trữ ③Hydro
（2） Hỗ trợ thực hiện sớm đổi mới

2

Chuyển đổi lượng phát thải khí gây hiệu ứng nhà trong những năm gần đây ở TP Kitakyushu

Lượng giảm phát thải khí nhà kính tại các khu vực trong thành phố



3

Phân tích các yếu tố góp phần làm tăng, giảm phát thải khí nhà kính

Lĩnh vực	Lượng cắt giảm trong năm 2020 so với năm 2013 (Vạn tấn CO2)	Các yếu tố tăng/giảm chính trong năm 2020 so với năm 2013
Gia đình	−60	Lượng khí thải CO2 giảm do đơn vị phát thải CO2 của ngành điện* được cải thiện nhờ mở rộng sử dụng năng lượng tái tạo và cải thiện mức độ tiêu thụ năng lượng (tiêu thụ năng lượng trên mỗi hộ gia đình) do nỗ lực tiết kiệm năng lượng.
Kinh doanh	−53	Lượng khí thải CO2 giảm do cải thiện đơn vị phát thải CO2 của ngành điện* do mở rộng năng lượng tái tạo và cải thiện mức độ tiêu thụ năng lượng (tiêu thụ năng lượng trên mỗi diện tích sàn) do các sáng kiến tiết kiệm năng lượng.
Vận tải	−37	Mặc dù số lượng ô tô ở trong thành phố ngày càng tăng nhưng lượng khí thải CO2 đang giảm do hiệu quả sử dụng nhiên liệu được cải thiện và sự phổ cập của ô tô thế hệ mới, điều này đã cải thiện đơn vị tiêu thụ năng lượng (CO2/xe/km) của toàn bộ ô tô. .
Công nghiệp	−381	Mặc dù lượng hàng hóa được vận chuyển trong thành phố ngày càng tăng, đơn vị phát thải CO2 của ngành điện* đã được cải thiện do mở rộng áp dụng năng lượng tái tạo và mức độ tiêu thụ năng lượng của quá trình sản xuất (mức tiêu thụ năng lượng trên mỗi mặt hàng sản xuất được vận chuyển, v.v.) đã được cải thiện làm lượng phát thải khí CO2 được giảm xuống.

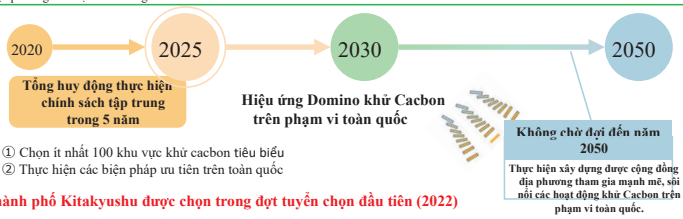
*"Đơn vị phát thải CO2 trong ngành điện" là lượng carbon dioxide thải ra khi sản xuất một lượng điện nhất định. Trong cơ cấu điện, đơn vị này sẽ được cải thiện nếu tỷ trọng nhiệt điện được giảm đi nhờ áp dụng rộng rãi các nguồn năng lượng tái tạo.

4

Ví dụ về các sáng kiến trong những gần đây - Các sáng kiến liên quan đến các khu vực khử cacbon tiêu biểu

Khu vực khử Cacbon tiêu biểu

- Đưa lượng khí thải CO2 từ tiêu thụ điện trong khu vực dân sinh (khu vực hộ gia đình, lĩnh vực thương mại và các khu vực khác) xuống gần như bằng 0 vào năm 2030
- Giảm phát thải khí nhà kính khác, bao gồm cả phát thải từ lĩnh vực giao thông vận tải và sử dụng nhiệt, ở mức phù hợp với mục tiêu năm 2030 của Nhật Bản. Đây là khu vực hiện thực hóa những hạng mục trên và được xác định như một khu vực kiểu mẫu cho "mô hình kiểu domino khử cacbon". Chính quyền địa phương muốn được lựa chọn sẽ gửi đề xuất theo lời kêu gọi đề xuất của Bộ Môi trường, sau đó Bộ Môi trường sẽ xem xét và đưa ra quyết định.
- Nếu một khu vực được chọn làm khu vực khử cacbon tiêu biểu thì sẽ có lợi ích như nhận được hỗ trợ từ quỹ hỗ trợ và khuyến khích cộng đồng địa phương của Bộ Môi trường.



① Chọn ít nhất 100 khu vực khử cacbon tiêu biểu
② Thực hiện các biện pháp ưu tiên trên toàn quốc

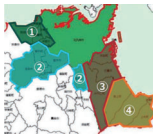
Thành phố Kitakyushu được chọn trong đợt tuyển chọn đầu tiên (2022)

5

Ví dụ về các sáng kiến trong những gần đây - Các sáng kiến liên quan đến các khu vực khử cacbon tiêu biểu

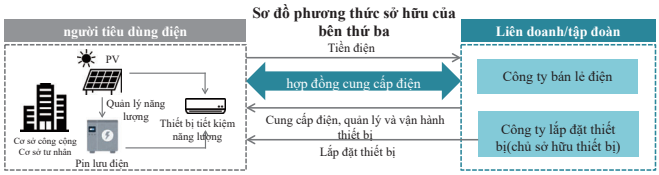
Đề xuất của thành phố Kitakyushu

Chúng tôi đang hợp tác với 18 khu trong khu vực đô thị Kitakyushu để lắp đặt các tấm pin mặt trời (PV), v.v. thông qua quyền sở hữu của bên thứ ba tại các cơ sở công cộng và các công ty tái chế ở khu Eco town TP Kitakyushu.



○Thời gian lập kế hoạch: Khoảng 5 năm kể từ năm 2022
○Lượng năng lượng tái tạo được áp dụng: Lên tới 37MW tại khu vực đô thị Kitakyushu
(Mục tiêu lắp đặt các tấm pin mặt trời tại khoảng 290 cơ sở công cộng ở thành phố Kitakyushu)
○ Quy mô dự án: Tổng chi phí dự án tối đa khoảng 9,7 tỷ yên (trong đó 5 tỷ yên dự kiến sẽ được sử dụng dưới dạng viện trợ từ chính phủ)

Sơ đồ phương thức sở hữu của bên thứ ba



6

Ví dụ về các sáng kiến trong những gần đây - Các sáng kiến liên quan đến các khu vực khử cacbon tiêu biểu

Tình hình thực hiện năm 2022

(1) Sử dụng các tấm pin mặt trời... áp dụng phương thức sở hữu của bên thứ ba

・Sử dụng tấm pin mặt trời cho 17 cơ sở công cộng....

・Trong số này, tổng cộng 15 cơ sở, bao gồm 14 cơ sở trung tâm phục vụ người dân, sẽ được trang bị pin lưu trữ cố định.

・Sử dụng các thiết bị tiết kiệm năng lượng (thiết bị điều hòa không khí hiệu suất cao, đèn LED) cho 34 cơ sở công cộng

(2) Nỗ lực giảm chi phí sử dụng năng lượng tái tạo

・Bắt đầu dự án sử dụng các tấm pin tái sử dụng

（3）Tình hình đưa 100% điện năng lượng tái tạo tới các cơ sở công cộng

・Thành phố Kitakyushu đã sử dụng100% điện năng lượng tái tạo cho 586 cơ sở (hiệu quả giảm thiểu: khoảng 10.500t-CO2/năm)

・100% điện năng lượng tái tạo đã được đưa vào sử dụng tại 625 cơ sở trên toàn khu vực (hiệu quả giảm thiểu: khoảng 10.900t-CO2/năm)

（4）Chuyển đổi ZEB của các cơ sở công cộng

・Triển khai thiết kế cơ bản để chuyển đổi ZEB cho 2 cơ sở

7

Daiseki

Tài liệu hội thảo

Chương trình hợp tác giữa thành phố với thành phố vì Xã hội không carbon giữa thành phố Hải Phòng và thành phố Kitakyushu (Khảo sát tái chế dầu thải)

Ngày 28 tháng 11 năm 2023
Công ty TNHH Daiseki
Phòng tổng hợp dự án
Phòng kế hoạch kinh doanh

Thông tin đã nắm được sau khi khảo sát

Giới hạn với người liên quan

○ Thị trường rác thải nguy hại
・Có rất nhiều dầu thải từ tàu thuyền phát sinh tại Cảng Hải Phòng.
・Có nhiều dầu động cơ thải do số lượng lớn các xe máy được bán ra.
・Bắt đầu hình thành lĩnh vực thu gom dầu bôi trơn do quy định trách nhiệm mở rộng của nhà sản xuất (EPR)
・Dầu đã qua sử dụng được các công ty không có giấy phép mua và bán dựa trên giá trị nhiên liệu còn tận dụng được.

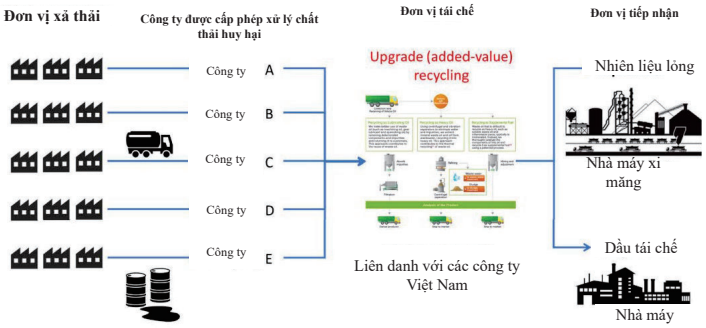
○Hạn chế kinh doanh tái chế chất thải nguy hại
・Việc kinh doanh chỉ có thể được thực hiện trên khu đất đã được quy hoạch.
・Cần tới 3-5 năm mới xin được giấy phép (đối với công ty nước ngoài còn lâu hơn)

○Các vấn đề liên quan đến trách nhiệm mở rộng của nhà sản xuất
・Chi tiết hoạt động chưa được quy định cụ thể mặc dù trách nhiệm này sẽ bắt đầu vào tháng 1 năm 2024
・Phương pháp tái chế duy nhất được phê duyệt là "chưng cất"
・Hiện tại, tất cả các nhà sản xuất đều phải nộp phí cho Quỹ EPR.
Có khả năng gánh nặng chi phí sẽ tăng thêm trong tương lai.

CÔNG TY DAISEKI

Mô hình kinh doanh tiềm năng

Giới hạn với người liên quan

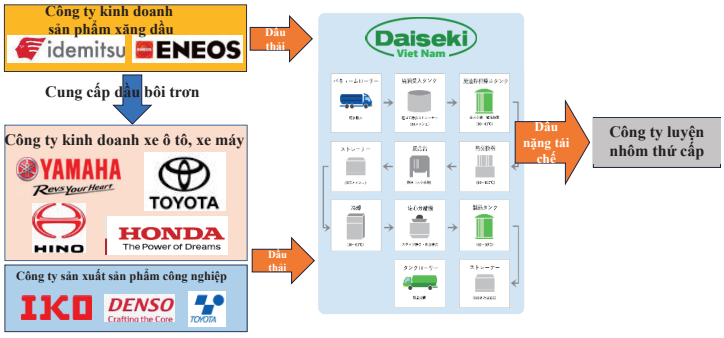


CÔNG TY DAISEKI

Đề xuất cơ chế cho phép quản lý thống nhất thông qua liên kết

Giới hạn với người liên quan

Từ sản xuất đến sử dụng → thu gom → sản xuất → sử dụng nhiên liệu tái chế, mọi công đoạn đều được thực hiện bởi một công ty Nhật Bản đáng tin cậy.



Phản hồi về dữ liệu như lượng thu gom và hiệu quả giảm phát thải carbon dioxide

CÔNG TY DAISEKI

Những hạng mục triển khai trong thời gian tới

Giới hạn với người liên quan

○Thỏa thuận với các công ty đối tác
・Chúng tôi đã thu hẹp số lượng ứng viên ở một số công ty nên sẽ tiến hành đàm phán.
・Hợp đồng hợp tác kinh doanh (Hợp đồng BCC) là lộ trình ngắn nhất để sử dụng các giấy phép hiện có
・Xác nhận tính khả thi của hoạt động kinh doanh bằng kế hoạch kinh doanh

○ Hợp tác với các công ty Nhật Bản
・Tổ chức các buổi làm việc với các bộ phận của Phòng Thương mại và Công nghiệp Nhật Bản Việt Nam (JCCI)
・Chúng tôi mong muốn nhận được sự hợp tác trong việc phát triển ngành công nghiệp huyết mạch tại Việt Nam với tầm nhìn hướng tới tương lai.
・Có tiếng nói từ phòng Thương mại và Công nghiệp để có ý kiến trình lên chính phủ là mong muốn của các công ty Nhật Bản.

CÔNG TY DAISEKI

Cuộc điều tra được thực hiện với sự hợp tác của Thành phố Hải Phòng.

Giới hạn với người liên quan

Thông qua hội thảo do ISC tổ chức, chúng tôi có thể trao đổi thông tin với các công ty xử lý chất thải.

CÔNG TY DAISEKI

BÁO CÁO TÓM TẮT

Thúc đẩy xây dựng Khu công nghiệp sinh thái hướng tới trung hòa Cacbon tại thành phố Hải Phòng, năm 2021 - 2023

Hội thảo chung về Mô hình tích hợp châu Á-Thái Bình Dương (AIM) 2050 Phát triển kịch bản Net-zero và Chương trình hợp tác giữa các thành phố vì xã hội không carbon giữa thành phố Hải Phòng và thành phố Kitakyushu

Thành phố Hải Phòng, ngày 28 tháng 11 năm 2023

IGES Institute for Global Environmental Strategies

Phác thảo dự án

Chuyển giao bí quyết

- Bí quyết của thành phố Kitakyushu trên 100% RE
- Bí quyết phát triển thành phố sinh thái của thành phố Kitakyushu

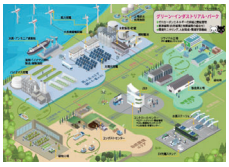
Cùng phản hồi qua lại

Phát triển dự án

- Tiết kiệm năng lượng
- Năng lượng có thể tái tạo
- Năng lượng thông minh
- Thu hồi năng lượng từ rác thải

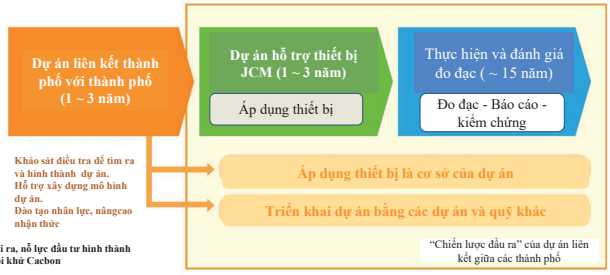
Đầu ra được kỳ vọng

Khu công nghiệp không phát thải



- ✓ Công nhận Khu công nghiệp sinh thái
- ✓ Khu công nghiệp không phát thải
- ✓ Chuỗi khử Cacbon
- ✓ Bản địa hóa một cách bền vững các Khu công nghiệp

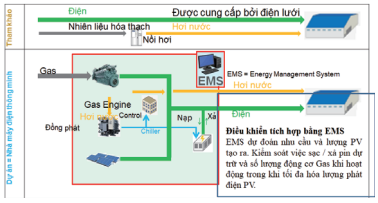
Khung chương trình và kết quả đầu ra được kỳ vọng



- Khảo sát điều tra để tìm ra và hình thành dự án.
- Hỗ trợ xây dựng mô hình dự án.
- Đào tạo nhân lực, nângcao nhận thức

Ngoài ra, nỗ lực đầu tư hình thành xã hội khử Cacbon

Nhà máy điện thông minh



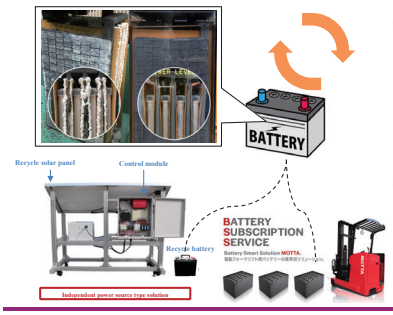
【Hạng mục nghiên cứu】

- Nghiên cứu khả năng xây dựng một "nhà máy điện thông minh" sử dụng khí đốt tự nhiên và năng lượng mặt trời thay vì dựa vào điện lưới để phát thải lượng khí thải CO2 thấp trong khu công nghiệp.

【Kết quả điều tra】

- Khu công nghiệp không muốn sử dụng khí đốt tự nhiên là nhiên liệu hóa thạch nhưng do nhu cầu điện lớn nên không cần EMS hay pin lưu trữ, đồng thời điều kiện ánh nắng mặt trời cũng không tốt nên có thể đánh giá tính khả thi thực hiện là thấp.
- Vì không có nhu cầu nên sẽ không tiếp tục phương án này.

Áp dụng thiết bị năng lượng tái tạo giá rẻ trên đảo Cát Bà



[Hạng mục nghiên cứu]

- Chúng tôi đang xem xét khả năng sử dụng năng lượng tái tạo với chi phí thấp cho các khu vực chưa có điện lưới của Đảo Cát Bà bằng cách sử dụng công nghệ tái chế pin axit chì.
- Một thiết bị quy mô nhỏ đã được chuẩn bị và tiến hành thử nghiệm trên bè nổi ở đảo Cát Bà.
- Chúng tôi cũng xem xét dịch vụ tái tạo ắc quy cho xe nâng điện tại các nhà máy.

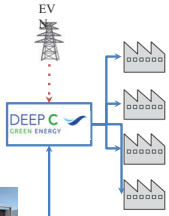
[Kết quả điều tra]

- Do Cát Bà đã được UNESCO công nhận là Di sản Thế giới nên tất cả các hộ gia đình đều phải di dời đến khu vực có lưới điện nên không còn bè nổi là còn ở khu vực không có điện.
- Việc giới thiệu áp dụng thiết bị này đã bị hủy bỏ vì không có điều kiện để tiến hành thử nghiệm.

Tích điện gió

Thiết bị điện gió 2.3 MW

Ắc quy VinES



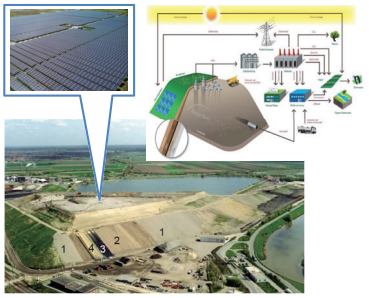
[Hạng mục nghiên cứu]

- Cơ sở phát điện gió lớn (2,3 MW) tại khu công nghiệp DEEP C tạo ra nhiều điện hơn vào ban đêm khi có gió mạnh nhưng là thời điểm có rất ít nhà máy hoạt động.
- Chúng tôi đang xem xét khả năng áp dụng cơ chế JCM cho dự án sử dụng pin Li-ion của ô tô Vinfast EV để lưu trữ điện năng tạo ra vào ban đêm và xả điện vào ban ngày.

[Kết quả điều tra]

- Hiện nay, điện phát ra trong đêm cũng được sử dụng, dù có tích trữ cũng không làm giảm lượng khí thải CO2 nên hiện đang phán đoán nội dung này không phù hợp với cơ chế JCM.
- Nếu trong tương lai có thể tăng hiệu quả tiết kiệm năng lượng thì dự án này sẽ trở lên cần thiết.

Phát điện năng lượng mặt trời tại bãi chôn lấp rác Đình Vũ

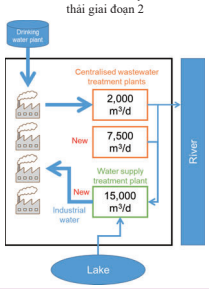


[Hạng mục nghiên cứu]
- Bãi chôn lấp rác Đình Vũ nằm cạnh khu công nghiệp DEEP C nên các công ty thuê đất liên tục phàn nàn về mùi hôi phát sinh từ đây.
- Do việc đóng cửa đang được xem xét nên khả năng lắp đặt thiết bị phát điện mặt trời quy mô lớn tại địa điểm bằng cách sử dụng cơ chế JCM...cũng đã được xem xét.

[Kết quả điều tra]
- Do địa điểm này đã được chọn làm địa điểm ứng cử cho việc lắp đặt cơ sở phát điện đốt rác và vẫn còn chỗ để chôn lấp đang được xác định sẽ không đóng cửa và sẽ tiếp tục được chôn lấp.
- Việc nghiên cứu khảo sát này sẽ bị hủy bỏ.

Tiết kiệm năng lượng của thiết bị xử lý nước thải

Hình ảnh cơ sở xử lý nước thải giai đoạn 2



Bơm hiệu suất cao（JCM）

Biến tần（JCM）

[Hạng mục nghiên cứu]
- Chúng tôi đã nghiên cứu khả năng nâng cao hiệu suất của cơ sở xử lý nước thải giai đoạn 2 tại Khu công nghiệp Nam Cầu Kiền.
- Chúng tôi còn tư vấn về việc lắp đặt máy bơm hiệu suất cao và thiết bị điều khiển biến tần của JCM.

[Kết quả điều tra]
- Chúng tôi đã giới thiệu một nhà sản xuất nhà máy xử lý nước thải lớn của Nhật Bản, nhưng chúng tôi không thể đạt được thỏa thuận về các điều khoản trong quá trình đàm phán kinh doanh.
- Vì không còn sự quan tâm sử dụng cơ chế JCM nên sẽ không tiếp tục thực hiện nghiên cứu dự án này nữa.

Quạt thông gió hiệu suất cao + biến tần cao áp

[Hạng mục nghiên cứu]
- Mục đích là để tiết kiệm năng lượng và giảm lượng khí thải CO2 bằng cách nâng cấp các quạt thông gió lớn cũ tại nhà máy Thép Việt Ý lên quạt thông gió hiệu suất cao và chuyển sang điều khiển biến tần áp suất cao.
- Điều tra, kiểm tra tính khả thi của các dự án trợ cấp thiết bị JCM.

[Kết quả điều tra]
- Chúng tôi đã chuẩn bị nộp đơn xin áp dụng cơ chế JCM, nhưng theo quyết định của đối tác, chúng tôi không thể đạt được thỏa thuận về các điều kiện như thời gian thu hồi vốn đầu tư, vì vậy chúng tôi đã bỏ việc nộp đơn xin áp dụng.

Đổi mới thiết bị hiệu quả cao tại nhà máy thép

Máy phun

Bơm chân không

[Hạng mục nghiên cứu]
- Để sản xuất các sản phẩm sắt cao cấp cần phải loại bỏ tạp chất khỏi thép nóng chảy và theo truyền thống người ta đã sử dụng một thiết bị gọi là máy phun. Bằng cách thay thế máy phun bằng bơm chân không, có thể giảm đáng kể mức tiêu thụ năng lượng và lượng khí thải CO2.
- Xem xét khả năng áp dụng vào dự án trợ cấp thiết bị JCM.

[Kết quả điều tra]
- Hiện chúng tôi đang điều tra các công ty thép nằm ngoài phạm vi thành phố Hải Phòng.

Nhiên liệu hóa rác thải dùng trong nhà máy xi măng

Hai Phong Cement

Chinfon Cement

[Hạng mục nghiên cứu]
- Các cuộc làm việc đã được tiến hành cùng với Xi măng Hải Phòng và Xi măng Chinfon về khả năng giới thiệu RDF hoặc nhiên liệu lỏng để nung xi măng làm nhiên liệu thay thế cho than.

[Kết quả điều tra]
- Cả hai nhà máy xi măng đều mong muốn sử dụng nhiên liệu thay thế nhưng không được phép đốt chất thải do nằm gần các công trình di tích.
- Nếu có thể chuyển đổi nhiên liệu thay thế thành nhiên liệu xi măng thì cũng có thể chuyển đổi rác thải nhựa được phân loại tại trung tâm sản xuất phân hữu c của URENCO thành nhiên liệu, dự kiến sẽ kéo dài tuổi thọ của các bãi chôn lấp.

Hệ thống phổ cập năng lượng tái tạo

[Hạng mục nghiên cứu]
- Xem xét khả năng triển khai `Mô hình Kitakyushu 100% năng lượng tái tạo" của Thành phố Kitakyushu, đưa năng lượng tái tạo vào tất cả các cơ sở công cộng.
- Đã tiến hành làm việc với các khu công nghiệp (2 công ty) và ngân hàng (1 công ty Nhật Bản, 2 ngân hàng địa phương)

[Kết quả điều tra]
- Nhiều cuộc gặp gỡ trao đổi đã được tiến hành liên quan đến việc sản xuất điện mặt trời trên mái nhà tại các khu công nghiệp.
- Giá bán điện thấp, điều kiện ánh nắng kém, không có hệ thống khuyến khích nên thời gian hoàn vốn đầu tư lâu.
- Vốn của các doanh nghiệp là loại hình tài chính duy nhất hiện có.
- Xác định rằng việc mở rộng theo chiều ngang sẽ khó khăn.

Tổng kết

- Một loạt các nghiên cứu và khảo sát đã được tiến hành về các hệ thống và thiết bị có thể đóng góp hình thành một “khu công nghiệp sinh thái”, nhưng thực tế đã chỉ ra rằng vẫn chưa có kết quả cụ thể nào được triển khai.
- Các công nghệ được khảo sát và xem xét thuộc "Hành động 1. Công nghiệp xanh", "Hành động 3. Năng lượng sạch" và "Hành động 5. Quản lý chất thải xanh" trong Kịch bản AIM, nhưng có ý kiến cho rằng không dễ để hiện thực hóa kịch bản này . Nó đã được thực hiện.
- Ngoài ra, các cuộc khảo sát vẫn đang tiếp diễn và chúng tôi mong muốn các bạn tiếp tục hợp tác để chúng tôi có thể hiện thực hóa triển khai dự án cụ thể cho dù chỉ là dự án có quy mô nhỏ.

FY2023 City-to-City Collaboration for Zero-Carbon Society

（Promotion of Eco-Industrial Parks Toward Carbon Neutrality in Hai Phong City, Vietnam）

Commissioned Report

March 2024

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