Green Growth Promotion Plan of
the City of Hai Phong

City of Kitakyushu, Japan
City of Hai Phong, Viet Nam
Introduction

The Government of Viet Nam formulated the “Green Growth Strategy” in 2012 in order to achieve the common goal shared by all of humanity, which is the protection of the environment, including global warming. The “National Action Plan on Green Growth” was approved by the Prime Minister in 2014 to put the national Green Growth Strategy into effect.

The City of Hai Phong, the third largest city in Viet Nam (population of approximately 1.9 million people), has evolved as the largest naval port in Viet Nam and the largest trading port in the northern region of Viet Nam. Hai Phong plays an important role in supporting the social and economic development of northern Viet Nam, which includes the capital city of Hanoi. In recent years, in particular, both domestic and foreign companies have established production bases in Hai Phong, which has led to the remarkable industrialization of the city. However, Hai Phong is facing various environmental problems, including issues with waste, air pollution, pollution of public waters, and traffic congestion, and needs to execute policies and measures that are both environmentally-friendly and allow socio-economic development.

The City of Kitakyushu, which became sister cities with Hai Phong in April 2014, is representative of industrial cities in Japan, and once suffered from various types of pollution. Kitakyushu was able to surmount these difficulties through the cooperation of businesses, residents, and the local government, and today, has been reborn as the most advanced eco-city in Japan.

The City of Hai Phong is aiming to create an environmentally-advanced, “Green Port City”, by applying the experiences, know-how, and technologies of Kitakyushu in environmental improvement.

Accordingly, the cities of Hai Phong and Kitakyushu, with support from the Ministry of the Environment, have decided to jointly develop the “Green Growth Promotion Plan” in order to specifically promote the “Hai Phong Green Growth Strategy Action Plan” (HPGGSAP), which has been compiled by the Hai Phong Department of Planning and Investment and approved by the Hai Phong People’s Committee in July 2014.

This plan is a compilation of these decisions and results, and divides the sectors to be addressed into seven areas: waste; energy; transportation; Cat Ba Island; water supply, sewage, and rainwater drainage; environmental conservation; and green production. Specific measures are proposed for each sector. In the future, these projects will be soundly implemented, which will further strengthen the intercity cooperation between Hai Phong and Kitakyushu. The different measures in each sector that are included in this plan will be developed and expanded to promote the development of Hai Phong as a leading advanced eco-model city in Viet Nam.

May 2015

City of Kitakyushu, Japan
City of Hai Phong, Viet Nam
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<th>Acronyms</th>
<th>Official Names</th>
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<tbody>
<tr>
<td>DARD</td>
<td>Department of Agriculture and Rural Development</td>
</tr>
<tr>
<td>DOC</td>
<td>Department of Construction</td>
</tr>
<tr>
<td>DOCST</td>
<td>Department of Culture, Sports and Tourism</td>
</tr>
<tr>
<td>DOIT</td>
<td>Department of Industry and Trade</td>
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<tr>
<td>DONRE</td>
<td>Department of Natural Resources and Environment</td>
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<tr>
<td>DOPI</td>
<td>Department of Planning and Investment</td>
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<td>DOT</td>
<td>Department of Transport</td>
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<tr>
<td>GHG</td>
<td>Green House Gas</td>
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<td>HEZA</td>
<td>Haiphong Economic Zone Authority</td>
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<tr>
<td>JCM</td>
<td>Joint Crediting Mechanism</td>
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<tr>
<td>NPO</td>
<td>Non-Profit Organization</td>
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<tr>
<td>PMU</td>
<td>Project Management Unit</td>
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<tr>
<td>URENCO</td>
<td>Urban Environment One-member Co., Ltd.</td>
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<tr>
<td>GGS</td>
<td>Green Growth Strategy</td>
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<tr>
<td>GGAP</td>
<td>Green Growth Action Plan</td>
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<tr>
<td>HPGGSAP</td>
<td>Hai Phong Green Growth Strategy Action Plan</td>
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<tr>
<td>SRI</td>
<td>System of Rice Intensification</td>
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1. Necessity & Positioning of the Plan
1. Necessity & Positioning of the Plan

1.1 Necessity of the plan

To date, the City of Hai Phong has experienced remarkable industrial development and urbanization. The development of urban infrastructure, such as Lạch Huyện deep sea port and expressways, in recent years is expected to further stimulate socio-economic activities. The flip side of this development means that Hai Phong is experiencing serious environmental problems, including air, water, and noise pollution, as well as traffic congestion.

In order to counter these problems, there is a need for a workable action plan to turn the Green Growth Strategy established by the Vietnamese government in 2012 and the “Green Port City” strategy of the Communist Party Politburo into reality.

Green Growth Strategy • Action Plan

- The national Green Growth Strategy (GGS) includes the measures necessary to achieve sustainable development and reduce greenhouse gas (GHG) emissions, and indicates the direction of measures that should be implemented in stages into the future.
- The City of Hai Phong decided to create an action plan in accordance with the following decisions by the Prime Minister.

<Decisions by Prime Minister>
- Green Growth Strategy: Decision by Prime Minister (September 2012, No.1393/QĐ-TTg)
- GG Action Plan: Decision by Prime Minister (March 2014, No.403/QĐ-TTg)

Photo 1.1.1 Photos of city and facilities

Green Port City

- Hai Phong is the third largest city in Viet Nam, and the largest port city in northern Viet Nam. In view of its importance, the Community Party Politburo issued instructions for the development of Hai Phong as an environmentally-advanced “Green Port City” (Politburo resolution (72-KL/TW)).
- There is a need to quickly formulate an Action Plan to put the “Green Port City” strategy into effect, which is an important concept for sustainable development.
1. Necessity & Positioning of the Plan

Hai Phong formulated the Green Growth Strategy Action Plan of the City of Hai Phong (1463/QD-UBND) (hereinafter referred to as HPGGSAP) in July 2014 based on the following strategies and plans: National Green Growth Strategy (1393/QD-TTg) (hereinafter referred to as GGS) approved by the Prime Minister in September 2012, Green Growth Action Plan (403/QD-TTg) (hereinafter referred to as GGAP) approved by the Prime Minister in March 2014, and the Green Port City strategy (72-KL/TW) of the Communist Party Politburo for the development and improvement of Hai Phong in period of national industrialization and modernization. This action plan, as illustrated in Figure 1.2.1, has been developed based on the master plans for each sector and the contents of other major plans of Hai Phong.

The Green Growth Promotion Plan of the City of Hai Phong is legally positioned in Section 8 of this action plan (1463/QD-UBND) (“The Department of Natural Resources and Environment will supervise the following in cooperation with local departments and organizations”). The plan is clearly specified as a method to “put the Green Growth Strategy into effect through the proposal of plans to develop and expand cooperation programs and the implementation of specific projects with the Ministry of the Environment of Japan and the City of Kitakyushu, in cooperation with the Department of Foreign Affairs and the Department of Planning and Investment”.

Photo 1.1.2 Green-advanced city: Kitakyushu
http://www.city.kitakyushu.lg.jp/kankyou/file_0264.html

Photo 1.1.3 River with improved water quality that has become a symbol of Kitakyushu
1. Necessity & Positioning of the Plan

**Figure 1.2.1** Legal positioning of the HPGGSAP and Green Growth Promotion Plan

<table>
<thead>
<tr>
<th>Various Master Plans</th>
<th>Various Master Plans</th>
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<tr>
<td>GGS: Green Growth Strategy (1393/QD-TTg)</td>
<td>GGAP: Green Growth Action Plan (403/QD-TTg)</td>
</tr>
<tr>
<td>Improvement &amp; Development of City of Hai Phong in the Industrial and Modern Development of Viet Nam (72-KL/TW)</td>
<td></td>
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<tr>
<td><strong>HPGGSAP</strong>: Hai Phong GGS•AP (Green Growth Strategy Action Plan: 1463/QD-UBND)</td>
<td>Green Growth Promotion Plan of the City of Hai Phong</td>
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<tr>
<td>Put into effect</td>
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**Other Major Plans in Hai Phong**

- Restructuring of agriculture for the purpose of value-added improvement and sustainable development (899/QD-TTg)
- Duty to implement measures to collect and process rural waste 2010-2020 (09/2010/NQ-HDND)
- Duty & measures for the development of public transport using buses 2012-2016 (04/2012/NQ-HDND)
- Phased development of cities in Viet Nam in response to climate change 2013-2030 (2623/QD-TTg)

- Industrial investment plan 2020 (2523/QD-UBND)
- Scientific research program (2013-2015)
  - Cities, transportation (2009/QD-UBND)
  - Social sciences (2029/QD-UBND)
  - Medicine (1778/QD-UBND)
  - Industries (1963/QD-UBND)
  - Resources & environment (1777/QD-UBND)
  - Agriculture, forestry, and fisheries (1778/QD-UBND)
- Duties, measures, systems, and administration for improving urban development and city management 2013-2015 (20/2012/NQ-HDND)
- Duty & measures for the development of public transport using buses 2012-2016 (04/2012/NQ-HDND)

**Construction**
- Review of Hai Phong’s MP to 2025 and vision to 2050 (1448/QD-TTg)
- Storm water drainage and waste treatment project (Japan ODA)

**Water supply**
- Hai Phong water supply plan to 2025 and vision to 2050 (2009/QD-UBND)
- Survey, review, and supplement to Hai Phong agricultural and rural development plans to 2020 (1779/QD-UBND)
- Hai Phong forest conservation and development plan to 2020 (2623/QD-TTg)
- Hai Phong rural industry development plan to 2020 (107/QD-UBND)
- Phased development of cities in Viet Nam in response to climate change 2013-2030 (2623/QD-TTg)
- Industrial investment plan 2020 (2523/QD-UBND)
- Scientific research program (2013-2015)
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- Review of Hai Phong’s MP to 2025 and vision to 2050 (1448/QD-TTg)
- Storm water drainage and waste treatment project (Japan ODA)
1.3 Relationship between the achievement of the Green Port City strategy and the Green Growth Promotion Plan

The Hai Phong Green Growth Promotion Plan takes advantage of the know-how and experience of the City of Kitakyushu on environmental improvement to develop as a specific and practical action plan for the HPGGSAP.

Hai Phong can play a leading role in Viet Nam as an environmentally-advanced Green Port City with the execution of its Green Growth Promotion Plan.

Figure 1.3.1 Conceptual diagram of actions towards the creation of a Green Port City
1. Necessity & Positioning of the Plan

1.4 Flow of support for the development of the Green Growth Promotion Plan

The flow of support for the development of the Green Growth Promotion Plan is shown in Figure 1.4.1. As illustrated in the figure, target areas have been divided into seven sectors: waste, energy, transportation, Cat Ba Island, water, sewage and storm water drainage, environmental conservation, and green production. Of these areas, waste, energy, transportation, and Cat Ba Island, which are closely related to the reduction of GHG emissions, have been positioned as key sectors, and the remaining sectors have been positioned as other areas.

Plans have been developed in line with the following procedure as shown in Figure 1.4.1 and in accordance with these sectors.

- Understanding the current situation (understanding the current situation and future plans, extracting issues)
- Strategy development (setting vision, targets by sector, and quantitative targets)
- Specific measures (consideration of measures by sector, planning of pilot projects)
- Formal validation of strategies and measures (feasibility and validation of measures, validation of effects after application, etc.)
- Orders/financing (financing methods, project implementation schedule, etc.)
- Compilation of plan

![Diagram showing flow of support for the development of the Green Growth Promotion Plan](image-url)
2. Accurate Understanding of the Current Situation
2. Accurate Understanding of the Current Situation

2.1 Natural conditions

Natural conditions in Hai Phong, such as successive changes in temperature and rainfall, are shown in Figure 2.1.1.

- Temperatures have been rising in recent years. Temperatures are also expected to rise about 1°C compared to temperatures in 1980 and 1990.
- Although rainfall has decreased in recent years, it is expected to increase slightly in the future.
- In either case, there is a need to continue to watch the various impacts from climate change that have originated with global warming. It is also important to consider responses for flood control, securing water sources, and agriculture, forestry, and fisheries.

![Temperature and Rainfall Graphs](image)

**Figure 2.1.1** Average yearly temperatures and rainfall in Hai Phong

Source: Department of Agriculture and Rural Development, Climate change, sea level rise scenarios for Viet Nam

2.2 Socio-economic conditions

Figure 2.2.1 shows trends and future forecasts for population and GDP in Hai Phong, in order to provide an overview of the socio-economic conditions in the city.

- According to Hai Phong’s master plan, the city’s population will increase by 1.4 times from 1.86 million in 2011 to 2.62 million in 2020. The population is expected to increase by 1.6 times to three billion by 2025.
- Economic activity is expected to grow, with GDP rising 4.3 times from VND 57,284 billion in 2010 to VND 246,360 billion in 2020.
2. Accurate Understanding of the Current Situation

- Hai Phong has developed as the largest port city and logistics hub in northern Viet Nam, and is expected to continue to evolve in the future.
- Since Hai Phong is close to Hanoi, there has been progress in the advancement of overseas companies into the market, and remarkable development of industries and services.
- In the future, Hai Phong aims to further develop and improve expressways, the Lach Huyen deep sea port, and Cat Bi International Airport, and will strengthen its functions as a logistics hub. The city expects population to increase and economic activity to be further stimulated.

![Graphs showing population and GDP forecasts](image)

Source: Hai Phong Statistical Yearbook, Hai Phong Master Plan

Figure 2.2.1 Future forecasts for population and GDP in Hai Phong

2.3 Social infrastructure

The current state and plans for major infrastructure in Hai Phong is illustrated in Figure 2.3.1. Currently, the city is proceeding with the development and improvement of expressways, the Lach Huyen deep sea port, and Cat Bi International Airport, and will further intensify the city’s functions as a logistics hub.
2. Accurate Understanding of the Current Situation

2.4 Greenhouse gas (GHG) emissions

- Viet Nam is one of the most vulnerable countries in the world to the impacts from sea level rise due to climate change. For this reason, the national government has positioned the reduction of GHG emissions, which is a factor behind climate change, as an important national polity.

- As an advanced environmental city, it is necessary for Hai Phong to illustrate specific quantitative values for future GHG emission reduction targets in the city’s Green Growth Promotion Plan, and to actively take initiatives to reduce GHG emissions.

- Forecasts for sea level rise are shown in Figure 2.4.1. Risks from flooding and storm surge damage due to rising sea levels are expected to increase.

- It may become difficult to secure water sources because of salt water intrusion into rivers.
2. Accurate Understanding of the Current Situation

2.5 Current issues

The issues to be considered or overcome when developing the Green Growth Promotion Plan are based on the current situation in Hai Phong and arranged in terms of general outline, government, businesses, and residents. Specific issues (detailed discussions) in various sectors, such as waste and energy, are described in detail in 4. Issues and Specific Measures by Sector.

(1) General outline

- The development and improvement of large-scale urban infrastructure, such as ports, airports, and highways, is continuing to move forward. However, the development of community infrastructure, such as waste management, sewage, and main roads, is behind schedule, environmental pollution and the deterioration of public health is rapidly increasing, and the improvement of community infrastructure is urgently needed to improve the quality of life of the city's residents.
- Currently, many companies from overseas that have made inroads into the market have expressed concern about the lack of development of component and parts-supply industries (local companies) in Viet Nam. Hai Phong is committed to the development of local industries, enhancing functionality, and strengthening the competitiveness of the manufacturing industry through collaboration and cooperation with foreign companies. It is important that this development will ultimately be connected to the self-sustaining development of Hai Phong.
- Control of GHG emissions, water demand, and energy demand due to rapid economic growth and population increases in the future is required. Hai Phong is also susceptible to sea level rise as it is a low-lying coastal city, and must develop responses to climate change.
- It is possible to attain economic growth while also improving the environment, as seen in the example of Kitakyushu, which overcame tremendous pollution and has achieved green growth, and seek to develop sustainably, with a balance between the economy and the environment.

(2) Government

- Cross-cutting linkages between related departments are necessary to solve the diverse problems facing the city. However, this has not necessarily been sufficiently achieved in Hai Phong.
- In order for Hai Phong to achieve green growth, it is necessary to have a clear strategy and urban management based on this strategy. However, the human resources, information, and financing to achieve this are inadequate.

(3) Businesses

- Companies do not have sufficient awareness about compliance. In particular, small-scale local companies face severe financial constraints, and cannot afford to implement environmental measures, such as for treatment of wastewater and exhaust gas.
- Hai Phong is not able to sufficiently respond to the needs of foreign companies that are making inroads into industrial estates and is missing business opportunities because the technical capacity and production management capacity of local companies are not sufficient.
(4) Residents

- The deterioration of the living environment and environmental pollution is progressing. However, awareness of the factors behind the waste and wastewater being discharged by residents is low, and it is necessary to improve environmental awareness in the communities.
- Residents often use automobiles and gasoline-powered motorbikes as a means of transportation to school and work. This results in traffic congestion in the city centers and causes air and noise pollution.
3. Formulation of Strategy
3. Formulation of Strategy

Strategy development will focus on the formulation of a vision that aims at the development of the Green Growth Promotion Plan, and basic policies for the plan will be compiled to achieve this vision. Next, specific quantitative targets to be achieved will be set based on this policy, and a system to promote this plan and the roles and responsibilities of stakeholders will be established.

3.1 Vision (Envisioning 2050)

Hai Phong set out a vision for sustainable development as an environmentally-advanced “Green Port City” as follows. The target year is envisioned to be 2050, which is the same as the target year for the GGS.

Vision (Envisioning 2050)

Hai Phong aims at the development of a Green Port City that ensures the sustainability of the society, economy, and environment, as a gateway and production base for northern Viet Nam.

Figure 3.1.1 Green Port City Vision
3. Formulation of Strategy

3.2 Basic policies

Basic policies have been set in each sector to achieve the vision described in the previous section.

<Waste sector>

*Proper treatment of waste and development of resource recycling society*

- Development of a social system in which waste is properly treated and resources are reused, and new recycling businesses are created.
- Achievement of lifestyle and industrial activities in which lower amounts of waste are generated, and creation of a society in which the impact on the environment and GHG emissions from waste are low.

<Energy sector>

*Promotion of efficient energy management and clean decentralized energy systems*

- Active promotion of the efficient use of energy and energy savings in the energy sector, where GHG emissions are the highest, in order to achieve significant reductions in GHG emissions.
- Introduction and application of new technologies to achieve significant reductions in GHG emissions and the launch of new projects related to the use of renewable energies, such as solar power, wind power, and biomass, in order to create a framework in which the economy and environment are compatible.

<Transportation sector>

*Introduction of low-carbon public transportation systems and modal shift to mass transit*

- Improvement of public transport systems that support economic activities through the introduction of low-polluting vehicles, development of land and sea routes for the efficient transport of large amounts of goods, and shift to transportation systems in which convenience and reduced environmental impacts are compatible.

<Cat Ba Island>

*Promotion of environmental protection and eco-tourism on the entire island*

- Comprehensive activities to control GHG emissions and reduce the impact on the environment in multiple areas, including waste management, energy, wastewater treatment, transportation, and industrial activities, in order to promote the protection and restoration of the valuable ecosystem of Cat Ba Island.
- Contributes to stimulating the island economy by developing eco-tourism, making use of the local resources on Cat Ba Island, which is blessed with a rich, natural environment.
3. Formulation of Strategy

<Water, sewage & storm water drainage sector>
Promotion of safe and secure water supply, sewage, and storm water measures that are in line with regional characteristics

- Water supply is the most important infrastructure to support socio-economic activities and the lives of people. In the future, Hai Phong will supply safe and secure water in response to increased demand, and strive to improve energy savings and leakage rates in the water purification and distribution processes.
- Wastewater treatment facilities for domestic sewage and industrial wastewater are necessary to secure social, economic, and environmental sustainability. Hai Phong will promote the development and improvement of local decentralized treatment facilities and large-scale sewage facilities based on the features of urban and rural areas.
- In response to the increase of heavy rains due to global warming and the increase of the occurrence of flooding and inundation due to rising sea levels, the development and improvement of effective infrastructure, including storm water drainage, will be promoted to carry out stable and ongoing economic activities, such as industrial and commercial activities to help city residents live safer lives.

<Environmental conservation sector>
Ensure high quality living environment and conserve rich, natural environments

- Strive to reduce environmental pollution that has a significant impact on the lives of the city’s residents, such as waste gas and wastewater emitted from various industrial activities, waste emissions from traffic, such as vehicles and motorbikes, and noise. The systematic and comprehensive implementation of measures to improve the quality of life of the city’s residents will be promoted.
- Efforts will be carried out to conserve the natural environment, such as Cat Ba Island and existing forests and green areas, and to maintain and restore biodiversity, and contribute to the development of sustainable industry (agriculture, fisheries, forestry, etc.).

<Green production>
Promotion of low-carbon development through improvement of productivity and technological innovation

- Introduction of industrial processes (cleaner production) that effectively use raw materials and energy, and production of environmentally-friendly products to increase product value and productivity.
- Environmentally-friendly agriculture that strongly discourages the use of chemical fertilizers and pesticides, water industries, such as cultivation and seafood processing that controls the emission of organic materials and reduces marine pollution, as well as sustainable forestry for the proper management and use of forests, will be carried out in order to promote sustainable economic activities.

Green Growth Promotion Plan of the City of Hai Phong
3. Formulation of Strategy

- Promote the development of new industries and new technologies that have low environmental impacts in cooperation with higher educational institutes, such as universities.

3.3 Target setting

Assessment indicators have been set to evaluate the targets to be achieved and the status of activities in each sector through the implementation of the Green Growth Promotion Plan and based on set basic principles.

Annual targets are divided into the following classifications to comply with the national GGS.

Target values have been set as shown in Table 3.3.1.

- Short-term: 2011 to 2020
- Mid-term: 2030
- Long-term: 2050

Table 3.3.1 Set target values and assessment indicators (proposed)

<table>
<thead>
<tr>
<th>Item</th>
<th>Target Year</th>
<th>2011 - 2020</th>
<th>2030</th>
<th>2050</th>
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<tbody>
<tr>
<td>National</td>
<td></td>
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<tr>
<td>Reduction of GHG emissions</td>
<td>8 to 10% reduction (compared to 2010)</td>
<td>1.5 to 2.0% reduction each year 20 to 30% reduction (BaU)</td>
<td>1.5 to 2.0% reduction each year</td>
<td></td>
</tr>
<tr>
<td>Energy consumption</td>
<td>1.0 to 1.5% reduction each year (per unit GDP)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>GHG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emissions</td>
<td>Approx. 10,950×10^3 t-CO₂/year</td>
<td>25% reduction (BaU)</td>
<td>50% reduction (BaU)</td>
<td></td>
</tr>
<tr>
<td>Reductions</td>
<td>10% reduction (compared to 2010%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste recycling rates</td>
<td>Urban solid waste: over 85% Industrial waste: over 85%</td>
<td>Urban solid waste: over 90% Industrial waste: over 90%</td>
<td>Urban solid waste: over 95% Industrial waste: over 95%</td>
<td></td>
</tr>
<tr>
<td>Energy consumption per GDP</td>
<td>Over 20% reduction (compared to 2010)</td>
<td>Over 50% reduction (compared to 2010)</td>
<td>Over 70% reduction (compared to 2010)</td>
<td></td>
</tr>
<tr>
<td>Public transportation usage rates</td>
<td>20%</td>
<td>30%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Achievement rates for air quality standards</td>
<td>Over 50%</td>
<td>Over 90%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Achievement rates for surface water environmental standards</td>
<td>Over 50%</td>
<td>Over 70%</td>
<td>Over 90%</td>
<td></td>
</tr>
<tr>
<td>Wastewater treatment rates</td>
<td>Domestic wastewater: over 5% Industrial wastewater: over 10%</td>
<td>Domestic wastewater: over 40% Industrial wastewater: over 70%</td>
<td>Domestic wastewater: over 75% Industrial wastewater: 100%</td>
<td></td>
</tr>
<tr>
<td>Green space area</td>
<td>Approx. 24,200 ha</td>
<td>Over 10% increase (compared to 2020)</td>
<td>Over 20% increase (compared to 2020)</td>
<td></td>
</tr>
<tr>
<td>Implementation rate of measures for mountain forests</td>
<td>Over 20%</td>
<td>Over 70%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Implementation rate of green agriculture</td>
<td>Over 10%</td>
<td>Over 40%</td>
<td>70%</td>
<td></td>
</tr>
</tbody>
</table>

※GHG emissions in 2010: 12,172×10^3 t-CO₂/year (for estimated values, refer to "Concepts of target setting").
Incidentally, the concept for setting target values and assessment indicators for GHG emissions are below.

<Concepts of target setting>

(1) GHG emissions

Targets for the entire country have been set and are indicated in the GGS.

① GHG emissions in 2000
- Viet Nam: 226,647×10^3 t-CO_2/year\(^{※1}\)
- Hai Phong: 5,382×10^3 t-CO_2/year\(^{※2}\)

※1 IGES, Market Mechanisms Country Fact Sheets
※2 Determined from the GDP ratio (2.37%) for Hai Phong compared with national levels in 2000 (Viet Nam: VND 441,646 billion, Hai Phong: VND 10,487.1, both nominal GDP)

② GHG emissions in 2010
- Viet Nam: 458,508×10^3 t-CO_2/year\(^{※3}\)
- Hai Phong: 12,172×10^3 t-CO_2/year\(^{※4}\)

※3 Assumed annual growth rate of GHG emissions = GHP annual growth rate

Average economic growth rate in 2001-2010 = 7.3% (JETRO Institute of Developing Economies), GHG emissions in 2010 = GHG emissions in 2000 \((=226,647×10^3)\times 1.073^{10}\)
※4 Determined from the GDP ratio (2.65%) for Hai Phong compared with national levels in 2010 (Viet Nam: VND 2,157,828 billion, Hai Phong: VND 57,284.1, both nominal GDP)

③ GHG emissions in 2020
- 10% reduction compared with GHG emissions in 2010 (national target in GGS)
- Hai Phong: Approx. 10,950×10^3 t-CO_2/year\(^{※5}\)

※5 GHG emission reductions = GHG emissions in 2010 \((12,172×10^3)\times 90\%\)

(2) Waste recycling rates

Target waste recycling rates of 85% were set as a guide for 2020 as indicated by the National Strategy on Environmental Protection (vision for 2020 and 2030).

(3) Energy consumption per GDP

The reduction of energy consumption per GDP for the entire country was set as guide.

(4) Public transportation usage rates

A target sharing ratio for buses in Hai Phong was set at 20-25% for 2020.

(5) Achievement rate for air quality standards

Current achievement rates for environmental standards (about 25%) were doubled in the short term (2020) in order to improve the living environment. After 2020, achievement rates will be improved year by year, and will completely satisfy current standards by 2050.
3. Formulation of Strategy

(6) Achievement rate for surface water environmental standards

Targets were set to achieve standards at each point in time, taking into consideration the future of sewage systems and wastewater treatment measures that should be implemented, based on the current environmental standard achievement rates※ in the city center (about 0%) and achievement rates for the entire city※ (about 40%).

※Achievement rates for surface water environmental standards B1 (irrigation water use) are shown.

(7) Wastewater treatment rates

Wastewater treatment rates were set in consideration of the current situation in which wastewater is mostly untreated.

(8) Green space area

Targets of 24,200 ha by 2020 were set for forest areas in the forest protection and development plan of Hai Phong (1600/QD-UBND, approved August 2013) (34.7% increase from 2014).

After 2020, targets will increase about 1% per year.

(9) Implementation rate of measures for mountain forests

Targets (area ratio) were set for afforestation, including tree planting, thinning, and weeding, as well as maintenance and management measures, mainly for plantation.

(10) Implementation rate of green agriculture

Promotion of green agriculture that uses less than 50% of chemical fertilizers and pesticides, in comparison with conventional methods rice farming.

Green agriculture can be promoted for green farming methods for vegetables and fruit that can be certified under the VietGAP system. Targets have been set for the systematic expansion of use of green farming methods, including for rice.

<Challenges for the quantification of GHG emissions>

① Development and enhancement of economic indicators and statistical data (energy consumption, business production, etc.)

② Improvement of forecasting accuracy of future economic indicators and statistical data

③ Improvement of calculation accuracy of GHG emissions

④ Improvement of calculation accuracy of effects of measures (GHG emission reductions※)

※Reductions = Future GHG emissions (if measures not implemented=BaU) – future GHG emissions (if measures implemented)
3. Formulation of Strategy

3.4 Promotion system

The following implementation system will be established for the promotion of this plan.

(1) Steady implementation of plan

The Planning and Investment Department will supervise and report on the HPGGSAP and the implementation progress of this plan, and submit regular reports to the People’s Committee each year. The Planning and Investment Department will reflect feedback from the People’s Committee in this plan for the steady implementation of the HPGGSAP and this plan, which is based on the HPGGSAP.

(2) Development of human resources

The Department of Home Affairs will develop the necessary social systems and systematically carry out the development of human resources that can respond to the effective implementation of measures in each sector. This will be carried out in cooperation with related departments, in order to put the HPGGSAP and this plan, which is based on the HPGGSAP, into effect.

(3) Financing

The Financial Department will encourage the central government to fully cooperate in order to secure costs for implementing the HPGGSAP and this plan, which is based on the HPGGSAP. The Planning and Investment Department will actively take advantage of private sector know-how and financing through mechanisms, such as PPP (public-private partnership).
(4) Understanding and application of the latest technology trends

The Science and Technology Department will gain an understanding of the latest technology trends to support green growth and to further improve functions. The Department will provide information on applicable technologies and related information to stakeholders.

(5) Cooperation with international organizations

The Department of Foreign Affairs will encourage international organizations to provide necessary cooperation and financial support in order to implement the HPGGSAP and this plan, which is based on the HPGGSAP.

(6) Information dissemination

The Information Communications Department and Press Department will inform the public, businesses, and private organizations about the contents and progress of projects using the city’s website, TV, and newspapers, in order to effectively implement the HPGGSAP and this plan, which is based on the HPGGSAP.

3.5 Stakeholder roles and responsibilities

The following roles and responsibilities for all stakeholders will be set in the implementation of this plan, as follows.

(1) Government

- The government will promote the development and improvement of infrastructure, such as for waste, water, and sewage, and will steadily implement specific measures based on this plan to ensure the sustainability of the society, economy, and environment.
- The government will inform businesses and residents about the details and progress of measures, and will encourage their cooperation and participation. The government will also provide support for environmental conservation activities of businesses and residents, and support learning (for example, donations to environmental conservation funds, clean-up activities in the city, etc.).
- The government will also inform businesses and the public about the effects of improvement on the environment through the implementation of measures, and will strive to create an environment in which further cooperation can be obtained (formation of a virtuous cycle).

(2) Businesses

- Businesses will review the production process in accordance with laws and regulations to fulfil its responsibilities as a company. Businesses will recognize that their duty is not only to pursue economic efficiency in production; they must also understand that emissions of waste, exhaust gas, and wastewater, as well as mass consumption of energy and natural resources, leads to degradation of the living environment of city residents and the natural environment.
- Proper treatment of pollutants emitted from factories, conservation activities, and effective use of natural resources, which are the raw materials for products, ensures public trust in companies
and the formation of a good corporate brand and image, and leads to the sustainable development of the company itself.

(3) Residents

- Residents must realize that their own behavior affects the environment, and that they have a responsibility to improve public health and the living environment, to pass on a beautiful, natural environment to future generations.
- Residents will strive to implement eco-life practices, and be responsible for the fair share of costs (levies, etc.) for treatment of waste and domestic wastewater carried out by public agencies.

<Eco-Life>

1) Reduce, separate, and recycle waste (promotion of 4Rs for waste)
2) Use eco-products and energy-saving appliances (certified products with eco-labels, etc.)
3) Practice energy-saving actions
4) Use public transportation
5) Take part in environmental studies
6) Take part in clean-up activities in the city
7) Improve manners, etc.

(4) Other (Tourists, etc.)

- The number of tourists and business people from outside the city increases every year. Although this stimulates the local economy, tourism can have an adverse effect on the living environment, natural environment, and tourism resources, as a result of an increase in waste, domestic wastewater, and traffic.
- Visitors to the city should bear part of the costs for developing and improving necessary infrastructure in order to reduce the impacts on the living environment, natural environment, and tourism resources in the city, for example, by the use of facility user fees and a tourism tax.
4. Issues & Specific Measures by Sector
4. Issues & Specific Measures by Sector

This section contains issues that Hai Phong faces in each sector, as well as specific measures to overcome these issues. Subsequently, specific measures that can be addressed quickly and from which high impacts can be expected are presented as pilot projects.

4.1 Composition of specific measures

Seven target sectors are shown in Table 4.1.1. There are four main sectors: waste, energy, transportation, and Cat Ba Island, which have potential to contribute to the reduction of GHG emissions, as well as three additional sectors. Specific measures and pilot projects are incorporated into these sectors.

<table>
<thead>
<tr>
<th>Main sectors</th>
<th>Waste</th>
<th>Energy</th>
<th>Transportation</th>
<th>Cat Ba Island</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other sectors</th>
<th>Water, sewage, and storm water drainage</th>
<th>Environmental conservation</th>
<th>Green production</th>
</tr>
</thead>
</table>

Figure 4.1.1 Composition of specific measures by sector
4.2 Specific measures in the waste sector

4.2.1 Waste: Current situation and issues

The current situation and issues in the waste sector are outlined below.

(1) Insufficient separation and recycling of household waste

- Waste reduction, separation, and recycling are generally not carried out. Waste is mostly landfilled, and there is concern about pressure on landfill sites. It is also difficult to establish new landfill sites due to opposition from residents.
- A composting facility has been constructed at the Trang Cat landfill site. However, the facility cannot produce good quality compost because separation is not carried out properly. Produced compost is only used as landfill cover materials.

(2) Improper treatment of domestic waste

- Only a small proportion of domestic waste is treated by incineration. Therefore, it is necessary to promote composting, as well as the reduction of the volume of waste and energy use by incineration treatment facilities or biogas facilities.
- A small incineration furnace (20t/day) developed by the Hanoi University of Science and Technology is operating in a rural district. However, there is concern about environmental pollution in neighboring fields because garbage dumps have not been established and proper management is not being carried out, such as the cleanup of scattered waste around the incinerator.
- There are a number of cases where hazardous waste is landfilled together with general waste, and has become a cause of concern for health damage and environmental pollution.

(3) Traceability of industrial, medical, and port waste

- As a rule, industrial, medical, and port waste is treated in a predetermined manner by specified
companies. However, in practice, Hai Phong does not have a complete understanding of the level of treatment or if waste is actually being treated properly. Therefore, it is necessary to understand the actual conditions and ensure traceability.

- For companies that illegally dump waste, it is necessary to enforce strict disciplinary action based on the government ordinance on penalties for violations of laws in the area of environmental protection (Degree No. 1/2006/ND-CP).

**Reference: Manifest System of Japan**

- Proper treatment and disposal by waste emitters can be checked using a manifest system.
- If treatment operators do not submit a manifest to waste emitters by a specified due date, waste emitters must check the status of treatment, take necessary measures, and report findings to the government.

![Diagram of manifest system of Japan](image)

**Figure 4.2.1 Manifest system of Japan**

(4) Improper treatment of industrial waste

- The scattering of industrial waste (gypsum) discharged from a fertilizer plant in the Dinh Vu industrial park, which is piled up, has become a major problem.

![Photo 4.2.4 Industrial waste piled up in the Dinh Vu industrial park](image)

- Fly ash generated from Hai Phong 1 & 2 coal-fired power plants is mixed with water to form slime, which is pumped into stockyards. For this reason, stockyards have become lakes of fly ash sludge, which has caused fear of environmental pollution in surrounding areas and health damage to residents.
(5) Reality of recycling businesses

- A recycling law for home appliances is being developed. Currently, environmental pollution is caused by the improper recycling of various wastes, such as consumer electronics, which is being carried out in handicraft villages around the country.

(6) Amount of generated waste

The amount of waste generated in 2025 is expected to be more than four times the current amount. The development of waste treatment and disposal facilities is an urgent need.

![Current amount of waste generated in Hai Phong and estimates for 2025](image)
(7) Waste incineration capacity
Incineration capacity is overwhelmingly deficient (currently, 33.9 t/day).

Table 4.2.1 Capacity of incineration facilities in Hai Phong

<table>
<thead>
<tr>
<th>Management companies of incineration facilities</th>
<th>Location</th>
<th>Treatment capacity</th>
<th>Incinerated waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>URENCO</td>
<td>Trang Cat disposal site</td>
<td>1.6 t/day(200kg/h)※</td>
<td>Hazardous waste, Medical waste</td>
</tr>
<tr>
<td>URENCO</td>
<td>Trang Cat disposal site</td>
<td>0.5t/day(60kg/h)※</td>
<td>General waste</td>
</tr>
<tr>
<td>Huyen Kien Thuy Province</td>
<td>In Hai Phong</td>
<td>20t/day</td>
<td>General waste</td>
</tr>
<tr>
<td>Cty Tan Thuan Phong</td>
<td>On the premises of Cty Tan Thuan Phong</td>
<td>10t/day</td>
<td>Hazardous waste</td>
</tr>
<tr>
<td>Cong ty Dai Thang</td>
<td>On the premises of Cong ty Dai Thang</td>
<td>1.8t/day</td>
<td>Medical waste, hazardous waste</td>
</tr>
</tbody>
</table>

※When in operation for eight hours

(8) Waste situation in Hai Phong
Households and offices in Hai Phong (urban area) discharge 1,600 t/day of waste.
- 200 t are transported to the composting center at Trang Cat.
- A large part of the remaining waste is landfilled in final disposal sites.

![Figure 4.2.3 Waste collection methods from Hai Phong](Source:Nisshara Corporation)

4.2.2 Waste: Specific measures
The measures shown in Table 4.2.2 are implemented to solve issues in the waste sector. Of these, the following measures will be implemented as pilot projects.
- Waste separation and recycling in rural and urban areas
- Proper treatment and recycling of industrial waste (production of raw materials for cement from industrial waste)
- Promotion of recycling projects (e-waste)
### Table 4.2.2 Details of specific measures in the waste sector

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Implementation period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
</table>
| 1. Waste separation and recycling in rural areas  ※Pilot project | • Establishment of intermediate treatment facility (separation line, composting line) with capacity of 40 t/day to recycle valuables and produce organic fertilizer, in order to carry out the separation and composting of domestic waste in rural areas.  
• Sales of produced organic fertilizer directly to farmers or to fertilizer companies to promote the spread of green agriculture. | Private companies | Short term | Recycling rates, reduction of GHG emissions |
|                  | **Pilot project** |                                          |                       |                       |
| 2. Waste separation and recycling in urban areas | • Using the experiences from the rural model, compost will be produced from domestic waste or market waste through the proper operation of URENCO’s composting facility (200 t/day). Compost will be sold to farmers or fertilizer companies.  
• Over the long term, a separation and collection system for domestic waste will be established, and reduction of waste before discharge and recycling after discharge will be promoted. | Private companies  
URENCO | Short term | Recycling rates, reduction of GHG emissions |
| 3. Energy recovery from waste | • Waste-to-energy will be carried out using high-calorie residue generated from composting facilities for domestic waste and other combustible waste.  
• In the future, domestic waste that cannot be treated by the extension of composting facilities will not be directly landfilled. Waste will be properly treated or converted to energy in biogas facilities or incineration facilities. | Hai Phong  
Private companies | Medium term | Amount of waste treated, electric power generation, reduction of GHG emissions |
| 4. Extending lifespan of final disposal sites and systematic securing of sites | • Aim to extend the lifespan of final disposal sites by reducing the volume of waste through intermediate treatment, and efforts to systematically secure final disposal sites.  
• Adoption of managed final disposal sites, including the Fukuoka Method for the development and improvement of final disposal sites, and prevention of soil contamination from leachate. | Hai Phong  
Private companies | Medium term | Amount of waste to final disposal site, reduction of GHG emissions |
| 5. Proper treatment and recycling of industrial waste | • Promotion of proper treatment of industrial waste that is discharged from factories and promotion of recycling of industrial waste, such as the utilization of fly ash from coal-fired power plants as raw materials/fuel for cement  ※Pilot project  
• Establishment of industrial waste treatment facility (separation, incineration) and power plant using residual heat from the treatment facility, and development of management-type industrial waste disposal site, as part of the Smart Island initiative on Cat Ba Island. | HEZA  
Private companies | Short term | Recycling rates, electric power generation, reduction of GHG emissions |
6. Proper treatment of hazardous waste

- Although a part of treatment facilities for hazardous waste, including medical waste, are in place, treatment facilities will be expanded in order to further promote the proper treatment of hazardous waste.

<table>
<thead>
<tr>
<th></th>
<th>Hai Phong Private companies</th>
<th>Medium term</th>
<th>Amount of waste treated, reduction of GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Promotion of recycling projects</td>
<td>- Efficient collection of resources generated in daily life, such as cans, bottles, PET bottles, and papers, and promotion of new recycling projects, such as for household appliances, automobiles, and tires, to create a recycling-oriented society.</td>
<td>Hai Phong Private companies</td>
<td>Medium term</td>
</tr>
<tr>
<td></td>
<td>- Develop and improve recycling complexes and transfer improper waste recycling businesses in local handicraft villages to reduce environmental impacts.</td>
<td>Same as above</td>
<td>Short term</td>
</tr>
<tr>
<td></td>
<td>- Proper recycling (reuse and recycling), treatment, and disposal of electrical and electronic waste, including CFCs. ※Pilot project</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Waste sector: Images of specific measures

- Waste separation
  - Source: Nishihara Corporation
- Compost produced from organic waste (organic compost)
  - Source: Nishihara Corporation
- Waste incineration facility
  - Source: Kogasaki Plant, Environment Bureau, City of Kitakyushu
- Recycling of waste home appliances
  - Source: Pamphlet of Kitakyushu Eco-Town
- Recycling of waste automobiles
  - Source: Pamphlet of Kitakyushu Eco-Town

Creation of environmental businesses

Figure 4.2.4 Images of the development of environmental businesses
Figure 4.2.5  Image of production of raw materials for cement from waste

Source: AMITA CORPORATION

Image of production of raw materials for cement from waste
4.2.3 Pilot project 1: Separation and composting of household waste

(1) Project overview (Overall)
- In Viet Nam, the development and improvement of legal systems has progressed and standards for the treatment and recycling of waste has gradually improved. However, the country faces problems with the mixing and landfilling of hazardous waste with non-hazardous waste. Therefore, Viet Nam is taking advantage of mechanisms that have already been established to reuse and recycle valuables in accordance with market principles, and is aiming to introduce advanced treatment systems for the entire waste system, in which low-carbon development and use of recycled resources are compatible in order to develop proper treatment and recycling systems.
- Of the following items in ① to ④, Nishihara Corporation and NTT Data Institute of Management Consulting carried out studies on the implementation of ①.
  a) Complete separation of solid waste and effective reuse of recyclables, such as metals, plastic, and paper (①).
  b) Composting of kitchen waste (organic) (①).
  d) Conversion of solid waste from industries, including hazardous waste, to raw materials and fuel (③).
  e) Reuse, recycling, and proper treatment of electric/electronic waste (e-waste), including fluorocarbons (④).

Current Status
- Most waste is landfilled due to insufficient separation of waste.
- There are many cases in which hazardous waste is mixed in with non-hazardous waste due to insufficient separation.
- Recyclables (metals, machinery, chemicals, fertilizer, paper, textiles, etc.) are reused and recycled based on market principles. Items that have no value are also handled as standard, however, most of the waste is landfilled.
- Waste management is commissioned to approved enterprises based on fixed rules, such as manifests. Uncertainties remain about the proper treatment of waste by consigned businesses.
- Only the recyclable and valuable parts of e-waste are traded. There is concern about the potential of pollution from waste residue.

Future Status
- Separation
- Collection & storage
- Collection
- Effective use
- Conversion to fuel
- Conversion to raw materials
- Recycling

Source: Nishihara Corporation, NTT Data Institute of Management Consulting

Figure 4.2.6  Project overview

- Status of treatment and recycling of target waste
  1) Amount of waste generated
     - According to a report on solid waste management and potential to collect waste in Hai Phong, the current waste discharge rate per capita in the city is approximately 0.7 kg/person per day (Nguyen Hoai Duc, 2014). When multiplying the population (1.9252 million) by the discharge rate,
the amount of waste generated in the entire city is about 1,347.7 tons/day (waste tons/day). Future forecasts indicate that the discharge rate will increase to 1.3 kg/person per day in the city area, and about 1.2 kg/person per day in the region. Lifestyle-related waste that is discharged every day is forecast to reach approximately 3,054 tons/day by 2025.

2) State of collection & transport, intermediate treatment, and final disposal

- Hai Phong Urban Environment Company (URENCO) is responsible for the collection and transport, intermediate treatment, and final disposal of general waste that is generated in the urban area. Each day, approximately 900 tons of waste is collected and treated.
- Of that 900 tons, 200 tons are converted into raw materials for compost at the Trang Cat composting facility. The remaining 700 tons are sent to the final landfill site.

3) Composting facilities

- The Trang Cat composting facility was constructed by URENCO at a total cost of JPY 2.1 billion using ODA from Korea. Lifestyle waste from households and waste from markets are transported to facilities on separate trucks. However, waste is mixed together in waste pits (Production of compost from market waste is not enforced.) Waste conveyed to pits undergoes the process of fermentation after paper, metals, and soil are separated at separation facilities (trommel, magnetic separators, hand-sorting conveyers).
- The period of primary fermentation is 20 days; secondary fermentation is one month. During the period of primary fermentation, lime and bacteria is added and compost is cutback using shovel loaders. Compost is aerated for 24 hours in primary fermenters. Aeration stops when the compost reaches a certain temperature. The produced compost is currently being used as a soil covering for the landfill site because product quality standards for compost have not been reached.
- Operating costs of the compost center are subsidized by the City of Hai Phong (VMD 200,000/ton).

4) Quality standards for organic compost produced using urban waste in Viet Nam

- Regulations on quality standards for compost that are specified in “So: 36/2010/TB-BNNPTNT” and regulations on the production and sale of organic compost from urban waste that are laid out in “CV512Phancompost” have been revised in “So41/2014/TB-BNNPTNT,” which was announced in November 2014. (New regulations have been applied since December 29, 2014).

5) Analysis of waste quality

- Waste quality analysis of samples was carried out in cooperation with URENCO for two types of waste: waste generated from households and waste generated from markets. Analysis of waste from markets was carried out based on the collection of waste from four different areas.
4. Issues & Specific Measures by Sector

- The composition ratio of kitchen waste was very high, with market waste at 85% (wet base) and household waste at approximately 75% (wet base).

Table 4.2.3 Physical composition of waste emitted from markets and households

<table>
<thead>
<tr>
<th>No.</th>
<th>Waste composition</th>
<th>Physical composition (wet base) (%)</th>
<th>Physical composition (dry base) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Market waste</td>
<td>Household waste</td>
</tr>
<tr>
<td>1</td>
<td>Food waste (can be composted)</td>
<td>85.9</td>
<td>74.1</td>
</tr>
<tr>
<td>2</td>
<td>Food waste (cannot be composted)</td>
<td>4.9</td>
<td>4.3</td>
</tr>
<tr>
<td>3</td>
<td>Disposable diapers</td>
<td>2.1</td>
<td>0.9</td>
</tr>
<tr>
<td>4</td>
<td>Paper</td>
<td>2.0</td>
<td>3.7</td>
</tr>
<tr>
<td>5</td>
<td>Plastic</td>
<td>2.4</td>
<td>5.0</td>
</tr>
<tr>
<td>6</td>
<td>Textiles</td>
<td>0.4</td>
<td>2.2</td>
</tr>
<tr>
<td>7</td>
<td>Vegetation</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>8</td>
<td>Rubber and leather</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>9</td>
<td>Metal</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>10</td>
<td>Glass</td>
<td>0.5</td>
<td>0.9</td>
</tr>
<tr>
<td>11</td>
<td>Ceramics and stone</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>12</td>
<td>Charcoal and ash</td>
<td>0.8</td>
<td>7.2</td>
</tr>
<tr>
<td>13</td>
<td>Hazardous waste</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td>14</td>
<td>Other</td>
<td>-</td>
<td>0.1</td>
</tr>
</tbody>
</table>

(2) Expected effects

① Reduction of GHG emissions

- The rural model (treatment capacity: 40 tons/day) estimates that about 60% (24 tons/day) of the 40 tons of waste/day will be used as raw materials for the production of compost. Trial calculations for GHG emission reductions were performed.
- The amount of emissions reduced in this project is calculated in “Reference emissions - Project emissions”. Reference emissions are calculated at 2,650 t- CO₂/year.
- Data (such as the amount of electricity used in the composting process) is needed to determine the amount of project emissions during the composting process. However, the practical use of the compost center in its current state has not been elaborated, and it is unclear how much electricity is used and how much energy is consumed.
- In this case, figures for GHG emissions generated during the composting process, as indicated by existing studies and surveys, are used as project emissions. The specific figure used is the generation of GHG emissions through composting (0.14 t CO₂/ton (waste)), as referenced in a Ministry of Economy, Trade, and Industry (METI) project development study on private sector infrastructure for an integrated waste-to-energy project in the city of Malang and surrounding areas in East Java, Indonesia, which was carried out in FY 2011.
- Calculations using the above values resulted in a figure of 1,226 t- CO₂/year, which was used as the reference value for project emissions. The GHG emission reduction effects from the
4. Issues & Specific Measures by Sector

Project are below. ※ All are GHG emission reduction effects from non-energy sources (avoidance of methane emissions).

**Rural model**: 2,650 ton-CO₂/day $\times$ 1,226 ton-CO₂/year = **1,424 ton-CO₂/year**

- The production scale of the urban model (treatment capacity: 200 tons/day) is five times that of the rural model. Therefore, the amount of GHG emissions reduced are expected to be nearly five times as much. Additional GHG emission reductions are expected through connections with waste-to-energy projects (below).

**Urban model**: $1,424 \times 5$ (composting projects) $+ 45,929$ (waste-to-energy projects) = **53,049 ton-CO₂/year**

※ However, energy consumption from aeration (project emissions) must be reviewed in the future.

Source: Nishihara Corporation, NTT Data Institute of Management Consulting

2) Cost effectiveness

【Rural model】

1) Requirements

Requirements, floor plan, and layout (draft) for the rural model are below.

Table 4.2.4  Requirements for the rural model

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirements</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separation line treatment capacity</td>
<td>40 tons/day</td>
<td>Composting production line to be connected.</td>
</tr>
<tr>
<td>Building site</td>
<td>Kiến Thuy district (rural area)</td>
<td>Land owned by Thanh Vinh Co.</td>
</tr>
<tr>
<td>Waste treatment costs</td>
<td>Expected to be covered by transportation costs collected from households and partial government subsidies.</td>
<td></td>
</tr>
<tr>
<td>Disposal costs for waste residue</td>
<td>VND 160/kg</td>
<td>Costs for disposal at neighboring Do Son disposal site.</td>
</tr>
<tr>
<td>Compost sales price</td>
<td>VND 600/kg</td>
<td>Does not include transportation costs.</td>
</tr>
</tbody>
</table>

Source: Nishihara Corporation, NTT Data Institute of Management Consulting

Figure 4.2.7  Floor plan and layout of recycling center
4. Issues & Specific Measures by Sector

2) Cost effectiveness

Initial costs for the introduction of the facility/equipment mentioned in the requirements listed in (1) are expected to be JPY 75 million. Because CO$_2$ emission reductions are calculated at 1,424 t-CO$_2$/year, the results of the equation, \[ \text{PJ overall costs} \div \text{CO}_2 \text{emissions related to energy use} \], are approximately JPY 52,670/t-CO$_2$ (※ GHG reductions from control of methane fermentation only).

At this time, it is anticipated that the project will use churning methods (open-type, straight-line composting equipment). However, cost effectiveness can be improved by considering cost reductions through the introduction of a piling method for composting (ventilated, non-ventilated type) to respond to actual conditions.

【Urban model】

1) Requirements

Requirements for the urban model are specified below.

- Composting facility

At this time, no initial costs are anticipated because URENCO will utilize the composting facility and equipment that has already been installed and is in use (200 tons/day). (※Necessity to upgrade the facility/equipment must be reviewed in the future).

- Waste-to-energy facility

The requirements for the waste-to-energy facility are listed below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirements</th>
<th>Remarks/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project period</td>
<td>20 years</td>
<td></td>
</tr>
<tr>
<td>Treatment capacity</td>
<td>600 tons/year</td>
<td>Single sequence</td>
</tr>
<tr>
<td>Operation hours (annual)</td>
<td>7,200 hours/year</td>
<td></td>
</tr>
<tr>
<td>Turbine steam conditions</td>
<td>400°C, 4MPa</td>
<td></td>
</tr>
<tr>
<td>Potential amount of electricity for sale</td>
<td>9,000 kW</td>
<td>Amount of electricity generated – Amount of electricity in the facility</td>
</tr>
<tr>
<td>Unit price of electricity for sale</td>
<td>JPY 11.7/kWh</td>
<td>USD 0.1005/kWh (USD 1 = JPY 117)</td>
</tr>
<tr>
<td>Building site</td>
<td>On the site of the current CP facility site</td>
<td></td>
</tr>
<tr>
<td>Collection and transportation costs</td>
<td>since the project will use existing resources (personnel, equipment, etc.) at the current CP facility.</td>
<td></td>
</tr>
<tr>
<td>Waste incineration and residue treatment costs</td>
<td>Treatment costs are not included since incineration ash and fly ash that has already been treated can be conveyed to the existing final disposal site.</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2.5 Requirements for waste-to-energy facilities

2) Cost effectiveness

The composting facility will operate 300 days annually (treat 60,000 tons/year). Treatment costs per one ton of compost are calculated at JPY 1,120. Based on these calculations, the cost benefit for the entire project (20-year period) will be approximately JPY 16,200/CO$_2$ (CO$_2$ emissions reductions related to energy use + GHG emission reductions from control of methane fermentation).
(※Additional detailed studies should be considered for repair costs under the O&M costs for the composting facility.)

Table 4.2.6 Breakdown of costs for waste-to-energy facilities

<table>
<thead>
<tr>
<th>Breakdown</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Initial costs</td>
<td>JPY 7.3125 billion</td>
<td>USD 62.5 million (USD 1 = JPY 117)</td>
</tr>
<tr>
<td>② Running costs (20 years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composting facility</td>
<td>JPY 1.344 billion</td>
<td>VND 200,000/t (VND 1 = JPY0.0056, operates 300 days/year)</td>
</tr>
<tr>
<td>Waste-to-energy facility</td>
<td>JPY 8.5316 billion</td>
<td>USD 72.92 million</td>
</tr>
<tr>
<td>③ Total</td>
<td>JPY 17.1881 billion</td>
<td>① + ②</td>
</tr>
<tr>
<td>④ GHG emissions reduction</td>
<td>1,060,980 t-CO₂/20 years</td>
<td></td>
</tr>
</tbody>
</table>

Source: Nishihara Corporation, NTT Data Institute of Management Consulting

(3) Project implementation system
- An urban model and a rural model can be developed for the composting of organic waste.
  - In the urban model, URENCO and Nishihara Corporation will establish a specialized SPC for composting, and implement activities from the start of the production process to the final sale of compost. This model will use equipment already in use at the Trang Cat composting plant that is operated by URENCO (treatment capacity: 200 tons/day).
  - The urban model will establish a waste-to-energy business (treatment capacity: 600 tons/day) using collected waste and waste residue generated at the Trang Cat composting plant, in order to recover energy from waste and further reduce the amount of waste sent to landfill.
- In the rural model, Thanh Vinh Co. and Nishihara Corporation will establish a specialized SPC for composting. The treatment capacity of the SPC is expected to be 40 tons/day. (※Thanh Vinh Co. has submitted a plan to the Vietnamese Ministry of Construction for treatment of solid waste (treatment capacity: about 10 tons/day) through a private sector model in the Kien Thuy area. The facility and equipment are expected to be installed by Thanh Vinh Co.)
- NTT Data Institute of Management Consulting will provide support for the development of the project, including various types of surveys. The project will also be promoted with the support of the Government of Japan, City of Kitakyushu, and composting experts.

Figure 4.2.8 Project implementation system
4. Issues & Specific Measures by Sector

(4) Project development schedule

<table>
<thead>
<tr>
<th>Rural model</th>
<th>Urban model + Waste-to-energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>• Prepare for open call and applications (Ministry of the Environment Project on the Overseas Business Development of Material-Cycle Industries in Japan) (survey on the foundation of a business environment, MOEJ JCM detailed F/S, other)</td>
<td>• Prepare for open call and applications (Ministry of the Environment Project on the Overseas Business Development of Material-Cycle Industries in Japan) (survey on the foundation of a business environment, MOEJ JCM detailed F/S, other)</td>
</tr>
<tr>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>• Produce compost (sample production, quality testing) as a preliminary composting production project in the city under contract with Thainh Vinh Co. and prepare for acquisition of certification. Detailed study on business plan of producing 40 t/day of compost (including facility equipment details, discussions and related studies to gain cooperation of farms that use compost (in cooperation with rural bureaus).</td>
<td>• Survey on waste discharge sources, such as refuse, residue from markets, food production plants, restaurants, and composting facilities (amount of waste discharged, composition, treatment changes, etc.), examination of separation and collection methods. Production of compost using high-quality organic waste (sample production, product quality testing); preparation for acquisition of certification. Preparation for the establishment of joint venture; consultations on contract details with contacts for sales of compost and electricity; discussions and related studies to gain cooperation of farms that use compost (in cooperation with rural bureaus).</td>
</tr>
<tr>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>• Support for the acquisition of certification for composting (product quality tests, scatter tests) (Process of acquiring certification may take about one year).</td>
<td>• [Composting project] Support for the acquisition of certification for composting (product quality tests, scatter tests) (Process of acquiring certification may take about one year).</td>
</tr>
<tr>
<td>Post 2017</td>
<td></td>
</tr>
<tr>
<td>• Business development</td>
<td>• [Waste-to-energy project] Preparation for establishment of joint venture; decision on financing methods.</td>
</tr>
</tbody>
</table>

Source: Nishihara Corporation, NTT Data Institute of Management Consulting

Figure 4.2.9  Project development schedule
4. Issues & Specific Measures by Sector

4.2.4 Pilot project 2: Production of raw materials for cement from waste

(1) Project overview

- The proper treatment of waste and the reduced use of fossil fuel and natural resources through the reuse of different types of waste generated in Hai Phong (mainly industrial system) as raw materials for cement, contributes to environmental conservation.

Figure 4.2.10  Overall overview of project
4. Issues & Specific Measures by Sector

① Reference materials: Example of Japan

In Japan, the cement industry plays an important role in the utilization and proper treatment of industrial waste. Acceptance of waste has become an important source of revenue for cement companies.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnace slag</td>
<td>Raw materials, admixture</td>
<td>9,711</td>
<td>9,304</td>
<td>8,734</td>
<td>7,647</td>
<td>7,408</td>
<td>8,082</td>
<td>8,485</td>
</tr>
<tr>
<td>Coal ash</td>
<td>Raw materials, admixture</td>
<td>6,995</td>
<td>7,256</td>
<td>7,149</td>
<td>6,789</td>
<td>6,631</td>
<td>6,703</td>
<td>6,870</td>
</tr>
<tr>
<td>Sludge, scrap</td>
<td>Raw materials</td>
<td>2,965</td>
<td>3,175</td>
<td>3,038</td>
<td>2,621</td>
<td>2,627</td>
<td>2,673</td>
<td>2,987</td>
</tr>
<tr>
<td>By-product gypsum</td>
<td>Raw materials (add-in materials)</td>
<td>2,787</td>
<td>2,636</td>
<td>2,461</td>
<td>2,090</td>
<td>2,037</td>
<td>2,158</td>
<td>2,286</td>
</tr>
<tr>
<td>Construction waste soil</td>
<td>Raw materials</td>
<td>2,589</td>
<td>2,643</td>
<td>2,779</td>
<td>2,194</td>
<td>1,934</td>
<td>1,946</td>
<td>2,011</td>
</tr>
<tr>
<td>Cinders (excluding coal ash), particulate matter, dust</td>
<td>Raw materials, thermal energy</td>
<td>982</td>
<td>1,173</td>
<td>1,225</td>
<td>1,124</td>
<td>1,307</td>
<td>1,394</td>
<td>1,505</td>
</tr>
<tr>
<td>Non-ferrous slag, etc.</td>
<td>Raw materials</td>
<td>1,098</td>
<td>1,028</td>
<td>863</td>
<td>817</td>
<td>682</td>
<td>675</td>
<td>724</td>
</tr>
<tr>
<td>Wood chips</td>
<td>Raw materials, thermal energy</td>
<td>372</td>
<td>319</td>
<td>405</td>
<td>505</td>
<td>574</td>
<td>586</td>
<td>633</td>
</tr>
<tr>
<td>Foundry sand</td>
<td>Raw materials</td>
<td>650</td>
<td>610</td>
<td>559</td>
<td>429</td>
<td>517</td>
<td>526</td>
<td>492</td>
</tr>
<tr>
<td>Waste plastic</td>
<td>Thermal energy</td>
<td>365</td>
<td>408</td>
<td>427</td>
<td>440</td>
<td>418</td>
<td>438</td>
<td>432</td>
</tr>
<tr>
<td>Steelmaking slag</td>
<td>Raw materials</td>
<td>633</td>
<td>549</td>
<td>480</td>
<td>348</td>
<td>400</td>
<td>446</td>
<td>410</td>
</tr>
<tr>
<td>Waste oil</td>
<td>Thermal energy</td>
<td>225</td>
<td>200</td>
<td>220</td>
<td>192</td>
<td>275</td>
<td>264</td>
<td>273</td>
</tr>
<tr>
<td>Waste clay</td>
<td>Raw materials, thermal energy</td>
<td>213</td>
<td>200</td>
<td>225</td>
<td>204</td>
<td>238</td>
<td>246</td>
<td>253</td>
</tr>
<tr>
<td>Reclaimed oil</td>
<td>Thermal energy</td>
<td>249</td>
<td>279</td>
<td>188</td>
<td>204</td>
<td>195</td>
<td>192</td>
<td>189</td>
</tr>
<tr>
<td>Waste tires</td>
<td>Raw materials, thermal energy</td>
<td>163</td>
<td>148</td>
<td>128</td>
<td>103</td>
<td>89</td>
<td>73</td>
<td>71</td>
</tr>
<tr>
<td>Meat &amp; bone meal</td>
<td>Raw materials, thermal energy</td>
<td>74</td>
<td>71</td>
<td>59</td>
<td>65</td>
<td>68</td>
<td>64</td>
<td>65</td>
</tr>
<tr>
<td>Debris</td>
<td>Raw materials, thermal energy</td>
<td>203</td>
<td>155</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>615</td>
<td>565</td>
<td>527</td>
<td>518</td>
<td>595</td>
<td>606</td>
<td>835</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>30,890</td>
<td>30,720</td>
<td>29,467</td>
<td>26,291</td>
<td>25,995</td>
<td>27,073</td>
<td>28,523</td>
</tr>
<tr>
<td>Amount used per 1 ton of cement (kg/t)</td>
<td></td>
<td>423</td>
<td>436</td>
<td>448</td>
<td>451</td>
<td>465</td>
<td>471</td>
<td>481</td>
</tr>
</tbody>
</table>

Source: Japan Cement Association
4. Issues & Specific Measures by Sector

(2) Acceptance of waste by cement companies

The current status of waste accepted by the cement industry in Viet Nam is shown in Table 4.2.8. At present, only a slight amount of waste is used; however, there is sufficient room for the industry to accept waste.

Table 4.2.8 Current status of waste receiving by cement companies

<table>
<thead>
<tr>
<th>Item</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
<th>Company E</th>
<th>Company F</th>
<th>Company G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of waste received</td>
<td>None</td>
<td>None</td>
<td>Blast furnace sludge</td>
<td>Sludge, waste oil, waste cloth, waste plastic, used and expired medication, cosmetics, waste gypsum, etc.</td>
<td>Bottom ash from thermal power plants</td>
<td>None</td>
<td>Various hazardous and industrial wastes (mainly high calorie), rice husks; import of coal ash, slag (Fe)</td>
</tr>
<tr>
<td>Waste consumption intensity</td>
<td>—</td>
<td>—</td>
<td>40kg/t (4% Sludge only</td>
<td>60kg/t (6%) Bottom ash only</td>
<td>60kg/t (6%) Bottom ash only</td>
<td>—</td>
<td>60kg/t (6%)</td>
</tr>
</tbody>
</table>

(2) Expected results

The track record of the use of waste as raw materials/fuel in the cement industry in Viet Nam is quite limited. The following effects can be expected if this project is implemented.

- Highly-transparent waste treatment ...
  Clear flow of treatment until final disposal
  (Waste emitters⇒AMITA⇒Cement companies)

- Promotion of proper treatment ...
  100% recycling, no generation of secondary residue, process for the purpose of recycling

- Extension of lifespan of final disposal sites ...
  Tied to the avoidance of landfill disposal

- Improvement of recycling rates ...
  Contribute to raising the standards for recycling rates in target areas

- Revenue source for local cement companies ...
  Incentives for cement companies and setting of proper treatment costs based on market principles

Figure 4.2.12 Expected results
4. Issues & Specific Measures by Sector

- GHG emission reduction effect: Approx. 1,169 t-CO₂/year

### Table 4.2.9 Project scale & GHG emission reductions

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>Calculation of construction costs</th>
<th>Treatment capacity</th>
<th>GHG emission reductions (expected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid fuel plants</td>
<td>Approx. JPY 300 million</td>
<td>Approx. 2,000 t/year</td>
<td>Approx. 1,169t-CO₂/year</td>
</tr>
<tr>
<td>Cement raw fuel plants</td>
<td></td>
<td>Approx. 24,000 t/year</td>
<td></td>
</tr>
</tbody>
</table>

※If producing 2,000 t/year of liquid alternative fuel (3,350 kcal/kg) and 24,000 t/year of cement alternative fuel (1,800 kcal/kg) to replace coal for general use (approx. 65,000 kcal/kg) in cement firing processes.

Source: AMITA

(3) Project implementation system

In addition to positive responses from several waste treatment companies for collaboration, there has been a good reaction from several cement companies (mainly foreign companies) on moving forward with the receipt of waste to produce raw fuel.

**Pattern 1**

Development of joint venture with local waste treatment company to supply alternative raw fuel to several cement companies after receipt and treatment of waste

**Pattern 2**

Development of joint venture with local waste treatment company to supply alternative raw fuel to partner cement companies after receipt and treatment of waste

**Pattern 3**

Development of joint venture between local waste treatment company, cement company, and AMITA.

Figure 4.2.13 Project implementation system
(4) Business model

- Treatment costs paid by generators of waste to AMITA. Commissions intermediate treatment to AMITA.
  ↓
- Payment of treatment costs for recycled products (alternative fuel) prepared and processed by AMITA to cement companies and delivery of product (treatment commission).*

*If calorific value of alternative fuel is high, it is anticipated that cement companies will also be interested in purchasing this fuel as an alternative to coal.

(5) Financing methods
- 50% subsidy for initial investment costs as a JCM project.
- Examination of potential to use the Environmental Conservation Fund which is scheduled to start operation from 2014 (low-interest loans, interest-free loans).

(6) Project implementation schedule

The project implementation schedule is below.

- **FY 2015**
  - Continuation of project F/S (market surveys, surveys on related laws, etc.)
  - Selection of partner company for implementation of project
  - Consensus building with related government departments
  - Survey on financing schemes

- **FY 2016**
  - Joint venture contracts with partner company for implementation of project
  - Various application procedures

- **FY 2017**
  - Start of construction and project

Source: AMITA

Figure 4.2.15 Project implementation schedule
4. Issues & Specific Measures by Sector

4.2.5 Pilot project 3: E-waste

(1) Project overview

① Overall flow of study

- The project will be implemented through the following four steps in the cities of Hanoi, Hai Phong, and Ho Chi Minh.

<table>
<thead>
<tr>
<th>Step 1: Survey on latest trends and identification of issues for legal frameworks related to e-waste in Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study on latest trends related to recycling of e-waste in Viet Nam after the promulgation of “Decision No 50/2013/QĐ-TTg” in August 2013 (roles and responsibilities of national and local governments, duties of manufacturers and importers, status of development of guidelines, status on the consideration of pilot PJ, other).</td>
</tr>
<tr>
<td>Identification of issues towards the development and enforcement of legal frameworks on recycling of e-waste, other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Organization of joint meetings to examine solution strategies through comparison with legal frameworks on e-waste in Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization of information on legal frameworks for recycling of e-waste in Japan, roles and responsibilities of national and local governments, and roles and responsibilities of private companies.</td>
</tr>
<tr>
<td>Comparison of differences of project environment in Viet Nam and legal systems being considered in Viet Nam.</td>
</tr>
<tr>
<td>Joint consideration of solution strategies for issues raised in step 1 with government and business stakeholders.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3: Organization of joint meetings for detailed examination of frameworks in Viet Nam and future action plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint consideration of detailed frameworks on e-waste and future action plans based on the solution strategies for issues examined in step 1 with government and business stakeholders.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4: Organization of mini-seminars in Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization of mini-seminars with stakeholders from national, local governments, and private companies based on the results in steps 1 to 3, and promotion of the dissemination of theses outcomes and mutual understanding with stakeholders.</td>
</tr>
<tr>
<td>Mini-seminars will be held in Hanoi, Ho Chi Minh, and Hai Phong in cooperation with national and local governments.</td>
</tr>
</tbody>
</table>

Source: NTT Data Institute of Management Consulting

Figure 4.2.16 Overall flow of study

② Study schedule

- Activities are being promoted according to the following schedule. The schedule of activities is being revised according to changes to the starting periods of new recycling systems.
## 4. Issues & Specific Measures by Sector

### Table 4.2.10 Study schedule

<table>
<thead>
<tr>
<th>Project details</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oct</td>
<td>Nov</td>
</tr>
<tr>
<td>(1) Survey on latest trends and identification of issues for e-waste in Viet Nam</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public info research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local field visits</td>
<td></td>
</tr>
<tr>
<td>(2) Organization of joint meetings to examine solution strategies through comparison with legal frameworks on</td>
<td>Meeting prep</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Org. of joint meetings</td>
<td></td>
</tr>
<tr>
<td>(3) Organization of joint meetings for detailed examination of frameworks in Viet Nam and future action plans</td>
<td>Meeting prep</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Org. of joint meetings</td>
<td></td>
</tr>
<tr>
<td>(4) Organization of mini-seminars in Viet Nam</td>
<td>Meeting prep</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Org. of mini-seminar</td>
<td></td>
</tr>
<tr>
<td>(5) Development of report</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4. Overview of regulations related to the collection and treatment of used products (1)

To December 31, 2014

- Law on Environmental Protection (into effect in 2006)
- Decision No 50/2013/QD-TTg

From January 1, 2015

- Law on Environmental Protection (revised in 2014)
- New Decision (Regulating the take-back and treatment of discarded products)
- Circular

Figure 4.2.17 Regulations related to the collection and treatment of used products (revisions to the Law on Environmental Protection)

Source: NTT Data Institute of Management Consulting
Overview of regulations related to the collection and treatment of used products (2)
List of starting dates for collection and treatment of used products is as follows.

Table 4.2.11 Starting dates for collection and treatment of used products

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of waste</th>
<th>Starting date (scheduled)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Batteries &amp; dry cells</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>All batteries</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>2</td>
<td>All dry cells</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>II</td>
<td>Electronic equipment, household/industrial electrical equipment</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Compact lightbulbs, lightbulbs</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>2</td>
<td>Computers (desktops, notebooks, monitors, CPU)</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>3</td>
<td>Printers, fax machines, scanners</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>4</td>
<td>Cameras, video cameras</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>5</td>
<td>Cell phones, tablets</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>6</td>
<td>DVDs, VCDs, CD recorders, others</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>7</td>
<td>Copy machines</td>
<td>2016/01/01</td>
</tr>
<tr>
<td>8</td>
<td>TVs, refrigerators</td>
<td>2016/01/01</td>
</tr>
<tr>
<td>9</td>
<td>Air conditioners, washing machines</td>
<td>2016/01/01</td>
</tr>
<tr>
<td>III</td>
<td>Industrial, agricultural, seafood chemical products, medication for people</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Industrial hazardous chemical products</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>2</td>
<td>Chemical products for animals</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>3</td>
<td>Chemical products for animals and plants</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>4</td>
<td>Chemical products for seafood</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>5</td>
<td>Medication for people</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>IV</td>
<td>Oils</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Oils</td>
<td>2015/01/01</td>
</tr>
<tr>
<td>2</td>
<td>Tires</td>
<td>2016/01/01</td>
</tr>
<tr>
<td>3</td>
<td>All inner tire tubes</td>
<td>2016/01/01</td>
</tr>
<tr>
<td>4</td>
<td>All tires</td>
<td>2016/01/01</td>
</tr>
<tr>
<td>5</td>
<td>All motorbikes, 2-wheelers</td>
<td>2018/01/01</td>
</tr>
<tr>
<td>VI</td>
<td>Transportation passenger cars</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>All vehicles</td>
<td>2018/01/01</td>
</tr>
</tbody>
</table>

Flow of collection and treatment

Information Disclosure & Reporting

Following information to be made public on MONRE, VEA, manufacturers’ and importing companies’ websites:
- Location of collection bases
- Treatment company name(s)
- Treatment performance

Following information to be reported to MONRE by manufacturers and importing companies once a year:
- Track record of products manufactured or imported and sold in Viet Nam
- Collection & treatment system
- Collection and treatment results

Duties of manufacturers and importers
- Establishment of collection bases
- Collection of used products sold in Viet Nam
4. Issues & Specific Measures by Sector

- Price negotiations with consumers at collection bases
- Transportation from collection bases to treatment companies
- Treatment of used products
- Reports on collection systems and treatment companies to MONRE and VEA
- Disclosure of information on company websites
- Submission of reports to MONRE once a year

Rights of manufacturers and importers and standards for establishment of collection bases

**Duties**
- Collection and treatment in cooperation with other companies.
- Collection and treatment can be commissioned to specialized companies

**Standards for establishment of collection points**
Collection bases will be established in consideration of the following points.
1) Products in circulation
2) Product features that may have an impact on the environment
3) Domestic distribution systems
4) Socio-economic and environmental conditions of the planned site

**Rights and duties of consumers and collectors**

**Duties**
- [Consumers] Bring used products to the collection point or collector.
- [Collectors] Bring used products collected from consumers to collection points.

**Rights**
- [Consumers and collectors] It is possible to request removal of waste after negotiating prices at collection points.

**Duties and rights of sales companies**

**Duties**
- Cooperation in establishing collection bases
- Cooperation in collection work

**Rights**
- Can freely establish collection bases in areas that are suitable for their own companies.
(2) Future schedule
The future schedule for this project is below.

![Future schedule diagram]

Source: NTT Data Institute of Management Consulting

Figure 4.2.19  Future schedule

(3) Plans for simple demonstration activities
- Hai Phong is currently examining the implementation of Viet Nam’s first simple demonstration activity on e-waste from households in cooperation between Hai Phong and DONRE. Hai Phong plans to proceed with the project after consideration of the details of this activity and in coordination with related organizations.
- Currently, the e-waste that is the target of this demonstration activity is limited to cell phones. This e-waste will be collected in coordination with local hazardous waste treatment companies, and proper recycling measures will be examined based on the collection conditions and situation.

![Simple demonstration activity diagram]

Source: NTT Data Institute of Management Consulting

Figure 4.2.20  Image of simple demonstration activity
4. Issues & Specific Measures by Sector

【Reference】Initiatives in Kitakyushu

(1) Free distribution of pamphlets on garbage disposal

(2) Fees for city-designated bags for waste and recycling

Reference table: Fees for Kitakyushu’s designated bags

<table>
<thead>
<tr>
<th>Type</th>
<th>No. bags per set</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large bags (45L)</td>
<td>10 bags per 1 set</td>
<td>JPY 500</td>
</tr>
<tr>
<td>Medium bags (30L)</td>
<td></td>
<td>JPY 330</td>
</tr>
<tr>
<td>Small bags (20L)</td>
<td></td>
<td>JPY 220</td>
</tr>
<tr>
<td>Special small bags (10L)</td>
<td></td>
<td>JPY 110</td>
</tr>
<tr>
<td>Cans, glass (25L)</td>
<td></td>
<td>JPY 60</td>
</tr>
<tr>
<td>PET bottles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large bags (45L)</td>
<td>5 bags per 1 set</td>
<td>JPY 100</td>
</tr>
<tr>
<td>Small bags (25L)</td>
<td></td>
<td>JPY 60</td>
</tr>
<tr>
<td>Plastics, container wrappings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large bags (45L)</td>
<td></td>
<td>JPY 100</td>
</tr>
<tr>
<td>Small bags (25L)</td>
<td></td>
<td>JPY 60</td>
</tr>
</tbody>
</table>

(3) Results

- Covers a part of waste treatment fees.
- Linked to reduction of waste.
- Clear plastic bags
  → Waste can be visualized → Concern about other people, linked to waste separation.

(4) Management of waste stations (collection points)

- Waste stations are set in one location within a neighborhood per every thirty households.
4. Issues & Specific Measures by Sector

- Management and cleaning of waste stations is conducted by residents on a rotating basis. → Keeps city clean.
- To keep waste from being scattered, Kitakyushu distributes nets or simple collection containers free of charge.

(5) Clean-up and awareness activities
- Implementation of clean-up activities with participation of residents and businesses → City beautification, improvement of townscape → Improves image
- On-demand courses on the 3Rs offered to elementary and junior high schools, kindergartens, companies.
- Waste collection activities by elementary schools by picking up garbage that has fallen on the road enroute to school.

4.3 Specific measures in the energy sector
4.3.1 Energy: Current situation and issues

The current situation and issues related to the energy sector are outlined below.

(1) High dependency on fossil fuels
- Social and economic conditions have developed significantly together with population increases and advances in factory and service facilities. In the future, there is concern about large-scale consumption of energy and increases in GHG emissions.
- Power supply sources in Hai Phong include four coal-fired power plants (PhaLai, UongBi, and Hai Phong 1, 2). The city is highly dependent on fossil fuels.
- From a perspective on global warming prevention and energy security, it will be necessary to promote the use of renewable energy and diversify energy sources.

(2) Electricity issues
- Hai Phong experiences power outages about twice a month, which can each last from a few hours to half a day. Therefore, factories are often equipped with in-house power generation equipment.
4. Issues & Specific Measures by Sector

- There is also a problem with electricity quality as power voltage is also unstable, and there is a risk that this will interfere with stable operations and advancement of industries.
- Power transmission losses are large. Efficiency in power transmission and distribution systems has become an issue.

(3) Promotion of energy conservation measures
- Full-fledged operations have just started, including the formulation and execution of energy conservation plans of specified operators based on the Law on Economical and Efficient Use of Energy. There is a need to promote the efficient use of energy in companies, such as the introduction of energy-saving equipment.

- Hai Phong lags behind in the efficient use of energy, such as waste heat.
- Coal-fired boilers are the mainstream in factories and hospitals that have a need for steam, and are a cause of environmental pollution.
- Energy-saving measures are not being carried out for lighting and air conditioning in offices and commercial facilities, which consume a great deal of power.
- Many companies have insufficient funding to implement energy-saving measures.
- Although energy-saving and labeling systems are available, implementation systems for energy-saving performance tests for products are insufficient and are not being promoted.
- Comprehensive energy management is not in place for factories, offices, and commercial facilities.
Table 4.3.1  Example of implementation of local survey (Beer factory A)

<table>
<thead>
<tr>
<th>Interviews</th>
<th>Inside factory</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Image" alt="Interviews Image" /></td>
<td><img src="Image" alt="Inside factory Image" /></td>
</tr>
</tbody>
</table>

- Energy-saving targets that have been set for each year based on production units have not been achieved to date.
- Energy audits have not been conducted, although their implementation is being considered for the end of this year.
- The introduction of energy-saving production equipment is being carried out in part. A refrigeration compressor of Japanese refrigeration equipment company A is being used.
- Last year, staff visited factories of a Japanese beer company for training, and learned about energy-saving methods in factories.
- Coal boilers and refrigeration compressors consume a great deal of energy.
- With the introduction of inverters for pumps and refrigeration compressors, the factory has been able to recover heat, etc.

Table 4.3.2  Example of implementation of local survey (commercial facility)

<table>
<thead>
<tr>
<th>Chillers</th>
<th>Refrigeration showcase</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Image" alt="Chillers Image" /></td>
<td><img src="Image" alt="Refrigeration showcase Image" /></td>
</tr>
</tbody>
</table>

- Energy conservation is recognized as a very important issue.
- Other stores in the same chain have insulation in the walls and roofs and have installed solar power.
- In response to an energy-saving assessment by a French company, the store introduced energy-saving lighting and inverter control for pumps.
- The store has also received an award from the Ministry of Industry and Trade for superior energy-saving actions.
- The store operates the chiller at night because electricity bills are less expensive. During the day, cold water is saved in storage.
- The company employs a system in which electricity consumption of major equipment in all stores is measured, and information is automatically transmitted to the store headquarters.

(4) Use of renewable energy
- The use renewable energy, such as solar, wind power, and biogas is not being promoted.
(5) Electric power consumption

There has been a large increase in the consumption of electric power. This trend is expected to become even stronger in the future.

4.3.2 Energy: Specific measures

Measures shown in Table 4.3.4 are implemented to solve problems in the energy sector. Of these measures, the following are being implemented as pilot projects.

- Efficient energy use in factories
- Efficient energy use in commercial facilities, office buildings, etc.
- Introduction of cleaner production in factories
- Energy savings in public facilities (energy savings for street lighting)

Table 4.3.3 Energy consumption per GDP (2013)

<table>
<thead>
<tr>
<th></th>
<th>kWh</th>
<th>GDP(USD)</th>
<th>kWh/GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hai Phong</td>
<td>$31.2 \times 10^8$</td>
<td>$2.73 \times 10^9$&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1.14</td>
</tr>
<tr>
<td>Japan</td>
<td>$9,236 \times 10^8$&lt;sup&gt;2&lt;/sup&gt;</td>
<td>$4,902 \times 10^9$</td>
<td>0.19</td>
</tr>
</tbody>
</table>

<sup>1</sup> 2010, Calculated at USD 1 = VND 21,000  
<sup>2</sup> FY 2012

*Based on the assumption that GDP growth rate and increased power consumption rate shown in the Socio-Economic Development Plan are equivalent*
### Table 4.3.4 Details on specific measures in the energy sector

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Efficient energy use in factories  ※ Pilot project</td>
<td>• Implementation of energy-saving assessments using energy saving centers and submission of proposals on efficient use of energy in order to promote energy saving efforts in companies that consume massive amounts of energy.  • Proposals on specific measures, such as applicable energy savings and energy reuse in small- and medium-sized companies, to improve efficiency of energy use.</td>
<td>Private companies DOIT</td>
<td>Short term</td>
<td>Energy reductions, reduction of GHG emissions</td>
</tr>
<tr>
<td>2. Efficient energy use in commercial facilities and office buildings, other  ※ Pilot project</td>
<td>• Proposals on efficient use of energy, such as the promotion of energy saving assessments in large-scale commercial facilities and office buildings with annual energy consumption of over 500TOE that are targets under the Law on Economical and Efficient Use of Energy. Introduction of energy savings for lighting and air conditioning, which consume a great deal of energy, and distributed power source systems, such as renewable energies.</td>
<td>Private companies DOIT</td>
<td>Short term</td>
<td>Energy reductions, reduction of GHG emissions</td>
</tr>
<tr>
<td>3. Introduction of cleaner production in factories  ※ Pilot project (See “Green production sector”)</td>
<td>• Promotion of review of production processes (cleaner production) that can achieve the efficient use of resources and energy in factories, including supporting industries (casting, metal processing, etc.) to promote energy savings.</td>
<td>Private companies DOIT</td>
<td>Short term</td>
<td>Energy reductions, reduction of GHG emissions</td>
</tr>
<tr>
<td>4. Promotion of introduction of renewable energies</td>
<td>• Promotion of the introduction of renewable energies, such as the use of photovoltaic power generation, solar heat, small-scale wind power generation, and use of geothermal heat, as part of the introduction of distributed power source systems in order to respond to the lack of basic electric power.</td>
<td>Private companies Residents</td>
<td>Short term</td>
<td>Electric power generation, energy reductions, reduction of GHG emissions</td>
</tr>
<tr>
<td>5. Energy savings in public facilities  ※ Pilot project</td>
<td>• Promotion of energy savings and efficient use of energy in facilities related to the city and People’s Committee, with Hai Phong taking the initiative.  • Promotion of energy-saving lighting, such as LED for existing and new streets and city lighting.</td>
<td>Governmental organizations DOT</td>
<td>Short term</td>
<td>Energy reductions, reduction of GHG emissions</td>
</tr>
<tr>
<td>6. Promotion of energy management  ※ Pilot project</td>
<td>• Introduction of energy management systems using smart meters in factories, office buildings, commercial facilities, and households, and promotion of optimal energy use, such as peak cut responses.  • Introduction of system for collective incoming power and voltage control for stable operations in industrial parks, and stabilization of voltage in basic electric power.</td>
<td>Private companies Residents Private companies</td>
<td>Medium term</td>
<td>Energy reductions, reduction of GHG emissions</td>
</tr>
<tr>
<td>7. Strengthening</td>
<td>• Examination and evaluation of energy use in predominantly energy-use facilities and support for the</td>
<td>Private companies</td>
<td>Short term</td>
<td>Energy reductions,</td>
</tr>
</tbody>
</table>
4. Issues & Specific Measures by Sector

<table>
<thead>
<tr>
<th>Energy-Saving Promotional Systems</th>
<th>Improvement of Energy Use Efficiency</th>
<th>DOIT</th>
<th>Reduction of GHG Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Setting indicators to evaluate energy savings and reduce environmental impacts in order to introduce and expand green production methods in industries (greening indicators).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Conduct of awareness raising activities for businesses and residents on energy savings and efficient use of energy, in addition to development of energy-saving models in households to promote energy savings.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Energy sector: Images of specific measures**

  ![Example of waste heat recovery power generation system](http://www.khi.co.jp/)
  
  ![Example of introduction of solar power generation system in factories (Kitakyushu)](http://sunsun-shop.net/industrial/sangyo/)
  
  ![Example of introduction of small-scale wind power generation system in factories](http://www.ghcraft.com/)
  
  ![Example of energy-saving assessments in factories](http://www.panasonic.biz/)
  
  ![Example of introduction of LED lighting on roads](http://www.pref.osaka.lg.jp/)
  
  ![Example of effects of the use of geothermal heat](http://www.sysken-kawada.jp/)

*Figure 4.3.2 Images of specific measures in the energy sector*
4.3.3 Pilot project: Energy savings and introduction of decentralized energy systems

(1) Project overview
- The project will implement feasibility studies on energy-saving assessments and introduce decentralized power source systems in a total of five factories and offices. The project will also conduct evaluations of feasibility studies and GHG emission reduction potential from the perspective of economic aspects and the identification of projects that can use the JCM.
- Conduct evaluations on feasibility studies and GHG emission reduction potential for energy-saving measures on lighting for rapidly developing infrastructure, similar to other emerging economies.
- Examination of the use of Hai Phong Environmental Conservation Fund, which will further defined in the future, in cooperation with Hai Phong.

<table>
<thead>
<tr>
<th>Topic of study</th>
<th>(1) Factories</th>
<th>(2) Offices</th>
<th>(3) Infrastructure, such as highways, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of cleaner production, including promotion of energy savings</td>
<td>Promotion of energy savings and low-carbon development of large-scale offices that are accompanied by co-benefits</td>
<td>Energy savings of infrastructure that include an outlook on efficiency of future infrastructure management.</td>
<td></td>
</tr>
<tr>
<td>Target of study</td>
<td>Energy-consuming factories, supporting industries (casting, metal processing, etc.), industrial estates</td>
<td>Hospitals, hotels, commercial facilities, other</td>
<td>Roads, bridges, other</td>
</tr>
<tr>
<td>Implementation items</td>
<td>(1) Selection of target facilities for study</td>
<td>(2) Assessment of current situation</td>
<td>(3) Examination of corresponding policies</td>
</tr>
<tr>
<td></td>
<td>(4) Proposals and discussions based on results of examination</td>
<td>(5) Assessment of GHG reduction potential and creation of MRV methodologies</td>
<td>(6) Joint examination of methods for use of Hai Phong Environmental Conservation Fund</td>
</tr>
<tr>
<td></td>
<td>(7) Evaluation of feasibility</td>
<td></td>
<td>(8) Preparation for application as JCM project</td>
</tr>
</tbody>
</table>
(2) Overview of individual project (contents, effects, financing methods, etc.)

1. Beer factory A

<table>
<thead>
<tr>
<th>State of Progress</th>
<th>Project Implementation System (Expected)</th>
</tr>
</thead>
</table>
| • 7/3: Explanation of project overview (NTT)  
• 7/31: Energy-saving assessment (NTT, NTT-GP)  
• Coordination with vendors, request for quotations, etc. |
| Refrigerator manufacturers (Maekawa MFG) (lead manager)  
Beer factory (Hanoi-Haiphong Beer) |

**Main Technologies Introduced**

High efficiency refrigerators

**Expected Project Scheme**

• Development of JCM projects through international consortiums using JCM assistance project

<table>
<thead>
<tr>
<th>Ministry of Environment</th>
<th>International consortium</th>
</tr>
</thead>
</table>

**Expected Open Proposals & Expected Project Scale**

<table>
<thead>
<tr>
<th>Introduction costs</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPY 13 million</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O&amp;M costs</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
<td>Under examination</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHG reductions (energy sources)</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 tCO₂</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Waste heat recovery power generation system in cement factory

<table>
<thead>
<tr>
<th>State of Progress</th>
<th>Project Implementation System (Expected)</th>
</tr>
</thead>
</table>
| • April: Meetings and factory check (NTT)  
• Currently, waste heat recovery power generation equipment is being installed.  
• Acquisition of energy-saving assessment report (NTT, NTT-GP)  
• Discussion with Japanese cement companies, etc. |
| Cement factory (Chinfon Cement)  
NTTD IOMC (Consultant) |

**Main Technologies Introduced**

Waste heat recovery power generation system

**Expected Project Scheme**

<table>
<thead>
<tr>
<th>Ministry of the Environment</th>
<th>International consortium</th>
</tr>
</thead>
</table>

**Expected Open Proposals & Expected Project Scale**

<table>
<thead>
<tr>
<th>Introduction costs</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPY 2 billion</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O&amp;M costs</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
<td>Under examination</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHG reductions (energy sources)</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
<td>To be calculated</td>
<td></td>
</tr>
</tbody>
</table>
### 4. Issues & Specific Measures by Sector

#### ③ Energy savings project in commercial facility (office)

<table>
<thead>
<tr>
<th>State of Progress</th>
<th>Project Implementation System (Expected)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Technologies Introduced</strong></td>
<td>Introduction of air-cooled, high-efficiency chillers and refrigeration showcases</td>
</tr>
<tr>
<td><strong>Expected Project Scheme</strong></td>
<td>- Development of JCM project through international consortium using MoEJ’s JCM assistance project</td>
</tr>
</tbody>
</table>

#### Main Technologies Introduced

- **Energy savings project in commercial facility (office)**
  - 4/24: Explanation of project (NTT)
  - 7/2: Energy-saving assessment (NTT, NTT-GP)
  - (Coordination with vendors)
  - 7/31: Discussions on future progress of project
  - August: Local survey of refrigeration showcase by candidate vendors

#### Expected Open Proposals & Expected Project Scale

<table>
<thead>
<tr>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction costs</td>
<td>JPY 50 million (Chiller + showcase)</td>
<td>-</td>
</tr>
<tr>
<td>O&amp;M costs</td>
<td>Under examination</td>
<td>-</td>
</tr>
<tr>
<td>GHG reductions (energy sources)</td>
<td>400 tCO₂ (chiller + showcase)</td>
<td>-</td>
</tr>
</tbody>
</table>

### ④ Lighting company A (infrastructure sector)

<table>
<thead>
<tr>
<th>State of Progress</th>
<th>Project Implementation System (Expected)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Technologies Introduced</strong></td>
<td>Street lighting system (LED), solar power panels, monitoring system</td>
</tr>
<tr>
<td><strong>Expected Project Scheme</strong></td>
<td>- Development of JCM project through international consortium using MoEJ’s JCM assistance project</td>
</tr>
</tbody>
</table>

#### Main Technologies Introduced

- **Lighting company A (infrastructure sector)**
  - 5/27: Explanation of project (NTT)
  - 7/2: Discussions on future progress of project (NTT, NTT-GP)
  - July~: Selection of candidate sites (Lighting company A)
  - Continue consideration of project order system since it is a public project

#### Expected Open Proposals & Expected Project Scale

<table>
<thead>
<tr>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction costs</td>
<td>JPY 400 million (LED + poles)</td>
<td>-</td>
</tr>
<tr>
<td>O&amp;M costs</td>
<td>Under examination</td>
<td>-</td>
</tr>
<tr>
<td>GHG reductions (energy sources)</td>
<td>600 tCO₂</td>
<td>600 tCO₂</td>
</tr>
</tbody>
</table>

---

*Public corporation is responsible for installation and management of street lights in Hai Phong. Currently, the company is considering the development of high-efficiency lighting and adoption of renewable energy.*
4. Issues & Specific Measures by Sector

(3) Project implementation schedule

Of the projects being considered this fiscal year, one project is being considered for implementation as a P/S in 2016, and, at the earliest, one project may be conducted as a JCM project in 2017.

![Project implementation schedule diagram]

*1 Construction project. Includes EPC (engineering, procurement, construction)
*2 MRV is an abbreviation for Measurement, Reporting, and Verification (for GHG emissions)

Figure 4.3.3 Project implementation schedule
4.4 Specific measures in the transportation sector

4.4.1 Transportation: Current situation and issues

The current situation and issues in the transportation sector are outlined below.

(1) Improvement plan for expressways, ports, airports, and railways (external transportation)

(2) Solving the problem of traffic congestion

- Hai Phong functions as the gateway to northern Viet Nam. However, there is concern about increased numbers of vehicles as a result of economic ripple effects, additional traffic congestion and worsening environmental issues with the development of the deep sea Lach Huyen International Port.

- National Route 5, which is the main road to Hanoi, passes through Hai Phong, and has remarkable levels of congestion. Immediate development of the Hanoi-Haiphong expressway is required.

- Railways that connect Hanoi and Haiphong and roads in the city intersect in 12 places, which has become a cause of congestion.
(3) Modal shift to mass transit
- The immediate development and improvement of transportation infrastructure for mass transit, such as extension of railways to the new Lach Huyen port, is required, in order to achieve a shift from transportation by trucks to inland water transportation that uses rail and feeder vessels.
- Cat Bi airport is promoting the development of international routes, and is developing new runways. Hai Phong must attract both passengers and international cargo flights, in order to develop a land, sea, and air transportation hub.

(4) Improvement of public buses
- Currently, utilization rates of public buses by residents stands at 1% (Hai Phong’s target: 30%). Therefore, it is necessary to reduce the number of vehicles and motorbikes to control traffic congestion in the city by improving bus convenience and comfort in order to increase ridership.
- In order to improve convenience, it is important to improve punctuality and set bus stops at highly convenient locations.
- Currently, commuter traffic is seen as inconvenient, with ports and factories concentrated on the right banks of the Cam river (southern side), and each company using individual shuttle buses.

(5) Promotion of controls on exhaust gas and low-carbon vehicles
- In order to solve air pollution issues, exhaust gas from motorbikes and vehicles must be controlled, and the expanded use of low-carbon vehicles (hybrids, electric vehicles, electric motorbikes, etc.) must be promoted. Current exhaust gas standards must also be improved from Euro II to Euro IV levels.
4. Issues & Specific Measures by Sector

(6) City development and traffic policies
- Traffic policies lack a mobility management perspective, such as awareness raising activities and distribution of public bus timetables and route maps, establishing bus-only lanes, and introduction of IC cards, which are necessary to promote a shift from vehicles and motorbikes to public buses.
- In addition to the expanded use of public buses, it is necessary to consider traffic policies that are integrated with urban development, including the promotion of the introduction of railroad mass transit systems, such as monorails and subways, and the integration of commercial facilities and housing complexes around stations in the future.

(7) Traffic volume (roads)
- Traffic volume is expected to increase on local roads even after the development and improvement of expressways.

![Figure 4.4.2](image-url)  Forecasts on traffic volume after development/improvement of expressway (2020)

(8) Volume of cargo transport (roads)
- Volume of cargo transport (roads) is expected to double by 2025.

![Figure 4.4.3](image-url)  Forecasts for volume of cargo transport (roads) (2025)
(9) Expressways

① Cargo vehicles
- The number of cargo vehicles is expected to decrease on National Route 5 and in the city after the construction of the expressway because it is close to industrial parks and ports on the coastal areas of Dinh Vu-Cat Hai and VSIP.
- In the long term, it is desirable to relocate factories to industrial parks in the suburbs and relocate the port (concentrated at Lach Huyen port) since cargo vehicles heading for the industrial parks on National Route 5 and within the city, as well as the ports along the Cam river, will continue to travel to the city.

② General vehicles
- The number of tourists and business people visiting Hai Phong from Hanoi by passenger car is expected to increase with the development of the expressway. Due to the increase of passenger cars, it is expected that traffic volume in the city will also increase.

(10) Airport
- In the future, it is expected that the number of visitors to Hai Phong will rise with the increase of flights to the city.
- Currently, although taxi transfers are the main form of transportation, it will be necessary to develop and improve shuttle bus services connecting the airport to the city to meet the needs of the increasing number of tourists to the city.

(11) Lach Huyen Port
- With the development and improvement of Lach Huyen International Port, the number of cargo vehicles is expected to increase significantly. However, it is expected that the increase of cargo vehicles will be controlled on National Route 5 and in the city because of the plan to directly connect the current port and expressway.
- However, economic ripple effects from this port (employees, increase in companies moving into the market, etc.) will be large, and traffic volume in the city is expected to increase.

(12) Improvement of railways
- Currently, the volume of cargo transport by railway is 1.03 million tons annually※. The number of passengers per year is about 400,000 (8 round-trip trains per day).
- The volume of cargo transport on roads is 28 million tons per year; traffic volume is 26 million people per year. Vehicles have become the main form of movement between Hanoi and Hai Phong.
- In the future, it will be necessary to reduce the volume of traffic on expressways and National Route 5 with the development of multiple rail lines and the introduction of high-speed railways.
In addition, since visitors are expected to increase with the use of trains rather than vehicles, it will be possible to reduce the volume of traffic within the city. Therefore, it is advantageous to develop and improve railways at an early stage.
※Data from 2008. Source: Hai Phong Department of Statistics.

4.4.2 Transportation: Specific measures
Various measures outlined in Table 4.4.1 are being implemented to address problems in the transportation sector. Of those measures, the following are being carried out as pilot projects.

- Development and improvement of public transportation systems (introduction of electric buses)
- Promotion of mobility management

### Table 4.4.1 Specific measures in the transportation sector

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
</table>
| 1. Improvement of public transportation systems | ・Promote shift to public buses from motorbikes and automobiles, which are causing air pollution due to exhaust gas, etc., and take the initiative to introduce low-emission vehicles, such as electric buses. **Pilot project**
・Consider introduction of railroad mass transit system, such as MRT, for the long term. | DOT Private companies | Short term | Public transport utilization rate, energy reduction rate, reduction of GHG emissions |
| 2. Expansion of use of low-emission vehicles | ・Expand the use of low-emission vehicles, such as hybrid and electric vehicles through the introduction of eco-tax reduction measures and subsidies.
・Shift from gasoline-powered motorbikes to low-emission electric motorbikes where motorbikes make up more than 50% of the share of means of transportation. | DOT | Short term | Energy reduction rate, reduction of GHG emissions |
| 3. Improvement of roads to alleviate congestion | ・Develop and improve ring roads with access to port facilities and industrial parks without passing through the city, in order to alleviate traffic congestion, pollution from exhaust gas, and noise pollution in the city.
・Create intersections with overpass/underpass between railways and roads in order to alleviate traffic congestion on roads from intersections between railways and main roads in the city. | DOT | Short term | Energy reduction rate, reduction of GHG emissions |
| 4. Development of logistics hub for land, sea, and air | ・Promote the development of logistics hub for land, sea, and air using the transportation and logistics infrastructure of the city, including the construction of the deep sea Lach Huyen port and extension of the Hanoi-Hai Phong railway to the port, development and improvement of the expressway between Hanoi and Hai Phong, and development of international routes for Cat Bi Airport. | DOT | Medium term | Energy reduction rate, reduction of GHG emissions |
| 5. Modal shift to mass transportation | ・Promote modal shift to increasing transport capacity, and railways and feeder vessels which have lower environmental impacts (shipping and inland waterways) for container cargo being transported by trailers, etc. | DOT Private companies | Medium term | Energy reduction rate, reduction of GHG emissions |
### 4. Issues & Specific Measures by Sector

<table>
<thead>
<tr>
<th>6. Promotion of exhaust gas countermeasures</th>
<th>DOT Private companies</th>
<th>Short term</th>
<th>DOT Private companies</th>
<th>Short term</th>
<th>Energy reduction rate, reduction of GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Improve current exhaust gas standards from Euro II to Euro IV as countermeasures for exhaust gas from motorbikes and vehicles, and promote replacement of old vehicles with expired expiration dates that do not meet regulations and standards for exhaust gas.</td>
<td>- Develop publicity and awareness activities to promote eco-driving, including turning off vehicles when stopped (“idling stop”).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Promotion of mobility management ※Pilot project</th>
<th>DOT Private companies</th>
<th>Short term</th>
<th>DOT Private companies</th>
<th>Short term</th>
<th>Public transport utilization rate, energy reduction rate, reduction of GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Revise bus routes and establish bus-only lanes, improve bus stops, introduce IC cards, and distribute bus timetables and route maps in order to improve public bus convenience and services. Promote shift from motorbikes and vehicles to public buses.</td>
<td>- Improve and develop sidewalks and bike lanes, promote walking and use of bicycles as alternative to motorbikes and vehicles. Promote the practice of eco-friendly lifestyles to improve health.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Promote the creation of low-carbon city using traffic policies</th>
<th>DOT DOC</th>
<th>Long term</th>
<th>DOT DOC</th>
<th>Long term</th>
<th>Public transport utilization rate, energy reduction rate, reduction of GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Promote the creation of a low-carbon city using traffic policies, including the introduction of railway mass transit systems, such as MRT, and concentration of commercial facilities and housing complexes around stations in the future.</td>
<td>- With the help of information and communication technologies (ICT), optimize road traffic by developing a system that integrates people, roads, and vehicles, eliminate accidents and traffic congestion, and promote environmental measures, such as energy savings.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Transportation sector: Image of specific measures

- **Low-emission bus (hybrid vehicle)**
  - Source: [http://www.hino.co.jp/](http://www.hino.co.jp/)

- **Bus-only lanes**
  - Source: [https://www.city.sapporo.jp/](https://www.city.sapporo.jp/)

- **Bicycle-only lanes (Kitakyushu)**

- **New transportation systems**
  - Source: [http://www.linimo.jp/](http://www.linimo.jp/)
4. Issues & Specific Measures by Sector

Figure 4.4.4 Images of specific measures in the transportation sector

- **Modal shift to feeder vessels**
  - Source: http://www.naiko-kaiun.or.jp/

- **Low-emission vehicles (electric vehicles)**
  - Source: http://www.mitsubishi-motors.co.jp/i-miev/

- **Low-emission vehicles (hybrid vehicles)**
  - Source: http://www.nissan.co.jp/

**CO2 emissions**

Source: http://www.naiko-kaiun.or.jp/
4.4.3 Pilot project 1: Introduction of low-emission buses (EV buses)

(1) Project overview

① Introduction and expanded use of electric buses
- Creation of environmentally-friendly public transportation system through the introduction of low-emission electric buses that use renewable energy, such as solar power, and improvement of operation and management.
- After the commercial introduction of electric vehicles, ensure the effects from the shift from motorbikes to buses by taking advantage of setting up new routes using EV on existing diesel bus routes.

② Improve operation and management of buses
- Promote operation, management, and use of buses with IC cards, and restructure bus route networks to be more efficient and convenient based on transportation survey data in cooperation with Nishi-Nippon Railroad Co.

2) Develop and improve infrastructure, such as charging stands
- Develop and improve charging stands in carports of Thinh Hung transportation in cooperation with Kyuden Technosystems, which has a wealth of experience in Japan and abroad.

Photo 4.4.6 Low-emission electric bus

Figure 4.4.5 Overview of remote monitoring system

- Current location measured with GPS (latitude, longitude)
- Collection of information on battery, including remaining battery life, electric current, and voltage at predetermined intervals, and notification of values to servers using cell phone networks.
- Receiving and display of data from server
- Encryption of transmissions using SSL
- Displays information sent to server in real time
- Presents emergency information to buses.
4. Issues & Specific Measures by Sector

(2) Expected results

- GHG emission reductions of about 6,825 t-CO₂/year with the introduction of 40 city buses and 40 intercity buses by 2020.
- With the introduction of an operating system, it is possible to have regular, scheduled operations and increase convenience.
- Fuel cost savings of about JPY 2.7 million per year with the replacement of existing buses with EV buses.

<table>
<thead>
<tr>
<th>Soft Energy buses (Introduced in this project)</th>
<th>Regular Japanese-made buses (demonstration stage)</th>
<th>Regular, Chinese-made buses (BYD auto e-bus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traveling distance on one full charge (km)</td>
<td>360 km (max.)</td>
<td>100 km</td>
</tr>
<tr>
<td>Price</td>
<td>About JPY 30 million</td>
<td>About JPY 100 million</td>
</tr>
<tr>
<td>Electric power consumption</td>
<td>0.6 kWh/km</td>
<td>1.2 kWh/km</td>
</tr>
<tr>
<td>Time required for full charge</td>
<td>4 hours</td>
<td>12 hours</td>
</tr>
<tr>
<td>Rapid charging</td>
<td>30 min (max.)</td>
<td>None</td>
</tr>
</tbody>
</table>

(3) Project implementation system

- Thinh Hung Transportation will introduce EV buses from Soft Energy Controls. Nishi-Nippon Railroad will provide support for operation and management.

(4) Procurement of financing

- Part of the introductory costs for one EV bus will be provided with the support of the Japanese government in FY 2015 to 2016.
- From FY 2017, it is expected that half of the cost difference between existing buses and EV buses will be provided through subsidies from the Vietnamese government.
4. Issues & Specific Measures by Sector

Table 4.4.3  Number of years required to recover initial investment for EV buses in FY 2015 and 2016 (demonstration project)

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>EV bus</th>
<th>Diesel bus</th>
<th>Difference</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Initial investment</td>
<td>Thousand yen</td>
<td>30,000</td>
<td>10,000</td>
<td>20,000</td>
<td>Cost of EV buses is JPY 60 million. Cost will be about JPY 30 million based on the assumption that a 50% subsidy for JCM projects will be used.</td>
</tr>
<tr>
<td>B  Electricity &amp; fuel charges</td>
<td>Thousand yen/year</td>
<td>562※1</td>
<td>3,240※2</td>
<td>-2,678</td>
<td></td>
</tr>
<tr>
<td>C  Number of years required to recover initial investment</td>
<td>Year</td>
<td>—</td>
<td>—</td>
<td>7</td>
<td>c=−a/b</td>
</tr>
</tbody>
</table>

Table 4.4.4  Number of years required to recover initial investment for EV buses from FY 2016 (full-scale project)

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>EV bus</th>
<th>Diesel bus</th>
<th>Difference</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>d  Initial investment</td>
<td>Thousand yen</td>
<td>20,000</td>
<td>10,000</td>
<td>10,000</td>
<td>Cost of EV buses is JPY 30 million according to volume efficiency. It is anticipated that the Vietnamese government will offer a 50% subsidy for the difference between this cost and the cost of diesel buses (JPY 10 million), which will reduce the cost of EV buses to JPY 20 million.</td>
</tr>
<tr>
<td>e  Electricity &amp; fuel charges</td>
<td>Thousand yen/year</td>
<td>562※1</td>
<td>3,240※2</td>
<td>-2,678</td>
<td></td>
</tr>
<tr>
<td>F  Number of years required to recover initial investment</td>
<td>Year</td>
<td>—</td>
<td>—</td>
<td>4</td>
<td>f=−d/e</td>
</tr>
</tbody>
</table>

※1 Mileage: 120,000 km/year, electric power consumption: 0.6kwh/km, electricity charges: JPY 7.8/kwh
※2 Mileage: 120,000 km/year, fuel consumption: 4.0km/l, fuel costs: JPY 108/l

(5) Project implementation schedule

- Project plan at this time is illustrated below.
- After the commercial introduction of electric vehicles, ensure the effects from the shift from motorbikes to buses by taking advantage of setting up new routes using EV on existing diesel bus routes.

Green Growth Promotion Plan of the City of Hai Phong
### 4. Issues & Specific Measures by Sector

#### Table 4.4.5 Project implementation schedule

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F/S</td>
<td></td>
<td>Hypothetical economic efficiency and effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demo project</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. city buses introduced</td>
<td></td>
<td>Verified economic efficiency and effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. long-distance buses introduced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion of project</td>
<td></td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>No. city buses introduced</td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>No. long-distance buses introduced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

※Use of conventional diesel buses on new routes.
4. Issues & Specific Measures by Sector

4.4.4 Pilot project 2: Promote use of public transportation

(1) Project overview

1) Objective

<table>
<thead>
<tr>
<th>Current situation &amp; problems with buses</th>
<th>Bus policies of Hai Phong</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current situation</strong></td>
<td><strong>Targets</strong></td>
</tr>
<tr>
<td>• Bus share ratio is about 1%</td>
<td>• Bus share ratio of 15-20% by 2020</td>
</tr>
<tr>
<td>• Private transportation, such as</td>
<td>(Transportation master plan)</td>
</tr>
<tr>
<td>motorbikes, account for about 80%</td>
<td></td>
</tr>
<tr>
<td>of all transportation.</td>
<td></td>
</tr>
<tr>
<td><strong>Problems</strong></td>
<td><strong>Policies</strong></td>
</tr>
<tr>
<td>• Buses run on main roads only.</td>
<td>• Expand bus lines (such as new establishment of</td>
</tr>
<tr>
<td>• Manners of bus riders and</td>
<td>No. 15 and 16 bus lines)</td>
</tr>
<tr>
<td>punctuality due to traffic</td>
<td>• Improve bus stops (signs at bus stops, new</td>
</tr>
<tr>
<td>congestion are becoming worse.</td>
<td>construction of bus shelters)</td>
</tr>
<tr>
<td>• Bus frequency is low.</td>
<td></td>
</tr>
<tr>
<td>• There are no announcements on</td>
<td></td>
</tr>
<tr>
<td>the bus, which makes it difficult for</td>
<td></td>
</tr>
<tr>
<td>riders to understand.</td>
<td></td>
</tr>
</tbody>
</table>

Proposals for mainly knowledge- and information-based improvement for Hai Phong’s bus policies, taking current issues into consideration.

![Figure 4.4.7 Project objective and policies](image1)

2) Contents

**Table 4.4.6 Activity targets and details**

<table>
<thead>
<tr>
<th>Target routes</th>
<th>Route No. 2</th>
<th>Operator: City bus (DOT)</th>
<th>Route No.3a-3b</th>
<th>Operator: Thinh Hung Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main targets</td>
<td>University and vocational school students along bus lines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity details</td>
<td>Activity 1: Improve bus services</td>
<td>Activity 2: Mobility management (MM)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Route No. 2**
[Urban area – Tien Lan-Vinh Bao]
• Bus users: 3,835 people/day
• 22 bus tops*
• Hai Phong University (10,000 students)
• World Bank project on improving bus stops is being promoted.

**Route No. 3a, 3b**
[Urban area – Do Son]
• Bus users (3a): 4,109 (3b): 3,561 people/day
• Bus stops: 22 (3a), 23 (3b)
• Hai Phong University (Economics department: 2,000 students)
• Universities, vocational schools, bus terminals along route.


![Figure 4.4.8 Target bus lines](image2)
【Activity 1】Details on improving bus service

1) Create timetables and make widely available to public
   - Create timetables (compile information on bus arrival and departure times for each bus stop on one table).
   - Timetables to be posted on the bus and the web to be able to be accessed anytime by anyone.
   - Bus drivers should operate the bus according to the bus timetable.

   Improve image of bus by operating on time.

2) Technical support by bus operators in Japan
   - Know-how on creating time tables
   - Guidance on bus staff training and safe driving for regular service
   - Announcements on buses
   - Management system for provision of information

Photo 4.4.7  Improvement of bus stops in Hai Phong

Figure 4.4.9  Technical support by bus operators in Japan

Photo 4.4.8  Example of improvements to bus stops (Becamex Tokyu bus)
4. Issues & Specific Measures by Sector

Example of information posted at bus stop

Figure 4.4.10 Example of information posted at bus stop

【Activity 2】Mobility Management (MM)

MM is an initiative to promote the appropriate use of a variety of transportation means, such as walking and public transportation through the “careful provision of information.”

Before
Person’s always using private mode only…

Information Provision:
Timetable | Bus Route Map

- Study constituents distribute information materials to MM study subjects (bus maps, timetables).
- Study subjects check the information and determine how to move around by bus.

After
They can choose a reasonable mode, depending on situation.

Figure 4.4.11 Image of Mobility Management (MM)
4. Issues & Specific Measures by Sector

Bus Time Table

Direction
Name of Bus Stop
Bus Route No.

Bus Route Map

Figure 4.4.12 Images of bus timetables and route maps

(2) Expected results
- Meet and increase bus demand by improving convenience and comfort.
- Sustainable development of public bus transportation businesses by ensuring punctuality.
- Contribute to alleviating traffic congestion and mitigating air and noise pollution.

(3) Project implementation system

<table>
<thead>
<tr>
<th>Japan</th>
<th>Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Kitakyushu</td>
<td>Hai Phong People’s Committee</td>
</tr>
</tbody>
</table>

Japanese government

Practitioners

Project team
- Japanese experts (consultants, bus operators)
- Local staff

Counterpart team
- Hai Phong Department of Transportation (DOT)
- Local universities (Hai Phong Univ, etc.)
- Bus operators (Thinh Hung Transportation, TNHH MTV, etc.)

Technical/financial support

Figure 4.4.13 Project implementation system
(4) Project implementation schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2016-2018</th>
<th>2019～</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop project implementation plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss with stakeholders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project implementation (2 lines)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey on local conditions</td>
<td>Bus staff training</td>
<td>Improve operation</td>
<td></td>
</tr>
<tr>
<td>Develop timetables</td>
<td>Create bus maps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rough budget</td>
<td>JPY 10 to 30 million</td>
<td>JPY 100 to 200 million</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.4.14  Project implementation schedule

(5) Division of main roles and responsibilities

Table 4.4.7  Division of main roles and responsibilities

<table>
<thead>
<tr>
<th>Activity 1</th>
<th>Activity 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve bus services</td>
<td>Mobility Management</td>
</tr>
<tr>
<td><strong>Hai Phong Department of Transportation</strong></td>
<td><strong>Hai Phong University</strong></td>
</tr>
<tr>
<td>•Survey on bus turnaround times (joint survey with bus companies)</td>
<td>•Survey on student needs and travel behaviors</td>
</tr>
<tr>
<td>•Set operating schedules</td>
<td></td>
</tr>
<tr>
<td>•Create timetables, post/distribute at bus stops, update websites</td>
<td></td>
</tr>
<tr>
<td>•Bus operation and management, guidance based on timetables.</td>
<td></td>
</tr>
<tr>
<td><strong>Bus operators</strong></td>
<td><strong>Discussion with DOT, universities</strong></td>
</tr>
<tr>
<td>•Implementation of survey on time required for target lines when setting service times</td>
<td></td>
</tr>
<tr>
<td>•Creation of timetables that allow for operation based on set service times.</td>
<td></td>
</tr>
<tr>
<td>•Creation of service management system using timetables</td>
<td></td>
</tr>
<tr>
<td>•Implementation of announcements on buses</td>
<td></td>
</tr>
<tr>
<td>•Thorough guidance to staff in relation to the above.</td>
<td></td>
</tr>
</tbody>
</table>

Rough budget

- JPY 10 to 30 million
- JPY 100 to 200 million

JPY 10 to 30 million

JPY 100 to 200 million
Supplementary materials

Concept of transportation problems due to the excessive use of motorcycles

Objectives of Mobility Management

Implementation of Mobility Management
4.5 Specific measures for the conservation of Cat Ba Island

4.5.1 Cat Ba Island: Current situation and issues

The current situation and issues for the conservation of Cat Ba Island are outlined below.

1) Waste

- Waste from households and tourist facilities are collected by a public corporation, however, waste is not separated.
- Collected waste is openly dumped (landfilled) in two landfill sites. Hai Phong struggles with outbreaks of flies. Leachate is also not treated.
- Waste from fish nurseries and fishing boats are illegally dumped into the sea.

1) Waste generation (※Partial estimates):

- Households: 2.3 t/day, hotels/restaurants: 7.2 t/day,
  Sewage sludge: 2.4 t/day

2) Frequency of waste collection:

1-2 times/day (urban areas), 6 times/month (rural areas)

3) Waste separation: Mixed collection with no separation

4) Waste recycling:

- Pig farms purchase kitchen waste from hotels and restaurants to use as feed
  (Waste other than what is used as feed is discarded.)

(2) Water & sewage

- Although the main source of water is groundwater and rivers, Hai Phong experiences serious water shortages. Four reservoirs (1 million m$^3$) are currently under construction.
- Sewage from tourist facilities (hotels, restaurants) is treated (treatment capacity: approximately 1,000 m$^3$/day). However, sewage from general households is not treated.
- Marine pollution from sewage from aquaculture facilities is continuing to advance, and has a serious impact on mangroves and coral reefs around the island.
(3) Energy

- Power failures occur about once a week for about half a day, with many occurring frequently in the summer months. Hotels and hospitals have installed generators that use diesel oil for emergencies.
- Renewable energies, such as solar power, are not being introduced.
- Coal-fired boilers are used at factories that produce aquatic feed and nam pla (fish sauce), and have a large impact on the environment. Energy-saving initiatives are also not being promoted.

(4) Natural environment

- The development of a large-scale resort and construction of a golf course are in progress, raising concern about the reduction of farmland, such as rice paddies, and impact on the natural environment.
- Nature preserves are rich in biodiversity, with about 3,860 different varieties of animal and plant species. However, it is difficult to grasp the actual conditions of the nature preserves because of the lack of human resources, financing, and equipment.
- The Cat Ba Bay tourism charge (introduced in 1986), which has not, to date, functioned well, is recently being collected and used for advertising and awareness activities related to clean-up and the environment. However, the amount collected is small, and it has not been linked to effective conservation activities for the natural environment.
(5) Transportation

・ Although there are tourist buses and carts used as a means of transportation, the tourist buses are diesel-fueled, and the island is facing problems from vehicle exhaust gas.

4.5.2 Cat Ba Island: Specific measures

The following measures shown in Table 4.5.1 will be implemented to address problems on Cat Ba Island. Of those measures, the following will be implemented as pilot projects.

・ Recycling of waste
・ Efficient use of energy in tourist facilities, etc.
・ Environmentally-friendly transportation to support eco-tourism

Table 4.5.1  Details on specific measures for Cat Ba Island

<table>
<thead>
<tr>
<th>Project Category</th>
<th>Project Details</th>
<th>Project Implementation Body</th>
<th>Project Period</th>
<th>Assessment Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conservation of natural environment</td>
<td>・Protection of existing species, including rare species, and the maintenance and restoration of biodiversity through the conservation of biological habitats on Cat Ba Island, such as forests and waters. ・Promote the development of ecosystem monitoring systems and creation of monitoring system for protection of the natural environment, in order to maintain and restore the valuable ecosystem.</td>
<td>People’s Committee Management committee NPO</td>
<td>Short term</td>
<td>Forest area, reduction of GHG emissions</td>
</tr>
<tr>
<td>2. Recycling of waste ※Pilot project</td>
<td>・Generation of electricity and hot water supply through biogasification from raw waste, livestock manure, sewage, and septic tank sludge, and promotion of resource circulation-type agriculture through the use of residue liquid as liquid fertilizer. ・Conversion of combustible waste (plastics, papers, textiles, pruning branches, other) to fuel for use as alternative energy for coal, and promotion of the production of raw fuel for cement from other waste.</td>
<td>Private companies</td>
<td>Short term</td>
<td>Waste recycling rate, energy reductions, reduction of GHG emissions</td>
</tr>
</tbody>
</table>
## 4. Issues & Specific Measures by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Specific Measures</th>
<th>Responsible Party</th>
<th>Time Frame</th>
<th>Goal of Specific Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governmental facilities, schools, and hospitals.</td>
<td>Promote the use of renewable energies, such as the introduction of solar power and solar hot water supply facilities.</td>
<td></td>
<td>Short term</td>
<td>Reduce GHG emissions</td>
</tr>
<tr>
<td><strong>Pilot project</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Promote the introduction of water-saving toilets and water-saving showers in tourist facilities, such as hotels, and promote the development of eco-hotels through such activities as curbing the unnecessary changing of sheets.</td>
<td>Same as above</td>
<td>Medium term</td>
<td></td>
</tr>
<tr>
<td>4. Streamlining factories and other facilities that consume large amounts of energy</td>
<td>Promote energy savings and fuel conversion to clean energy in industries that are large consumers of energy, such as those that produce aquatic feed and ice, and reduce environmental impacts.</td>
<td>Each business</td>
<td>Short term</td>
<td>Reduce energy, reduce GHG emissions</td>
</tr>
<tr>
<td>5. Environmentally-friendly transportation to support eco-tourism</td>
<td>Introduce electric motorbikes, assist bicycles, and low-emission vehicles (hybrid, electric vehicles) that have smaller impacts on the environment, and contribute to environmental conservation and improving the attractiveness of eco-tours.</td>
<td>People’s Committee, Private companies DOCST</td>
<td>Short term</td>
<td>Reduce energy, reduce GHG emissions</td>
</tr>
<tr>
<td>6. Complete treatment of wastewater from tourist facilities</td>
<td>Proper operation of current wastewater treatment facilities, as well as the introduction of decentralized treatment facilities, such as the installation of septic tanks in tourist facilities that are not carrying out the treatment of wastewater.</td>
<td>People’s Committee, Private companies</td>
<td>Medium term</td>
<td>Sewage treatment rate, reduce GHG emissions</td>
</tr>
<tr>
<td>7. Promotion of eco-tourism</td>
<td>Promote eco-tourism, such as the organization of eco-schools, in order to help tourists get in touch with nature on Cat Ba Island and cultivate a spirit that cherishes nature.</td>
<td>Management Committee, People’s Committee, NPO</td>
<td>Short term</td>
<td>No. of events organized</td>
</tr>
<tr>
<td></td>
<td>Promote awareness on conservation of the natural environment to island residents and tourists in cooperation with the Management Committee of the Cat Ba Archipelago Biosphere Reserve, Cat Hai Province People’s Committee, and the Seawater Management Committee.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Cat Ba Island: Images of specific measures

- **Conservation of the natural environment**
- **Installation of solar power generation system in school**

Source: [http://standard-project.net/](http://standard-project.net/)
Electric motorbikes for rent

Assist bicycles for rent

Source: http://numazu-sanki.com/greeting.html/
Construction and installation of wastewater treatment facility (septic tank)

Figure 4.5.1 Image of specific measures on Cat Ba Island
4. Issues & Specific Measures by Sector

4.5.3 Pilot project 1: Development of comprehensive resource recycling system

(1) Project overview
- This project will promote comprehensive recycling of waste generated on the island, cut GHG emissions through a reduction in the volume of landfilled waste, and protect the environment. The project will also promote environmentally-friendly tourism, eco-agriculture, and fisheries to contribute to the development of sustainable socio-economic systems on the island.
- Study and examination of technologies and systems towards project development.
  ① Production of biogas from organic waste with high moisture content
  ② Production of solid fuel from combustible waste with low moisture content
  ③ Production of raw fuel for cement from combustible waste that cannot be used for the above
  ④ Design of waste separation and collection systems and incentives

![Overview of project diagram](image-url)
4. Issues & Specific Measures by Sector

◇ Biogas projects: Flow of goods and money

Figure 4.5.3 Flow of goods and money in biogas projects

◇ Biogas projects: Results of comparison of costs, other

Table 4.5.2 Results of comparison of costs, other in biogas projects

<table>
<thead>
<tr>
<th></th>
<th>Power Generation Pattern</th>
<th>Compressed Biogas Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of recycled waste</td>
<td>5.6 t/day (Approx. 2,000 t/year) (Organic waste: 2.4 t/day, sewage sludge: 3.2 t/day)</td>
<td>Same as left column</td>
</tr>
<tr>
<td>Volume of biogas produced</td>
<td>225 m$^3$/day (82,000 m$^3$/year)</td>
<td>Same as left column</td>
</tr>
<tr>
<td>Electric power production</td>
<td>400-500 kWh/day (150,000~180,000 kWh/year)</td>
<td>—</td>
</tr>
<tr>
<td>Initial costs</td>
<td>JPY 90-100 million (Max. 50% JCM project subsidy)</td>
<td>JPY 110-120 million (Max. 50% JCM project subsidy)</td>
</tr>
<tr>
<td>Running costs</td>
<td>JPY 16-18 million/year (JPY 11-13 million/year)</td>
<td>JPY 18-20 million/year (JPY 12-14 million/year)</td>
</tr>
<tr>
<td>Recovery of investment</td>
<td>5 years ※With 50% subsidy as JCM project</td>
<td>Same as left column ※With 50% subsidy as JCM project</td>
</tr>
<tr>
<td>Environmental conservation fees ※1</td>
<td>Basic commission as a source of revenue (fixed)</td>
<td>Approx. JPY 19-21 million/year (JPY 20-22/person)</td>
</tr>
<tr>
<td>Electricity sales price</td>
<td>JPY 10/kWh</td>
<td>—</td>
</tr>
<tr>
<td>Compressed biogas sales price</td>
<td>—</td>
<td>JPY 110/kg</td>
</tr>
<tr>
<td>GHG emission reductions</td>
<td>2,000-3,000 t-CO$_2$/year (From energy sources: 5-20 t-CO$_2$/year)</td>
<td></td>
</tr>
</tbody>
</table>

※1) Consideration of collection of fees for waste treatment as source of revenue.
4. Issues & Specific Measures by Sector

◇ Production of solid fuel: Flow of goods and money

![Flowchart showing the flow of goods and money in projects producing solid fuel]

Source: Amita Institute for Sustainable Economies

Figure 4.5.4  Flow of goods and money in projects producing solid fuel

◇ Production of solid fuel: Calculation results from reduction of costs and GHG emissions

Table 4.5.3  Calculation results from reduction of GHG emissions in projects to produce solid fuel

<table>
<thead>
<tr>
<th>Volume of recycled waste</th>
<th>0.8 t/day (Approx. 300 t/year) - Plastics, paper, textiles, pruned branches, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of solid fuel waste</td>
<td>0.8 t/day (approx. 300 t/year)</td>
</tr>
<tr>
<td>Amount of heat generated from solid fuel</td>
<td>6,500-7,500 GJ/year</td>
</tr>
<tr>
<td>Initial costs (Production of solid fuel)</td>
<td>JPY 55-60 million (max. 50% JCM subsidy)</td>
</tr>
<tr>
<td>Initial costs (Use of solid fuel)</td>
<td>JPY 30-35 million (max. 50% JCM subsidy)</td>
</tr>
<tr>
<td>Running costs</td>
<td>※Excludes depreciation costs in parentheses</td>
</tr>
<tr>
<td>Recovery of investment</td>
<td>5 years ※With 50% subsidy as JCM project</td>
</tr>
<tr>
<td>Environmental conservation fees</td>
<td>※1) Basic commission as a source of revenue (fixed)</td>
</tr>
<tr>
<td>※1) Basic commission fees</td>
<td>Approx. JPY 14-15 million/year (JPY 15-16/person)</td>
</tr>
<tr>
<td>Solid fuel sales price</td>
<td>JPY 15,000-16,000/t</td>
</tr>
<tr>
<td>GHG emission reductions</td>
<td>350-400 t-CO₂/year (From energy sources: 30-50 t-CO₂/year)</td>
</tr>
</tbody>
</table>

※1) Consideration of collection of fees for waste treatment as source of revenue.

Source: Amita Institute for Sustainable Economies
(2) Expected results (includes co-benefits)

- Reduction of amount of landfilled waste
  →Reduces landfill costs and extends life of landfill site=Reduction of risks to secure new landfill sites
  →Conservation of natural environment  →Contributes to registration as World Heritage site
- Creation of locally-produced energy
  →Contributes to energy self-sufficiency
- Creation of environmental projects (biogas, production of solid fuel)
  →Creation of employment and economic development in the area
- Increases value as eco-island
  →Improves the power of island brands, stimulates tourism and island economy
- Creation of inexpensive, organic fertilizer
  →Provide organic agricultural products to hotels, etc.
  →Adds value to agricultural products, increases incomes of farmers

(3) Project implementation system

The implementation system for each project is outlined below.

◇ Biogas project

![Diagram of Biogas Project Implementation System]

**Source:** Amita Institute for Sustainable Economies

Figure 4.5.5 Implementation system for biogas project
4. Issues & Specific Measures by Sector

◇ Project on production of solid fuel

![Diagram](image)

Figure 4.5.6 Implementation system for project on the production of solid fuel

(4) Financing (support measures of the Japanese government that may be considered for use) & project schedule

Financing and the project schedule are as follows.

<table>
<thead>
<tr>
<th>FY</th>
<th>Implementation theme</th>
<th>Main implementation targets</th>
<th>Financing &amp; support policies (tentative)</th>
</tr>
</thead>
</table>
| FY 2015 | Detailed F/S (Demonstration, detailed project plan) | ・Confirm amount and quality of waste through demonstrations on separation by residents and businesses, and confirmation of level of environmental awareness  
・Detailed examination of project plan. Identification of potential to develop projects  
・Design required systems and measures (such as the development of separation systems, etc.)  
・Confirm clear intentions of Hai Phong (Cat Hai province) (system, financing, institutions, etc.)  
・Confirm clear intentions of counterparts (system, financing, etc.)                                         | JCM (F/S) project of Ministry of the Environment, other                                                  |
<table>
<thead>
<tr>
<th></th>
<th>FY 2016</th>
<th>FY 2017</th>
<th>Source: Amita Institute for Sustainable Economies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P/S (Design and</td>
<td>EPC (Engineering,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>estimates, consensus</td>
<td>procurement,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and financing)</td>
<td>construction)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Design and estimates</td>
<td>• Decision on equipment</td>
<td></td>
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<tr>
<td></td>
<td>• Decision-making and</td>
<td>subsidies</td>
<td></td>
</tr>
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<td></td>
<td>council decisions in</td>
<td>• Detailed designs,</td>
<td></td>
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<tr>
<td></td>
<td>Hai Phong (Cat Hai</td>
<td>procurement,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Province)</td>
<td>construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Conclusion of</td>
<td>• Start of operations,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>agreements with</td>
<td>MRV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>above</td>
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<td></td>
<td>• Conclusion of contracts</td>
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<td></td>
<td>with counterparts</td>
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<td></td>
<td></td>
<td>JCM (P/S) project of</td>
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<td></td>
<td></td>
<td>Ministry of the</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environment, other</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>JCM project (Ministry of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environment), JICA</td>
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<tr>
<td></td>
<td></td>
<td>cooperation fund, grant</td>
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<td></td>
<td></td>
<td>assistance (Ministry of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign Affairs), other</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Green Growth Promotion Plan of the City of Hai Phong
4. Issues & Specific Measures by Sector

4.5.4 Pilot project 2: Low-carbon development of the entire Cat Ba Island

(1) Project overview (overall)

① Objective
• Evaluation of feasibility and assessment of potential to reduce GHG emissions as viewed from the economic aspects of projects and the identification of projects that can use the JCM, with a focus on the tourism sector, which is the main industry of the island, and keeping the low-carbon development of the entire Cat Ba Island in mind.

② Overview of activities
• Low-carbon development methods target the introduction of energy-saving and renewable energies, as well as water conservation.
• Conduct of surveys on current situations at a total of 24 local sites through site visits, and examination of corresponding measures for low-carbon development.
→ Study targets: Seven hotels, three tourist transportation services, tourism farms, three ice plants, two nam pla (fish sauce) production plants, public facility management and city services companies (street lighting), sea farms, shrimp aquaculture companies, waterworks authority, large-scale resort development company, general hospitals, national parks, speed boat management companies.
• Examination of and proposals on financial mechanisms for environmental conservation projects on Cat Ba Island.

③ Candidate projects
• Selection of the following three projects as candidate projects from the perspective of feasibility and potential for reduction of GHG emissions, and study of demonstration projects.
  1) Project on photovoltaic power generation and EV buses in tourist farm, zoo, and botanical garden.
  2) Energy savings in hotels
  3) Installation of LED lighting on roads
(2) Activity schedule

Discussions are being carried out with local project counterparts at this time.

<table>
<thead>
<tr>
<th>Item</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec-Feb</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Meetings</td>
<td>Local kick-off meeting</td>
<td>Domestic (1), local inception workshop</td>
<td>Local progress report meeting</td>
<td>Domestic (2), local interim report meeting</td>
<td>Local report meeting on outcomes</td>
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<tr>
<td>(2) Local surveys</td>
<td>1&quot; survey</td>
<td>2&quot; survey</td>
<td>3&quot;, 4&quot; survey</td>
<td>5&quot;, 6&quot; survey</td>
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<td>(3) Selection of candidate sites</td>
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<tr>
<td>(4) Surveys and assessment of current conditions for each facility and site</td>
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<td>(5) Examination of corresponding measures</td>
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<tr>
<td>(6) Proposals and discussions based on results of examination</td>
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<tr>
<td>(7) Assessment of GHG emission reduction potential and development of MRV methodologies</td>
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<tr>
<td>(8) Assessment of feasibility</td>
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<td>(9) Development of reports</td>
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</tbody>
</table>

Figure 4.5.7 Activity schedule

(3) Specific projects

- **Pilot project 2-①: Introduction of photovoltaic power generation and EV buses in tourism farm, zoo, and botanical garden**

  ① Project overview

  - Quoc Hung, a tourism and transportation services company on Cat Ba Island, has developed a 16-ha tourism farm, zoo, and botanical garden with a target opening date of 2017. A Japanese photovoltaic power generation system (including consideration of solar sharing) will be introduced to this site. This system will be devoted to the company’s power consumption, including in restaurants, shops, offices, and for street lighting, and will be used to charge EV vehicles for the company’s transportation services.

  - Currently, regular buses are not running on Cat Ba Island. However, a bridge between Hai Phong and Cat Ba Island will be completed in 2017, and the number of visitors to the island is expected to increase. The company is planning to start regular bus services using EV buses in 2017. Using a combination of Japanese electric bus kits and ultra-lightweight Chinese vehicles, Hai Phong aims to introduce EV microbuses to Cat Ba Island via local companies in Kitakyushu. With the addition of a charging system for EV vehicles to the above-mentioned photovoltaic power generation system, the company hopes to contribute to the island’s sustainable development.
4. Issues & Specific Measures by Sector

generation system, Hai Phong aims to create tourism and transportation services that have zero GHG emissions on the island.

Photo 4.5.7  Image of projects

Table 4.5.5  Specifications for EV microbuses

② Project scale and expected results

- Project scale (theoretical)

  **Photovoltaic power generation system**
  
  Power generation capacity: 200 kW
  
  Initial costs: JPY 10 million (after JCM project assistance)
  
  GHG emission reductions: 100 t-CO₂/year
  
  Cost effectiveness: JPY 100,000/t-CO₂/year

- **EV buses**

  No. buses: 20 for demonstration purposes (includes 20 charging devices)

  Initial costs: JPY 68 million (after JCM project assistance)

  GHG emission reductions: 700 t-CO₂/year

  Cost effectiveness: JPY 39,000/t-CO₂/year

- Proposed utilization of open recruitment menu of the Japanese government for project development

  FY 2015: Detailed F/S

  After FY 2016: JCM project assistance (Ministry of Environment)

(Source: Materials provided by Kitakyushu and Company S)
3. Project implementation system

The project implementation system is outlined below.

![Diagram of project implementation system]

Source: NTT Data Institute of Management Consulting

Figure 4.5.8  Project implementation system for photovoltaic power generation and introduction of EV buses in tourism farm, zoo, and botanical garden

Green Growth Promotion Plan of the City of Hai Phong
4. Issues & Specific Measures by Sector

• Pilot project 2-②: Energy savings in hotels

① Project overview
This project will change outdated equipment in the Cat Ba Island Resort and Spa, which has the largest number of rooms on Cat Ba Island, to high-efficiency air conditioning systems and energy-saving refrigeration rooms and cold storage rooms.

![Photo 4.5.8  View of hotel](Image)

![Photo 4.5.9  Outdoor air conditioning unit (manufactured by Hitachi)](Image)

② Expected results
Reduce GHG emissions through the use of energy-saving air-conditioning equipment.

- Initial costs: JPY 6 million (after JCM project assistance)
- GHG emission reductions: 45 t-CO\(_2\)/year
- Cost effectiveness: JPY 130,000/t-CO\(_2\)/year

③ Financing
Propose the utilization of open recruitment menu of the Japanese government for project development

- FY 2014: Ascertain project feasibility
- FY 2015: JCM P/S
- After FY 2015: JCM project assistance scheme (Ministry of the Environment)
4. Issues & Specific Measures by Sector

④ Project implementation system

The project implementation system is outlined below.

Source: NTT Data Institute of Management Consulting

Figure 4.5.9  Project implementation system
4. Issues & Specific Measures by Sector

- Pilot project 2-③: Installation of LED lighting on streets

① Project overview
Street lighting on Cat Ba Island is managed and operated by the Cat Hai Province Management and City Services Public Corporation. Lights are installed in 313 locations on the island. An energy-saving project is being proposed for street lights, with all sodium lamps being considered for conversion to LED lighting.

Photo 4.5.10 Street lights
Photo 4.5.11 Park lights

② Expected results (tentative)
Initial costs: JPY 3 million (after JCM project assistance)
GHG emission reductions: 100 t-CO$_2$/year
Cost effectiveness: JPY 30,000/t-CO$_2$/year

③ Financing
Propose the utilization of open recruitment menu of the Japanese government for project development

FY 2015: Detailed F/S
After FY 2016: JCM project assistance scheme (Ministry of the Environment)

④ Schedule, other (2-①～③)
Of the projects that are being examined this year, one project will be implemented as a P/S in 2016, with the intention of being implemented as a JCM project in 2017.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F/S</td>
<td>F/S application (adoption)</td>
<td>Detailed F/S &amp; proposal</td>
<td>Basic agreement</td>
<td>Preparation for application to JCM project assistance scheme</td>
<td>Preparation for application to JCM project assistance scheme</td>
</tr>
</tbody>
</table>

Figure 4.5.10 Schedule for Cat Ba Island pilot project 2-①～③
4. Issues & Specific Measures by Sector

(4) Proposed financing mechanism for environmental conservation projects on Cat Ba Island

① Current status of financing mechanisms

・Currently, tourists pay the Cat Ba Bay tourism fee, as well as a tourism charge when using national parks. The commissions from these user charges are used for environmental conservation activities, including the salaries of cleaning staff and awareness activities on the island.

・The amount collected is as follows: Cat Ba Bay: VND 30,000, forests in the national park: VND 15,000 or VND 35,000, and sea: VND 30,000.

・Annual income from tourism fees are as follows: Cat Ba Bay: VND 3.8 billion (2013), national park: VND 1.5 billion (2013).

・Because the amount of fees collected are not sufficient, Hai Phong is currently considering raising the price of these tourism fees.

② Proposals for new financing mechanisms

・It is necessary to further increase financing in order to conduct low-carbon development of the island and to implement environmental conservation projects. The introduction of a new “environmental conservation fee” is being proposed to Hai Phong. The following are examples of collection methods.

1) Include fees in price of ship boarding tickets for tourists to enter the island. Ship operators will pay the collected amount to the city.

2) Include fees in accommodation price for hotels on Cat Ba Island. Each hotel will pay the collected amount to the city (or determine the amount of the fee in advance based on a set of standards, such as the number of hotel rooms).

・Items 1) and 2) include the following points. Entry routes to Cat Ba Island are by sea only (speedboat or ferry). Since tourists on day trips will also need to pay this fee, there will be enough tourists visiting the island to keep the fee per person low. The shipping company is run by the two most influential hotels on the island, which would make this a relatively highly-effective method of collecting fees.

・Since hotel guests are also subject to this fee, it is easy to distinguish between tourists, and residents and workers on the island.

・It is also possible to extend the range of the purpose of the fees. Understanding and approval of fee collectors and tourists can be obtained with easily understandable and straightforward explanations.

・It is necessary to further discuss the selection of the above schemes, amount collected, and target projects with the city.
4.6 Specific measures for water & sewage and storm water drainage sector

4.6.1 Water & sewage and storm water drainage: Current situation and issues

The current situation and issues in the water & sewage and storm water drainage sector are outlined below.

(1) Promotion of improvement of water supply

- The ratio of people in rural areas that use water which meets the technical standards of the country is 58.9%. There is a need to promote improvement of water supply in these areas.

(2) Conservation of existing water resources

- Pollution of rivers, which are the main source of water, is gaining momentum as a result of the inflow of domestic wastewater, factory wastewater, and wastewater from farmland. During the dry season, in particular, pollution is exacerbated due to lower amounts of water in rivers.
- Twenty-seven percent of the upstream region of rivers in Hai Phong are located in Chinese territory. In recent years, damage from salt water intrusion and issues with water intake have occurred because water intake on the Chinese side has increased and the amount of water is significantly lower during the dry season. In particular, the impact of salt damage on agriculture in the provinces of Vinh Bao and Tien Lang is significant.
(3) Securing new water resources

- It is necessary to prepare for increases in water demand due to population growth and economic development in the future, as well as long-term water resource development.

(4) Improvement of water leakage rates

- Water leakage measures in Hai Phong are the best in Viet Nam, with leakage rates in the urban area at 14%. Further improvement is necessary from the perspective of GHG emission reductions and improvement of profitability of water projects.

(5) Insufficient treatment of industrial and medical wastewater

- Industrial wastewater is properly treated in only some large-scale industrial parks, such as Nomura industrial park. However, since the proper and complete treatment of industrial wastewater is limited to only a few industrial parks, it is necessary to ensure that wastewater from all industrial parks is thoroughly treated.
- There are a number of cases in which untreated sewage from industrial clusters, such as Vinh Niem industrial park, factories, and hospitals, is released into rivers because even though these facilities have wastewater treatment facilities, they are not in operation.
- In rural areas, pollution of water bodies has become a problem due to sewage that is discharged from handicraft villages.

(6) Urgent need to improve sewage treatment plants

- At present, domestic wastewater from households and offices is not treated at all, and has become the cause of pollution of rivers.
- Sewage treatment plants have not been improved at all. It is necessary to carry out the steady implementation of measures in the JICA Study on Sanitation Improvement Plan for Haiphong City in the Socialist Republic of Vietnam (2001) and the Hai Phong Environmental Improvement Project II (2009-).
(7) Flooding measures needed in city center

- Since Hai Phong is low-lying, surrounded by rivers, and easily affected by the tide, storm water drainage is difficult. It is necessary to improve storm water drainage pipes, drainage pumps, floodgates, and levees.
- At high tide, if it rains 100 mm/day, flooding may occur for two to three hours in the city center.
- In recent years, rainfall of 300 mm/day may occur once every two years, rather than once every 10 years.

(8) Flooding measures needed in suburbs and rural areas

- Flooding frequently occurs in Vinh Bao province. In 2012, two typhoons flooded a 10,000 ha area, which resulted in major damage. Flooding has also occurred in the upstream areas of the rivers of Thai Binh and Lach Tray, as well as the right bank area of the Gia river. It is necessary to install regulating reservoirs and storm water drainage pumping stations, maintain floodgates, and carry out river dredging.

4.6.2 Water & sewage and storm water drainage: Specific measures

The measures shown in Table 4.6.1 will be carried out to address issues in the water, sewage, and storm water drainage sector. Of these measures, the following will be carried out as pilot projects.

- Supply of economical, good-quality tap water from water supply facilities (expansion of U-BCF)
• Introduction of decentralized wastewater treatment facilities in rural areas (wastewater measures for handicraft villages: 2 areas)
• Flooding measures in urban areas (introduction of sewerage ledger system)

Table 4.6.1 Details of specific measures in the water, sewage, and storm water drainage sector

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provision of economical, good quality tap water from water supply facilities</td>
<td>• Supply good quality water at low costs through the introduction of U-BCF at An Duong water purification plant, which is the principal water purification plant in Hai Phong, with support from JICA and the Water &amp; Sewer Bureau of Kitakyushu. The project will make use of the experiences of U-BCF (upward biological contact filtration) introduced in the Vinh Bao water purification plant. ※Pilot project • Expansion of U-BCF to water purification plants throughout Hai Phong and Viet Nam in cooperation with the Water &amp; Sewer Bureau of Kitakyushu.</td>
<td>HPWSCO</td>
<td>Short term</td>
<td>Quality of treated water, amount of chemicals used</td>
</tr>
<tr>
<td>2. Improve water leakage rates</td>
<td>• Taking advantage of the technology for water block distribution systems of the Water &amp; Sewer Bureau of Kitakyushu, implement leakage reduction measures (control current leakage rates from 14% to 10%), and contribute to low-carbon development through revenue growth and reduction of energy consumption by improving leakage rates.</td>
<td>HPWSCO</td>
<td>Medium term</td>
<td>Energy reduction quantity, leakage rates, GHG emission reductions</td>
</tr>
<tr>
<td>3. Improve sewage and final wastewater treatment plants</td>
<td>• Promote improvement of sewer pipes and construction of sewage systems, final wastewater treatment plants, and storm water storage facilities in five industrial districts, with support from JICA in four districts in the city center (Hong Bang, Ngo Quyen, Le Chan, Hai An). • Promote improvement of energy-saving sewage systems and final wastewater treatment plants in other urban areas and further improve sewage collection and treatment rates to mitigate pollution in rivers.</td>
<td>PMU DOC SADCO</td>
<td>Short term</td>
<td>Energy reduction quantity, GHG emission reductions</td>
</tr>
<tr>
<td>4. Active introduction and proper management of individual wastewater treatment facilities of businesses and decentralized wastewater treatment facilities</td>
<td>• Improve wastewater treatment facilities and promote proper treatment of medical wastewater with support from The World Bank in 15 hospitals throughout the city. • Introduce wastewater treatment facilities, such as septic tanks in An Lao province (An Lao town, Truong Son town) and treat domestic wastewater. Carry out cleaning and repairs of existing sewer pipes and ensure water quality of water supply sources (Da Do river). • Implement proper management and operation of existing wastewater treatment facilities and promote improvements for underdeveloped treatment facilities in order to achieve the proper treatment of industrial wastewater in existing industrial estates and clusters of small- and medium-sized groups of companies.</td>
<td>Health department SADCO Private company</td>
<td>Short term</td>
<td>Percentage of sewage treated, energy reduction quantity, GHG emission reductions</td>
</tr>
<tr>
<td>5. Introduction of decentralized wastewater treatment facilities in rural areas</td>
<td>• Introduce decentralized wastewater treatment facilities in rural areas to protect the living environment, improve water quality of raw water, and secure good irrigation water. • My Duong village: Foundry wastewater treatment, Tien Huong village: Wastewater treatment in</td>
<td>DARD DOC</td>
<td>Short term</td>
<td>Percentage of sewage treated, energy reduction quantity,</td>
</tr>
</tbody>
</table>

Green Growth Promotion Plan of the City of Hai Phong
### 4. Issues & Specific Measures by Sector

#### 4.1 Rural areas
- Noodle-manufacturing companies
- Trang Minh village: Wastewater treatment related to waste recycling
- Chinh Mi village: Wastewater treatment related to bamboo work

<table>
<thead>
<tr>
<th>GHG emission reductions</th>
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<tbody>
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</table>

#### 6. Flooding and inundation measures in urban areas
- Implement appropriate measures, such as the establishment of a flooding information management center and construction of embankments and pumping stations in order to deal with flooding and inundation which has worsened in recent years.
- Development of sewerage ledger system for the effective management and operation of sewage and wastewater facilities and as part of the above flooding measures.
- In the future, implement measures from a knowledge and information-based perspective, such as the creation of flooding and inundation master plans that consider the effects of climate change, creation of hazard maps, and conduct of evacuation drills.

<table>
<thead>
<tr>
<th>DOC SADCO</th>
<th>Medium term</th>
<th>Flooded area, flood damage</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Short term</td>
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</table>

#### 7. Flooding measures in rural areas
- Promote the development and improvement of regulating reservoirs, storm water drainage pump stations, and floodgates, in addition to river dredging, in order to reduce the damage to rice crops from flooding of rivers in the grain-producing region of Hai Phong due to typhoons and heavy rains.
- Develop and improve estuary weirs in order to prevent damage to fields from salt water intrusion due to the decrease in river flow in the dry season.

<table>
<thead>
<tr>
<th>DARD</th>
<th>Medium term</th>
<th>Flooded area, flood damage</th>
</tr>
</thead>
</table>

### Water, sewage, and storm water drainage sector: Images of specific measures

**Figure 4.6.1**

Upward Biological Contact Filtration facility (U-BCF)

Source: http://www.kobelco.co.jp/

**Photos 4.6.8**

Detection equipment for leaks in water supply pipes

Source: From catalog of underwater robot manufacturer
4. Issues & Specific Measures by Sector

Example of septic tank in hospitals and as a decentralized wastewater treatment facility

Example of improvement of energy-saving, final wastewater treatment plant

Example of installation of pumping station in rural area

Example of wastewater treatment plant in Trang Due industrial park in An Duong province

Example of wastewater treatment system in rural area

Figure 4.6.2 Images of specific measures in the water, sewage, and storm water drainage sector
4.6.3 Pilot project 1: U-BCF expansion project

(1) Project overview

- Kitakyushu is taking the initiative to expand the application of the Upward Biological Contact Filtration (U-BCF) system (patent held by Kitakyushu) to its sister city of Hai Phong in Viet Nam. The U-BCF is effective in improving the safety of tap water quality and is inexpensive to operate.

- A consortium that includes the member companies of the Kitakyushu Overseas Water Business Association (KOWBA) was commissioned by JICA to implement a preparatory survey on improvement of the An Duong water purification plant (July 2014 to March 2015). Based on the results of this survey, U-BCF will be installed in the An Duong water purification plant (designed capacity of 100,000 m$^3$), which is Hai Phong’s primary water purification plant, by around FY 2017, with the help of grant aid from JICA.

- U-BCF will be expanded to other parts of Viet Nam in cooperation between the Haiphong Water Supply One Member Co., LTD and the City of Kitakyushu, using the full-scale U-BCF system in the An Duong water purification plant as a showcase.

(2) History of the U-BCF expansion project in Hai Phong

Figure 4.6.3 History of the U-BCF expansion project in Hai Phong

Figure 4.6.4 Upward Biological Contact Filtration (U-BCF)
(3) Project development schedule
The project development schedule is envisioned below.

- An Duong U-BCF development project
  - 2015: Detailed design (orders placed by Viet Nam using grant aid)
  - 2016: Maintenance and construction (orders placed by Viet Nam using grant aid)
  - 2017: Start of operation of U-BCF in An Duong water purification plant

- Expansion of U-BCF to other parts of Viet Nam
  The full-scale U-BCF in the An Duong water purification plant in Hai Phong will be developed as a showcase to allow water stakeholders in Viet Nam, which is struggling with pollution of water sources, to have a direct look at U-BCF.
  With this showcase, U-BCF will be expanded within Hai Phong, as well as throughout Viet Nam and other countries in southeast Asia in cooperation between the Haiphong Water Supply One Member Co., LTD and the City of Kitakyushu.
4.6.4 Pilot project 2: (1) Handicraft village wastewater measures: Thien Huong noodle production village

(1) Project overview
A water purification system will be installed to treat wastewater from each noodle production site (each household) in order to address the issue of water pollution in the Thien Huong noodle production village in Thuy Nguyen province.

① Overview of water purification system
・ The purification system is comprised of a pre-treatment facility for wastewater, which contains a high concentration of organic matter (mainly starch), and septic tanks that treat wastewater together with domestic wastewater (toilets, kitchens, bathrooms, etc.) after pre-treatment.
・ If there is a methane fermentation tank for pig farming, methane gas can be produced from sludge generated from pre-treatment of starch wastewater and septic tanks to promote the circulation of resources.

Figure 4.6.5  Image of individual wastewater treatment in noodle production village

② Preprocessing facility for starch wastewater
・ To separate highly-concentrated organic matter (starch) into a solid and liquid in several minutes, immerse an agent and auxiliary, which are helpful for solid-liquid separation of starch wastewater, as shown in the photos below.
4. Issues & Specific Measures by Sector

- The equipment required for treatment is simple (as shown in the photos below). Solid-liquid separation can be carried out using permeable pyrene bags.

![Equipment for pretreatment of starch wastewater](image)

**Figure 4.6.6 Equipment for pretreatment of starch wastewater**

◇Results of simulated demonstration on wastewater from noodle production

- A demonstration was conducted by creating mock wastewater based on local interviews about the noodle production process and purification of wastewater using a flocculation and separation purifying agent.
- The demonstration confirmed that it is possible to easily treat wastewater from noodle production using the proposed methods.

<table>
<thead>
<tr>
<th>Item</th>
<th>Results of demonstration BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw water</td>
<td>15,000 mg/L</td>
</tr>
<tr>
<td>After treatment</td>
<td>830 mg/L</td>
</tr>
<tr>
<td>Removal rate</td>
<td>Approx. 95%</td>
</tr>
</tbody>
</table>

The results in the table on the left were only obtained based on mock wastewater used in this study. It is necessary to carry out tests using local wastewater in order to improve accuracy.
4. Issues & Specific Measures by Sector

3 Septic tanks

- Septic tanks are installed to purify about 5 m³/day of a combination of pretreated starch wastewater and domestic wastewater.
- Treatment lowers the level of BOD to under 30 mg/L.

Assumption of industrial wastewater standards in QCVN24:2009/BTNMT

Figure 4.6.7 Example of septic tank (compact type)
4. Issues & Specific Measures by Sector

(2) Expected results
- Improvement of living environment in noodle production village.
- Improvement of water quality of waterways, which are the main water sources for irrigation, etc.
- Development of brands and contribution to local economy by the designation of traditional handicraft villages as a result of environmental improvement.
- Role as a showcase (window) to expand the treatment of wastewater from noodle production in Viet Nam.

Table 4.6.3 Results of improvement of water quality

<table>
<thead>
<tr>
<th>Item</th>
<th>Removal rate</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD</td>
<td>Over 90%</td>
<td>Under 30mg/L</td>
</tr>
<tr>
<td>SS</td>
<td>Over 90%</td>
<td></td>
</tr>
</tbody>
</table>

(3) Project implementation system
- In the initial stages of the project, a consortium was organized, primarily made up of small- and medium-sized manufacturers of flocculants in Japan. ODA project feasibility studies and ODA demonstration projects will be developed with counterparts (C/P), such as DARD.

(4) Financing
- JICA’s ODA project feasibility studies and ODA demonstration/expansion projects will be implemented in the early stages, with small- and medium-sized manufacturers of flocculants playing a major role.
- Support schemes in Hai Phong will be examined to promote expansion to the entire Thien Huong noodle production village.
<table>
<thead>
<tr>
<th>Type of facility</th>
<th>Installation costs</th>
<th>Operation, maintenance, and management costs (per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretreatment facilities for starch wastewater</td>
<td>Approx. JPY 60 million</td>
<td>Must be calculated based on the results of the field demonstration.</td>
</tr>
<tr>
<td>Septic tanks</td>
<td>Approx. JPY 800 million</td>
<td>Approx. JPY 0.29 million</td>
</tr>
<tr>
<td>Total</td>
<td>Approx. JPY 860 million</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1) Includes installation costs for each facility (does not include pipe laying costs)
Note 2) Based on the assumption that noodle production is carried out 25 days each month.

(5) Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. JICA ODA feasibility study</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. JICA ODA expansion and demonstration project</td>
<td></td>
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<tr>
<td>3. Expansion to entire village of Thien Huong</td>
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<tr>
<td>4. Expansion and development to other areas</td>
<td></td>
<td></td>
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</tbody>
</table>
4.6.5 Pilot project 2: (2) Handicraft village wastewater measures: My Dong foundry village

(1) Project overview

① Overview

- Hai Phong is promoting a plan to install wastewater treatment facilities in order to improve water pollution from the inflow of wastewater from the My Dong foundry village in Thuy Nguyen province.
- In this pilot project, focus is placed on the management and operation of facilities, and support measures are examined in order to ensure the effective management and operation of treatment facilities and other facilities.

② Overview of wastewater treatment facility in My Dong district

- Domestic wastewater and wastewater from factories that are scattered in existing factory cluster areas (about 5.3 ha) and throughout the village will be collected for treatment at the planned wastewater treatment facility, which will be constructed in the corner of an existing factory cluster area. The volume of wastewater is estimated to be Q=900 m$^3$/day.
4. Issues & Specific Measures by Sector

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Current standards</th>
<th>Raw water quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>--</td>
<td></td>
<td>11-13</td>
</tr>
<tr>
<td>SS</td>
<td>mg/L</td>
<td>100</td>
<td>487-578</td>
</tr>
<tr>
<td>BOD</td>
<td>mg/L</td>
<td>50</td>
<td>270-345</td>
</tr>
<tr>
<td>COD</td>
<td>mg/L</td>
<td>150</td>
<td>1,700-1,900</td>
</tr>
<tr>
<td>Total nitrogen</td>
<td>mg/L</td>
<td>30</td>
<td>19.2-21.1</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>mg/L</td>
<td>6</td>
<td>0.5-1.34</td>
</tr>
<tr>
<td>Pb</td>
<td>mg/L</td>
<td>0.11-0.12</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>mg/L</td>
<td>0.25-0.4</td>
<td></td>
</tr>
<tr>
<td>Cr</td>
<td>mg/L</td>
<td>0.05-0.07</td>
<td></td>
</tr>
<tr>
<td>Oil content</td>
<td>mg/L</td>
<td>2.3-2.4</td>
<td></td>
</tr>
</tbody>
</table>

Materials: From basic drawings and specifications of wastewater treatment facilities in My Dong district.

Figure 4.6.11 Proposed water quality standards for treated water

(2) Expected results
- Improves the water quality of waterways (rivers) into which sewage is being discharged from the foundry village through the installation of wastewater treatment facilities.
- Improves the work and living environment in the foundry village.
- Improves the water quality of irrigation water in rural areas to guarantee good farming conditions.

(3) Project implementation system
- Hai Phong will promote the development and improvement of facilities in My Dong district. Japan will mainly provide support for the development of human resources for the proper management and operation of wastewater treatment facilities.
- Target facilities include treatment facilities and existing facilities in My Dong, as well as Trang Minh district in Kien Giang province which has completed a detailed design.

Figure 4.6.12 Project implementation system
(4) Financing

- Hai Phong will secure costs related to the development and improvement of wastewater treatment facilities in this district (approx. VND 106.6 billion), and will steadily move forward with construction.
- The development of human resources will be carried out using JICA’s technical cooperation projects and other relevant schemes.

Photos 4.6.13 Examples of existing sewage treatment plants: Sewage treatment plant in Minh Duc district (target sewage volume: Q=2,000 m³/day)
※Authority transferred to SADCO in July 2014 (Facility completed in 2012, Finland ODA)

Photos 4.6.14 Examples of existing sewage treatment plants: Tien Lang sewage treatment plant (target sewage volume: Q=1,000 m³/day)
※Managing authority: Tien Lang Department of Roads and Public Road Corporation (Facility completed in 2013, Finland ODA)

(5) Schedule
The project period is set for approximately three years in consideration of the understanding of the state of existing facilities and service period of new facilities.
### Table 4.6.7 Project schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇My Dong district</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Detailed design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Work order procedures and construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Start of facility services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>◇Trang Minh district</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Work order procedures and construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Start of facility services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>◇JICA project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Understanding situation of existing and planned facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Development of human resources for management and operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.6.6 Pilot project 3: Introduction of sewerage registry system

(1) Project overview
- In Hai Phong, where flooding is frequent, it is necessary to maintain sewage and wastewater facilities and continue to take full advantage of various functions to mitigate flood damage.
- To achieve this, Hai Phong will introduce a sewerage registry system for the efficient management and operation of sewage and wastewater facilities.
- This system will be used in the Flood Information Management Center, which is currently being planned in Hai Phong.

![Overview of sewerage registry system](image)

* Model of sewerage registry system developed in the JICA Partnership Program (FY 2012-2013)

Figure 4.6.13  Overview of sewerage registry system

(2) Expected results
- Efficiency in the maintenance and management of sewage facilities and asset management
- Support for the systematic renewal of facilities
- Potential to examine flooding measures and accurately provide information to residents through the stockpile of information on flooding history.

(3) Project implementation system
- Develop a system in the Hai Phong City Environmental Improvement Project (ODA, jurisdiction: Project Management Unit (PMU) of the Hai Phong City Environmental Improvement Project) to be operated by the Hai Phong Sewerage and Drainage State Limited Company (SADCO).
- Japanese companies which have developed the system and the Kitakyushu Water & Sewer Bureau will undertake the development of human resources necessary to continue operation of the system.

Hai Phong
- People’s Committee
- DOC (overall management of sewage projects)
- PMU (jurisdiction over the Hai Phong City Environmental Improvement Plan)
- SADCO (system operation and maintenance)

Japanese companies: System development, human resources development

Kitakyushu Water & Sewer Bureau: Human resources development

Cooperation
(4) Financing

- Pilot projects will use funding from the Hai Phong Environmental Improvement Project (ODA), which is currently carrying out the development and improvement of sewage treatment plants.
- After the pilot projects are completed, SADCO will carry out the operation and maintenance of the system.
4. Issues & Specific Measures by Sector

4.7 Specific measures in environmental conservation sector

4.7.1 Environmental conservation: Current situation and issues

The current situation and issues in the environmental protection sector are outlined below.

(1) Pollution from industrial parks and clusters

- Air pollution is prevalent in the Thuy Nguyen area, where a number of coal-fired power plants and cement factories are located.
- A number of steel manufacturing companies are located along National Route 5, which has become a source of pollution.
- Clusters of small- and medium-sized companies are scattered throughout the Vinh Niem district, and industrial wastewater is discharged directly into rivers without proper treatment. These companies are also causing noise pollution in surrounding residential areas.
- Although a number of industrial parks are located in the city, there are many that do not implement environmental measures, including the installation and operation of concentrated wastewater treatment plants.
- Air and water pollution, as well as soil contamination, is advancing in various handicraft villages as a result of production methods that are not environmentally friendly.
- It would be effective for companies that are the cause of air and water pollution to save energy, conserve resources, and reduce the impact on the environment by installing electrostatic precipitators, desulfurization equipment, and wastewater treatment facilities, as well as review production processes (cleaner production).

(2) Lifestyle pollution

- Water quality is deteriorating in city rivers due to the inflow of domestic and industrial wastewater. Water pollution of the waterways in the city center is especially severe.
remarkable, as a result of the generation of methane gas, which is a GHG.

- The number of motorbikes, which are the main means of transportation in Hai Phong, has reached about 900,000, and has become a cause of air pollution as a result of exhaust gas.
- A number of large container trucks travel in Hai Phong because factories are scattered throughout the city. This is causing traffic congestion, and air and noise pollution.
- Odors and soil contamination from leachate has resulted from open dumping of organic waste at final waste disposal sites.

(3) Monitoring and factory site inspections
- Hai Phong does not have a monitoring system for the integrated management of environmental data, such as air pollution, in real time.
- Site visits are conducted at factories and businesses that emit air pollutants. However, measures to control pollution at source are not in place to guide companies that do not comply with environmental standards.

(4) Destruction of the natural environment
- Aquaculture activities on Cat Ba Island are causing marine pollution, and conservation of the valuable species that inhabit the island is not being carried out.
- Although there are no large-scale mines in the city, mineral resources, such as iron and zinc, limestone, and clay, are being extracted. Sustainable and efficient use of mineral resources is required.
(5) Pollution of rivers

Pollution of rivers

Achievement of water quality standards (B1 standards) (excluding city center)

Surface water quality standards (QCVN08:2008/BTNMT): BOD

<table>
<thead>
<tr>
<th></th>
<th>A1 (Water for domestic use)</th>
<th>A2 (Water for domestic use)</th>
<th>B1 (Irrigation, other)</th>
<th>B2 (water transport, other)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD(mg/L)</td>
<td>4</td>
<td>6</td>
<td>15</td>
<td>25</td>
</tr>
</tbody>
</table>

Figure 4.7.1 Water quality of rivers and waterways in Hai Phong
(BOD average values, 2012, 2013)

Pollution of rivers (city center)

Achievement of water quality standards (B1 standards)
0/13: 0%

Figure 4.7.2 Water quality of waterways in city center
(BOD average values, 2012, 2013)
4. Issues & Specific Measures by Sector

Pollution along the coast

There are no coastal water environmental standards for TSS.

Figure 4.7.3 Water quality on the coast (COD average values, 2013)

Figure 4.7.4 Water quality on the coast (TSS average values, 2013)
4. Issues & Specific Measures by Sector

Air Pollution

Achievement of air quality standards 2/8 = 25%

Figure 4.7.5 Distribution map of $\text{SO}_2$ (mg/m$^3$) (2009, 2011, 2012)
4.7.2 Environmental conservation: Specific measures

The measures shown in Table 4.7.1 and 4.7.2 will be implemented to overcome the challenges in the environmental protection sector. Of these measures, the following will be implemented as pilot projects.

- Elimination of water pollution (restoration of Tay Nam canal)
- Development and improvement of environmental monitoring systems (development and improvement of air and noise monitoring systems)

Table 4.7.1 Details on specific measures in the environmental protection sector (1)

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Air pollution measures</td>
<td>・Promote the introduction of facilities and equipment in factories that do not have exhaust gas measures in place, and reduce environmental impacts by reviewing production processes.</td>
<td>Each company DONRE</td>
<td>Short term</td>
<td>Achievement rate of environmental standards, reduction of GHG emissions</td>
</tr>
<tr>
<td></td>
<td>・Promote modal shift to railway container transportation and switch from motorbikes to public buses in order to reduce the amount of exhaust gas from large container trucks and motorbikes.</td>
<td>DOT</td>
<td>Long term</td>
<td></td>
</tr>
<tr>
<td>2. Elimination of water quality pollution</td>
<td>・Promote the expansion of decentralized wastewater treatment plants in communities and wastewater treatment plants in factories. Develop and improve sewage systems from a long-term perspective, in order to promote purification of rivers and canals that have been polluted by domestic and industrial wastewater.</td>
<td>PMU, DONRE, DARD, SADCO</td>
<td>Long term</td>
<td>Sewage treatment rate, Achievement rate of environmental standards, reduction of GHG emissions</td>
</tr>
<tr>
<td></td>
<td>・Launch restoration project for Tay Nam canal, which has significant levels of water quality pollution, dredge waterways, develop and improve wastewater treatment facilities in factories and communities, and ensure sufficient water volume during normal periods.</td>
<td>DONRE, DOC, SADCO</td>
<td>Short term</td>
<td></td>
</tr>
<tr>
<td></td>
<td>・Conduct thorough monitoring of sewage that is being discharged into water sources, in order to provide safe drinking water to residents.</td>
<td>DONRE, DARD, SADCO, HPWSCO</td>
<td>Long term</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as above</td>
<td>Short term</td>
<td></td>
</tr>
<tr>
<td>3. Environmental measures for industrial parks and clusters</td>
<td>・Provide guidance on various environmental measures to help companies avoid air and water pollution, as well as soil contamination in existing industrial parks, clusters of small- and medium-sized groups of companies, and handicraft villages.</td>
<td>DONRE, DARD</td>
<td>Medium term</td>
<td>Sewage treatment rate, amount of energy reductions, achievement rate of environmental standards, reduction of GHG emissions</td>
</tr>
<tr>
<td></td>
<td>・Conduct regular site inspections of each company as a measure to address pollution at source. Encourage companies to make efforts to comply with environmental standards, such as wastewater and exhaust gas, in addition to imposing disciplinary action for companies that are in violation of the Law on Environmental Protection.</td>
<td>Same as above</td>
<td>Short term</td>
<td></td>
</tr>
<tr>
<td>4. Environmental measures for waste disposal sites</td>
<td>・Control the generation of odors through proper soil coverage and promote a switch from existing landfill disposal sites to new management-type disposal sites to prevent pollution of groundwater, in order to respond to the generation of odors from landfill disposal sites and pollution of surrounding groundwater.</td>
<td>DOC, URENCO, DONRE</td>
<td>Short term</td>
<td>Reduction of GHG emissions</td>
</tr>
</tbody>
</table>
## 5. Development of environmental monitoring systems

- Develop an environmental monitoring system to centrally manage the environment in the entire city by strengthening air quality monitoring (points, frequency) in order to properly understand the situation in the entire city. Promote the installation of automated water quality monitoring equipment in order to properly understand the water quality situation in rivers throughout the city. ※Pilot project

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DONRE DONRE</td>
<td>Short term</td>
<td>Achievement rate of environmental standards, number of monitoring stations</td>
</tr>
</tbody>
</table>

## 6. Climate change measures

- Promote reduction of GHG emissions through the efficient use of energy and control of exhaust gas from automobiles, in order to prevent rising sea levels and flooding damage in low-lying areas from heavy rain.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DOT DOIT</td>
<td>Short term</td>
<td>Reduction of GHG emissions</td>
</tr>
</tbody>
</table>

## 7. Conservation of the natural environment

- Conserve the rich, natural environment that consists of the beautiful sea and a number of islands, including Cat Ba Island, gain a grasp on information related to the ocean and islands, and aim for complete protection and management, in order to maintain and restore the irreplaceable species that live on the island.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Committee of provincial People’s Committee, Haiphong Economic Zone Authority NPO</td>
<td>Short term</td>
<td>Green area, forest area, reduction of GHG emissions</td>
</tr>
</tbody>
</table>

- Promote effective land use and increase green areas and waterfronts in urban areas to create a comfortable urban space.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DOC</td>
<td>Short term</td>
<td></td>
</tr>
</tbody>
</table>

- Monitor the implementation of appropriate environmental impact assessments and progress of development projects, in order to prevent environmental degradation from the conduct of large-scale development projects.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DOC</td>
<td>Short term</td>
<td></td>
</tr>
</tbody>
</table>

- Promote the development of plans related to crisis management in order to quickly respond to marine accidents and environmental pollution resulting from oil spills from oil tankers.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DONRE</td>
<td>Short term</td>
<td></td>
</tr>
</tbody>
</table>

- Reduce the use of nylon bags in daily life, such as plastic shopping bags that are scattered in seas and rivers, to control environmental pollution.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DONRE</td>
<td>Short term</td>
<td></td>
</tr>
</tbody>
</table>

- Strive to sustainably and efficiently use mineral resources that are extracted in the city, and consider the landscape after these mineral resources are extracted.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DOC DONRE</td>
<td>Short term</td>
<td></td>
</tr>
</tbody>
</table>

## 8. Awareness on environmental conservation

- Conduct awareness activities (creation of pamphlets and booklets, parent-child eco-classes, and on-demand lectures, etc.) in order to increase awareness on environmental conservation for businesses, civic groups, and residents, and issue calls to encourage the practice of green lifestyles.

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementing body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DONRE NPO</td>
<td>Short term</td>
<td>Number (type) of booklets created, number of awareness activities organized</td>
</tr>
</tbody>
</table>
4. Issues & Specific Measures by Sector

- Environmental conservation sector: Images of specific measures

Figure 4.7.6   Images of specific measures in the environmental conservation sector
4.7.3 Pilot project 1: Restoration of Tay Nam canal

(1) Project overview

The restoration of Tay Nam canal, which is the most polluted waterway in Hai Phong, will be carried out as a pilot project on improvement of the water environment in the city.

① Current situation

Conservation of the living environment is strongly needed as water pollution in the canal is significant due to the inflow of domestic and industrial sewage, as well as strong odors around the canal.

Generation of methane gas at Tay Nam canal. BOD \( \approx 1,686 \text{mg/L (2012 average)} \), CODcr \( \approx 2,990 \text{mg/L (2012 average)} \)
② Causes of pollution

The causes of pollution of Tay Nam canal have been determined through interviews with SADCO and are outlined in Table 4.7.3

<table>
<thead>
<tr>
<th>Causes of pollution</th>
<th>Details</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inflow of domestic and commercial sewage</td>
<td>・Inflow of sewage primarily from An Kim Hai canal</td>
<td>・Sewage from households along the canal is directly discharged into the Lach Tray river by pumps</td>
</tr>
<tr>
<td></td>
<td>・Inflow of sewage from some households around the canal</td>
<td></td>
</tr>
<tr>
<td>2. Inflow of domestic wastewater and industrial wastewater from Vinh Niem industrial cluster</td>
<td>・Inflow of different types of untreated industrial wastewater. ・Major sources of pollution include dyeing, feed, plastic production, fittings and fixtures, light bulbs, manufacturing of chemicals, and seafood processing. ・Sewage that improved at first was problematic in that it was constructed as a split-type system and was directly connected to storm water pipes. ・Sewage treatment facilities have been improved; however, they have never been in operation because operation and maintenance costs have not been clarified.</td>
<td>・Volume of water used (total): Approx. 600 m³/day ・Volume of wastewater and quality of wastewater from factories is unclear.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Elution of nutrient salts from deposited sludge</td>
<td>・As shown in the figure below, a considerable amount of sludge has been deposited in the target area. ・Therefore, it is surmised that a significant amount of organic matter and nutrient salts are being eluted from sludge.</td>
<td>・SADCO is planning the development of a proposal for the dredging of sludge.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Progress of pollution due to water stagnation</td>
<td>・Under normal conditions, floodgates remain closed to prevent inflow and tidal increases, which results in stagnation of the water in the canal.</td>
<td></td>
</tr>
</tbody>
</table>

③ Project details

The details of the project to improve the water environment of Tay Nam canal, based on the causes of water pollution listed above, are outlined below.

1) Target water quality
   ・Short term (to 2030): Environmental standard B2, BOD: under 25 mg/L (achieve minimum environmental standards)
   ・Long term (to 2050): Environmental standard A2, BOD: under 6 mg/L (secure good living environment)
2) Details of measures and roles & responsibilities

- To address the aforementioned causes of pollution, the following measures will be comprehensively implemented to achieve the above-mentioned water quality targets.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Project details</th>
<th>Project managing body</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sewage measures for households</td>
<td>• JICA project under implementation • Other reliable connections to sewage pipes</td>
<td>• PMU • DOC</td>
<td>Short term</td>
</tr>
<tr>
<td>2. Measures for industrial wastewater from Vinh Niem</td>
<td>• Renewal of sewage and storm water pipes and repair of faulty connections • Introduction of removal facilities in each factory • Construction of final wastewater treatment plants</td>
<td>• DOC • Hai Phong ※ Hai Phong + ※</td>
<td>Short term</td>
</tr>
<tr>
<td>3. Sludge dredging</td>
<td>• Removal of sludge in target area</td>
<td>• SADCO</td>
<td>Short term</td>
</tr>
<tr>
<td>4. Development of environmental revetments</td>
<td>• Development of revetments with purification functions, provision of biological habitat, and formation of beautiful landscape.</td>
<td>• SADCO</td>
<td>Medium term</td>
</tr>
</tbody>
</table>

※Support from Japan is under consideration

Figure 4.7.9 Image of project implementation locations and measures
4. Issues & Specific Measures by Sector

(2) Expected results

- Control the generation of methane gas (CH$_4$), a GHG, generated from the canal.
- Proper treatment of wastewater from Vinh Niem small-scale industrial cluster.
- Improve surrounding living environment by preventing odors and improving water quality.
- Provide recreation space through the creation of a good waterside environment.

(3) Project implementation system

- Form consortium, including water treatment manufacturers, to provide support for the introduction of pilot facilities and development of human resources for removal facilities and wastewater treatment facilities.
- Hai Phong will dredge the canal and construct environmental revetments with the DOC and SADCO as the main project bodies under the guidance of the People’s Committee, and will develop, improve, and operate and maintain final wastewater treatment facilities.
(4) Financing

- In principle, Hai Phong and individual factories in the Vinh Niem industrial cluster will be responsible for necessary costs for removal facilities and final treatment plants in individual factories.

- However, in order to break the status quo, the project will use various financial schemes to promote the development of a pilot facility, such as JICA’s support program for overseas development of small- and medium-sized businesses and the Ministry of the Environment’s model project for improvement of the water environment in Asia.

- Hai Phong will be responsible for costs to implement projects for the renewal of sewage and storm water pipes and repair of faulty connections.

(5) Schedule: Support and other related projects

The project schedule is outlined below.

<table>
<thead>
<tr>
<th>Item</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feasibility studies (for both removal and wastewater treatment facilities)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Renewal of sewage pipes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Local demonstration projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Development and improvement of other necessary facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Human resources development for operation and management of facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

※ indicates support project

Figure 4.7.10 Project implementation system
4.7.4 Pilot project 2: Development of air and noise monitoring systems

(1) Project background and overview

① Background
- Currently, Hai Phong is developing an environmental monitoring management plan (MP) with a target year of 2025. In that plan, Hai Phong is planning the installation of automated air quality monitoring equipment.
- Although specifications for air quality monitoring are defined by law, it is difficult to gain a good understanding of actual conditions because monitoring is carried out infrequently. Continuous monitoring is effective in understanding the actual situation of air pollution and considering measures.
- In this MP, Hai Phong plans to install automated monitoring equipment in three locations where air pollution is significant.

② Overview
- Automated air quality monitoring equipment (fixed stations) will be installed in three locations indicated in the MP in order to contribute to environmental monitoring in Hai Phong. The use of monitoring results and publicizing methods for these results will be proposed.
- Proposals will also be made for the introduction of mobile stations that can monitor air pollution at any point.

Figure 4.7.11  Schematic drawing of air quality monitoring points in the master plan
4. Issues & Specific Measures by Sector

③ Target points and target items

Target points and target items for fixed stations are shown in the table below.

Table 4.7.6 Automated air & noise monitoring points (fixed stations) and monitored items in Hai Phong

<table>
<thead>
<tr>
<th>No.</th>
<th>Location</th>
<th>Purpose of monitoring</th>
<th>Monitored items</th>
<th>Notes</th>
</tr>
</thead>
</table>
| No. 1 | Near Minh Duc industrial cluster | Understand impact from industrial activities | • Sulfur dioxide (SO2)  
• Carbon monoxide (CO)  
• Suspended particulate matter (SPM)  
• Particulate matter (PM2.5) | |
| No. 2 | Intersections on Lach Tray road and Nguyen Van Linh road | Understand impact from traffic | • Nitrogen dioxide (NO2)  
• Carbon monoxide (CO)  
• Suspended particulate matter (SPM)  
• Particulate matter (PM2.5) | |
| No. 3 | Dong Hai elementary school | Understand impact from traffic | | City center |

④ Rough system configuration and flow of information

* In addition, hazardous air pollutants, such as benzene, trichloroethylene, tetrachloroethylene, and dichloromethane, as well as dioxins are monitored at four stations.

Reference: Air quality monitoring in Kitakyushu

Figure 4.7.12 Rough system configuration and flow of information
4. Issues & Specific Measures by Sector

5. Example of configuration of equipment in fixed station

Possible to measure TSP by changing sampling head

◇ Inside view

 Ambient Air Sampling Head

PM-10, PM2.5 & Sampling Head

◇ Example of composition of monitoring equipment

Wall Speed & Direction

Temperature & Humidity

Temperature & Humidity

◇ Outside view of fixed station

Documents from Horiba
(Horiba has completed delivery of 10 stations to MONRE. Horiba specifications have become the standard in Viet Nam.)

Figure 4.7.13 Example of composition of monitoring equipment in fixed station

6. Overview of mobile stations

- Mobile stations are configured to carry out monitoring of air quality at any point with the installation of monitoring equipment in 2-ton vehicles.
- If it is difficult to install fixed stations due to budget constraints or other problems, an alternative choice would be to install a mobile station and make an effort to gain an understanding of the actual conditions of air pollution in the city.

◇ Target items: Same as for fixed stations (can be set optionally)

- Example of vehicle specifications
  - Vehicle type: 2-ton
  - Length: 5.5 m
  - Width: 2.0-2.5 m
  - Height: 2.8-3.2 m
  - Total exhaust volume: ~2,700 cc (gasoline vehicle)
  - Gross weight: ~ 5 tons

Figure 4.7.14 Overview of mobile stations and example of configuration of monitoring equipment
4. Issues & Specific Measures by Sector

(2) Effects, other
- Understand actual conditions of air pollution (achievement of environmental standards and collection of monitoring data).
- Confirm effects if implementing measures.
- Communicate information to residents in abnormal situations.
- Display air pollution and noise monitoring values using electronic billboards in public spaces during normal periods (help residents become aware of daily pollution and noise).
- Possible to monitor pollution at any point if using mobile stations, other

(3) Project implementation system
The project implementation system is outlined below.

![Project implementation system diagram]

Figure 4.7.15 Project implementation system

(4) Financing
- About JPY 120 million for three monitoring systems and one central monitoring station.
- About JPY 40 million for mobile stations only.
- JICA projects will be considered for the installation of pilot facilities, including for the development of human resources.
- Potential for financing provided solely by Hai Phong will also be considered for the introduction of mobile stations.
4.8 Specific measures in green production sector

4.8.1 Green production: Current situation and issues

The current situation and issues in the green production sector are outlined below.

(1) Improve productivity and promote environmental consideration in manufacturing industry

・ Many local companies carry out production activities using outdated machine tools and coal-fired furnaces. This results in the production of low-quality parts and has a greater impact on the environment.

・ Local companies have a number of problems with factory management, including complying with delivery times and product quality, as well as conserving equipment, which does not lead to orders from foreign companies.

・ Technological and management capacity are low in small- and medium-sized companies, in particular, which does not lead to the development of supporting industries. There is an urgent need for technology transfer and human resources development.

・ There are few incentives for local companies since there are no certification systems for disseminating environmentally-friendly, high-quality, Vietnamese-manufactured products.

(2) Greening of agriculture

・ Major impacts on the ecosystem can be seen due to pollution of farmland and water, as efforts to reduce the use of chemical fertilizers and pesticides in crop production is not moving forward as much as it could be.

・ It has been pointed out that soil fertility has decreased due to the overuse of chemical fertilizers on farmland.

・ Approximately 150 tons of pesticides are used for 80,000 ha of farmland. This has become a problem in terms of safety of crops and securing safety of farm work.

(3) Greening of fishing industry

・ Fish carcasses and fish feces are deposited on the seabed as a result of aquaculture practices. Marine pollution is significant, and damage from red tide and other phenomenon has been seen.
4. Issues & Specific Measures by Sector

(4) Greening of handicraft villages
· Water and air pollution is progressing due to dust and the use of chemicals in various handicraft villages that are carrying out casting and the production of construction materials, woodwork, pottery, and textiles, as well as recycling of waste.

(5) Rural infrastructure development
· Infrastructure in rural areas, such as water supply, sanitation, and irrigation facilities, as well as roads, is weak.

(6) Conservation of forests and farmland
· The conversion from forests and farmland to urban and industrial land is progressing. Forest and farmland is important for conservation as it has an important function in the control of natural disasters and absorption of CO₂ emissions.
4. Issues & Specific Measures by Sector

**Green Growth Promotion Plan of the City of Hai Phong**

**Figure 4.8.1** Trends and forecasts in land use in Hai Phong

**Figure 4.8.2** Trends and forecasts for GDP in Hai Phong

**Figure 4.8.3** Transition of crop acreage in Hai Phong
4.8.2 Green production: Specific measures

The measures shown in Tables 4.8.1 and 4.8.2 will be implemented to overcome the challenges in the green production sector. Of these measures, the following will be carried out as pilot projects.

- Promotion of green production
- Development of green agriculture

**Table 4.8.1 Details of specific measures in green production sector (1)**

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Promotion of cleaner production</strong>  ※Pilot project</td>
<td>• Introduce new technologies and train cleaner production consultants to enhance educational infrastructure, such as universities, in order to promote manufacturing processes that effectively use raw materials and energy.  • Introduce Japanese-manufactured, high-efficiency electric furnaces in foundries, and reduce GHG emissions and improve energy savings, productivity, and product quality as part of these efforts.  • Create a Platform for the Promotion of Cleaner Production in cooperation with local academic and research institutes.  • Promote mutual exchange of heat and resources between factories to promote energy savings and resource conservation, in order to optimize work within factories, as well as within the region.</td>
<td>Companies</td>
<td>Short term</td>
<td>Amount of energy reduced, reduction of GHG emissions</td>
</tr>
<tr>
<td><strong>2. Production of eco-products</strong></td>
<td>Promote production of environmentally-friendly products to enhance their value.  • Develop mechanism for certification of eco-products by the city.</td>
<td>Companies</td>
<td>Short term</td>
<td>Same as above</td>
</tr>
<tr>
<td><strong>3. Develop new technologies</strong></td>
<td>• Promote the development of new industries and new technologies that have less impact on the environment, in cooperation with higher educational institutions, such as universities.  • Promote the creation of a low-carbon society using green IT technology.</td>
<td>Companies</td>
<td>Short term</td>
<td>Same as above</td>
</tr>
<tr>
<td><strong>4. Develop small- and medium-sized businesses</strong></td>
<td>• Improve technological and production management capacity of small- and medium-sized businesses and develop supporting industries to promote autonomous industrial development in Hai Phong.  • Develop mechanisms to support entrepreneurs, such as venture companies.</td>
<td>Companies</td>
<td>Short term</td>
<td>Same as above</td>
</tr>
<tr>
<td><strong>5. Sale of environmentally-friendly products</strong></td>
<td>• Avoid excessive packaging, which results in large amounts of waste, and reduce the use of plastic bags as much as possible.  • Promote recycling as much as possible for</td>
<td>Private companies Residents DONRE</td>
<td>Short term</td>
<td>Amount of energy reduced, waste recycling rates, reduction of GHG emissions</td>
</tr>
</tbody>
</table>
### 4. Issues & Specific Measures by Sector

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Greening of various handicraft villages</td>
<td>Containers and packaging, which are provided to place or wrap goods in at the time of purchase.</td>
<td>Companies DARD</td>
<td>Short term</td>
<td>Amount of energy reduced, reduction of GHG emissions</td>
</tr>
<tr>
<td>7. Development of green agriculture ※Pilot project</td>
<td>• Improve the living and surrounding environment by reevaluating the low-level of production technologies and outdated equipment in various handicraft villages to reduce water, air, and soil pollution as much as possible.</td>
<td>Companies DARD</td>
<td>Short term</td>
<td>Green agriculture implementation area, waste recycling rates, amount of energy reduced, reduction of GHG emissions</td>
</tr>
<tr>
<td>8. Improvement of rural infrastructure</td>
<td>• Promote the development and improvement of infrastructure in rural areas, such as water supply, sanitation, and irrigation facilities, as well as roads, to improve the living standards of farmers.</td>
<td>Companies DARD</td>
<td>Medium term</td>
<td>Forest area, reduction of GHG emissions</td>
</tr>
</tbody>
</table>

### Table 4.8.2 Details of specific measures in green production sector (2)

<table>
<thead>
<tr>
<th>Project category</th>
<th>Project details</th>
<th>Project implementation body</th>
<th>Project period</th>
<th>Evaluation indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Promote sustainable water industry</td>
<td>• Promote aquaculture and seafood processing that will control the emission of organic pollutants and reduce marine pollution.</td>
<td>Companies DARD</td>
<td>Short term</td>
<td>Achievement rate for environmental standards</td>
</tr>
<tr>
<td>10. Use of forest resources</td>
<td>• Maintain and improve forest area, configuration of trees, spaces where creatures live, and the functions of forests, such as CO₂ absorption capacity, to promote the sustainable use of forest resources.</td>
<td>DARD</td>
<td>Medium term</td>
<td>Forest area, reduction of GHG emissions</td>
</tr>
</tbody>
</table>
Green production sector: Images of specific measures

- **Planting environmentally-friendly brand rice**
  - Source: http://shigabunsan.blog58.fc2.com/
  - Description: Images of specific measures

- **Sales of environmentally-friendly brand rice**
  - Source: http://www.city.hikone.shiga.jp/

- **Development of human resources in manufacturing (Canon)**
  - Source: http://canon.jp/
  - Description: Images of specific measures

- **Green curtain: Example of eco-lifestyle (high cooling efficiency)**
  - Source: http://www2.city.suginami.tokyo.jp/

- **Certification mark for environmentally-friendly brand farm produce**
  - Fulfils conditions, such as no more than 50% use of chemical fertilizers and pesticides
  - Source: https://www.facebook.com/

- **Eco-bags**
  - Eliminates need for plastic bags when shopping
  - Source: https://www.facebook.com/

Figure 4.8.4 Images of specific measures in green production sector
4. Issues & Specific Measures by Sector

4.8.3 Pilot project 1: Installation of high-efficiency electric furnaces in foundries

(1) Objective
Installation of electric furnaces in foundries
Reduce GHG emissions, improve energy savings, and improve productivity and product quality with the installation of high-efficiency, Japanese-manufactured electric furnaces in foundries in Hai Phong.

Figure 4.8.5 Introduction of the latest technologies (electric furnaces) in foundries

(2) Need and concept of "supporting industries"
What are supporting industries?
- Supporting industries form the basis for all industries, such as casting, forging, cutting, welding, and plating.
- Local supporting industries with advanced technologies and skills are essential for the introduction of pioneering industries.

Figure 4.8.6 Industrial structure in Hai Phong

Materials from The University of Kitakyushu, NTT Data Institute for Management Consulting
(3) Targeting

Selective attack on all areas!

Surrounding industries
[Casting] [Forging] [Cutting]
[Welding] [Canning] [Plating]

Facilities targeted for energy savings
- Melting furnaces
- Heat-treating furnaces
- Heating furnaces
- Machine tools (engine lathe, milling machine, drill press)
- Forging machines
- Dust collectors
- Lighting
- Electric fans
- Compressors, other

[Focus of targeting]
- Expected to reduce CO₂
- Expected to help achieve energy savings
- Needs of local companies
- Agreement with industrial policies in Hai Phong
- Technical advantage for companies in Japan

Reduce CO₂, save energy, and improve productivity and product quality with the installation of Japanese-manufactured, high-efficiency electric furnaces in foundries (Melting furnaces account for 90% of electricity use in foundries)

Figure 4.8.8 Focus of targeting

(4) Voices of local foundries in Hai Phong

Hai Phong is the site of the largest foundry cluster area in Viet Nam. My Dong district, in particular, is referred to as the “foundry village,” and has a history of over 100 years. Japanese companies, which have traditionally outsourced the production of casting products to China, are now starting to look for new consignment factories in Viet Nam.

Figure 4.8.9 Features of My Dong district
(5) Features and effects of the introduction of Japanese-manufactured electric furnaces

The features and effects of the introduction of Japanese-manufactured electric furnaces are below.

<table>
<thead>
<tr>
<th>Implementation details</th>
<th>Annual potential CO₂ emission reductions (t-CO₂/year)</th>
<th>Initial costs (Costs for installation of equipment)</th>
<th>Cost effectiveness (t-CO₂/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ Shift from coal-fired furnaces</td>
<td>1,000</td>
<td>JPY 50 million</td>
<td>JPY 50,000</td>
</tr>
<tr>
<td>◆ Shift from Chinese-manufactured electric furnaces</td>
<td>400</td>
<td>JPY 50 million</td>
<td>JPY 120,000</td>
</tr>
</tbody>
</table>

[Comparison between Japanese- and Chinese-manufactured electric furnaces]

****Advantages****
- Reduce CO₂ (~1/2)
- Low electricity charges (~1/2)
- Safety
- No malfunctions
- Simple maintenance
- Long lifespan

****Disadvantages****
- Price is high (3-4 times higher)

Figure 4.8.10 Features and effects of the introduction of Japanese-manufactured electric furnaces
4. Issues & Specific Measures by Sector

(6) Use of JCM subsidies

Japanese-manufactured electric furnace: USD 400,000-500,000
Chinese-manufactured electric furnace: USD 100,000-150,000

![Diagram showing use of JCM subsidies](image)

Even in the worst case scenario, it is possible to recoup initial investment in three years with reductions in electricity costs.

(7) Future plan: Implementation of F/S and P/S

※Today's casting techniques started about 30-40 years ago in China, and has been passed down through a transfer of skills over the years. It is necessary to learn proper techniques in order to improve productivity and product quality.

- Examination of maintenance system through the formation of a union.
- Development of optimal operating methods for electric furnaces through guidance on casting technologies.※
- Studies on project feasibility (detailed design, construction plan, financing plan, operation plan, etc.)
- Development of methodologies (examination of eligibility requirements, etc.)
- JCM-related studies (examination of future introduction and expansion plans, etc.)

(Promotion system)
- Viet Nam: Casting companies (Thang Phuong, four other companies)
- Japan: Electric furnace manufacturer: TBD
  Trading company: TBD
  Supporting organizations: NTT Data Institute of Management Consulting, The University of Kitakyushu, City of Kitakyushu

※Local casting industries have seen an increasing trend in production, and three to five companies have newly established factories, and are moving quickly to install electric furnaces. At this rate, the companies will be installing low-grade, Chinese-manufactured electric furnaces. The influence of these companies is strong, and Chinese-manufactured electric furnaces will end up dominating the electric furnace market of this area. Even with the use of JCM subsidies, there will be no room for the introduction of Japanese-manufactured electric furnaces to enter the market. Therefore, the project proposes the initial introduction of "used" Japanese-manufactured electric furnaces to these companies, in order to allow them to learn about the benefits of these furnaces (operability, energy saving capability, etc.), and become advocates for the introduction of the furnaces.

![Diagram showing future plans](image)
(8) Development of Platform for the Promotion of Cleaner Production through the training of CP consultants and the formation of a base for environmental education

Development of Platform for the Promotion of Cleaner Production through the training of CP consultants and the formation of a base for environmental education

Figure 4.8.13 Development of Platform for the Promotion of Cleaner Production

(9) Pilot project

Table 4.8.3 Overview of pilot project
4.8.4 Pilot project 2: Promotion of green agriculture

(1) Project overview
① Promotion of rice farming to simultaneously improve production, secure food safety, and protect the environment
・ Methane gas (CH\textsubscript{4}), a GHG, and nitrous oxide (N\textsubscript{2}O) are generated from rice fields.
・ The SRI farming method,* which is being promoted in Viet Nam today, introduces environmentally-friendly farming methods, such as the use of organic fertilizer and slow-release fertilizer, as well as water management methods, to increase crop yields and reduce the use of chemical fertilizers and pesticides. The SRI farming method also helps achieve reductions in GHG emissions.
・ The project will establish and expand the application of green farming methods that are suitable for rice farming in Hai Phong on farms that will be used for demonstration purposes.
※ SRI: System of Rice Intensification. This farming method is currently being practiced in Dong Phu village located in the suburbs of Hanoi, as a JICA project (University of Tokyo, etc.).

② Promotion of safe, high value-added organic vegetable farming
・ The use of organic fertilizer produced from waste helps control the use of chemical fertilizers and pesticides, and promotes the growth of safe, delicious vegetables (collaboration with composting businesses.)

③ Features of environmentally-friendly rice farming (using SRI as an example)

<table>
<thead>
<tr>
<th>Major items</th>
<th>Conventional methods</th>
<th>SRI method</th>
<th>Effects of SRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice planting conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of seedling</td>
<td>Over 20 to 30 days</td>
<td>6 to 12 days (within 14 days)</td>
<td>Amount of seeds: 80 to 90% reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit crop yields: 50 to 100% increase</td>
</tr>
<tr>
<td>Plantation density</td>
<td>4 to 5 seedlings/spot</td>
<td>1 to 2 seedlings/spot</td>
<td></td>
</tr>
<tr>
<td>Plantation intervals</td>
<td>15 to 20 cm</td>
<td>25×25 cm or 25×25 cm</td>
<td></td>
</tr>
<tr>
<td>Plantation pattern</td>
<td>Random</td>
<td>Square</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td>Manually or with the use of herbicide</td>
<td>Use of rotary weeding machine</td>
<td>Significant reductions</td>
</tr>
</tbody>
</table>

Figure 4.8.14  Example of pilot project in green production sector

Table 4.8.4  Features and effects of SRI farming method
### 4. Issues & Specific Measures by Sector

<table>
<thead>
<tr>
<th>Water management</th>
<th>Flooding method</th>
<th>Continuous flooding</th>
<th>Intermittent flooding</th>
<th>30 to 50% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water depth</td>
<td></td>
<td>5 to 10 cm</td>
<td>2 cm (during flooding period)</td>
<td></td>
</tr>
<tr>
<td>Chemical fertilizer</td>
<td>convention method 100</td>
<td>100</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Root growth</td>
<td>Normal</td>
<td>Healthy growth compared to conventional methods</td>
<td>Good resistance to pests, collapse and low temperatures</td>
<td></td>
</tr>
</tbody>
</table>

#### Photo 4.8.4 Examples of rice farming using the SRI method

4) SRI initiatives in Viet Nam

- A decision was issued in October 2007 by the Ministry of Agriculture and Rural Development that recognized SRI as an advanced technology.
- Five principles of SRI in Viet Nam
  1) Use healthy, young seedlings (number of leaves is 2 to 2.5, seedlings 8 to 15 days after plantation)
  2) Plant single seedlings at intervals.
  3) Keep rice fields wet, but do not flood them.
  4) Weed at early stages (Do not use herbicides.)
  5) Reduce the amount of chemical fertilizers as much as possible and use organic fertilizers.
- As of 2010, SRI has been introduced to 770,000 farmers in 22 provinces centered around northern Viet Nam.
- SRI is under the jurisdiction of the Department of Plant Protection of MARD; the National Centre for Agriculture and Fisheries Extension, the Department for Crop Production, and the Department of Water Resources, which are involved in the dissemination of technology, are generally not involved in the dissemination of SRI. For this reason, the dissemination of SRI in Viet Nam is limited.
Table 4.8.5  Example of assessment of rice yield using SRI in Viet Nam (2006: average of nine provinces)

<table>
<thead>
<tr>
<th>Item</th>
<th>Dry season</th>
<th>Wet season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SRI</td>
<td>Conventional practices</td>
</tr>
<tr>
<td>Number of rice husks per stubble</td>
<td>141</td>
<td>171</td>
</tr>
<tr>
<td>Number of rice husks per 1 m²</td>
<td>31,148</td>
<td>28,109</td>
</tr>
<tr>
<td>Crop yield (ton/ha)</td>
<td>6.8</td>
<td>6.2</td>
</tr>
</tbody>
</table>

(Source: Department of Plant Protection, 2010)
5. SRI initiatives in Hai Phong

- Hai Phong started to expand the use of SRI from 2008. To date, 175 models have been developed, however, the area is small at 2,600 ha.
- Farmers that have introduced SRI have reported an increase in crop yield and have given the method a good evaluation. General effects are outlined in Table 4.8.6.
- Although farmers have expressed their desire to do more, the initiatives carried out to date have been achieved with support from the national government. In the future, there will be a need for funding in order to expand the use of SRI.

<table>
<thead>
<tr>
<th>Item</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Seed rice</td>
<td>5 to 20% reduction</td>
</tr>
<tr>
<td>2) Fertilizer</td>
<td>10 to 15% reduction</td>
</tr>
<tr>
<td>3) Agricultural chemicals</td>
<td>Reduction of number of times used to 2 to 3 times/season (conventionally, 5 to 6 times/season)</td>
</tr>
<tr>
<td>4) Cost</td>
<td>Reduction in costs due to the above reductions</td>
</tr>
<tr>
<td>5) Rice yield</td>
<td>Increased</td>
</tr>
</tbody>
</table>

(Source: Department of Agriculture and Rural Development)

6. Examination of diverse green farming

1) Initiatives on Cat Ba Island
Crops (rice, etc.) that have used liquid fertilizer which has been generated in the process of biogasification from waste on Cat Ba Island have been grown on a pilot basis to contribute to the expansion of the application of green farming.

2) Initiatives to grow organic vegetables using compost fertilizer
- The farming of organic vegetables, which has recently been attracting attention, is carried out in cooperation with local cooperatives, farms, and private companies that are engaged in the production and sale of organic vegetables, using organic fertilizer that was produced in the composting pilot project in the waste sector. This initiative aims to establish a potentially profitable mechanism in the pilot project to improve the income of small farms.
4. Issues & Specific Measures by Sector

(2) Expected results

① Rice farming (using SRI as example)
  - Increase crop yield of safe and delicious rice without pesticide residue → Increased revenue
  - Acquisition of rice version of VietGAP certification (currently being examined)
  - Reduction of the use of chemical fertilizers and pesticides
    → Reduction of farming costs, contribution to environmental conservation
  - Reduction in the amount of water used
    → Contributes to environmental conservation
    → Reduction of overall labor, including other elements
  - Reduction of GHG emissions (mainly reduction of methane gas in the case of SRI)※Approximately 60% reduction in the Indonesian example on the right.

② Growing organic vegetables
  - Increases farmers’ incomes (price of organic vegetables is about three times the price of regular vegetables.).
  - Provides safe food and contributes to environmental conservation through a reduction in the use of chemical fertilizers and pesticides.
  - Branding of agricultural products and activation of rural areas through the promotion of green agriculture.

(3) Project implementation system

- Demonstration projects are implemented and established for agricultural practices on farms in Hai Phong by dividing the production of organic rice and organic vegetables into groups and providing models for each farm based on guidance from joint teams comprised of member of universities from both Japan and Viet Nam. Technology transfer and expansion to local farmers is also planned.
(4) Financing
In principle, the JICA Partnership Program (about three years) will be applied to implement the project.

(5) Schedule
The project schedule is below.

**Table 4.8.7 Project schedule**

<table>
<thead>
<tr>
<th>Item</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Survey on farmland characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Selection of optimal farming methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Technology transfer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Management of product quality (includes monitoring)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Consideration of brand development and market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Full-scale sales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**
JICA project period
4.9 Summary of GHG emission reductions (approximate) through the expansion of pilot projects

The results of trial calculations of GHG emissions, in cases where expansion of proposed pilot projects was carried out in a certain amount of time, are shown in Table 4.9.1. GHG emission reductions are estimated to be about 132,860 t-CO$_2$/year.

Table 4.9.1  Reduction of GHG emissions (estimate) through the expansion of pilot projects

<table>
<thead>
<tr>
<th>Sector</th>
<th>Project name (tentative)</th>
<th>Scale, etc. (estimated)</th>
<th>GHG emission reductions(t-CO$_2$/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Waste</td>
<td>1) Waste separation and composting</td>
<td>Rural area: 40 t/day Urban area: 600 t/day</td>
<td>1,420</td>
</tr>
<tr>
<td></td>
<td>2) Production of liquid fuel</td>
<td>Capacity: Approx. 2,000 t/year</td>
<td>1,170</td>
</tr>
<tr>
<td></td>
<td>3) Cement raw materials</td>
<td>Capacity: Approx. 24,000 t/year</td>
<td></td>
</tr>
<tr>
<td>2. Energy</td>
<td>1) Waste-to-energy at cement factory</td>
<td>Estimated output: 10,000 kW</td>
<td>19,000</td>
</tr>
<tr>
<td></td>
<td>2) Energy savings in commercial facilities</td>
<td>Conversion to chiller + showcase: approx. 10 places</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td>3) Energy savings in factories</td>
<td>Installation of high-efficiency refrigerators: approx. 20 places</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>4) Conversion of street lights to LED lighting</td>
<td>LED: 2,000 lights  ※1  PV+LED: 1,000 lights ※2</td>
<td>1,200</td>
</tr>
<tr>
<td>3. Transportation</td>
<td>・ Introduction of EV buses</td>
<td>Introduction of 80 buses by 2020. Transfer over is effective when starting new routes.</td>
<td>6,800</td>
</tr>
<tr>
<td>4. Cat Ba Island</td>
<td>1) Waste recycling (gas power production, solid fuel production, control of methane gas related to landfill disposal)</td>
<td>Amount of waste from biogasification: 5.6 t/day Amount of waste from production of solid fuel: 0.8 t/day</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>2) Solar power and EV buses on tourist farm, zoo and botanical garden</td>
<td>Solar power generation × 5 locations EV buses × 20 buses</td>
<td>500 700</td>
</tr>
<tr>
<td></td>
<td>3) Energy savings in hotels</td>
<td>Introduction of high-efficiency air conditioning system × 5 locations</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>4) Conversion of street lights to LED lighting</td>
<td>LED lighting using sodium vapor lamps in 313 locations on the island</td>
<td>100</td>
</tr>
<tr>
<td>5. Green production</td>
<td>1) Expansion of green agriculture (rice paddies)</td>
<td>Target area: 5,000ha</td>
<td>24,000</td>
</tr>
<tr>
<td></td>
<td>2) Cleaner production</td>
<td>1.5 t furnace per 1 company. Production: 150 t/month Anticipated that 20 companies will install furnaces ※Electric furnaces: 5 companies, coal-fired furnaces: 15 companies</td>
<td>17,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>132,860</td>
</tr>
</tbody>
</table>

※1 LED is the abbreviation for Light-emitting diode. ※2 PV is the abbreviation for photovoltaics.
5. Formal Validation of Strategies and Measures
5. Formal Validation of Strategies and Measures

5.1 Formal validation of strategies and measures: Practical examples for sustainable improvement of projects

In order to achieve the goal set out in the Green Growth Promotion Plan according to schedule, it is necessary to carry out regular monitoring to determine if target measures are achieving the stated results in the process of implementation of measures in various sectors, and examine and implement improved methods if problems arise.

Here, the introduction of the PDCA cycle is proposed as a method to formally validate the process of executing plans. The PDCA cycle is a technique to continually improve processes through the repetition of four stages of activities, namely, Plan, Do, Check, Action (See Figure 5.1.1.)

“Plan” is the creation of an action plan to set and achieve targets. “Do” is the action taken in line with the developed plan. “Check” is a comparison of the results of actions and initial targets, exposes problem areas, and identifies factors for success or failure. In “Action,” measures are taken to improve processes and plans and review implementation systems in consideration of the results of analyses. When the “Action” stage is completed, the process returned to “Plan” and the next cycle is implemented. By repeating this cycle, the process can be gradually improved helicoidally (spiraling upwards) (See Figure 5.1.2.)
5.2 Practical examples for sustainable improvement of projects

Implementation items and points to remember are easily organized in each stage of the PDCA cycle for the sustainable improvement of each project (measure) and using the composting of waste as an example.

Table 5.2.1 Examples of implementation of PDCA cycle for the sustainable improvement of projects (using composting of organic waste as an example)

<table>
<thead>
<tr>
<th>Item</th>
<th>Implementation items</th>
<th>Points to remember</th>
</tr>
</thead>
</table>
| Plan | ◇ Development of specific project plans  
     ◇ Amount of compost to be secured, product quality level, etc.  
     ◇ Determination of assessment indicators and monitoring methods that can check progress  
     ◦ Amount of waste accepted  
     ◦ Waste quality (ratio of organic waste, ratio of valuables, etc.)  
     ◦ Operating efficiency of facility  
     ◦ Amount of compost produced, product quality level, etc. | ◦ Reflect present risks, details of past cases, and forecasts of prospects in plans.  
     ◦ Objective of planning is to identify problem areas and establish a method to improve. |
| Do   | ◦ Implement project  
     ◦ Conduct monitoring and keep a record of evaluation indicators | ◦ Record of evaluation indicators must be kept  
     ◦ Evaluation indicators are divided into those that are directly related to the product and those that are used for production conditions. |
| Check | ◦ Confirm quantity and quality level of products, confirm other indicators (production conditions, etc.)  
     ◦ Extract problems related to production of the product  
     (Ex.) Some criteria have not been satisfied with regard to product quality level → Identify cause → Consider improvement measures | ◦ It is necessary to objectively analyze problems using evaluation indicators. |
| Action | ◦ Give shape to remedial measures  
     ◦ Clarify points to confirm effect of remedial measures  
     ◦ Reflect results in next planning stage | ◦ It is important to have an objective analysis and accurately reflect results in subsequent plans. |
6. Methods for Ordering & Financing
6. Methods for Ordering & Financing

This is a summary of ordering and financing methods to implement the measures included in the Green Growth Promotion Plan.

6.1 PPP & PFI

(1) Overview
◇ A scheme in which the public and private sectors work together to provide public services is called PPP (public-private partnerships). PFI is one typical method of PPP.
◇ PPP includes PFI, designated administrative systems, market testing, public-build and private-operation (DBO: design, build, operate), more comprehensive private consignment, and outsourcing of municipal projects.

![Figure 6.1.1 Various techniques included in PPP](image)

◇ PFI (Private Finance Initiative) is a concept that aims to provide efficient and effective public services through the use of private sector financing and know-how in the design, construction, operation, and management of construction for public works and the provision of public services led by the private sector.

(2) General PFI schemes

![Figure 6.1.2 Flow chart of general PFI schemes](image)
### 6. Orders & Financing

#### (3) Example

- **Project on the maintenance and management of facilities that use sewage and biomass energy in Kurobe City**


<table>
<thead>
<tr>
<th>Applicant for contract</th>
<th>Kurobe City (Toyama Prefecture)</th>
<th>General view of facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of facility</td>
<td>Facility scale: 2,050 m² Facility using biomass energy (mixing tanks, digestion tanks, power generators, boilers, etc.), foot bath</td>
<td>![General view of facility](source: Website of Kurobe City)</td>
</tr>
<tr>
<td>Project details</td>
<td>Maintenance, operation, and management of power generating facilities for sludge-drying facilities and the use of electricity on site through the use of biogas generated from sewage sludge and coffee grounds.</td>
<td></td>
</tr>
<tr>
<td>Project period</td>
<td>17 years (Period of maintenance, operation and management is 15 years)</td>
<td></td>
</tr>
<tr>
<td>VFM</td>
<td>About 4.1% (when selecting a designated business)</td>
<td></td>
</tr>
<tr>
<td>Contract price</td>
<td>Approx. JPY 3.6 billion</td>
<td></td>
</tr>
<tr>
<td>Publication of implementation policy</td>
<td>January 31, 2008</td>
<td></td>
</tr>
</tbody>
</table>
| Features | • Methane fermentation facility that uses sewage sludge and regional biomass (coffee grounds)  
• About 1 million m³ of biomass is generated each year. The biogas is used as energy to produce dry fuel from sludge and electric power.  
• Dry materials from sewage sludge are registered and sold as fertilizer. Initiatives are also being carried out towards the use of these materials as fuel for power plants.  
• The generated power is used for electricity in facilities, and covers 50-80% of electric power usage.  
• Footbaths that use biomass have been installed as an amenity with the purpose of contributing to the development of the region.  
• Amount of condensed sludge, such as sewage sludge, etc.: 25,810 m³/year  
• Amount of regional biomass accepted: 2,800 m³/year |  |

#### 6.2 Environmental conservation fees for Cat Ba Island

(1) **Overview**

- Currently, tourists pay a Cat Ba Bay tourism fee. The funds from this fee are used for environmental conservation. The amount collected is broken down as follows: Cat Ba Bay: VND 30,000, national park forest: VND 15,000 or VND 35,000, and sea: VND 30,000.
- There is a need for additional funds to implement environmental conservation projects for the low-carbon development of the island. To secure this financing, a new Cat Ba Island environmental conservation fee will be proposed. Hai Phong will continue to use the collection mechanism for the current fees.
6. Orders & Financing

- Hai Phong will add the environmental conservation fee to ship boarding charges to Cat Ba Island from the mainland. The collection of this fee will be commissioned to hotels which operate the boats to the island to ensure that fees are collected effectively.

(2) Collection and use of the environmental conservation fee

![Figure 6.2.1 Overview of collection and use of Cat Ba Island environmental conservation fee]

6.3 Tourism tax

(1) Overview

An important element of tourism in Hai Phong is the natural environment. In the future, Hai Phong will introduce a tourism tax not only for Cat Ba Island, but for the entire city as well, and will use the funds collected for environmental conservation projects throughout the city.

![Figure 6.3.1 Overview of Hai Phong tourism tax]

- A tourism fee of USD 1 per night will be levied on guests staying at hotels with a 3-star rating or higher.
- If half of the four million visitors in 2010 stay at a hotel with a 3-star rating or higher, Hai Phong could gain financial resources of about VND 42.6 billion
  \[1\text{USD} \times 2,000,000 = \text{USD 2 million} = \text{VND 42.6 billion}\]
- To make sure that there is no waste, such as duplication of subsidies, it is important for Hai Phong to centrally manage these fees.
6. Orders & Financing

(2) Examples
1) Dresden (Germany) tourism tax
   - Tourist spot with historical buildings, art, and charming natural scenery.
   - A charge of EUR 1.3 (USD 1.8) per person per night is collected from travelers that stay in the city.
   - The tourism tax is devoted to culture and leisure facilities, as well as events.
2) Capri (Italy): Island entrance tax
   - Capri is a small island about 10 km² from southern Italy. It is Italy’s leading resort. In particular Capri is famous for a sea cave called the “Blue Grotto.”
   - Capri has instituted an island entry tax of EUR 1.5 per person (USD 2.1). This tax is added to the fee for ferries to the island from the Italian mainland.
   - The island entry tax is dedicated to improving public and tourism services, as well as protection of cultural heritage and environmental conservation.

6.4 Environmental conservation fund
(1) Overview
   A fund was established with the purpose of providing financial support to companies and residents that are implementing environmental conservation measures. It was scheduled to start operation in 2014.

Figure 6.4.1 Overview of Hai Phong Environmental Conservation Fund
(2) Use of the Environmental Conservation Fund

1) Selection and examination of subsidies
   - Subsidies are preferentially provided to companies that are practicing highly-effective projects on environmental improvement and conservation, as well as companies that are having financial difficulties. Hai Phong will also verify the effects after the subsidy has been granted and will develop a mechanism to publicize the collective experiences and know-how on environmental conservation measures.

2) Support united with national support policies
   - The national government will introduce incentives in terms of taxation and financing for investment plans that promote the introduction of new energy technologies and energy-efficient facilities.
   - In addition to widely publicizing national support policies such as these, the government will also offer effective and efficient support that is integrated with national support policies.

3) Financing
   - Part of the tourism tax will be used as a source of revenue.
   - Awards and appearances on TV will be offered by the Press Bureau to companies that have made donations to help companies improve their image. The advantages of donating should be pointed out to companies to increase the number of companies offering donations.
   - Financial resources of the fund will be secured in order to strengthen the collection function of environmental taxes and fines.
Reference Materials

1. Attachment 1: Statistical Data .......................................................... Ref-1
2. Attachment 2: Calculations of GHG Emissions .................................. Ref-5
3. Attachment 3: Process of development of Hai Phong Green Growth Promotion Plan...Ref-7
Attachment 1: Statistical Data

(1) Socio-economic conditions: Population

Population

Source: Hai Phong Statistical Yearbook, Hai Phong City Master Plan

Urban & rural population, 2005

Urban & rural population, 2020


(2) Socio-economic conditions: GDP

GDP (Current Price)

(3) Socio-economic conditions: Industry

**GDP (Current Price)**

![GDP graph showing industry and construction growth from 2007 to 2020](chart)

- **2005**: GDP by industry ratio, 7,746 bill VND
- **2010**: GDP by industry ratio, 21,282 bill VND
- **About 3.8 times GDP by industry ratio, 2005**

*Source: Hai Phong Statistical Yearbook, Hai Phong Socio-Economic Plan (2020)*

(4) Socio-economic conditions: Agriculture, forestry, and fisheries

**Livestock breeding numbers**

- **Water buffalo**
- **Cattle**

*Source: Hai Phong Statistical Yearbook, Hai Phong Socio-Economic Plan (2020)*
(5) Socio-economic conditions: Agriculture, forestry, and fisheries

Livestock breeding numbers

Pigs

Poultry

(6) Socio-economic conditions: Tourism

No. of tourists
(at hotels)

No. of hotels
No. of rooms
(7) Water & sewage

**No. households with water supply (city center)**

Source: Haiphong Water Supply One Member Co., LTD

255,800 households = Approx. 1.3 million people
Attachment 2: Calculations of GHG Emissions

- GHG emissions for the entire city of Hai Phong were calculated on the basis of existing statistical data and materials, using emissions per unit in Japan.

- In the future, Hai Phong will further collect statistical data and improve the accuracy of GHG emission calculations using the emissions per unit in Viet Nam.

(1) Evaluation indicators: GHG emissions

<table>
<thead>
<tr>
<th>Sector</th>
<th>Classification</th>
<th>Annual emissions (t CO₂/year)</th>
<th>2010</th>
<th>2020 (BaU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste</td>
<td>Total</td>
<td>597,370</td>
<td>2,541,016</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emissions from solid waste disposal sites</td>
<td>589,183</td>
<td>2,527,991</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Emissions from managed sites</td>
<td>589,183</td>
<td>2,527,991</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Emissions from non-managed sites</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste incineration</td>
<td>8,187</td>
<td>13,025</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- General waste</td>
<td>0</td>
<td>2,182</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Industrial waste</td>
<td>8,187</td>
<td>10,843</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>13,231,507</td>
<td>49,574,194</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>Total</td>
<td>183,948</td>
<td>279,269</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Energy industries (thermal power generation plants)</td>
<td>1,715,438</td>
<td>4,884,506</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Manufacturing industry</td>
<td>11,184,482</td>
<td>42,980,829</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Service industry</td>
<td>331,587</td>
<td>1,708,859</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>Total</td>
<td>50,476</td>
<td>71,133</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Airplanes</td>
<td>7,300</td>
<td>48,831</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Automobiles</td>
<td>5,233</td>
<td>6,190</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Buses</td>
<td>2,168</td>
<td>2,564</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Motorbikes</td>
<td>86,802</td>
<td>102,661</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Trucks</td>
<td>76,971</td>
<td>102,803</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Railroads</td>
<td>3,181</td>
<td>12,724</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Ships</td>
<td>2,293</td>
<td>3,495</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>244</td>
<td>1,971</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emissions from landfilling digested sludge</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emissions from treatment of industrial wastewater</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emissions from treatment of domestic wastewater</td>
<td>50,232</td>
<td>69,161</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Final treatment plant</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Septic tank, untreated</td>
<td>50,232</td>
<td>69,161</td>
<td></td>
</tr>
<tr>
<td>Green production</td>
<td>Emission in industrial processes</td>
<td>2,447,381</td>
<td>9,405,036</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mining products</td>
<td>2,109,770</td>
<td>8,107,632</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Chemical industries</td>
<td>337,611</td>
<td>1,297,403</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emissions in the agricultural sector</td>
<td>696,420</td>
<td>696,420</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Livestock-derived</td>
<td>248,731</td>
<td>248,731</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Farmland</td>
<td>447,689</td>
<td>447,689</td>
<td></td>
</tr>
<tr>
<td>Changes to land use</td>
<td>Changes to carbon stock change from land conversion</td>
<td>0</td>
<td>54,426</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Reduction of forests, farmland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>17,207,103</td>
<td>62,621,492</td>
<td></td>
</tr>
</tbody>
</table>
2) Issues related to GHG emissions, other

1) Current situation and future of GHG emissions
   - As of 2010, GHG emissions from Hai Phong are estimated at 17.2 million t-CO$_2$/year.
   - By 2020, the GHG emissions are expected to increase by about 3.7 times compared to levels in 2010, in conjunction with increases in population and activation of socio-economic activities. This makes the systematic reduction of emissions important.

2) Key sources of GHG emissions
   - Estimates for 2020 show that emissions from the energy sector will be the highest, accounting for 70.2% of total emissions. It is important to implement measures in this sector.
   - Secondly, emissions from industrial processes, such as cement factories, are also high, and is expected to account for about 15.0% of total GHG emissions.

Figure: Current and future conditions of GHG emissions and emission sources in Hai Phong
(Current conditions: 2010, Future conditions: 2020)
Attachment 3: Process of development of Hai Phong Green Growth Promotion Plan

Process of development of Hai Phong Green Growth Promotion Plan

<table>
<thead>
<tr>
<th>Date</th>
<th>Process of development of plan, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 8, 2014 (Tue)</td>
<td>【Adoption as Ministry of the Environment JCM project】 Supporting the development of Green Growth Promotion Plan in the City of Hai Phong in cooperation with the City of Kitakyushu</td>
</tr>
<tr>
<td>April 22, 2014 (Tue)</td>
<td>【1st Workshop】(Preliminary discussions with related departments)</td>
</tr>
<tr>
<td></td>
<td>● Overview of project</td>
</tr>
<tr>
<td></td>
<td>● Annual schedule, implementation system, etc.</td>
</tr>
<tr>
<td>May 26, 2014 (Mon)</td>
<td>【2nd Workshop】(Kick-off meeting)</td>
</tr>
<tr>
<td></td>
<td>● Participation of Ministry of Environment</td>
</tr>
<tr>
<td></td>
<td>● Presentation on Green Growth Promotion Plan (draft proposal)</td>
</tr>
<tr>
<td></td>
<td>● Presentation on pilot projects (draft proposals)</td>
</tr>
<tr>
<td>July 28-29, 2014 (Mon-Tue)</td>
<td>【3rd Workshop and Sectional Meetings】</td>
</tr>
<tr>
<td></td>
<td>● Discussions on quantitative indicators for the Green Growth Promotion Plan</td>
</tr>
<tr>
<td></td>
<td>● Organization of five sectional meetings and specific discussions by sector</td>
</tr>
<tr>
<td>October 20 (Mon), 2014</td>
<td>【4th Workshop】(Interim report)</td>
</tr>
<tr>
<td></td>
<td>● Presentation on Green Growth Promotion Plan (interim plan)</td>
</tr>
<tr>
<td></td>
<td>● Presentation on pilot projects (interim plan)</td>
</tr>
<tr>
<td>January 19 (Mon), 2015</td>
<td>【5th Workshop】(Final report)</td>
</tr>
<tr>
<td></td>
<td>● Participation and site visits by Ministry of the Environment</td>
</tr>
<tr>
<td></td>
<td>● Presentation on Green Growth Promotion Plan (final plan)</td>
</tr>
<tr>
<td></td>
<td>● Presentation on pilot projects (final plan)</td>
</tr>
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</table>

Stakeholders and areas of responsibility

<table>
<thead>
<tr>
<th>Name of organization</th>
<th>Areas of responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitakyushu Asian Center for Low Carbon Society</td>
<td>Overall project management</td>
</tr>
<tr>
<td>Institute for Global Environmental Strategies</td>
<td>Compilation of JCM project</td>
</tr>
<tr>
<td>Nikken Sekkei Civil Engineering Ltd.</td>
<td>Planning, studies, and project development (transportation, water, sewage, and storm water drainage, environmental conservation, green production)</td>
</tr>
<tr>
<td>NTT Data Institute of Management Consulting, Inc.</td>
<td>Studies and project development (waste, energy, Cat Ba Island)</td>
</tr>
<tr>
<td>Nishihara Corporation</td>
<td>Studies and project development (waste)</td>
</tr>
<tr>
<td>Amita Corporation</td>
<td>Studies and project formation (waste)</td>
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<tr>
<td>Amita Institute for Sustainable Economies Co., Ltd.</td>
<td>Studies and project development (Cat Ba Island)</td>
</tr>
<tr>
<td>The University of Kitakyushu</td>
<td>Studies and project development (energy, green production)</td>
</tr>
<tr>
<td>MI Consulting Group</td>
<td>Support for the management of workshops</td>
</tr>
</tbody>
</table>
Attachment 3: Process of development of Hai Phong Green Growth Promotion Plan

1st Workshop (April 22, 2014)

2nd Workshop (May 26, 2014)

3rd Workshop (July 28, 2014)

4th Workshop (October 20, 2014)

5th Workshop (January 19, 2015)