FY2015

Project to Support the Formation of JCM Programs
to Realize Low-Carbon Societies in Asia

Report on
Ho Chi Minh City – Osaka City Cooperation Project
for Developing Low Carbon City

March 2016

Global Environment Centre Foundation

(GEC)

Ⅰ. Summery

1. An Outline of the Service

1.1 The Objectives of the Service

The objectives of the service is to turn Ho Chi Minh City, whose environmental impact is increasing, into a low-carbon city by achieving the three goals shown below, thereby creating a model low-carbon city for other mega-cities in Asia which have similar environmental problems. The service is provided based on past study results as well as the memorandum signed by the Mayor of the Osaka City Mayor and the Chairman of the Ho Chi Minh City People's Committee regarding cooperation between the municipal governments for low-carbon city development, which stipulates the utilization of the Joint Crediting Mechanism (JCM).

1) Identify the possibilities for large-scale, packaged JCM projects which cover large geographical areas and develop such projects, by exporting systems which integrate the excellent environmental technologies and environmental administration systems used by Osaka City.
2) Establish operational and maintenance systems which provide organizational and institutional support for the implementation of large-scale JCM projects, including the strength of a cooperation body for the two cities and the creation of a low-carbon city master plan.
3) Implement these projects as early as possible in the period between the 2015 fiscal year and 2016 fiscal year and implementation of large-scale JCM projects.

1.2 The Description of the Service

The content of the service is as described below.

1) Providing support for the formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 and conducting a capacity development project
2) The implementation of feasibility studies for JCM projects (including the creation of JCM methodologies and project design documents (PDD))
    (1) The energy conservation project for factories on an industrial estate in Ho Chi Minh City
    (2) The project for switching street lights to highly efficient LED lights
    (3) The project for the extended use of CNG (compressed natural gas) taxies
    (4) The project for the promotion of the industrial use of photovoltaic systems
3) The promotion of cooperation between the municipal governments and public-private cooperation
4) Holding symposiums, workshops, etc.
    (1) Holding city mayor-level symposiums through inter-city cooperation
    (2) Holding study results debriefing workshops
    (3) Explanation meetings on the development of JCM projects for low-carbon city development in Ho Chi Minh City
5) PR activities
6) Reporting the output of this city to city cooperation project
    (1) Attending and giving reports at progress debriefing sessions in Japan which are held five times a year at the Ministry of the Environment (including the preparation of necessary information materials)
    (2) Attending and giving presentations at preliminary meetings in Japan prior to workshops, etc. to be held in Ho Chi Minh City (including the preparation of

necessary information materials)

(3) Providing information (giving presentations, setting up booths, etc.) at meetings designated by the Ministry of the Environment (except for (1) and (2))
- the Workshop and Seminars on JCM City-to-City Collaboration in Tokyo in January 2016
- the 7th High Level Seminar on Environmentally Sustainable Cities in Hanoi in March 2016

1.3 Service Flow

The service flow is as shown below.

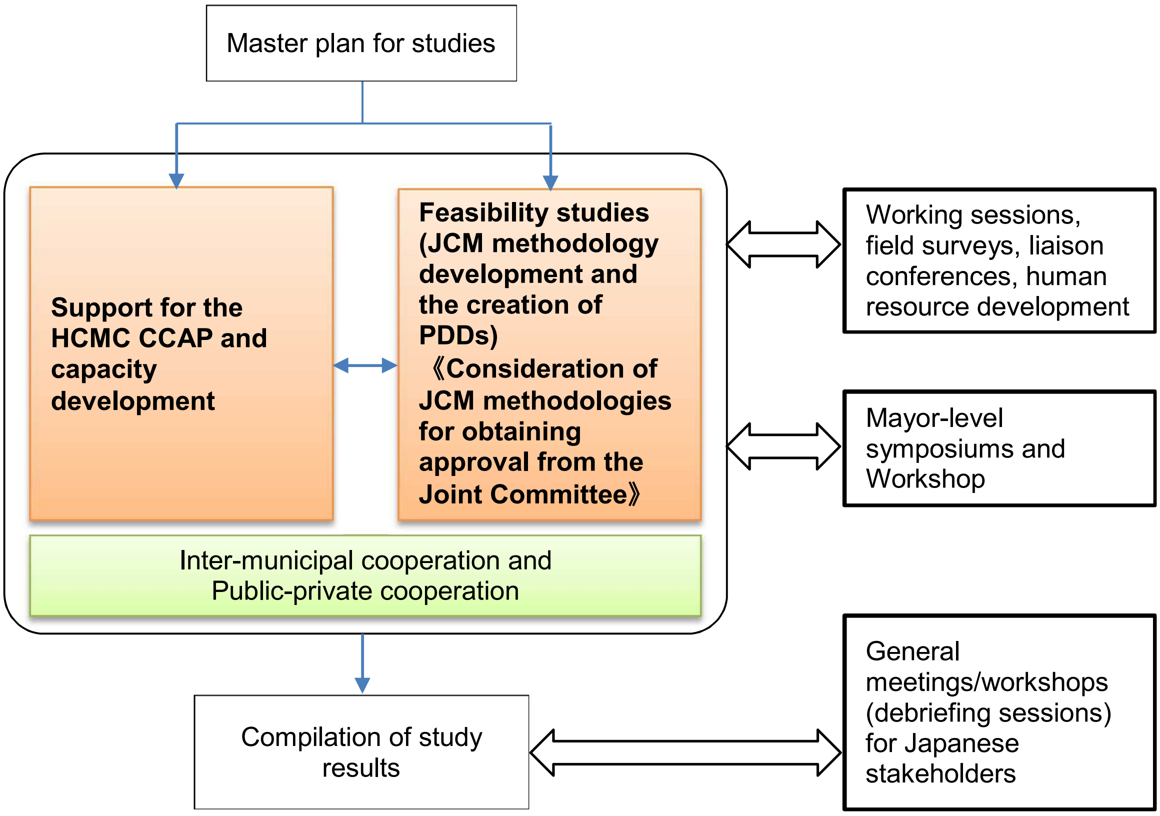

Diagram: Service Flow

1.4 Organizational Structures for the Project Implementation

Organizational structures for the project implementation are as shown below.

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The following organizations provided support for the above-mentioned activities: the Japan International Cooperation Agency Kansai International Center (JICA Kansai), the New Energy and Industrial Technology Development Organization (NEDO), the Ho Chi Minh Office of the Japan External Trade Organization (JETRO Ho Chi Minh) and the Kansai Economic Federation (Kankeiren).

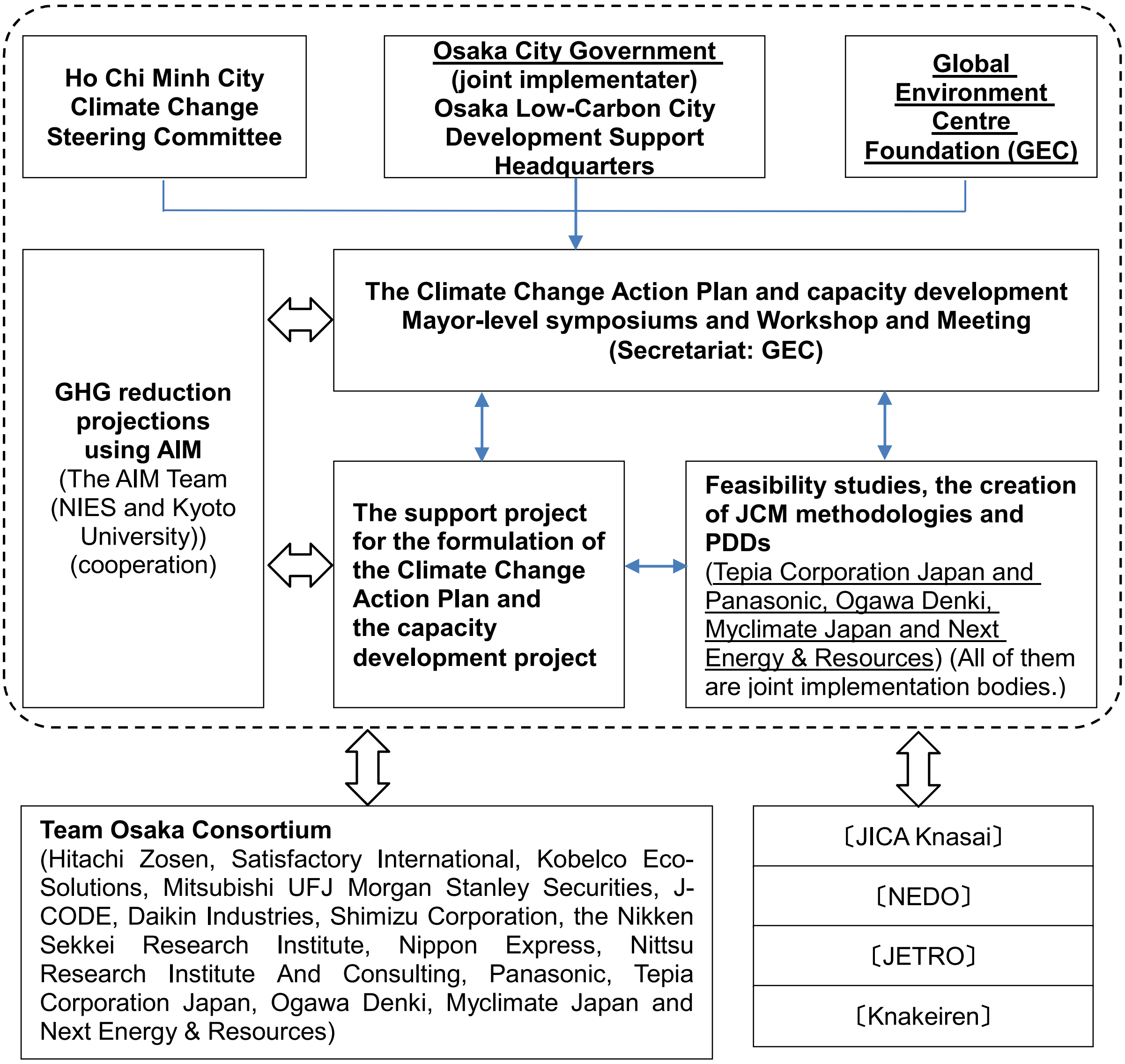

Diagram: The Organizational Structure for Project Implementation

2. Providing Support for the Formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 and Conducting a Capacity Development Project

As a continuation from the 2014 fiscal year, support was provided for the formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020, using experience gained from the formulation and implementation of the Action Plan for Global Warming Countermeasures for Osaka City. The aim of the support was to promote mid-term to long-term climate change measures in Ho Chi Minh City by identifying the possibilities for large-scale JCM projects which contribute to the development of a low-carbon Ho Chi Minh City, and by expanding the project scopes to cover the entire city. In order to implement JCM projects over large geographical areas and to continuously develop new projects, it was essential to create an organizational structure which ensures the implementation and maintenance of the formulated CCAP. For this reason, a capacity development project was conducted for Ho Chi Minh City, with the aim of creating the necessary organizational structure and systems for the Ho Chi Minh City People's Committee as well as improving its operational techniques and strengthening its cooperation with private businesses, by transferring know-how, techniques, systems, etc. that the Osaka City Government has implemented.

Regarding support for the formulation of the CCAP, the draft CCAP was formulated through cooperation between the Ho Chi Minh City People's Committee and the Osaka City Government as well as with the participation of private companies in the 2014 fiscal year. The Climate Change Bureau and relevant departments at the Ho Chi Minh City People's Committee, etc. continued discussions and coordination in Ho Chi Minh City with the aim of obtaining approval from the Ho Chi Minh City People's Committee in 2016. Therefore, continuous support was needed in the 2015 fiscal year.

When supporting the formulation of the CCAP, we aimed to enable the continuous development of new JCM projects and the geographical expansion of the project scopes, by proposing low-carbon city plans based on the knowledge, know-how and technologies of Osaka City. The proposals included: the formulation of a future vision for a low-carbon society; the formulation of a road map on priority measures, etc. to achieve a low-carbon society; and the creation of a strategy which utilizes the strengths and potentials of Osaka and the Kansai Region.

2.1 Support for the Formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020

During the studies conducted in fiscal year 2014, as a result of discussions with the Ho Chi Minh City People's Committee regarding the formulation of the Ho Chi Minh City Climate Change Action Plan 2016-2020, issues to be resolved before formation were identified. In fiscal year 2015 as well, support was given for the formulation of the Action Plan, in cooperation with the Osaka City Government, to continue efforts to solve the issues and make the Action Plan more effective for the continuous development of JCM projects and the geographical expansion of the project scopes, in order to make Ho Chi Minh City a low-carbon society. More specifically, detailed discussions were continued through local meetings, emails, web conferences, etc. and by close consultation with the Ho Chi Minh City People's Committee.

As a result, as shown on the back hereof, the Ho Chi Minh City Climate Change Action Plan 2016-2020 (draft) was completed and will be approved by the Ho Chi Minh City People's Committee in the first half of 2016.

Table: Outlines of Meetings, etc. Held in Ho Chi Minh City

Meeting	Date	Discussion counterparts
The 1st local meeting	June 8-10, 2015 (Mon.-Wed.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee, other relevant departments and the local counterparts for the JCM project feasibility studies
The 2nd local meeting	July 7-11, 2015 (Tue.-Fri.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee
The 3rd local meeting	September 15-17, 2015 (Tue.-Thu.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee and other relevant departments
The 4th local meeting	October 22-23, 2015 (Thu.-Fri.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee and other relevant departments
The 5th local meeting	January 20-21, 2016 (Wed.-Thu.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee

2.2 Capacity Development for the Geographical Expansion of the JCM Project Scopes and the Continuous Development of New Projects

The capacity development project for the Ho Chi Minh City People's Committee was conducted with the aim of human resource development and smooth organizational management, by focusing on the PDCA (plan-do-check-act) cycle of the Climate Change Action Plan (CCAP), based on the experience and know-how of the Osaka City Government. The project aimed for the effective and efficient improvement of the effectiveness of the formulated CCAP and the ability to solve environmental problems. It also aimed for the geographical expansion of the JCM project scopes and the continuous development of new projects. The capacity development project was conducted through working sessions between the Ho Chi Minh City People's Committee and the Osaka City Government.

3. Implementation of Feasibility Study on JCM Project

We implemented the feasibility study on the following 3.1 through 3.4., which were expected to be realized at an early date, and similar projects of which were likely to develop in the future. Among them, the Energy-Saving Project of the Plants in the Industrial Estate in Ho Chi Minh City and the Project for the Promotion of the Industrial Use of Photovoltaic Systems were adopted for the Financing Programme for JCM Model Projects in the fiscal year of 2015.
In order to realize the target projects as JCM projects, we developed the applicable JCM methodologies (setting of eligibility criteria; identification and calculation of reference emission; calculation of project emission; establishment of the monitoring method; quantitative evaluation of the amount of emission reduction and setting of default value and preset value etc., which are required for the calculation of emission reduction; and preparation of excel spread sheet) and created the project design document (PDD).

Feasibility Study	Financing Programme for JCM Model Projects
Energy-Saving Project of the Plants in the Industrial Estate in Ho Chi Minh City [Tepia Corporation Japan, Panasonic Corporation]	Energy Conservation for Plants by the Use of Air Conditioning Control Systems [Yuko-Keiso Co., Ltd.]
Project for the Promotion of the Industrial Use of Photovoltaic Systems [Next Energy & Resources Co., Ltd.]	Introduction of Photovoltaic Generation in Shopping Malls in Ho Chi Minh City [AEON Retail Co., Ltd.]

3.1 Energy-Saving Project of the Plants in the Industrial Estate in Ho Chi Minh City (Tepia Corporation Japan, Panasonic Corporation)

(1) Project Overview

This project aims to reduce CO2 emissions in the industrial estate in Ho Chi Minh City by encouraging the plants there to save energy through the implementation of energy-saving diagnosis and the introduction of appropriate technologies.
Four plants of the following companies were selected for the study: Nidec SERVO Vietnam, which is a subsidiary located in Ho Chi Minh City; Nidec TOSOK; TOYOITEC Vietnam; and Nidec Vietnam.

(2) Target Facilities

Experts examined the whole of each plant in terms of energy saving, centering on the air conditioning system, the compressor, and the reflow furnace. The examination included the installation of instruments measuring the electricity and pressure of the air conditioning system and the compressor. As a result, we selected equipment that enhances the operation efficiency through controlling the movement of utility facilities in the plants. Specifically, we selected “Be One” as the air conditioning system most likely to be introduced into the four plants, and compressor control equipment.

(3) Study Results

The total reduction in CO2 emissions from three of the four plants was estimated to be 2,227 tCO2/year.

This project was adopted as Energy Conservation for Plants by the Use of Air Conditioning Control Systems (Yuko Keiso Co., Ltd.) as a result of application for the Financing Programme for JCM Model Projects in the fiscal year of 2015 based on the results of the feasibility study.

3.2 High-efficiency LED Street Light Conversion Project (Ogawa Electric Co., Ltd.)

(1) Project Overview

This project aims to convert the street lights in Ho Chi Minh City from high-pressure sodium lamps to highly efficient LED lamps.

(2) Target Facilities

The target is Stanley Electric’s highly-efficient, lightweight, and thin LED street lights. Its light source is the COB module which Stanley Electric has been developing, using its technical skills acquired through the development of LED lights for automobiles.

(3) Study Results
If 4,000 of the 14,000 streets lights in Ho Chi Minh City are converted to LED, the reduction in CO2 emissions is estimated to be 1,037 tCO2/year.

However, it was found that to carry this out as a JCM project, due to the scheme of international consortium it is essential to form a scheme whereby the owner of the street lights (now, the Ho Chi Minh City Department of Transport) participates as a business partner, and it is necessary to solve the issue of the local government's gaining approval for budgeting the cost of replacing street lights with LED. On the other hand, the study made it possible to fully grasp Vietnam's system of managing street lights, the method of paying electricity charges for street lights, and the proposal and approval processes within the People's Committee, and gain useful information on how to apply for JCM.

3.3 CNG Taxi Dissemination Project (myclimate Japan Co., Ltd.)

(1) Project Overview
This project aims to cooperate with a taxi company in Ho Chi Minh City to reduce GHG emissions by remodeling the company's taxis to change from gasoline to CNG.

(2) Target Facilities
The target is K-Techcorp's remodeling of Mai Linh Corporation's taxis into CNG vehicles and Saisan Co., Ltd. and its subsidiaries' construction of CNG supply stations.

(3) Study Results
According to Mai Linh's CNG taxi business profitability estimate, Saisan's CNG supply and sales business, and K-Techcorp's vehicle remodeling business, it appears difficult to implement Mai Linh's CNG taxi business and Saisan's CNG supply and sales business on a private basis. To carry out this project, it will be necessary to reduce the selling price of CNG through measures by the Vietnamese Government or the Ho Chi Minh City People's Committee to give an incentive to use CNG. Therefore, we hope that such measures will be carried out by the Vietnamese Government and the Ho Chi Minh City People's Committee, both of which have a policy addressing the use of CNG.

3.4 Project for the Promotion of the Industrial Use of Photovoltaic Systems (Next Energy & Resources Co., Ltd.)

(1) Project Overview
This aims to promote the construction of an inexpensive and simple self-consumption system with a limited power storage capacity for unused spaces in industrial facilities of 100 to 300 kW for business purposes. Specifically, a study was carried out about the introduction of a photovoltaic system in AEON Mall Binh Tan, which is scheduled to open in the summer of 2016.

(2) Target Facilities
The target is a photovoltaic system (320 kW) made by Next Energy & Resources Co., Ltd.

(3) Study Results
It was estimated that, if a photovoltaic system of 320 kW was introduced, the amount of reduction in CO2 emissions would be 286 tCO2/year.

Based on the results of this feasibility study, an application was made for the Financing Programme for JCM Model Projects in the fiscal year of 2015. As a result, this project was adopted as “Introduction of Photovoltaic Generation in Shopping Malls in Ho Chi Minh City” (AEON Retail Co., Ltd.).

4. Promotion of Cooperation between the Municipal Governments and Public-private Cooperation

In the process of supporting the formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP), etc. through cooperation between the Ho Chi Minh City People’s Committee and the Osaka City Government, we clarified the needs of Ho Chi Minh City regarding the development of a low-carbon city and the sustainable development of the city. We also promoted the transfer of knowledge, know-how, technologies and systems for urban management and urban development from Osaka City, as well as pushing forward specific JCM projects, in response to identified needs. With the aim of identifying possibilities for JCM projects, information was shared with private businesses, etc. which are interested in the implementation of JCM projects (see “5.3 The Explanation Meeting on the Development of JCM Projects for Low-carbon City Development in Ho Chi Minh City (October 2015)”). We also promoted a further involvement of private businesses and public-private cooperation for project implementation support, via the Team Osaka Consortium which was established under the project (see “7.2 Attending and Giving Presentations at the Preliminary Meeting in Japan Prior to Workshops, etc. to Be Held in Ho Chi Minh City”).

5. Holding Symposiums, etc.

5.1 The Osaka City and Ho Chi Minh City Joint JCM Symposium (November 2015)

The Ho Chi Minh City and Osaka City International Symposium for Developing a Low-carbon City was held in Ho Chi Minh City on Friday, November 6, 2015, in order to share the results on the transfer of knowledge, know-how, technologies and systems for urban management and urban development from Osaka City and private companies to Ho Chi Minh City, as part of the climate change measures for Ho Chi Minh City. More specifically, the symposium aimed to share the latest reports on the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 as well as to share reports on the implementation progress for the JCM projects.

About 100 persons participated in this symposium: about 40 persons from Japan, including Mr. Tanaka, Vice Mayor of Osaka City and Mr. Nohara, Director of the Environmental Policy Department, Environment Bureau, Osaka City; about 60 persons from Viet Nam, including Mr. Cang, Deputy Chairman of the Ho Chi Minh City People’s Committee, Mr. Phuc, Deputy Director of the Department of Natural Resources and Environment, officials from the relevant departments of Ho Chi Minh City (Department of Industry and Trade, Department of Planning and Architecture, Department of Transport, Department of Construction, Department of Science and Technology, etc.).

At the beginning, Mr. Cang, Deputy Chairman of the Ho Chi Minh City People’s Committee and Mr. Tanaka, Vice Mayor of Osaka City, gave opening addresses, followed by an explanation of the status of progress in the ongoing Ho Chi Minh City Climate Change Action Plan (2013-2015) and concrete projects in progress by Mr. Phuc, Deputy Director of the Department of Natural Resources and Environment (DONRE). In addition, Mr. Chau, Deputy Director of the Ho Chi Minh City Climate Change Bureau (HCCB) explained the outline of the next Ho Chi Minh City Climate Change Action Plan (2016-2020), which was developed with the support of the Osaka City Government in this fiscal year. After these representations, Mr. Nohara, Director of Environmental Policy Department, Environment Bureau, Osaka City, explained the concrete measures, plan, and projects for developing Ho Chi Minh City inti a low-carbon city, based on Osaka City's experience. Based on these presentations, both cities shared information on the status of progress in concrete efforts to develop Ho Chi Minh City into a low-carbon city. In addition, the participants from Ho Chi Minh City stated that "Through the process of preparing the action plan, we will promptly implement concrete projects, recognize the importance of cooperation with public companies, and request the Osaka City Government to continue to give us support in our management of progress in the action plan through its practical skills, development of residents' awareness and human resources, guidelines, etc." Moreover, the participants from Osaka City stated that "We will continue to give Ho Chi Minh City support in its development into a low-carbon city, closely cooperating with Japan's Ministry of the Environment and formulating concrete projects under the action plan. Because it is important to use science and technology for production activities, we would like to cooperate also with research institutes and the like (such as Osaka City Institute of Public Health and Environmental Sciences, four public universities, National Institute for Environmental Studies, and Kyoto University)." Responding to this, The Chairman of the Ho Chi Minh City People's Committee handed over a document addressed to Osaka City Mayor to request the Osaka City Government to continue to cooperate in the development of human resources and the promotion of projects.

Next, the project implementing bodies explained the contents of the JCM model projects, the demonstration projects, and the JCM project feasibility study and it was confirmed that the concrete efforts to carry out the projects showed a steady progress.

After that, the Ho Chi Minh City Climate Change Bureau presented its policy on progress management in the implementation of the action plan, while the Osaka City Government presented its measures based on the PDCA cycle of Plan-Do-Check-Action. Both cities held a discussion about the construction of a system for smoothly carrying out the plan and confirmed that they would continue to cooperate with each other to develop Ho Chi Minh City into a low-carbon city also in the future.

5.2 Holding a Study Results Debriefing Workshop (February 2016)

A study results debriefing workshop was held on February 25, 2016, in order to report on the study results regarding the inter-city cooperation projects for the 2015 fiscal year and the JCM projects. At the workshop, the latest report on the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 and reports on the implementation progress for the JCM projects were given. The workshop was also used to discuss future cooperation frameworks between Ho Chi Minh City and Osaka City, as well as to discuss implementation policies for the transfer of knowledge, know-how, technologies and systems for urban management and urban development from Osaka City and private companies to Ho Chi Minh City, with regard to future climate change measures to be taken based on the CCAP.

5.3 The Explanation Meeting on the Development of JCM Projects for Low-carbon City Development in Ho Chi Minh City (October 2015)

The Explanation Meeting on the Development of JCM Projects for Low-carbon City Development in Ho Chi Minh City was held on Friday, October 30, 2015, in order to give explanations on inter-city cooperation activities conducted by the Osaka City Government in Ho Chi Minh City and on support projects conducted by relevant organizations. The meeting also aimed to share an outline of the JCM and reports by the businesses which conduct JCM projects, as well as to have discussions on the creation of project implementation frameworks and MRV (measurement, reporting and verification) procedures, with the aim of promoting the utilization of the JCM. The meeting was hosted by the Osaka City Government and co-hosted by the GEC.

The meeting had 63 participants from private companies, etc., who listened to and shared opinions about the Osaka City Government's support for achieving a low-carbon society and the Japanese government's efforts, as well as explanations on the project support systems provided by the Ministry of the Environment, NEDO and JICA which use the JCM (Joint Crediting Mechanism).

6. PR Activities

To explain the project and promote the deepening and expansion of the understanding of JCM, PR activities were carried out using city mayor-level symposiums, local workshops, explanation meetings on the development of JCM projects, etc.

7. Cooperation with Other Entities regarding Relevant Services

7.1 Attending and Giving Reports at Progress Debriefing Sessions in Japan

To report on the status of progress in the projects, we attended the following meetings held by the Ministry of the Environment: the kickoff meeting on May 12, 2015; the 2nd progress debriefing session on August 6, 2015; the 3rd progress debriefing session on November 17, 2015; and the final debriefing session on January 12, 2016.

7.2 Attending and Giving Presentations at the Preliminary Meeting in Japan Prior to the Workshops, etc. to Be Held in Ho Chi Minh City

We held a preliminary meeting which aimed to share information and exchange opinions between personnel from the Ministry of the Environment and Team Osaka, regarding the content of the project for the 2015 fiscal year, the implementation policies, the schedule, etc.

7.3 Providing Information at Meetings Designated by the Ministry of the Environment

We attended the Workshop and Seminars on JCM City-to-City Collaboration held in Tokyo on January 28 and 29, 2016 and the 7th ESC high-level seminar held in Hanoi on March 3 and 4, 2016, in which the Osaka City Government made a presentation about the project.

Ⅱ. Main Text of the Report

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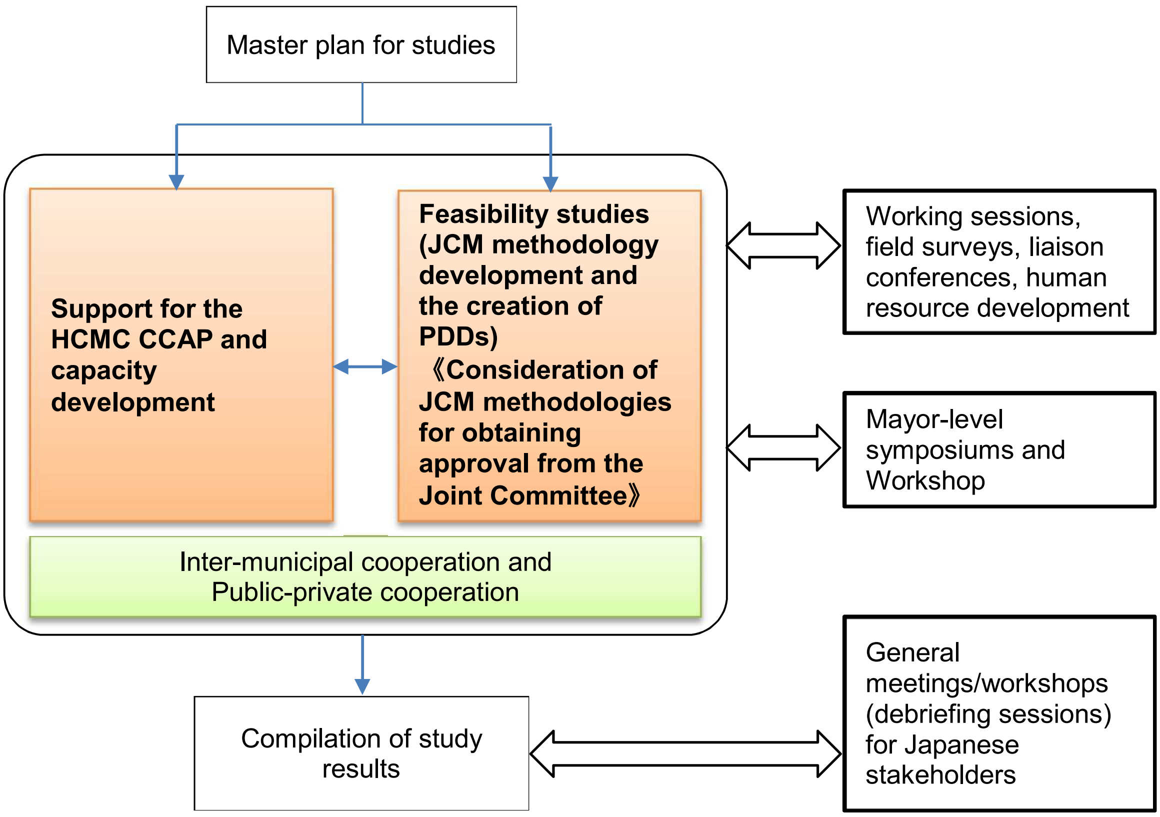

Diagram: Service Flow

1.4 Organizational Structures for the Project Implementation

Organizational structures for the project implementation are as shown below.

1) The Organizational Structure of the Ho Chi Minh City People's Committee for the Development of a Low-carbon City

The development of a low-carbon city in Ho Chi Minh City is mainly implemented by the Ho Chi Minh City Climate Change Steering Committee.

The Steering Committee is made up of all the departments of the Ho Chi Minh City People's Committee and the director of each department serves as a member of the committee. The Advisory Group and the Climate Change Bureau were established under the Steering Committee. The Climate Change Bureau was set up within the Department of Natural Resources and Environment (DONRE).

2) The Organizational Structure of the Osaka City Government for the Development of a Low-carbon City

The Osaka City Government set up a cross-departmental body called the Osaka Low-Carbon City Development Support Headquarters on July 11, 2013, prior to launching the technical cooperation for the development of a low-carbon city in Ho Chi Minh City through public-private cooperation.

The objective of the headquarters is to promote the transfer of the comprehensive technical know-how on urban management and urban development that Osaka City has, by utilizing the advanced technologies of private companies, etc. while also obtaining support from the Osaka Prefectural Government, in order to develop low-carbon cities in Asia. Thereby, the headquarters aims to provide solutions to urban problems in Asia as well as revitalizing the local economy of Osaka.

3) The Organizational Structure for Project Implementation

Joint conferences were held between the Ho Chi Minh City Climate Change Steering Committee and the Osaka Low-Carbon City Development Support Headquarters with the support of the Global Environment Centre Foundation (GEC).

Private companies (Tepia Corporation Japan, Panasonic Corporation, Ogawa Electric Co., Ltd., Myclimate Japan Co., Ltd. and Next Energy & Resources Co., Ltd.) conducted feasibility studies, and the National Institute for Environmental Studies (NIES) made projections using the Asia-Pacific Integrated Model (AIM). The Team Osaka Consortium shared information on the development and implementation of JCM projects in Ho Chi Minh City among themselves.

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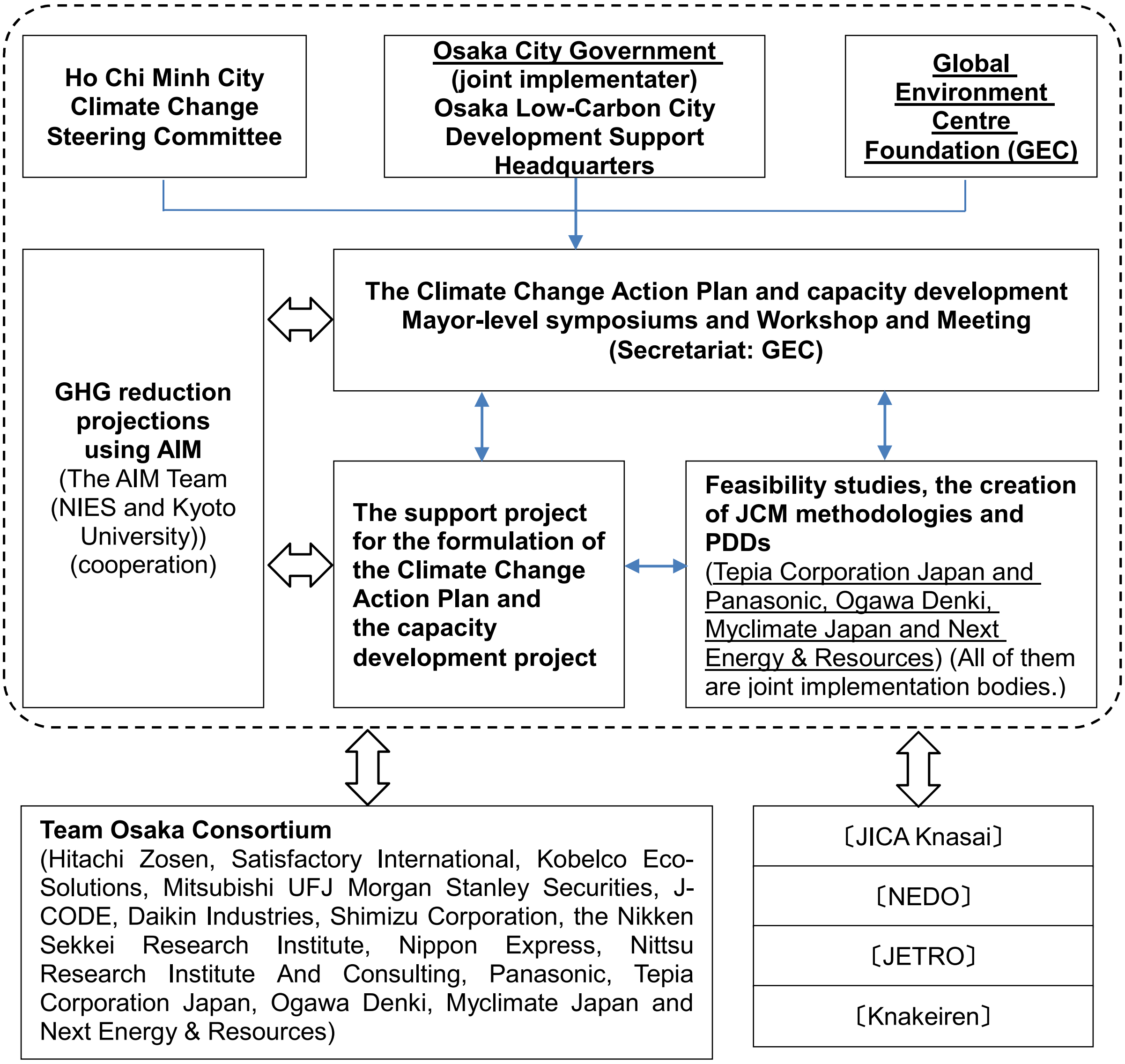

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2.1 Support for the Formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020

During the studies conducted in the 2014 fiscal year, the following issues were identified through discussions with the Ho Chi Minh City People's Committee regarding the formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020.

<Issues that need to be resolved>

- Ascertaining current greenhouse gas (GHG) emissions (This issue was not discussed in the 2014 fiscal year.)

- Estimation of future GHG emissions (AIM is planned to be used in collaboration with the National Institute for Environmental Studies (NIES).)

- Setting the target year and target value for the GHG emissions reduction

- Clarification of priority fields, priority measures and priority projects
- Consideration of the organizational structure for the implementation of the CCAP, progress management and the revision of the CCAP
- Proposals on model projects which utilize JCM
- Proposals on applicable finance schemes

<Proposals on low-carbon city plans which enable the geographical expansion of the JCM project scopes and the continuous development of new projects>

- The formulation of a future vision for a low-carbon society
- The formulation of a road map on priority measures, etc. to achieve a low-carbon society
- The creation of a strategy which utilizes the strengths and potentials of Osaka and the Kansai Region

The Ho Chi Minh City People's Committee had the following schedule for 2015 regarding the formulation of the CCAP.

<The Schedule for the Formulation of the CCAP>

June 2015	The completion of the draft by the Climate Change Bureau
July 2015-March 2016	Discussions and coordination with the relevant departments
April 2016	Submission of the draft CCAP to the People's Committee
June 2016	Approval by the Ho Chi Minh City People's Committee

Therefore, in the 2015 fiscal year, it was necessary to continue to provide support for the formulation of the CCAP in collaboration with the Osaka City Government, until the CCAP was approved by the Vietnamese government. In particular, regarding GHG emissions projections, the AIM Team (the National Institute for Environmental Studies (NIES)) had been cooperating with the Ho Chi Minh City People's Committee (the Climate Change Bureau, the Department of Science and Technology, the University of Natural Resources and Environment, etc.) since the 2014 fiscal year. Examinations of GHG emissions projections were to be continued in the 2015 fiscal year, by the Science Committee, etc. made up of the AIM Team and the relevant departments of the Ho Chi Minh City People's Committee. Therefore, we planned to utilize the examination results for the formulation of the CCAP, in cooperation with the AIM Team. We also planned to utilize the examination results to set the GHG emissions reduction target through consultation with the Ho Chi Minh City People's Committee.

Therefore, in the 2015 fiscal year, we worked towards resolving the issues identified in the 2014 fiscal year studies regarding the formulation of the CCAP. We also continued detailed discussions on the formulation of the CCAP, so that we can help to create an action plan which can effectively achieve a low-carbon Ho Chi Minh City, which also enables the continuous development of new JCM projects and the geographical expansion of the project scopes. Throughout this process, we utilized field survey opportunities, emails and web conferences in order to maintain close communications with the Ho Chi Minh City People's Committee.

1) Outlines of Meetings, etc. Held in Ho Chi Minh City

The following meetings, etc. were held in Ho Chi Minh City regarding the formulation of the draft Climate Change Action Plan (CCAP).

Table: Outlines of Meetings, etc. Held in Ho Chi Minh City

Meeting	Date	Discussion counterparts
The 1st local meeting	June 8-10, 2015 (Mon.-Wed.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee, other relevant departments and the local counterparts for the JCM project feasibility studies
The 2nd local meeting	July 7-11, 2015 (Tue.-Fri.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee
The 3rd local meeting	September 15-17, 2015 (Tue.-Thu.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee and other relevant departments
The 4th local meeting	October 22-23, 2015 (Thu.-Fri.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee and other relevant departments
The 5th local meeting	January 20-21, 2016 (Wed.-Thu.)	The Climate Change Bureau of the Ho Chi Minh City People's Committee

2) The 1st Local Meeting (June 2015)

A meeting was held with the Climate Change Bureau of the Ho Chi Minh City People's Committee, other relevant departments and the local counterparts for the JCM project feasibility studies, in order to share information and exchange opinions on the content of the project for the 2015 fiscal year, the implementation policies, schedules, etc.

[Date] June 8-10, 2015 (Mon.-Wed.)

[Discussion counterparts] The Climate Change Bureau of the Ho Chi Minh City People's Committee, other relevant departments and the local counterparts for the JCM project feasibility studies

[The main discussion content]
As a kickoff meeting for the 2015 fiscal year studies, discussions were held with the Climate Change Bureau of the Ho Chi Minh City People's Committee, regarding the inter-city cooperation projects for the 2015 fiscal year and the feasibility studies for four JCM projects. Discussions on each feasibility study were also held individually. The inter-city cooperation projects for the 2015 fiscal year are: the support project for the formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 (which is to be approved by the Vietnamese government by the end of 2015), and the capacity development project. The four JCM projects are: i. the energy conservation project for factories on an industrial estate in Ho Chi Minh City (Tepia Corporation Japan and Panasonic Corporation), ii. the project for

switching street lights to highly efficient LED lights (Ogawa Electric Co., Ltd.), iii. the project for the extended use of CNG taxies (Myclimate Japan Co., Ltd.), and iv. the project for the promotion of the industrial use of photovoltaic systems (Next Energy & Resources Co., Ltd.).

3) The 2nd Local Meeting (July 2015)

The 2nd local meeting was held in order to check progress regarding the draft Climate Change Action Plan (CCAP) and to make arrangements for the city mayor-level symposium.

[Date]	July 13-14, 2015 (Mon.-Tue.)
[Discussion counterparts]	The Climate Change Bureau of the Ho Chi Minh City People's Committee

[The main discussion content]

(1) The progress regarding the draft Climate Change Action Plan (CCAP)

- The Climate Change Bureau plans to complete the first draft CCAP at the end of June and it aims to complete the final draft by the end of September.
- The draft created by the Climate Change Bureau will be shared with the Osaka City Government via email and the Osaka City Government will reply to the Climate Change Bureau with comments and corrections where necessary, after examining the draft.

(2) Coordination for the City Mayor-level Symposium

- The next symposium will be the last symposium stipulated in the memorandum. As is stipulated in the memorandum, the symposium will be held as a celebration for the completion of the CCAP, which is an outcome of the two-year cooperation between the two cities.
- The Osaka City Government wants to use the symposium as an opportunity to seek the possibility of continuing the cooperation between the two cities into the future.

4) The 3rd Local Meeting (September 2015)

The 3rd local meeting was held in order to check progress regarding the draft Climate Change Action Plan (CCAP) and to make arrangements for the city mayor-level symposium.

[Date]	September 15-17, 2015 (Tue.-Thu.)
[Discussion counterparts]	The Climate Change Bureau of the Ho Chi Minh City People's Committee, the Ho Chi Minh City Foreign Affairs Office of the Ministry of Foreign Affairs of Vietnam and other relevant departments

[The main discussion content]

(1) The progress regarding the draft Climate Change Action Plan (CCAP)

- We consider that the effective implementation of the CCAP requires continuous support. For this purpose, it is important to continue cooperation based on the renewal of the memorandum of understanding (MoU).

- The Director of DONRE Mr. Kiet agreed on the importance of specific activities including projects for the effective implementation of the CCAP, and also agreed on the continuation of the cooperation.

- The centerpiece of the city mayor-level dialogue and symposium on November 6 is the CCAP. Based on the content of the CCAP, we want to announce the Osaka City Government's proposals on next-term cooperation.

- The Climate Change Bureau plans to hold a study meeting on the content of the CCAP for relevant departments on September 25. Based on the results of the meeting, it plans to complete the final draft of the CCAP in October.

- The background paper for the CCAP will be 400 pages. The background paper will be edited into a 100-page full version of the CCAP. The public explanation version of the CCAP will be 20 pages.

(2) Coordination for the City Mayor-level Symposium

- The city mayor-level symposium will be held on November 6, as is stated in the official letter submitted in the past. The symposium is planned to be held at the Hotel Nikko Saigon.

- The Vice Mayor of Osaka City plans to visit Vietnam for the symposium, as was the case for the symposium held in January 2015.

5) The 4th Local Meeting (October 2015)

The 4th local meeting was held to allow members of the relevant departments of the Ho Chi Minh City People's Committee concerning the Climate Change Action Plan (draft) to attend the seminar, and to host a discussion with the Climate Change Bureau, and assist in coordination for the city mayor-level symposium.

[Date]	October 22-23, 2015 (Thu.-Fri.)
[Discussion counterparts]	Climate Change Bureau and other relevant departments of the Ho Chi Minh City People's Committee

[The main discussion contents]

(1) Seminar for the relevant departments concerning the Climate Change Action Plan (CCAP) (draft)

- The Climate Change Bureau sponsored a seminar concerning the CCAP (draft), convening the other relevant departments.

- The Climate Change Bureau presented the CCAP (draft) and discussed it with the other relevant departments. During the discussion, the feasibility and budgeting of the measures and projects specified in the CCAP (draft) and the collection of data necessary for each were examined further and a decision was made that the content of the CCAP (draft) should be examined in further detail.

- The Osaka City Government explained the importance of the implementation and management of the CCAP after its establishment, as well as its intention to transfer its know-how, skills, systems, etc. to the Ho Chi Minh City People's Committee and to continue to cooperate in the Committee's systematization, institutionalization, improvement of management skills, and improvement of cooperation with private companies, etc.

(2) Coordination for the City Mayor-level Symposium

- As planned before, both cities agreed that the city mayor-level symposium would be held at the Hotel Nikko Saigon on November 6. In addition, they agreed on the proceedings.

- The Ho Chi Minh City People's Committee notified the Osaka City Government to the effect that, during the symposium, it would submit documents to the Osaka City Government to request the continuation of cooperation in and after 2016.

- It was decided that the Vice Mayor of Osaka City would pay a courtesy visit to the Chairman of the Ho Chi Minh City People's Committee on November 5, the day before the symposium.

- Because the Vice Mayor of Osaka City plans to visit the local counterpart for a project entitled "Anaerobic Digestion of Organic Waste for Biogas Utilization at Market," which has been carried out by the Saigon Trading Group (SATRA) and Hitachi Zosen Corporation under the Financing Programme for JCM Model Projects, the Vice Mayor requested the Ho Chi Minh City People's Committee to accompany him at the meeting with the counterpart.

6) The 5th Local Meeting (January 2016)

The 5th local meeting was held to allow coordination for the final debriefing workshop (to be held in February).

[Date] January 19-20, 2016 (Wed.-Thu.)

[Discussion counterpart] Climate Change Bureau of the Ho Chi Minh City People's Committee

[The main discussion content]

(1) Coordination for the Final Debriefing Workshop

- It was decided that, as planned before, the final debriefing workshop would be held at the meeting room of the Department of Natural Resources and Environment (DONRE) on February 25.

- The workshop will proceed in the following order: GEC's report on the summary results of the "Survey for the Support of Low-carbon City Development by Cooperation between Ho Chi Minh City and Osaka City"; the Ho Chi Minh City People's Committee's "Establishment of 'HCMC Climate Change Action Plan (CCAP) 2016-2020' for the Development of the HCMC Low-carbon City"; the Osaka City Government's "Progress Management for the Implementation of the CCAP 2016-2020: The Utilization of the Plan-Do-Check-Action (PDCA) Cycle"; and each FS company's report on the results of the FS.

- Discussions will be made at the workshop and subsequent wrap-up meetings about both cities' concrete efforts for cooperation in and after 2016.

7) Climate Change Action Plan (draft)

The Climate Change Action Plan (draft) established through the above-described activities are attached at the end of the Japanese edition and aims to receive approval from the Ho Chi Minh City People's Committee in the first half of 2016.

2.2 Capacity Development for the Geographical Expansion of the JCM Project Scopes and the Continuous Development of New Projects

The capacity development project for the Ho Chi Minh City People's Committee was conducted with the aim of human resource development and smooth organizational management, by focusing on the PDCA (plan-do-check-act) cycle of the Climate Change Action Plan (CCAP), based on the experience and know-how of the Osaka City Government. The project aimed for the effective and efficient improvement of the effectiveness of the formulated CCAP and the ability to solve environmental problems. It also aimed for the geographical expansion of the JCM project scopes and the continuous development of new projects. The capacity development project was conducted through working sessions between the Ho Chi Minh City People's Committee and the Osaka City Government.

(1) The Ho Chi Minh City People's Committee's Suggestions about the Implementation of CCAP

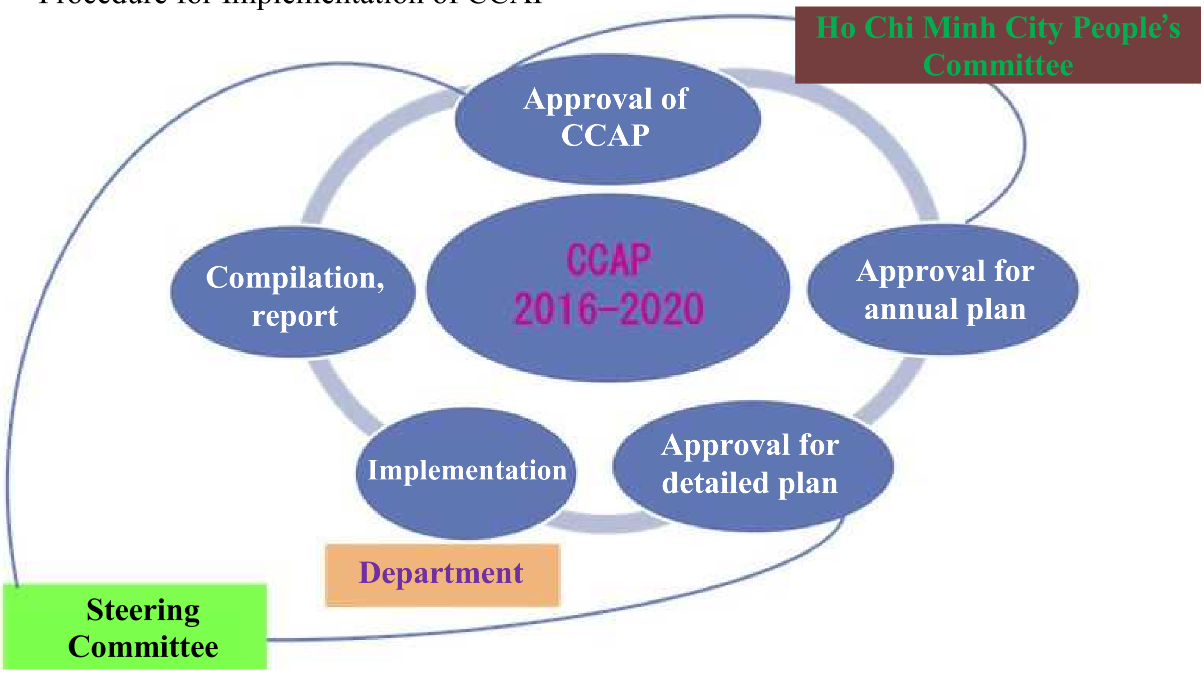
1) Purposes

- To improve the efficiency of administration in the field of climate change measures
- To strengthen the independence of each industry or field
- To promote the participation of companies and residents

2) Fields

The CCAP covers the following ten fields:
1. Urban planning; 2. Energy; 3. Traffic; 4. Manufacturing; 5. Water management;
6. Waste management; 7. Construction; 8. Health; 9. Agriculture; 10. Tourism

3) Procedure for Implementation of CCAP



4) Schedule

Establishment and approval of annual plan: names of programmes and projects and financial sources for their implementation of

Establishment and approval of detailed plan: contents and policies of programmes and projects

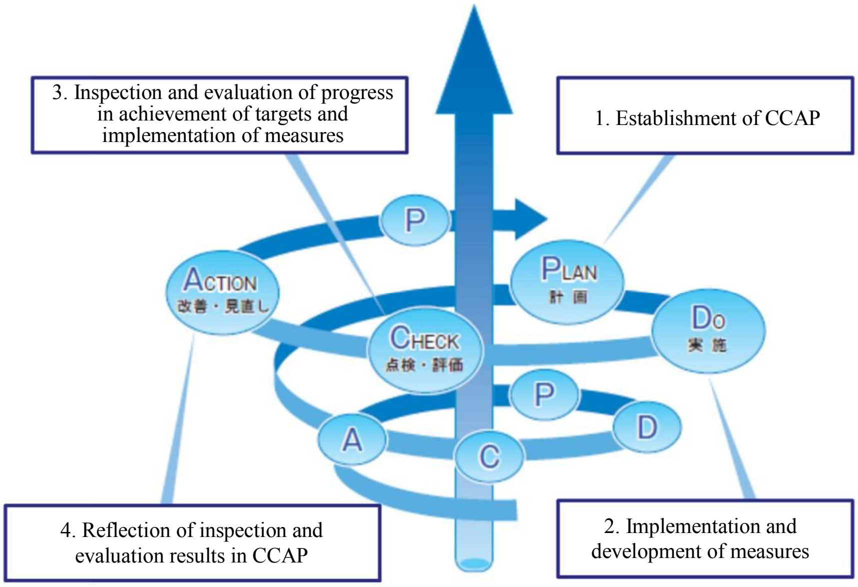
Compilation and report on each programme or project every year
Final complete compilation and report: September 2020

5) Suggestions

- The Ho Chi Minh City People's Committee should independently carry out the CCAP 2016-2020.
- It should promote international cooperative activities for supporting the implementation of the CCAP.
- It should expand the range of fields where it cooperates with the Osaka City Government (in Japan).
- It should especially promote the improvement of administrative capacity, the development of pilot projects, and the development of JCM projects.

(2) The Osaka City Government's Suggestions about the Implementation of the CCAP

1) Importance of Management of Progress in the CCAP (Management of the PDCA Cycle)

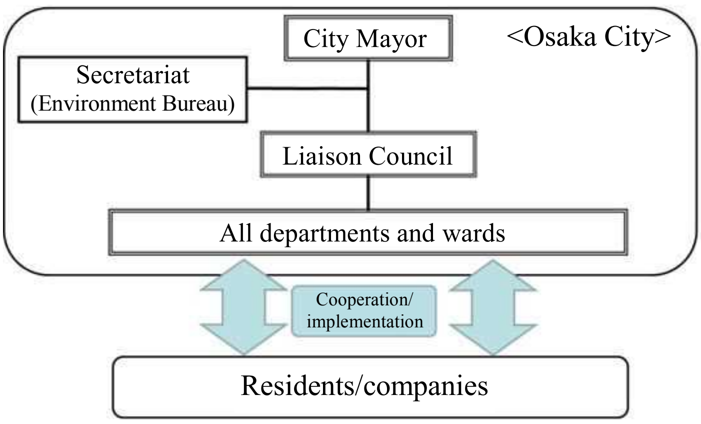


2) Plan – Sending Information on the Established CCAP

It is important to share the CCAP with the relevant departments, residents, and companies.

3) Do – Implementation and Development of Measures

Each department carries out measures together with residents and companies as one body.



4) Do – Each Entity's Activities

It is important for the whole Ho Chi Minh City People's Committee to enhance the motivation to create a low-carbon society.

5) Check – Inspection and Evaluation of Progress in Achievement of Targets

It is necessary to understand and publish CO_2 emissions. The Osaka City Government has carried out this as follows:

Sector	Emissions in FY1990 (10,000 t – CO_2)	Emissions in FY2013 (10,000 t – CO_2)	Change (%)
Industry	997	558	▲ 44%
Business	392	624	59%
Household	285	439	54%
Transport	320	269	▲ 16%
Waste	67	49	▲ 27%

6) Check – Inspection and Evaluation of Progress in Implementation of Measures

It is necessary to evaluate the progress in the implementation of these measures quantitatively, and carry out each project stably. The Osaka City Government has done this as follows:

Main measures	Status of progress
Promotion of introduction of photovoltaic generation (Target: 15,000 kW at the end of FY2020)	Photovoltaic generation was 94,000 kW in April 2015.
Use of unused energy generated at refuse incineration plants and sewage disposal plants	The amount of residual heat generated at refuse incineration plants was 480 million kWh.
Promotion of eco houses	The number of eco houses certified by FY2013 is 2,836.
Promotion of measures for public facilities (ESCO project)	The number of facilities repaired by FY2014 is 13.
Promotion of introduction of next-generation cars and eco cars	The number of low-emission vehicles is 57,436 in the urban area (at the end of March 2014).
Promotion of greening in public spaces and private land	The number of parks in the urban area is 985 and the total area is 949.8 ha (in April 2014).
Promotion of waste measures	The target of annual waste disposal should be less than one million tons was achieved one year earlier than planned.

7) Check – Inspection and Evaluation Methods

It is important for each department to carry out inspection and evaluation, share information, and discuss for the future.

8) Action – Regular Review of CCAP

To construct a sustainable low-carbon society, it is necessary to review the CCAP regularly based on the results of the above-described check.

3. Implementation of Feasibility Study on JCM Project

We implemented the feasibility study on the following 3.1 through 3.4., which were expected to be realized at an early date, and similar projects of which were likely to develop in the future. Among them, the Energy-Saving Project of the Plants in the Industrial Estate in Ho Chi Minh City and the Project for the Promotion of the Industrial Use of Photovoltaic Systems were adopted for the Financing Programme for JCM Model Projects in the fiscal year of 2015.
In order to realize the target projects as JCM projects, we developed the applicable JCM methodologies (setting of eligibility criteria; identification and calculation of reference emission; calculation of project emission; establishment of the monitoring method; quantitative evaluation of the amount of emission reduction and setting of default value and preset value etc., which are required for the calculation of emission reduction; and preparation of excel spread sheet) and created the project design document (PDD).
Complying with "Guidelines for Developing Proposed Methodology (JCM_VN_GL_PM_ver01.0)", we developed JCM methodologies with the aim of being approved by JCM Joint Committee. We also prepared to make a proposal immediately in case of being asked by Ministry of the Environment.
We made PDD according to "Guidelines for Creating Project Design Document and Monitoring Report (JCM_VN_GL_PDD_MR_ver01.0)" and the methodologies we developed. We also prepared to ask the third party entity (TPE) TPE to confirm the validity immediately in case of being asked by Ministry of the Environment.

Feasibility Study	Financing Programme for JCM Model Projects
Energy-Saving Project of the Plants in the Industrial Estate in Ho Chi Minh City [Tepia Corporation Japan, Panasonic Corporation]	Energy Conservation for Plants by the Use of Air Conditioning Control Systems [Yuko-Keiso Co., Ltd.]
Project for the Promotion of the Industrial Use of Photovoltaic Systems [Next Energy & Resources Co., Ltd.]	Introduction of Photovoltaic Generation in Shopping Malls in Ho Chi Minh City [AEON Retail Co., Ltd.]

3.1 Energy-Saving Project of the Plants in the Industrial Complex in Ho Chi Minh City

(1) Outline of the Project

① Background and Outline
Industries such as export-processing-type Japanese small and medium-sized Japanese enterprises have been accumulated in Ho Chi Minh City, Vietnam, since the lifting of US economic sanctions in 1994 and accession to ASEAN in 1995. Economic growth rate of Vietnam as a whole has grown by 5% in average every year even after Asian Currency Crisis in 1997 and Lehman Shock in 2011. Energy saving is the urgent task for the sustainable development of Ho Chi Minh City, because the electric consumption there is expected to increase due to the further industrialization in the future.
This project is to encourage the industrial complex in Ho Chi Minh City to save energy through implementation of Energy-Shindan and introduction of the appropriate technologies, and to reduce its CO_2 emission.
To be precise, energy-saving professionals conduct the Energy-Shindan for the plants located in the industrial complex in Ho Chi Minh City, using information such as the energy-

consumption data of the production/power facilities and production situations. The possible measures for saving energy will be extracted from the results. This project will identify and make a short list of the measures for saving energy, which are attractive in terms of investment, clarification of the amount of energy saving and CO_2 emission reduction, future development of the same kind of projects, business development, and ease of developing the JCM methodologies.

② Background of Planning and the Situations of the Host Country

Japanese energy-saving technologies, which have a great energy-saving effect, have strong potential to disseminate in Vietnam where the price rate of electric power tends to increase. However, the energy-saving technologies have not disseminated enough. We assume that it is because companies have not understood the necessity of improvement of energy saving and introduction of the appropriate technologies.

One of the measures to improve the situation where people are concerned about the lack of electric power is dissemination of “Energy-Shindan”(energy-saving checkup) conducted by the private companies. Energy-Shindan is the project that proposes a total solution leading to the improvement of the energy efficiency of the entire plant through visualizing the amount of energy consumption. The advantages of this project for the companies include the fact that they can introduce appropriate equipment and grasp the situation of the cost-benefit performance as well as of improvement in energy efficiency.

③ Dissemination of the Project

If this “Energy-Shindan” disseminates and expands in the field of industry in Vietnam, the non-existence of “total solution provider”, which is one of the current problems, is resolved. And it also facilitates the introduction of energy-saving equipment in Vietnam. Regarding the energy saving of the plants, the scale of CO_2 emission of each project is small. However, the ripple effect is greatly expected if we can establish a successful model and the similar projects are developed, because there are driving/production facilities, the targets for the Energy-Shindan, in most of the plants.

The target area, Ho Chi Minh City is the largest economic area in Vietnam. At least 916 companies are located in 18 industrial complexes (source: JETRO Ho Chi Minh office in 2014). If you include the complexes in the surrounding provinces such as Dong Nai, Long An, and Binh Duong, the number of the companies are several times more than that in Ho Chi Minh City. Power consumption in the field of industry accounts for a substantial percentage of the power consumption in Ho Chi Minh City. Therefore significant amount of CO_2 reduction is expected if the project covers these plants.

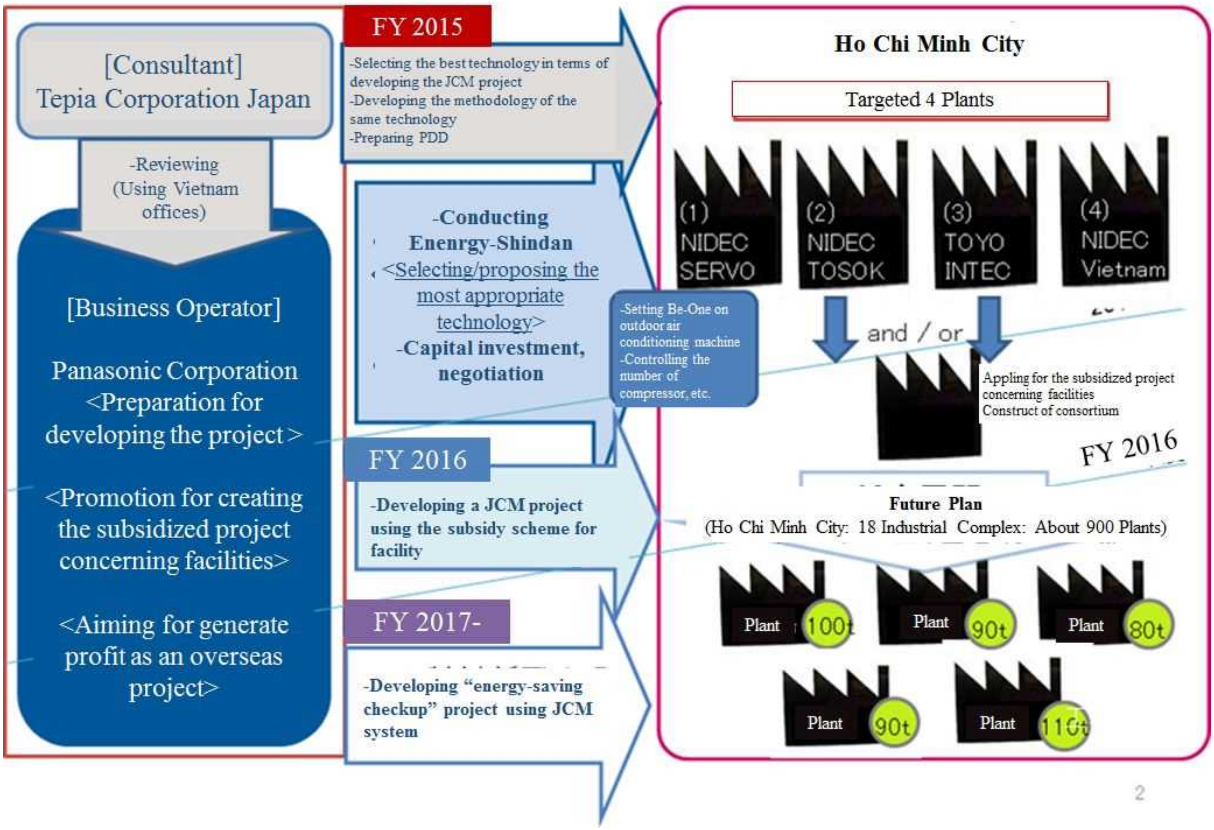


Figure 3.1.1 Full Picture of the Project

(2) How to Conduct the Study

We selected four average-scale Japanese companies among general plants in Ho Chi Minh City to conduct the study. Then the Energy-Shindan was conducted for them. We extracted the energy-saving technologies that can be applied to all of those companies and for which the methodologies for developing the JCM project can be established.

In the first stage, we evaluated each technology, assuming a wide variety of technologies that have potential for introduction including:, energy-saving technologies for power facilities, such as controlling the number of compressors, lowering the pressure, and using inverter for pumps; energy-saving technologies for production facilities, such as exhaust heat recovery and heat insulation of furnace; energy saving of air conditioners through controlling the operation of outside unit of air conditioner; and "SE-LINK (Save Energy Link)" that realizes the best total operation through linking the power facilities with production facilities.

And then we reviewed the way to think about the methodologies for the technologies selected.

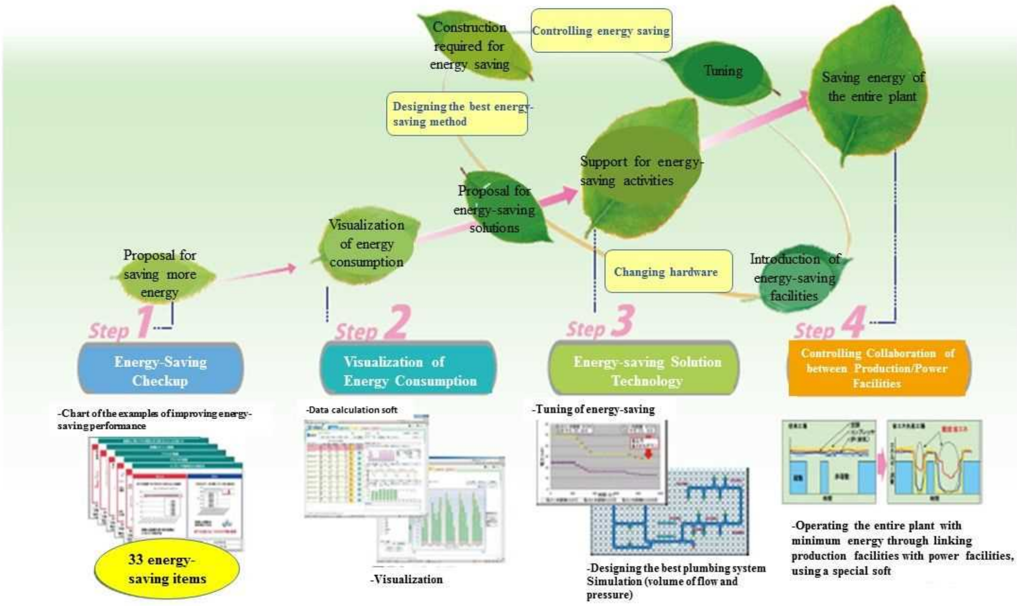


Figure 3.1.2 “SE-LINK (Save Energy Link)”

① System of Conducting the Study

Tepia Corporation Japan mainly established methodologies, and prepared PDD and the study report. And, as the implementation body, Panasonic Corporation conducted the Energy-Shindan and reviewed the project implementation scheme. We selected Nidec SERVO Vietnam, Nidec TOSOK, TOYOITEC Vietnam, and Nidec Vietnam as the local counterparts.

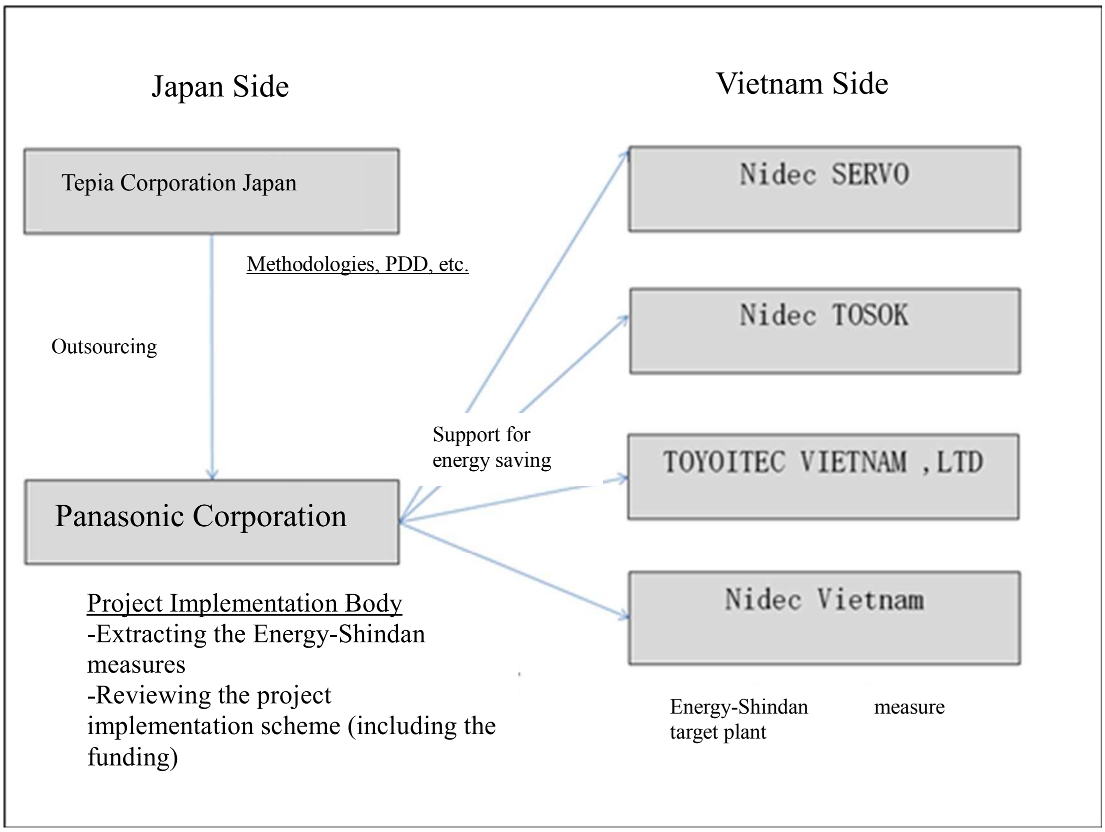


Figure 3.1.3 Survey Implementation Structure

② Challenges for the Survey

The biggest challenges of this survey are the selection of the technologies employed in the project and the development of the methodologies covering the project.

To be specific, we need to consider the following points: the technology needs 1. to satisfy the high demand of local plants on high efficiency of investment (payout time) 2. to be so flexible that they can be introduced to many plants 3. to be in accord with JCM system. And we should consider how to select the technologies, for which the methodologies can be established and MRV can be implemented. Furthermore, we need to seek the way to establish the objective and protective methodologies that also cover above-mentioned conditions. With the scale of this project, it is difficult to complete the establishment of the methodologies. However, it is important to review the way the methodologies are and the way of thinking after studying more than one reference scenario that has a high potential.

③ Contents of the Survey

The contents of the survey are as follows:

(a) Energy-Shindan and Making a Short List of the Measures

We conducted the Energy-Shindan for four plants in Ho Chi Minh City. Energy-Shindan professionals conducted it for the targeted plants, using the energy consumption data of production/power facilities and the information of the production situations. And then we extracted the possible energy-saving measures, such as: coordinating the operation of the air conditioners through setting Be One on the outside unit of air conditioners; controlling the number of processors, lowering the pressure; exhaust heat recovery; and heat insulation of the furnace. After these efforts, we clarified the contents of the measures to be taken, investment effect, amount of the energy saved, and amount of CO2 emission reduction.

In addition to them, we identified and made a short list of the measures that are expected to generate the same kind of projects, that are attractive as business, and for which the JCM methodologies can be easily established.

(b) Establishment of Methodologies and Preparation of PDD

We analyzed the challenges of the past JCM methodologies concerning energy-saving and established the methodologies applicable to the energy-saving measures extracted in above (a), so as to prepare PDD. We did not study the rate-based methodologies but those limited to the specific energy-saving measures that have high potential for realization, because we wanted to secure the objectivity. On the other hand, we set as a wide eligibility criteria as possible to establish the methodologies applicable to many energy-saving measures.

(c) Study on Project Implementation Structure and Financial Plan

In order to develop the project for FY 2016, we embodied the project implementation structure and financial plan, which are required for the implementing the Energy-Shindan measures extracted in (a) in the targeted plants.

(d) Presentation in Local Workshops in Ho Chi Ming City

Our efforts to promote the future dissemination of the project include the presentation of the implementation status of the project at International Symposium on Low-Carbon Mega City Development Programme under City-to-City Cooperation between HCMC and Osaka City (in FY2015) held in Ho Chi Minh City on November 10, 2015. We share the information with Department of Natural Resources and Environment of Ho Chi Minh City and promoted the project.

④ Targeted Plants

At the beginning of the survey, we selected Nidec SERVO Vietnam and Nidec TOSOK the affiliated companies of Nidec Group that has many plants in Ho Chi Ming City, and TOYOITEC Vietnam. And then we added Nidec Vietnam that is responsible for the entire Nidec Group companies in Vietnam.

JETRO Ho Chi Minh introduced us the four companies as target Japanese companies in Ho Chi Minh City, because Panasonic, which is in charge of Energy-Shindan, had planned to implement "Energy-Shindan" in Ho Chi Minh City. And then we discussed had discussion over the target plants. Assuming that the project is implemented as JCM subsidized project concerning facilities, we decided that the companies would participate in the energy-saving project as pilot companies, though each of them, who is Panasonic's client of the energy-saving business model, would introduce the energy-saving technologies. Followings are the outline of the target plants.

Table 3.1.1 List of Targeted Plant

Company	Nidec SERVO	Nidec TOSOK	TOYOITEC	Nidec Vietnam
Year Started Business in Vietnam	2009	1994	2010	2005
Scale of Energy Consumption	Medium Scale	Large Scale	Small Scale	Middle Scale
Plat Location	District 9 Sai Gon High-Tech Park	District 7 Tan Thuan Export Processing Zone	Tan Phu District Tan Binh Industrial Complex	District 9 Sai Gon High-Tech Park
Outline	An affiliate company of Nidec Group producing consumer/business-use precise small motor, fan/blower sensor, and motor application products and other products	An affiliate company of Nidec Group mainly producing control valve, which is the heart of automatic transmission (AT) and continuously variable transmission (CVT), solenoid valve, spool valve, harness module, and other auto parts	An affiliate company of Toyo itec Co., Ltd., which is based in Osaka, in Vietnam. It is an integrated EMS company mainly producing printed circuit board assembly (PCBA).	This company is responsible for Nidec Vietnam Group. It is located in High-Tech Park in District 9. Nidec SERVO and Nidec SANKYO are their neighborhood. It is the hub for the production of fan and DCM motor. The production processes in the plant include forming, pressing, and mounting, and assembling.

Photo 3.1.1 Nidec SERVO located in Sai Gon High-Tech Park in District 9, Ho Chi Minh City

⑤ Target Facilities

In this project, as mentioned above, we tried to make a short list of the measures to be taken, after implementation of the Energy-Shindan by professionals. We assumed a wide variety of the measures, such as: energy-saving technologies of the power facilities like controlling the number of compressors, lowering the pressure, and using invertor for pumps; energy-saving technologies for the production facilities like exhaust heat recovery and heat insulation of furnace; saving energy of air-conditioning facilities through controlling the operation of the outside machine; and "SE-LINK", which realizes the best total operation through linking the power facilities with production facilities. From this aspect, we conducted the energy-saving of air conditioners, compressors, the reflow furnace, and the rest of the plant and set the air-conditioning control equipment, watmeters and pressure meters to extract/analyze the data. As a result, as the technology to be employed in the project, we selected the equipment that enhances the operation efficiency through controlling the movement of the utility facilities in the plant. And we developed the methodologies, assuming this equipment is employed as the technology for this project (mentioned later in (4)). For now, we introduce about the outline of "Be One", the air-conditioning control equipment and compressor control equipment, which are highly potential for being introduced in the four plants.

(a) Air-Conditioning Control Equipment "Be One"

Be One is the equipment controlling the operation of the air conditioners through being set on the outside unit of air conditioner. This equipment constantly monitors the operational status of the compressor in the outside unit of air conditioner. Trying not to damage the compressor, it turns off the motor at intervals such as once or twice for two to three or four to five minutes in 30 minutes according to the setting so as to control the operation.

Electric monitoring equipment (Photo 3.1.2) and automatic switching system (Photo 3.1.3) are the heart of this system. And with those functions, you can run the program to turn on/off the refrigerant compressor and its power motor. Be One employs the compressor-protection system that can automatically protect the compressor from excessive/inappropriate switching. And the standard interval of the switching control of this control equipment is 30 minutes. The user should only enter the time he/she wants to turn off the compressor on the second time scale to save energy (between 10%/180 seconds to 50%/900 seconds). The program in the control equipment does all other works.

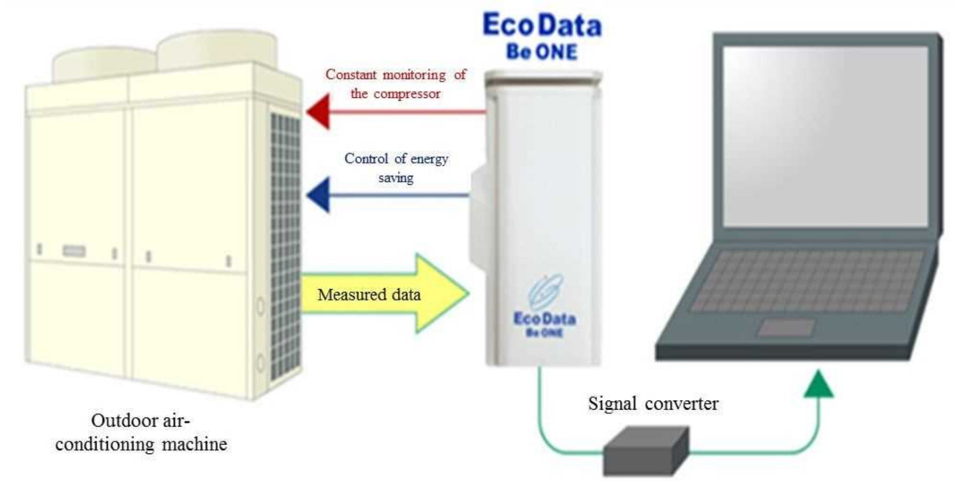


Figure 3.1.4 Air-conditioning control equipment using Be One

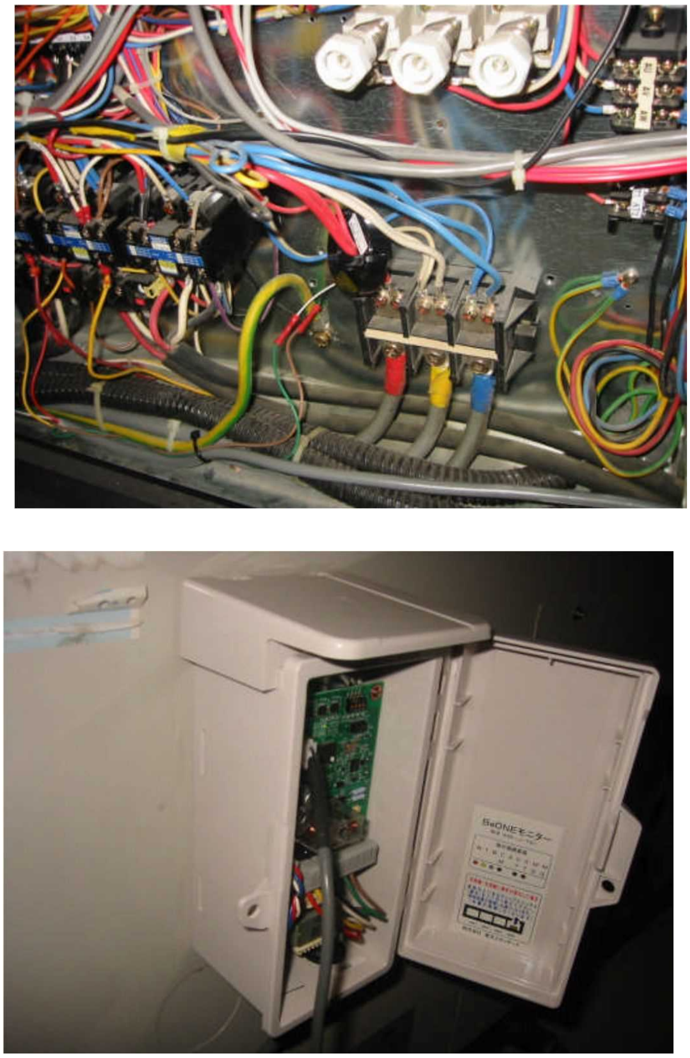


Photo 3.1.3 Be One control equipment

Indoor unit continuously blow in while outside unit controls the compressor. The equipment is characterized by comfortable energy saving. As seen in Table 3.1.5, the temperature inside does not change, because more than one air-conditioning facilities in the same floor work together and each of them is turned off at slightly different timing. That's why it can be introduced without difficulty in the production line.
The energy-saving method using this equipment has a great impact on the production plants that are in operation for a long time in the tropical area such as Ho Chi Minh City, the target are where temperature is high throughout the year.

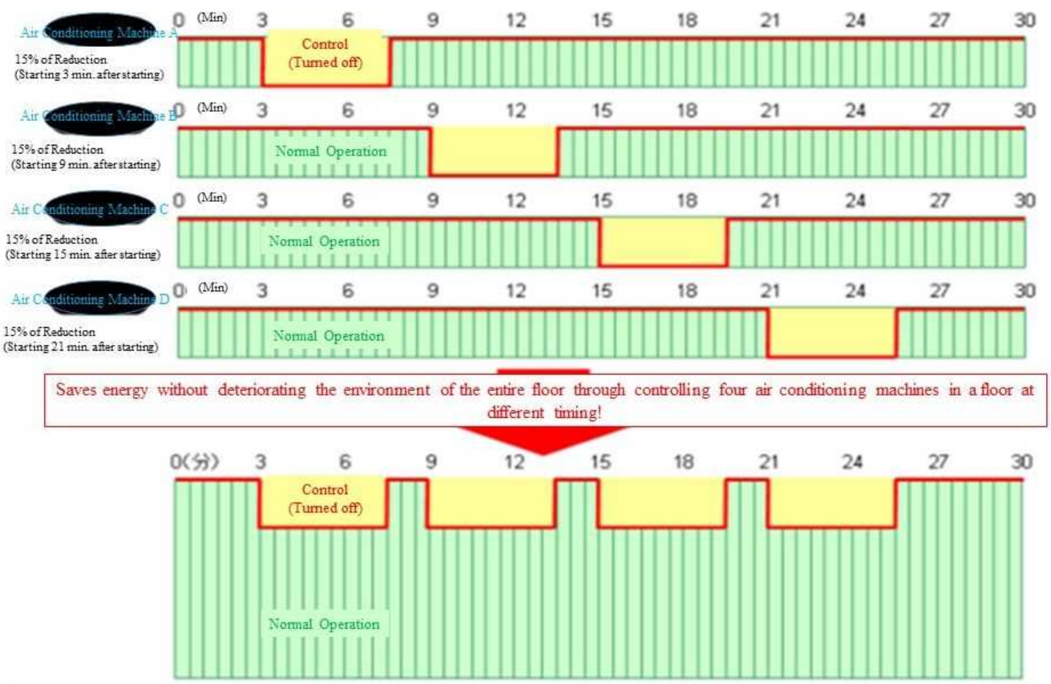


Figure 3.1.5 Example of Control, in case Be One is set in four air conditioners, which work together

(b) Equipment for Controlling the Number of Compressor
More than one compressor are set in plants according to the amount of air required there, so as to cool down the air through blowing or through compressing the air with a motor powered by electricity and steam and moving the machine with the power of the air when it is reversed. Compressors consume too much energy because more compressors are always in operation than really needed as the trouble caused by the lack of wind should be avoided.
Equipment for controlling the number of compressors saves energy and maintains the necessary pressure at the time through turning on/off each compressor according to the operational status. This is equipment controls the number of the machines in operation and those turned off with pressure of the header through linking more than one compressor. Introduction of this control equipment can eliminate the situations where more than one machine is in the unload status. (In this situation, power is consumed, but the air can be discharged immediately. It is similar to the idling status of auto.) Normally, the equipment always controls the number of the compressor to be best through setting the flow meter and automatically controlling the control panel.

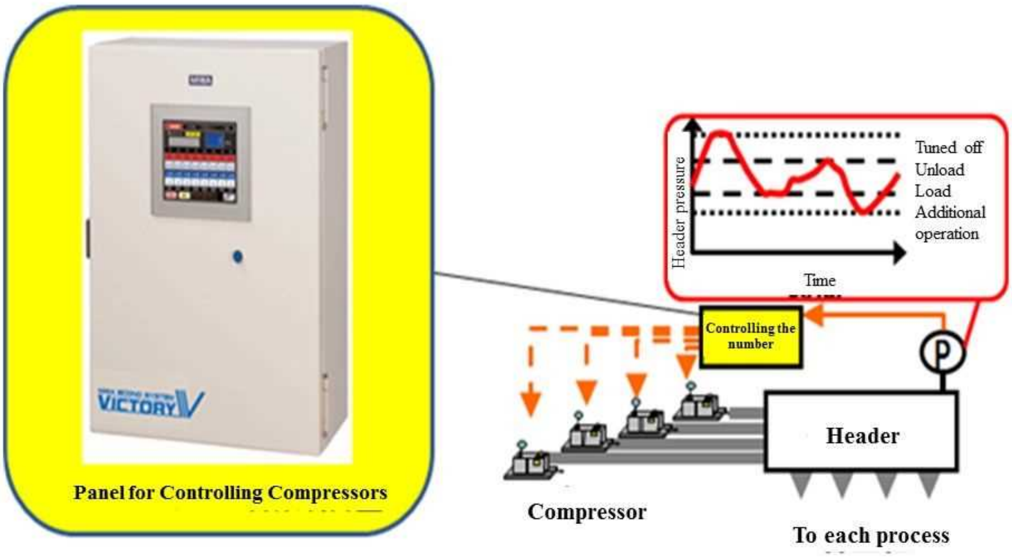


Figure 3.1.6 Equipment for Controlling the Number of Compressors

(3) Checkup on Site and Results
We conducted Energy-Shindan on site twice in June and July 2015. Followings are the contents of the Energy-Shindan of each targeted plant, check items of each process, and its results:

① Nidec SERVO
Nidec SERVO is a hub for the production of consumer/industrial-use precise small motor, fan blower processor, and motor applicable products and other products. The production processes includes die casting, painting, press working, machine processing, and assembling. Energy-Shindan covered the entire plant, including the items concerning the production facilities, such as automatic control of the melting furnace in the die-casting process, setting heat-insulating cover on the crucible, setting the invertor in the emission blower in the process of painting, and improvement of air blow in the processing process; and those concerning the power facilities like compressors.
As a result, it became clear that there was a room for improvement in the operation of compressors in terms of excessive operation and operation management. The checkup also proved that controlling the number of compressors, setting the flow meter for the sake of operation management of power consumption per air content, and lowering the pressure had an energy-saving effect. And, regarding the air-conditioning facilities, it turned out that outside air-conditioning machine being controlled by Be One also had a positive effect. Table 3.1.2 shows the results of the checkup sorted by item (items pointed out, approximate amount of investment, return on investment, and priority).

Table 3.1.2 Items of Energy-Shindan for Nidec SERVO and Its Results

Process	Item		Investment	Effect	Priority
Die Casting (AI)	1	Melting furnace Reduction of fixed E Standby state	Labor cost	Medium	
	2	Melting furnace SE-Link automatic control	Partially, yes	Medium	

			Labor cost		
	3	Setting heat-insulating cover on the crucible of melting furnace, etc.	Yes	Medium	In operation on site
	4	Reduction of gas by air pre-heating burner	Yes	Medium	
Painting Process	5	Coating nozzle optimization and pulsed	Yes	Small	To be conducted on site
	6	Setting invertor in the exhaust blower	Yes	Small	
	7	Setting heat pump to heat water in the process of corrosion control and cleaning	Yes	Small	
Press Working Machine Processing	8	Measures against air leakage	Labor Cost	Medium	
Machine Processing	9	Energy-saving blow for air-blowing cleaning	Yes	Medium	
	10	Pulsing air blow of lathe	Yes	Medium	
	11	Study on the method to reduce the remaining droplet in the process of alkali cleaning Pulsing air blowing and energy-saving blowing	Yes	Medium	To be conducted on site
Assembling	12	Double lighting	No	Small	
	13	Sunlight-protection film	Yes	Small	Completed the implementation on site
	14	**Saving energy of outside unit of air-conditioner by Be One**	**Yes**	**Medium**	**Very high (JCM)**
Compressor	**15**	**Controlling the number of compressors** **Setting the flow meter for operation management of power consumption per air content**	**Yes**	**Medium**	**Very high (JCM)**
	16	Lowering pressure (from 0.69MPa to 0.6MPa)	Labor cost	Large	
Dryer	17	Reviewing the dew point (Setting at 10 degrees Celsius is impossible) CKD Made	Labor Cost	Small	
Air Conditioning	18	Reviewing air flow of the port	Labor Cost	Small	
On site (Overlapped)	19	Measures against Air Leakage: Setting the flow meter	Labor Cost	Medium	

Mounting Reflow Furnace	20	Adjusting the exhaust air volume	Labor Cost	Small	
	21	**Exhaust heat recovery**	**Yes**	**Medium**	**Very high (JCM)**
	22	Heat insulation (inside and out)	Yes	Small	In operation on site (outside)
	23	Diminishing the size of the opening	Labor Cost	Small	
	24	Transforming it into the dual line	Yes	Medium	
Resin Mold	25	Unifying the supply in the process of drying materials (primary tank)	Yes	Medium	
	26	Confirmation on the effect on the drying process (operating without emission)	Labor Cost	Medium	
	27	Insulating the heat of cylinder	Yes	Medium	
	28	Cooling tower pump (supply) Fully opening the valve and adjusting the invertor (plus, transforming it into a pump)	Labor Cost	About ▲30% 120,000/year of Reduction	Completed the joint implementation (14 July)
	29	There is a fixed E of runner crusher	Labor Cost	Small	
	30	Runner recycling equipment: Confirm the material and other aspects	Yes	Medium	

Photo 3.1.4 Be One on the outside unit of air conditioner

② Nidec TOSOK

This plant mainly produces control valve, which is the heart of automatic transmission (AT) and continuously variable transmission (CVT), solenoid valve, spool valve, harness module, and other auto parts. There are the heating treatment process and clean rooms. A great number of outside unit of air-conditioners were set because of its large building area. Therefore we assumed that too many compressors were in operation in the production line, and that air conditioners worked excessively. We conducted the checkup focusing on those points.

As a result, there was a room for improvement in terms of the aspects such as: reviewing the size of the clean-room area (some of the processes handle in the clean room does not have to be there); reviewing the way to operate the vacuum pump in the heating treatment process; and changing the temperature setting of the cold water in the chiller. However, above all, operation control of the outside unit of air conditioners had the greatest effect. And, controlling the number of compressors was very effective in saving energy. Table 3.1.3 shows the results of the checkup sorted by item

Table 3.1.3 Items of Energy-Shindan for Nidec TOSOK and Its Results

Process	Item		Investment	Effect	Priority
Air Conditioning (Coil assembling line in the first floor of Building A)	**1**	**Saving energy of the outside unit of air conditioners by Be One (to be implemented in other areas of the plant)**	**Yes**	**Large**	**Very high (JCM)**
Compressor (Three of them in Building G)	**2**	**Operating the compressors while controlling the number of those in operation (enhancing the operation efficiency)**	**Yes**	**Medium**	**Very high (JCM)**
	3	Lowering the pressure (from 0.62MPa to 0.55MPa)	Labor cost	Medium	
Heat Treatment Process (Carburizing Furnace)	4	Reviewing the purity of N2 used as an antioxidant agent (from 99.999% to 99.99%)	Labor cost	Medium	
Heat Treatment Process (Magnetic Annealing)	5	Reviewing the vacuum pumps in its standby state. (RP of one of the pumps is turned off)	Labor cost	Small	
Jet Clean Center (Building G)	6	Pulsing air cleaning, reviewing the distance to the work	Yes	Small	
	7	Reviewing the temperarure at 50-degree-Celsius cleaning (dropping down to normal temperature)	Labor cost	Small	

Clean Room (Second Floor of Building G)	8	Preventing the proliferation of heat load in the ultra-sonic cleaning process (reviewing the standby-operation of vacuum drying, etc.) A/D/E/F=2/3/4/3 , apart from five lines in Building G	Labor cost	Medium	
	9	Insulating the heat of characteristics test equipment (heat source, exhaust pipe)	Yes	Small	
Clean Room (Second Floor of Building A)	10	Consolidating the clean area (closing the unnecessary breather in the area)	No	Large	
	11	Reviewing AHU filter and the exhaust filter of each room	Yes	Medium	
	12	Reviewing differential pressure control by applying the design standard for cleanness	No	Quality	
	13	Enhancing the cleanness by eliminating the cardboard	No	Small	
Clean Room (Second Floor of Building E)	14	Improving the environment through reviewing the filter on the outlet	Yes	Small	
	15	Blocking the direct sunlight on the outside machines	Yes	Medium	
Building G	16	Changing the temperature of the cold water of the chiller (from 6 degrees Celsius to 7)	No	Large	
	17	Changing the difference of the temperature of return water of the chiller (from 4 degrees Celsius to 5)	Yes	Large	
First Floor of Building G	18	Adding RA from the process	Yes	Large	

Photo 3.1.5 Checking the operation status of the compressor

③ TOYOITEC

This is an EMS company mainly producing printed circuit board assembly (PCBA). It has an advantage of the integrated production system, consisting of “board mounting”, “assembly of the finished product”, “inspection”, “packing”, and “quality control”. Since there is a reflow furnace in the process of mounting the board, it was expected that the exhaust heat recovery from the furnace would be a key point. It turned out that, in addition to the items such as exhaust heat recovery from the furnace, adjustment of the air volume of the emission, and heat-insulating treatment inside the furnace, controlling the number of compressors and operation management of air conditioners by Be One had a certain level of effect on energy saving.

The checkup also revealed the fact that scale of annual power consumption of this plant was small, approximately 200,000 kWh (equivalent to 2,400,000 yen per year), and that the impact of the measures on energy saving was limited.

Therefore, we decided to exclude this plant from the projects to apply for the subsidized project concerning facilities, which we plant to implement after the main survey, because it offers only a little benefit. Table 3.1.4 shows the results of the checkup sorted by item.

Table 3.1.4 Items of Energy-Shindan for TOYOITEC and Its Results

Process		Item	Investment	Effect	Priority
Mounted Reflow Furnace	1	Adjusting the air volume of emission	Labor cost	Small	
	2	**Exhaust heat recovery**	**Yes**	**Medium**	**Very high (JCM)**
	3	Insulating heat (inside)	Yes	Small	
	4	Diminishing the size of the opening	Labor cost	Small	
Compressor	**5**	**Reducing fixed E by setting the invertor**	**Yes**	**Medium**	**Very high (JCM)**
Compressors in General	**6**	**Saving energy of outside unit of air conditioners by Be One**	**Yes**	**Medium**	**Very high (JCM)**

④ Nidec VIETNAM

As a hub for the production of fan and DCM motor, this plant has processes of forming, pressing, mounting, and assembling. In this plant, excessive operation of the outside unit of air conditioners and compressors, many of which are used in area surrounding reflow furnace in the process of assembling, was expected. Therefore, when conducting the checkup, we focused on air-conditioning facilities, though the checkup covered the whole plant. The results showed these were the key elements for energy-saving: setting exhaust heat recovery units in the reflow furnace in the process of mounting, replacing the lights in the process of forming and pressing with electrodeless lamps, controlling the number of outside unit of air conditioners and the compressors in the process of assembling. Table 3.1.5 shows the results of the checkup sorted by item.

Table 3.1.5 Items of Energy-Shindan for Nidec VIETNAM and Its Results

Process		Item	Investment	Effect	Priority
Building 2, Mounted Reflow Furnace	1	Adjusting the air volume of emission (Some of the apparatuses are not in operation)	Labor cost	Medium	
	2	**Setting exhaust heat recovery unit: Measuring the power consumption(4 units)**	**Yes**	**Medium**	**Very effective (JCM)**
	3	Insulating heat (outside)	Yes	Small	
	4	Diminishing the size of the opening	Labor cost	Small	
	5	Transforming into dual line	Yes	Medium	
Compressor (Building 1, Building 2)	**6**	**Enhancing the operation efficiency through controlling the number** ***Flow meter for operation management of power consumption per air content, etc.**	**Yes**	**Large**	**Very effective (JCM)**
	7	Lowering the pressure (Building 1: from 0.7MPa to 0.6MPa)	Labor cost	Medium	
	8	Reviewing the operation of the dryer (reducing the number)	Labor cost	Small	
	9	Lowering the room temperature through setting the exhaust fan (Building 1)	Labor cost	Small	Conducted by the company (About 2 degrees Celsius or lower)
Assembling Building 1: Fan Building 2: DCM	10	Measures against air leakage (setting flow meter, etc.)	Labor cost	Medium	
	11	Protection from jam caused by suction of AHU of the air conditioner in Building 2: Reducing the operation of outside unit of air-conditioner	Labor cost	Medium	
	12	**Saving energy of outside unit of air conditioners by Be One**	**Yes**	Medium	**Very effective (JCM)**
Forming, Pressing	13	Replacing the lights with electrodeless lamps (more efficient than LED)	Yes	Medium	
	14	Not cooling down the air of the plant while the material dryer is on standby	No	Medium	
Entire Plant	15	Reducing the exhaust loss of the air conditioners (replacing the opened doors leading outside with double doors)	No	Small	


Photo 3.1.6 Checking the pressure of the compressor

Photo 3.1.7 Checking how Be One is set

⑤ Common Issues of the Four Companies and Direction of Selecting Technologies

The results showed that the great energy-saving effect could be expected through controlling the number of outside unit of air-conditioners by Be One and controlling the number of compressors, and exhaust heat recovery from the reflow furnace. And the two energy-saving technologies, among others, were versatile and had great potential for dissemination; controlling air conditioners by Be One and controlling the number of compressors. Therefore, we selected these two technologies for the JCM project to be implemented, and decided to develop the methodologies for each technology.

(4) Results of the Survey on JCM Methodologies and PDD Preparation

To develop the JCM methodologies as “Energy-Saving Project of the Plants in the Industrial Complex in Ho Chi Minh City” , we assume a wide variety of the technologies, which would be employed for the project, including: the energy-saving technologies of power facilities such as controlling the number of compressors, lowering the pressure, and setting the inverter in the pumps; energy-saving technologies for production facilities such as exhaust heat recovery from the furnace and heat insulation; and energy saving of air-conditioning facilities such as controlling the operation of outside unit of air-conditioners. Then professionals conducted the Energy-Shindan. After that, we made a short list of the technologies that have great potential to attract energy-saving investment, and developed the methodologies of the technologies. (Please refer to (3) for the implementation outline of the Energy-Shindan.) As a result, we decided to introduce “control equipment” that enhances the operation efficiency through controlling the operation of the air conditioner and compressor facilities, because setting Be One on the air conditioners and controlling the number of compressors had a high potential for realizing the energy saving. It was selected as the technology to be employed for the project. We prepared PDD focusing the equipment.

① Eligibility Criteria

The following three criteria were set for the proposal for thise methodologies, so that reduction CO2 reduction can be strictly evaluated without disturbing the implementation and dissemination of the energy-saving projects in the plants in Vietnam.

[Methodologies for Air-Conditioning Control]

Criterion 1

Preliminarily measure the power consumption of the target facilities for a week or more before the control equipment controls the operation. The power consumption is measured once or more an hour.

In the area where the average temperature difference between each month is less than 10 degrees Celsius, the preliminary measurement is conducted for a week or more in an arbitrary period of the year. In the area where the average temperature difference is 10 degrees Celsius or more, it is conducted in the winter season (from November to February).[1]

The measurer can measure the ammeter and convert the value into power consumption.

The temperature setting should be same and should not be changed during the preliminary measurement.

100 effective samples of data or more, excluding the data during the period when facilities are not in operation, should be collected.

Regarding the air conditioners whose temperature management criteria are the same, one of them can be selected for the measurement.

[Methodologies for Controlling the Number of Compressors]

Criterion 1

Preliminarily measure the power consumption of the target facilities for a week or more before the control equipment controls the operation. And the measurer measures the following items once or more an hour. 100 or more effective samples of data, excluding the data during the period when facilities are not in operation, should be collected.

- Power consumption of the target facilities
- Volume of compressed air generation (Air pressure)in the target compressors

The measurer can measure the air pressure and convert the value into the volume of compressed air generation (Air pressure).

[1] Using ClimatView, it is judged with from the nearest observation point to the project site,

It is required to measure power consumption and amount of air prior to the control (, which is defined as “primary measurement” here), so as to reflect the results of primary Energy-Shindan and to disseminate Energy-Shindan.
The conditions of the preliminary measurements are as follows: the measurement should be conducted once or more an hour for a week or more, and 100 or more samples of the data should be collected.
In Ho Chi Minh City, the average temperature is about 30 degrees Celsius throughout the year. The difference between the average monthly temperatures is about 3 to 4 degrees Celsius, which is quite moderate. However, the average temperature difference in Hanoi is 10 degrees Celsius or more. Therefore we decided to measure for a week or more in an arbitrary period of the year in the area where the difference between the average monthly temperatures is less than 10 degrees Celsius. And in the area where the difference is 10 degrees Celsius or more, the measurement is conducted for a week or more in the winter season (from November to February). Considering the frequency of data collection for Energy-Shindan conducted by Panasonic and the frequency of data collection of Be One, the data was to be collected once or more an hour. The number of the effective samples of data, excluding the data during the period when the target facilities are not in operation, was decided to be 100.
Regarding the air conditioners, many plants have dozens to hundreds of machines. However, it is difficult to set the meter on every machine. The measurer can select a sample machine to measure the value, because, excluding the meeting room and the special rooms like clean rooms, the space is basically controlled at the same temperature, and thus the difference between the operation status of each air conditioner is considered small.

[Methodologies for Controlling Air Conditioners]
Criterion 2
Once the project is implemented, do not raise or lower the temperature set at the time of preliminary measurement by more than 3 degrees Celsius.

[Methodologies for Controlling the Number of Compressors]
Criterion 2
Once the project is implemented, the air pressure should not be increased or decreased by 0.1MPa from the average pressure, which was measured at the time of preliminary measurement. In case the air pressure exceeds this range after the implementation of the project, the period should be excluded from the operation time.

In order to keep the load condition before the introduction of the facilities and after at the same level, we imposed the following limitation: not to raise or lower the set temperature of the air conditioner by more than 3 degrees Celsius; the air pressure of the compressors should not be increased or decreased by 0.1MPa from the average pressure.

[Methodologies for Controlling Air Conditioners]
Criterion 3
Regarding the monitoring after the implementation of the project, energy consumption and operation time of all the target facilities should be monitored by the control equipment.
In case of measuring the energy consumption with an ammeter on each control equipment, a wattmeter should also be set on every tenth equipment. Measuring results of ammeter and those of wattmeter are collated. If there is a gap between the results in these two meters, the measuring data should be corrected conservatively at the same rate when the gap was widest.

[Methodologies for Controlling the Number of Compressors]
Criterion 3
The power consumption of the target facilities should be able to be monitored with the wattmeter at the time of the monitoring after the implementation of the project.

It is difficult to measure all facilities for controlling air conditioners. However, once the project is implemented, the power consumption of all the target facilities can be measured by ammeters, because Be One and the equipment for controlling the number of compressors are set. Therefore, after the implementation of the project, power consumption of all the target facilities should be measured.
In case power consumption is measured by the ammeter set on each control equipment, every tenth equipment to be introduced should also carry a wattmeter, so that the measuring results of the ammeter and that of wattmeter can be collated. This measure is taken, because the error range is considered to become wide if the monitoring is conducted only by ammeters. The conservative value should be employed after the collation.

② Reference scenario concept
To set a more conservative scenario than Business as Usual (hereafter BaU), the following scenarios were investigated.

- Scenario 1

‘Electricity consumption when latest air conditioning units/compressor units were used’ is taken as a reference scenario.

＜Result of investigation＞
Among air conditioning units currently being sold for use in factories in Vietnam, the specifications for units sold by Daikin Vietnam and TRANE were obtained and investigated. For models for sale with similar cooling power, Daikin's COP was 2.33~2.75 (total indoor & outside units), whereas TRANE ranged 2.10~3.38 (exterior compressor power only).
While in the other hand, the existing air conditioning COP (exterior compressor power only) that was established in this study was 2.03~2.05. Because of this, when considering the reference COP as the model currently on sale, if the saving more than 20% by introducing the Be One, the amount of reductions in CO2 cannot be counted.
However, as a result of the energy saving diagnostic, the saving is 20~22% over the Be One, which gives a credit in this scenario of closed to zero, or a negative evaluation.
Regarding the compressor units, KOBELCO Vietnam’s specifications were obtained, however as there was no entry regarding ‘electricity consumption’, it was not possible to set this scenario based on the manufacturer specification.

- Scenario 2

Correlate the data, which obtained from the energy saving diagnostic, of the operating time as for air conditioning units and that of airflow and electricity consumption as for compressor units, respectively.
The electricity consumption based on the mean operating time/airflow time obtained from the energy saving diagnostic which is on the linear function (I) connecting the devices’ rated maximum electricity consumption (the rated electricity consumption when air conditioners are operating with RLA and fan/all compressor units are on load) and the minimum electricity consumption (the rated electricity consumption when air conditioning units are operating with

fan only/all compressor units are off load), and on the linear function (II) with the same gradient which falls below all the observed data is used as the reference electricity consumption.

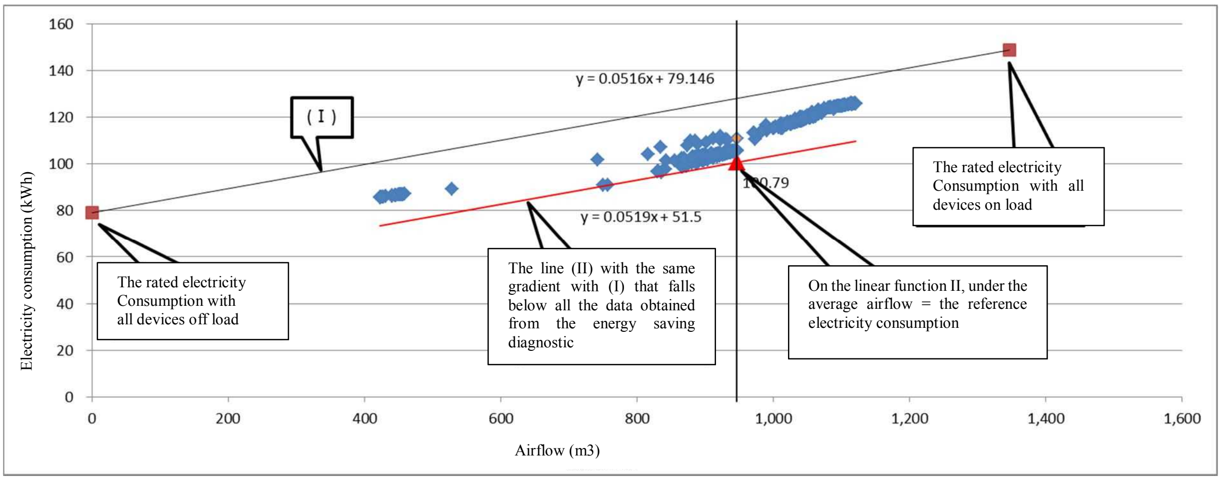


Figure 3.1.7 Scenario 2 diagram

＜Result of investigation＞

When calculating using the data from the energy saving diagnostics of air conditioning units and compressor units made by SERVO, and TOSOK's air condition units, in all the calculations, the results are lower than the energy used in the energy saving diagnostic after the implementation of the project, so in this scenario the credit is negative.

- Scenario 3

Correlate the data, which obtained from the energy saving diagnostic, of the operating time as for air conditioning units and that of airflow and electricity consumption as for compressor units, respectively.
The electricity consumption based on the mean operating time/airflow time obtained from the energy saving diagnostic which is on the approximate linear function (III) based on the measurement data and on the linear function (IV) with the same gradient which falls below all the observed data is used as the reference electricity consumption.

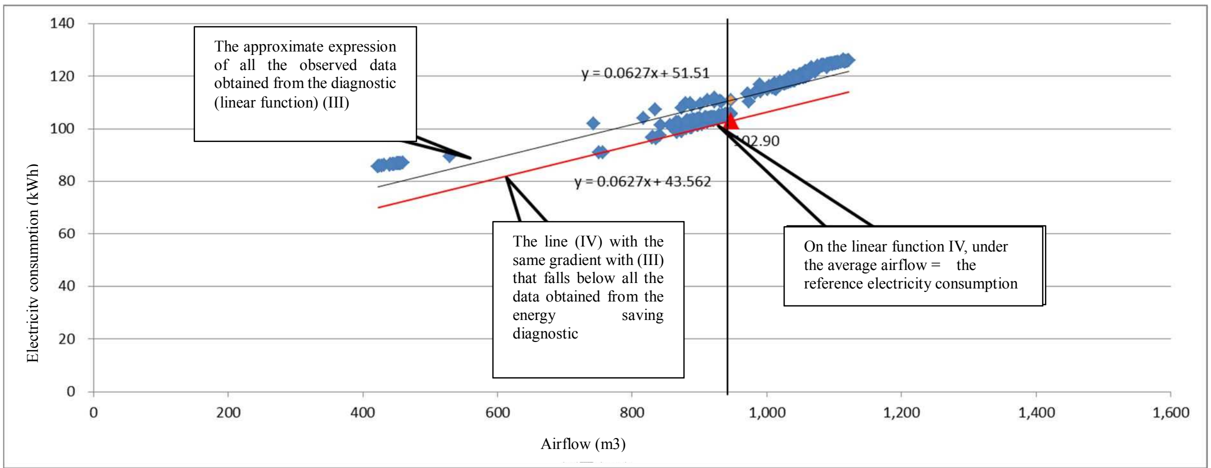


Figure 3.1.8 Scenario 3 diagram

＜Result of investigation＞
When calculating using the data from the energy saving diagnostics of air conditioning units and compressor units made by SERVO, and TOSOK's air condition units, in all the calculations, the results are lower than the energy used in the energy saving diagnostic after the implementation of the project, so in this scenario the credit is negative.

• <u>Scenario 4</u>

The minimum value of the electricity consumption per unit airflow calculated from the sample data of the electricity consumption as for air conditioners and the sample data as for compressor units is taken as the reference electricity consumption.

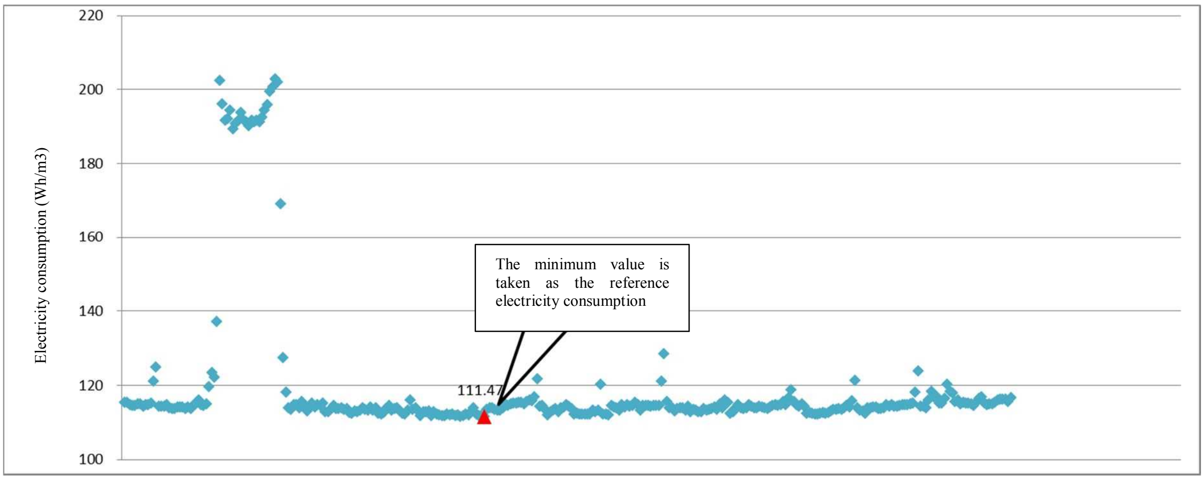


Figure 3.1.9　Scenario 4 diagram

＜Result of investigation＞
When calculating using the data from the energy saving diagnostics of air conditioning units and compressor units made by SERVO, and TOSOK's air condition units, in all the calculations, the results are lower than the energy used in the energy saving diagnostic after the implementation of the project, so in this scenario the credit is negative.

• <u>Scenario 5</u>

The average electricity consumption per unit airflow calculated from the sample data of the electricity consumption as for air conditioners and the sample data as for compressor units <u>after deleting the top 10% of the data</u> was used as the reference electricity consumption.

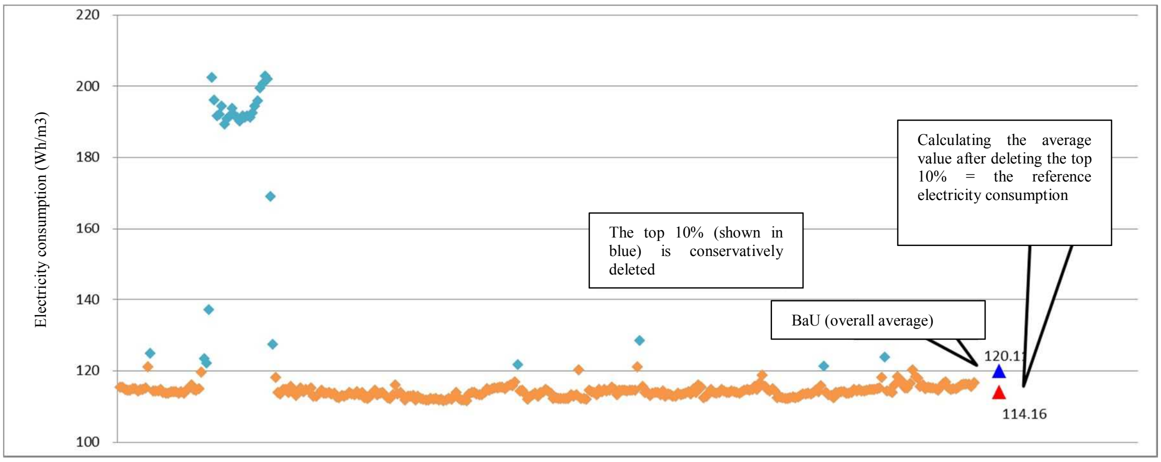


Figure 3.1.10 Scenario 5 diagram

＜Result of investigation＞
Using energy saving diagnostic data from SERVO's air conditioning units, compressor units, TOSOK's air conditioning units to calculate, in all cases, these were higher than the results of the energy saving diagnostic after the implementation of the project, which makes the results more conservative than the BaU scenario, whereby we can conservatively appraise them.

As a result of investigating the five scenarios above, because scenarios 1~4 are too conservative, emissions following implementation of the project are greater than the reference emissions, which result in a negative evaluation. In only scenario 5, which in all cases is more conservative than BaU and amount of emissions was valued. Considering the result, this investigation results in adopting the concept of Scenario 5 and establishing methodology.

③ Calculation of reference emissions
The reference emissions is the assumed emitted GHG quantity from continually running the subject equipment without using a control device. In reference to 4.2 above, by deleting the top 10% of the data from the electricity consumption per unit airflow calculated from the sample data of the electricity consumption as for air conditioners, the reference scenario is set more conservatively then BaU scenario.
And then, the mean of the lower 90% of the data is calculated and converted into a per hour value which is used as a reference electricity consumption (an eigenvalue established before the project).
When using one of the air conditioning units as a sample, the above method was used to calculate the reference electricity consumption per air conditioning unit by dividing proportionally by the cooling power of each unit, which was then used to compute the reference electricity consumption of the air conditioning unit in question.
The reference electricity consumption computed using the above method, multiplied by the operating time after project implementation, is used as the reference emission level. Specific calculations are given below:

(a) The reference emissions of air conditioning units
$RE_y = EL_{RE,ac} * T_{ac,y} * CEF_{electricity}$ (1)
$EL_{RE,ac} = EL_{average,i} * F_i / 1 * RC_{ac} / RC_i$ (2)
$EL_{average,i} = \Sigma_{90\%}(EL_{i,n}) / (n_i * 0.9)$ (3)

RE_y	The reference emissions in the year y	kWh/y
$EL_{RE,ac}$	The reference electricity consumption per hour of the air conditioning unit in question	kWh/h
$T_{ac,y}$	Operating time of the air conditioning unit in the year y	h/y
$CEF_{electricity}$	CO_2 emission coefficient of electric power The published value released by the ministry of natural Resources and Environment (MONRE) which are the Designated National Authorities (DNA) of the Clean Development Mechanism (CDM) is used for the electric power supply from the national grid unless there is a specific direction from the joint committee.	tCO_2/kWh
$EL_{average,i}$	The mean electricity consumption of the sample air conditioning unit i which is obtained from the preliminary measurement	kWh/frequency of measurement
F_i	The number of samples per hour used for the preliminary measurement	
RC_{ac}	The summation of the rated cooling power of the air-conditioning unit in question	kW
RC_i	The rated cooling power of the air conditioning unit i	kW
$\Sigma_{90\%}(EL_{i,n})$	The summation of the bottom 90% of the valid samples of the electricity consumption obtained from the preliminary measurement of the sample air conditioning unit i	kWh/frequency of measurement
n_i	The number of the valid samples from the preliminary measurement of the sample air conditioning unit i	

(b) The reference emissions of compressor units

$RE_y = EL_{RE,co} * T_{co,y} * CEF_{electricity}$ (1)

$EL_{RE,co} = EL_{average,co} * AF_{average,co} * F_{co} / 1$ (2)

$EL_{average,co} = \Sigma_{90\%} (EL_{co,n} / AF_{co,n}) / (n_{co} * 0.9)$ (3)

RE_y	The reference emissions in the year y	kWh/y
$EL_{RE,co}$	The reference electricity consumption per hour of the compressor in question	kWh/h
$T_{co,y}$	Operating time of the compressor in the year y	h/y
$CEF_{electricity}$	CO_2 emission coefficient of electric power The published value released by the ministry of natural Resources and Environment (MONRE) which are the Designated National Authorities (DNA) of the Clean Development Mechanism (CDM) is used for the electric power supply from the national grid unless there is a specific direction from the joint committee.	tCO_2/kWh
$EL_{average,co}$	The mean electricity consumption per airflow of the sample compressor in question which is	kWh/frequency of measurement

	obtained from the preliminary measurement	
$AF_{average,co}$	The mean airflow of the compressor in question obtained from the preliminary measurement	m^3/frequency of measurement
F_{co}	The number of samples per hour used for the preliminary measurement	
$\Sigma_{90\%}$ $(EL_{co,n}$ / $AF_{co,n})$	The summation of the bottom 90% of the electricity consumption per airflow obtained from the preliminary measurement of the compressor in question	kWh/frequency of measurement
$EL_{co,n}$	The valid samples of the electricity consumption of the compressor in question obtained from the preliminary measurement	kWh/frequency of measurement
$AF_{co,n}$	The valid samples of the airflow of the compressor in question obtained from the preliminary measurement	m^3/frequency of measurement
n_{co}	The number of the valid samples from the preliminary measurement of the compressor in question	

④ Setting of the pre-study values

Through the pre-study diagnostics, the reference electricity consumption per hour ($EL_{RE,ac}$: kWh/h) of the air conditioning unit in question and the reference electricity consumption of the compressor ($EL_{RE,co}$: kWh/h) in question are calculated, which are eigenvalues used throughout the study.

In order to calculate these values, the following parameters are collected:

- Items for the preliminary measurement of air conditioning units

	Set temperature of the sample air conditioning unit at the preliminary measurement	Check at the preliminary diagnostic
RC_{ac}	The summation of the rated cooling power of sir conditioning units	Check on the catalogues or nameplates
RC_i	The rated cooling power of the sample air conditioning unit *i*	Check on the catalogues or nameplates
F_i	The number of the samples per hour at the preliminary measurement	Shown in the result of the preliminary diagnostic
$EL_{i,n}$	The number of the valid samples of the electricity consumption obtained from the preliminary measurement of the sample air conditioning unit *i*	Shown in the result of the preliminary diagnostic
n_i	The number of the valid samples of the sample air conditioning unit *i* at the preliminary measurement	Shown in the result of the preliminary diagnostic

- Items for the preliminary measurement of compressors

	Air-pressure at the preliminary diagnostic	Check at the preliminary diagnostic
F_{co}	The number of the samples per hour at the preliminary measurement	Shown in the result of the preliminary diagnostic
$AF_{average,co}$	The mean airflow of the compressor in question obtained from the preliminary measurement	Shown in the result of the preliminary diagnostic
$EL_{co,n}$	The number of the valid samples of the electricity consumption obtained from the preliminary measurement of the compressor in question	Shown in the result of the preliminary diagnostic
$AF_{co,n}$	The valid samples of airflow obtained from the preliminary measurement of the compressor in question	Shown in the result of the preliminary diagnostic
n_{co}	The number of the valid samples at the preliminary measurement of the compressor in question	Shown in the result of the preliminary diagnostic

⑤ Monitoring items and monitoring plan

The monitoring items following implementation of the project are the respective electricity consumption (calculated for each device) and operating time of the air conditioning units and compressor units.

- Post-study monitoring items for air conditioning units

$EL_{PJ,i,y}$	The electricity consumption of the air conditioning unit *i* in question in the year *y*	kWh/y
$T_{ac,y}$	The operating time of the air conditioning unit in the year *y*	h/y

- Post-study monitoring items for compressor units

$EL_{PJ,j,y}$	The electricity consumption of the compressor *j* in question in the year *y*	kWh/y
$T_{co,y}$	The operating time of the compressor unit in the year *y*	h/y
	The pressure of compressed air in the year *y*	MPa

As operating time is counted excluding outages, if the electricity consumption data can be collected more than once an hour, operating time can be monitored simultaneously.
With the Be One it is possible to establish the electricity use of the equipment per hour after project implementation, which makes it possible to monitor using only the Be One.
Also, as the Be One uses an ammeter to measure the electricity used, by attaching an electricity meter to one in every 10 devices using the Be One control device, measurement results of both the electricity meter and ammeter can be verified against each other.

⑥ Calculation of the project emissions

The project emissions are calculated by using the CO_2 emission coefficient of the electricity and the summation of all electricity usage after the implementation of the project measured from each of the air conditioning units and compressor units. As with qualification criterion 3, the electricity usage of all devices will be monitored after project implementation.

- The project emissions of air conditioning units

The project emissions are calculated from the summation of the electricity consumption measured from the target devices after the project implementation and the CO_2 emission coefficient of electricity.
The electricity use of all equipment in the study is to be monitored.
When monitoring the electricity consumption for each control device using an ammeter, by attaching an electricity meter to one in every 10 devices, measurement results of both the electricity meter and ammeter can be verified against each other. If there is a discrepancy between the measurements results of two maters, the data can be supplemented conservatively using a ratio equal to the biggest ratio of discrepancy.

$$PE_y = \Sigma_i (EL_{PJ,i,y}) * CEF_{electricity} \qquad (4)$$

PE_y	The project emissions in the year *y*	tCO_2e/y
$\Sigma_i EL_{PJ,i,y}$	The summation of the electricity consumption of the air conditioning unit *i* in question in the year *y* (the summation of the values measured from each controlling device). When monitoring the electricity consumption for each control device using an ammeter, by attaching an electricity meter to one in every 10 devices, measurement results of both the electricity meter and ammeter can be verified against each other. If there is a discrepancy between the measurements results of two maters, the data can be supplemented conservatively using a ratio equal to the biggest ratio of discrepancy.	kWh/y
$CEF_{electricity}$	CO_2 emission coefficient of electric power The published value released by the ministry of natural Resources and Environment (MONRE) which are the Designated National Authorities (DNA) of the Clean Development Mechanism (CDM) is used for the electric power supply from the national grid unless there is a specific direction from the joint committee.	tCO_2/kWh

- The project emissions of compressor units

The project emissions are calculated after project implementation by multiplying the measurements of electricity usage for the devices and the CO_2 coefficient of electricity.

$$PE_y = EL_{PJ,y} * CEF_{electricity} \qquad (4)$$

PE_y	The project emissions in the year *y*	tCO_2e/y
$EL_{PJ,j,y}$	The electricity consumption of the compressor in question in the year *y*	kWh/y

$CEF_{electricity}$	CO_2 emission coefficient of electric power The published value released by the ministry of natural Resources and Environment (MONRE) which are the Designated National Authorities (DNA) of the Clean Development Mechanism (CDM) is used for the electric power supply from the national grid unless there is a specific direction from the joint committee.	tCO_2/kWh

⑦ Calculation of GHG emissions reduction

The reduction in emissions is calculated by subtracting the project emissions from the reference (for air conditioning units and compressor units).

$$ER_y = (RE_y - PE_y) \qquad (5)$$

ER_y	The GHG emissions reduction in the year *y*	tCO_2e/y
RE_y	The reference emissions in the year *y*	tCO_2e/y
PE_y	The project emissions in the year *y*	tCO_2e/y

⑧ Project emissions reduction (targeting 3 companies) and estimation of wider effects

(a) Nidec SERVO

- Introducing the Be One to the air conditioning units

Introducing 90 control devices for outside air conditioning units (the summation of the rated cooling power （RC_{ac}）: 5,039.6kW) with Joint Crediting Mechanism (JCM).

During the 27 days between June 11, 2015 and June 27, 2015, taking one outside air conditioning unit specified as a sample (total output power (RC_i) : 58.6kW), electricity usage was carried out with a frequency of once per hour (F_i), collecting 393 valid electricity usage data (n_i). From the same measurement results, the mean electricity consumption ($EL_{average,i}$) of the remaining data after conservatively deleting the top 10% of the single device was 11.97kWh/h. (See PDD for details of calculation (Project Design Document). Consequently, the reference electricity consumption per hour ($EL_{RE,ac}$) of all upgraded air conditioning units is 1,029.5kWh/h.

Assuming an annual operating time ($T_{ac,y}$) of 6,888 hours/year post-upgrade, the air conditioning reference emissions ($RE_{ac,y}$) are 3,973.3tCO2/year.

Predicting a post-project implementation electricity usage ($EL_{PJ,i,y}$) of 6,189,281kWh/year, the project emissions ($PE_{ac,y}$) are 3,467.9tCO2/year.

According to the above, the reduction in emissions of the introduction of the Be One is 505.5tCO2/year.

- Control of unit quantity of compressor units

With respect to the 7 compressor units in the JCM, one unit was fitted with a control device.

During the 7 days between June 14, 2015 and June 20, 2015, the electricity consumption and compressed air volume of all seven units was measured twice every hour (F_{co}), collecting 336 valid data (n_{co}) for electricity usage. For the same measurement results, the top 10% of electricity consumption values for electricity consumption per unit airflow ($EL_{co,n} / AF_{co,n}$) was conservatively deleted, and the average electricity consumption ($EL_{average,co}$) was 0.114kWh/30mins. (See PDD for details of calculation).

The average airflow obtained from preliminary measurements ($AF_{average,co}$) was 946.8m^3-/30mins, so the reference electricity consumption for airflow hours ($EL_{RE,co}$) was 215.8kWh/h.

Assuming an annual operating time ($T_{ac,y}$) of 8,400 hours/year post-upgrade, the air conditioning reference emissions ($RE_{ac,y}$) are 1,015.9tCO2/year.

If post-project implementation electricity usage ($EL_{PJ,j,y}$) is predicted at 1,776,348kWh/year, the project emissions ($PE_{co,y}$) are 995.3tCO2/year.
According to the above, emissions reduction from control of unit number of compressor units is <u>20.6tCO2/year.</u>

(b) Nidec TOSOK
Introducing the Be One to air conditioning units
In respect of the outside air conditioning units in the JCM (the summation of the rated cooling power (RC_{ac}): 2,557.3kW), 109 control units were installed.
In the 23 days between June 10, 2015 and July 2, 2015, in respect of the two outside air conditioning units designated as sample (total output (RC_i) : 45.8kW), electricity usage was measured with a frequency of once every hour (F_i), collecting 344 valid data for electricity usage. For the same results, the top 10% of electricity consumption data for the two units was conservatively deleted, giving an average electricity consumption ($EL_{average,i}$) of 42.59kWh/h. (See PDD for details of calculation).
Consequently, the reference electricity consumption ($EL_{RE,ac}$) of all upgraded air conditioning units per hour is 2,377.9kWh/h.
Assuming an annual operating time ($T_{ac,y}$) of 6,000 hours/year, the air conditioning reference emissions ($RE_{ac,y}$) are 7,993.9tCO2/year.
Predicting a post-project implementation electricity usage ($EL_{PJ,i,y}$) of 11,968.164kWh/year, the project emissions ($PE_{ac,y}$) are 6705.8tCO2/year.
According to the above, reduction in emissions from the installation of the Be One is <u>1,228.1tCO2/year.</u>

- Control of number of compressor units

TOSOK will not restrict number of compressor units for the JCM.

(c) Nidec VIETNAM
- Introducing the Be One to air conditioning units

In the JCM in respect of outside air conditioning units (the summation of compressor power (RC_{ac}): 504kW), 69 control units will be installed. As Nidec Vietnam already has coolers with the Be One installed, the summation of compressor power was used.
For the 14 days between September 17, 2015 and September 30, 2015, in respect of the single outside air conditioning unit specified as a sample (power of both compressors (RC_i) : 7.5kW), electricity usage was measured with a frequency of once every hour (F_i), yielding 315 valid sample electricity consumption data (n_i). From the same output results, the top 10% of the electricity consumption data were conservatively deleted and the average of the remaining electricity consumption data ($EL_{average,i}$) was 6.07kWh/h. (See PDD for details of calculation).
Consequently, the reference electricity consumption per hour ($EL_{RE,ac}$) of all upgraded air conditioning units is 408.13kWh/h

Assuming an annual operating time ($T_{ac,y}$) of 6,864 hours/year post-upgrade, the air conditioning reference emissions ($RE_{ac,y}$) are 1,569.6tCO2/year.
Predicting a post-project implementation electricity usage ($EL_{PJ,i,y}$) of 2,158,701kWh/year, the project emissions ($PE_{ac,y}$) are 1,209.5tCO2/year.
According to the above, the reduction in emissions of the introduction of the Be One is <u>360.1 tCO2/year.</u>

- Control of number of compressor unit

With respect to the 4 compressors in the JCM, one unit was fitted with a control device.

During the 7 days between July 13, 2015 and July 19, 2015, the electricity consumption and compressed air volume of all four units was measured twice every hour (F_{co}), collecting 203 valid sample data (n_{co}) for electricity usage. For the same measurement results, the top 10% of electricity consumption values for electricity consumption per unit airflow ($EL_{co,n}$ / $AF_{co,n}$) was conservatively deleted, and the average electricity consumption ($EL_{average,co}$) was 0.102kWh/30mins. (See PDD for details of calculation).
The average airflow obtained from preliminary measurements ($AF_{average,co}$) was 1,077.0m^3-/30mins, so the reference electricity consumption for airflow hours ($EL_{RE,co}$) was 219.3kWh/h.
Assuming an annual operating time ($T_{co,y}$) of 8,400 hours/year post-upgrade, the air conditioning reference emissions ($RE_{co,y}$) are 1,032.2tCO2/year.
If post-project implementation electricity usage ($EL_{PJ,j,y}$) is predicted at 1,747,410kWh/year, the project emissions ($PE_{co,y}$) are 979.1tCO2/year.
According to the above, emissions reduction from control of unit number of compressors is 53.1tCO2/year.

(d) Reduction effect for three companies (total)
According to (a) to (c), the assumed CO2 reduction efficiencies (¥10K/t) for the credit and investment for the emissions reductions brought about by the plans for each of three companies are shown in Fig. 3.1.6 below.

Table 3.1.6 Provisional calculations of reduction effect

Company's name	Strategy	Reference emissions (tCO2/year)	Project emissions (tCO2/year)	Emissions reduction (tCO2/year)	Investment cost (¥10k)	CO2 emissions efficiency (¥10k)
Nidec SERVO	Introducing the Be One to air conditioning units	3,973.3	3467.9	505.4	2,430	4.81
	Regulation of unit quantity of compressor units	1,015.9	995.3	20.6	490	23.79
Nidec TOSOK	Introducing the Be One to air conditioning units	7,993.9	6,705.8	1,288.1	2,943	2.28
Nidec VIETNAM	Introducing the Be One to air conditioning units	1,569.6	1,209.5	360.1	1,863	5.17
	Regulation of unit quantity of compressor units	1,032.2	979.1	53.1	390	7.34
Total		15,584.9	13,357.6	2,227.3	8,116	3.64

Also, when assuming that all companies carry out installation works in the first half of 2016 and launch the project from September 1, 2016, the total emissions and reductions from both air conditioning units and compressors for three factories up until 2020 are shown in Fig. 3.1.7. (2016 is calculated by the day from the start day)

Table 3.1.7 Amount of emissions and reduction from the three factories in each year until 2020

Year	Reference emissions (tCO_2)	Project emissions (tCO_2)	Emissions reduction (tCO_2)
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	5,209.2	4,464.7	744.5
2017	15,584.9	13,357.6	2,227.3
2018	15,584.9	13,357.6	2,227.3
2019	15,584.9	13,357.6	2,227.3
2020	15,584.9	13,357.6	2,227.3
Total	67,548.8	57,895.1	9,653.7

(e) Reduction effect in case of spread of the technology to Ho Chi Minh City
According to the above, the total emissions reduction of the three factories selected from all types and scales of factories is 2,227.3tCO2/year, which if converted to a per-factory average gives 742.4tCO2/year.
Out of the 916 companies in the industrial complexes in Ho Chi Minh City, 109 are owned by Japanese firms (according to research by JETRO Ho Chi Minh office in 2014). When rolling out this project, in respect of the Japanese firm-owned factories, which formed the primary target, under the assumption that the project implementation system will be instituted while gradually expanding implementation, from three factories in 2016, five in 2017, 10 in 2018, 30 in 2019 and 61 in 2020, the emissions reduction efficiency of the project as a whole will be as shown in the table below:

Table 3.1.8 CO2 reduction effect of the entire project

Year	2016	2017	2018	2019	2020	Accumulated total
CO2 reduction (t-CO2)	774	3,468	8,421	20,808	65,623	99,065
Roll-out number (factories)	3	5	10	30	61	109

*The factory roll-outs for each year are assumed to begin operation (122 days of operation) from the 1st of September of the given year.

(5) Survey results of project realization
For the realization of the project, financial aspects and implementation systems, a specific schedule were investigated by implementing the energy saving diagnostic, assuming target technologies and investigating the JCM methodology of the technologies.
① Project development outlook
In this study, the project was applied for and adopted to the equipment subsidy scheme for 2015 after formulating target factories and target energy saving strategies, methodology, investment plans and system implementation based on the results of the local diagnostics, and through equipment investment plans between all firms (including the prices and condition). Going forward, a contribution to the realization of the Low Carbon Society in Ho Chi Minh City is to be pursued through implementation of the equipment subsidy project. In the introduction of the Be One and restriction of compressor unit numbers as the subject of this feasibility study, the

focus of the project will compress to the Be One with high CO2 reduction efficiency, as well as increasing the remit from three to six factories, pursuing a composition of cases with higher efficiency.

② Financial strategy

On introduction of technology selected based on the energy saving diagnostic, assumptions of the most part of the procurement of the large body of funds undertaken by the factories themselves are shown in Fig 3.1.9 below. In addition, when using the equipment subsidization project scheme, financial plans adapted for each firm's situation are shown below. Investment pay-back time for the project is 2.02 years, with an internal profit margin of 46%.

In regards to assumed risk with the implementation of the project, although the possibility of the government interference in the target country in the investment cannot be discounted, as the current political situation in Vietnam is stable with a long-term energy saving plan in place, the possibility in which relevant risk is extremely low. Although there is an assumed possibility of target firms pulling out, as the demographic and recent economic growth performance portend a high rapid economic growth, the coming about of such a situation where firms pull out appears to be low.

1) Investment pay-back years With subsidy: 2.02 years (without: 4.05 years)
2) Internal profit margin With 50% subsidy:46% (without: 16%)
3) Annual cash flow (before taxes): shown below:

Table 3.1.9 Provisions of annual cash flow and calculation of investment pay-back (before taxes)
(Without subsidy) Unit：¥10k

Number of years	Income from electricity consumption reduction	Initial investment	Conservative maintenance	Balance in income and expenditure	IRR
0		(7,236)			16%
1	2,822		(1,036)	1,787	
2	2,822		(1,036)	1,787	
3	2,822		(1,036)	1,787	
4	2,822		(1,036)	1,787	
5	2,822		(1,036)	1,787	
6	2,822		(1,036)	1,787	
7	2,822		(1,036)	1,787	

(With 50% subsidy) Unit：¥10k

Number of years	Income from electricity consumption reduction	Initial investment	Conservative maintenance	Balance in income and expenditure	IRR
0		(3,618)			46%
1	2,822		(1,036)	1,787	
2	2,822		(1,036)	1,787	
3	2,822		(1,036)	1,787	
4	2,822		(1,036)	1,787	
5	2,822		(1,036)	1,787	
6	2,822		(1,036)	1,787	
7	2,822		(1,036)	1,787	

*Conservatively calculated along with the methodology. The durable years of the Be One is assumed to be 7 years.

③ MRV (Measuring, Reporting and verification) System

Table 3.1.11 below shows the MRV system. In anticipation of the widespread of the business throughout Vietnam, Yuko Keiso Co., Ltd. that holds the license of electric construction in Vietnam is to join the international Consortium. The company is a professional group of measuring, controlling and observing, and in the recent years after expanding its business into Vietnam, with its open network technologies, it has established a solid track record of investigation and measurement support as a project implementing body in the JCM system project with the country.

Nidec3 mainly implements operation and management of equipment and monitoring. Yuko Keiso Co., Ltd. (Vietnam) is in charge of equipment maintenance works and the entire supporting services. The company takes initiative in reporting and verification with support from Panasonic and Mitsubishi UFJ Morgan Stanley.

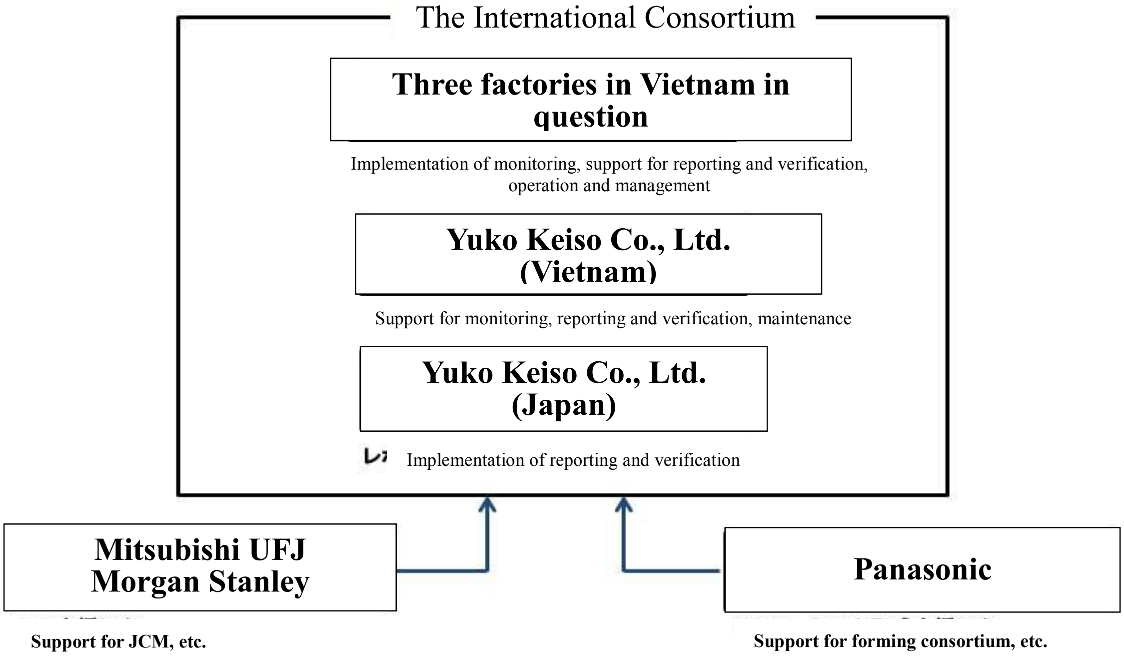


Figure 3.1.11 Diagram of project implementation system

④ Future prospect and tasks

After this study, industrialization of a large-scale energy saving plan regarding air conditioning equipment of each factory will be promoted by utilizing the equipment subsidy scheme for 2016 and by specializing in installation of the Be One which was confirmed to be the most efficient in energy saving and to be highly versatile.

As for the first phase of the future tasks, developing the business to Japanese-affiliated companies is take account. The installation to Japanese-affiliated companies will be easy since they are highly conscious about energy saving. In order to spread the business to the whole Vietnam including local companies, it is essential that the government of Vietnam to implement the necessary measurement of issuing the specific implementation guideline for "Law on Energy Efficiency and Conservation" and setting up incentive systems to encourage energy saving as well as that, the concept of total factory energy saving solutions that adopt various energy-conserving technologies to be promoted and widespread triggered by the experimental proves demonstrated in this study.

3.2 High-efficiency LED Street Light Conversion Project

(1) Project Overview

① Project Background and Purpose

The intention of this project is to convert the street lights of Ho Chi Minh City, which at present are utilizing high pressure natrium lamps, to high efficiency LED lighting. Concerning the switching over to LED of city street lights, large numbers of local governments have expressed interest, and the standardized implementation of LED is being advanced in consideration of its safety aspects. Within such a context, business persons both domestically and from abroad are undertaking activities directed toward gaining entry into the Vietnamese market.

Ogawa Electric Co., Ltd. and Stanley Electric Co., Ltd., by means of cooperation with the Ho Chi Minh City province's Energy Conservation Center (ECC-HCMC), made an arrangement to install 120 LED lamps in the southern Vietnam province of Vinh Long to further preparations for a small-scale LED street light conversion pilot project. Prior to implementing this pilot project, for the purpose of conforming to Vietnamese regulations, we carried out a careful examination of all relevant specifications as well as an assessment of the costs, and also arrived at a pilot project implementation agreement with the province of Vinh Long. Furthermore, in order to reduce our costs, Stanley Electric mapped out our business policies for the project with respect to establishing a production system at a local plant. Both the functional and the cost aspects of Stanely Electric's LED lighting have been highly evaluated, and its illumination design which is specifically oriented for operators of motorcycles and automobiles is a significant distinguishing characteristic. Accordingly, in March of 2015, ECC-HCMC issued a proposal to engage in an LED street light conversion project in Ho Chi Minh City, the region's largest market, to the People's Committee of Ho Chi Minh City, based on the pilot project in Vinh Long province.

In the sourthern part of Vietnam in which Ho Chi Minh City is located, ECC-HCMC has proposed various energy-saving projects, and carried out projects together with business people from inside as well as outside of Vietnam. For that reason, ECC-HCMC is a focal point for constant appeals regarding the promotion of energy conservation, including from the People's Committee of Ho Chi Minh City. With Ho Chi Minh City being the biggest metropolis in Vietnam and having such a substantial number of street lights, economizing energy usage in the equipment that must be installed there in order to ensure safety at night is of tremendous importance.

Ogawa Electric and Stanley Electric have jointly undertaken the sale of electrical products among other forms of business development in Vietnam, and by introducing lighting equipment suited for an LED street light conversion project that includes Ho Chi Minh City, we are seizing a chance to further expand our business opportunities, such as may become a first step toward responding to requests to change over other types of installations to LED. First, we intend to innovate Japanese electrical products which are advanced even on a global scale, and to appeal to the superiority of our country's technology. Then, together with achieving entry into the market of Vietnam's largest city, we will gain a foothold for the dissemination and development of – as well as the expansion of business opportunities for – Japanese technology in general.

In setting the target for this project, we anticipate beginning with the introduction of the equipment for a 4,000-lamp LED street light conversion pilot project to be considered in Ho Chi Minh City. After that, we will replace 137,869 high pressure natrium lamps throughout the Ho Chi Minh City area with LED lamps, and proceed with the matter of newly establishing additional LED lamps. Our prior research has revealed that there are a sum total of 235,238 lamps in the eight provinces and municipalities which comprise the southern Vietnam region, and we will promote the conversion of these to LED, as well. Finally, we expect to expand into Vietnam's other major cities, and eventually, to further our expansion into all regions

throughout the entire country.
With regard to the 4,000 lamps to be examined in Ho Chi Minh City, we applied for fiscal year 2016 Joint Crediting Mechanism ("JCM") Facilities Support Project registration and forged partnerships with ECC-HCMC, ETEC, and the Vietnamese company GIAGIA, with the ambition of advancing our street light conversion project all across the country by means of this more robust organization.
Due to the fact that we are preceding other countries into Vietnam, we considered application of Japan's bilateral credit system an extremely helpful framework, and we desired to pursue preliminary research directed toward the creation of a business plan.
As an estimate of the initial stage investment amount (based on current conditions) for carrying out the project in question, considering it as a JCM project we anticipate a figure of $3,000,000 USD [difference from reference investment: $1 USD = ￥120 JPY; therefore, equivalent to ￥360,000,000 JPY upon conversion]. This is based on our expectation to aim for the implementation of 2,500 of the principal roads' lamps in fiscal year 2016.

② Project Plan and Contents
Among the street lights using high pressure natrium lamps which are presently installed throughout Vietnam, we will proceed starting with the switchover to LED of the street lights in Ho Chi Minh City. By replacing the high pressure natrium lamps with LED ones, we can anticipate a reduction of electricity consumption by as much as approximately 50% compared to the past. In addition to curtailing electricity consumption, LED lights have an operating life approximately 2.5 times longer than their high pressure natrium counterparts, meaning that the frequency with which the work of changing the lamps in high places must be performed is reduced. Therefore, benefits can also be enjoyed from their maintenance aspects.

(a) Project Effectiveness and Efficiency
By means of intercity cooperation with Osaka, environmental improvement through projects which contribute to its styling of itself as a "low-carbon city" is being furthered in Ho Chi Minh City, the largest metropolitan area in Vietnam with a population numbering more than 10,000,000. Based on this, the impact of the appeal to residents, tourists, and others of converting street lights to LED in the emergining mega-city Ho Chi Minh City, where such great numbers of lights are existing, is very high. Moreover, with the continuation of economic development in Vietnam and Ho Chi Minh City, the stringency of electrical power distribution is becoming an issue; current circumstances are that planned blackouts, among other power-saving efforts, are being carried out, and so suppressing the amount of electrical power consumed is an effective measure from the viewpoint of energy security, as well.
The LED Street Light Conversion Project, with ECC-HCMC having become its center, is advancing in the form of pilot projects being implemented in succession in each of the cities in the southern Vietnam region, such that its effectiveness is little by little being substantiated. Given the practical impact it has had, initating the project in Ho Chi Minh City has increased the possibility of early actualization of the project overall, and thus has been an extremely efficient business plan.
Because we have aimed at the early realization of the project while working alongside the activities of ECC-HCMC and continuously remaining in discussion with them, our efficiency has been high. Additionally, Stanley Electric has cooperated with Ogawa Electric to preemptively create a prototype model which takes into account the technological specifications and regulations for street lights in the neighboring cities around Ho Chi Minh City, and they have proceeded with the provision of support concerning standards for safety features including brightness. A system which efficiently furthers the actualization of the project has been put in place.

(b) Project Validity

As has already been stated, alongside Vietnam's rapid economic development, its demand for electrical power has been increasing. The need for energy-saving is high, as is the need for constraint of electrical power consumption in the lighting utilized for street lights. Therefore, beginning with the present project, the spreading of a type of roadway lighting that conserves energy is a prescription for dealing with an urgent issue for Vietnam. Furthermore, by introducing equipment like street lights which are constantly seen by people such as ordinary city residents, we can also anticipate the effect of an expansion of applications of LED toward multiple purposes other than street lights. Keeping that in mind, it can be said that there is validity in this project's significance.

Again, the most crucial role of street lights is as a security measure during the nighttime, in terms of ensuring traffic safety. With regard to this point, the street lights planned to be installed on this occasion are Stanley Electric LED bulbs. The level of the street lights' brightness was derived in the technological specifications review process directed toward the installation of LED in the city of Nha Trang which was carried out by said firm. At the same time, these bulbs also feature the foresight of Stanley Electric's technology, which has been cultivated through its being a lighting appliance maker of lamps for use in automobiles and motorcycles, as well as of an illumination design that inherently takes motor vehicle operators' visibility into account. Inasmuch as we have arranged for street lights into which such high technology and wisdom are concentrated to be introduced, the validity of this project is also high with respect to the point of fulfilling the most important role for street lights to the maximum possible degree.

(c) Project Feasibility

As previously stated, ECC-HCMC has been decided as the center of our project, which forms one part of the emerging "City Street Light Energy Economization (Conversion to LED)" program. It is a plan that is being pursued for implementation in Vietnam's largest urban center, Ho Chi Minh City, based on pilot projects in the neighboring cities around Ho Chi Minh City up until now. Due to these factors, and because it is consonant with the needs of the actual site itself, the feasibility of our project is high. Moreover, we have not set all 147,000 natrium lamps throughout the entire Ho Chi Minh City area as our target all at once. By rather starting with changing 4,000 lamps to LED we have heightened the project's practicability. Also, because it is being based on a project implementation proposal to the People's Committee of Ho Chi Minh City that takes as its origin our actual achievements in surrounding cities, and for the Ho Chi Minh City government energy-saving is becoming increasingly important, the probability is high that this project – which is linked to the improvement of the city environment (including the "cityscape") – will be approved. The cost aspect at the time of installation may be thought of as the most problematic issue. However, Stanley Electric has prepared a plant in Vietnam and enacted a system of local production for local consumption. Insofar as we can respond to this largest issue by being able to develop products which have a competitive advantage over other foreign makers, even with regard to the cost aspects we recognize that we have sufficient operability. Finally, concerning Ogawa Electric, assumed to become the Japanese side's responsible organization in this project: We have established a representative office in Ho Chi Minh City, rooted in our Asian expansion plan, and we have community-based policies in Vietnam in the same way as in Japan. In that we are already proceeding with discovery and initiation in matters related to Vietnam, a foudational system directed at the actualization of the project is in place.

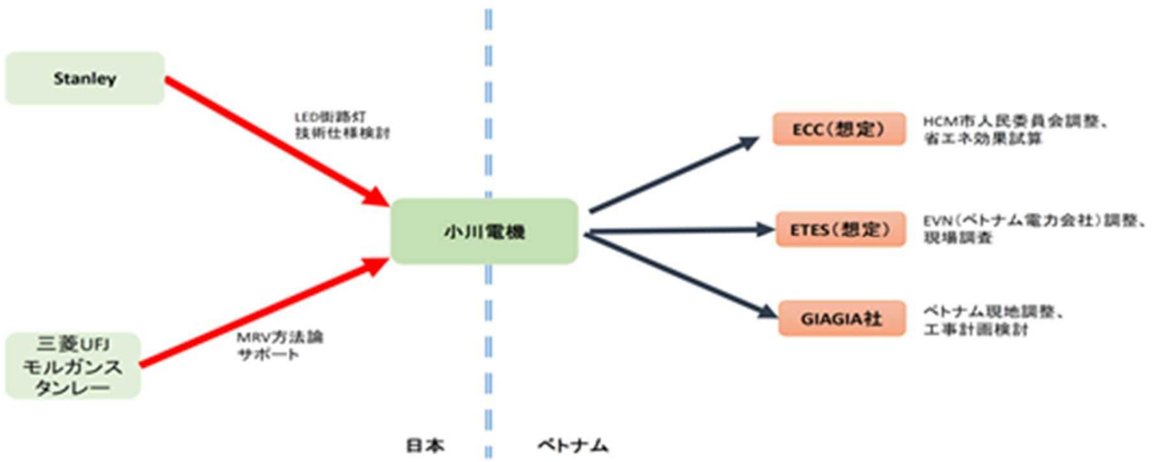
(d) Regional Extensibility of LED Street Lights

This project will proceed from switching over 4,000 lamps in Ho Chi Minh City to LED, followed by replacing 147,000 high pressure natrium lamps throughout the greater Ho Chi Minh

City region with LED ones, followed by pursuing the matter of newly establishing additional LED lamps. Continuing on, a sum total of 235,238 lamps in the eight provinces and municipalities comprising the southern Vietnam region will be converted to LED, and the supposition is to then advance into the principal cities of Vietnam which also include Danang and Hanoi. In terms of the future, we anticipate proceeding with expansion into all regions of the entire country via a strong organizational structure grounded in the cultivating of cooperative partnerships with various entities Ogawa Electric is coordinating business with, such as the Vietnamese company GIAGIA, ECC-HCMC and/ or other local energy conservation centers, Vietnam's nationalized electrical power corporation EVN, and ETEC, a consultant with whom we have established ties.
Regarding the 4,000 lamps for our project, we applied for fiscal year 2016 JCM Facilities Support Project registration and forged partnerships with ECC-HCMC, ETEC, and GIAGIA, with the ambition of advancing our street light conversion project all across the country by means of this more robust organization. We anticipate beginning with the introduction of the equipment for the 4,000 lamps in Ho Chi Minh City. After that, we will convert 147,000 high pressure natrium lamps throughout the greater Ho Chi Minh City area to LED. The product to be used offers a high competitive advantage not only as pertains to its technological aspects, but also in relation to cost. At the same time, Ogawa Electric, with our head office in Osaka, will provide support concerning sales promotions, the installation plan, and on-site coordination. Founded upon our community-based policies, Ogawa Electric is an electrical equipment trading firm that sells electrical equipment commodities in our 37 business offices centered in Osaka but also in Wakayama, Nara, Shiga, and Hyogo, as well as Tokyo. We established a representative office in Ho Chi Minh City four years ago, and are in the process of furthering our business development in Vietnam.

(3) Investigation regarding Project Feasibility

① System for Conducting the Investigation



・Ogawa Electric: Formulation of lighting equipment installation plan, selection of LED technology, review of business and financial plans

・ECC-HCMC: Coordination with People's Committee of Ho Chi Minh City and Vietnam Electricity Corporation, trial calculations regarding energy conservation

・Stanley Electric: Technological specifications review for LED lighting equipment

・GIAGIA Corp: On-site coordination with Vietnamese companies, construction plan formulation for sample equipment

・Mitsubishi UFJ Morgan Stanley Securities (MUMSS): Consideration of JCM methodology

(3) Detail of the research

① Overview of Vietnam and Its Current Electrical Power Supply Situation

(a) Overview

Official Country Name: Socialist Republic of Vietnam

・Population: 90,730,000　Urban: 33.1% of total population　Rural: 66.9%

・Area: 330,000 km^2 (roughly equivalent to area of Japan excluding Kyushu)

・Ethnicities: Kinh (90% of total population), 53 minority ethnic groups

・Religions: Buddhism (80% of total population), Catholicism, Caodaism (new religious movement), others

・Administrative Subdivisions: 58 provinces, 5 direct-controlled municipalities (Hanoi, Ho Chi Minh City, Haiphong, Danang, Can Tho)

・Rate of Unemployment: 2.1% overall, 3.4% in urban areas, 1.5% in rural areas　[when considering working population as persons aged 15-55]

・Rate of Impoverished Households: 8.2%

Ho Chi Minh City is the leading urban center among Vietnam's five major metropolitan areas. It is located in the southern part of Vietnam, and with an area of 2,095 km^2 within its municipal boundaries, it is the largest, most influential city in the south Vietnam region. The area is divided into 19 districts and 5 prefectures, and has a population of 7,396,446 people.

* Source: JETRO Vietnam Report

(b) Current Electrical Power Supply Situation in Vietnam

○Total Power Generation: 145,540 GWh (11.1% increase from previous year)

・Breakdown by Power Source:　Hydropower: 41.1%, Natural Gas-fired Power: 30.7%, Coal-fired Power: 25.9%, etc.

・Power Generation Installed Capacity: 32,047 MW (8.1% increase from previous year)

・Breakdown by Power Source:　Hydropower: 41.9%, Coal-fired Power: 28.6%, Natural Gas-fired Power: 21.6%, etc.

○ Rate of Electrification (Prevalence Rate): 96.5%

・Lowest in northern areas, particularly in mountainous regions

○Average Cost of Electricity: 1,622 dong/ kWh (7.5% increase from previous year), 7.6 cents/ kWh (5.4% increase)

・No base charge. Costs are set at one of three levels (six levels for individual households) depending on the time slot.

○7th National Master Plan for Power Development ("Power Master Plan VII" or PDP7)

・A project for electrical power development in the 2011-2020 period, in anticipation of the year 2030. Its aim is to achieve total power generation of 330,000 to 362,000 GWh and a power generation installed capacity of 75,000 MW by 2020.

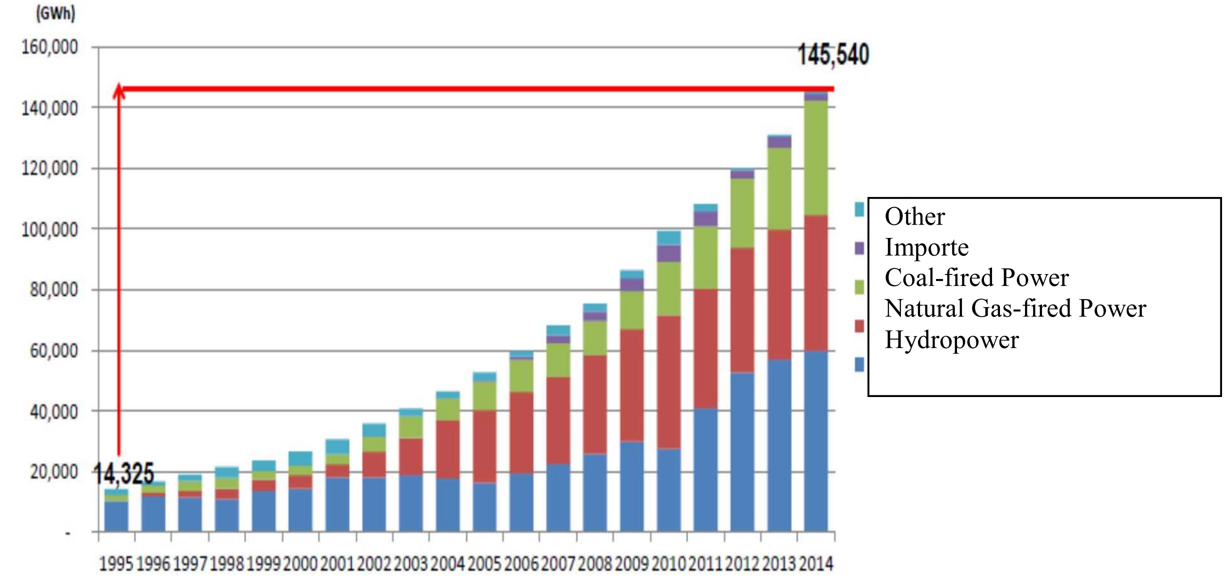
○EVN (abbreviation of Vietnam Electricity)　Vietnam Electricity Corporation

・Established as a government-owned enterprise in 1994. Engaged in the generation, transmission, distribution, and sale of electrical power.

〇Trends in Total Power Generation

As shown in the graph below, together with an increase in Vietnam's GDP to a level seven times greater in 2014 than it had been in 1995, the country's total power generation in 2014 was approximately ten times greater in comparison to 1995. This underscores the urgent need for rapid development of electrical power sources in Vietnam.

Trends in Total Power Generation



単位:USD

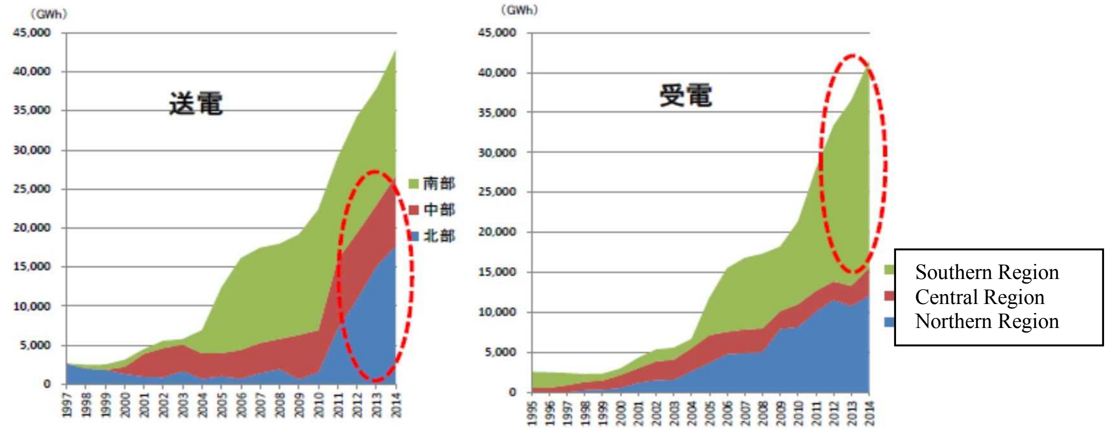
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
一人あたりGDP	289	338	362	361	375	402	413	440	489	604	700	797	920	1154	1181	1297	1532	1753	1902	2053

* Source: JETRO Vietnam Electric Report in October 2015

〇Current Situation of Total Incoming Power among Northern, Central, and Southern Areas at 500 KV

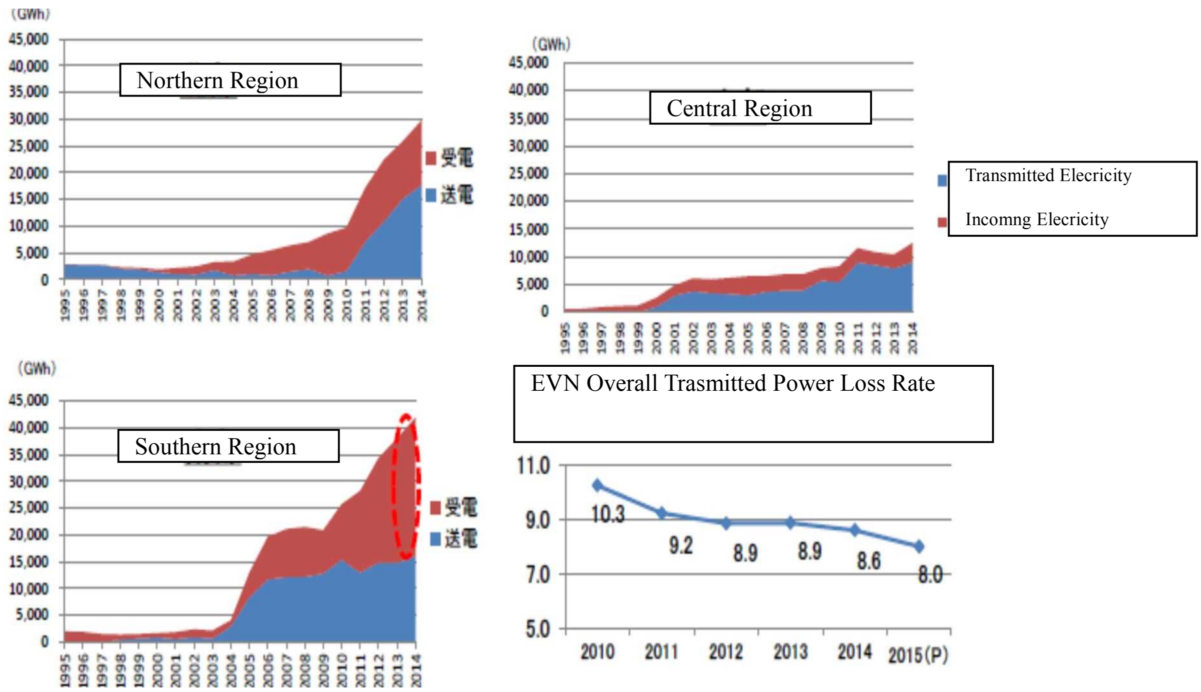
As shown in the following graphs, electrical power transmission from the northern and central regions is increasing, while in southern areas incoming power has been rising sharply. In other words, with its rapid increase in demand for electrical power, the south is depending upon the northern and central parts of the country for the transmission of that power. However, insofar as the resultant transmitted power loss is extremely high, distribution which achieves a greater balance between supply and demand in each respective region is desirable. Moving forward into the future it will be necessary to reduce Ho Chi Minh City's quantity of incoming electricity.

Current 500 KV Total Incoming Power Situation



* Source: JETRO Vietnam Electric Report in October 2015

Current 500 KV Total Incoming Power Situation (Regional Comparison)



* Source: JETRO Vietnam Electric Report in October 2015

(4) Investigation Contents and Results

① Current Roadway Lighting Situation in Vietnam

(a) Energy Conservation Regulations and Policies concerning Street Lights in Vietnam

・In regulations governing the efficient utilization of energy that were issued by the Vietnamese Assembly on June 17, 2010, it was specified that organizations which manage street lights should be in compliance with the following stipulations:

“The technical regulations of the given locality for city street lights should be followed, and high efficiency lighting equipment should be prioritized.”

“In the case of servicing and/ or repairing city street lights, energy-saving lighting equipment should be used.” And,

“In the case of managing the operation of city street lights, management should vary based on the given region, season, and time of day.”

・In government regulations which were officially proclaimed on December 20, 2010 (No. 2331/QD-TTg), a particular premium for the Vietnamese government’s efforts toward energy conservation was placed upon energy in the transportation sector.

・In government regulations which were officially proclaimed on January 26, 2011 (Direction 171/Ct-TTg), emphasis was placed upon energy-saving measures such as changing out high pressure natrium lamps when exchanging lamps used for roadway lighting, and introducing a system of automatic light control based on whether it is daytime or nighttime.

(b) Current Roadway Lighting Situation in Ho Chi Minh City
In recent years, urbanization of the outskirts around cities in Vietnam has been occurring rapidly, leading to a heightened demand for public/city street lighting. In the 1990s, investment in public lighting had been progressing only in large-scale cities such as Hanoi, Ho Chi Minh City, Haiphong, Hue, and Danang. However, today there are 646 cities and suburbs throughout Vietnam which are investing in public lighting, and as the urbanization of the areas around the country’s big cities continues, investment in public lighting is increasing by a percentage of 10-20% every year.
Ho Chi Minh City’s public lighting is under the management of the Transportation Bureau of the People’s Committee of Ho Chi Minh City, and is divided into five separately-administered infrastructure and transportation management districts (No.1, No. 2, No. 3, No. 4, and the Saigon River Tunnel as No.5). Actual servicing and repair of the street lights is performed by the Saigon Public Lighting Company. Normal Rated Power (NRP) of the public lighting in Ho Chi Minh City as a whole is 27,986 kW, and electricity consumption comes to 117,500,000 kWh annually. The annual cost of electricity amounts to approximately 186,800,000,000 VND (approximately ￥980,000,000 JPY).
In Ho Chi Minh City at present there are 137,869 street light lamps installed. Of these, 1,200 are LED lamps installed on a trial basis; 11,013 are high pressure natrium lamps produced through support from France which are managed by the Central Management Center; and another 39,830 are street light lamps with dimming control capability.

(c) Ho Chi Minh City Future Plans concerning Public Lighting
In terms of Ho Chi Minh City’s plans for public lighting moving forward, the city has indicated an interest in lowering electricity consumption, increasing the quality of illumination, and reducing running costs. Public lighting is viewed as an essential public service for ordinary citizens, meaning that the following demands must be met in the future:

・Increase quality of/ improve public lighting environment
・Reduce electricity consumption of street lights and lower maintenance costs every year
・Toward a heightening of awareness regarding environmental preservation both domestically and abroad, lower quantity of emissions of carbon dioxide
・Enhance image as “eco” and “green” yet refined city, and attract new investment concerning industry, culture, and tourism

(d) Future Support concerning Ho Chi Minh City Public Lighting
In order to accelerate the materialization of the plan described above, Ho Chi Minh City is taking action of its own accord in the following ways:

・During peak hours, 50-70% of all street lights are being switched off. However, this cannot be said to be a radical solution to the underlying problem. Rather, there is a possibility that it could decrease the expected lifespan of the lighting, have a dangerous effect for persons using the roadway, etc.
・Street lights which utilize a lighting dimmer-stabilizer have been installed and are being managed in such a way that when roads are at their peak in terms of congestion, the lamps respond by alighting to 100% of their brightness, while during off-peak hours, their output is lowered to 40-60%.
・11,013 of the city's street light lamps are being managed by the Central Management Center, and their illumination output is being controlled and monitored at a desired level.

(e) Issues related to Installation of LED Street Lights
According to the contents of the explanation provided by Ho Chi Minh City Public Lighting Company board member Mr. Dung at an ECC-sponsored seminar concerning the conversion of pulic lighting to LED that was conducted on August 11, 2015, the current situation with respect to Ho Chi Minh City's street lights is as follows:

・The first time that LED was utilized in public lighting in Vietnam was in 2008 in Danang.
・The present situation regarding public lighting within Ho Chi Minh City is that there is an aggregate of 136,869 lamps, which includes 97,039 high pressure natrium lamps, 39,830 fluorescent lamps, and approximately 1,200 LED lamps that are being adopted by means of World Bank's financial assistance, for trial operation, or for some other such purpose.
・For the public lighting corresponding to what in Japan would be referred to as "crime prevention lighting," there is a desire to consider adopting LED for the portion that currently uses 30 W to 50 W fluorescent lamps.
・In order to adopt LED, it is important to define the plans and orientation of the city as a whole with regard to product standards and regulations, technology and product quality, cost, and finance.
・Various problems have arisen when using LED manufactured in China or South Korea.
・Previously, LED was tried in "crime prevention" lights on a test basis, but in the event that light up failure occurred, since there was no product component, repair support could not be carried out.

② Investigation to Verify LED Street Lights
We performed an investigation concerning the current state of roadway lighting in Ho Chi Minh City, carrying out the selection of verification test target streets through cooperation with ECC-HCMC. Based on the results thereof, we conducted verification tests to gather on-site verification data pertaining to technological applicability, level of illumination/ brightness, and visibility, and we identified and reported on the degree of energy conservation effectiveness. We chose the four streets listed below, confirmed the actual conditions of the street lights on each, and initiated our review of the roads which were to further the conversion to LED.

No	Street name	District	RatedPower Consumption			Height (m)	Installation Placement	Distance between street lights (m)
			250W	150W	100W			
1	Linh Dong	Thu Duc	67			8	One-side	40
2	Khu noi bo Nam Long	District 9	21	91		11	One-side	25－35
3	Duong 47Quoc Huong	District 2			11	7.5	One-side	30
4	Duong so3 KhuHaiQUan	District 2			11	7.5	One-side	30

(a) Detailed Investigations of 4 Selected Streets

・Linh Dong Street Investigation Overview

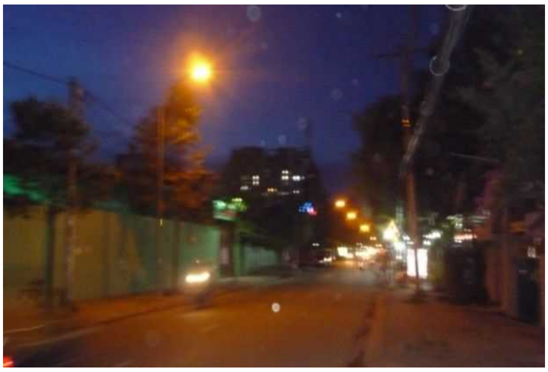
Road Width: 8 m; Road Surface: Asphalt; Street Light Installation Status: One side only; Height of Street Lights: 6 m, 8 m; Distance of Intervals between Street Lights: 30 m, 31 m; Lamp Type: 250 W high pressure natrium; Number of Lamps: 67

- Road Width: 8 m (Pedestrian footpath: 2-3 m)
- Road Surface: Asphalt
- Street Light Installation: One side only
- Height: 6 m, 8 m
- Distance of Intervals between Street Lights: 30 m, 31 m
- Lamp Type: High pressure natrium
- Rated Power Consumption: 250 W
- Number of Street Light Lamps: 67

Measurement Point 1 Distance of Interval between Street Lights: 30 m Street Light Distance from Pedestrian Walkway: 1 m Street Light Height: 8 m Units: 1 x				Measurement Point 2 Distance of Interval between Street Lights: 31 m Street Light Distance from Pedestrian Walkway: 1 m Street Light Height: 6 m Units: 1 x			
Street Light Placement			Street Light Placement	Street Light Placement			Street Light Placement
31	13	6	36	27	2	2	16
28	14	7	38	29	2	4	17
23	10	8	29	20	5	5	10
19	7	4	23	17	4	3	7
Other Preconditions - Traffic Volume: Heavy - Roadside Trees: Few - Brightness of Road Surroundings: Bright				Other Preconditions - Traffic Volume: Heavy - Roadside Trees: Few - Brightness of Road Surroundings: Bright			

* The brightness distribution measurement points were at 4 m by 4 m from the street lights.

【Measurement Point 1】



【Measurement Point 2】

・ Khu Noi Bo Nam Long Street Investigation Overview

– Road Width: 6-8 m (Pedestrian footpath: 2-3 m)
– Road Surface: Asphalt
– Street Light Installation: One side only
– Height: 6 m, 8 m
– Distance of Intervals between Street Lights: 25-35 m
– Lamp Type: High pressure natrium
– Rated Power Consumption: Twenty-one 250 W lamps, ninety-one 150 W lamps

<table>
<tr><td colspan="4">Measurement Point 1
Lamp Type: 250 W
Distance of Interval between Street Lights: 30 m
Street Light Distance from Pedestrian Walkway: 1 m
Street Light Height: 11 m
Units: 1 x</td><td colspan="4">Measurement Point 2
Lamp Type: 150 W
Distance of Interval between Street Lights: 26 m
Street Light Distance from Pedestrian Walkway: 1 m
Street Light Height: 9 m
Units: 1 x</td></tr>
<tr><td>Street Light Placement</td><td></td><td></td><td>Street Light Placement</td><td>Street Light Placement</td><td></td><td></td><td>Street Light Placement</td></tr>
<tr><td>33</td><td>7</td><td>4</td><td>32</td><td>27</td><td>2</td><td>2</td><td>26</td></tr>
<tr><td>28</td><td>13</td><td>8</td><td>33</td><td>20</td><td>2</td><td>4</td><td>21</td></tr>
<tr><td>23</td><td>11</td><td>7</td><td>25</td><td>14</td><td>5</td><td>5</td><td>15</td></tr>
<tr><td>19</td><td>7</td><td>6</td><td>20</td><td>12</td><td>4</td><td>3</td><td>9</td></tr>
<tr><td colspan="4">Other Preconditions
- Traffic Volume: Light
- Roadside Trees: Many
- Brightness of Road Surroundings: Bright</td><td colspan="4">Other Preconditions
- Traffic Volume: Light
- Roadside Trees: Many
- Brightness of Road Surroundings: Bright</td></tr>
</table>

* The brightness distribution measurement points were at 4 m by 4 m from the street lights.

【Measurement Point 1】

【Measurement Point 2】

・47 Quoc Huong Street Investigation Overview

– Road Width: 5-7 m (Pedestrian footpath: 2-3 m)
– Road Surface: Asphalt
– Street Light Installation: One side only
– Height: 7.5 m
– Distance of Intervals between Street Lights: 25-35 m
– Lamp Type: High pressure natrium
– Rated Power Consumption: Eleven 100 W lamps

Measurement Point 1 Distance of Interval between Street Lights: 32 m Street Light Distance from Pedestrian Walkway: 1 m Street Light Height: 7.5 m Units: 1 x				Measurement Point 2 Distance of Interval between Street Lights: 32 m Street Light Distance from Pedestrian Walkway: 1 m Street Light Height: 7.5 m Units: 1 x			
Street Light Placement			Street Light Placement	Street Light Placement			Street Light Placement
20	3	1	22	17	1	1	20
18	3	3	19	18	2	1	16
13	5	4	15	14	2	2	11
8	4	4	10	10	2	3	9
Other Preconditions - Traffic Volume: Light - Roadside Trees: Many - Brightness of Road Surroundings: Average				Other Preconditions - Traffic Volume: Extremely light - Roadside Trees: Many - Brightness of Road Surroundings: Average			

* The brightness distribution measurement points were at 4 m by 4 m from the street lights.

【Measurement Point 1】

【Measurement Point 2】

・Khu Hai Street Investigation Overview

- Road Width: 6-8 m (Pedestrian footpath: 2 m)
- Road Surface: Asphalt
- Street Light Installation: One side only
- Height: 7.5 m
- Distance of Intervals between Street Lights: 30-35 m
- Lamp Type: High pressure natrium
- Rated Power Consumption: Eleven 100 W lamps

Measurement Point 1 Distance of Interval between Street Lights: 30 m Street Light Distance from Pedestrian Walkway: 1 m Street Light Height: 7.5 m Units: 1 x				Measurement Point 2 Distance of Interval between Street Lights: 30 m Street Light Distance from Pedestrian Walkway: 1 m Street Light Height: 7.5 m Units: 1 x			
Street Light Placement			Street Light Placement	Street Light Placement			Street Light Placement
18	3	1	20	19	2	1	17
15	5	3	16	17	3	3	16
12	5	4	14	12	4	2	10
8	4	4	11	10	2	3	9
Other Preconditions - Traffic Volume: Light - Roadside Trees: Few - Brightness of Road Surroundings: Average				Other Preconditions - Traffic Volume: Light - Roadside Trees: Few - Brightness of Road Surroundings: Average			

* The brightness distribution measurement points were at 4 m by 4 m from the street lights.

[Measurement Point 1] [Measurement Point 2]

・Summary of Street Light Survey

Street measurement was conducted at 4 locations within Ho Chi Minh City. However, at each street, installation environment of the street light and the surrounding environment of the street differed, and illuminance also differs greatly between streets. When LED lamp is actually being installed, a detailed condition assessment of each location will be crucial.

Street Light Conditions

No	Street Name	Area	(m) Street Width (m)	High Pressure Sodium Light Rating			(m) Street Light Height	Street Light Installation Position	Distance Between Lamps
				250W	150W	100W			
1	Linh Đông	Thủ Đức	8	67			8	One Side	40
2	Khu nội bộ Nam Long	9	8	21	91		11	One Side	25 - 35
3	Đường 47 Quốc Hương	2	5-7			11	7,5	One Side	30
4	Đường số 3 khu Hải Quân	2	6-8			11	7,5	One Side	30

Street Light Conditions

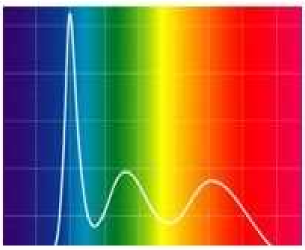
No	Street Name	Average Illuminance (lux)
1	Linh Đông	14,5
2	Khu nội bộ Nam Long	17,1
		10,7
3	Đường 47 Quốc Hương	8,8
4	Đường số 3 khu Hải Quân	8,5

(b) Examination of LED Street Light Specification

• Technical Advantages of LED Street Light Whose Introduction is Considered

Stanley Electric CO., Ltd. will be able to manufacture street lights that utilize LED light source by employing the technical expertise gained through manufacturing of LED lighting for cars. Using COB module, which Stanley Electric CO., Ltd. is newly developing, as the light source, product development for this public project will be conducted with improvement of efficiency, lightness and thinness as its objectives. The following 4 points can be listed as the expertise of Stanley Electric CO., Ltd. Firstly, development of LED device. We can manufacture products that meet the requirements of our customers even in low color temperature (2000K – 2400K) by utilizing fluorescent substance blending method unique to Stanley and LED with Ra96 color rendering property. Moreover, advanced technology is applied on packaging. Among conventional LED devices, it is common for silver mirror layer to sulfurize and luminous flux to decrease after installation. However, LED devices of Stanley Electric CO., Ltd. treated against sulfurization, they hardly show decrease of luminous flux.


硫化対策LEDデバイス


3波長スペクトル分布

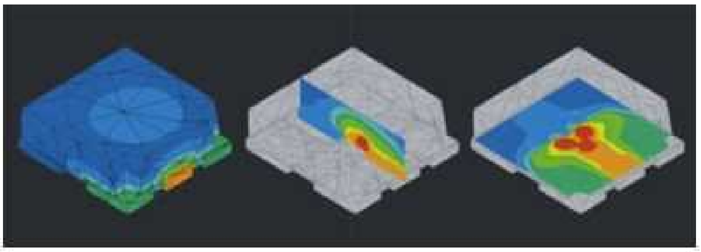

暖かみのある低色温度を採用したLED電球

The second point is the optical lens/reflector technology. Stanley Electric CO., Ltd. adopts an integrated system that includes design, metal mold formation and production. This enabled us to "offer high quality lens without color separation or glare" and "realization of efficient extraction of light".



MR16型LEDランプ

The third point is its advanced light distribution simulation technology. It realized "reduction of development time and cost" by unifying automobile headlight simulation and LED optical performance evaluation. Lastly, the fourth point is its substantial reliability test facility for conducting thermal conduction analysis simulation. In manufacturing LED lighting equipment, how efficiently the lighting equipment can radiate heat is crucial. Therefore, if this heat radiation technology is not properly established, it causes decrease of luminous flux and shorter lifespan.



LEDデバイス放熱シミュレーション

Stanley Electric CO., Ltd. has been selling street light in the ASEAN market, and it has the record of around 8000 installations of street lights, especially in Thailand. From Vietnam, Thailand and Indonesia where it already has factories, Stanley Electric CO., Ltd. regards the whole of ASEAN area as one region, and it will conduct the whole production process from part procurement to assembling of the finished product inside Vietnam. Through this, realization of local cost and maintenance, which are regarded as challenges, can be progressed with best possible preparation.

Introduction Record in the ASEAN Area

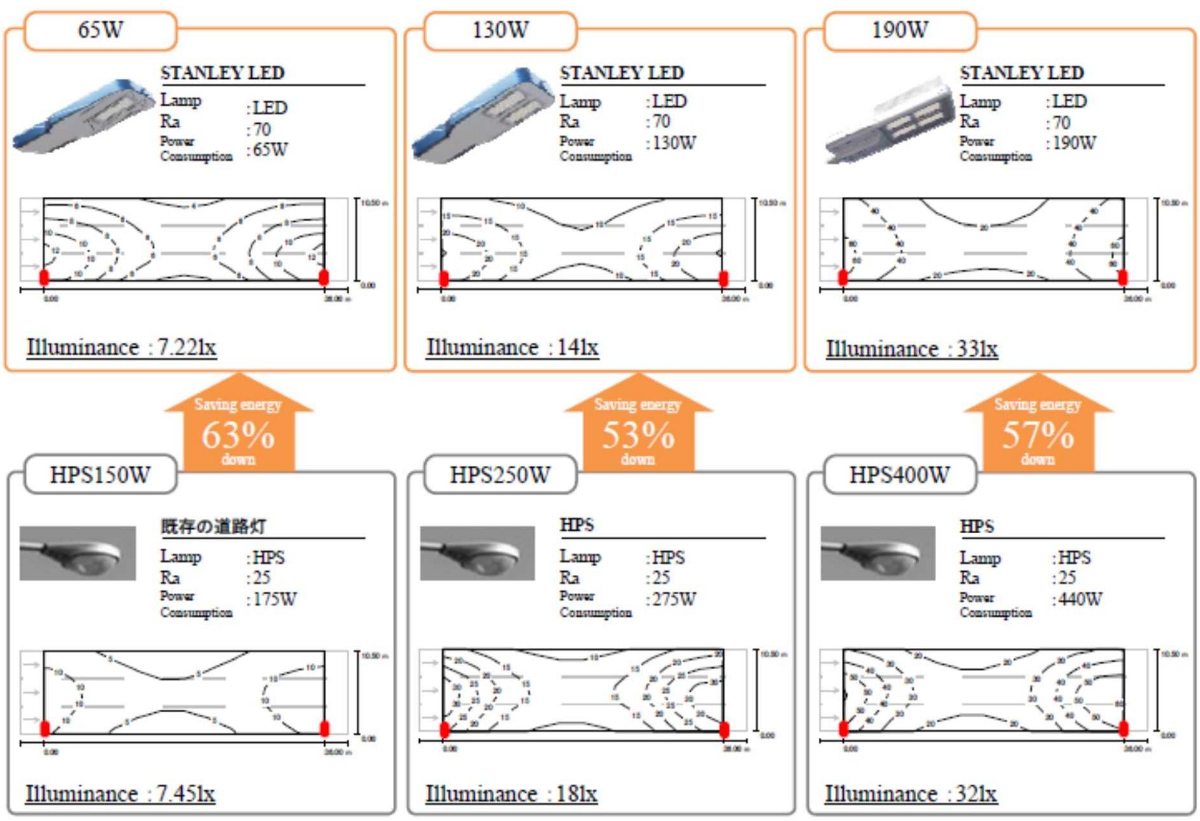
Customer	Delivery period	Qty (pcs)	Type (Watt)	Application
Factories in Thailand (THAILAND)	2009-Current	Over 3,000	45W-120W	Street Light
Bangkok Metropolis (THAILAND)	2010	180	15W-30W	Pedestrian Bridge
LAO PDR Electric (THAILAND)	2010	350	90W	Street Light (Main Road Lao <-> Thai)
Port of Authority (THAILAND)	2010	120	90W	Street Light near the port
ADB project (THAILAND)	2011	220	150W	Rural Road
Air Force base (THAILAND	2011	280	75W	Street light
Factories in Indonesia, Vietnam and Cambodia	2011	Over 20	75W-125W	Street light
Shanghai City (CHINA)	2011	100	75W	Street light
Industrial estate (THAILAND)	2012-current	Over 2,000	75W, 100W	Street light
Local Government (THAILAND)	2012-current	Over 700	75W, 125W	Street light Rural Road

Yangon City（MYANMAR）	2013	185	60W	Street light, Flyover
Highway（THAILAND）	2014	800	125W	Road light

(c) Simulation Before and After Installation

Regarding the simulation of replacement of high pressure sodium Light by LED street light, as shown in the document below, more than 50% reduction of electricity consumption is achieved while retaining almost the same illuminance (lx).

Coparison HPS with LED (65W, 130W)



(d) Electricity Consumption and CO2 Reduction According to the Simulation Result

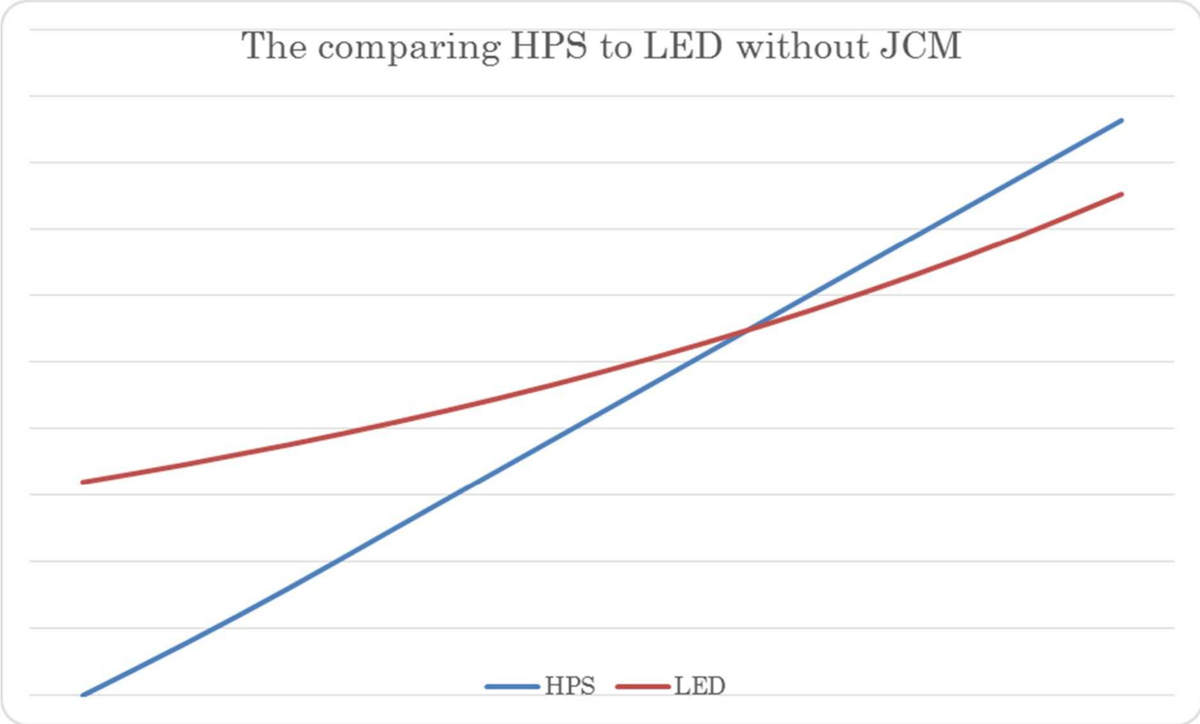
		Reference Lighting Equipment			Project Lighting Equipment		
		HPS	HPS	HPS	LED	LED	LED
		150W	250W	400W	65W	130W	400W
Quantity of fixture(pcs)		1,000	2,500	500	1,000	2,500	500
Powe Consuption(W)	Lamp	150	250	450	65	130	250
	Ballast etc	30	50	50	7	13	15
Operationg hours (h)		12	12	12	12	12	12
Operationg days(日)		365	365	365	365	365	365
Operationg time per a year(h)		4,380	4,380	4,380	4,380	4,380	4,380
Total Wattage(kWh)		657,000	2,737,500	985,500	315,360	1,565,850	580,350
Total Wattage(kWh)		4,380,000			2,461,560		
emmision factor (tCO2/kwh)		0.541					
amount of emission(tCO2/year)		2,369			1,332		
reduce emission(tCO2/year)					Δ 1,037		
reduce emission for 10years(tCO2)					Δ 10,370		

* In order to guarantee maintenance quality, reference of high pressure sodium light only calculated the electricity consumption of the lighting section, while LED was calculated as the total of lighting section and power source section

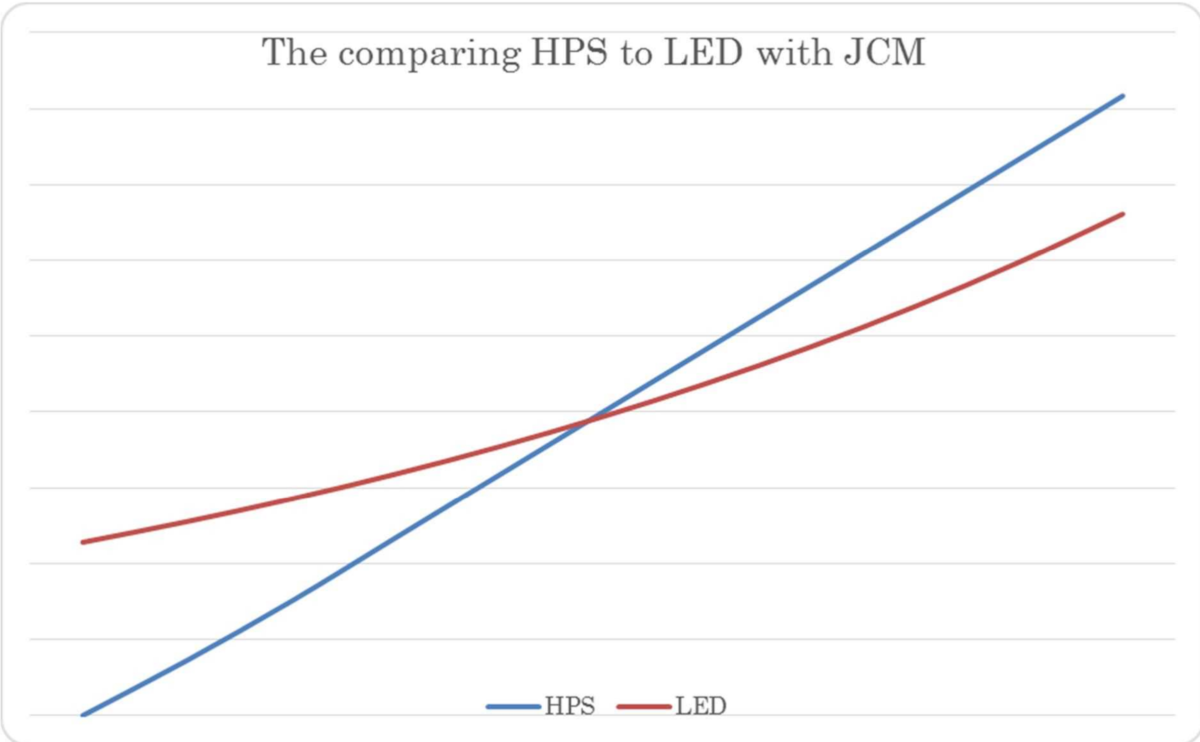
• If 4000 high pressure sodium lights are replaced by LED, yearly CO2 reduction will be 1,038tCO2/year.

(e) On Investment-Return Period in Years

• When the Joint Crediting Mechanism is not used, the initial cost of installing LED street lights will be recovered in about 6 to 7 years through the difference in electricity cost between LED lights and high pressure sodium lights.



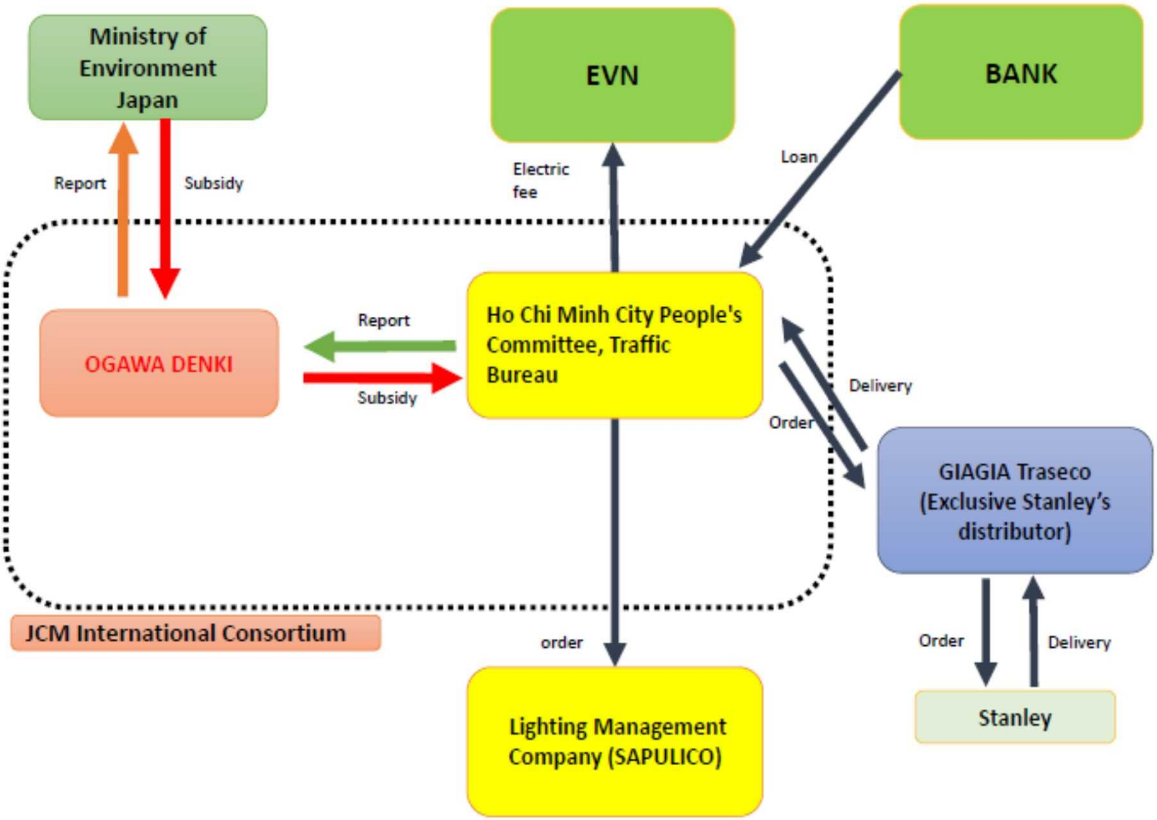
• When the Joint Crediting Mechanism is used and 50% subsidy is given, the initial cost of installing LED street lights will be recovered in about 4 to 5 years through the difference in electricity cost between LED lights and high pressure sodium lights.



(5) Content of Survey toward JCM Project Realization

① Confirmation of Project Structure

Project structure can be examined by the structure shown below.



(a) Ho Chi Minh City People's Committee, Traffic Bureau

The ownership of street lights belongs to Ho Chi Minh City People's Committee, and replacement of street lights with LED will be within the purview of its Traffic Bureau. As the ownership of the street lights will belong to Ho Chi Minh City People's Committee, it has to be included in the international consortium.

(b) Lighting Management Company (SAPULICO)

The lighting management company is appointed to maintain/manage public lighting by the People's Committee. In Ho Chi Minh City, 130 billion dong (5.9 million US dollar, approx. 733,450,000 yen) yearly budget is allocated for the maintenance/management of public lighting, and the company maintains/manages the public lighting using this budget. The lighting management company maintains/manages public lighting based on the instruction given by the 5 areas respectively. Each area submits the report regarding maintenance/management to the Traffic Bureau for conducting works.

(c) Vietnam Electricity (EVN)

Regarding public lighting, EVN collect electricity bill, and generate and distribute electricity. It is engaged with power generation/distribution business. They also import/export electricity, construct and manage power stations. There are 3 power companies within EVN. Divided by region, they are; EVN NPC (Northern Power Corporation), EVN CPC (Central Power Corporation), EVN SPC (Southern Power Corporation), EVN HANOI (Hanoi City Power Corporation), EVN HCMC (Ho Chi Minh City Power Corporation) and EVN NPT (National

Power Transmission Corporation). EVN HCMC in particular is responsible for collection of electricity bill for public lighting in Ho Chi Minh City as well as power supply and electricity meter management. Payment of electricity bill will be done by Ho Chi Minh City People's Committee.

② Confirmation of Finance Scheme
Even if Ho Chi Minh City People's Committee receives equipment subsidy of JCM and decide to proceed with the project, it does not mean it has sufficient budget for public lighting. Therefore, in order to pay for the remaining amount that is not covered by the subsidy, finance scheme for this project will be necessary. Below is the result of examination of possible finance scheme.

(a) Examination of Loan from Various Financial Institutions
4 banks, namely 2 banks which are in capital tie-up with a Japanese megabank, Bank for Investment and Development of Vietnam (BIDV), one of 4 big public commercial banks which became independent by separating from State Bank of Vietnam, and Vietnam Development Bank where Japan Bank for International Cooperation is investing, were approached in order to find out if they could be willing to finance this street light project. All 4 of them answered that financing of this project would be possible.

(b) It is possible for the People's Committee to receive loan with an approval of the People's Committee. However, actually gaining approval from the People's Committee is supposed to take a very long time.

③ Examination of Methodology
Methodology was examined as below.

(a) Title of the methodology

Installation of LED lamps for surface road lighting system (Ver. 01)

(b) Terms and definitions

Terms	Definitions
LED	LED means light –emitting diode. LED. the high-efficiency and high-power technology makes LED to be lighting for street light , architectural lighting and so on. The lighting part of LED lighting is LED.
LED lamp for surface road lighting system	LED lamp for surface road lighting system is defined as the lamp to be installed in order to fulfill the demand to brighten the surface road (including pedestrian) to secure the people walking and the vehicle transportation in night time, with the application of LED. Its mirror lens surrounding lamp is arranged in angular wider. Average road surface luminance has to be appropriate by the following table. …

<table>
<tr><td></td><td>(Unit: cd/m^2)
<table>
<tr><th colspan="2">External Conditions / Road Classification</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td colspan="2" rowspan="2">National expressway</td><td>1.0</td><td>1.0</td><td>0.7</td></tr>
<tr><td>-</td><td>0.7</td><td>0.5</td></tr>
<tr><td rowspan="4">National highway</td><td rowspan="2">Major arterial road</td><td>1.0</td><td>0.7</td><td>0.5</td></tr>
<tr><td>0.7</td><td>0.5</td><td>-</td></tr>
<tr><td rowspan="2">Arterial road/collector road</td><td>0.7</td><td>0.5</td><td>0.5</td></tr>
<tr><td>0.5</td><td>-</td><td>-</td></tr>
</table>
Note External conditions A, B, and C refer to the following:
A.........A roadside condition where there is continuous light that affects the road traffic
B.........A roadside condition where there is intermittent light that affects the road traffic
C.........A roadside condition where there is little light that affects the road traffic
It meets “Guidelines of LED Luminaires for Road/Tunnel Lighting ” was issued on September, 2011 by Japanese Ministry of Land, Infrastructure, Transport and Tourism</td></tr>
<tr><td>Power consumption</td><td>Power consumption is defined as the total of Ballast wattage and Lamp wattage.
In order to ensure the conservativeness, power consumption of reference lamp (PCre) is only Lamp wattage.</td></tr>
<tr><td>Electricity consumption</td><td>Electricity consumed by equipment (in this methodology, by reference and project lamps). Electricity consumptions can be directory measured through the lighting control system, or can be calculated by multiplying the power consumption and the operation hours.</td></tr>
</table>

(c) Summary of the methodology

Items	Summary
GHG emission reduction measures	Installation of LED lamps for surface road lighting system reduces the consumptions of electricity provided from a electricity grid, which leads to the reduction of GHG emissions occurred in thermal power plants.
Calculation of reference emissions	Reference emissions are calculated by the electricity consumed by reference road lamps, and CO2 emission factor of the grid.
Calculation of project emissions	Project emissions are calculated by the electricity consumed by project LED road lamps, and CO2 emission factor of the grid.
Monitoring parameters	● Operation time of LED lamps for surface road lighting system (hour) ● Number of each type of LED lamps for surface road lighting to be replaced/installed ● Sum of power consumptions of reference lamps (W), determined before the project implementation based on the number of replacement by and/or new installation of project LED lamps for surface road lighting system ● Electricity consumed by project LED lamps for surface road lighting system (kWh)

(d) Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The project installs LED lamps for surface road lighting system in public areas, by replacing existing road lamps and/or newly introducing.
Criterion 2	The electricity to operate the surface road lighting system is supplied by the electricity grid.
Criterion 3	The project involves the lighting control system which measures the electricity consumptions of each LED lamp and which monitor the operation of each LED lamp.

(f) Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Consumed grid electricity used for the reference systems	CO2
Project emissions	
Emission sources	GHG types
Consumed grid electricity used for the project systems	CO2

(g) Establishment and calculation of reference emissions

○Establishment of reference emissions

Existing road lamps are mercury lamps and high-pressure sodium vapor lamps, which consumes a large amount of grid electricity.

Compared to existing lamps, the reference road lamps should be set as efficiency high-pressure sodium vapor (HPS) lamps, whose specs are set as follows:

Type of reference lamp	Power consumption (W)		Guidelines of LED Luminaires for Road/Tunnel Lighting ”	To be replaced by project LED lamps
HPS 150W	Lamp wattage	150W		LED 65W
	Ballast wattage	30W		
HPS 250W	Lamp wattage	250W		LED 130W
	Ballast wattage	50W		
HPS 400W	Lamp wattage	400W		LED 250W
	Ballast wattage	75W		

Reference emissions are calculated by the sum of the electricity consumptions of total reference lamps. Total electricity consumptions of reference lamps are calculated by the multiplication of the sum of the power consumption (W), the operation hours (h), and the grid emission factor (GEF) (tCO2/kWh). In order to secure the conservativeness of reference emissions, only the lamp wattage as the power consumption of reference lamps is used for the calculation. The operation hours of the reference lamps equals to the operation hours of the project LED lamps to be monitored through the lighting control system. The turn on/off of the lighting system is controlled by the lighting control system, whose timing is also monitored.

○Calculation of reference emissions

$$REp = \sum (PCre) * Hpj * GEFvn/1000$$

REp: Reference emissions for period p (tCO2)
PCre: Power consumption of each reference lamp (W)
Hpj: Operation hours of project LED lamps (hour), which is regarded as the same as operation hours of reference lamps
GEFvn: Grid emission factor of Vietnamese electricity grid (tCO2/kWh)

(h) Calculation of project emissions

Project emissions are calculated by multiplying the total electricity consumptions of project LED lamps to be monitored by the lighting control system, and the grid emission factor (GEF).

(i) Calculation of emissions reductions

$$PEp = \sum(ECpj) * GEFvn$$

PEp: Project emissions for period p (tCO2)
ECpj: Electricity consumptions of project LED lamp (kWh), to be monitored through the lighting control system (monitoring system)
GEFvn: Grid emission factor of Vietnamese electricity grid (tCO2/kWh)

(j) Data and parameters fixed ex ante

The source of each data and parameter fixed *ex ante* is listed as below.

<table>
<tr><th>Parameter</th><th>Description of data</th><th>Source</th></tr>
<tr><td>GEFvn</td><td>Grid emission factor of Vietnamese electricity grid. Here <u>0.541tCO2/kWh</u> is applied.</td><td>Vietnamese government’s official document</td></tr>
<tr><td>PCre</td><td><table>
<tr><td>Type of reference lamp</td><td>Power consumption (W) (only lamp wattage is used for the calculation to secure conservativeness)</td><td>Guidelines of LED Luminaires for Road/Tunnel Lighting ”</td><td>To be replaced by project LED lamps</td></tr>
<tr><td>HPS 150W</td><td>150W</td><td></td><td>LED 65W</td></tr>
</table></td><td></td></tr>
</table>

HPS 250W	250W		LED 130W
HPS 400W	400W		LED 250W

In general power consumptions of lamps are composed of lamp wattage and ballast wattage. In this methodology, for the calculation of the reference emissions with conservativeness, only the lamp wattage of reference lamps is used.

(k) Examination of Monitoring
A wireless extension unit called Node is attached to each street light. By installing a base unit equipped with GateWay at an appropriated distance, we will be able to monitor the information of each street light from our company server.

(5) Examination of PDD
(a) Project Summary
This project solicits replacement of 4000 street lights among 14000 street lights with LED light located in Ho Chi Minh City, in order to reduce electricity consumption and the maintenance works with utilizing the long lifespan of LED. Additionally, the standard such as illuminance and brightness follows the Guideline for Installation of LED Light to Road specified by the Japanese Ministry of Land, Infrastructure, Transport and Tourism. The site of the project is Ho Chi Minh City, the second largest city in the Socialist Republic of Vietnam. The business partner of the Vietnamese side will be the Traffic Bureau of Ho Chi Minh City People's Committee.

(b) Eligibility Requirements
• Ensure that there will be no difference before and after installation through conducting the site survey of the street light currently in use and produce simulation document before the installation of LED street light. Install LED street light based on “the Guideline for Installation of LED Light to Road” specified by the Japanese Ministry of Land, Infrastructure, Transport and Tourism in March 2015.
• The electricity of each street light is supplied by the electricity grid of Vietnam Electricity (EVN).
• This project requires not only the installation of LED street light but also of control system. This control system is able to schedule the LED street lights in order to turn them on and off, or regulate their brightness. It also can collect data regarding the electricity consumption amount of the length of operation, and gather them on the server.

(c) Emission Reduction Calculation
As shown in the table below, this project can achieve 1037t CO2 reduction per year, meaning from 2016 to 2020, 5185t CO2 can be reduced.

		Reference Lighting Equipment			Project Lighting Equipment		
		HPS	HPS	HPS	LED	LED	LED
		150W	250W	400W	65W	130W	400W
Quantity of fixture(pcs)		1,000	2,500	500	1,000	2,500	500
Powe Consuption(W)	Lamp	150	250	450	65	130	250
	Ballast etc	30	50	50	7	13	15
Operationg hours (h)		12	12	12	12	12	12
Operationg days(日)		365	365	365	365	365	365
Operationg time per a year(h)		4,380	4,380	4,380	4,380	4,380	4,380
Total Wattage(kWh)		657,000	2,737,500	985,500	315,360	1,565,850	580,350
Total Wattage(kWh)		4,380,000			2,461,560		
emmision factor (tCO2/kwh)		0.541					
amount of emission(tCO2/year)		2,369			1,332		
reduce emission(tCO2/year)					Δ 1,037		
reduce emission for 10years(tCO2)					Δ 10,370		

* In order to guarantee maintenance quality, reference of high pressure sodium light only calculated the electricity consumption of the lighting section, while LED was calculated as the total of lighting section and power source section

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	2,369	1,332	1,037
2017	2,369	1,332	1,037
2018	2,369	1,332	1,037
2019	2,369	1,332	1,037
2020	2,369	1,332	1,037
Total (tCO_{2e})	11,845	6,660	5,185

(6) Issues Facing the Realization of JCM Project

When conducting this survey for JCMFS, we had the aim to in the end prepare an application for JCM Equipment Subsidy Project. However, due to the scheme of international consortium, it was necessary for this street light project to form a scheme where the local municipality participates as the business partner. As it was extremely difficult to gain approval from the municipality even if we prepared budget for replacement cost of LED street light. Therefore, it was not possible to prepare the application within 2015. On the other hand, there were much information gained through this survey, including the management system of street lights in Vietnam, payment method for the electricity bill of street lights and the proposal/approval process within the People's Committee. Moreover, in order to measure the reduction in electricity consumption, it is necessary to install a monitoring system. However, installation of the monitoring system will increase the cost, and it will also lead to the loss of employment for those who are currently maintaining the street lights. These problems are also major hurdles in proceeding with this project. This information is highly valuable in turning Replacement Project of Street Lights with LED into a JCM Equipment Subsidy Project in future. We will proceed to prepare project utilizing these information.

3.3 CNG Taxi Dissemination Project

(1) Project Outline

① Project Outline

The aim of the project is to reduce the amount of GHG emission by replacing fossil fuel with CNG through modifying taxies owned by local taxi company in Ho Chi Minh City, the Socialist Republic of Vietnam (hereinafter referred to as Vietnam).

Three integrated business models below are considered in the project.

① CNG taxi business conducted by taxi company, *Mai Linh Corporation*.

② CNG supply business conducted by *Saisan Co.,Ltd* and its local subsidiaries.

③ CNG vehicle modification business conducted by *Ktech Corporation.*

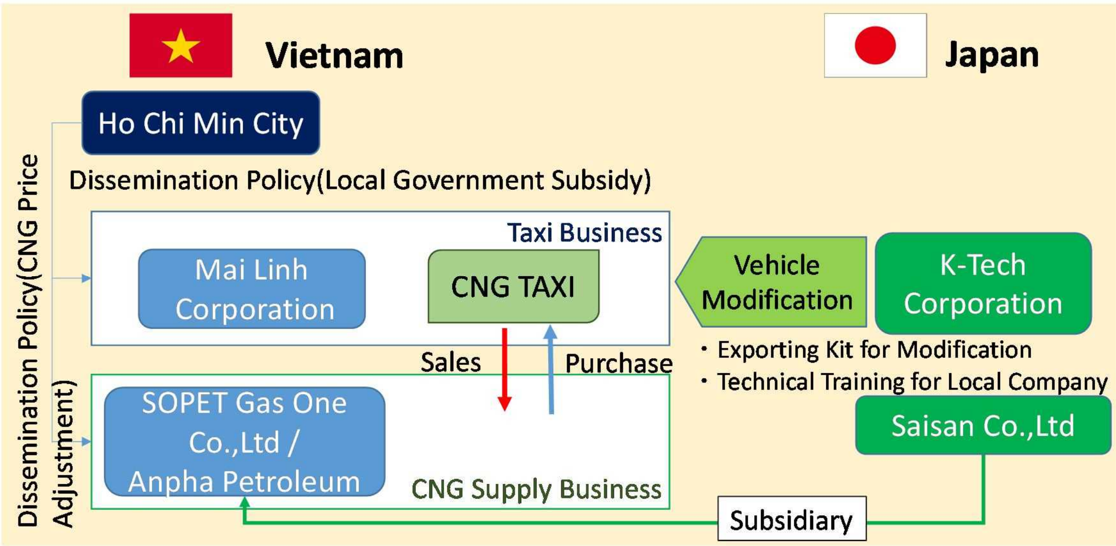


Figure 3.3.1 CNG taxi dissemination project outline

Mai Linh Corporation (hereinafter referred to as *Mai Linh*) is one of the major taxi companies in Vietnam, and is assumed to conduct the CNG taxi business in this project. In Vietnam, where there are abundant amount of crude oil and natural gas, the production of natural gas is expected to exceed that of oil in the future, hence the government is emphasizing on dissemination of CNG utilization. As such, the proposed CNG taxi business by *Mai Linh* is consistent with the government policy to promote CNG taxi.

In this project, *Saisan Co.,Ltd* (hereinafter referred to as *Saisan*) is assumed to run CNG supply stations through cooperation with its local subsidiaries. *Saisan*,, of which headquarter is in Saitama prefecture, sells LPG. Setting "business expansion in foreign countries" as its main business development strategy, the company has so far acquired 51% of the shares of *SOPET Gas Co., Ltd*, a natural gas supply company in Vietnam, in January 2012. *SOPET Gas* is then renamed to *SOPET Gas One Co., Ltd*, "*Gas One*" being the trademark of *Saisan,* and sell natural gas to Japanese companies in Vietnam. Today, the equity share of *Saisan* has increased to 75%, enabling the company to administrate *SOPET Gas One*. In addition, *Saisan* acquired 49% of the shares of *Anpha Petroleum* (hereinafter referred to as *Anpha*), which is the largest private LPG supply company in Vietnam, in October 2014. *Anpha* owns 20% of the share of total LPG for households in Ho Chi Minh City and 30% share of that in the northern part of Vietnam. With LPG supply business as its main business, *Saisan* is interested in expanding to CNG supply business which is consistent with a national policy.

Ktech is assumed to operate CNG vehicle modification business in this project. The company is an automobile maintenance company in Yamagata prefecture and has strength in modifying

vehicles to adapt to natural gas. The company is also considering business expansion abroad as an important matter and is interested in starting business in Vietnam, in addition to its current business in Myanmar, which has already been developed.
In accordance with the intention of Ho Chi Minh City to promote CNG usage and the interested of the city in CNG vehicles, this survey was planned. Firstly, to examine the feasibility of the business, the survey team researched on the trend of taxi business, CNG usage in public transportation, as well as related regulations. Then, the survey team conducted a trial calculations of the profitability of said three businesses.

② Business Environment Survey
(a) Trend of Taxi Business
In Vietnam, motorization has progressed rapidly and the number of registered vehicles has been increasing. Likewise, the number of taxies has also been increasing. The transition of the number of taxies owned by two major taxi companies in Vietnam are shown below.

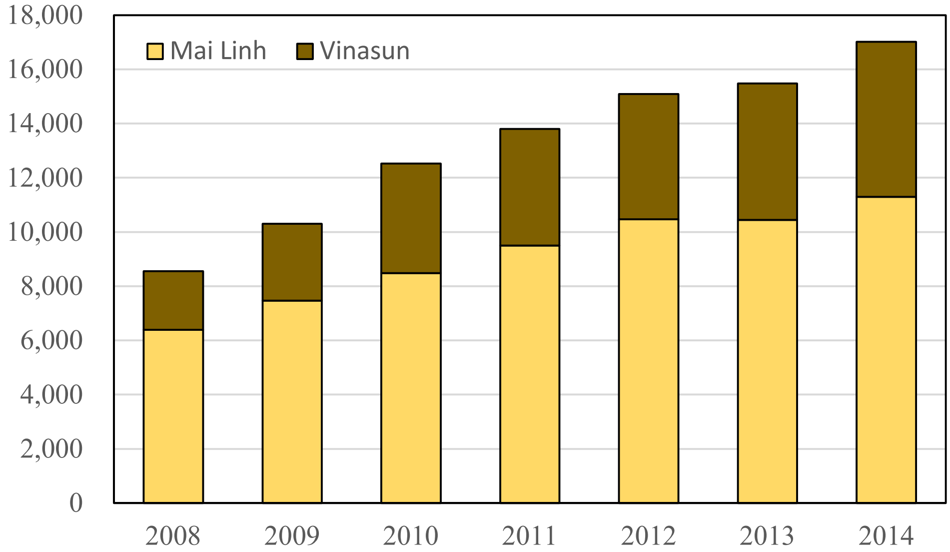


Figure 3.3.2 Transition of the number of taxies of Mai Linh and Vinasun in Ho Chi Minh City

The GDP growth of Vietnam has been relatively low in recent years, but remains above 5%. Therefore, the economy of the country is expected to continue to grow. As the population has a tendency to increase, the taxi business is expected to expand as well.

(b) Trend of CNG usage in public transportation
In Vietnam, where vehicle usage including taxi usage has become popular rapidly, there are expectations on the reduction of fuel costs and increasing interests in CNG usage from the environmental point of view. CNG is attracting attention from the locals due to its emission of less amount of GHG as compared to gasoline, as well as its emission of less amount of NO_x and SO_x which are air pollutants. In the National Strategy on Climate Change[2)], a goal is set in a way that "usage of CNG and LPG for buses and taxies is planned to be expanded till 20% by 2020 and 80% by 2050". Currently, in Ho Chi Minh City, CNG bus business has already begun.

[2)] Viet Nam Government Portal, (2011). National Strategy on Climate Change, IV. STRATEGY's MISSIONS Hanoi, Vietnam: Viet Nam Government Portal.
http://chinhphu.vn/portal/page/portal/English/strategies/strategiesdetails%3FcategoryId%3D30%26articleId%3D10051283

Based on expansion of taxi business and promotion of CNG usage by the national policy, a potentially huge demand is expected in vehicle modification business to adapt to CNG.

③ Feasibility study on establishment of CNG supply stations

In studying the feasibility of CNG supply business in Vietnam, the survey team clarified specifications needed to run the business by documentary searches and advanced examples studies.

(a) Expected specifications of CNG supply station

Through the study, the survey team found that the CNG stations in Vietnam is totally different from those in Japan.

In general, CNG stations in Japan are provided with CNG through pipes from natural gas storages to each station (shown in Figure 3.3.3), while CNG stations in Vietnam are not connected to storages through pipes. Therefore, to provide natural gas, natural gas is charged in large tanks at the storages (mother station) and the charged tanks are transported to supply stations (daughter station). This method is generally known as “mother-daughter supply method” (shown in Figure 3.3.4). The devices and equipment needed in this type of station in Vietnam are listed in Table 3.3.1.

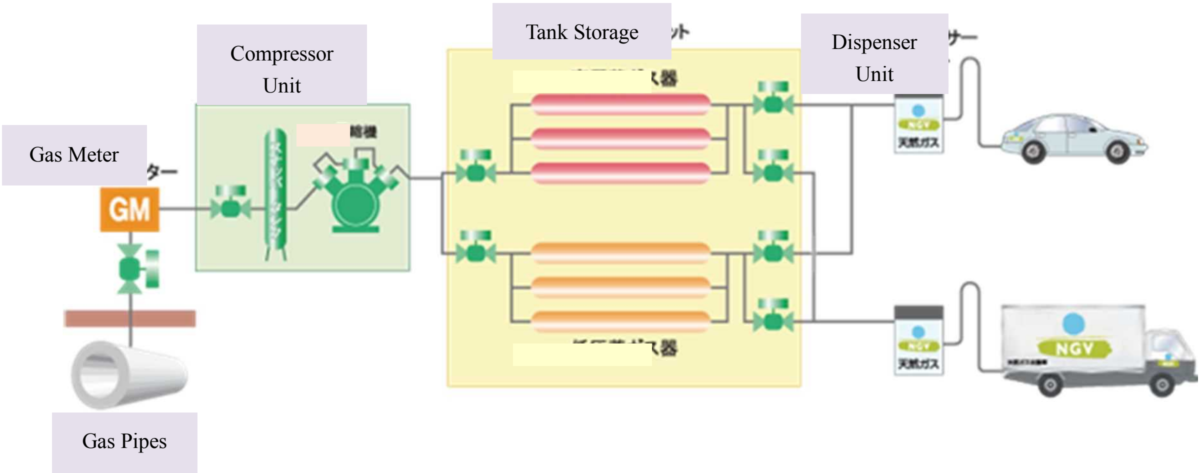
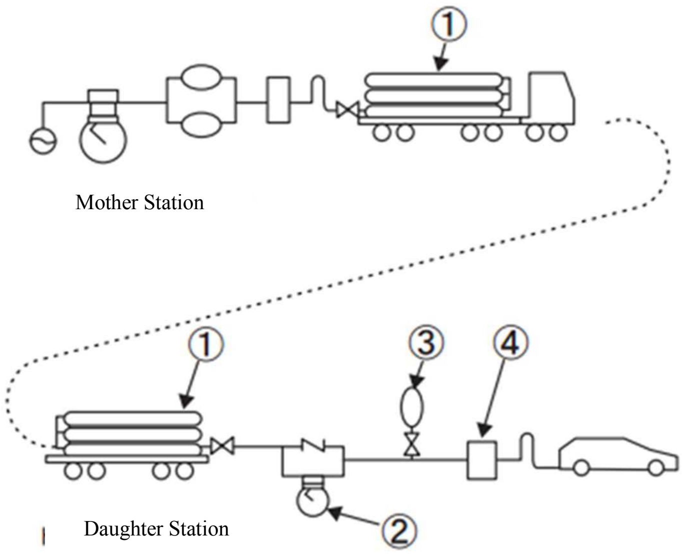


Figure 3.3.3 Ordinary CNG supply method in Japan



①Transportation Trailer ②Compressor ③Tank Storage ④Dispenser

Figure 3.3.4 Mother-Daughter Supply Method

Table 3.3.1 Devices and Equipment for CNG stations in Vietnam

No.	Device/Equipment	Purpose
1	Compressor	To increase pressure of CNG to be transferred to tank storage in daughter station.
2	Tank Storage (1,000L)	To store CNG tanks.
3	Dispenser	To transfer CNG from tanks to vehicles.
4	Emergency Control	To manually stop the supply of CNG from storage in case of emergency.
5	Trailer Post	To move CNG tanks from the trailer at daughter station.
6	Transportation Trailer	To transfer CNG from mother station to daughter station.

The survey team found out that the initial cost in Vietnam would be higher than that of Japan because 5. Trailer Post and 6. Transportation Trailer are necessary, which are conventionally not needed in Vietnam.
Through the observation of CNG stations owned by *Petrovietnam Southern Gas Joint Stock Company* (hereinafter referred to as *PVGS*), the survey team clarified the specifications above. *PVGS* owns four stations in the city, which are currently supplying CNG to 100 buses. The survey team contacted *PVGS* through *Anpha, and* conducted hearing survey and observation of CNG stations.
(b) Expected operation structure of the CNG station
The survey team researched on the operation structure in local CNG stations and found out that three staffs are required at all times to operate the stations. Of which, one is a service staff and the remaining two are guards. The working shift for the staffs is 8 hours for each turn. As pressure monitoring is obligatory in Vietnam, this operation structure is needed.
Through the research, the survey team finally acquired specifications of CNG stations in Vietnam and the operation structure. Based on the information, the team conducted a trial calculation on the profitability of the project.

④ Survey on the taxi modification technology introduction
In this business, it is assumed that *Ktech* modifies *Mai Linh's* taxies from existing gasoline taxies to CNG taxies. The survey team examined the feasibility of modification in terms of regulations and technology.

(a) Regulation related to vehicle modification
Regarding the modification of *Mai Linh* taxies, there are two options: ① importing modified CNG vehicles from Japan, and ②Importing modification kits from Japan and conduct taxi modification at local maintenance factories.
In November 2013, the imports restriction was introduced (Decree 187/2013/ND-CP), and right steering wheel vehicles (including vehicles used to be right steering wheel vehicles) is prohibited in import. As Japanese vehicles are right handed, it is impossible to export modified vehicles from Japan to Vietnam.
On the other hand, importing devices and equipment related to modification is allowed. Therefore, it is possible to import modification kits and conduct modification in local factories. The survey team confirmed that there are no tariffs for modifying kits. According to the

ASEAN-Japan Comprehensive Economic Partnership Agreement (AJCEP), tariffs for the abovementioned goods are exempted. In this agreement, modification kits for this project are categorized in “No 87, vehicles except for railways and rail motors, its goods, and accessories” and are classified as goods which are exempted from tariff.

(b) Technology related to vehicle remodeling
Mai Linh owns a total of 10,900 taxies as of 2013[3], and the vehicle models are shown in Table 3.3.2 below. The fuel efficiency of Japanese brands are approximately 9 km/L, and the weights range between 1,000-1,600kg. These vehicles are suitable for modification using modification kits by *Ktech*.

Table 3.3.2 Vehicles owned by Mai Linh

	4 seats	7 seats
Japanese Brands	・Toyota VIOS ・NISSAN SUNNY	・TOYOTA INNOVA ・NISSAN LIVINA
Korean Brands	・HYUNDAI VERNA ・HYUNDAI i10 ・KIA MORNING (Picanto)	・KIA Carens

Therefore, the survey team conclude that modification is possible from the regulation and technology point of views.

⑤ Business profitability study
Considering the results above, the survey team conducted trial calculations regarding the profitability of ①CNG taxi business by *Mai Linh*, ②CNG supply business by *Saisan*, and ③CNG vehicle modification business by *Ktech.*

(a) Profitability of CNG taxi business by *Mai Linh*
Profitability per modified taxi is assessed.

Table 3.3.3 Profitability from replacing gasoline taxis with CNG taxis

Item	**Value**	
	Reference Case(Gasoline use)	**Project Case(CNG use)**
Traveling Distance	54,750 km/year	54,750 km/year
Energy Efficiency	13.4 km/ℓ	12.0 km/㎥
Energy Consumption	4,086 ℓ/year	3,422 kg/year※1
Energy Cost per Unit※2	20,600 VND/ℓ	24,600 VND/kg
Annual Fuel Cost	**84,171,600 VND/year**	**84,181,200 VND/year**
Reference Case – Project Case = -9,600 VND/year		

Calculation results indicate that based on current circumstances, CNG taxi business is not profitable. At the initial stage of the survey, the survey team hypothesized that CNG selling price was cheaper than that of gasoline, and that the payback period of taxi modification

[3] Le Anh, (2014). Mai Linh revenue continues falling Ho Chi Minh, Vietnam: The Saigon Times. http://english.thesaigontimes.vn/32845/Mai-Linh-revenue-continues-falling.html

business was within a year. However, the latest findings suggest that CNG selling price with consideration of compression cost is almost the same as gasoline selling price. Through the findings, the survey team found out that there are no cost merit in replacing gasoline taxi with CNG taxi, and calculation results indicate that the feasibility of the CNG taxi business is low.
Meanwhile, the survey team researched on possible reasons which are causing little difference between the selling prices of gasoline and CNG in Vietnam, and found out that there are significant differences in the case of neighboring countries. Most of the countries which produce CNG employ a preferential taxation system to promote the usage. Thus, the selling price of CNG is usually set to be cheaper compared to gasoline.

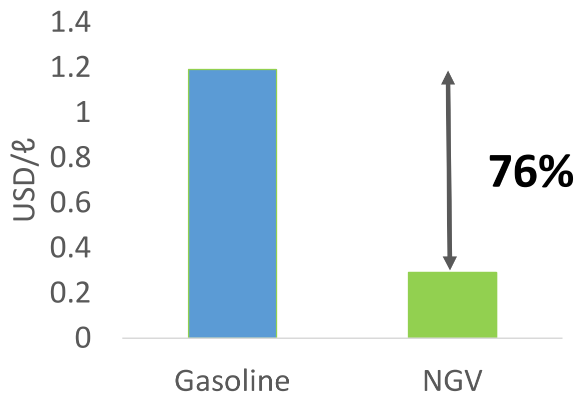


Figure 3.3.5 Fuel price differences for Natural Gas Vehicles in Thailand

In Thailand, neighboring country of Vietnam where CNG usage is popular, there is a policy to promote CNG usage and a preferential taxation system for CNG. As the result, on the basis of quantity of heat of each fuel, gasoline costs 1.119USD while CNG costs 0.29USD, indicating a 76% cost difference. The selling price of NGV in Thailand is 10.55 baht/kg, whereas the selling price of CNG in Vietnam is 24,600VND/kg, which is approximately four times as expensive as that of Thailand. Considering that public funds are used to promote CNG usage and reduce the selling price in Thailand, the survey team infers that policies to subsidize CNG has not been introduced in Vietnam.
As both Vietnam and Thailand are natural gas producing countries, it is assumed that there are little differences in the specifications of CNG supply infrastructures and implementation costs. Considering this, the price differences between the two countries are possibly caused by the existence of supporting policies.
Through the survey, it became clear that it is not profitable in replacing gasoline taxi with CNG taxi in Vietnam, where the CNG selling price is expensive due to lack of subsidy and preferential taxation system.

(b) CNG supply business by *Saisan*
Next, the survey team estimated the profitability of CNG supply business by local subsidiary of *Saisan*. The estimation is made based on the following assumptions.

Assumption 1: One CNG supply station supports 100 CNG vehicles
Assumption 2: Net profit from CNG sales is 10%

As the number of vehicles that a station supports differs according to regions, an average of 100 is set for the profitability estimation. As for the net profit rate, the rates generally vary from 5% to 10% regardless of the type of gas, hence 10% is set for the profitability estimation. When conducting trial calculation on the investment cost of CNG stations, the survey team attempted to obtain information from *PVGS* through *Anpha*, but failed due to confidentiality of the information. The team then adopted specifications identified previously as an alternative way for the calculation.

Table 3.3.4 Estimated profitability of CNG supply business

Item	Value
Total Initial Cost (per station)	**26,270 million VND**
Number of Taxies	100 (vehicles)
CNG consumption per Taxi	3,422 kg/year/car
CNG Price	24,600 VND/kg
Annual Sale	8,418 million VND
Gross Profit Rate※1	10%
Annual Gross Profit	**842 million VND**
Payback Period	**About 32 years**

The initial cost per CNG supply station is estimated at 26,270 million VND. If CNG is sold to 100 vehicles based on this calculation, the payback period is estimated at 32 years. The construction cost of CNG stations, which is initial cost, is almost the same worldwide because the specific equipment are not procurable in Vietnam. Therefore, it is unlikely to reduce the construction cost in Vietnam to a tenth of the reference cost of the United States. Possible efforts to reduce construction cost is to adopt cheap local labor, and in this case, 32 years is estimated as the shortest theoretical payback period.
As *Saisan* sets 5-7 years as ordinal payback period for gas supply station businesses, based on current circumstance, the survey team concluded that it is not feasible to conduct CNG supply business in Ho Chi Minh City.

(c) CNG vehicle modification business run *Ktech.*
Regarding the profitability of CNG vehicle modification business by *Ktech*, no initial investment cost is required since the business solely involves exporting and selling of modification kits to local automobile maintenance companies. The net profit is sales, which comes from selling of modification kits to local automobile maintenance companies, subtracted with the raw price including material costs, transportation costs, and tariffs. Therefore, this business model is expected to be feasible, providing that steady amount of sales is achieved and local companies acquired vehicle modification techniques. Thus the profitability calculation for this business is unnecessary.

(d) Feasibility of CNG taxi dissemination project
From the results above, both CNG taxi business by *Mai Linh* and CNG supply business by *Saisan* are not feasible for private sectors.
For comparison purposes, the survey team studied the profitability of the existing CNG bus business by *PVGS* in Vietnam. The study results suggest that the profitability of the business by *PVGS* is low as well. Despite that Ho Chi Minh City originally planned to introduce 1,000 CNG buses and *PVGS* would be the supplier, the actual number of CNG buses introduced as of now is merely a tenth of the initial assumption (100 buses). Judging from the CNG selling price in Vietnam, there is no preferential policy for CNG. According to *Anpha*, which observed CNG stations of *PVGS*, the CNG station business of *PVGS* is in deficit and not likely to achieve profitability in near future. Hence, the possibility to disseminate CNG taxies is low under the current situation. It will take time to develop policies to support private CNG taxi businesses,

considering the lack of such policies for public CNG buses currently.
Based on the findings above, the survey team concluded that it is premature to propose specific preferential policies to Ho Chi Minh City.

Regardless that the CNG taxi dissemination project is attracting much attention from the Vietnamese government and is technologically achievable, it is theoretically unprofitable under current circumstances. Before the survey, the project was expected to be profitable, since the possibility of the People's Committee introducing preferential policies seemed relatively high. However, after obtaining further information from *PVGS* and evaluating the project in detail, the abovementioned hurdles are identified.
Judging from the survey results, it is hard to think that the situation related to CNG will be improved rapidly. To formulate CNG related projects, it is necessary to deal with the issue in the long run, hence it is reasonable to forgo the JCM feasibility survey this year. With that, the survey team decided to end the research.

⑥ Future Challenges
It is essential that the Vietnamese government, Ho Chi Minh City, introduces policies to reduce CNG selling price to realize this project. In the neighboring country Thailand, the selling price is 10.55 baht/kg, which is the price reflecting subsidiaries from the government. It is said that 10.55 baht is still 40% short to achieving a profitable selling price and 17.58 baht/kg (approximately 10,500 VND/kg) is the break-even point.
Based on the assumption that both Vietnam and Thailand are CNG producing countries and there are little differences in CNG supply infrastructure specifications and cost, the survey team conducted a trial calculation using 10,500 VND/kg as the selling price of CNG.

For CNG supply business which supplies CNG to 100 vehicles per station, assuming that the selling price is 10,500 VND/kg and the desired payback period is 5~7 years, we estimated the profitable net profit.
If the net profit is 10,500 VND/kg, the payback period will be 7 years, indicating that there is room for consideration for the project.
Next, the survey team estimated the profitability of *Mai Linh*'s CNG taxi business under the assumption that the consumers purchase CNG for 21,000 VND/kg, which includes the 10,500 VND/kg net profit.

Table 3.3.5 Payback period estimation of *Mai Linh*'s CNG taxi business

Item	Value
Total Initial Cost (per 100 taxies)	**3,473 million VND**
CNG selling Price	**21,000** VND/kg
Annual CNG Consumption	3,422 kg/year/car
Annual CNG Cost	71,862,000 VND/year/car
Reference Gasoline Cost	84,171,600 VND/year/car
Number of Taxi	100
Annual Gross Profit	**1,231million VND/year**
Payback Period	**About 3 years**

In this scenario, the payback period would be 3 years, indicating that there is room for consideration for the project.

From the estimations with reference to the situation in Thailand, the survey team found that the project with 21,000 VND/kg selling price and 10,500 VND/kg net profit would be sufficient to achieve profitability. To disseminate CNG in Vietnam, it is important to reduce the CNG selling price. According to the calculations, it is difficult to realize the project unless the selling price is reduced to 21,000 VND/kg from the current 24,600VND/kg.

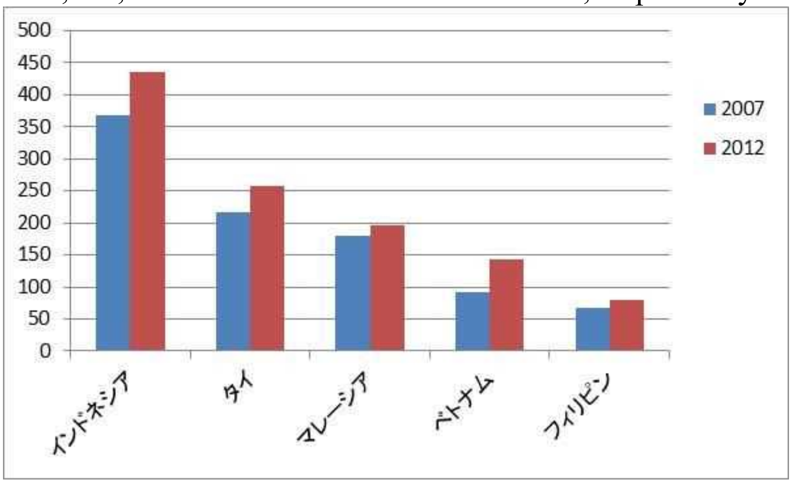
In conclusion, it is expected that the Vietnamese government and Ho Chi Minh City, which have strategies for CNG usage, would develop policies to disseminate CNG.

3.4 Project to diffuse industrial photovoltaics (PV)

(1) Background of the study

① Approach to policy on climate change

Vietnam is considered to be one of the most seriously affected countries by climate change. The country's average temperature and altitude have risen by 0.5 to 0.7 degrees and by 2 to 4 cm, respectively, for the last 50 years. According to the climate change scenario[4] published by the Government of Vietnam, the average temperature is expected to rise by 2 to 3 degrees Celsius, the sea level to rise by 1 meter, and the annual rainfall to increase by 5%. It is predicted that, if the sea level rises by 1 meter, it will adversely affect approximately 11% of the Red River Delta and result in 10% loss of the country's GDP.[5] Due to expansion of fuel consumption caused by the rapid economic growth, GHG emissions in the country have increased at a remarkably higher rate than other Southeast Asian countries. They sharply increased from 150,000,000 tons of CO2e in 2000 to 246,800,000 tons of CO2e in 2010, and they are estimated to reach 470,000,000 and 760,000,000 tons of CO2e in 2020 and 2030, respectively.[6]



Source: The chart is developed by this study group on the basis of Energy Balance of Non-OECD Countries for 2012.

Chart 3.4.1: CO2 emissions in Southeast Asia

The government acknowledges that the long-term goals such as eradication of poverty and achievement of sustainable development are threatened by an increasing number of disasters with increasingly serious damage caused by climate change, which is the result of intensified environmental load due to the economic growth of the country. Therefore, Nguyen Tan Dung, the Prime Minister of Vietnam, approved the National Strategy on Climate Change in December 2011, and the National Committee on Climate Change was established under the auspices of him in January 2012. Incorporating measures responding to climate change into annual socio-economic development resolutions, the government put a great deal of effort into these measures such as activities for energy-saving, application of environmental protection taxes, introduction of feed-in tariff (FIT) for wind power, promotion of CDM projects, and commencement of Joint Crediting Mechanism (JCM).

The government has proposed a variety of measures responding to climate change. The centerpiece of these measures is the National Target Program to Respond to Climate Change

[4] "Climate change and sea level rise scenarios for Viet Nam" MNRE, 2012

[5] World Bank, 2010

[6] The Initial Biennial Updated Report of Viet Nam to submit to the UNFCCC (December 2014)

(NTP-RCC), which shows the basic framework of approaches to climate change and stipulates that the Ministry of Natural Resources and Environment should coordinate the roles of other Ministries and governmental agencies.[7] (After the establishment of the National Strategy on Climate Change (see below), this program was revised in August 2012.) Additionally, the National Strategy on Climate Change[8] was established in December 2011 as the long-term strategy from 2011 to 2050 and then the National Action Plan on Climate Change[9] was established in October 2012 for implementing the strategy, and specific numerical targets and necessary commitments were specified by both of them.

While the Ministry of Natural Resources and Environment had a major role in development of the above-mentioned policies, the Ministry of Planning and Investment, which is in charge of development plan, investment, and fund allocation in Vietnam, developed policies such as the National Green Growth Strategy[10], which was approved in September 2012, and the National Action Plan on Green Growth[11], which was established in March 2014 in order to implement the strategy. While the NTP-RCC and the National Strategy on Climate Change cover a broad range of fields regarding climate change and put more emphasis on research and measures to adapt the country to it than measures to mitigate it, the National Green Growth Strategy specializes in the issues on economy, resource, and energy, and put emphasis on activities to reduce GHG (Table 1).

Table 3.4.1: Characteristics of each policy

Name/ Issue date	Characteristics
National Target Program to Respond to Climate Change (NTP-RCC)/December 2008	・Developed by the Ministry of Natural Resources and Environment. ・Divided into the following three periods: Starting up from 2009 to 2010, Implementation from 2011 to 2015, and Development in 2016 and later. ・The budget was specified, which was covered equally by 50% foreign funds and 50% domestic funds (30% national funds, 10% local funds, and 10% private funds etc.).
National Target Program to Respond to Climate Change (from 2012 to 2015)/August 2012	・Developed by the Ministry of Natural Resources and Environment as well as the Ministry of Planning and Investment. ・The above-mentioned program was revised in accordance with the establishment of the National Strategy on Climate Change.
National Strategy on Climate Change/December 2011	・Developed by the Ministry of Natural Resources and Environment. ・Long-term strategy from 2011 to 2050. ・For renewable energy, it is aimed at increasing the output of hydroelectric power generation to 20,000 to 22,000 MW by 2020 and the combined proportion of new energy and recycled energy in the total of primary commercial energy to 5% by 2020 and 11% by 2050. ・In order to reduce GHG emissions in the transportation sector, it is aimed at increasing the proportion of buses and taxies using compressed natural gas or liquefied petroleum gas to 20% by 2020 and 80% by 2050.
National Action Plan on Climate Change/October 2012	・Developed by the Ministry of Natural Resources and Environment. ・Action plans to implement the National Strategy on Climate Change in 2012 to 2020. ・The above-mentioned targets specified in the National Strategy on Climate Change were not mentioned, and few specific measures were presented. ・In order to increase international financial support for measures responding to climate change, it stipulated that improvement of the financial scheme, good use of invested fund, and technology transfer should be conducted in 2012 to 2015 chiefly by the Ministry of Natural Resources and Environment and the Ministry of Finance.

7 Standing Office of Viet Nam National Steering Committee for United Nations Framework Convention on Climate Change and Kyoto Protocol: http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_49enDecision%20158%20on%20approval%20of%20NTP.pdf

8 Same as above: http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_64enNational%20Climate%20Change%20Strategy.pdf

9 Same as above: http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_65enEn_1474_QĐ-TTg.pdf

10 Same as above: http://www.noccop.org.vn/Data/vbpq/Airvariable_ldoc_67enVietNam-GreenGrowth-Strategy.pdf

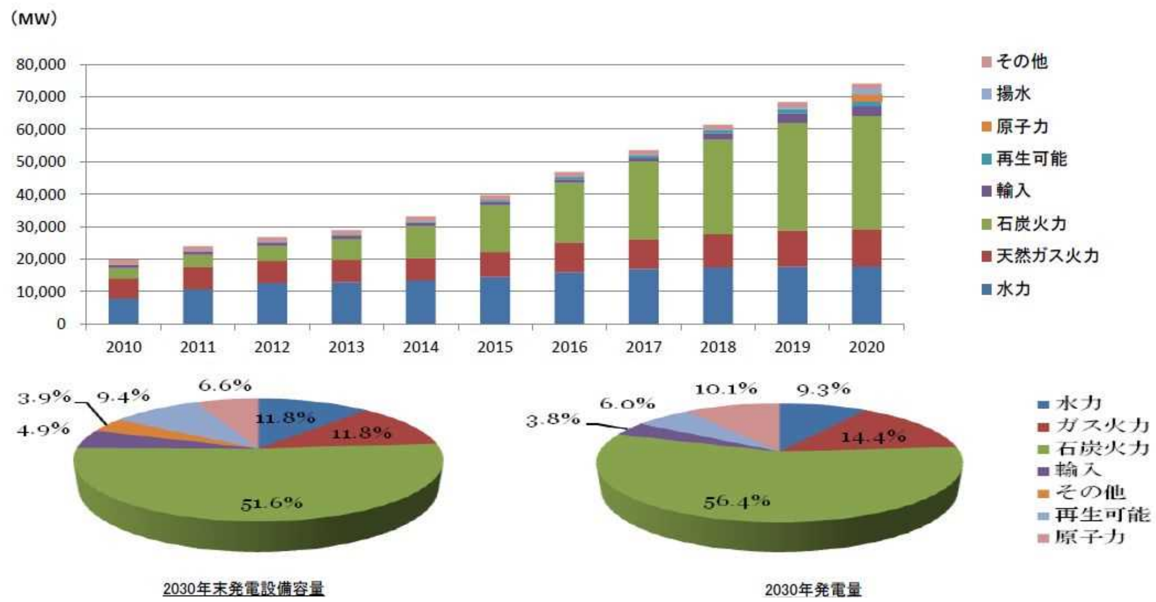
11 Vietnam Climate Finance Options: http://cfovn.mpi.gov.vn/Portals/0/Upload/Decision_403-2014-TTg_EN.pdf

National Green Growth Strategy/September 2012	・Developed by the Ministry of Planning and Investment. ・Target period is from 2011 to 2020, and can be extended to 2050. ・Aimed at implementing the National Green Growth Strategy and the National Strategy on Climate Change, as part of sustainable development. ・Objectives regarding reduction of GHG emissions and energy consumption are as follows. － 2011 to 2020: 8 to 10% reduction of intensity of GHG emissions from 2010, 1 to 1.5% annual reduction of energy consumption per unit of GDP, and 10% reduction of GHG emissions in the energy sector from a “business-as-usual” baseline (or 20% reduction if supported internationally) － Until 2030: At least 1.5 to 2% annual reduction of GHG emissions, 20% reduction of GHG emissions in the energy sector from a “business-as-usual” baseline (or 30% reduction if supported internationally) － Until 2050: 1.5 to 2% annual reduction of GHG emissions ・Major strategies on finance are as follows. - Contribution of public fund for implementing the strategies will be primarily focused on improvement of energy efficiency and use of renewable energy. － In order to encourage financial institutions and companies (especially small and medium-sized companies) to operate in accordance with the green growth principles, appropriate system and policies will be developed and made public. － Finance, credits and market-based method will be used and appropriate CDM credit system and carbon tax system will be established for the development of green economy and green products.
National Action Plan on Green Growth/March 2014	・Developed by the Ministry of Planning and Investment. ・Based on the National Green Growth Strategy, the target year is defined as from 2014 to 2020. ・Major plans on finance are as follows. － Legal grounds for allowing the government to encourage financial institutions and companies to invest in actions based on this plan will be established. － As the primary responsible organization, the Ministry of Planning and Investment will allocate domestic financial resources in cooperation with the Ministry of Finance and other organizations, and be in charge of coordination regarding international support. － Framework of financial policy for green growth will be established, and relevant systems and organizations will be improved. (The Ministry of Finance is primarily responsible for this plan, which will be conducted in 2013 to 2014.) － For the promotion of green growth, commercial banks will be restructured in order to improve their ability in finance and credit business. (The State Bank of Vietnam, the central bank of the country, is primarily responsible for this plan, which will be conducted in 2013 to 2020.)

Source: The table is developed on the basis of Standing Office of Viet Nam National Steering Committee for United Nations Framework Convention on Climate Change and Kyoto Protocol.

② Outline of electric power in Vietnam

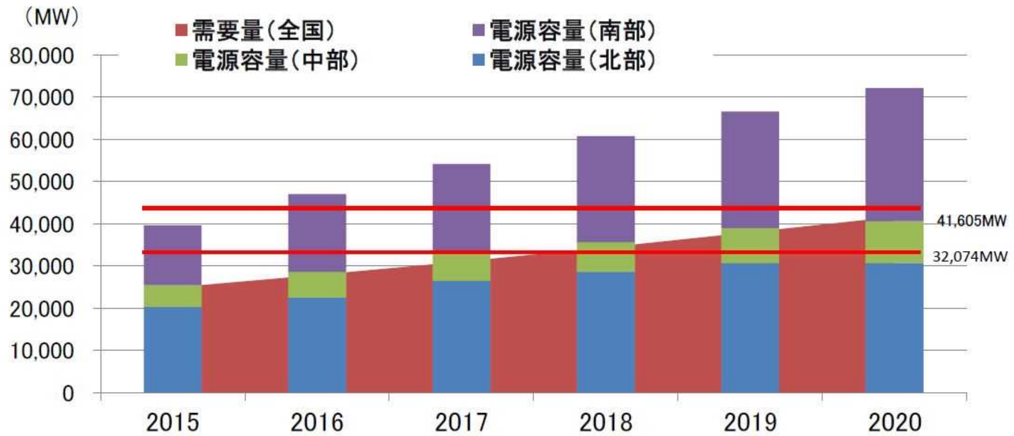
The energy consumption in Vietnam has been expanding with the economic growth. With the prediction that the demand for electricity would increase at approximately 14% every year, the PDP7 (7th Power Development Plan), which was established in 2011, defined target installed capacity of power generation as 75,000 MW by 2020 (approximately 2.3 times larger than 2014) and 146,800 MW by 2030 (approximately 4.6 times larger than 2014), as shown in Chart 3.4.2.



Source: JETRO, 2015 Survey on Electric Power in Vietnam

Chart 3.4.2: PDP7 Power Development Plan

The demand for electric power is predicted to increase by approximately 10% per year from 2015 to 2020 (Chart 3.4.3). The progress in power source development under the PDP7 has been much greater than that under the PDP6[12], and stable electricity supply can be expected if the development is completed as planned. However, rainfall may negatively affect electricity supply in the northern part of the country, where dependence on hydroelectric power generation is especially strong. If the development is delayed and rainfall in the northern part affects negatively, the southern part, which receives electricity from the northern and middle parts, may also face a power shortage.



Source: JETRO, 2015 Survey on Electric Power in Vietnam

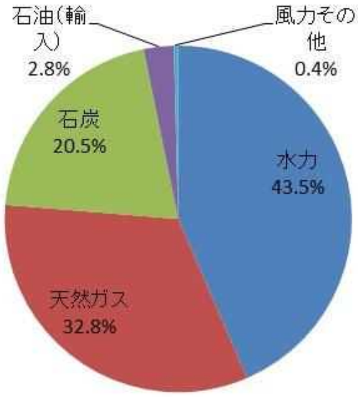
Chart 3.4.3: Prediction of demand for electricity by region (from 2015 to 2020)

The total capacity of power generation at the end of 2014 was 145,540 MW, which was an 11% increase from the previous year. The hydroelectric power generation accounted for about 42% of the total installed capacity of power generation in Vietnam. While the downward trend of

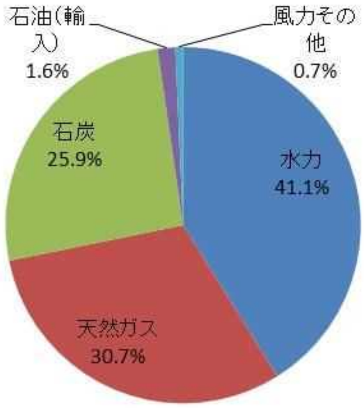
[12] The rate of implemented development of power source between 2006 and 2010 was 69.1%, but it increased to 84.3% between 2011 and 2014 under the PDP7. However, the rate in 2014 decreased to 56.3%.

the country's dependence on hydroelectric power generation continues (it accounted for 73% in 1995), the proportion of coal-fired power generation is increasing. Regarding use of renewable energy for power generation, hydroelectric power generation accounted for the most of it, while power generation with solar, wind and biomass was not developed very much.

At the end of 2013



At the end of 2014



Source: JETRO Hanoi, Survey on Electric Power in Vietnam (2015)

Chart 3.4.4: Power generation by energy source in Vietnam

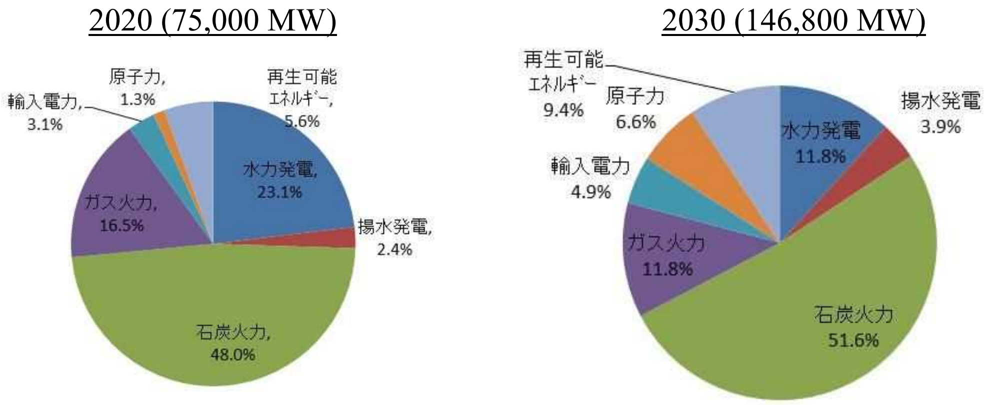
Regarding power generation by energy source in 2014, while the trend of dependence on water power continued with the proportion of more than 40% of the total output, the output by coal-fired power generation gained a 40 percent increase from the previous year, accounting for about 26% of the total output, thanks to aggressive establishment of large-scale coal-fired power stations. It is predicted that coal-fired power generation will account for about the half of the total capacity in 2030 and environmental load will keep increasing for a long period of time.

③ Policy for renewable energy

(a) Target

As mentioned above, Vietnam strives to increase output of power generation and diversify power source with promotion of the use of renewable energy, in order to deal with the increasing demand for electricity. Covering the period from 2011 to 2020 with a prospect until 2030, the PDP[13] set up a target for each power source (Chart 3.4.5). According to it, the proportion of renewable energy in the total output of power generation, which is currently only 3.5%, should be 5.6% and 9.4% by 2020 and 2030, respectively.

[13] Decision No. 1208/2011/QD-TTg



Source: 7th Power Development Plan

Chart 3.4.5: Target by power source in Vietnam

Regarding renewable energy, target by each power source was listed.

Table 3.4.2: Targets in renewable energy development stipulated by PDP7

Power source	Target output by 2020	Target output by 2030
Wind	1,000 MW	6,200 MW
Biomass	500 MW	2,000 MW
Water	17,400 MW	Not stipulated
Water with pumped-storage system	1,800 MW	5,700 MW

Source: 7th Power Development Plan

(b) Supporting measures

Before the National Target Program to Respond to Climate Change (NTP-RCC) was approved in 2008, Vietnam's Electricity Law (2004) stipulated that investment could be made in, and preferential tax treatment could be applied to, the development of power stations using renewable energy.[14] With the decree enacted in 2006 (Decree 151/2006/ND-CP), 70% of a cost of constructing low head hydro power station or wind power station could be loaned, and the range of its application was widened in 2008 in order to cover any renewable energy projects.[15] Furthermore, accelerated depreciation as preferential tax treatment has become applicable to projects of power generation with renewable energy since November 2013.[16] Meanwhile, the Energy Efficiency and Conservation Law, which was enacted in 2011, proclaimed that it would prioritize reasonable development of clean energy, increase the proportion of renewable energy use, and take energy-saving measures, and proposed preferential use of lighting equipment with renewable energy for public lighting, promotion of solar or biomass energy equipment for the construction and agriculture industries, etc. In addition, in the provision regarding details and

[14] Ministry of Industry and Trade of Vietnam: http://media.vneec.gov.vn/Images/Upload//User/thuky/2015/1/12/7ffcd30e4_27_electricity_law.pdf

[15] Centre Database on Legal Normative Documents: http://vbpl.vn/TW/Pages/vbpqen-toanvan.aspx?ItemID=4483

[16] Law on Investment No. 59/2005/QH11; Ministry of Finance Circular No. 45/2013/TT-BTC

implementation of the Energy Efficiency and Conservation Law, it was stipulated that preferential tax treatment would be applied to investment in manufacturing of products that would use renewable energy.[17]

Furthermore, FIT scheme was established in 2011 for wind power generation.[18] With the Decision No. 24/2014/QD-TTg in May 2014, FIT purchase prices for power generation with waste-to-energy (WtE) and biomass were promulgated, and took effect in June and October, respectively (Table 3.4.3).

Table 3.4.3: FIT purchase price by renewable energy source

Energy source (Effective date)	FIT purchase price
Wind (June 2011)	VND1,614/kWh[19]
Solid waste (June 2014)	Direct incineration: VND2,114/kWh Incineration of gas collected from landfill: VND1,531/kWh)[20]
Biomass (October 2014)	VND1,220/Khw[21]

Source: Developed by MUMSS on the basis of IEA/IREANA Joint Policies and Measures database

(c) Current status of PV

The national average of solar irradiance in Vietnam is 5 kWh/m^2 and considered to be relatively high. Photovoltaics has been developed primarily in the middle and the southern parts of the country, where the length of daylight hours is relatively stable through the year even at the time of the rainy season. In particular, the southern part of the country, where Ho Chi Minh City is located, is considered to be the center of development of PV in Vietnam, because of its favorable weather with the fact that the total hours of daylight are 2,000 to 2,600 per year and that a certain amount of daylight can be obtained even in the rainy season. In addition, the infrastructure and manufacturing system for related equipment are relatively well built there.[22]

Thanks to the fact that a photovoltaic system can be installed on a roof of an existing building, it is easier to be introduced than other renewable energy systems, and therefore, it has been introduced steadily both in public and private sectors. In particular, the middle and the southern parts of the country, where Ho Chi Minh City is located, are considered to have potentially greater capacity of power generation, thanks to their geographical advantage in the amount of solar irradiance and length of daylight hours. Not only domestic business operators but also foreign ones are introducing photovoltaic systems there.

[17] No. 21/2011/ND-CP

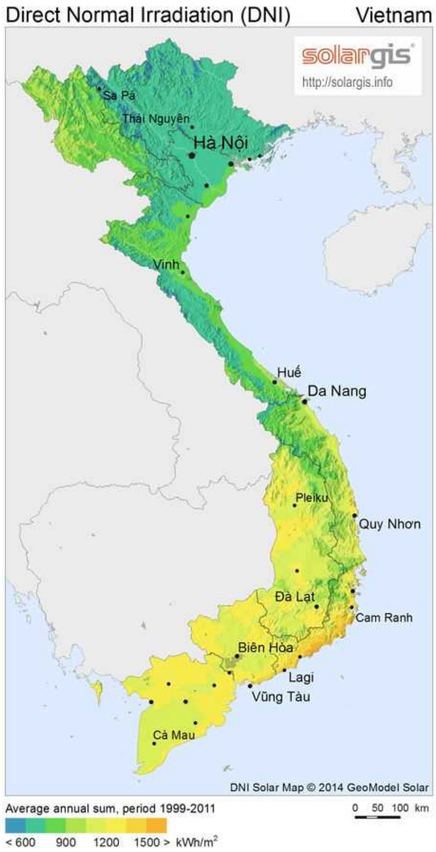
[18] DLA PIPER (2014) “RENEWABLE ENERGY IN THE ASIA PACIFIC A Legal Overview”

[19] Decision No. 37 on mechanisms for support and development of wind power projects in Vietnam (Decision No. 37/2011/QD-TTg)

[20] Decision No. 31 on the support mechanism for the development of solid waste power projects in Vietnam (Decision No. 31/2014/QD-TTg)

[21] Decision No. 24 on the mechanism to support the development of biomass power projects in Vietnam (Decision No. 24/2014/QD-TTg)

[22] Science and Technology News (Vietnam Academy of Science and Technology)



Source: SolarGIS

Chart 3.4.6: Direct normal irradiation (DNI) in Vietnam

Intel Products Vietnam constructed a solar power station, which is one of the largest in the country (321 MW per year: about 300 kW scale), in the Saigon Hi-Tech Park in Ho Chi Minh City. The Government of Vietnam has advanced development of renewable energy with loans or support from multilateral development banks such as the World Bank, the European Investment Bank, and the Japan International Cooperation Agency (JICA). Recent aid programs implemented for PV are as follows.

・A photovoltaic system whose maximum output is 12 kW and annual output is 18,000 kWh was installed on the roof of the government building of the Ministry of Industry and Trade in Hanoi with financial support by the Government of Germany (2010).
・The construction of a solar power station in Quang Binh Province was financially supported with ODA provided by Korea (2011).

Photovoltaics is behind other renewable energy in introduction of FIT scheme. However, in 2015, the Ho Chi Minh City People's Committee commissioned the Energy Conservation Center Ho Chi Minh City (ECC-HCMC), which is under the umbrella of the Department of Science and Technology (DOST), to develop a project that would install solar panels in 50 houses, 7 office buildings, and 5 commercial facilities. The estimated price in this project is about 10 Japanese yen per 1 kWh, and a movement starting from regional level such as this project can be a model of the future FIT scheme for PV.[23]

[23] ECC-HCMC Hearing

(2) Outline of the study

① Purpose and principle of the study

By promoting the diffusion of PV in industrial facilities primarily located in Ho Chi Minh City, the biggest industrial city in Vietnam, this study is intended to contribute to stable operation of factories and commercial facilities and to achieve sustainable urban economic growth through drastic reduction of power supply.

Corporations in developed countries including Japan have been making their way into Vietnam, and many industrial parks and large-scale commercial facilities have been constructed in the metropolitan area of Ho Chi Minh. The number of industrial parks is 18 in Ho Chi Minh City now, and it reaches more than 80 in the area within a 30 to 40 km radius of the city, including Binh Duong, Ba Ria‐Vung Tau, and Dong Nai Provinces.[24] In addition, Aeon Group is running two large-scale shopping malls in the metropolitan area of Ho Chi Minh, and is expected to open the third one in 2016.[25]

The electricity price has remained low in Vietnam due to the government's policy. This is one of the reasons why the diffusion of renewable energy was hindered in the country. However, in June 2011 it became possible to revise the electricity price up to 4 times per year,[26] and the PDP7 stipulated that the electricity price should be raised to 8 to 9 US cents/kWh by 2020. EVN, a state-run power company in Vietnam, has raised the electricity price by 5% two times per year since 2012. With the Decision No. 69 in January 2014, EVN became allowed to raise the electricity price independently by up to 7 to 10%, and it raised the price to 7.6 US cents/kWh in March 2015, which was a 7.5% increase from the national average in the previous year. Under these circumstances, the introduction of FIT as a policy to promote renewable energy was just initiated, as mentioned above.

Against a backdrop of the current trend, Next Energy & Resources Co., Ltd. (hereinafter referred to as "Next Energy"), one of the largest PV business operators in Japan, signed the Memorandum of Understanding (MOU) with ANT THY Co., Ltd. (hereinafter referred to as "ANT"), a major operator of electric distribution equipment business in Vietnam, in order to build a cooperative relationship for expanding the PV market in the country. The purpose of this project is to advance building up a simple and reasonable PV system for self-consumption with limited storage capacity at an unused space in an industrial facility etc. that needs a PV system of 100 to 300 kW, which is the target of this initiative.

② Structure for conducting the study

As a primary operator of this study project, Next Energy will manage the whole process of it, while making an effort to build up a structure for the JCM model project in cooperation with ANT. In addition, Next Energy will advance development of a low-cost PV system suitable for the conditions of the host country. Furthermore, Next Energy will conduct research on establishment of sales and other structures and on a taxation system for the operation of the project, in order to ensure the successful operation of the financing programme for JCM model project. Mitsubishi UFJ Morgan Stanley Securities Co., Ltd., which has accumulated not only expertise in MRV development but also findings based on its long-time commitment to environmental protection in the host country, will support the whole process of the study project. In addition, understanding the necessity of financially supportive measures such as FIT in order to promote renewable energy and being at the position that allows itself to make a proposal to the governmental agencies on the basis of accumulated experience, Mitsubishi UFJ Morgan

[24] JETRO Ho Chi Minh "Collection of data regarding industrial parks in the southern part of Vietnam" (March 2014)
[25] The 4th store in Vietnam.
[26] Decision No. 24/2011/QD-TTg

Stanley Securities Co., Ltd. will collect information on building up a system which is currently under discussion in the host country and report the findings in order to examine the future trend of the market.
ANT will gain deeper understanding of JCM and engage in capacity building activities for relevant customers, such as teaching merits of JCM for business operators, in addition to the duties based on the MOU with Next Energy. The structure for conducting the study and roles of each company are shown below (Chart 3.4.7, Table 3.4.4).

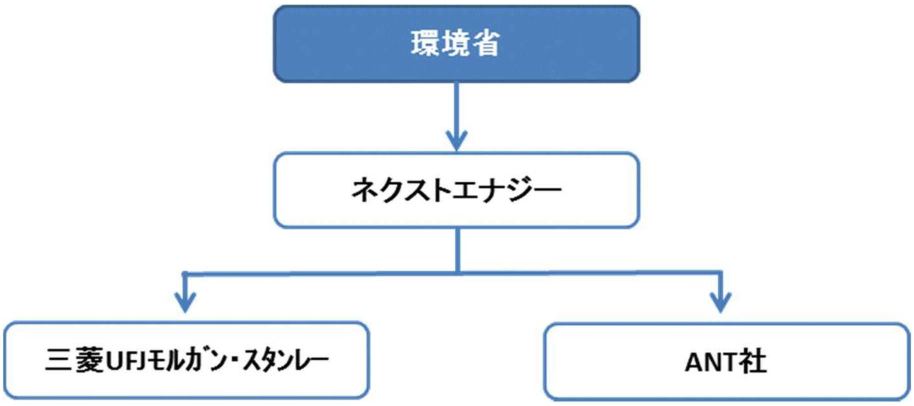


Chart 3.4.7: Structure for conducting the study

Table 3.4.4: Roles and study area for each company

Role	Company	Duty
Primary operator of the study	Next Energy & Resources Co., Ltd.	・Conducting total management of the study. ・Evaluating applicability of photovoltaic technology to large-scale commercial facilities and helping development of a plan to introduce the technology. ・Collecting data on MRV methodology and on estimated effects of GHG emission reduction. ・Studying various items (selection of technology to be proposed, estimate of the cost for introduction of it, financial planning, and evaluation of potential for introduction of the technology) to launch the JCM model project. ・Holding a workshop.
Contractor	Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. (MUMSS)	・Collecting information about policies on climate change and renewable energy in Vietnam. ・Building up JCM methodology. ・Estimating GHG emission reductions.
Contractor	ANT THY Co., Ltd.	・Constructing, managing and

		maintaining the PV system, as a partner for the project.

③ Study items

Study items and methods are as follows.

(a) Plan to launch the project

In this study, we developed a plan to launch the project, considering Aeon Mall, a Japanese large-scale commercial facility, and Japanese companies including Fuji Xerox as a model business. Aeon Mall and Fuji Xerox are existing customers of ANT, which is a partner for the study. In order to reduce costs, we designed a smallest-scale storage system, taking into account the capacity to generate electricity and the demand for it. In addition, Next Energy transferred its original technology for reducing labor in construction to ANT, and therefore localization of the manufacturing and installment was achieved in order to further cut costs.

A PV system of 320 kW class is to be installed at Aeon Mall Binh Tan, whose opening is scheduled for the summer of 2016. We submitted this case to the second call for the financing programme for JCM model project.

(b) Examination of the main points of JCM methodology

In this study, we examined the main points of JCM methodology, on the basis of the following.

- Definition of eligibility criteria
- Definition and calculation of reference emissions
- Definition of default value
- Monitoring items and frequency
- Measurement of project emissions
- Calculation of emission reductions

(c) Examination of a structure for conducting the project and of a financial plan

For the introduction of the PV system to Aeon Mall Binh Tan, we established an international consortium in the financing programme for JCM model project and drew up a financial plan based on the prospect that the subsidy would be granted.

(d) Presentation at a local workshop in Ho Chi Minh City

We took part in the workshop held in Ho Chi Minh City by the Global Environment Centre Foundation, the secretariat for this study project, and reported the results of this study.

(3) Target project

① Outline of the project

(a) Aeon Mall Vietnam Binh Tan

① Location: Lot PT1, Hi-tech Healthcare Park, 532A Kinh Duong Vuong, Binh Tri Dong B ward, Binh Tan District, HCMC

② Site area: Approximately 46,800 m^2

③ Floor space: Approximately 114,000 m^2

④ Rentable space: Approximately 59,000 m^2

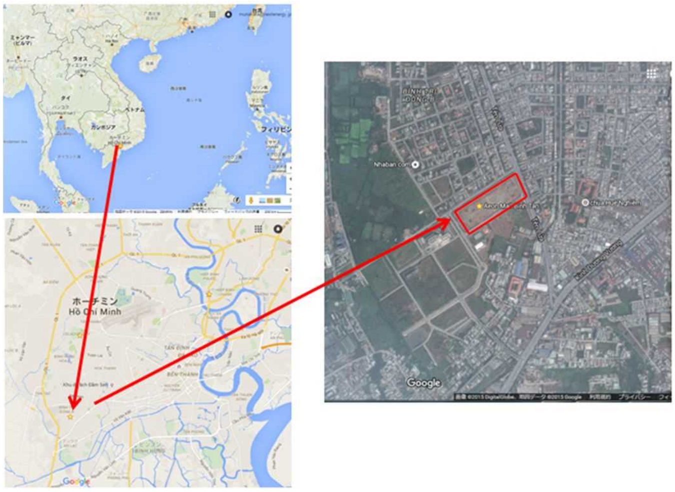
⑤ Parking capacity: Approximately 1,500 cars and 4,000 motorcycles

⑥ Magnet store: Aeon (GMS [general merchandise store])

⑦ Number of specialty stores: Approximately 160

⑧ Property owner: Aeon Vietnam Co., Ltd.

⑨ Management: Aeon Mall Vietnam Co., Ltd.



A 320 kW photovoltaic system for self-consumption without reverse power flow will be introduced.
The photovoltaic modules will supply freezing and refrigerating display cases to be installed at the ground floor with electricity of alternating current transferred from direct current by 16 power conditioners, while acting as roof material for the parking garage to be at the third floor and the bicycle parking garage to be at the ground floor of the building.

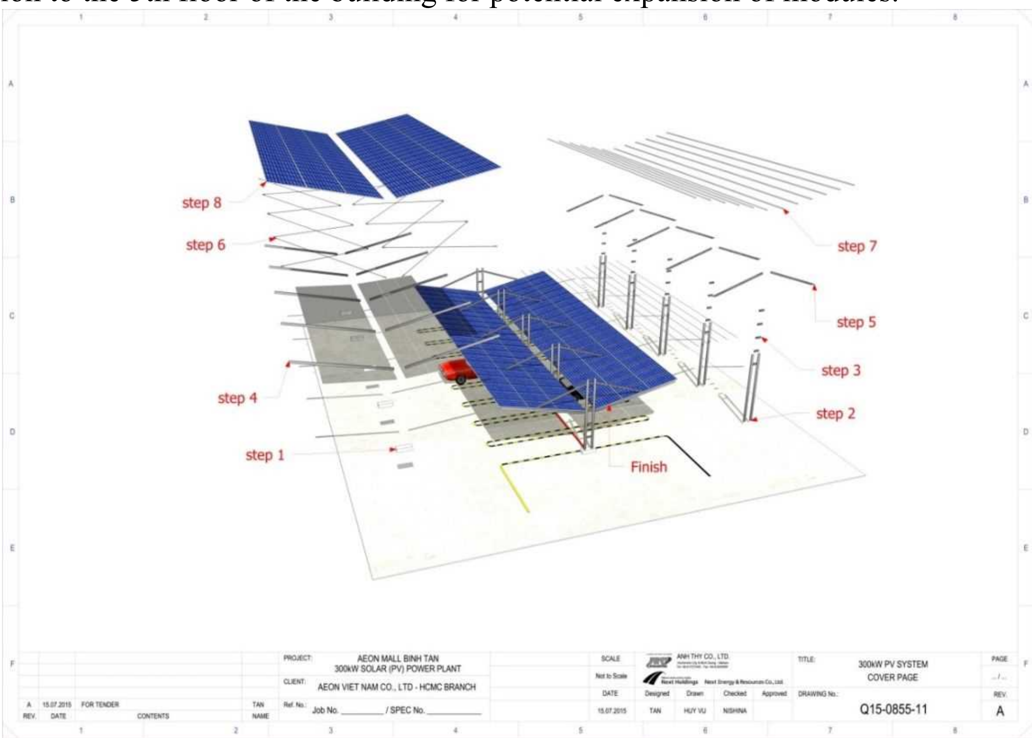
(b) Fuji Xerox and other Japanese companies
Regarding other Japanese companies than Aeon, we conducted a hearing and identified the needs of a local factory of a major Japanese furniture maker as shown below, and submitted a rough estimate. We are to keep having discussion in order to launch the project.
Type of equipment: photovoltaic equipment for self-consumption without reverse power flow, which can be installed on a roof of the factory of the major Japanese furniture maker.
Photovoltaic capacity: 1.8 MW

② Background of the proposed project
(a) Likeliness of diffusion of the project
Aeon Vietnam Co., Ltd. and Aeon Mall Vietnam Co., Ltd., which are operating large-scale commercial facilities in Vietnam, have already opened one store in Hanoi and two stores in Ho Chi Minh City. If the photovoltaic system is successfully introduced this time, the system will likely be installed on roofs of those existing stores.
In addition, they are also planning to open two new stores in Indonesia. The photovoltaic system will likely be introduced to them, too.
Meanwhile, now that many Japanese companies are making their way into Vietnam, we have already started a synoptic survey on a photovoltaic system for major Japanese furniture makers.

(4) Study on launching the JCM project
① Outline of the proposed technology
The specifications of technology to be introduced in Aeon Mall Binh Tan, which will be applied for the financing programme for JCM model project, are as follows.
(1) Capacity of photovoltaic system: 320 kW, self-consumption, without reverse power flow into the power system
(2) Number of photovoltaic modules: 1,424
(3) Module specifications: NERP156x156-60-P SI (255 W)
(4) Power conditioner: 20 kW, 400-230 V 3 P4W, 16 sets
(5) Monitoring system: Solajit®

Rendering of the photovoltaic system

The system and the mounting frame for the photovoltaic modules were designed to allow relocation to the 5th floor of the building for potential expansion of modules.



② Cost of introduction
Approximately 560,000 USD

③ Financial plan

It will be financed by the financing programme for JCM model project and by Aeon Vietnam Co., Ltd.

④ Structure for conducting the project

The project will be conducted under the following structure.

⑤ Structure for conducting MRV

The following structure for conducting MRV is planned in this project.

Regarding measurement of the power output in monitoring, Next Energy and ANT, which are in charge of supply and engineering of the photovoltaic system, will install monitoring equipment, and Aeon Vietnam Co., Ltd., a primary operator of the project, will conduct the measurement with support from the companies. Regarding documentation of monitoring data and development of a monitoring report, Aeon Vietnam Co., Ltd. will conduct them with support from a JCM consultant, and a third-party entity will verify them. After the Japan and Vietnam JCM Joint Committee approves the result of verification, the credits will be issued.

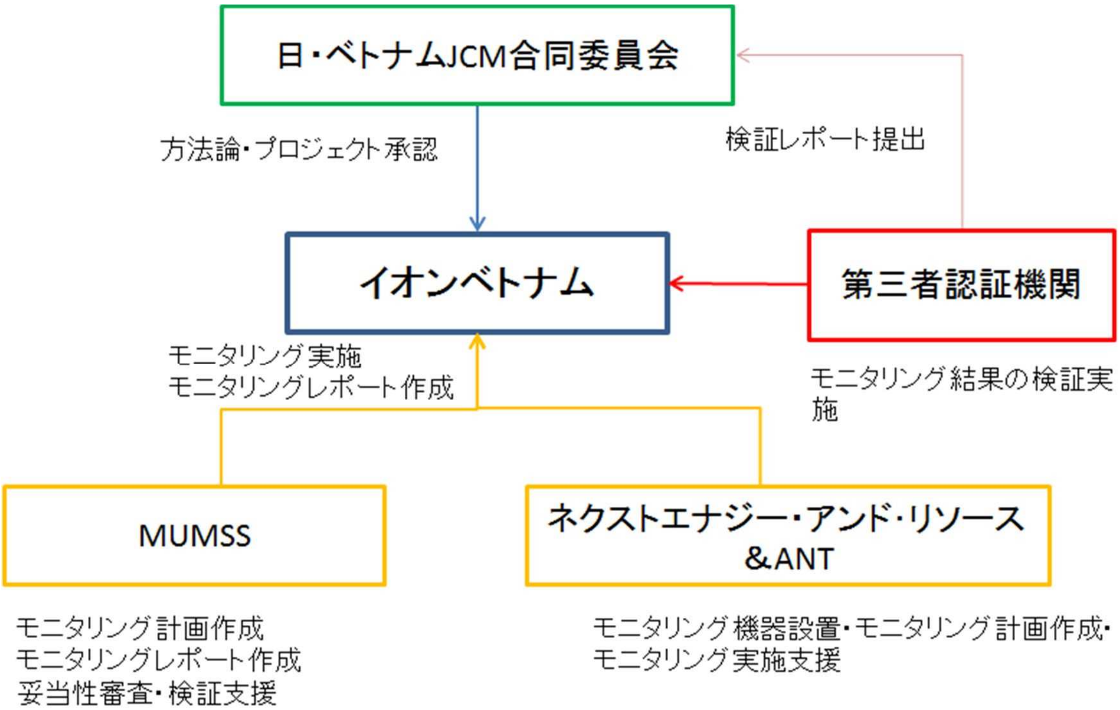


Chart 3.4.8: Structure for conducting MRV

In addition to discussing methods of assessing contribution to GHG emission reduction etc. and selection criteria of a case, it will support capacity building for a local institution that is a potential candidate for the project in the host country. Furthermore, in order to conduct MRV including third-party certification, it will discuss how the structure for conducting MRV should be incorporated into the existing structure or system of energy management and what mechanism may enable smooth daily operation of energy management and MRV. It will also confirm the performance of measurement equipment to be introduced for monitoring.

(5) Scrutiny of JCM methodology and estimation of GHG emission reduction potential
The methodology regarding introduction of PV was chiefly based on the following existing study results and proposed methodology in which MUMSS was involved.
<Proposed JCM methodology>
・ Proposed JCM methodology for Japan-Palau “PW_PM001 Displacement of Grid and Captive Genset Electricity by a Small-scale Solar PV System”
・ Proposed JCM methodology for Japan-Maldives “Displacement of Grid and Captive Genset Electricity by Solar PV System”

<Existing study results>
・ Feasibility study project report for the joint crediting mechanism in FY 2012 “Research for introducing large scale solar power plants (mega solar power plants) with thin film PV in the Republic of Indonesia”
・ Financing programme for JCM model project by the Ministry of the Environment in 2012, “Small-scale solar power plant for commercial facilities in island states (Palau)”
・ Financing programme for JCM model project by the Ministry of the Environment in 2013, “Small-scale solar power plants for commercial facilities project II (Palau)”
・ Financing programme for JCM model project by the Ministry of the Environment in 2013, “School building rooftop solar power plant project (Maldives)”
・ Financing programme for JCM model project by the Ministry of the Environment in 2013, “PV power generation system for the office building (Malaysia)”

① Terms and definitions
Definitions of the following terms were in consideration for the methodology.

Term	Definition
Grid (Power system)	Spatial extent of the power stations that are physically connected through transmission and distribution lines to the project activity. The national grid in Vietnam will be used as the grid in this methodology.
Photovoltaic system	A photovoltaic system is a method of directly converting solar energy into electricity with the use of solar cells. A photovoltaic system is composed of one or more modules connected to an inverter and, with the use of a power conditioner, converts direct current electricity that it generates into alternating current electricity, which is the same as electricity in the grid.

② Eligibility criteria
Taking into account the above-mentioned existing methodologies, we examined the following eligibility criteria.

Requirement	Description
① This project activity is intended to newly introduce a photovoltaic system to a commercial or industrial facility where no power station with renewable energy has been in operation before the initiation of this project activity, and to supply electricity to the facility for self-consumption or to the connected grid.	・ Requirements for identifying emission reduction technology ・ Power sources with renewable energy accounted for only 0.7% of the total electricity generation in Vietnam (actual result in 2012). While wind power generation, to which FIT was already applied, accounted for the most part of it, PV has been introduced to only roofs of public buildings or for an experimental purpose, and therefore this project has scarcity value.
② The solar cells of the photovoltaic system to be introduced in this project acquire certification of performance and safety standards specified by the International Electrotechnical Commission (IEC) or other national standards in accordance with the IEC. Relevant IEC standards are as follows: - Performance standards: IEC 61215 (Crystalline), IEC 61646 (Thin-film), IEC 62108 (Concentrator) - Safety standards: IEC 61730-1 (Requirements for construction) and IEC 61730-2 (Requirements for testing)	・ Requirements for identifying emission reduction technology ・ Photovoltaic modules are technology/products that are not easy to distinguish from each other except by price due to their simple structure and function. Therefore, making it a requirement that equipment for this project should acquire certification of performance and safety standards specified by the IEC or other national standards in accordance with the IEC, we hope to help suitable Japanese technologies, which are superior in stability and durability, to be selected for the JCM project.
③ Total service including operation is provided.	・ Ensure certain effects for a certain period of time and the maximum contribution to the host country. ・ In this project, Next Energy will provide total service in cooperation with ANT.

③ Calculation of reference emissions

The reference emissions in this methodology are CO2 emissions that would be produced from the use of fuel in the power station connected to the electrical grid system if the photovoltaic system was not introduced. It is obtained by multiplying output of electricity generated in this project and CO2 emission factor of the grid together.

$$RE_p = PEG_p \times EF_{elec}$$

Parameter	Description	Source
RE_p	Reference emissions during the period p (tCO_2)	
PEG_p	Net electricity generation by the	Actual data to be monitored

	photovoltaic system installed in the project during the period p (MWh/p)	
EF_{elec}	CO_2 emission factor of the grid or in-house power generation (tCO_2/MWh)	The latest official value will be used.

Assuming that a less efficient inverter, which is used for reference, is used in the calculation of output of electricity generated in this project, we apply smaller estimate of the output to the calculation of reference emissions in order to secure conservativeness.

④ Measurement of project emissions

Amount of electricity consumed by accessories installed in this project, such as those for lighting and cooling the building, will be counted as project emissions. Project emissions in CDM methodologies of renewable energy are considered to be zero. Therefore, this method can contribute to conservative calculation of emission reductions.

$$PE_p = PEC_{AUX,p} \times EF_{elec}$$

Parameter	Description	Source
$PEC_{AUX,p}$	Amount of electricity consumed by project accessories during the period p (MWh/p)	Actual data tobe monitored
EF_{elec}	CO_2 emission factor of the grid or in-house power generation (tCO_2/MWh)	The latest official value at the time of initiation of the project will be used.

⑤ Parameter to be defined in advance

The following parameter is to be defined in advance in this methodology.

Parameter	Description	Source
EF_{elec}	CO_2 emission factor of the grid or in-house power generation (tCO_2/MWh) If an in-house power station is not installed at the project site, the latest official value of grid emission factor at the time of validation as a default value will be set in advance. If an in-house power station is installed at the project site, the following can be used, too. As shown below, it can be set conservatively. EF_{elec} = min (EF_{grid}, $EF_{captive}$) $EF_{captive}$ = 0.8 tCO_2/MWh*	[EF_{grid}] Unless the Joint Committee directs otherwise, the official value announced by the Ministry of Natural Resources and Environment of Vietnam will be used. The value is 0.5657 tCO_2/MWh as of January 2016. [$EF_{captive}$] CDM approved small scale methodology: AMS-I.A

	*The latest value at the time of validation in CDM approved small scale methodology: AMS-I.A	

The above-mentioned value is based on the combined margin calculated with the operating margin and the build margin at 50% each. In CDM methodologies, the combined margin in the case of PV should be calculated with the operating margin and the build margin at 75% and 25%, respectively. Estimating lower operating margin in Vietnam, where the operating margin is higher, leads to a smaller emission factor and therefore results in the method of estimating reference emissions conservatively.

⑥ Monitoring item and method

The following two items are to be monitored.

Parameter	Description	Source
PEG_p	Net electricity generation by the photovoltaic system installed in the project during the period p (MWh/p)	Measured with a wattmeter
$PEC_{AUX,p}$	Amount of electricity consumed by project accessories during the period p (MWh/p)	Measured with a wattmeter

⑦ Emission reductions

GHG emission reductions will be estimated in accordance with the following.

[Reference emissions]

$$RE_p = EG_{PE,p} \times EF_{elec}$$

Parameter	Description	Provisional value	Source
RE_p	Reference emissions during the period p (tCO_2)	286	Calculated value
PEG_p	Net electricity generation by the photovoltaic system installed in the project during the period p (MWh/p)	505.922	Estimate by Next Energy
EF_{elec}	CO_2 emission factor of the grid or in-house power generation (tCO_2/MWh)	0.5657	The latest official grid emission factor by the Government of Vietnam (data obtained in 2013 and announced in 2015)

[Project emissions]

The photovoltaic system to be introduced in this project will be installed inside an existing building and accessories will not be installed. Therefore, project emissions are zero.

$$PE_p = PEC_{AUX,p} \times EF_{elec}$$

Parameter	Description	Provisional value
PE_p	Project emissions during the period p (tCO2)	0
$PEC_{AUX,p}$	Amount of electricity consumed by project accessories during the period p (MWh/p)	0

[Emission reductions]
$RE_p - PE_p = 286$

[Emission reduction potential]
If this project is horizontally expanded to other industrial areas, GHG emission reduction potential is estimated as follows. If a photovoltaic system of similar scale to this project is introduced at 20 sites, 50,000 tons or more of CO2 reduction can be expected in 9 years, which is a legal lifetime of this technology. We conclude that PV systems will likely be widespread in Vietnam, where the number of large-scale commercial and industrial facilities is expected to increase.

Table 3.4.5: Estimate of GHG emission reductions (in case of horizontal expansion, tCO2)

	1 year	9 years
1 site	286	2,574
5 sites	1,430	12,870
10 sites	2,860	25,740
20 sites	5,720	51,480
	1 year	9 years

⑧ Study on development of JCM PDD
(a) General description of the project
As is shown in the previous section.

(b) Structure for conducting the project and the project participants
As is shown in the previous section.

(c) Duration of the project
Based on the regulation of the financing programme for JCM model project, this project will be in operation for 17 years, which is a legal lifetime of photovoltaic equipment.

(d) Location of the project
This project will be conducted at Aeon Mall Binh Tan, which is located in Ho Chi Minh City in Vietnam.

(e) Contribution from developed countries

(f) Explanation of how the project meets eligibility criteria of the approved methodology

Requirement	Status
① This project activity is intended to newly introduce a photovoltaic system to a commercial or industrial facility where no power station with renewable energy has been in operation before the initiation of this project activity, and to supply electricity to the facility for self-consumption or to the connected grid.	・ Any power station with renewable energy was not installed at the project site, and the equipment of this project will be newly installed.
② The solar cells of the photovoltaic system to be introduced in this project acquire certification of performance and safety standards specified by the International Electrotechnical Commission (IEC) or other national standards in accordance with the IEC. Relevant IEC standards are as follows: - Performance standards: IEC 61215 (Crystalline), IEC 61646 (Thin-film), IEC 62108 (Concentrator) - Safety standards: IEC 61730-1 (Requirements for construction) and IEC 61730-2 (Requirements for testing)	・ Equipment to be installed in this project is in accordance with the IEC standards shown on the left.
③ Total service including maintenance and operation by an engineering company is provided.	・ Next Energy and ANT are to provide total service including maintenance and operation in this project.

(g) Calculation of emission reductions
Through the calculation formula set forth in the previous section, the annual emission reductions are estimated to be 286 tons per year, a total of 2,574 tons for the project period of 9 years.

(h) Emission source and monitoring point
Emission source in this project is only GHG emissions by electric power system.

Reference emissions	
Source of GHG emissions	Type of GHG emissions
Electric power system	Carbon dioxide
Project emissions	
Source of GHG emissions	Type of GHG emissions
Not applicable	Not applicable

Regarding the monitoring point, electricity transmitted from a power conditioner (inverter) to the target facility is monitored by a power logger, which enables remote monitoring of measured data.

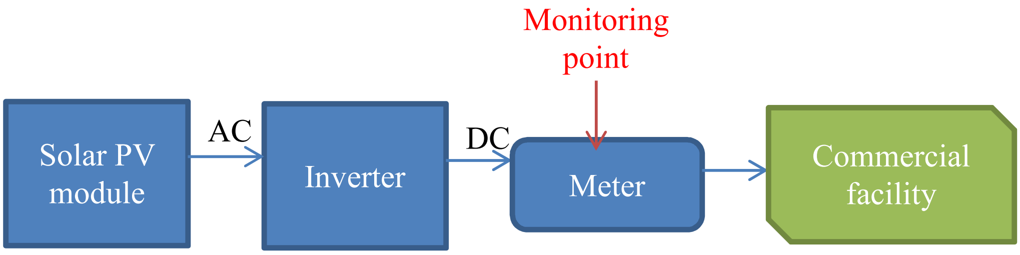


Chart 9: Monitoring point 1

(i) Environmental impact assessment
Environmental impact assessment is not needed for this project in Vietnam.

(j) Discussion with local stakeholders
We have already had discussions with Aeon Vietnam Co., Ltd., which is an operator of the target site, and Aeon Mall Vietnam Co., Ltd., which is a manager of the equipment, for conducting the JCM model project before applying for the financing programme for the project. We will have another discussion for PDD if necessary.

(6) Conclusion and future development

As described in Chapter 1, a movement toward introduction of FIT for PV has been in progress in Ho Chi Minh City, but it has not yet reached a full-scale introduction. In addition, a sale price of electricity for EVN is unclear. Therefore, it is considered that it will take more time for PV to be widespread. On the other hand, due to the raised electricity price, demand for price reduction through introduction of a PV system for self-consumption is surely increasing among many Japanese companies that made their ways into Vietnam. However, we assume that uncertainty of the approval process and lack of reliable contractors prevent more Japanese companies from introducing it. Under these circumstances, our application submitted for the financing programme and actual results of construction achieved through this study can be a great advantage when our company expands photovoltaic business in Vietnam in the future. On the basis of these actual results, we keep trying to expand this business.

4. Promotion of Cooperation between the Municipal Governments and Public-private Cooperation

In the process of supporting the formulation of the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP), etc. through cooperation between the Ho Chi Minh City People's Committee and the Osaka City Government, we clarified the needs of Ho Chi Minh City regarding the development of a low-carbon city and the sustainable development of the city. We also promoted the transfer of knowledge, know-how, technologies and systems for urban management and urban development from Osaka City, as well as pushing forward specific JCM projects, in response to identified needs. With the aim of identifying possibilities for JCM projects, information was shared with private businesses, etc. which are interested in the implementation of JCM projects (see "5.3 The Explanation Meeting on the Development of JCM Projects for Low-carbon City Development in Ho Chi Minh City (October 2015)"). We also promoted a further involvement of private businesses and public-private cooperation for project implementation support, via the Team Osaka Consortium which was established under the project (see "7.2 Attending and Giving Presentations at the Preliminary Meeting in Japan Prior to Workshops, etc. to Be Held in Ho Chi Minh City").

5. Holding Symposiums, etc.

5.1 The Osaka City and Ho Chi Minh City Joint JCM Symposium (November 2015)

1) Outline

The Ho Chi Minh City and Osaka City International Symposium for Developing a Low-carbon City was held in Ho Chi Minh City on Friday, November 6, 2015, in order to share the results on the transfer of knowledge, know-how, technologies and systems for urban management and urban development from Osaka City and private companies to Ho Chi Minh City, as part of the climate change measures for Ho Chi Minh City. More specifically, the symposium aimed to share the latest reports on the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 as well as to share reports on the implementation progress for the JCM projects.

2) The Program

[Date] 08:30-15:30, November 6, 2015 (Fri.)

[Venue] Origami Ballroom, Hotel Nikko Saigon, Ho Chi Minh City, the Socialist Republic of Vietnam

[Attendants]

From Japan: A total of about 40 attendants from the Osaka City Government, Tepia Corporation Japan, Panasonic Corporation, Ogawa Electric Co., Ltd., Stanley Electric Co., Ltd., GIAGIA TRASECO Co.,Ltd, AEON Vietnam, AEON Mall Vietnam, Next Energy & Resources Co., Ltd., ANH THY Co.,Ltd, Hitachi Zosen Corporation, K.K. Satisfactory international, the New Energy and Industrial Technology Development Organization, Pacific Consultants Co.,Ltd., Hitachi Transport System, Ltd., Toshin Development Co., Ltd., the Urban Infrastructure Technology Center Foundation and the GEC

From Vietnam: A total of about 55 attendants from the Ho Chi Minh City People's Committee, including the Department of Natural Resources and Environment (DONRE), the Department of Agriculture and Rural Development, the Department of Planning and Architecture, the Department of Planning and Investment, the Department of Industry and Trade, the Department of Construction, the Department of Science and Technology, and the Ho Chi Minh City Foreign Affairs Office of the Ministry of Foreign Affairs of Vietnam

[Program]

[Morning]	
8:30 - 9:50	Opening Addresses (Mr. Tat Thanh Cang, Vice Chairperson, the Ho Chi Minh City People's Committee) (Mr. Seigo Tanaka, Vice Mayor, the Osaka City Government)
8:50 - 9:20	The Progress and Evaluation of the "HCMC Action Plan for Climate Change Adaptation and Mitigation towards 2015" (Mr. Dao Anh Kiet, the Director of the Department of Natural Resources and Environment, the Ho Chi Minh City People's Committee)

9:20 - 9:50	The Formulation of the “HCMC Climate Change Action Plan (CCAP) 2016-2020” for the Development of a Low-carbon HCMC (Mr. Nguyen Trung Viet, the Ho Chi Minh City Climate Change Steering Committee)
9:50 - 10:10	Cooperation between Ho Chi Minh City and Osaka City for the Development of a Low-carbon City (Kenichiro Nohara, the Director of the Environmental Policy Department, the Environment Bureau, the Osaka City Government)
10:10 - 10:30	Policy Dialogue and Opinion Exchanges
10:30 - 11:00	Photo Session & Coffee Break
11:00 - 12:00	Reports on Progress regarding the Implementation of the JCM Projects • Anaerobic Digestion of Organic Waste for Biogas Utilization at Market (Hitachi Zosen Corporation) • Introduction of Energy-from-Waste Project in Ho Chi Minh City (Hitachi Zosen Corporation) • The Introduction of Photovoltaic Systems at Commercial Facilities (AEON Mall Vietnam, Next Energy & Resources Co., Ltd.) • The Promotion of Green Hospitals by Improving Efficiency/Environment in National Hospitals in Vietnam; the Demonstration of Energy Conservation in Hotels through the Development of BEMS (the Promotion of Low Carbon Hotels) (New Energy and Industrial Technology Development Organization (NEDO))
[Afternoon]	
13:30 - 14:30	Progress Reports on the Development of JCM Projects • The Energy Conservation Project for Factories on an Industrial Estate in Ho Chi Minh City (Tepia Corporation Japan and Panasonic Corporation) • The Project for Switching Street Lights to Highly Efficient LED Lights (Ogawa Electric Co., Ltd.) • The Creation of a Kitchen Waste Recycling System in Ho Chi Minh City in Vietnam (Hitachi Zosen Corporation) • Energy Conservation at Factories through the Introduction of EMS (Asics, Myclimate Japan)
14:30 - 14:50	The Introduction of a JICA Technical Cooperation Project the “Project to Support the Planning and Formulation of Nationally Appropriate Mitigation Actions (NAMAs) in Vietnam (Support for Local Government Capacity Building for NAMAs and MRV)” (Pacific Consultants Co.,Ltd.)
14:50 - 15:30	Progress Management for the Implementation of the CCAP 2016-2020: The Utilization of the Plan-Do-Check-Act (PDCA) Cycle (The Department of Natural Resources and Environment of the Ho Chi Minh City People’s Committee, the Osaka City Government, the Global Environment Centre Foundation)
15:30	Closing Ceremony (Kazuhiro Oishi, Deputy Director-general, the Global Environment Centre Foundation)

3) The Main Proceedings Content

○ Lecture on basic trends by Mr. Phuc, Deputy Director of the Department of Natural Resources and Environment:

- He presented “The Progress and Evaluation of the “HCMC Action Plan for Climate Change Adaptation and Mitigation towards 2015”.”

- He showed information on not only the Ho Chi Minh City People’s Committee’s domestic activities up to 2015, but also the wide range of support by the Osaka City Government so far in the low-carbon city development project, and expressed his gratitude for the support.

- With regard to future policy, he declared his intention to emphasize projects that use JCM.

○ Presentation by Mr. Chau, Deputy Director of the Department of Natural Resources and Environment:

- He presented “Preparation of the CCAP for Low-carbon City Development in Ho Chi Minh City.”

- He explained the selection of the target fields of the CCAP, the goals and policy of the CCAP, etc.

- According to the BaU Scenario, the target of GHG reduction from 2016 to 2020 was set at 19.1% in 2020 compared with 2013, if support is given from the outside, such as the Osaka City Government.

○ Presentation by Director Nohara:

- He presented “Cooperation between Ho Chi Minh City and Osaka City for the Development of a Low-carbon City.”

- The Osaka City Government celebrated the Ho Chi Minh City People’s Committee’s preparation of the CCAP and presented issues to be tackled by the People’s Committee, such as results of inter-city cooperation (e.g. support for establishment of the CCAP and promotion of JCM projects) and the importance of progress management and governance at the implementation stage of the plan.

○ City mayor-level policy dialogue: (Mr. Tanaka, Vice Mayor of Osaka City, Mr. Cang, Vice Chairman of the People’s Committee, et al.):

- During the preparation of the CCAP, the current GHG situation became clear, and engendered a sense of crisis as to what should be done in the future, including natural conditions and social and economic conditions.

- It is necessary to give suggestions about efforts for developing a low-carbon city to not only the Ho Chi Minh City People’s Committee but also neighboring cities and districts and the central government.

- It is important to implement concrete projects promptly, so they can be completed before they become outdated.

- Because this requires cooperation with government enterprises, it is necessary to succeed in the project for the Binh Dien Wholesale Market.

- Importance has been placed also on energy-saving projects, which will gain great results through the accumulation of small things achieved by residents. Energy saving during production activities will reduce costs and improve competitiveness. In addition, efforts in the field of traffic have great effect. Because the Osaka City Government has practical skills, it is helpful if Osaka City gives us support.

- The Osaka City Government will closely cooperate with the Ministry of the Environment to continue to support the low-carbon city development in Ho Chi Minh City.

- Because it is important to use science and technology for production activities, cooperation is needed also with research institutes in Osaka City (such as the Institute of Public Health and Environmental Sciences, four public universities, national scientific institutes, and Kyoto University).

- Because it is important to manage progress through the enlightenment of residents, the development of human resources, and the use of guidelines, it would be helpful if the Osaka City Government continues support.

- Although it is important to hold a city mayor-level policy dialogue once a year, it would be useful to hold dialogues several times a year, including video meetings.

○ Hand Delivery of Document:

After the Ho Chi Minh City People's Committee expressed its gratitude for the Osaka City Government's support, Vice Chairman Cang delivered to Vice President Tanaka a document in which the Chairman of the Ho Chi Minh City People's Committee requested the Mayor of Osaka City to continue to cooperate in the development of human resources and the promotion of projects.

5.2 Holding a Study Results Debriefing Workshop (February 2016)

1) Outline

A study results debriefing workshop was held on February 25, 2016, in order to report on the study results regarding the inter-city cooperation projects for the 2015 fiscal year and the JCM projects. At the workshop, the latest report on the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) 2016-2020 and reports on the implementation progress for the JCM projects were given. The workshop was also used to discuss future cooperation frameworks between Ho Chi Minh City and Osaka City, as well as to discuss implementation policies for the transfer of knowledge, know-how, technologies and systems for urban management and urban development from Osaka City and private companies to Ho Chi Minh City, with regard to future climate change measures to be taken based on the CCAP.

2) The Program

[Date] 08:30-12:00, February 25, 2016 (Thu.)

[Venue] Meeting Room, Department of Natural Resources and Environment, Ho Chi Minh City, the Socialist Republic of Vietnam

[Attendants]

From Japan: A total of about 20 attendants from the Osaka City Government, Next Energy & Resources Co., Ltd., Hitachi Zosen Corporation, K.K. Satisfactory international, and the GEC

From Vietnam: A total of about 30 attendants from the Ho Chi Minh City People's Committee, including the Department of Natural Resources and Environment (DONRE), the Department of Agriculture and Rural Development, the Department of Planning and Architecture, the Department of Planning and Investment, the Department of Industry and Trade, the Department of Construction, the Department of Science and Technology, and the Ho Chi Minh City Foreign Affairs Office of the Ministry of Foreign Affairs of Vietnam

[Program]

8:30 – 9:00	Opening Addresses (Ms. Nguyen Thi Thanh My, Deputy Director of Department of Natural Resources and Environment, Ho Chi Minh City People's Committee) (Mr. Makoto Mihara, Acting Director of Environmental Policy Division, Environmental Policy Department, Environment Bureau, Osaka City Government)
9:00 – 9:20	Report on Summary Results of the "Survey for the Support of Low-carbon City Development through Cooperation between The People of Ho Chi Minh City and Osaka City" in FY2015 (Masaaki Tabo, Global Environment Centre Foundation)
9:20 – 9:40	Establishment of "HCMC Climate Change Action Plan (CCAP) 2016-2020" for HCMC Low-carbon City Development (Ms. Le Nguyen Que Huong, Climate Change Bureau, Department of Natural Resources and Environment, Ho Chi Minh City People's Committee)
9:40 - 10:10	Reduction of Greenhouse Gas in Ho Chi Minh City in 2020 – Updated Version (Dr. Tran Thanh Tu, AIM Team)
10:10 – 10:30	Management of Progress in Implementation of the CCAP 2016-2020: Utilization of Plan-Do-Check-Action (PDCA) Cycle (Hiroyuki Ishida, the Environmental Policy Division, the Environmental Policy Department, the Environment Bureau, the Osaka City Government)
10:30 – 10:45	Photo session & coffee break
10:45 – 11:30	Report on the Status of Progress in Implementation of the JCM project • Introduction of Photovoltaic Generation in Shopping Malls in Ho Chi Minh City (Next Energy & Resources Co., Ltd.) • Anaerobic Digestion of Organic Waste for Biogas Utilization at Market (Hitachi Zosen Corporation) • Introduction of Energy-from-Waste Project in Ho Chi Minh City (Hitachi Zosen Corporation)

	• Energy Saving at Plants through Air-conditioning Management Systems (Tepia Corporation Japan, Panasonic Corporation <proxy report: GEC>) • Project for Switching Street Lights to Highly Efficient LED Lights (Ogawa Electric Co., Ltd. <proxy report: GEC>)
11:30 – 12:30	Discussions
12:30	Closing Ceremony (Kazuhiro Oishi, Deputy Director-general, the Global Environment Centre Foundation)

3) The Main Proceedings Content

○ Ho Chi Minh City

- The Osaka City Government and the Ho Chi Minh City People's Committee have so far cooperated to develop Ho Chi Minh City into a low-carbon city. In the field of climate change in particular, the People's Committee has carried out various projects in cooperation with DONRE, the Ho Chi Minh City Climate Change Bureau (HCCB), the Osaka City Government's Environment Bureau, GEC, and private companies.

- Special mention should be made of the fact that training for the development of human resources for waste disposal and GHG reduction, and the preparation of a draft of the Climate Change Action Plan (CCAP) 2016-2020 were carried out with considerable cooperation between both cities and the relevant parties. In addition, the Ho Chi Minh City People's Committee has cooperatively proceeded with pilot projects for the disposal of waste, the effective use of energy, and the improvement of transport facilities.

- In particular, it can be said that the Memorandum of Understanding on Developing Low-Carbon City Between Ho Chi Minh City and Osaka City, which both city mayors signed on October 22, 2013, is a great achievement, especially for the cooperative relationship between both cities.

○ Osaka City

- In the city mayor-level policy dialogue held in Ho Chi Min City on November 6, 2015, Vice Mayor Tanaka of Osaka City and Vice Chairman Cang of the Ho Chi Minh City People's Committee discussed the CCAP compiled in Ho Chi Min City. At that time, Vice Chairman Cang handed Vice Mayor Tanaka a document in the name of the Chairman of the Ho Chi Minh City People's Committee concerning the Osaka City Government's continuation of cooperation in the development of human resources for the management and implementation of the CCAP and the implementation of projects and programmes for developing Ho Chi Min City into a low-carbon city.

- The Osaka City Government hopes to respond proactively to the Ho Chi Minh City People's Committee's requests for cooperation, and proceed with concrete consultations with the Committee concerning the content of inter-city cooperation in and after 2016 so that the Memorandum of Understanding on Developing Low-Carbon City Between Ho Chi Minh City and Osaka City, which was exchanged between both city mayors in October 2013, can be developed further.

- Because the Osaka City Government is convinced that Ho Chi Minh City People's Committee's implementation of the CCAP and realization of projects will promote the development of the city into a low-carbon and comfortable city and a city that leads the development of low-carbon cities not only in Vietnam but also in the Asian region, the Osaka City Government would like to continue to make full efforts to give support to Ho Chi Minh City People's Committee's implementation of the CCAP and realization of projects.

- Because the Osaka City Government recognizes that the ongoing projects are pilot projects, the Government would like to make efforts to create further projects following the CCAP. However, because some projects require civil administrative procedures, Hitachi Zosen's biogas project for the wholesale market cannot be carried out on schedule. We would like to continue to request administrative support from the Ho Chi Minh City People's Committee.

- It was announced that smooth implementation of CCAP requires the passing of a law. The Osaka City Government would like to offer cooperation in that passing.

○ Presentations and Discussions

- In COP21, the Vietnamese Government showed a GHG reduction target of 8% based on Vietnam's present ability and the target of 25% on the assumption that assistance is given from overseas (compared with BAU in either case). This requires overseas assistance and it is important to improve Vietnam's ability to attract international cooperation and investments.

- According to the results of AIM's examination, if climate change measures are carried out according to the CCAP, it will be possible to reduce GHG by 19.1% compared with 2013.

- The Osaka City Government has made efforts, placing importance on the following: sharing the plan with the relevant departments, residents, and companies at the "Plan" stage; at the "Do" stage holding liaison meetings within the City Government and each department, as well as carrying out measures together with residents and companies as one body; quantitatively inspecting and evaluating the status of target achievements and progress in the measures at the "Check" stage; and regularly reviewing the plan at the "Action" stage.

- In January this year, the factory energy conservation project (Tepia Corporation Japan, Panasonic Corporation) and the photovoltaic project (Next Energy & Resources Co., Ltd.) were adopted as Financing Programme for JCM Model Projects. It was reported that these projects were steadily progressing toward the introduction of equipment. With regard to the project of switching street lights to LED, the Ho Chi Minh City administrative authorities' cooperation was requested for promotion of the project.

- From the viewpoint of water supply management, it seems important to promote greening, improve the efficiency of the water supply system, and promote the use of rainwater.

- We would like to promote the expansion of the biogas project for the wholesale market into other markets, as well as the popularization of photovoltaic generation.

5.3 The Explanation Meeting on the Development of JCM Projects for Low-carbon City Development in Ho Chi Minh City (October 2015)

The Explanation Meeting on the Development of JCM Projects for Low-carbon City Development in Ho Chi Minh City was held on Friday, October 30, 2015, in order to give explanations on inter-city cooperation activities conducted by the Osaka City Government in Ho Chi Minh City and on support projects conducted by relevant organizations. The meeting also aimed to share an outline of the JCM and reports by the businesses which conduct JCM projects, as well as to have discussions on the creation of project implementation frameworks and MRV (measurement, reporting and verification) procedures, with the aim of promoting the utilization of the JCM. The meeting was hosted by the Osaka City Government and co-hosted by the GEC.

The meeting had 63 participants from private companies, etc., who listened to and shared opinions about the Osaka City Government's support for achieving a low-carbon society and the Japanese government's efforts, as well as explanations on the project support systems provided by the Ministry of the Environment, NEDO and JICA which use the JCM (Joint Crediting Mechanism).

[Date]	14:00-16:30, October 30, 2015 (Fri.)
[Venue]	Meeting Rooms I and II, the Environment Bureau, the Osaka City Government
[Attendants]	The Osaka City Government, the Japan International Cooperation Agency (JICA) Kansai International Center, the New Energy and Industrial Technology Development Organization (NEDO), the Kansai Economic Federation and the GEC
[Participants]	63 participants
[Description]	The participants listened to explanations on inter-city cooperation activities conducted by the Osaka City Government in Ho Chi Minh City and explanations on support projects conducted by relevant organizations. They also listened to an outline of the JCM as well as listening to reports from businesses which conduct JCM projects. They also discussed the creation of project implementation frameworks and MRV (measurement, reporting and verification) procedures, in order to increase the utilization of the JCM.

[The Main Proceedings Content]

- Within the global framework of COP21, which is to be held in Paris, the Osaka City Government is giving inter-city cooperation in the continuous development of projects for realizing low-carbon society in Asia through the use of JCM and other measures, with the support of the Ministry of the Environment. The Osaka City Government is supporting the Ho Chi Minh City People's Committee's establishment of a climate change action plan through policy support and the development of human resources according to the memorandum concluded with the Ho Chi Minh City People's Committee in October 2013. The plan will consist of measures in ten fields, such as energy, transportation, and waste. Public-private cooperative projects for implementing the measures have been promoted through the use of the Ministry of the

Environment's JCM and others. The projects have already produced some results, such as the registration of the Eco-Drive Project utilizing digital tachograph as Vietnam's first JCM project in August. Information on the Osaka City Government's efforts through inter-city cooperation has been sent all over the world through international conferences held overseas. The Osaka City Government's efforts are drawing attention. For example, some Asian cities have requested the Osaka City Government to exchange opinions about low-carbon city development.

- The entities conducting FS explained several specific case studies. JICA explained private cooperative efforts for ODA projects in the environment field. NEDO explained its project for promoting JCM. GEC explained the outline of JCM and the construction of the system for carrying out JCM projects.

- NEDO's project concerns "what should be popularized in what way." In particular, it aims to popularize and realize energy-saving technology.

- The entities conducting FS provided information on how to start the efforts for JCM, how to find local partners, and how to construct a domestic system. It is very effective to show that small and midsize companies' finding local partners requires cooperation with the Ministry of the Environment, the Osaka City Government, and GEC. Without cooperative support from the Osaka City Government and others, it would be difficult to even come into contact with any local key person.

- To develop Ho Chi Minh City into a low-carbon city through the use of the Ministry of the Environment's JCM and others, the Osaka City Government would like to promote inter-city cooperation further and give companies opportunities for overseas development.

6. PR Activities

To explain the project and to help deepen and expand understanding of JCM, PR activities were carried out through city mayor-level symposiums, local workshops, and explanation meetings on the development of JCM projects, etc.

7. Reporting the Output of this City to City Cooperation Project

7.1 Attending and Giving Reports at Progress Debriefing Sessions in Japan

(1) The Kickoff Meeting (May 2015)

We attended the kickoff meeting held at the Ministry of the Environment on May 12, 2015 and gave reports at the meeting.

The main content of the kickoff meeting proceedings is as shown below.

1) The Report on the Project

- When will the Ho Chi Minh City Climate Change Action Plan (HCMC CCAP) be completed?

  → The plan is that the CCAP will be approved at the Communist Party Congress to be held at the end of the year. Therefore, the HCMC counterparts told us that the Ho Chi Minh City Climate Change Bureau (HCCB) will complete the draft CCAP at the end of June and it will submit the final draft by the end of September, and we are making our plan accordingly. Therefore, we expect that consultations, etc. will take place until the last moment before the submission, which is the end of September, but especially until the end of June when the draft will be completed first.

- Does it mean that frameworks for the implementation of JCM projects will be created based on the CCAP?

  → In the previous fiscal year, along with the Osaka City Government, we created a list of highly feasible specific projects which should be included in the CCAP. Through consultations with the HCMC counterparts, we matched the listed projects with local needs, and prepared for the inclusion of the projects in the CCAP. Therefore, we will implement JCM projects by incorporating specific projects into the CCAP, including projects which have already received subsidies and projects for which project planning studies (PS) have been conducted.

2) The Feasibility Study for the Factory Energy Conservation Project by Panasonic and Tepia

- What is the difference between this study and the environmental management conducted by KPMG AZSA LLC until the previous fiscal year? We understand that they were also doing energy audits.

  → The previous fiscal year's study was mainly conducted in Da Nang. They did not conduct energy audits for specific factories in Ho Chi Minh, nor did they conduct audits with a view to a specific JCM project. On the other hand, this feasibility study is more likely to lead to a JCM project, as we selected factories where Panasonic's technologies can be applied, and energy audits will be conducted for local factories with a view to the development of a JCM project.

- It was a good idea to select factories owned by Japanese-affiliated companies. Are you considering the establishment of a business model, with a view to the future expansion of the project? We would like you to establish a business model in this fiscal year, because carrying on the study to establish a business model into the next fiscal year is not the way to go. We also have to say that the Ministry of the Environment will not be able to provide support if every project starts with a feasibility study, when a commercial project is created using your business model. We would like you to consider a business model which will enable the establishment of a project which does not involve conducting a feasibility study beforehand.

  → We plan to create a project in the next fiscal year. Panasonic is also working on it with a view to creating commercial projects. The Nidec Group which we selected for the feasibility study has several companies in Vietnam, and we want to focus on expanding the project to these companies.

  → We selected the factories for the feasibility study from a list of factories owned by Japanese-affiliated companies which was provided by JETRO Ho Chi Minh. We think that it is realistic to start with a Japanese-affiliated company as they are more used to the idea of taking energy conservation measures, but we also think that there is the potential to expand the project scope from Japanese-affiliated companies to local companies. Regarding expanding to other factories owned by Japanese-affiliated companies, it should not be difficult as we already have the list provided by JETRO, as explained above.

- Expansion of the project into other factories is important. We can achieve high cost-effectiveness for the subsidies, if the subsidy rate for the expansion of the project is around 5-10% (and at least 50% of the credits go to the Japanese government).

- For the geographical expansion of the scope of the factory energy conservation project, it is important to clarify its role in policies including municipal policy, therefore we recommend that you lobby the municipal governments on the matter, in relation to inter-city cooperation.

3) The Feasibility Study for the LED Street Lights Project by Ogawa Electric Co., Ltd.

- Have the locations for the introduction of LED lights been decided?

  → We are yet to reach the final decision. The Energy Conservation Center HCMC (ECC HCMC) is making a plan, but it takes time because the HCMC People's Committee is a large local government and has a complex approval process. We will proceed with the consideration of technical specifications, etc. while waiting for approval. For your information, we launched a pilot project with a small local government outside Ho Chi Minh in the previous fiscal year, and the process went very smoothly from making the proposal to reaching the decision. However, this is not the case with Ho Chi Minh City.

  → As you know, the creation of an international consortium, including the decision on the composition of the consortium, is important when taking into account the Financing Programme for JCM Model Projects. Therefore, it is necessary to create the framework very carefully, particularly for this project as we will have to make clear who will own the street lights. The creation of the framework is the most important point of the study.

- As it is a project by the HCMC People's Committee (a local government), we recommend that you consider using ADB's fund as a sovereign project.

- As street lights are municipal infrastructure, you should lobby the municipal government for the implementation of the project, along with the Osaka City Government.

4) The Feasibility Study for the CNG Taxi Project by Myclimate Japan

- Has the technology been established?

  → It is an established technology and it has also been used.

- In that case, why are you going to conduct the study?

  → Both SOPET and Anpha, which are the gas supply companies we plan to use, have never supplied CNG although they have supplied LPG.

- Wouldn't it be difficult to implement the project at an early date, if even the construction of CNG stations is yet to be considered?

  → It is necessary to make decisions after considering the feasibility of constructing CNG stations, including the feasibility of the project for Mai Linh Taxi.

  → Saisan Co.,Ltd should have knowledge on the cost-benefit analysis for the construction of CNG stations, and they should be able to work out the construction costs in Vietnam based on commodity prices, etc. in Japan and Vietnam. Therefore, the important thing is whether or not the project is feasible for Mai Linh Taxi and K-tech. This should be looked into, and if it is not feasible for the two companies, it will be impossible to implement the project. We would like you to report on the feasibility for the two companies by the next debriefing session. Based on the results, we will consider whether the study should be implemented.

- As the HCMC People's Committee considers the utilization of CNG as an important measure (e.g. already introducing CNG for buses), you should find out the intentions of the HCMC People's Committee regarding the construction of CNG stations for cars and lobby them to enable the construction.

5) The Feasibility Study for the Industrial PV Project by Next Energy & Resources

- What is new about the project for receiving the subsidy? If it has already been decided that your company will install photovoltaic (PV) systems at the AEON Mall, this project will not be eligible for the Financing Programme for JCM Model Projects.

→ It has not been decided which company will install PV systems at the AEON Mall, although it has been decided that PV systems will be installed at the mall. We understand that quotations are currently being collected from various companies. ANT is yet to decide whether to have PV systems installed at their facilities.

(2) The 2nd Progress Debriefing Session (August 2015)

We attended the 2nd progress debriefing session held at the Ministry of the Environment on August 6, 2015 and gave reports at the meeting.

The main content of the debriefing session proceedings is as shown below.

1) The Report on the Project

- We gave the following reports on the progress made regarding the inter-city cooperation projects, since the kickoff meeting of the Ministry of the Environment in May. HCMC counterparts told us that the Ho Chi Minh City Climate Change Bureau (HCCB) will complete the draft CCAP at the end of August and it will submit the final draft by the end of September. The city mayor-level policy dialogue and international symposium for this fiscal year is planned to be held on November 6. One of the aims of the event is to celebrate the completion of the CCAP. Currently, we are coordinating the event with the local office of the Ministry of Foreign Affairs of Vietnam and the HCCB. The Memorandum of Understanding on Developing Low-Carbon City Between Ho Chi Minh City and Osaka City which was signed in the 2013 fiscal year will come to an end this fiscal year. Therefore, we plan to hold a city mayor-level policy dialogue with the aim of continuing inter-city cooperation and signing a new MoU for the next fiscal year onwards.

- We received instructions on a presentation on the project at COP 21 (in Paris) from the special researcher in charge of the matter the other day. In accordance with the instructions, we applied to hold an event at the COP 21 Climate Generations Areas (areas which do not require a pass).

2) The Feasibility Study for the Factory Energy Conservation Project by Panasonic and Tepia

- We gave the following reports on the progress of the feasibility study for the factory energy conservation project. As was initially planned, field surveys (energy audits) were conducted for Nidec SERVO, Nidec TOSOK and TOYOITEC. In addition, a field survey was conducted for Nidec Vietnam in response to a request from Nidec Vietnam. It has been determined that there will be enough energy saving effects for Nidec SERVO, Nidec TOSOK and Nidec Vietnam and detailed examinations are currently taking place. The energy saving effects for TOYOITEC are expected to be small and therefore TOYOITEC was given a lower priority.

- The report gives CO_2 emissions reduction estimates (the air conditioner control system Be-ONE and the control system for multiple compressors), but the CO2 reduction effects for the control system for multiple compressors are low. Closer examinations should be conducted.

- How will you guarantee the equipment during the statutory service life, and fulfill your obligation to repair the equipment?

  → The statutory service life for Be-One and the control system for multiple compressors should be seven years, as they are categorized as electronic equipment. We will consider a system for ensuring that the equipment is able to operate during the statutory service life by repairing it in the factory when it has failed.

- The operation of equipment involves the management of hundreds of air conditioning units, which is difficult to conduct manually. Therefore, a management system is likely to be needed at the relevant factory. Will such a management system be eligible for subsidies?

  → It is probably difficult if it is only for the management of equipment, but it could become eligible for subsidies if it enhances overall energy conservation effects through the management of all the equipment installed by the project, for example.

- We would like you to consider applying for subsidies when the 2nd invitation starts for the Financing Programme for JCM Model Projects.

  → We will consider it.

3) The Feasibility Study for the LED Street Lights Project by Ogawa Electric Co., Ltd.

- We gave the following reports on the progress of the feasibility study for the LED street lights project. We plan to launch the trial introduction of LED street lights and verification surveys in early October. The Department of Transportation of the HCMC People's Committee will host a seminar on the introduction of LED street lights on August 11 and Ogawa Electric Co., Ltd. will give a presentation.

- At a consultation with the GEC, they recommended that we introduce a management system for all the street lights. Is it really necessary?

  → We understand that, in another LED project which was selected for the Financing Programme for JCM Model Projects, a management system for all LED equipment was to be introduced. A total management system is not necessarily required, but the introduction of a total management system might increase the possibility of the project being selected, because candidate projects are likely to be compared with past selected projects in the selection process.

  → The GEC advised that it is important to follow past selected projects, particularly from the standpoint of increasing the amount of CO2 emissions reduction which can be confirmed with certainty.

4) The Feasibility Study for the Industrial PV Project by Next Energy & Resources

- The GEC gave the following reports on the progress of the feasibility study for the industrial PV project, on behalf of Next Energy & Resources. Currently, the plan is to install PV systems on the rooftop of the third AEON Mall and on the roof over its bicycle parking area, which are currently under construction.

  → We would like you to make sure that the project is ready on time, because we do not have much time before the 2nd invitation starts for the Financing Programme for JCM Model Projects.

(3) The 3rd Progress Debriefing Session (November 2015)

We attended the 3rd progress debriefing session held by the Ministry of the Environment on November 17, 2015 to make our report. The main contents of the session proceedings are as shown below.

1) The Report on the Project

- What do you think of the continuation of the project in the next fiscal year?

  → At the city mayor-level symposium held the other day, Vice Chairman Cang handed Vice Mayor Tanaka a signed letter in which The Mayor of Ho Chi Minh City requested the Osaka City Mayor to continue cooperation in the future. The Osaka City Government has understood that the Ho Chi Minh City People's Committee wishes to continue this project in and after the next fiscal year.

- We understand that the Osaka City Government is planning to advance into Jakarta City and Manila City.

  → We understand that the Osaka City Government selected Jakarta City and Manila City based on candidate cities with which the Osaka City Government already has cooperative relationships.

- Terrorist attacks occurred in Paris the other day. We would like to know the latest information on COP21. GEC is considering whether to participate or not.

  → Right now there we have ideas about whether to proceed as planned or reduce the scale of our participation, but right now there is no concrete information. Because this decision could affect people's lives, it is best to base our decision on the judgment of the organizers.

2) The Feasibility Study for the Factory Energy Conservation Project by Panasonic and Tepia

- Regarding the feasibility study for the factory energy conservation project, a request was given to Nidec's head office as to whether to carry out the project as a JCM project for the following six factories: Nidec VIETNAM, Nidec SERVO, and Nidec TOSOK, where local surveys were conducted (for inspection about energy saving); and three other factories of similar size where no survey was conducted. They should respond to the request made soon. We are considering applying for the ongoing second invitation to the Financing Programme for JCM Model Projects if they decide that the project will be carried out as a JCM project.

→ Although we understand that Nidec's criteria for judgment on project investments are strict, we would like Nidec to make try to understand JCM projects.

→ We will make efforts to respond to Nidec's requests for research, such as a feasibility study of ESCO projects by the use of Nidec's investments other than JCM subsidies and gain an understanding from Nidec.

- What do you think of the horizontal development of the Factory Energy Conservation Project?

  → We are planning to expand it to other factories in Ho Chi Minh City and have listed about 20 factories as candidates. We are considering expanding it to neighboring districts and other countries after that.

- There were some cases where JCM projects were not feasible because it was problematic to gain an understanding from companies about "the obligation to maintain and restore equipment during the statutory service life," one of the preconditions for JCM projects.

- If all the installed equipment is monitored, the initial investments in the monitoring system will increase. Is it necessary to monitor all the equipment?

  → Although all the equipment should be monitored in principle, we think this depends on methodology.

3) **The Feasibility Study for the LED Street Lights Project by Ogawa Electric Co., Ltd.**

- We gave a report on the status of progress in the feasibility study for the LED street lights project. At present, we have not applied for the Financing Programme for JCM Model Projects, although we have conducted the following during the feasibility study: presentation at the August seminar sponsored by the Ho Chi Minh City Department of Transportation (managed by the Energy Conservation Center (ECC)); review of test installation of 11 street lights; examination of the financing plan as requested by ECC; and consideration of forming an international consortium. The problem is that, although we have requested a direct consultation with the Department of Transportation, which manages street lights, to ECC, this has not been achieved yet. With regard to Da Nang City, the People's Committee, the street light management company, Stanley Electric, and Ogawa Electric Co., Ltd. concluded a memorandum on the switching of street lights to LED ones. Ogawa Electric Co., Ltd. has submitted a written proposal to the People's Committee.

- At the meeting held in August for a report on the status of progress, we instructed you to investigate the newness of LED street lights. How did you achieve that?

  → Although the switch of lights to LED has been progressing in buildings in both

Ho Chi Minh City and Da Nang City, only a few street lights have been replaced with LED, on an experimental basis. Basically, the current street lights are high-pressure sodium lights. Therefore, it seems that the newness requirement has been secured. With regard to the monitoring system, it was concluded that such a system cannot be introduced. Although a consultation was held with the local counterpart about the introduction of an automatic monitoring system for the management of all street lights by the use of PLC and Wi-Fi, there are problems, such as a sharp rise in the equipment investment cost and the road light management company's loss of work (the company is currently managing street lights by patrol and visual check).

→ During the Financing Programme for JCM Model Projects, we do not seek "newness" but prefer "advancement" of the technology. In this sense, Stanley Electric's LED is excellent in that the lighting technology can effectively cover a wider area by using a special lens. Therefore, it seems that advancement has been secured. We are consulting with Ogawa Electric Co., Ltd. about the monitoring system. We have requested Ogawa Electric Co., Ltd. to consider introducing an automatic system, because the current monitoring by patrol and visual check seems to be unable to guarantee accuracy. We told Ogawa Electric Co., Ltd. that, given that an automatic monitoring system has been adopted for the Financing Programme for JCM Model Projects in another country, the possibility of adopting such a system for the Programme will decrease in this country.

- Examine and report the amount of CO2 reduction and the cost-effectiveness as soon as possible.

- With regard to this FS, the Committee judged that examiners can complete it in about a half year. Responding to this, the Ministry of the Environment thinks that the FS should be finished at the end of September. Attention should be paid to the cost of the FS. In addition, please explain the condition that an application should be made for the Financing Programme for JCM Model Projects.

→ With regard to the term of the FS, GEC, Ogawa Electric Co., Ltd., and the other parties concerned in the FS had an understanding that it would not expire at the end of September but that they had at least until their application for the second invitation to the Financing Programme for JCM Model Projects. Because this FS is now in progress, we would like you to approve payment of the FS cost at least by the end of the second invitation term (scheduled for December 18). Although Ogawa Electric Co., Ltd. presented the FS at the city mayor-level symposium in Ho Chi Minh City, if the term expires at the end of September, Ogawa Electric Co., Ltd. will have to pay the cost.

→ Because the content cannot be judged by the International Cooperation Office alone, the Office will judge it in coordination with the examiners and other related departments.

→ Because no consultation can be held with the Department of Transportation, which manages street lights in Ho Chi Minh City, it is impossible to consider making an application for the Financing Programme for JCM Model Projects. In Da Nang City, if approval can be gained for the submitted proposal, we would like to proceed with the application procedure.

→ The Ministry of the Environment judged from the written proposal at the time of the invitation that the project could be carried out as a JCM project after about a half year's FS. However, the preconditions have changed.

→ Because ECC, which is the local counterpart for the FS, had experience in introducing LED street lights in neighboring districts around Ho Chi Minh City in cooperation with Ogawa Electric Co., Ltd. and Stanley Electric, when we held a local consultation with ECC before the application, we judged it possible to carry out the project quickly, based on ECC's explanation about the plan in Ho Chi Minh City, including the number of street lights to be replaced. At the same time, ECC proposed the FS based on a strong request for Japan's promotion of the project for switching the existing street lights to LED ones. ECC, however, has begun to move slowly since the beginning of the FS. Because we could not predict such a situation at the beginning of the FS, we feel deeply let down by ECC.

- We would like you to proceed with the FS so that the project will become advantageous to the Ministry of the Environment.

- With regard to the problem of inability to consult with the Department of Transportation, although the FS has been carried out within the framework of inter-city cooperation, we would like to have an explanation for the cooperation between the Osaka City Government and GEC.

→ The Osaka City Government presented the responsible officer of the HCMC Urban-Civil Works Construction Investment Management Authority, which is in charge of LED, through an introduction of the Climate Change Bureau. We would like to proceed with the FS with the cooperation of the Osaka City Government in the future also.

→ We understand that the HCMC Climate Change Action Plan has been completed. Has the LED Project been included as a measure in the plan? If so, the Ho Chi Minh City People's Committee should be encouraged to promote the project from the viewpoint of the implementation of the plan. Efforts should be made to use inter-city cooperation for advancing and realizing the project, which has been delayed due to private-private cooperation.

4) FS for the Industrial PV Project by NER

- GEC reported the progress in the FS for the Industrial PV Project on behalf of Next Energy & Resource (NER). With regard to the FS, we understand that a study about implementation of the project as a JCM project has been completed and AEON Retail and AEON Vietnam will apply for the second invitation to the Financing Programme for JCM Model Projects as the Japanese and Vietnamese representatives, respectively.

(4) The Final Debriefing Session (January 2016)

We gave a report at the final debriefing session held by the Ministry of the Environment on

January 12, 2016. The main proceedings were as follows:

- The final debriefing workshop was scheduled to be held in Ho Chi Minh City on February 26 (Fri).

- With regard to related meetings, both the Osaka City Government and the Ho Chi Minh City People’s Committee are planning to participate in the JCM inter-city cooperation workshop to be held in Tokyo on January 28 (Thu) and 29 (Fri) and the ESC high-level seminar on March 4 (Thu) and 5 (Fri).

- An invitation to the Financing Programme for JCM Model Projects was issued concerning “The Energy Conservation Project for Factories on an Industrial Estate in Ho Chi Minh City” (Panasonic Corporation, Tepia Corporation Japan) and “The Project for the Promotion of the Industrial Use of Photovoltaic Systems” (NER). FS was carried out for both projects in this fiscal year.

- The Osaka City Government would like to continue the inter-city cooperation also in and after the next fiscal year, making use of the connection with the local counterpart, companies, associations, and others developed in these three years. Because the financial plan is important for carrying out a low-carbon project, we would like to develop a low-carbon project, incorporating the scheme of the Financing Programme for JCM Model Projects and schemes developed by the Ministry of Economy, Trade and Industry and JICA. In addition, because the importance of relaxation measures has been filtering into the local counterparts, we would like to proceed with the development of new projects.

- For this purpose, we would like to promote JCM, centering on the horizontal development of the existing projects and participating in activities that increase opportunities for corporate matching and missions of the Kansai Economic Federation.

- Moreover, we would like to advance into other cities, making use of the experience gained from the inter-city cooperation with the Ho Chi Minh City People’s Committee.

- The Ministry of the Environment expects that new projects will be found with the support of the Osaka City Government. We would like you to raise the level of JCM projects.

7.2 Attending and Giving Presentations at the Preliminary Meeting in Japan Prior to the Workshops, etc. to Be Held in Ho Chi Minh City

We held a preliminary meeting which aimed to share information and exchange opinions between personnel from the Ministry of the Environment and Team Osaka, regarding the content of the project for the 2015 fiscal year, the implementation policies, the schedule, etc.

[Date] May 14, 2015 (Thu.)

[Participants] The Osaka City Government, Tepia Corporation Japan, Panasonic Corporation, Myclimate Japan Co., Ltd., Next Energy & Resources Co., Ltd., Osaka

University, the Japan Conference on Overseas Development of Eco-Cities (J-CODE), K.K. Satisfactory international, Daikin Industries, Ltd., Hitachi Zosen Corporation, Mitsubishi UFJ Morgan Stanley Securities Co., Ltd., and the GEC

[Main discussion content]

- The GEC gave an outline of the project for the 2015 fiscal year, before the companies conducting the 2015 fiscal year feasibility studies explained the content of their projects. Then, Hitachi Zosen Corporation and J-CODE gave presentations on the relevant projects for Ho Chi Minh City.

- This is the third year of the cooperation project between Ho Chi Minh City and Osaka City. We have built networks of various people in Japan and Ho Chi Minh City. Please tell us any key people you know in Ho Chi Minh City who could help create projects, as we would like to give support.

- We would like to see the involvement of a wider range of stakeholders in the projects, for example expanding projects to local companies rather than just Japanese-affiliated companies, and also developing new projects via collaborations between companies within Team Osaka.

- The Osaka City Government will provide support for JCM projects, but it will also provide support for the business expansion of companies in general as part of the inter-city cooperation, without being limited to JCM projects. For example, we are considering using a JICA scheme for a rainwater storage project at the Ho Chi Minh City District 4 Elementary School and one company is currently applying for it. We are also considering the introduction of energy saving equipment at hospitals in Ho Chi Minh City in the future.

- Would it be possible to combine several projects and implement them as one project? (e.g. An AEON Mall + PV systems + P&BR (park and bus ride))

- The Ministry of the Environment requested the Osaka City Government to lobby the HCMC municipal government for the implementation of projects which are public in nature, such as the installation of street lights and the construction of CNG stations.

- We have been developing projects which can utilize the JCM, by listening to local needs from the ECC HCMC, etc. We have large networks of people involved with energy conservation. Please utilize our networks.

- The introduction of LED lights is a public works project and therefore we have to wait for decisions by the HCMC People’s Committee at each stage of the process. We want to proceed with the project by consulting with Ogawa Electric Co., Ltd., as we have particular problems such as who will own the street lights, when applying for the Financing Programme for JCM Model Projects.

- We want to know the situation for the supply of CNG in Ho Chi Minh City.

  → Vietnam does not produce natural gas. We are currently working on the project with Saisan Co.,Ltd which mainly sells LPG in Ho Chi Minh City. We will study the technologies and costs involved with switching from LPG infrastructure to CNG infrastructure.

- Will CNG be accepted in Ho Chi Minh City?

  → They probably want to mainly consume fuels that can be produced in their own country.

- There are other major taxi companies in Ho Chi Minh City such as Vinasun. Why did you choose Mai Linh Taxi?

  → Mai Linh Taxi has about 6,000 taxies in Ho Chi Minh City as of 2015. If this project succeeds, we could consider expanding the project to other taxi companies.

  → The HCMC People's Committee plans to use CNG. In fact, some CNG buses have been introduced through a project for switching to CNG buses. We heard that the HCMC People's Committee requested a similar measure for taxies, to Mai Linh Taxi and Saisan's local subsidiary.

- Why is the size of PV systems limited to 100-300 kW?

  → As a result of interviews, demand for 100-300 kW power generation accounted for most of the replies.

- Is it not possible to install PV systems at elementary schools in Ho Chi Minh City, as part of environmental education, and also as a disaster management measure which provides a backup power supply?

  → We have installed PV systems at schools in Japan. We also have been consulted on the introduction of a power storage system, but the specifics are yet to be decided. If there is demand in Ho Chi Minh City, the introduction will not be difficult, from a technical standpoint. The issue is who will pay for it.

  → When considering the utilization of the Financing Programme for JCM Model Projects, the amount of subsidy will be higher for the introduction of a PV system and a power storage system than for the introduction of a PV system alone. Therefore, it is seen as less cost effective.

- The Urban Renaissance Agency (UR) services as the secretariat of J-CODE. In the previous fiscal year, the Ministry of Land, Infrastructure, Transport and Tourism asked UR to support private companies' business expansion overseas.

- We are placing priority on planning projects along the Ho Chi Minh City Urban Railway Line 1 which is under construction using Japanese ODA (scheduled to be completed by 2020). One of them is the underground shopping mall construction project at Ben Thanh Station. We are currently negotiating with the HCMC People's Committee on the underground shopping mall business rights. The HCMC People's Committee wants to know our experience and ability to run and manage underground shopping malls, and therefore we are negotiating with the cooperation of the Osaka City Government and underground shopping mall business operators in Osaka City. We are planning similar projects in areas around Suoi Tien Station which is the Urban Railway Line 1's terminal in Binh Duong Province, as well as at two places along the railway line between the two stations.

- Novaland, which is a major apartment developer in Vietnam, is conducting a development project on 50 hectares of land along the river north to Binh Dien Market, and UR is giving advice to Japanese workers at Novaland. We heard that a company from Osaka City will also invest in the project. There is the idea that Binh Dien Market could be made into a tourist site like Tsukiji Market in Japan, but local personnel do not understand the concept of coexisting with the market.

- Currently, we are selling equipment to developing countries without using JCM or other similar schemes. In the current situation where manufacturers from other countries such as South Korea are becoming competitive, we are considering using JCM and JICA schemes in order to seize a wider range of business opportunities.

7.3 Providing Information at Meetings Designated by the Ministry of the Environment

(1) The Workshop and Seminars on JCM City-to-City Collaboration (Tokyo) (January 2016)

We attended the JCM Inter-city Cooperation Workshop held in Tokyo on January 28 and 29, 2016. The Osaka City Government made a presentation and a discussion concerning this project.

The Osaka City Government reported that it had promoted the strengthening of the inter-city cooperation with Ho Chi Minh City in its developing into a low-carbon city and the discovery and formation of JCM projects through this study project with the support of the Ministry of the Environment and that it would continue to give cooperation to Ho Chi Minh City. The Ho Chi Minh City People's Committee expressed its gratitude for the cooperation so far and showed their willingness to receive cooperation also in the future.

(2) The 7th ESC High Level Seminar (Hanoi) (March 2016)

We attended the 7th ESC High Level Seminar held in Hanoi on March 3 and 4, 2016. The Osaka City Government made a presentation and a discussion concerning this project.

The Osaka City Government attended the session "Better City-to-City Cooperation" on the second day and made a presentation about the Project for Supporting the Development of a Low-carbon City by Inter-city Cooperation between Ho Chi Minh City and Osaka City. Dr. Viet from Ho Chi Minh City, the partner city, made a comment to the effect that Ho Chi Minh City expects the Osaka City Government to give cooperation in developing human resources for the realization of the low-carbon city development, promoting projects based on model projects, formulating policies, etc.

During the discussion, the moderator made questions about the inter-city cooperation's advantages to Osaka City. Another speaker (UCLG-ASPAC (United Cities and Local Governments Asia Pacific)) made questions about how to secure a budget and human resources for the promotion of the inter-city cooperation. The Osaka City Government answered that information about its efforts for the inter-city cooperation can be disseminated all over the world through the participation in this seminar and that the strengthening of the exchange of opinions in the field of the environment will make it possible to expect positive effects on the exchange of opinions in other fields, such as economy and education. With regard to how to secure a budget and human resources, the Osaka City Government made a comment to the effect that because local governments carry out inter-city cooperation projects with limited budgets and human resources, it is essential to receive cooperation and support from the central government and international organizations.

(3) The Creation of a Leaflet

We created a leaflet on the studies and distributed it at various conferences and meetings, as part of the PR activities for the studies.

Team OSAKA–Ho Chi Minh Project for Developing Low-Carbon City

Based on the MoU on Developing Low-Carbon City Between Ho Chi Minh City and Osaka City signed by the both city mayors in October 2013, this project aims to establish, with a close cooperation between Ho Chi Minh City (HCMC) and Osaka City, a low-carbon society in Ho Chi Minh City, one of the most vulnerable cities to the climate change adverse effects in the world.

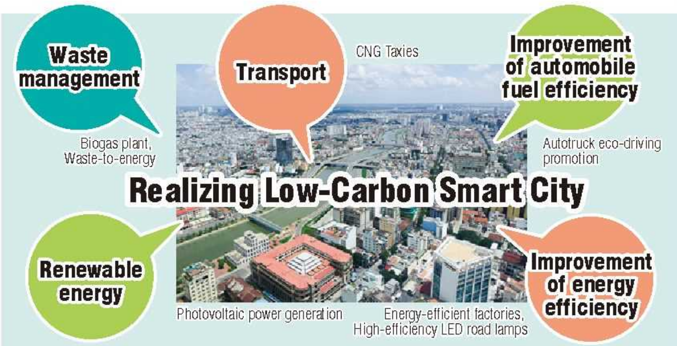
Project to Support the Large-Scale Formation of JCM Programs to Realize Low-Carbon Societies in Asia

HCMC- Osaka City Cooperation Project for Developing Low-Carbon City

Global Environment Centre Foundation (GEC) has been implementing this city-to-city cooperation project under the commission of the Ministry of the Environment, Japan (MOEJ), and supported by Osaka City, since 2013.

Goals

- **Advanced environmental technology and administration** of Japan and Osaka to be provided to HCMC, as a packaged system.
- As the core for developing a low-carbon HCMC with a long-term vision, **administrative institution to tackle climate change, climate change action plan, and capacity development** to be developed.
- JCM fund to be utilized for the transfer of low-carbon/environmental advanced technologies to HCMC



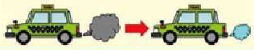
Contents in 2015

- Support to develop and implement HCMC Climate Change Action Plan (CCAP)
- Support for the progress management of CCAP implementation with capacity enhancement of PDCA
- Promotion of PPP based on city-to-city cooperation
- Realization of JCM projects

Feasibility Study (FS) Panasonic Corporation and Tepia Corporation Japan
Energy efficiency improvement in factories

Feasibility Study (FS) Ogawa Denki CO., LTD.
LED lamps for road lighting

Feasibility Study (FS) Myclimate Japan Co., Ltd.
CNG taxies promotion



Feasibility Study (FS) Next Energy & Resources Co., Ltd.
Photovoltaic power generation

2 JCM model projects are at the implementation phase.

→Low-carbon technologies are to be transferred to HCMC.

Utilization of Biogas from Solid Waste at Wholesale Market
Japanese implementer: Hitachi Zosen
GHG reduction: 3,355tCO_2/year

Eco-Drive Project with Digital Tachographs
Japanese implementer: Nippon Express
GHG reduction: 315tCO_2/year

Ⅲ. HO CHI MINH CITY CLIMATE CHANGE ACTION PLAN FOR 2016-2020, WITH A VISION TO 2030

(DRAFT Version of Feburary 2016)

PEOPLE'S COMMITTEE OF HO CHI MINH CITY
CLIMATE CHANGE STEERING BOARD

DRAFT

TECHNICAL REPORT

HO CHI MINH CITY CLIMATE CHANGE ACTION PLAN FOR 2016-2020, WITH A VISION TO 2030

Ho Chi Minh City
Feburary 2015

LIST OF ABBREVIATIONS

CC	Climate Change
IPCC	Intergovernmental Panel on Climate Change
GG	Greenhouse gas
IZ	Industrial Zones
HCMC	Ho Chi Minh City

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A. PREFACE

1. INTRODUCTION

According to the Master Planning on Economic and Social Development towards 2020, with a view to 2025, Ho Chi Minh city will be a modern, civilized city with a special urban role; taking the lead in industrialization and modernization with a growing contribution to the region and the nation; gradually becoming a great center of economy, finance, commerce, science, and technology of the nation and Southeast Asia; and actively contributing to essentially making Vietnam modern industrialized country by 2020.

Ho Chi Minh City is the second largest city in Vietnam by area (2,095.57 km^2) and the country's first metropolis of over 10 million people (2015). It is also the biggest center for services and economic activity in Vietnam, consistently contributing over many years to 21% of the country's GDP, 20% of its export turnover, and 33% of its total national budget revenue. It carries social and economic developing investment value of around VND 100,000 billion/year and has had an average GDP growth of 9.6% a year (7.9–9.6%), which is 1.66 times of the national average growth (Vietnam 5.2–5.8%). Its economic structure continues to change in a positive way: services account for 59.6% of GDP; industry and construction account for 39.4%; agriculture accounts for 1%. Annual per capita income in 2014 was USD 5,131 (Vietnam's average is USD 2,000 per capita), a 12.89% increase over 2013 (USD 360 in 1976 and USD 1,011 in 2000). GDP per capita at the end of 2015 is expected to reach USD 5,538. Ho Chi Minh city has also the economic leader among key economic regions in the south which, along with Ho Chi Minh, includes Dong Nai, Binh Duong, Ba Ria-Vung Tau, Tay Ninh, Long An, Tien Giang, and Binh Phuoc. Ho Chi Minh is also among localities attracting considerable foreign direct investment (FDI) of USD 39 billion.

Until 2015, Ho Chi Minh City (including 24 districts with 322 wards, communes, and towns) has had 20 Urban Areas, 16 Industrial Zones (13 Collective Industrial Zones, 2 Export Processing Zones and 1 High-Tech Zone) with over 2,000 factories operating in Industrial Zones, 26 Industrial Clusters, and about 12,000 manufacturing facilities (large, medium, and small) in addition to Industrial Zones and Industrial Clusters.

In addition to having a high level of social and economic development, urbanization, and industrialization, Ho Chi Minh is also the urban area with the highest rate of exploitation and consumption of natural resources and power in the nation. Every year, Ho Chi Minh consumes from 16.3 billion KWh electricity (2011) to 19.4 billion KWh electricity (2014), increasing 8–10% year. Every day, Ho Chi Minh explores and uses 1.6–1.7 million m^3 of supply water and releases about 1.4–1.5 million m^3 of medical, industrial, domestic, and other kinds of wastewater. The amount of fuel (petroleum and oil of all kinds, including kerosene and gasoline) is provided for over 500,000 motor vehicles and approximately 5.5 million motorbikes of all kinds (most of which have capacities over 100 cm^3), thousands of industrial boilers, drying kilns, etc. up to 3,000 m^3/day (petroleum is around 2,200 m^3/day), not to mention firewood and every kind of coal.

Economic structure changes in direction of service, industry and agriculture. Until 2020, the service sector will account for 58.16–60.07% of GDP, the industry and construction sector 39.19–41.07%, and the agriculture sector 0.74–0.78%. Until 2025, the service sector will account for 58.29–61.10%, the industry and construction sector 38.29–41.05%, and the agriculture sector 0.61–0.66%.

Regarding the orientation of industry and sector development, the city focuses on developing service sectors with 9 sector groups: (1) finance service, credit, bank and insurance; (2) commerce; (3) transport, warehouse, port service; (4) postal & telecommunication and information technology & media; (5) asset and real estate business; (6) consulting information service, science and technology; (7) tourism; (8) medicine; (9) education and training. The goal is to develop a leading financial center in Southeast Asia.

In addition, the city will promote the development of a modern service infrastructure, including a system of markets, trading centers, good delivery centers, office towers, luxury restaurants and hotels, electronic commerce, high-tech medical centers, universities with international standards, and synchronous development between modern service infrastructure and traditional service infrastructure.

The city's tourism will be developed similarly to countries in the region; the city will be developed to become a center of tourism with tourist transshipment services, bringing people to the country for shopping, conferencing, medical examinations and treatment, and cuisine, as well as promoting the development of domestic tourism.

The development of industry and construction in Ho Chi Minh is focused on high added value sectors, fields, and stages ; on developing 4 industrial sector groups with a strong emphasis on science and technology and value added fields (mechanics; electrics and information technology; medicinal chemistry and rubber; foodstuff processing), energy saving, clean industrial, biotechnological sectors; developing the fashion industry in textile and garments (leather and footwear), the design industry; and steadily transitioning from machining and assembling operations into production .

The city will continue to develop high-tech industrial zones, arrange production in planning industrial zones and clusters, develop supporting industries for the development of the mechanical industry, electronics and informatics, and limit new investing projects that use many unskilled laborers.

For the orientation of rural and agricultural development, Ho Chi Minh will develop modern agriculture with high productivity, quality, efficiency, and competitiveness in line with the agricultural characteristics of a special urban and the key southern economic region. Its goal is to achieve average GDP growth in the agriculture sector of 5%/year for the 2011–2015 period, 5%/year for the 2016–2020 period, and 5%/year for the 2021–2025 period.

Average GDP growth in the industry and construction sector for the 2011–2015 period reached 8.7%/year and the forecasts for the 2016–2020 and 2021–2025 periods are 8.7% and 8.5%/year, respectively.

2. SCIENTIFIC AND LEGAL BASIS

2.1. Legal basis

The Ho Chi Minh City Climate Change Action Plan for 2016–2020, with a Vision to 2030 is established basing on the legal basis below.

2.1.1. Laws and by-laws

- Law on Economical and Efficient Use of Energy (2010);

- Law on Natural Disaster Prevention (2013);
- Environmental Protection Law (2014);
- Decision No. 158/2008/QD–TTg dated December 30, 2008 of the Prime Minister on approving National Target Program for Climate Change Adaptation;
- Official letter No. 3815/BTNMT–KTTVBDKH dated October 13, 2009 with respect to giving guidance for Ministries, Sectors, localities to make Action plan for climate change adaptation;
- Decision No. 24/QD–TTg dated January 06, 2010 of the Prime Minister on approving Master Planning of Ho Chi Minh city towards 2020, with the vision towards 2025;
- Decision No. 1719/QD–TTg dated October 04, 2011 of the Prime Minister on promulgating Criteria for evaluating the prior plan according to Assistance Program for climate change adaptation;
- Decision No. 2139/QD–TTg dated December 05, 2011 of the Prime Minister on approving National strategy for climate change adaptation;
- Results on updating the Scenario of climate change, sea level rise for Vietnam (announced by the Ministry of Natural resources and Environment in March 2012);
- Decision No. 1393/QD–TTg dated September 25, 2012 of the Prime Minister on approving the National strategy for green growth;
- Decision No. 1474/QD–TTg dated October 05, 2012 of the Prime Minister on promulgating the National action plan for climate change adaptation;
- Decision No. 1183/QD–TTg dated August 30, 2012 of the Prime Minister on approving the National Target Program for Climate Change Adaptation for the 2012–2015 period;
- Scheme 1775/QD-TTg on Management of greenhouse gas emissions, management of carbon credit business into the world market (November 2012);
- Decision No. 2631/QD–TTg dated December 31, 2013 of the Prime Minister on approving Master Planning on Economic and Social Development of Ho Chi Minh city towards 2020, with the vision towards 2025;
- Official letter No. 990/BTNMT–KTTVBDKH dated March 24, 2014 with respect to "Guidance on updating Action plan for climate change adaptation" for Ministries, sectors, localities;
- Strategies, planning, plans for developing the nation, sectors, regions and Ho Chi Minh city towards 2020 and the following years.

2.1.2. Policy of Ho Chi Minh City

- Decision No. 2838/QD–UBND dated June 11, 2014 on promulgating Plan for Implementation of Action Program No. 34–CTrHD/TU of the City party committee, and Resolution No. 08/NQ-CP of the Government regarding the implementation of Resolution No. 24–NQ/TW of the 7^{th} Congress of the 11^{th} Central Executive Committee with respect to active measures to climate change, enhancement of natural resource management, and environmental protection;

- Decision No. 2484/QD–UBND dated May 15, 2013 of the People’s Committee of the City on promulgating Action plan for climate change measures in Ho Chi Minh city until 2015;
- Official letter No. 6811/UBND–DTMT dated December 20, 2014 of the People’s committee of the city with respect to priority fields and provision of figures serving the development of Action Plan for Climate Change Measures in Ho Chi Minh City.

2.2. Scientific basis

In addition to the legal basis, Action Plan for Climate Change in Ho Chi Minh City for the 2016–2020 period, with a vision to 2030 is established on the basis of the following scientific research that has been accepted and is being implemented:

- Development of a program for enhancing public awareness on climate change (2010–2012) as conducted by the Department of Science and Technology, Environmental Protection Fund, Department of Natural resources and Environment, and relevant units.
- Development of a model for calculating some parameters which are under the effects of climate change. This model serves the planning of land use, traffic, water resources and infrastructure for Ho Chi Minh City (2009–2011). Conducted by the Department of Science and Technology, the Sub-institute of Hydrology, Meteorology and Environment; the Department of Natural Resources and Environment; schools and institutes.
- Evaluate the effects of climate change on downstream areas, quality, and sanitization of the water of Saigon River and propose proper adaptive solutions (2011–2012). Conducted by the Department of Science and Technology, the Institute of Water and Environmental Technology, the Department of Natural resources and Environment, and relevant units.
- Study the effects of climate change on Can Gio mangrove forest flora and propose protective measures (2012–2015). Conducted by the Department of Science and Technology, Department of Natural resources and Environment, Department of Agriculture and Rural Development, the People’s Committee of Can Gio suburban district; relevant units.
- Develop a hydro-meteorological atlas (2011–2013). Conducted by the Department of Science and Technology, Sub-institute of Hydrology, Meteorology and Environment; schools, institutes.
- Study the proposal on climate change measures for salt production by salt farmers in the Can Gio suburban district, Ho Chi Minh City (2012–2015). Conducted by the Department of Science and Technology.
- Study a decision-making supporting system to manage surface water resources in the Saigon river basin adapting to climate change. Conduct a case study of regulations concerning the Dau Tieng reservoir to ensure a safe water supply from the Saigon river (2012–2015). Conducted by the Department of Science and Technology, Institute of Environment and Natural Resources, Committee of Dong

Nai river basin, Department of Natural Resources and Environment, Department of Agriculture and Rural Development and relevant units.

- Study and assess the effects of climate change on migration and the challenges posed to lifeline infrastructure systems for Ho Chi Minh citizens (2013–2015). Conducted by the Department of Science and Technology, Department of Labor, Invalids and Social affairs, Institute of city developing research and relevant units.
- Study the effects of climate change on current conditions and the planning of industrial solid waste landfills and hazardous wastes (2013–2015). Conducted by the Department of Science and Technology, Department of Natural Resources and Environment, Department of Construction, Department of Architecture Planning; relevant units.
- Study and assess the socio-economic effects of climate change on urban flooding; develop proper strategies to improve flood adapting capacity (2013–2015). Conducted by the Department of Science and Technology, Steering Center of Flood Preventing Program, relevant Departments and localities.
- Study the capacity of urban drainage systems' capacity to accommodate rain event frequencies that exceed the systems' design standards (2013–2015). Conducted by the Department of Science and Technology, Steering Center of flood preventing program, research institutes, schools.
- Study the effects of sea level rise on collective residential areas and identify populations, especially the affected poor population in Ho Chi Minh, corresponding to different climate change scenarios (2013–2015). Conducted by the Department of Science and Technology, Department of Labor, Invalids and Social affairs, relevant units.
- Develop a riverbank erosion risk-warning map that accounts for the effects of climate change (2013–2015). Conducted by the Department of Science and Technology, Sub-institute of Hydrology, Meteorology and Environment, research institutes, schools.
- Assess the scarcity of fresh water resources in Ho Chi Minh based on the Water Stress Index (Water Stress Index-WSI) in HCMC development scenarios until 2030 and climate change-induced sea level rise scenarios, and propose solutions to reduce WSI (2013–2015). Conducted by the Department of Science and Technology, Department of Natural Resources and Environment; Department of Transport, Department of Architecture Planning; relevant Schools, Institutes.
- Study the effects of the urban heat island phenomenon on public health under the effects of climate change (2013–2015). Conducted by the Department of Science and Technology, Department of Health, Department of Labor, Invalids and Social affairs.
- Study the effects of climate change on developing fresh water supply infrastructure and rural sanitation and suggest adaptive solutions (2013–2015). Conducted by the Department of Science and Technology, Department of Agriculture and Rural development, research institutes, schools.

In the short 2016–2020 period, (1) heat and (2) rainfall intensity are two main climate change factors affecting all social and economic development fields of Ho Chi Minh. Changes regarding these two factors will be the cause of a series of adverse effects on natural and human life in the city. In addition, in spite of the short timespan (5 years), sea level rise is not sufficient to cause serious consequences. However, it is an issue to note when implementing adaptive solutions and making appropriate adjustments in the work of urban planning and water resource management.

3. STATUS OF SOCIOECONOMIC DEVELOPMENT IN HO CHI MINH CITY FOR THE 2011-2015 PERIOD

3.1. Economic growth and economic restructuring

For the 2011–2015 period, HCMC's GDP is expected to increase 9.6%/year on average, 1.66 times the national rate (5.78%). The service sector has the highest growth at 11.2%/year. The industry and construction sector will increase 7.4%/year and the agriculture, forestry and fishery sector rose 5.8%/year. According to the new method, the 5-year GRDP of the city has seen an average increase of 7.46%/year. GDP per capita is expected to be USD 5,538 (exceeding the USD 4,800 planned).

Economic restructuring is heading in the right direction. The value added nature of the service sector accounts for its large proportion of GDP (the proportion for 2015 is expected to reach 59.9%), higher than for the previous period (2005: 50.5%; 2010: 57.9%). The industry and construction sector will reach 39.2% in 2015, lower than for the previous period (2005: 48%; 2010: 41%), and the agriculture, forestry, and fishery sector will account for 0.9% in 2015, also lower than for the previous period (2005: 1.5%; 2010: 1.1%).

3.2. Real status of economic development

3.2.1. Services

High quality, high added-value services continue to make up an increasing proportion of the city's economic structure. The average growth rate of services for the 2011-2015 period is expected to reach 11.2%.

3.2.1.1. Commerce, import & export

Commerce and service activities saw a strong growth rate and contributed significantly to the city's socioeconomic development. For the 2011–2015 period, total revenue from retail goods and services is expected to reach VND 2,947,088 billion, increasing 14.4%/year on average (according to practical rate)[1]. Commerce, service activities, and the development of extensive retail and sales distribution systems to achieve modernization have all promoted better circulation of goods and helped stimulate production. Market size has grown 2.38 times over that of the 2006–2010 period. The commercial sector accounts for

[1] VND 460,952 billion in 2011 (23.5% year-over-year increase), VND 517,620 billion in 2012 (12.3% increase) , and VND 582,635 billion in 2013 (12.5% increase).,Estimated to reach VND 655,365 billion in 2014 (12.5% increase) and VND 730,516 billion in 2015 (11.5% increase). Data from the Bureau of Statistics.

80.5% of this market, a 16.1%/year increase, on average. Excluding the price fluctuation factor, total revenue from retail goods and services is estimated to increase 8.1%/year[2].

Despite being heavily impacted by the economic recession, export turnover for the period 2011–2015 maintained a high growth rate estimated to reach USD 154.4 billion, an average increase of 9.24%/year. Excluding crude oil, exports are estimated to reach USD 116.1 billion (exceeding the 5-year plan's USD 100 billion), increasing 9.39%/year[3] on average. Goods market and import-export market restructuring is tending towards gradually increasing the proportion of processed industrial products, many of which are technology-related. The proportion of natural resource and raw agricultural product export is decreasing.

Export quality is gradually improving and the proportion of value added exports has reached roughly 18%, which is higher than the national average rate and steadily increasing. Export commodities saw positive growth: industrial product exports accounted for 69.4%, exceeding the target of 54.4% (2015) and 62.0% (2020). Total export value for the period (2011–2015) was higher than total import turnover., Ho Chi Minh was the first locality in the nation to achieve an export turnover above USD 32 billion/year, which contributed to improving the trade balance of the country (reducing the deficit and contributing to a surplus), improving the payment balance, and improving foreign exchange market health.

The city's import turnover for the 2011–2015 period is estimated to reach USD 145.3 billion, an 8.86%/year[4] average increase, which is lower than that of the 2006–2010 period and 12.1% and lower than export growth.

3.2.1.2. Finance and banking

Money market and banking activities in the city have gradually stabilized, interest rates have gradually decreased, funding is going more towards production and business, and the economy is developing. Mobilizing and interest rates of credit institutions their downward trend, with loan interest rate falling from 21%/year in 2011 to 16%/year in 2012. Rates fluctuated between 11-13%/year in 2013 and 8-12% in 2014, in which short-term loan interest rates for the five priority fields never exceeded 7%/year.

Capital mobilization and loan outstanding balances at credit institutions in the locality retained a relatively high growth rate, contributing capital to the economy. For the 2011 - 2014 period, capital mobilization increased 13.5%/year on average and loan balances increased 10.5%/year. The bad debt rate of commercial banks in the city until 2014 was 5.31%, an increase of 1.01% over 2011[5].

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[2] Increased 7.2%, 8.5% in 2012, and 8.6% in 2013. Is estimated to increase by 7.8% in 2014 and 8.5% in 2015.

[3] Reached USD 20.4 billion in 2011 16.5% year-over-year increase USD 21.7 billion in 2012 (6.3% increase), and USD 22.3 billion in 2013 (2.6% increase). Estimated to reach USD 24.6 billion in 2014 11.9% increase) and 27.1 billion in 2015 (10.2% increase).

[4] USD 27.4 billion in 2011 (24.5% increase); USD 26.3 billion in 2012 (4% decrease);USD 28.6 billion in 2013 (8.7% increase); Estimated to reach USD 30.6 billion in 2014 (10.1% increase); Estimated to reach USD 32.4 billion in 2015 (6.9% increase).

[5] 4.3% in the end of 2011; 5.5% in the end of 2012; 4.69% in the end of 2013.

3.2.1.3. Tourism

As one of the key economic sectors contributing to Ho Chi Minh's economic restructuring, the city's tourism continues to make it one of the leading tourism centers of the country offering many activities and diversified products. Since 2011, tourism has shown stable growth and the number of international visitors has steadily increased over the years to 4.1 million arrivals which accounted for 60% of the country's total arrivals (6.8 million)[6]. This is estimated to reach 20.5 million arrivals by 2020, an average increase of 8.5%/year. The number of domestic visitors from 2013 to 2015 is estimated to reach 52.5 million, an average increase of 12%/year. Tourism revenue has steadily grown over this period[7], with VND 391 trillion as of 2020 estimate for an average increase of 16.4%/year.

3.2.1.4. Transport services, ports and warehouses

The city approved the Planning for Developing Interprovincial Road Cargo Transport Yards in Ho Chi Minh City until 2025. It is also considering approval of Planning for public passenger transport development in Ho Chi Minh City until 2025 and has approved a bus investing scheme for the 2014-2017 period.

State management work in the transport sector has seen positive change. This firstly has close management on road and waterway transport; timely meets the commuting needs of the people, especially in the occasion of holidays. It also continuously improves passenger transport service quality and ensures cargo transport by road and waterway safely.

Bus-serving infrastructure has been gradually improved and investment has gone into putting several bus yards into operation at Dam Sen Park, 23/9 Park, Hung Temple Historical Cultural Park, Quang Trung software Park, Binh Khanh (Nha Be suburban district), Thoi An (District 12), etc. HCMC coordinated with departments and sectors and the People's Committee of Districts and Suburban Districts to review land funds for static traffic in the city, basically establishing 977.55 ha, reaching 85.31% in comparison with the planned target (1,146 ha). The city has begun preparing to implement a number of other yards in areas such as Hoc Mon, Cu Chi, Tan Phu, and Nha Be

The city has restructured the bus transport units, improved management work and effectively used funds from bus subsidy; proposed several solutions to improve serving quality and public passenger transport services. At the same time, the City has mobilized resources and socialized to increase revenues in order to develop public passenger transport.

The city has completed construction and put into use many works serving waterway transport to enhance the cargo transport by waterway. It has supported to reduce road traffic jams. For example, the city has cleared the waterway connecting the junction of Den Do - Ha Tien cement factory 1 via Giong Ong To; completed Phu Dinh river port stage 1; especially finished dredging Soai Rap channel - stage 2 to the altitude -9.5 m, ensuring

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[6] International arrivals reached 3.1 million in 2010, increased to 3.5 million in 2011 (6 million nationwide); 3.8 million in 2012 (6.8 million nationwide); 4.1 million in 2013 (7.6 million nationwide); Estimated to reach 4.4 million in 2014 and 4.7 million in 2015.

[7] Tourism revenue reached VND 57 trillion in 2011; VND 71 trillion in 2012; VND 83 trillion in 2013. Estimated to reach VND 86 trillion in 2014 and VND 94.6 trillion in 2015.

30,000 DWT ships in full load and 50,000 DWT ships offloading. At the same time, it has planned to dredge Soai Rap channel to the altitude -12m to ensure 50,000 DWT ships in full load and 70,000 DWT ships offloading. The city has continued to focus on investment in upgrading Cat Lai port, Hiep Phuoc port urban area and implementing the Project for clearing the waterway linking Saigon River and Dong Nai River through Rach Chiec.

Seaport volume for the 2011 - 2015 period is estimated to reach 388.23 million tons, a 20% increase over the 2006 -2010 (320 million tons) period.

River port volume for the 2011–2015 period is estimated to reach 119.5 million tons, a 33% increase over the 2006–2010 period (90 million tons).

The city is working with the Ministry of Transport and Ministry of National Defense, and is unifying plans for relocating ports on the Saigon River and Ba Son shipyard. It is also continuing to implement the Planning of the waterway, and port and dock network in Ho Chi Minh City towards 2020. In addition, it is investing in construction of river cargo ports connecting the city's seaport system; building transport relationship; and efficiently supporting traffic between road transport and waterway transport through the new port system in Hiep Phuoc, Phu Huu, Phu Dinh with Cat Lai industrial zone. Hiep Phuoc is connected with the new urban areas such as the South of Saigon, Northwest, and Thu Thiem. The city is also urging the implementation of a relocating plan. Developments of ports on Saigon River are limited. Ports and wharfs using steel, cement, petroleum and building materials are mainly being developed in the Hiep Phuoc area.

3.2.2. Industry and construction sector

The city has made efforts to implement the Industrial Restructuring Program, quickly increasing the proportions of four key industries, which strongly involve science and technology, and supporting industries, gradually shrinking labor-intensive industries, processing industries, and industries that cause environmental pollution. Therefore, the city’s industrial production activities are still being maintained. The growth rate of the city’s industrial production value between 2011 and 2015 was estimated to be 7.4%/year[8], lower than for the 2001–2005 period (15.9%/year) and 2006–2010 period (13.3%/year). Although this figure was short of the target (the production value was planned to increase by 13%/year), this growth rate in the context of a global economic recession for the last five years is quite encouraging.

Industry has been positively restructured to be more productive. The production proportions of the four key industries (mechanical engineering, electronics and information technology, chemicals, rubber and plastics and food processing) accounts for about 60.0% (in 2015)[9] of the city’s total production value. Of this, mechanical engineering accounts for 20.4%, electronics and information technology 4.1%, chemicals, rubber and plastic 18.6%, and food processing 16.9%.

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[8] In which the growth rate was 8.1% for 2011; 7.6% in 2012; 7.4% in 2013; 6.8% in 2014; estimated to increase by 7% in 2015 compared with the same period. Using the IIP calculation method, the City’s industry is estimated to increase by 6.4% per year; in which: it was 6.8% in 2011; 5.1% in 2012; 6.35% in 2013; 7.0% in 2014;estimated to be 7.0% in 2015.

[9] Higher than the previous period (in 2005: 54.6%, in 2010: 57%).

The city has made a shift from labor-intensive industries and industries with low and average technology levels to those with a high level of science and technology, along with industry that involve biotechnology, clean technology that does not cause environmental pollution, and saving energy, all of which entail high labor productivity and added value.

The production value of the construction sector increased over the years (in 2011 it was VND 132,937 billion, a 3.27% increase. It increased 4.33% to VND 144,141 billion in 2012, 4.69% to VND 152,556 billion in 2013, 7.7% to VND 167,515 billion in 2014, and 7.5% to VND 187,282 billion in 2015The average growth rate from 2011 to 2015 was 5.35%/year, and the growth rate for the 2006–2010 period was 17.8%/year.

Current situation regarding investment activity, production results at export processing zones, industrial zones, and high-technology zones:

The city is implementing the Development Plan for HCMC’s Industrial Cluster by 2020, with an Orientation to 2030. Capital attracted into industrial zones and export processing zones is estimated to reach USD 4 billion[10], which is 100% of the target. The investment and construction of infrastructure for production and business activities have been fully implemented and synchronized, bringing a higher export turn-over each year[11]. Five years ago, export turnover was estimated to be USD 25 billion with average annual growth of 15%. By the end of 2015, it is estimated that the total number of laborers working in Export Processing Zone and Industrial Zone is 280,000.

For the high technology sector, the total investment capital into high technology zones is estimated to be USD 2,536.01 million. The city has focused on attracting investment into high-technology sectors and implemented research and training activities for the benefit of investors. It has also organized investment promotion activities together with infrastructure building, land acquisition, and planning to bring higher export turnover each year[12]. The export value in five years is estimated to be USD 13 billion.

3.2.3. Agriculture sector

Since 2011, HCMC has promoted agriculture expansion activities with an emphasis on programs to transfer new technologies in varieties and promoted the application of technologies, developed new cultivation techniques for farmers to grow vegetables, flowers, and ornamental flowers, among other things. On average, the annual production value increased by 6%[13], achieving the target.

The agriculture sector was developed on to be modern, effective, and sustainable. The plant, livestock and fishery industries have been restructured to match those of an urban

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[10] USD 1,526.75 million in 2011; USD 411.73 million in 2012; USD 608.83 million in 2013; estimated to be USD 1,453 million in the 2014 – 2015 period.

[11] USD 3.6 billion in 2011; USD 4.5 billion in 2012; USD 5.1 billion in 2013; USD 5.5 billion in 2014; estimated to be USD 6.3 billion in 2015.

[12] USD 1 billion in 2011; USD 2.23 billion in 2012; USD 2.753 billion in 2013; USD 3.126 billion in 2014; estimated to be USD 4 billion in 2015.

[13] Increased by 5.7% in 2011; 6.6% in 2012; 5.7% in 2013; estimated to increase by 6.0% in 2014; estimated to increase by 6% in 2015. (For the 2011 – 2015 period, production value increases on average 6%/year).

city. The goal is to achieve clean agriculture and prevent environmental pollution while increasing the application of high technologies, biotechnology, and forecasts, combined with the construction of new rural areas. Plants and livestock that achieve high productivity and are well-suited to the conditions of the city are prioritized for development. By 2015, the total area for raising ornamental flowers is expected to be 2,250 ha, representing annual growth of 3.3%. The total number of dairy cows is expected to be 99,000 cows, annual growth rate of 4.4%. The total number of ornamental fish is expected to reach 100 million with an annual growth rate of 10.8%, HCMC has opened and put into operation an experimental farm for raising *cow milks with high technology from Israel, Biotechnology Centre.* The proportion of industries by the end of 2015 compared with 2010 is as follows: farming will increase from 26.7% to 26.8%, livestock breeding will decrease from 44.2% to 37.8%, fishery will increase from 21.1% to 27.3%, and forestry will decrease from 1.3% to 1%. In 2015, average revenue on a hectare of agricultural land is estimated to be VND 370 million, a two or three-fold over the VND 158.5 million ha per year of 2010. HCMC has promoted the Program for Supporting the Transition of Agriculture Structure towards an Urban Agriculture, which has been underway since the implementation of Decision No. 36/2011/QD-UBND and Decision No. 13/2013/QD-UBND regarding the promotion for a structure transition in urban agriculture economy. Until now, there have been 4,172 plans and projects that have been approved with a total of 14,152 loans given and a total investment of VND 6,106.56 billion, of which the total borrowed was VND 3,609 billion. Thanks to the program, 01 dong from the budget for loan interest support has attracted 32 dongs from the society, of which 20 dongs is from the bank and 12 dongs is from the people.

Generally, although every year has seen a decrease in the total area of agricultural land, the production value and efficiency continue to increase and the income gap between rural and urban areas has narrowed. The average monthly income of a rural person in 2010 was VND 1.93 million, 66.6% of the income of those living in urban areas This increased to VND 2.92 million per month in 2012, an amount equal to 76.8% the income of urbanites (VND 3.81 million per month). In 2014, the figure rose to VND 3.29 million a year, or 80% of urbanites (VND 4.12 million a month) and an increase of 70.8% over 2010. Improvements continue to be made with regard to forest protection, fire prevention, and forest management, especially the protection of forests and special-use forests. It is estimated that by 2015, the city's forest coverage will reach 16.51%, a 0.31% rise over 2011 (16.2% in 2011). Forest and tree coverage in the city will reach 40%, 0.64% higher than that of 2011 (39.36% in 2011).

High-technology Agricultural Zone operation: Investment and construction activities have been finished, attracting many investors. Research activities and application of biotechnology to produce high-quality plant and livestock breeds in high-technology agricultural zone have continued to be promoted, creating many products of commercial value. These activities have supplied the market with more than 74.1 tons of high-quality F1 vegetable seeds[14]and more than 12,645.3 tons of finished products (straw mushrooms, cucumbers, melons, hydroponic cucumbers, hydroponic gourds, hydroponic winter melons, hot-steam processed fruits)[15] that have generated revenues over VND 325 billion.

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[14] 19.9 tons in 2011; 10.2 tons in 2012 and 14 tons in 2013; estimated to be 30 tons for the 2014 – 2015 period.

[15] 106.7 tons in 2011; 3,580 tons in 2012 and 3,958.6 tons in 2013; estimated to be 5,000 tons for the 2014 – 2015 period.

3.3. Current situation of social development

Every year, HCMC has had between 270,000 and 300,000 people of working age in search of jobs. In 2011–2015 period, the city is expected to generate jobs for about 1,429,689 people, an annual average of 285,938, and create about 615,400 new jobs for laborers, with a yearly average of 123,080 jobs. Generally, the number of labors in the city has been rather stable in recent years and the unemployment rate has dropped over the years, from 5% in 2011 to 4.9% in 2012 and 4.83% by the end of 2013. It dropped to only 4.67% by the end of 2014. By 2015, this figure is estimated to be 4.5%–4.6%.

3.4. Infrastructure

3.4.1. Urban transport infrastructure development

In the last 5 years, HCMC has used the national budget[16] to invest in priority transport construction projects such as building the Phu Long, Do, and My Thuy bridges (LTL.25B); repairing and maintaining the Saigon bridge; improving infrastructure including roads on the north and south sides of the Nhieu Loc–Thi Nghe channel (the section from confluence to Nguyen Huu Canh Street), Suoi Cai bridge on Ha Noi highway, the six steel crossovers at priority interchanges (Hang Xanh crossroad, Thu Duc crossroad, the interchange between Hoang Van Thu/Truong Son/Cong Hoa, the interchange between 3 Thang 2 Street/Nguyen Tri Phuong/Ly Thai To, the interchange between Cong Hoa and Hoang Hoa Tham streets and the Cay Go roundabout), etc.

By the end of 2015, the number of newly built bridges will be 74 (26% higher than the 50 planned). The total length of newly constructed roads will be 254.2 km (21% above the planned 210 km). Traffic density in the city by is estimated to reach 1.95 km/km² by 2015, exceeding the proposed target of 1.9 km/ km². The ratio between land for transport and land for construction satisfies the target of 8.2%.

While the investment from the national budget is still limited, many measures have been taken to mobilize capital from other sources (investment in the form of BOT and BT contracts) to invest in the development of transport infrastructure, and these have been successful to a certain extent. The accumulated amount of disbursment from 2002 to the end of 2010 is VND 10,649 billion. Money disbursement for the 5-year is as follows: VND 2,757 billion in 2011; VND 2,633 billion in 2012, VND 3,074 billion in 2013, and VND 3,615 billion in 2014 (estimated). Also, the city has attracted VND 10,503 billion from ODA capital to invest in the development of an urban transport system and contribute to reducing traffic congestion on Vo Van Kiet and Mai Chi Tho Streets, Saigon bridge No. 2, extending inter-provincial highway 25B (phase 2), constructing the Bong Bridge and Le Van Sy bridge on the Nhieu Loc–Thi Nghe channel and the Hau Giang bridge on Tan Hoa–Lo Gom bridge, building the Rach Chiec bridge on the Ha Noi highway, building the

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[16] Since the beginning of 2011, the City has allocated an investment of VND 19,883 billion for transport projects.

Phu Long bridge section on the Eastern Ring Road of the city (from inter-provincial 25B to Rach Chiec), building two traffic junctions of BOT An Suong–An Lac project, completing phase 1 of a construction project for connecting the road between Tan Son Nhat, Binh Loi and Outer Ring road (the section from Nguyen Thai Son intersection to Road No. 20), upgrading and extending Binh Trieu Bridge, and upgrading and extending Ha Noi Highway (finishing the main road from Saigon bridge to Station No. 2 intersection).

The city has announced plans to design a traffic intersection between Ben Luc–Long Thanh highway and National Highway No. 50 and issued technical designs to make adjustments to the section passing through the vicinity of the Nha Be district in Can Gio province. It organized a meeting to coordinate Ben Luc - Long Thanh highway and urban railway No. 4 and has put into operation the 20 km section from the intersection with Ringroad No. 2 to NH 51 for Long Thanh - Dau Giay highway route. In 2014, the Ministry of Transport also finished construction of the remaining 4 km in the vicinity of the city as preparation for beginning construction of the Ben Luc–Long Thanh route.

The Eastern Ring Road (from Dong Van Cong street to Rach Chiec bridge) has been connected to the HCMC - Long Thanh - Dau Giay highway, creating a new shorter route between HCMC and Long Thanh in Ba Ria–Vung Tau, reducing the regular transport overload on NH 1—the section from Thu Duc intersection to the Vung Tau crossroads—at the same time increasing the urbanization rate of the area of District 2 and District 9.

The city is currently implementing projects aimed at extending Ha Noi Highway, Provincial Highway 10, and Provincial Highway 10B, among others. Upon completion, they will expand the road and transport systems in the city as well as connect more routes to city entrances.

The city is currently making the following requests of the Ministry of Transport: upgrade NH 50 soon; develop and approve sub-projects of Ring Road No. 3 and No. 4; and organize the setting up of landmarks and boundaries to clear the land so that the city can organize the planning, construction, and review of lands which have potential for exploitation.

3.4.2. Living water program for urban and rural residents

In the past five years, the City has implemented the construction of 03 water treatment plants with a total capacity of 750,000 m^3/day: Dong II channel water plant (150,000 m^3/day capacity) was completed in 2013. Thu Duc 3 water plant construction commenced in April 2013. Tan Hiep 2 water plant construction commenced on November 19th, 2013 and is expected to be completed by the end of 2015. In addition, the City has built centralized water processing stations with low capacity to serve smaller clusters of rural residents.

At the moment, the rate of urban households (in 19 districts and 5 towns) being supplied with clean water is 93.13%. Of these nine districts (districts 1, 3, 4, 5, 6, 7, 8, 10, and 11) and two towns (Can Gio, Nha Be) supply 100% of their residents with clean water.

By December 31, 2014, there will be seven other districts (districts 2 and 9, Tan Binh, Tan Phu, Binh Thanh, Go Vap, and Phu Nhuan) and Tan Tuc, whose 100% of households are provided with clean water, which will raise the ratio of urban residents provided with clean water to 96.17%.

It is estimated that by the end of 2015:

+ On average, the total capacity of clean water provided will be 2.420 million m^3/day and night, achieving 101.2% of the water supply target for the 2011–2015 period (2.391 million m^3/day and night) and 156% the total capacity of clean water provided in the 2006–2010 period (1.551 million m^3/day);

+ The rate of urban households supplied with clean water is 98.5%, 0.5% higher than the plan for the 2011–2015 period (98%) and 13.5% higher than the 2006–2010 period (85%);

+ The proportion of water wasted is estimated to be 32%, the same as the 2011 - 2015 plan and 7% lower than the 2006–2010 period (39%). The current capacity of water supply plants and the quality of water remain stable;

+ The average standard of water for living activities supplied is 141 liters/person/day[17] (the figure for 2011 was only 122 liters/person/day);

+ Water for living activities program for rural residents: manage and exploit 123 centralized water to provide living water for 352,328 rural households.

In addition, water sources have been turned into potable sources for the 11,837 households in rural areas, increasing the number of rural households supplied with clean water to a figure of 114,354 households, or 32.7% of all rural households.

It is expected that by 2015, 100% of urban households will be supplied with clean or hygienic water.

3.4.3. Electricity supply

The city has invested into building 220 kV and 110 kV electrical grids. Modern technologies have been applied to create underground electrical grids to ensure a stable electricity supply, improving grid operation management, reducing electricity loss, and creating a better power picture in the city. From 2011 to 2015, 11 construction projects for the 220 kV electrical grid were completed with a total capacity increase of 2,500 MVA and 76.25 km of wires. In addition, 62 projects for the 110 kV electrical grid were completed with a total capacity increase of 3,326 MVA and 224.38 km of wires. A wind measuring station was protected and data was collected to create a wind planning map to form a basis for assessing the potential for developing wind energy in the coastal area of the Can Gio district. The resulting electricity output is estimated to be 92.4 billion kWh[18] and 18.5 billion kWh/year on average. Commercial electricity output is 87.45 billion kWh[19] for an average annual increase of 5.3% and is estimated to be 19.4 billion kWh in 2015, a 26.7% increase over 2011 but still lower than the proposed target of 21–23 billion kWh.

The electricity sector has implemented many synchronized investment and renovation methods to enhance and upgrade the distribution network. It has closely inspected measuring devices and implemented energy-saving programs for all customers. The rate of

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[17] Living water supply standards over the year:122 litres/person/day in 2011; 125 litres/person/day in 2012; 132 litres/person/day in 2013.

[18] 16,266 million kWh in 2011; 17,737 million kWh in 2012; 18,588 million kWh in 2013; 19,393 million kWh in 2014; estimated to be 20,421 million kWh in 2015.

[19] 15,314 million kWh in 2011; 16,725 million kWh in 2012; 17,651 million kWh in 2013; 18,365 million kWh in 2014; estimated to be 19,400 million kWh in 2015.

power loss decreased over the period from 5.76% in 2011 to 5.0% in 2015[20]. The amount of electricity saved was 2,249 million kWh[21], or 454 million kWh/year on average.

3.4.4. Environmental protection and climate change measures

The city has issued many documents aimed at increasing state management efficiency and the commitment by organizations and individuals to protecting the environment and to contributing to protecting residents' health and quality of life. It continues to build a legal system for protecting the environment of areas around the city. These initiatives include developing an plan for implementing strategies to protect the city's environment towards 2020 with a view towards 2030; planning solid waste management in HCMC towards 2025 with a vision towards 2050; giving instructions on the management of private waste collecting efforts in the city and instructions for conducting normal solid waste management in the city; giving instructions on the management of medical waste in the city; and amending Decision No. 73/2007/QD-UBND dated May 10, 2007 regarding the issuance of regulations on the management of sludge.

Thanks to the efforts of different levels and industry, the city has achieved positive results. 100% of export processing zones and industrial zones have constructed and are operating centralized waste processing stations; 100% of urban areas are collecting and processing normal solid waste[22]. That is 70-80%[23] in rural areas; 100% of hazardous waste is collected, stored, transported, and processed due to effective system implementation[24]; 100% of hospitals and major centers[25] and 85-90% of small and private clinics[26] has completed the task of collecting and processing medical waste; 100% of health stations at ward-commune-town levels, and 100% of hospitals and medical centers managed by the city[27] and 19/22 hospitals belonging to the Ministry or national industry have a waste treatment

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[20] 5.76% in 2011; 5.56 in 2012; 4.96% in 2013; 5.15% in 2014; estimated to be 5.0% in 2015.

[21] 391 million kWh in 2011; 468 million kWh in 2012; 510 million kWh in 2013; 410 million kWh in 2014; estimated to be 470 million kWh in 2015.

[22] Household waste (6,400–7,200 tons/day) after collection and transportation is processed at the two complexes for waste management: the Tay Bac-Cu Chi Solid Waste Management Complex and Da Phuoc-Binh Chanh Solid Waste Management Complex.

[23] 20%–30% of solid household waste in rural areas is processed by local residents.

[24] Hazardous waste (350–400 tons/day) is collected, transported, and processed at hazardous waste management facilities in the city (currently there are 42 units that specialize in collecting and transporting waste and 10 facilities that specialize in hazardous waste processing). About 30-40% of the hazardous waste is treated by hazardous processing facilities in HCMC and the remaining is collected and transported to other provinces for treatment or safe storage.

[25] After being collected, medical waste (14-17 tons/day) is processed by incinerators with a capacity of 7 tons/day in Binh Hung Hoa (Binh Tan) and 21 tons/day in the Dong Thanh construction site (Hoc Mon).

[26] 10-15% of the remaining medical solid waste is mixed together primarily with solid household waste and transported to landfills.

[27] The city manages all of its 29 hospitals. All 24 hospitals in the area are managed at the district level, and there are 36 hospitals, 322 ward/commune health stations, 11 health centers with no hospital beds, and 24 preventative health centers.

system that meets environmental protection standards[28]; 100% of the task of environmental protection propaganda has been completed. It is expected that by the end of 2015, the rate of collecting, transporting and treating domestic waste, hazardous waste and medical waste will continue to be 100% and the rate of medical waste treatment will be 100%.

Industrial waste has been controlled and processed by moving polluting production facilities to centralized industrial zones and nearby areas. 100% of industrial zones and export processing zones have built and are operating systems for centralized waste processing stations that meet environmental standards. Currently, these export processing zones and industrial zones are continuing to invest and expand a centralized waste processing plant to meet development needs[29]. The city has begun a project to invest and develop an automatic analyzer system in export processing zones and industrial zones and a central environment analyzer system to constantly monitor the waste processing situation at businesses.

The city has inspected, checked, and given administrative penalties to business facilities in export processing zones and industrial zones. It has supervised the compliance with laws and regulations on environmental protection of 1,033 facilities in medical production as well as medical service providers. In the coming years, the city is expected to check 400 other units in the city and receive and process 52 applications for eligibility certificates to import scrap, with 20 other applications to be processed later. In addition, the city has organized the appraisal and evaluation of the environmental effects of all investment projects in the area and has inspected and verified regular environmental protection for approved projects.

The city has taken measures with 35 (95%) of its 37 facilities causing serious environmental pollution, in accordance with Decision 64/2003/QD-TTg of the Prime Mister. For the two remaining facilities, pollution has been treated but the facilities have not been relocated, and this needs to be done[30]. This is because these two facilities belong directly to the national government. Due to the typical features of their industry, they lie in residential areas. The relocation schedule has therefore been pushed back, the city having many submitted requests many times to the Ministry and industry at the government level that these facilities be relocated and also to make frequent checks and measurements to ensure comprehensive pollution treatment. The City has updated the list of facilities causing serious environmental pollution in all of the city's 24 districts in accordance with Decree no 04/2012/BTNMT dated May 8, 2012 by the Ministry of Natural Resources and Environment for the next period.

The city has also cooperated with international organizations in environmental protection and climate change measures. It has effectively implemented the Action Plan for Climate Change Adaptation in Ho Chi Minh City towards 2015. It issued and began the Implementation Plan for the Action Program No. 34-CTrHD/TU of the municipal party committee and Resolution No. 08/NQ-CP of the Government in the implementation of

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[28] Three facilities are in the process of constructing a sewage treatment system, including Transportation Hospital No. 8, the Orthopedics and Rehabilitation Hospital, and the Rehabilitation Centre.

[29] For business facilities outside export processing zones and industrial zones, the city is developing a program to move these business facilities to export processing zones and industrial zones. The general rate of industrial sewage treatment of the whole city is estimated to be 75%. By 2015, this figure is expected to be 85%.

[30] Ha Tien Cement Factory and Ba Son Shipbuilding factory.

Resolution No. 24-NQ/TW of the 7th Plenum of the 11th Central Committee about active adaptation with climate change. Also, it enhanced the task of natural resource management and environmental protection. The city has also coordinated with Rotterdam City in the Netherlands to quickly implement a program Ho Chi Minh is developing to address sea level rising, adapting to climate change, phase II; developing an Action Plan for Climate Change in the City for the 2016-2020 period, with a view to 2030. HCMC has worked with Osaka City (Japan) to implement phase 1 (2011-2013) and phase 2 (2013-2015) of the Program of Developing a Low Carbon City; Comprehensive Waste Management Program; Program for Re-Collecting Energy from Waste,. It has also proposed projects that apply the JCM mechanism in the area of solid waste management[31]. In addition, the city has implemented many international C40 program initiatives and cooperation with countries such as the Netherlands, Germany, and Austria to seek new sources of capital and improve the competence of urban management for officials in climate change measures.

3.4.5. Science and technology

From 2011 to 2015, the City implemented many action plans and programs that further apply science and technology in production and business to improve productivity and quality. Since 2011, the city has implemented 17 priority scientific and technology research programs. Three of these focused on information security, traffic congestion prevention, and flooding prevention to serve the six breakthrough programs of the city, and the other 15 science and technology programs supported corporations with hundreds of science and technology projects every year. The rate of scientific research applied in reality after checking is 35.5%/year on average. The city has applied the pilot mechanism of purchasing the whole package of scientific research to resolve difficulties in payment procedure. 49 studies have been done via this method and 32 studies led to signed contracts.

Intellectual property protection activities have received a strong emphasis. From 2011 to 2015, 47,500 applications for brands were submitted and 27,500 certificates were issued, 3,000 applications for industrial designs were submitted and 1,800 patents were issued, and 950 patent and useful solution applications were submitted and 191 patents were issued. This has created a healthy, advantageous business environment and promoted the development of the science and technology market.

To promote technological innovation, the city has supported businesses in designing and developing devices and products to replace imported products through 28 projects which come from purchase orders of businesses in mechanical engineering, electronics, IT, chemical pharmaceuticals and plastic-rubber under the co-investment method (30/70 state investment/corporate investment ratio). Products from the project have a similar level of quality and are sold to businesses at an average price from 50% to 70% lower than the import price, helping companies reduce foreign-exchange costs and contributing positively to the restructuring of the city’s four priority industries while mobilizing social resources for scientific and technology investment and development through the Fund for Scientific and Technology Development of the corporate, a demand stimulation program that helps businesses to improve their competitiveness.

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[31] JCM is the common credit mechanism between Vietnam and Japan for carbon emission reduction.

3.4.6. Health and public health care

Every year, the City examines and gives medical treatment for about 30 million patients, 30% – 50% of are transferred from other provinces to big specialty hospitals in the city. To reduce hospital overload, the City has given directions to general and specialty hospitals in the city to send special-duty doctors to give professional support to hospitals at the district level for a minimum duration of 01 year; implementing Project 1816 of the Ministry of Health, which appoints alternate professional staff at the City level to support hospitals at the district level with the aim of improving the quality of medical examinations and treatment. The project for alternating medical staff for the 2013–2020 period has been effectively implemented and has seen the application of new medical examination models such as establishing satellite clinics[32], satellite departments[33], and family doctor models[34]. The procedure for receiving patients at the examination department has been improved, information technology has been utilized to manage patients, and there has been an increase in the number of reception counters, medicine distribution counters, information desks, and examination desk to reduce patient wait times and improve patient satisfaction.

The city has invested in upgrading the deteriorating infrastructure of units to meet residents' demands for health check-ups and treatment. In central hospitals, priority is given to adding more floors, expanding space, and limiting land expansion. After construction, many hospitals have proved their efficiency in the examination and treatment of patients, one example of which was the completion and operation of examination and reproductive health care areas at Tu Du hospital, the high-technology treatment zone of Binh Dan hospital, and the Cardiology Hospital, and the expansion of the examination and diagnostic area of Pediatric Hospital No. 1, Pediatric Hospital No. 2, and the National Hospital of Traditional Medicine, as well as the intensive radiation area of Oncology Hospital and Nhan Dan 115 hospital. Some district hospitals were newly constructed and operated to provide health care services for local residents. These include District 6 Hospital, Tan Phu Hospital, Binh Tan District Hospital, and Cu Chi District Hospital (under construction). Certain hospitals were also renovated, upgraded, or expanded, including District 11 Hospital, Thu Duc District Hospital and District 2 Hospital.

In addition, some projects to build new hospitals and to renovate and upgrade district hospitals have been decided by the District People's Committee and will move forward if capital can be secured. These projects include building Binh Khanh - An Nghia General Health Clinic in Can Gio District, Binh Chanh District Hospital, and General Hospital of Can Gio District; reforming and extending District 8 Hospital; building Go Vap District

[32] 17 city hospitals established 48 satellite clinics for 12 district hospitals.

[33] Orthopedics Hospital has installed 100 hospital beds at An Binh Hospital; Orthopedics Department at Tan Phu District Hospital has developed 50 hospital beds for physiotherapy and rehabilitation for patients transferred from Orthopedics Hospital. Pediatric Hospital No. 1 established a satellite department with 150 paediatric beds in Binh Tan District Hospital and 70 beds in Tan Phu District Hospital. Pediatric Hospital No. 2 established a satellite department with 50 paediatric beds at District 2 Hospital. Oncology Hospital constructed a satellite department at District 2 Hospital with 150 hospital beds for the Departmentof Internal Oncology.

[34] By now 20 (87%) of 23 district hospitals and 88 (27.7%) of health stations have implemented family doctor clinics.

Hospital; and building and upgrading District 7 Hospital. Other hospitals are going to be invested in, constructed, or upgraded, including Tan Binh District Hospital, District 12 Hospital, Nha Be District Hospital and District 4 Hospital to ensure the completion of capital construction of district hospitals by 2016. Investment will be further encouraged to implement the city's priority projects[35]. These will utilize supporting capital from the national government (VND 8,000 billion) to implement 02 priority projects: Pediatric Hospital and Oncology Hospital No. 2.

Emphasis is always placed on training the city's medical staff to further enhance the quality of medical examinations and treatment. The city had 13 doctors for every 10,000 residents in 2011. It is estimated that this will increase to 15 doctors for every 10,000 residents in 2015. In the 2011–2015 period, the City effectively implemented programs to improve medical examinations and treatment, reducing the number of days in residency for patients. It also invested in more equipment, meeting the increasing demands for medical services of the city's residents and residents from neighboring provinces. It maintained a ratio of 42 hospital beds for every 10,000 residents from 2011–2013, which increased to 43 hospital beds for every 10,000 residents in 2014 and is estimated to reach 42 hospital beds for every 10,000 residents in 2015. Attention has also been given to the local health station network. The number of wards and communes having health stations and the number of health stations having doctors and midwives or pediatric nurses were consistently 100%. The malnutrition rate in children under five stayed at a rate of 5.9% in 2011 and 5.3% in 2012, falling to 4.1% in 2013 and 4.2% in 2014, and is estimated to be under 5% in 2015. The death rate of infants under 10.04% in 2011, 3.75% in 2012, 4.29% in 2013, and 4.9% in 2014. From 2015 onwards, it is estimated to be under 10‰ every year. Attention was always given to the population and child health care activities. In 2011, the number of people having medical insurance cards accounted for 63.8% of the total city population; in 2015, this figure is estimated to be more than 68%.

The city has made many recent efforts involving medical treatment to reduce death rates. Dangerous outbreaks occurring at companies, businesses and schools are actively, effectively, and timely handled to prevent the further spread of diseases. This has had favorable results: there have been no epidemics for many years. The few outbreaks that did occur were successfully prevented from becoming epidemics. Epidemic prevention activities in recent years have mainly focus on petechial fever and hand-foot-mouth disease. Other efforts have focused on epidemics such as SARS, H5N1 (avian influenza), H1N1, measles, and Ebola.

With the development of the city's health care sector, the private health care system has achieved many positive results in the health care of people. There are currently 38 private hospitals in the city, 19 of which are general hospitals (three hospitals were built with 100% foreign capital) and 19 specialty hospitals (one was built with 100% foreign capital). Most hospitals have been received investment and been constructed in accordance with international standards and modern equipment to ensure efficient health care services.

The city has reinforced and increased efforts to check and supervise food hygiene for facilities that include public kitchens, schools, industrial zones to limit mass food

[35] Including: City's Pediatric Hospital, Oncology Hospital No. 2 (district 9), General Hospital of Hoc Mon Area, General Hospital of Cu Chi Area, General Hospital of Thu Duc Area, Orthopedics Hospital, Project of Medical Test Centre.

poisonings[36]. During the 2011 – 2015 period, the city implemented the Building Experimental Food Management in Safe Food Chains Model in Ho Chi Minh City project. The City has also worked with provinces to manage food safety in food chains, which has allowed it to supervise the sources of farm produce delivered to be consumed in the city[37].

In 2011, the city introduced the Drug Price stabilization program as a market stabilization program for the city. The program has had a positive impact on the management of drug prices in the city. Besides stabilizing the prices of drugs in the program, it has also helped to stabilize the prices of other drugs, even imported ones. In 2014, there were 530 commodities in total, including 150 active agents. 21 treatment groups saw prices stabilize, 12 companies participated in the stabilization program, and 3,169 vendors offered stabilized drugs. The accumulated revenue from the stabilization program was approximately VND 215 billion.

4. EVALUATION ON OUTCOMES OF CLIMATE CHANGE ADAPTATION ACTIVITIES FOR 2009-2015

Ho Chi Minh City's climate change adaptation activities were initiated in 2009 when it became a member of the C40 (May 2009) following a period of preparation.

In addition to development and completion of a national organizational and management system for climate change adaptation, the climate change adaptation work was designed to have two main tasks: implementing domestic programs and plans, and engaging in international cooperation.

4.1. Implementation of domestic tasks

In accordance with Decision No. 158/2008/QD-TTg dated December 2, 2008 by the Prime Minister on issuing the National Target Program for Climate Change Adaptation in 2010, Ho Chi Minh City has deployed the ***National Target Program for Climate Change Adaptation in Ho Chi Minh City in 2010***. The city has assessed the impact of climate change on sensitive areas, identified solutions, developed response plans, and set a premise for successful implementation of climate change adaptation activities in the coming years to guarantee the city's sustainable development. Among them, 14 urgent important tasks have been completed as the basis for developing the ***Ho Chi Minh City Climate Change Adaptation Action Plan by 2015***.

[36] In 2011, there were 8 food poisoning cases; in 2012 there was 6 cases; in 2013 there was 1 case; in 2014 there were 3 cases, none leading to death.

[37] By now, 04 units have participated in the chain: CP Vietnam Corporation, Agriculture Development TNXP JSC (ADECO), Hai Duc and Da Lat GAP Companies (Lam Dong), producing 820,000 chicken eggs/ days; approximately 2 tons of vegetables/day. A survey has been conducted to make a list of 46 potential facilities to take part in the chain including (chicken eggs: 4 facilities with an output of 420 million eggs/year; Chicken: 3 facilities with output of 6,940 tons/year; Pork: 11 facilities with output of 3,250 tons/year; Seafood: 13 facilities with output of 22,000 tons/year; Vegetables: 15 facilities with output 44,240 tons/year).

In parallel, HCMC has developed and deployed the ***Ho Chi Minh City Climate Change Adaptation Action Plan by 2015*** with 41 programs and projects collected from departments. The important issues and priorities that were implemented for 2009-2015 were: (1) Conducting communications and raising public awareness about climate change; (2) Developing a portal for the city's program for climate change adaptation; (3) Developing an integrated data information system about climate change; (4) Publishing technical manuals on housing construction for climate change adaptation; (5) Publishing manuals on urban planning for climate change adaptation; (6) Enhancing the capability of departments' staff. For 2011–2015, **75** staff members were sent to study and be trained abroad. Funds for the training courses mostly came from foreign organizations through cooperative programs for climate change adaptation. In addition, many staff also attended various international conferences and workshops to learn and share their experience concerning urban management, the environment, waste, and climate change; (7) Piloting alternative schemes, and improving lighting systems in alleys to replace all kinds of high power-consumption lights with power-saving lights; (8) Implementing the Greenhouse Gas Inventory Program - Phase 1 (2014), in which greenhouse gas emissions for the base year 2013 were calculated; and (9) Implementing the Project on Management of Greenhouse Gas Emission and Carbon Credit Trading in the World Market.

4.2. International cooperation activities

International cooperation activities regarding climate change measures were aimed at strengthening and supporting the search for international financial resources to support domestic tasks, promote the image of the city, promote the transfer of technologies and techniques, and enhance management and international integration capability. Ho Chi Minh City's international cooperation activities regarding climate change measures were considered very successful, building friendly, cooperative, and sustainable relationships with the three main partners described below.

Cooperation with the C40 and Connecting Delta Cities (CDC)

One of the milestones in Ho Chi Minh City's international cooperation on climate change measures is that the city joined C40 (Cities Climate Leadership Group), an organization with leaders from cities around the world who made a commitment to climate change mitigation and adaption at the C40 Cities Mayors Summit in Seoul, South Korea in May 2009. Annually, the Standing Steering Committee requests that the City People's Committee attend international events on climate change held by the C40 and member cities, most of which have an international standing on par with Ho Chi Minh City. Since 2010, Ho Chi Minh City has been a member of Connecting Delta Cities (CDC), an organization of about 10 members that share information about their individual experiences. Since 2012, Ho Chi Minh City has also been a member of the Green Growth Network.

Cooperation with Rotterdam, Netherlands

Ho Chi Minh City has worked with Rotterdam to successfully implement the ***Ho Chi Minh City Moving towards the Sea with Climate Change Adaptation Program***. In Phase 1 (2011–2013), Rotterdam contributed **USD 1,350,000** in funding and Ho Chi Minh City contributed **VND 1,095,840,000.** The achievements of Phase 1 were: (1) Setting up a project database (Atlas); (2) Establishing the Ho Chi Minh City Climate Adaptation Strategy (CAS) and Action Plan by 2100; and (3) Completing the Summary Report of Ho

Chi Minh City Moving towards the Sea with Climate Change Adaptation and attached appendixes.

Phase 2 of the Program (2013–2015) is being implemented with the following main goals: (1) Applying CAS principles in socioeconomic development planning at the city and district level and to some legal regulations, processes, and procedures; (2) Integrating climate change factors into socioeconomic development planning in District 4 in order to improve the implementation efficiency of the planning in line with the socioeconomic development aims of the district; and (3) Calling for investment for two climate change adaptation projects in District 4.

Cooperation with Osaka, Japan (2011–2015)

Implementing the ***Integrated Waste Management including Energy Recovery Program*** (2011–2013). At the end of the period, two projects were proposed to be funded by Japan and were approved by the Ho Chi Minh City People's Committee for a project feasibility study. These were a (1) Project for producing biogas for renewable energy from organic waste with a capacity of 40–60 tons/day at Binh Dien Agricultural Product and Foodstuff Wholesale Market; and a (2) Project for treating urban solid waste combined with (electrical and thermal) energy regeneration with a capacity of 400–600 tons/day.

Implementing the ***Low-Carbon City Development Program*** (2013–2015). Osaka pledged support for Ho Chi Minh City to develop the Ho Chi Minh City Climate Change Action Plan for 2016–2020 with respect to consulting, calculating CO_2 emissions, and improving the operational capabilities —all of which are currently being implemented.

4.3. Advantages

In recent years, Ho Chi Minh City’s climate change measures activities have— despite being part of a new field and being undertaken with little preparation time—brought certain efficiencies thanks to the following favorable factors:

- Quickly, timely, and focused guidelines from the Central Government to the leaders of the City People's Committee.

- The City's Steering Committee on the Implementation of the Action Plan for Climate Change has built a wide and deep network connecting provinces nationwide with international organizations.

- Taking action rapidly, systematically, and actively with a strong sense of responsibility among civil ser1vants and the city’s department- and district-level staff.

4.4. Difficulties and limitations

The following difficulties and limitations were encountered when conducting the above activities:

- In terms of science: In general, the content of climate change management can be evaluated and predicted qualitatively, but there are also many things that are difficult to quantitatively evaluate and predict, including evaluating damage caused by climate change to areas of socioeconomic life. Climate change is often accompanied by natural disasters such as storms, floods, droughts, extreme weather, and epidemics, but there should be more thorough, long-term and specific investigations to determine what is caused by climate change, what is caused by natural disasters, and what is caused by humans.

- In terms of professional management: Climate change is a new field that encompasses many sectors and fields, and its application to management is therefore still limited. To accurately calculate the effectiveness of climate change or greenhouse gas emission programs/projects, it is necessary to have sufficient data and information from many departments along with complete statistics that are updated frequently (e.g. full updates on project information and full analyses of technology and specifications).

- In terms of mechanisms and policies: Climate change is still a new field which lacks support policies, regulations, and guidance on implementing climate change measures programs/projects.

- In terms of community involvement: The domestic enterprise sector (state and private enterprises) has not actively participated in climate change measures. This limitation is partly due to a lack of policies and mechanisms, and partly due to a lack of information, knowledge, and capability among enterprises, especially small and medium enterprises.

- In terms of implementation: Due to limited personnel and experience, operational setbacks are being encountered and program/project progress is slow.

*** <u>In summary:</u>**

The Steering Committee on the Implementation of Action Plan for Climate Change Adaptation effectively conducted climate change adaptation work between 2009– 2015. Implemented particularly successfully work identified in Decision No. 2484/QD-UBND dated May 15, 2013 of the Ho Chi Minh City People's Committee on issuing Ho Chi Minh City Climate Change Adaptation Action Plan by 2015; Decision No. 2838/QD-UBND dated June 11, 2014 of the City People's Committee on issuing the Plan for Implementation of the Action Program No. 34-CTrHD/TU by the City’s Party Committee; and Resolution No. 08/NQ-CP of the Government on implementation of Resolution No. 24-NQ/TW of the 7th Meeting of the 11th Central Committee, which concerns actively responding to climate change and enhancing resource management and environmental protection.

In a broader aspect, the city was responsible for actively contributing to the national and global climate change adaptation projects. This has enhanced the role, reputation, and good image of the city.

5. URGENCY FOR DEVELOPING A CLIMATE CHANGE ACTION PLAN

5.1. Current status of climate change in Ho Chi Minh City

5.1.1. Temperature

Temperature data for 1995–2014 at Tan Son Hoa station shows that in this period, the city's average temperature rose by 0.9°C, a slight increase compared with that for 1978–2007 (0.7°C) (it is necessary to re-check this figure because this increase is quite high!). However, this period was characterized by the rapid and significant increase of annual average temperature, reaching 28.0°C for 1995–2004 and up to 28.3°C for 2005–2014. The lowest annual average temperature for this period was 27.5°C, equal to the highest annual average temperature for 1978–2007. In addition, the figures also recorded that the annual average temperature remained high for years and grew increasingly higher: for the 10 years of the 1995–2004 period, the number of years with annual average temperatures of 28.0°C or higher was 6 out of 10 years, but for 2005–2014 this number was 10 out of 10 years. The highest annual average temperature stayed nearly the same (28.5°C and 28.6°C) for two decades. However, between 2005–2014, two years experienced the highest temperatures ever recorded, while for 1995–2004 only one year reached 28.5°C.

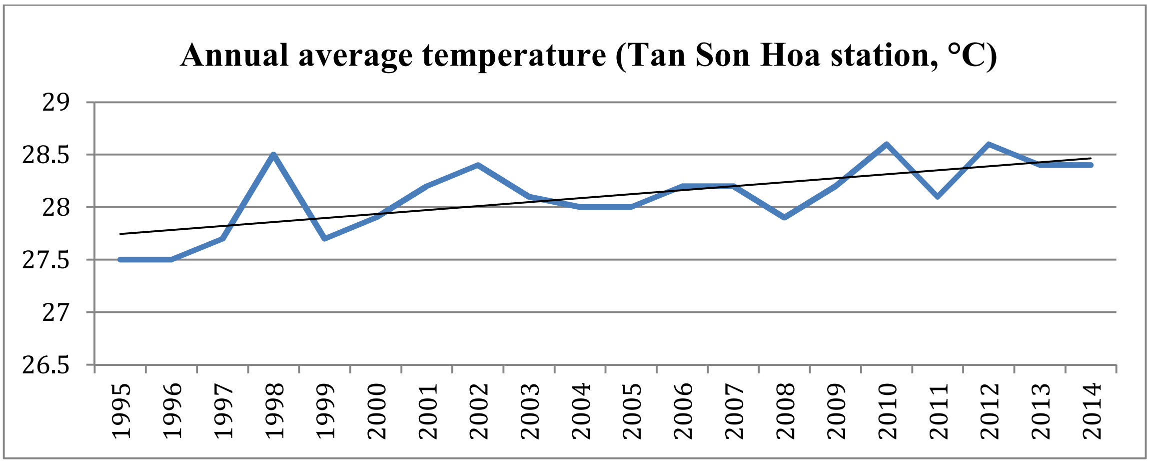

Figure 1. Average temperatures between for 1995–2014 as measured at Tan Son Hoa station

5.1.2. Rainfall

Compared to the 1978–1992 (1,542 mm/year) and 1993–2007 (1,618 mm/year) periods, the annual average rainfall for 1995–2014 (1,959 mm/year) increased by 300–400mm, 4–5 times higher than the increase in the two previous periods (from 1978–1992 to 1993–2007, the annual average rainfall increased by only about 80 mm). For 1995–2004 and 2005–2014, the annual average rainfall was approximately the same (1,963 and 1,955 mm/year).

The 1995–2004 period was charactized by a steadily high average volume of rainfall: 4 out of 10 years had average rainfall of approximately 2,000 mm or higher between 1995–2004. This grew to 6 out of 10 years for 2005–2014, during which period the average rainfall reached 2,730 mm, much higher than that of many other years. For 1995-2004, it was also recorded the year with the highest average rainfall of the period was followed by the years with the lowest average rainfall (2002: 1,321 mm/year, less than 50% of the rainfall in 2000). For 2005–2014, the average rainfall remained high but was more stable than in the previous period.

The number of rain events with rainfall higher than 100 mm has steadily risen. During the 1952–1961, 1962–1971, 1972–1981, and 1982–1991 periods, the number of rain events with rainfall higher than 100 mm respectively increased 0–4 times/10 years. For the 10 years from 2003 to 2013, 15 rain events were recorded with rainfall higher than 100 mm.

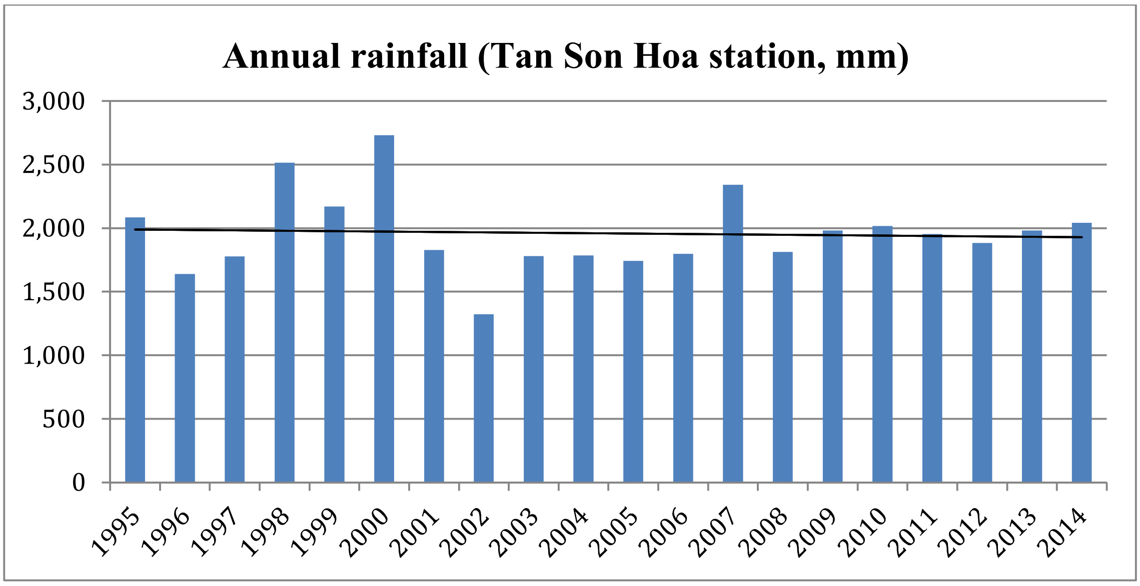

Figure 2. Rainfall for 1995–2014 as measured at Tan Son Hoa station

Table 1. Number of rain events with rainfall higher than 100 mm

Period	1952–1961	1962–1971	1972–1981	1982–1991	1992–2002	2003–2013
Number of rain events with rainfall higher than 100 mm	0	1	2	3	4	15

5.1.3. Sea level

According to Nguyen Ky Phung, within a period of 28 years (1980–2008), the water level in Vung Tau rose 10 cm; on average, the speed of water level rise in Vung Tau station was 3 mm/year[38]. Also at Phu An station, the statistics showed that just for 20 years from 1995 to 2014, the highest average water level of the period increased by 15 cm (from 1.39 m of the 1995–2004 period to 1.56 m of the 2005–2014 period). The highest average water level for 1995–2004 (1.39 m) was approximately at the level 2 alarm (1.4 m), but for 2005–2014, the highest minimum water level of the entire period (1.42 m) exceeded the level 2 alarm (the highest average water level for this period was 1.56 m, exceeding level 3 alarm). For 1995–2004, only 6 years saw the highest annual water level exceed the level 2 alarm; no year exceeded the level 3 alarm. But for 2005–2014, all 10 years had the highest water level exceeding the level 2 alarm. 4 of these years exceeded the level 3 alarm (1.5 m) and 3 water levels higher than 1.6. The highest water level in two years 2013 and 2014 at Phu An station was 1.68 m, a level close to 1.7m.

Table 2. Annual average water levels measured at Vung Tau station

Year	1980	1990	2000	2008	2010	2015

38 Climate change and its effects on Ho Chi Minh City – Nguyen Ky Phung – Vietnam National University-HCMC Publishing House, 2012, p. 149.

Annual average water levels measured at Vung Tau station (cm) (38)	-29	-30	-18	-19		

Note: Data corresponds to the continental reference level "zero". To convert into water levels compared to "zero" on the sea chart, add 288 cm.

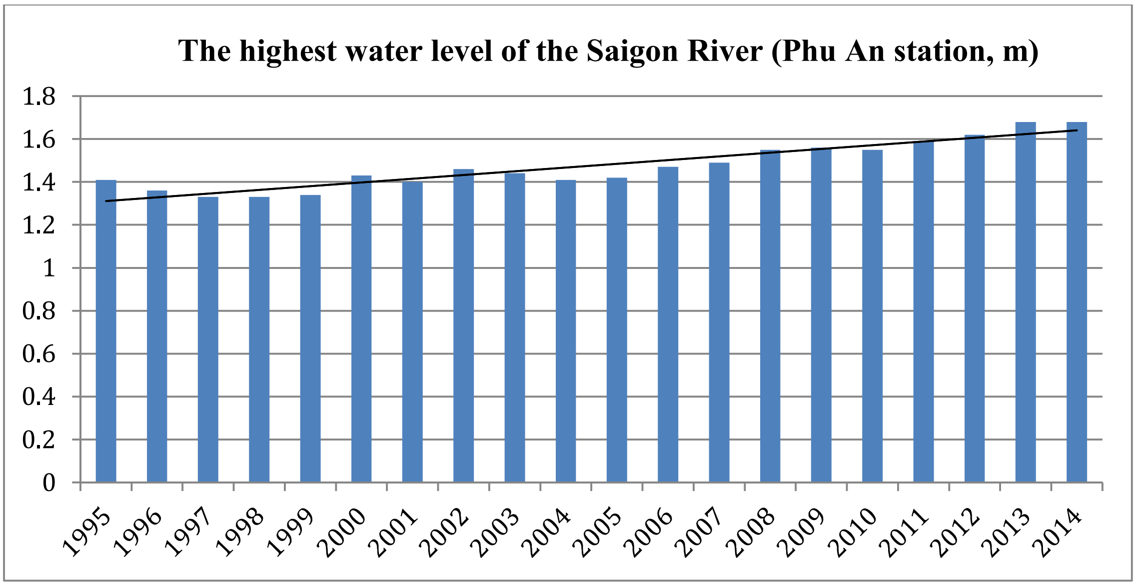

Figure 3. Water levels for 1995–2014 as measured at Phu An station

5.1.4. Changeable weather

As mentioned in the above sections, in all 3 aspects—temperature, rainfall and water level—abnormally high rises and rapid, prolonged increases were recorded, especially for 2005–2014 and recent years (2013, 2014).

Besides the above-mentioned phenomena, more extreme weather events were recorded. July 2015, for example, was assessed to be the hottest month ever by NOAA, NASA, and JMA (the global average temperature was 0.81°C higher than the average July temperature for the twentieth century). The first seven months of 2015 were recorded as the hottest time since people began recording temperature data (from the 1880s): up to 0.85 °C higher than the average level of the twentieth century. The rain level in September 2015 in Ho Chi Minh was recorded as up to 142 mm (An Lac station), causing long flooding and affecting people's lives. All of these were abnormal weather events, the causes and trends of which should be carefully evaluated and analyzed. The WMO also warned that El Nino 2015 would result in a peak strangely similar to that of 1997 and could be one of the most devastating on record.

5.2. Climate change trends in Ho Chi Minh City by 2020 and 2030

Through evaluation of the climate change factors mentioned above, we note that for Ho Chi Minh City, the factors with the strongest impact include temperature, rainfall, and the water level (tides) of the Saigon River Saigon River. According to our evaluation, the sea level rise for 2020–2030 will not have a significant impact on Ho Chi Minh City due to a slow rise rate.

5.2.1. Temperature

In the Scenarios of Climate Change, Sea Level Rise for Vietnam prepared by the Ministry of Natural Resources and Environment (MONRE) in 2011, it was forecast that the annual average temperature increase in Ho Chi Minh City under a medium emission scenario (B2) in 2020 and 2030 compared to the 1980–1999 period would be 0.5°C and 0.8°C, respectively (approximately 28.2°C and 28.5°C).

Compared with the annual average temperatures of the two periods—1995–2004 (28.0°C) and 2005–2014 (28.3°C)—mentioned above, we found that in the coming period, these parameters should be further supplemented and revised, or the high emission scenario for Ho Chi Minh city should be defined because the actual annual average temperature for 2005–2014 was approximately equal to and exceeded the forecast for 2020.

5.2.2. Rainfall

Also, according to the Scenario of Climate Change and Sea Level Rise for Vietnam (MONRE, 2011), the forecast annual average rainfall increase in Ho Chi MinhCity under the medium emission scenario (B2) by 2020 and 2030 compared to the 1980–1999 period would be 0.9% and 1.4%, respectively. According to some studies, this increase would be about 35 mm in 2020 and 44 mm in 2030 (equivalent to about 1,850 mm and 1,860 mm).

However, based on the actual results of the 1995–2014 period (1,960 mm), we estimate the average rainfall of the city will reach up to 2,000 mm/year by 2020, and the increase may be determined using the high emission scenario because the actual data of annual average rainfall of the 1995–2014 period also exceeds calculated data according to the average emission scenario B2 for the average rainfall of 2020.

5.2.3. Water level

An evaluation by the Ministry of Natural Resources and Environment in 2011 showed that the sea level rise from Ke Ga Cape to Ca Mau Cape compared to the 1980–1990 period in the B2 scenario was expected to be from 8–9 cm (2020) and 12–14 cm (2030). In some of the latest calculations, the experts assessed that the average water level rise for Ho Chi Minh City in B2 scenario would reach 14 cm (2020) and 19 cm (2030), with the directly affected flooded area and population reaching 1,562 ha/34,350 (2020) and 2,034 ha/36,124 people (2030), respectively.

According to results of the actual evaluation of the highest water levels of Saigon River for 1995–2014 mentioned above (the highest average water level of the 1995–2004 and 2005–2014 periods measured at Phu An station were 1.39 m and 1.56 m, respectively), we estimate the highest average water level measured at Phu An station would be up to 1.62–1.65 m by 2020 (an increase of about 1–1.5 cm/year). Human activities were the other main reason apart from increased rainfall for sea level rise. Human impact should be carefully assessed in separate studies for more accurate forecasting of the Saigon River water level to serve as a basis for calculation and evaluation regarding economic and social planning.

5.3. Existing and potential effects of climate change on areas of urban development within Ho Chi Minh City

Because current data on and methods for evaluating the impact of climate change on Ho Chi Minh City are very limited, detailed quantitative evaluations of the impact of climate change on each area cannot be done at present. Evaluating the impact of climate change to develop the Ho Chi Minh City Climate Change Action Plan for 2016–2020, with a View to 2030 will therefore primarily be done by qualitative methods and by inheriting quantitative evaluations performed in the period before 2015 for certain areas.

5.3.1. Urban planning

Urban planning is a general field and a foundation for the development of other fields. The impact of climate change on urban planning can therefore be considered in combination with every field of socioeconomic development of Ho Chi Minh City. Considering the impact of urban planning on climate change measures in line with the conditions of Ho Chi Minh City, the key issues are urban green space and water surface area.

To enhance green space, in addition to planting urban trees (parks, street trees, etc.), the City also can apply solutions for enhancing green space on roofs and taking full advantage of buildings' attic and roof space. The increase of green space will contribute to reducing ambient air temperature and improving the microclimate environment of the urban core. Accordingly, the demand for energy consumption for cooling will decrease and also contribute to the reduction of greenhouse gas emissions.

Similarly to enhancing water surface area, this solution helps reduce ambient air temperature. On the other hand, the collection and use of stormwater falling into conditioning lakes of various scales located sporadically throughout the city will contribute to reducing pressure on the drainage system and reducing the need for water.

5.3.2. Energy

a) Electric power

Because Ho Chi Minh City does not directly produce electricity but instead receives it from the national grid, the impact of climate change in Ho Chi Minh City mainly affects the system of electricity transmission and distribution. High temperature will reduce the efficiency of power transmission. In addition, strong winds can also cause damage to the power transmission system as most of the HCMC power transmission system is designed to withstand winds at speeds below 30 m/s. Flooding will affect the lines and transformer stations, while high humidity will increase the risk of damage to the steel infrastructure.

According to research by the International Centre for Environmental Management (ICEM) in the framework of the cooperation program between Ho Chi Minh City and Asian Development Bank (ADB) on "Ho Chi Minh City Adaptation to Climate Change", it is estimated that at present around 60% of existing 500 kV transmission lines are located in flooded areas without any measures against control flooding, and 48% of the lines are located in flooded areas with projects underway to reduce flooding. Nearly 400 kilometers of the existing 220 kV transmission lines and 200 km of the 220 kV transmission line are planned to be located in flooded areas. Similarly, 310 and 350 km of 110 kV transmission lines have been installed or are being planned for installation within flooded areas. For transformer stations, climate risks for existing and planned stations are quite serious. The two existing 500 kV transformer stations and four planned transformer stations are located in flooded areas and are at very high risk of flooding. Four of the eight existing and planned 220 kV transformer stations are located in flooded areas, but will be reduced to two stations once the flooding reduction projects are implemented. The 110 kV transformer stations are at the highest risk, with 52% of the existing stations located in flooded areas (ICEM, 2009).

In addition, one of the important side effects of climate change on the energy sector is its impact on energy demand. In Ho Chi Minh City, the rising temperatures will lead to increased energy demand for cooling. This will cause power production and transmission systems to operate at their lowest efficiency. For cities in tropical climates like Ho Chi Minh City, the demand for cooling accounts for a significant proportion of total power consumption. This is therefore a problem that is more serious for Ho Chi Minh City, especially when combined with "urban heat island” phenomenon.

As with the relationship between temperature and the electricity sector, electricity and water are also closely connected. On one hand, electricity is an essential component of the operation, production, and distribution of feed water and wastewater treatment. On the other hand, water is the raw material required for cooling system of every energy production plant (US EPA). Therefore, when climate change impacts water resources, it will also have an indirect impact on electricity production and consumption. In other words, when the demand for water increases (probably a consequence of temperature increase or salinity intrusion), the demand for electricity consumption to produce feed water also increases; or, if demand for electricity increases, there will need to be a corresponding higher amount of water for electricity production. Moreover, as Ho Chi Minh City gets its power mainly from the national grid, water shortages will impact national power production, especially hydroelectricity, as well as the power supply to Ho Chi Minh City. Water shortage risk may stem from changes in the hydrological regime, drought, and conflict of water consumption demand for hydroelectric production, irrigation and other activities.

Although Ho Chi Minh City occasionally suffers from large storms or natural disasters, the nature of unpredictable climate change could mean an increased risk of abnormal storms. Moreover, in recent years, a number of big storms in Vietnam have affected the weather in Ho Chi Minh City and have resulted in a number of phenomena such as tornadoes and thunderstorms that have harmed people and property. On the qualitative side, flood and natural disasters can harm people and property in general, especially power sector infrastructure. Meanwhile, electricity and water are the two stable services that must be restored and re-operated as soon as disasters occur in order to maintain the entire system of urban activities.

b) Fuel

The most important cause of rapidly increasing greenhouse effect is fossil fuel combustion. This was mentioned in the First Evaluation Report of the Intergovernmental Panel on Climate Change (IPCC) and has been consistently confirmed in subsequent reports. For a rapidly growing city like Ho Chi Minh, fuel consumption is essential for economic growth. Thus, the city’s fuel consumption has helped accelerate the greenhouse effect and exacerbated the impact of climate change, which grows increasingly more severe. On the other hand, the city’s activities have also been impacted by climate change in areas that include fuel transport and distribution.

5.3.3. Traffic

Traffic is one of the sectors most directly vulnerable to the effects of climate change. At the same time, traffic has the greatest impact on the operation of the entire economy, especially when Ho Chi Minh City is the focal point and the economic center of the whole region, as well as of the country.

In terms of road infrastructure, if no better drainage solutions are devised, about 76% (equivalent to 45 kilometers of road) of the two main roads and 56% (176 km) of the belt-line road in Ho Chi Minh City will be flooded during extreme weather conditions. In addition, approximately 115 km of roads connecting Ho Chi Minh City with neighboring provinces and some major provincial roads to transport goods between such provinces and Ho Chi Minh City are also likely to be affected under severe flooding conditions from 2050. There is also a high risk of flood: 50% for existing intersections and 80% for planned intersections.

By 2050, Ho Chi Minh City is expected to have more urban rail infrastructure such as a metro, a monorail and a tramway. The urban rail system is also at risk of suffering from the effects of climate change, particularly the metro and tramway systems.

Besides the road system, other transport infrastructure systems such as bus station and parking lots are also at potential risk of being significantly affected by floods. This will lead to decreased transport network performance and other economic losses.

5.3.4. Industry

Rising sea levels are reducing industrial land area. Some industrial zones located in low areas will be flooded and lose their usability. Industrial zones and production and business establishments located in low-lying areas face more risk of flooding, requiring drainage solutions for flood tide and sea level rises. According to calculations by the IPCC (ICEM, 2007), if the sea level rises by 1 meter by 2100, the production facilities in 20 provinces will be flooded. 500 (9%) of these establishments are in Ho Chi Minh City (9%), including 16 industrial zones (of which 9 industrial zones will be severely flooded).

The decline of plant species leads to a shortage of raw materials for industries such as textiles, the agricultural products and food processing industry, seafood processing, and aquaculture.

Water shortages in the dry season also causes water supply difficulties for the industry.

Extreme weather conditions and natural disasters reduce the life of materials, components, machinery and equipment, and reduce the quality of construction works, requiring increased costs for recovery. The increased temperatures will make it more difficult to store raw materials and products.

5.3.5. Water management

The change in seasonal rainfall distribution is leading to a change in the downstream flow rate of rivers, reducing the volume in the dry season and increasing the volume in the rainy season while also changing the city's groundwater reserves. The rainfall increase in the rainy season will increase water runoff, exacerbating soil erosion and causing pollutants and garbage on the ground to gather in the surface flows. Urban flooding could also join highly polluted surface water with other sources of clean water, dispersing pollutants into groundwater. The increase in the flow rate of Dong Nai River and Saigon River would cause floods, erosion, landslides, and flash floods that could threaten the capability of the reservoir system. Meanwhile, the rainfall decrease in the dry season could create greater risk of water shortages for living activities, production and other purposes at the same time that demand for domestic water by the city's residents is expected to increase due to rising temperatures. This imposes more pressure on the safe water supply of the city.

The rainfall decrease in the dry season and the temperature rises also cause the salinity of the rivers to continue rising and getting worse. In the dry season, salinity intrusion is worse upstream and reduces the water quality of rivers at the water intakes of feed water treatment plants. The long dry season will cause difficulties for desalination operations at the Dau Tieng Reservoir and Tri An Reservoir upstream. As reported by SAWACO, since 2011 there have been times when the salinity at the water intakes exceeded legally-permitted levels, leading to the suspension of water intake for the production of feed water. By the end of January 2011, the daily average chloride concentration (salinity) of river water at the Hoa Phu pumping station at Tan Hiep water plant exceeded 100 $mgCl^-/L$. Salinity occasionally reached 270 $mgCl^-/L$, a level higher than the legally-permitted 250 $mgCl^-/L$ as established in the National Technical Standards for the Quality of Drinking Water by the Ministry of Health.

The salinization of Dong Nai River and Saigon River greatly affects the operations of surface water treatment plants that supply water for the daily living needs of people and for production activities and services. This is because treatment plants currently only utilize purification and discoloration technologies, and does not use freshwater production technologies. The salinization of the river system also affects the water supply for agricultural production in the city, especially in southern Ho Chi Minh City.

According to one scenario for climate change and sea level rise (Ministry of Natural Resources and Environment, 2012), the rainfall in the dry season (December to May) will continue to fall in the southern and south central coastal regions until the middle of the 21st century for all the scenarios. The decline in water resources will therefore last longer and grow worse and salinity will increase to higher levels with more frequency and longer duration. In contrast, rainfall in the rainy season in the southern region is forecast to increase along with the frequency of abnormally heavy events, exacerbating the current pollution of surface water and groundwater caused by urban flooding and causing a dispersion of pollutants into surface water and groundwater.

Although sea level rise has not been significant over the past 5 years (2011–2015), , the occurrence of flood tide at peak has been very complex, continuously increasing from 1.55m in 2010 to 1.68m in 2013 and 2014. This increase in flood tide at peak was due to the rapid urbanization of the city when the canals and swamps were filled for urban construction, narrowing the drainage space of rivers. The increase in flood tide at peak in recent years has increased flooding in alleyways and residential areas with low natural elevations in Districts 7 and 8 and the Nha Be, Binh Tan, and Binh Chanh districts. In the event that flood tide at peak continues to rise unusually as it did in the 2010– 2015 period, the number of flooded roads, wards, and districts with low topography will increase, negatively affecting both quality-of-life and socioeconomic development not only in the flooded areas but also in neighboring areas. In the next 5 years, sea level rise is forecast to be insignificant. Thus, in order to restrict urban flooding due to flood tide for 2016–2020, it is necessary to effectively implement urban planning and create temporary spaces for drainage and water storage. The construction of dikes and tide barriers is considered a long-term solution to cope with sea level rise toward the mid-21st century.

The clearer differentiation of rainfall due to climate change has led to an increase in the frequency and intensity of heavy rains over short periods of time. These rains exceed the capacity of the drainage system of the region (which can withstand rainfall of up to 100 mm within three hours) and cause flooding in these regions, especially when there is a combination of flood tides and heavy rains. The rising level of tides at peak and the frequency and intensity of heavy rains due to the effects of climate change can combine to cause unusual flooding in some areas of Ho Chi Minh not previously affected by flooding. Statistics showed that there were 15 rain events with rainfall over 100 mm within three hours for 2003–2013, compared to four such events for 1992–2002. An increase in the frequency of heavy rains in a short time is forecast to continue for 2015–2020 and toward 2030 due to the effects of climate change. It is therefore, when researching and implementing flooding restricting solutions for Ho Chi Minh City, it is necessary to integrate the potential impact of more frequent heavy rains in short time periods and avoid new flooding points caused by such rain.

Climate change also makes the movements of tropical storms become unpredictable and increases the probability of Ho Chi Minh City being affected. According to statistics, most of the storms affecting Ho Chi Minh City take place in the last months of the year and generate heavy rains with rainfall of up to 200–300mm/day or even higher, with high waves causing severe flooding. The risks of unusual flooding by tropical storms should be considered to minimize damage caused to Ho Chi Minh City by tropical storms.

Water supply and drainage infrastructure works will be negatively affected by urban flooding. The operations of domestic sewage treatment plants and pumping stations can be interrupted when they are located in even areas of flooding, let alone unusual flooding. It is the same for surface water treatment plants and the water supply network. Damage to or interrupted operations at these works will impact the city in a number of ways. For example, the shutdown of drainage works could cause more severe flooding, stopping the operation of electric infrastructure and causing a series of accompanying chain effects.

5.3.6. Waste management

a) Solid waste

The negative impacts of climate change on waste management are indicated by: (1) an increase in the biodegradation speed of organic matters in solid waste, wastewater, and sludge in the collection, transport, and disposal of the above types of waste, and (2) urban flooding due to the increased frequency and intensity of heavy rains in short time periods, increasing the dispersion of pollutants from waste storage areas into receiving sources. Therefore, in order to ensure safety, management activities and operating costs will inevitably rise, particularly when these indications of climate change become increasingly clearer.

Significant progress has been made in solid waste management. Advanced technologies have been successfully applied in the collection, treatment, and recycling of solid waste. This process has not only reduced the environmental impact but also contributed to the reduction of greenhouse gas emission. Through the recovery of raw materials and energy, solid waste is increasingly being considered a valuable resource. In order to effectively and reasonably reduce the greenhouse gas emissions generated by the waste management process, it is necessary to consider such important issues as treatment technologies, mechanisms to encourage cleaner treatment technologies, and the calculation of greenhouse gas emissions. However, solid waste management must still focus on minimizing waste and enhancing on-site recycling in order to reduce the consumption of energy and raw materials, in addition to the regeneration of energy and raw materials by solid waste treatment. If advanced technologies are applied, solid waste produced by the city will become an important resource to replace fossil fuels.

Thus, in order to reduce the risk of environmental pollution due to the effects of climate change and greenhouse gas emission, solid waste management systems should address the issue of waste management such that all waste is recycled or regenerated by the most effective means possible, particularly by reducing landfill usage in order to avoid the high risk of pollution, which increases particularly quickly as indications of climate change progress.

b) Wastewater

The current drainage system of Ho Chi Minh City mostly consists of shared sewers to drain both domestic wastewater and stormwater. Heavy rains occurring over short time periods will overload sewer capacity and cause urban flooding, which leads to leakage of domestic wastewater on the street, especially during heavy rains and high flood tides. Moreover, urban flooding can disrupt the operations of the domestic wastewater treatment plants in the same manner as feed water treatment plants. Increased temperatures will affect the domestic wastewater transmission pipeline network, from waste generators to treatment plants.

c) Sludge

Climate change has not had a major impact on the sludge management of the city, except for increasing the risk of environmental pollution caused by this type of waste, especially in drainage systems when the risk of flooding continues to grow as described above. Sludge is generated in cities mainly from wastewater treatment and from deposition in the drainage system. Except for hazardous sludge, which is managed by certificate and treated thoroughly, other types of sludge in the city—especially that dredged from canals—are facing problems in treatment. This is because no treatment plants have not been built, although one is being planned in the form of the Da Phuoc Solid Waste Treatment Complex. Sludge from the wastewater treatment system—especially activated sludge—is easily biodegradable for greenhouse gas emission but is also a potential source for energy regeneration. The current biggest problem in the sludge management system is how to control the large volume of sludge generated as well as how to treat it at a time when state management regulations in this area have not been established.

5.3.7. Construction

Ho Chi Minh City is at a low elevation that is mostly below sea level. In the rainy season, urban infrastructure may be flooded for extended periods. This can reduce the quality, durability and service life of construction works. Climate change will affect the comfort, usability, load capacity, durability, and safety of such works. As infrastructure designed in accordance with existing standards will be inadequate in terms of things such as load capacity, durability, and safety in the face of climate change, it is necessary to plan and construct new roads. Existing infrastructure is not capable of accommodating higher sea levels and is unlikely to be so in the future.

Climate change also affects construction planning and design. Urban development, infrastructure, industrial zone, agriculture, tourism, etc., as well as land use of Ho Chi Minh City towards climate change measures, requires more research and planning. Changes must also be made to the city's development planning policy, and things such as flood control dikes and river tourism need to be developed

5.3.8. Health

On the subject of natural conditions, the Evaluation Study of the Organization for Economic Cooperation and Development (OECD) indicated that Ho Chi Minh City is listed as one of 10 cities in the world and one of 5 cities in Asia that will be hit hard by climate change and inevitably suffer from the adverse effects of extreme weather. Sea level rise will seriously impact flooded areas such as those in the south and southeastern parts of the city. Areas affected will beCan Gio, Nha Be, Binh Chanh, and Binh Thanh districts, as well as districts 4, 7 and 8. Frequently flooded areas will become favorable places for mosquitoes and flies to breed and grow, increasing the risk that tropical diseases such as malaria, dengue and the digestive diseases will spread. The temperature rise and the hot weather will increase the growth rate and development of many types of bacteria, insects, and disease carriers, leading to an increased number of contagious infections.

Concerning the technical and social infrastructure conditions, poor flooding control and drainage infrastructure are favorable conditions for generating various types of epidemics and digestive diseases. Droughts and hot weather will increase the risk of clean water shortages, and the limited water supply will lead to poorer quality in terms of sanitation and environment and washout capacity, thereby creating favorable conditions for diseases to easily develop.

Regarding the conditions of health infrastructure, the health facilities system of Ho Chi Minh City is doing an increasingly better job of meeting the healthcare needs of the people. However, in general, major hospitals (including private hospitals) are overloaded. The bed occupancy rate is high because the number of patients is usually higher than the number of beds. Being that health infrastructure cannot properly meet social needs even under normal conditions, there will be many more problems when climate change begins to have a more profound effect if Ho Chi Minh City does not actively prepare.

In addition, extreme weather brings an increased risk of becoming infected with cardiovascular, respiratory, and neurologic diseases—especially among elderly people—due to being directly affected by heat waves, reduced bodily resistance, and increased risk of infectious diseases.

Ho Chi Minh City will also be put under pressure of health infrastructure overload due to the reception of patients from the neighboring areas if these areas are also subject to the impacts of climate change, particularly the Mekong Delta region.

5.3.9. Agriculture and food security

a) Farming

Climate change may impact the seasons, leading to changes in season structure as well as irrigation techniques and agricultural productivity and output. It may also degrade and decrease soil quality and quantity due to flooding and drought. Changes in intensity and duration of sunshine, water shortages, and increased CO_2 levels and temperatures in the future will affect the growth of entire crops and the productivity of harvested products. Every crop has its own optimal temperature for growth and reproduction, but hot weather that exceeds the optimal temperature of the crop may hurt the productivity and output. Higher temperatures could lead to higher rates of evaporation and less rainfall in the dry season. Demand for irrigation water would increase in all agricultural areas. In addition, as the sea level rises and flood tides appear, water flow in rivers will draw in the dry season, making sea water intrude into inland areas and increasing salinity annually. This will affect the productivity and quality of crops, as well as soil quality.

b) Livestock raising

Climate change can reduce the resistance of some livestock because it can cause changes in fluctuation range of factors such as temperature and moisture. Also, changes in weather factors can give rise to new diseases that spread through the raising of livestock and poultry, which can develop into epidemics or pandemics. Rising temperatures and droughts can threaten meadows, the feed supply for livestock raising, and effectively reduce the feed supply for cattle and the available number of meadows for grazing. For animals which live on food, changes in crop production due to water shortage or drought can be a problem as well.

c) Fishery and salt production

Rising sea levels, flood tides, and lowered river water levels cause salinity to intrude into inland areas, harming habitats suitable for freshwater aquatic animals and driving down their quality of life. A higher temperature causes an obvious stratification in temperature levels in hydro-habitats. This can affect the organism life, temperature and season change which can have impacts on time of reproduction and migration. Some aquatic animals can disappear in an area but appear in another as a result of migration. However, migration to new areas can make these animals compete with others for food and other resources. Also, higher temperatures cause the photo-chemical process and decomposition of organic substance to happen faster, which affects creatures' food supply. It also makes aquatic animals consume more energy for respiration and other activities, reducing the productivity and quality of marine animals. Some diseases affecting aquatic life can become more common because water gets warmer when temperatures increase. High rainfall makes salt concentration remain lower for a long time, which may cause brackish water and inshore creatures to die as they cannot withstand the changes in salt concentrations.

Apart from the rise in temperature, sea water gradually becomes more acidic due to the higher amount of CO_2 in the atmosphere. Higher acid concentrations can harm aquatic animals with shells by weakening their shells. Acidization may also threaten the structure of sensitive ecosystems on which some aquatic animals depend. Climate change can deteriorate and destroy coral reefs and alter the physiological and biochemical processes which happen in a symbiotic relationship among coral, alga, and aquatic creatures.

For marine resources and the fishery industry, climate change can make fishery activities, including aquaculture, less economically viable. Rising sea levels worsen water's physical, chemical, and aquatic characteristics, resulting in a change in the structure and components of existing societies and a decrease in reserves. Rising temperatures make sources of aquatic animals become more dispersed and cause creatures with high economic value to decrease in number or disappear. Floating plants, the first chain link in the food supply for floating animals, are destroyed, leading to a dramatic decrease in the number of floating animals and diminishing the food supply for animals in the middle and upper water levels.

Furthermore, rising sea levels affect the size and infrastructure of salt production areas, and frequent heavy rain events also has impact salt production activities.

d) Forestry

Rising temperatures and droughts cause a reduction in the productivity and size of crops, leading to higher demand for converting forest lands into lands for agricultural production. It also causes greater exploitation of aqua products and causes migration to areas of higher elevation, which promotes deforestation. Rising temperature and evaporation levels, together with prolonged droughts, will cause changes in the distribution and growth of forest plants and animals. Climate change will affect the quality and quantity of forest ecosystems and biodiversity, and decrease the environmental and economic functions and services of the forest. Higher temperatures and prolonged droughts will increase the risk of forest fires, causing damage to biological resources, increasing greenhouse gas emissions, and creating favorable conditions for some insects to thrive.

e) Irrigation

Extreme weather conditions can expose the current system of coastal dikes to overflowing and rupturing. Urban reservoirs are threatened because rainfall has been redistributed over time and space, causing many changes in the reservoirs compared to their original designs. Rainfall is distributed unevenly; some areas receive little rain over short periods of time but receive it with higher frequency, unpredictability, and intensity. For the system of river dikes, girdle shaped dikes, and girdle shaped banks, the impact of flood tides reduce the amount of water discharged into the sea. In addition, rising river water levels and more rainfall from torrential rains make it more difficult to discharge water, leading to flooding around the city.

In the dry season, low river levels and rising sea levels, together with flood tides, make it harder for downstream drains for rivers to get fresh water into the fields. Extreme weather conditions can cause adverse river and stream flows in terms of mode and capacity. As a result, irrigation infrastructure will work under different conditions that originally intended. This will result in less and usage of this infrastructure and a failure to meet the demands of agricultural activities.

e) Rural development

Climate change can affect rural infrastructure, threatening rural life and rural public health. Extreme weather conditions can seriously affect the living water supply system and rural hygiene environment through the flooding or rupturing of water supply infrastructure. Rural transport systems may also be affected when many routes are flooded with eroded road surfaces and platforms. The exhaustion of river flows in the dry season can lead to a shortage of fresh water supply supplies for rural areas, affecting waterway transport. The appearance of more unpredictable, intense, and frequent torrential rains in short periods of time can erode river banks and cause soil loss. It has been shown that, residents are forced to migrate, which affects personal livelihood and as well as the steadiness and sustainability of development programs to improve rural public health.

5.3.10. Tourism and raising community awareness

Since the 1970s, people have been researching the relationship between tourism and climate, beginning from the checking of climate thresholds to identifying the length of seasons to preparing suitable tourism activities. Climate plays an important role in the selection of tourism locations and spending as many tourism destinations are closely connected to the natural environment. Some kinds of tourism require very special climate conditions, including beach tourism, winter sports, or medical or health care tourism. Climate change will therefore have a strong impact on and play an important role in the competitiveness and sustainable development of the tourism industry.

Effects of climate change on the tourism industry

Some areas directly affected: revenue, operating costs (e.g. heating, cooling, and insurance premiums), damage to infrastructure

Climate is the premise for all tourism activities. People choose places to travel based on location, time of year, local product quality, and purchasing power in the holiday season. These factors are affected by climate and can tremendously impact competition between locations and the profits of tourism companies. In addition, IPCC (2007) also concludes that climate change causes several extreme weather conditions such as higher temperatures during the day in most regions, tropical storms with high density and heavy winds, high rainfall, and prolonged draughts. As a result, the tourism industry will suffer from increasing damage to infrastructure, emergency requests, higher operating costs (e.g. insurance premiums, backup water, and evacuation procedures), and interruption of business activities.

In Vietnam, prolonged floods will cause damage to many historic places and tourism resources. Tourism destinations will be destroyed or will deteriorate from erosion caused by high intensity floods. Frequent rain events can, together with winds, floods or sunshine accompanied by high temperatures, also cause rapid deterioration of architectural materials. This wastes the money and efforts of the State and its people. The increase in the number of extreme weather conditions—too many floods or too much rain or sunshine—will have a direct impact on customer transportation activities, whether that involves airways, roads, or waterways. This will in turn affect activities in outdoor tourism destinations such as those centered on ecological tourism (salt-marsh forests in Can Gio, ecotourism area in Cu Chi, etc.).

Indirect effects: Climate change can also have an indirect impact on tourism activities in areas that include transport, energy, water management, land use management (for tourism services), and national defense.

Some indirect effects that cause environmental change: water shortages, biodiversity loss, degradation of scenic beauty, increase in infectious diseases, and damage to infrastructure.

As environmental conditions are an important factor to the tourism industry, broad-based climate change will indirectly cause negative and profound effects on tourism at different levels. These effects include a decrease in water quality, loss of biodiversity, of degradation scenic beauty, changes in agricultural production, more natural disasters, erosion of sea banks, flooding, damage to infrastructure, and epidemics. Mountains, islands, and coastal areas are especially vulnerable to climate change. In addition, a lack of fresh water due to salinity intrusion also will hurt the quality of customer service by making destinations less attractive and thus drawing in fewer customers and achieving less consumption.

As can be seen, climate change affects revenue from tourism services, which affects global economic growth.

Direct effects that change society: Climate change is considered dangerous for the future economic growth and political stability of some countries. Climate change leads to worsened revenue, thereby affecting economic growth, political stability and, ultimately, national security. Meanwhile, extreme weather conditions can dramatically worsen tourists, indirectly affecting traffic safety and health (due to epidemics).

All tourism companies and locations will need to adapt to climate change in order to mitigate relevant risks and take advantage of new opportunities in a sustainable economy, society, and environment.

5.4. Greenhouse gas emissions

5.4.1. Method of calculating greenhouse gas emissions

The method of calculating greenhouse gas emissions in Ho Chi Minh city is essentially based on the theory propounded in the Guidelines to Greenhouse Gases Inventories of the Intergovernmental Panel on Climate Change 2006 (IPCC 2006) for the following sectors (1) Energy; (2) Industrial processes and product usage; (3) Agriculture, forestry and land use rights; and (4) Waste. The general formula to calculate greenhouse gas emissions is as follows:

$$\textbf{Amount of greenhouse gases emitted} = \mathbf{AD \times EF}$$

In which,

- **AD (activity data):** Qualitative data on the level of each activity.
- **EF (emission factor):** Emission factor or greenhouse gas absorption corresponding to each activity unit.

However, to use the result of greenhouse gas emission as an indicator to assess the energy and resource consumption efficiency of socioeconomic activities in Ho Chi Minh City, the task of greenhouse gas inventories is further divided into more detailed sectors on the basis of the ten sectors for which the Action Plan for Climate Change in 2016-2020 was built.

It is difficult to calculate greenhouse gas emissions for each sector based on the data available for HCMC. It is also impossible to directly calculate the greenhouse gas emissions for some activities in certain sectors because such activities only contribute indirectly or affect the greenhouse gas emissions of other activities. Therefore, greenhouse gas inventories are only implemented in those sectors that directly emit greenhouse gases and therefore provide sufficient data for calculation.

5.4.2. Calculation of greenhouse gas emissions and potential for greenhouse gas emission mitigation in some sectors

5.4.2.1. Greenhouse gas inventories

Greenhouse gas inventories from socioeconomic development activities in HCMC in the base year of 2013 are made for priority emission sectors and with sufficient data for calculation. Some sectors with no suitable data for calculation or only indirect greenhouse gas emissions will not be listed in inventories for this period.

In addition, the calculation and forecast of greenhouse gas emissions according to a business as usual (BaU) scenario is based on the General Plan for Socioeconomic Development of HCMC towards 2020, with a View to 2025 and development plans and programs of each sector and industry. The Office for Climate Change, HCMC co-operated with Japan's Asia-Pacific Integrated Model (AIM) to implement the inventories of greenhouse gas emissions from activities in HCMC in 2013 and forecast greenhouse gas emissions in 2020 according to a BaU scenario with results presented in Table 1.

Table 3. Results of greenhouse gas inventories in the base year of 2013 and forecast of greenhouse gases according to a BaU scenario in 2020 in HCMC

	2013		2020BaU		2020CCAP	
	Amount of greenhouse gas emissions (thousand tons CO_2tð)	Proportion (%)	Amount of greenhouse gas emissions (thousand tons CO_2tð)	Proportion (%)	Amount of greenhouse gas emissions (thousand tons CO2tð)	Proportion (%)
Energy-related greenhouse gas emissions	**28,094**	**93.6**	**49,947**	**95.1**	**41,390**	**97.4**
Agriculture (energy-related)	26	0.1	38	0.1	36	0.1
Industry	15,001	50.0	27,811	52.9	25,622	60.3
Trade	2,988	10.0	6,717	12.8	3,444	8.1
Household	5,074	16.9	8,047	15.3	5,652	13.3
Transportation	5,006	16.7	7,333	14.0	6,652	15.7
Non energy-related greenhouse gas emissions	**1,918**	**6.4**	**2,583**	**4.9**	**1,425**	**3.4**
Agriculture (non-energy related)	635	2.1	406	0.8	399	0.9
Solid waste management	1,283	4.3	2,177	4.1	1,026	2.4
CO_2 absorption					**(334)**	**-0.8**
Total greenhouse gas emissions	**30,012**	**100.0**	**52,530**	**100.0**	**42,482**	**100.0**
Intensity of greenhouse gas emissions (ton CO_2 td/billion dong)	39.3		35.8		29.0	
Intensity of greenhouse gas emissions (ton CO_2 td/person)	3.8		5.7		4.6	

(The above results were calculated by Japan-based AIM Group, based on data provided by HCMC.)

In addition, the Climate Change Office calculated specific greenhouse gas emissions for surgeon other areas and activities, specifically:

a) Water supply

Based on realistic production situations at water treatment plants in HCMC, the treatment of water drawn from surface and groundwater involves the following greenhouse gas emitting activities:

1. Using power in pump station grade 1 and treatment plant
2. Using amount of chemicals in water treatment process
3. Releasing wastewater from water treatment process
4. Releasing other discharge sources such as from the use of lubricants and fuels in plants and etc.
5. The amount of greenhouse gas emissions from other discharge sources such as the use of lubricants and fuels to operate specialized vehicles in the plant is minimal compared to the amount of greenhouse gases emitted from power, chemicals, and wastewater sludge accrual. The greenhouse gas emissions from other sources can be neglected. Greenhouse gas emissions in the water supply sector can be estimated by this simple formula:

$$\mathbf{CO_{2\,water\ supply} = CO_{2\,electricity} + CO_{2\,chemical} + CO_{2\,wastewater\ sludge}}$$

In which $CO_{2\,electricity}$ = greenhouse gas emissions from the production of electricity;

$CO_{2\,chemical}$ = greenhouse gas emissions from the production of chemicals;

$CO_{2\,wastewater\ sludge}$ = Greenhouse gas emissions from treating wastewater sludge.

In which:

(1) $\boldsymbol{CO_{2\,electricity} = EF_{network} \times \sum Electricity}$

with $EF_{network}$ = emissions factor of Vietnam's electricity network. The emissions factor of Vietnam's electricity network in 2013 was 0.62 ton CO_2/MWh.

(2) $\boldsymbol{CO_{2\,chemical} = \sum (EF_i \times m_i)}$

with EF_i = emissions factor to produce an i amount of chemicals m_i = i amount of chemicals used in plants' water treatment processes.

(3) Currently, wastewater sludge from water treatment plants in HCMC is treated via the two following methods:

- Directly discharge to a system of rivers and canals (Thu Duc Water Treatment Plant, BOO Thu Duc);

- Direct into basins, reduce volume, dredge, level off, or bury (Tan Hiep Water Plant, Kenh Dong and Tan Phu Underground Water Plant).

Using method No. 1, greenhouse gases are emitted through the anaerobic decomposition of evaporative solid substances in the system of rivers and canals of the city. The formula for calculating greenhouse gas emissions in the sewage sector according to the Guidelines for Greenhouse Gases Inventories of IPCC (2006) is applied as follows:

$$\boldsymbol{CO_{2\,sludge} = COD \times B_0 \times MCF \times GWP\_CH_4}$$

In which COD is the amount of organic components in sludge;

(Conversion factor: 1kg VS (volatile solid = 1.5 – 1.7kg COD, choosing the value 1kg VS= 1.5 kg COD);

B_0: maximum ability to create methanol from sludge (0.25kgCH_4/kg COD according to the Guidelines of IPCC 1996);

MCF: methanol conversion factor; (using default value when discharging into the sea or rivers, according to Guidelines of IPCC 1996);

GWP_CH_4: global warming potential of CH_4 (default is 21).

Using method no 2, the amount of greenhouse gases emitted from the two processes is as follows:

- Anaerobically decompose organic substances in wastewater sludge during the process of storing sludge in basins or tanks;
- Anaerobically decompose organic substances in wastewater sludge during the process of leveling off or burial.

This opposes that all organic substances available in wastewater sludge decompose anaerobically during leveling off or burial. The greenhouse gas emissions from the anaerobic decomposition of organic substances while burying the accrued sludge is calculated by the formula:

$$\mathbf{CO_{2\ sludge} = VS \times 16/12 \times MCF \times GWP\_CH_4}$$

In which VS: volatile waste in sludge;

MCF: methanol conversion factor (use value MCF = 0.4 for burial not managed well and with depths of less than 5 m);

GWP_CH_4: global warming potential of CH_4.

On the basis of the above-mentioned calculation methods, the greenhouse gas emissions from water supply activities in HCMC are calculated for the base year of 2013 as follows.

Table 4. Greenhouse gas emissions from water treatment plants in 2013

	Thu Duc	**BOO Thu Duc**	**Binh An**	**Tan Hiep**	**Kenh Dong ***	**Tan Phu**
$CO_{2electricity}$ (tons)	57,038.27	30,757.42	6,482.95	21,145.88	1,988.71	7,754.87
$CO_{2\ chemicals}$ (tons)	4,028.54	1,517.28	930.76	4,179.55	433.98	1,886.99
$CO_{2\ sludge}$ (tons)	192.09	1.48	-	3,378.03	-	1,154.61
Total CO_2 (tons CO_2)	**61,258.91**	**32,276.18**	**7,413.71**	**28,703.46**	**2,422.70**	**10,796.47**

**Operation figures are from the second half of the year (July, 2013–December, 2013) as Kenh Dong water plant went into operation in July 2013*

Table 5. Estimated greenhouse gas emissions in water supply activities for 2011–2014

Year	2011	2012	2013	2014
Greenhouse gas emissions (tons CO_2)	148,545	141,178	143,151	142,891

b) Waste water management

Formula:

$$\textbf{Emissions}_{\text{waste water treatment}} = Q \times BOD \times B_0 \times MCF \times GWP\_CH_4$$

In which Q: sewage capacity (m^3/day and night);

BOD: organic components in wastewater;

B_0: highest ability to create methanol from waste water (0.6 kg CH_4 / kg BOD);

MCF: methanol conversion factor;

GWP_CH_4: global warming potential of CH_4.

Table 6. Methanol conversion factor

Type of wastewater and discharge method	MCF small value	MCF big value	Default value
Discharge wastewater into sea and rivers	0.0	0.2	0.1
Good aerobic treatment and management	0.0	0.1	0
Poor aerobic treatment and management, or overflowing	0.2	0.4	0.3
Anaerobic reaction tank does not absorb methanol	0.8	1.0	0.8
Shallow anaerobic tank (depth < 2m)	0.0	0.3	0.2
Deep anaerobic tank (depth > 2m)	0.8	1.0	0.8
Decomposition tank	0.5	0.5	0.5

Table 7. Calculation of greenhouse gas emissions in waste water management in HCMC in 2013

Type of waste water	Amount of waste water treated by aerobic method	Canh Doi, Phu My Hung	Medical waste water	Industrial waste water	Estimated remaining waste water from water supply	Total
Estimated BOD_5 concentration mg/l	42	300	350	500	100	
MCF	0	0.2	0.1	0.2	0.1	
Waste water treatment technology	Air bubbling pond/ Finished pond	Anaerobic – Airless – Aerobic (active sludge)				
Total treatment amount m^3/day and night in 2013	186,000	10,000	24,000	45,000	2,007,000	2,272,000
Total greenhouse gas emissions (ton CO_2/day)	-	7.56	10.58	56.70	252.88	327.73
Total treatment amount (m^3/day and night) in 2015	186,000	10,000	24,480	45,900	1,933,620	2,200,000
Total greenhouse gas emissions (ton CO_2/day)	-	7.56	10.80	57.83	243.64	319.83
Total treatment amount (m^3/day and night) in 2020	186,000	10,000	26,928	50,490	2,126,582	2,400,000
Total greenhouse gas emissions (ton CO_2/day)	-	7.56	11.88	63.62	267.95	351.00
Total treatment amount (m^3/day and	186,000	10,000	32,313.6	60,588	2,567,098	2,856,000

night) in 2025						
Total greenhouse gas emissions (ton CO_2/day)	-	7.56	14.25	76.34	323.45	421.61
Total treatment amount (m^3/day) and night in 2030	186,000	10,000	37,699.2	70,686	3,007,615	3,312,000
Total greenhouse gas emissions (ton CO_2/day)	**-**	**7.56**	**16.63**	**89.06**	**378.96**	**492.21**

c) Waste water sludge management

Formula:

$$CH_4 = 10^{-6} \times Q_s \times MLVSS \times CF_S \times (16/12) \times (1 - MCF_S \times BG_{CH4})$$

CH_4 = CH_4 emissions

Q_s = sludge capacity of the treatment system (m^3)

MLVSS = concentration of volatile solids in sludge (mg/l)

CF_s = carbon rate available in biomass (default value = 0.53 g C/g MLVSS)

MCF_s = methanol conversion factor for sludge treatment

BG CH_4= carbon to CH_4 factor in biogas (default value 0.65)

Table 8. Greenhouse gas emissions from waste water sludge in HCMC in 2013

Type of waste water sludge	**MLVSS mg/l**	**Anaerobic aerobic factor**	**Estimated volume (ton/day)**	**Total greenhouse gas emissions (ton CO_2/day)**
Dredged sludge	500		2000	14.84
Tunnel sludge	3000		350	15.582
Sludge from treatment system for concentrated household waste water	1500	0	70	1.5582
Sludge from treatment system for scattered household waste water	2200	0	300	9.7944
Sludge from treatment system for concentrated industrial waste water	1000		300	4.452
Sludge from treatment system for scattered waste water in facilities and factories	1000		1000	14.84
Sludge from dredging canals	300		20000	89.04
Total				**150.1066**

d) Industry and Construction

Calculated with emissions factor of Vietnam's electricity network (EF) with source data from EVN HCMC.

Formula:

$$\sum \mathbf{m}_{CO2,\,y} = \mathbf{EF}_{CO2,\,y} \times \sum \mathbf{Q}_y$$

In which:

$m_{CO2,y}$: Amount of CO_2 emissions in y year (ton CO_2);

$EF_{CO2,y}$: CO_2 emissions factor of electricity network in y year (ton CO_2/MWh);

Q_y: Electricity quantity in y year (MWh).

Table 9. Greenhouse gas emissions from electricity consumption in industry – construction in 2011-2014

Year	2011	2012	2013	2014
Total electricity consumption (MWh)	6,451,039	6,913,040	7,186,161	7,557,370
Emissions factor (kg CO_2/kWh)	0.43	0.43	0.62	0.62
Amount of CO_2 emissions (ton CO_2/year)	**2,773,947**	**2,972,607**	**4,455,420**	**4,685,569**

Table 10. Greenhouse gas emissions from electricity consumption in industrial zones and export processing zones in 2011-2014

Year	2011	2012	2013	2014
Total electricity consumption (MWh)	1,571,750	1,641,990	1,923,690	1,999,650
Emissions factor (kg CO_2/kWh)	0.43	0.43	0.62	0.62
Amount of CO_2 emissions (ton CO_2/year)	**675,852.50**	**706,055.70**	**1,192,687.80**	**1,239,783.00**

5.4.2.2. Potential for greenhouse gas emissions mitigation

Through the implementation of all projects (“self-contribution” and “unconditional contribution”, “having international support” and “conditional contribution”) and mitigating emissions from the electricity network, in the 2020CCAP scenario, HCMC may achieve a 1**9.2%** reduction in total greenhouse gas emissions for the 2020 BaU scenario. This contributed to the goal of achieving a 10-20% reduction of greenhouse gas emissions countrywide, which was proposed under the Green growth strategy, and the 8-25% reduction target proposed in the Intended Nationally Determined Contribution report– INDC of Vietnam to COP21). The potential for greenhouse gas emissions mitigation in HCMC in 2020 compared with the BaU scenario is calculated according to category of contribution as follows:

(1). Based on currently implemented projects and projects under consideration to be implemented under the city's budget as stated in Appendix 1 ("self-contributed" projects, also known as "unconditional contribution" projects): 10.5%;

(2). Potential for greenhouse gas mitigation from the electricity network (through efficient electricity distribution and loss minimization): 6.1%;

(3). Projects that need international support, including some projects proposed by the AIM Group ("conditional contribution" with support from the international community): 2.6%.

5.5. Necessity

Vietnam is at risk of being adversely affected by climate change. According to research by the World Bank (2007), Vietnam is one of the five countries in the world that suffer the most from climate change, especially as a result of rising sea levels and floods involving tsunami.

According to a scenario issued by the Ministry of Natural Resources and Environment, by 2100, the average temperature of Vietnam will have increased by 1.1^{o}C (low emissions scenario) to 3.6^{o}C (high emissions scenario) above the average in 1980–1999. Annual rainfall is expected to increase by 1.0–5.2% (low emissions scenario) and 1.8–10.1% (high emissions scenario) in the rainy and dry seasons, and will experience increased super storm frequency and intensity (MONRE, 2009). With sea level rises of up to 1 metre, it is estimated that 20% of HCMC will be flooded (MONRE, 2010). Potential economic losses attributable to rising sea levels may reach up to 10% of GDP. Observational hydrometereology figures have shown that storms in the East Sea are becoming more frequent and intense.

In HCMC, the average temperatures in the dry season are seeing unexpectedly high increases . Rain events with more than 110 mm of rainfall (enough to cause floods) are becoming more frequent (before 1998, such rains only occurred once every four years; now they occur four times per year). Flood tides and torrential rains are the two main factors causing floods in HCMC and are profoundly damaging the economy of the city and the lives and health of its citizens.

While the benefits of climate change have not been exploited, the factors of climate are adversely affecting HCMC. However, thousands of programs, initiatives, and projects in all sectors are being carried out annually in HCMC under the Development Strategy, Plan and Programme at the national, regional, and city level to further socioeconomic development. Most programs and projects are designed to adjust to climate change and to mitigate CO_2 emissions, the effects of climate change, or both. Budgets for these programs range from low (a few hundred million dong) to high (thousands of billion dong), in spite of a limited city budget.

Therefore, the Action Plan for Climate Change focuses on the following:

(1). Identifying factors of climate change that affect HCMC;

(2). Evaluating (quantitatively or qualitatively) the damage caused by climate change in the present and future forecast;

(3). Building and integrating programs and projects under the action plan into programs and projects of the city in order of priority;

(4). Evaluating the ability to build a low carbon emisison city;

(5). Identifying financial and human resources.

These are necessary tasks to synchronize the city's socioeconomic development activities with climate change measures activities to improve the efficiency of energy and material usage and the efficiency of infrastructure either completed or under construction, attracting investment (domestic and international) to new construction, mitigating CO_2 emissions, and achieving low carbon emissions, green growth, sustainability to be ready for international integration.

B. OBJECTIVES, REQUIREMENTS AND CONTENT OF THE ACTION PLAN

1. OBJECTIVES

The Action Plan for Climate Change of Ho Chi Minh City for the 2016-2020 Period with the Vision towards 2030 has been developed with the following general and particular objectives:

1.1. General objectives

- To improve the efficiency of the State Management System for climate change issues;
- To enhance Ho Chi Minh City's (HCMC's) climate change measures competence while implementing its socio-economic development plans;
- To contribute to the national goal of greenhouse gas emission reduction and enhancing the efficiency of using energy and natural resources in HCMC's socio-economic development activities.

1.2. Particular objectives

- To integrate climate change factors into HCMC's Strategies, Programmes, Planning, and Plans for socio-economic development with specific conditions and suitable for the 2016–2020 period.
- To develop 1) A system of legal documents for the purpose of State management in climate change measures in the city, and (2) Prioritized projects and solutions to mitigate greenhouse gas emission and harmful effects and adapt to climate change in the following ten socio-economic development areas (in order of priority):
  - (1). Urban planning
  - (2). Energy
  - (3). Transportation
  - (4). Industry
  - (5). Water management
  - (6). Waste management
  - (7). Construction
  - (8). Health
  - (9). Agriculture
  - (10). Tourism and raising community awareness.
- To create opportunities for international cooperation and attract investment for climate change measures initiatives.

- To reduce greenhouse gas emissions by 2020 compared with emissions in normal development scenarios (BaU):
    - Unconditional contribution (self-contribution): 10.5%
    - Conditional contribution (with external support): 19.1% (including emission potential from electricity grid of 6.1%).

2. REQUIREMENTS

The content of the Action Plan for Climate Change in Ho Chi Minh City for the 2016–2020 period, with the vision towards 2030 must meet the following requirements:

- Accurately identify main climate change factors of the 2016 – 2020 period, with a view to 2030, that negatively or positively affect the city's socio-economic development;
- Make qualitative and quantitative assessments (in areas with sufficient information) of socio-economic benefits and damages caused by these effects;
- Develop (1) a system of legal documents for State management of climate change measures, and (2) Strategies, Planning, Programmes, Plans, and Short-term, Middle-term and Long-term Solutions of industries, regions, and sectors in the city *arranged in order of priority* to (a) mitigate CO_2 emissions and use energy and materials effectively and (b) adapt to climate change while satisfying the following requirements:
    + Being in line with (a part of) national, regional, and municipal Strategies, Planning, Programmes, Plans, and Solutions for socio-economic development, environment, and climate change;
    + Engaging relevant parties, especially social organizations (Youth Union, Ho Chi Minh Young Pioneers, Women's Union, Veterans' Association, etc.) and residents of the city.
- Ensuring feasibility in terms of resources needed for implementation (e.g. policies, finances, technical knowledge, technologies, and human resources), time, efficiency, and outcomes;
- Ensuring the ability to check, supervise, and assess the implementation process as well as final outcomes.

3. CONTENT

(1) To review climate change related documents and Action Plan for Climate Change of the Ministries, industries, and local governments which were issued to identify relevant content that needs to be amended or supplemented, including:

- Specifying challenges and opportunities that climate change presents to each industry and sector.
- Specifying viewpoints, approaches, and prioritized orientation in climate change measures and green growth for each industry and sector.

- Specifying priorities, tasks, and solutions for implementation which:
  + Identify main factors of climate change in Ho Chi Minh City for the 2016–2020 period.
  + Based on department-implemented assessments of the consequences of climate change on each industry and sector for the 2010– 2013 period, identifying serious consequences of climate change on industries and sectors.
  + Identifying the city's goals in climate change measures.
  + Selecting prioritized solutions for climate change measures and proposing a list specific tasks and projects to adapt to climate change (in order of priority).
  + Developing a roadmap and preparing resources for the implementation of the Action Plan for Climate Change by period (2016–2020 and post-2020)—resources that include organizational structures, human resources, capital (including government funding), local authorities, funding from international organizations, funding from the public (including private sector funding), capital allocated to other programmes and projects, etc.

(2) To review development strategies, programmes, planning and plans at the national, industry, regional, and local government level (those issued or hosted by the Ministry, an industry, or a local government and presented to the national authority for issuance) to integrate climate change factors into development strategies, planning and plans pending for issuance. Steps of implementation are as follows:

- Step 1: Collect development strategies, programmes, planning and plans issued or hosted by the Ministry, industries, or local governments and presented to the national authority for issuance as well as development strategies, programmes, and plans issued or hosted by the Ministry, industries, and cities and presented to the national authority for issuance

- Step 2: Review and evaluate the relationship between climate change factors and the content of each development strategy, programme, and plan to identify the relevancy and necessity of factoring climate change issues into development strategies, programmes, planning and plans. Specifically:

+ Assess whether industries and sectors are affected by climate change, and whether development activities reduce climate change measures or deprive opportunities brought by climate change.
+ Identify whether industries and sectors where greenhouse gas emissions can be reduced. As Vietnam is not a country for which greenhouse gas emission reductions are mandated, the following principles should be noted while implementing mitigation methods: (1) Greenhouse gas emission volume is voluntarily determined based on the capability of that industry and whether there is financial support from local governments of other countries or international organizations; (2) Greenhouse gas emission mitigation methods also bring economic benefits and development opportunities to industries and local governments.

Climate change issues should not be factored into development strategies, programmes, planning and plans if such has not been done already

- Step 3: Choose climate change measures methods to integrate, including:

+ Identify and list all climate change measures methods relevant to development strategies, programmes, planning and plans, including both short-term and long-term methods. On that basis, choose optimal measures methods which are suitable with the available resources, technologies, and techniques ensuring sustainability.

+ Identify and list all greenhouse gas emission mitigation methods which are relevant to the content of development strategies, programmes, planning and plans. On that basis, choose greenhouse gas emission mitigation methods suitable with national, regional, and local conditions.

For sectors requiring measures methods but also having many potentials for greenhouse gas reduction, it is necessary to choose harmonious and optimal measures and mitigation methods.

- Step 4: Integrate climate change factors into development strategies, programmes, planning and plans. After being identified, climate change measures methods and greenhouse gas reduction must be factored into documents for development strategies, programmes, planning and plans. This step abides by the following principles:

+ Assimilate or integrate the goals of climate change measures into the goals of development strategies, programmes, planning and plans.

+ Climate change issues factored into development strategies, programmes, planning and plans must be compatible and harmonious with other issues.

During this process, it is necessary to compare and consider the priority level of climate change issue factoring with the main issues in development strategies, programmes, planning and plans (in addition to climate change measures goals, there are still many socio-economic goals, some of which might contradict with the goal of greenhouse gas emission reduction and climate change measures).

C. ACTION PLAN CONTENT

CHAPTER 1. HO CHI MINH CITY CLIMATE CHANGE ACTION PLAN FOR 2016–2020, WITH A VIEW TO 2030

1.1. Planning

1.1.1. Orientation

- Integrating climate change aspects into the city's planning, especially for green area and water surface planning.
- Developing and completing legal documents in order to encourage and create favorable legal conditions for projects related to urban planning for climate change measures.

1.1.2. Action plan

- Implementing Urban Planning for climate change measures.
- Integrating climate change aspects into the city's Planning for Water Drainage and Construction.
- Developing regulations and activities for urban planning. Establishing Green Works criteria in line with the natural conditions and social aspects of Ho Chi Minh City.
- Conducting construction planning for urban areas located on wetlands.
- Increasing green areas by 13,700 hectares (equivalent to 10,000,000 trees) compared with the current green areas, including parks, trees along roads, and waterways.
- Covering 10–30% of roofing areas with trees, depending on the part of the city, and focusing on the city center (of which the current area is 165 km^2; previously 140 km^2), including townhouses, condominiums, supermarkets, hotels, public works, etc.
- Increasing green areas in the setbacks of villas with frontage wider than 8 meters.
- Increasing (artificial) water surfaces by approximately 800 hectares over the current surface area of reservoirs both in urban core and suburban areas. This includes retention basins, the surface water area of the city, and newly constructed works (coefficient k = 1.2).
- Integrating the following into public works: –green areas around bodies of water; green areas and reservoirs in parks—; green areas and reservoirs in public areas—; green areas and reservoirs near roads—; green areas and reservoirs in housing areas —.

1.2. Energy

1.2.1. Aims

- Improving energy efficiency while ensuring adequate energy supply for the socio-economic development needs of the city.
- Investing in technology (manufacturing processes and equipment) in order to increase energy efficiency (electricity and fuel), raw materials, and natural resources.
- Using all kinds of household electrical appliances with high energy efficiency, especially appliances that use renewable energy.
- Developing and implementing policies to encourage better energy efficiency.
- Developing renewable energy with a focus on solar energy and bio-energy.

1.2.2. Action plan

- Improving the energy efficiency of household electrical appliances annually.
- Improving the energy efficiency of industrial electrical appliances annually.
- Developing renewable energy sources and increasing the usage ratio of renewable energy by 3–5% compared with the total electrical energy consumption of the city, with a focus on solar energy and bio-energy. Promoting research on renewable energy sources (bio-energy, solar, and wind) in line with the conditions of Ho Chi Minh City. Designing and installing 3–5 pilot solar energy stations for 3–5 schools, 3–5 hospitals (health facilities) and 1–3 wholesale markets. Promoting the use of solar energy water heaters in households and other service providers, especially for newly constructed works.
- Using E5 bio-fuel to completely replace A92 fuel.
- Upgrading the electrical grid to reduce power losses in the distribution system to below 4%.
- Applying technology and equipment to improve energy efficiency for daily living and service purposes, especially in condominiums, office buildings, hotels, and supermarkets. Reducing power consumption by 8–10%.
- Investing in new technology applications, using energy efficiently to reduce power consumption for each industrial sector by 5–8%.
- Improving the public lighting system by using lights with higher energy efficiency.
- Promoting communications and raising public awareness regarding energy efficiency in daily life and production.
- Developing legal documents and establishing the Fund to Incentivize Renewable Energy Use.

1.3. Transport

1.3.1. Orientation

- Reducing greenhouse gas emissions from transport activities.
- Improving the area and the quality of roads to reduce the amount and duration of traffic jams.
- Improving the efficiency of traditional fuels and using methods of transport that use new and renewable fuel or energy.
- Developing a green transport system and encouraging and creating favorable conditions for the use of public transport.
- Developing waterway transport to support road transport.
- Developing and implementing policies to encourage investments in the city's transport systems.

1.3.2. Action plan

- Constructing a metro system.
- Constructing the Bus Rapid Transit (BRT) system.
- Improving the operational efficiency and service quality of the existing bus system.
- Promoting the use of compressed natural gas (CNG) powered buses and increasing the number of CNG buses to 1,000.
- Constructing and operating 5–7 lines of waterway passenger transport.
- Encouraging the use of public and private means of transport powered by electricity.
- Researching and deploying private transport and public transport connection models.
- Developing a traffic information management system.
- Encouraging the practice of environmentally friendly driving methods.
- Modernizing the road system.
- Encouraging the use of private means of transport with small cylinder capacity for intra-city travel.

1.4. Industry

1.4.1. Aims

- Applying new technologies to use (consume) energy (electricity and fuel), raw materials and natural resources effectively. Focusing—in large, medium, small, and micro scopes—on four prioritized industrial sectors, namely (1) mechanical engineering (which accounts for 20% of the value of the entire industry), (2) electronics (information technology, which accounts for 4%), (3) chemicals (rubber and plastics, which account for nearly 20%), and (4) food processing.

- Gradually improving technology for medium, small. And very small (micro) industrial facilities.

1.4.2. Action plan

- Improving energy efficiency by 5–8% annually, depending on the industrial sector.
- Improving the efficiency of raw materials by 3–5% over current usage, depending on the manufacturing sector.
- Reusing scrap.
- Implementing energy audits in all industrial parks and export processing zones.
- Applying new technology at 10–20% of the plants in four prioritized industrial sectors and 20–30% of medium, small, and very small production facilities.
- Using solar energy to supply heat to 10–30% of small and very small production facilities.
- Establishing quotas on energy consumption and greenhouse gas emissions for each production sector in order of priority.
- Establishing the Fund for Climate Change Adaptation (USD200–300 million) to support the application of new technologies with high energy and raw material efficiency.
- Developing Regulations to Incentivize New Technology Use for Low-Carbon Emissions for industrial sectors.

1.5. Water management

1.5.1. Aims

a) Water supply

- Limiting groundwater depletion and contributing to land subsidence prevention, which are exacerbating the impacts of sea level rise due to climate change, as well as researching solutions to recharge the underground aquifer;
- Actively promoting water quality monitoring in the Dong Nai river basin (including the Saigon river) among stakeholders (city and local governments, departments, reservoir management agencies, research institutes, water supply companies, etc.);
- Establishing an early warning system, allowing the raw water intake to be shut down in a timely fashion when serious pollution occurs in the Dong Nai and Saigon rivers for any reason;
- Enhancing surface water treatment and the processes and means by which to deal with raw water quality changes;
- Actively promoting energy efficiency in the production and distribution of clean water, especially at raw water and drinking water pumping stations;
- Strengthening the resilience of water treatment plants in the event of severe weather conditions and flooding;

- Strengthening the resilience of water supply system against the severe weather conditions and flooding;
- Collecting and reusing rainwater as a water supply source.
- Developing and implementing policies on the efficient use of clean water.

b) Drainage and adaptation to flooding (flooding control)

- Strictly managing urban planning and construction according to plan to ensure no further reduction of the city's water surface area or natural water retention capacity.
- Changing views on flooding control: changing from thorough flooding control to water regulation, actively adapting to reduce flooding risks.
- Ramping up investment in construction to increase the water surface area and water retention capacity of the entire city.

1.5.2. Action plan

a) Water supply

- Investing in construction of new water treatment plants/stations and networks with advanced water treatment techniques capable of eliminating micro contaminants effectively and producing drinking water, while ensuring the provision of clean water for 100% of the city's demand for living activities.
- Partitioning management areas, investing in network upgrades, striving to reduce drinking water loss (leakage) in the water supply network from 32–34% to below 25%.
- Constructing reservoirs with a capacity of 15–40 million m^3 to store and pre-treat raw water–.
- Implementing pilot projects to collect and reuse rainwater in high-rise buildings (20–30), schools (20–30), hospitals (3–5), and wholesale markets (2–3).
- Researching and preparing treatment technology options in case surface water sources are contaminated by normal or special types of waste.
- Developing legal documents to encourage the "socialization" of the water supply sector.
- Planning and identifying sites for constructing raw water reservoirs, a water pretreatment step (others include preliminary sedimentation, self-screening, and reduction of water quality fluctuations) to further stabilize the water treatment process; considering the possibility of storing raw water for the purposes of public water supply and flooding control;
- Beginning spatial planning, land acquisition, and site identification to move the current site for raw water collection for the water supply from Dong Nai river (and Sai Gon river) to Tri An lake (and Dau Tieng lake), ensuring the feasibility of safe and long-term water supply solutions.
- Installing high energy efficiency pumps at raw and clean water pumping stations, which help quickly recover investment capital and benefit the environment.

- Developing regional linking mechanisms and policies to coordinate the management and exploitation of water resources.
- Enhancing measures to protect water resources, control pollution, limit waste released into water resources, and plant and protect watersheds.
- Enhancing control of water resources, sharing the results of water quality monitoring, flow rates, etc. in Dong Nai river basin for early warning on the effects of climate change and for preparation of specific responses.

b) Drainage and flooding control

- Making a master plan for city wastewater drainage and detailed planning of the drainage system.
- Planning the regulating reservoir network.
- Treating 50–75% of the city's wastewater volume, equivalent to 800,000—1,200,000 m^3/day. Applying treatment technologies which use less energy or renewable energy (electricity) and minimize byproducts (organic and biological sludge).
- Reusing 30–50% of the urban wastewater volume after treatment for different purposes (tree watering, street cleaning, cooling, agriculture).
- Gradually implementing projects to construct dikes and the six tidal barriers owned by the City, namely the Rach Tra, Vam Thuat, Ben Nghe, Tan Thuan, Phu Xuan, and Kinh River barriers under Irrigation Planning and Flooding Control for Ho Chi Minh City.
- Constructing a system to collect and separate domestic wastewater from rainwater in order to transfer it to domestic wastewater treatment plants for new urban areas. Improving and increasing the capacity of the Binh Hung wastewater treatment plant. Conducting a project to construct wastewater treatment plants in Nhieu Loc Thi Nghe basin and Tham Luong Ben Cat basin. Continuing the call for investment for remaining wastewater treatment plants such as Tan Hoa Lo Gom, Tay Sai Gon, Binh Tan, and Suoi Nhum.
- Collecting and reusing rainwater to help the city solve flooding problems caused by heavy rain as well as reduce the pressure of water supply for city residents to find water supplies. In some areas, collected rainwater can be used to recharge and maintain groundwater resources to prevent the occurrence of subsidence. Collecting and reusing stormwater for 30–50% of constructed works and 100% of newly constructed works.
- Using absorbent materials to pave sidewalks.

1.6. Waste management

1.6.1. Aims

- Reducing the volume of waste generated at waste sources.
- Promoting waste reuse and recycling.

- Applying new waste treatment technologies towards the recovery and regeneration of energy and raw materials.
- Improving on and developing new effective waste management systems.

1.6.2. Action plan

- Implementing a program to classify solid waste at sources for the central districts (1, 3, 4, 5, 6, 7, 8, 10, Tan Binh, Binh Thanh, Phu Nhuan, and Go Vap) and constructing systems of scrap recycling facilities (5–7 plants). Decreasing solid waste volume collected and transported to the treatment complex by 5–7%.
- Constructing a solid waste incineration plant combined with energy regeneration with a capacity to treat 30–50% of the volume of organic solid waste, which is capable of energy regeneration. Reducing 50–90% of the greenhouse gas volume generated by municipal solid waste.
- Constructing 1–3 complexes to treat 100% of the city's biodegradable organic solid waste (food) using anaerobic methods, biogas production, energy (electricity, heat) regeneration, and processing organic liquid fertilizer for supply to areas of the city that grow clean vegetables.
- Reducing the volume of waste moved to landfills to below 35% (wet weight) of the total volume of municipal solid waste generated daily.
- Collecting, recycling, and disposing of 100% of hazardous industrial and medical waste.
- Collecting, recycling and disposing of 100% of sludge (sludge in drains, canals, municipal, industrial and medical wastewater treatment stations/plants, cesspool, construction works).
- Implementing a system to classify solid waste at the source, reducing the volume of waste generated at the source by 5–7%.
- Applying information technology in waste management.

1.7. Construction

1.7.1. Aims

- Applying the most recent results on building physics to reduce energy used for lighting and air conditioning in civil and industrial works.
- Encouraging the use of new, environmentally friendly building materials. Using green materials.
- Promoting building greening.
- Researching construction on soft soil and water surfaces for the construction of urban areas in the South.

1.7.2. Action plan

- Using adobe bricks for 100% of newly constructed works using the city budget in accordance with Circular No. 09/2012/TT-BXD on the use of adobe building materials in construction works, or at least 50% of light adobe materials for construction works higher than 9 stories in accordance with Directive No. 04/2013/CT- UBND of Ho Chi Minh City People's Committee on increasing the use of adobe building materials in the city.
- Enhancing capacity in construction investment management and management of environmentally friendly works.
- Developing a legal framework for a higher percentage of land use when planning construction project for environmentally friendly works.
- Using energy efficiently in construction activities.
- Constructing 1–2 pilot residential works on soft soil or water surfaces for the city's southern areas.
- Reusing and recycling construction waste.

1.8. Health

1.8.1. Aims

- Developing facilities to enhance the capacity of local health networks, especially in the suburbs and sensitive, vulnerable areas (short of infrastructure).
- Training and improving the quality of health staff
- Establishing a natural disaster prevention system (for storms, floods, cyclones, earthquakes, tsunamis, and fires) and minimizing the effects of climate change.

1.8.2. Action plan

- Organizing training classes to give local health staff climate change expertise.
- Studying and predicting diseases that will affect health as temperatures rise.
- Constructing 1–2 training centers for disaster prevention and minimizing the effects of climate change for 1–2 vulnerable districts.

1.9. Agriculture

1.9.1. Aims

- Developing, improving capacity for local staff; enhancing communication and information dissemination, raising awareness among farmers regarding climate change adaptation and mitigation.
- Researching and evaluating the effects of climate change on the city's agriculture and rural development sectors; preparing solutions to respond to climate change in agriculture.

- Improving efficiency and the use of energy and natural resources in agricultural activities.
- Prioritizing the implementation of (urgent, no-regret) projects to respond to climate change.

1.9.2. Action plan

- Training to raise awareness and capacity for climate change adaptation for local staff in agriculture and rural development in the city.
- Propagating and disseminating knowledge and information, and raising awareness among farmers regarding climate change adaptation and mitigation.
- Effectively managing and protecting existing forests, especially the Can Gio Biosphere Reserve; developing forest and green areas of the city, which contribute to increasing the city's forests and green coverage.
- Evaluating the impacts of climate change and sea level rise on agriculture, forestry, fishery, irrigation and rural development based on climate change and sea level rise scenarios; proposing solutions for climate change adaptation and mitigation.
- Reviewing, evaluating, identifying, and implementing priority projects on climate change adaptation (contributing to the reduction of greenhouse gases and promoting climate change adaptation) in agriculture and rural development in the city.
- Researching and developing urban agriculture.

1.10. Tourism and raising community awareness

1.10.1. Aims

- Promoting eco-tourism and waterway tourism activities.
- Raising awareness among visitors regarding environmental protection in tourism activities
- Diversifying tourism activities to create flexibility when sudden climate changes occur
- Improving energy efficiency
- Encouraging the use of renewable energy sources, which are suitable for tourism and include wind, photovoltaic energy, solar energy, geothermal energy, biomass, and energy regenerated from waste.

1.10.2. Action plan

- Increasing the number of visitors participating in eco-tourism activities by 30–40% compared with that at present;
- Constructing more eco-tourism areas;
- Opening waterways and coastal mangrove areas for tourism;
- Implementing public awareness programs that encourage visitors to change their travel patterns.

- Replacing and investing in equipment for tourism activities (air conditioning systems, upgrading infrastructure for tourism, etc.) in restaurants, hotels, museums, etc. in the city.

1.11. Other tasks

In addition to the solutions in the 10 abovementioned sectors, the climate change adaptation work of Ho Chi Minh City also includes comprehensive solutions and other support solutions, including:

- Developing a system of regulations on greenhouse gas inventory and the city level Monitoring-Report-Verification (MRV) system for greenhouse gas emissions;
- Incorporating climate change issues into the strategies, planning, and development plans of each sector and field;
- Modernizing the surveying system and meteorological forecasting technologies to ensure forecasting and early warning of weather and climate extremes and natural disasters; establishing a climate change and sea level rise evaluation and monitoring system;
- Training and increasing capability of natural disaster risk management and increasing capability of search and rescue staff;
- Increasing international cooperation: Introducing climate change measures activities and communicating to the international community the need for cooperation on Ho Chi Minh City;
- Organizing conferences and seminars and performing regular tasks to assist with climate change measures work.

CHAPTER 2. MAKING A LIST OF PRIORITY PROJECTS ON CLIMATE CHANGE MEASURES

The list of solutions/projects on climate change measures of Ho Chi Minh City for the 2016-2020 period is based on the following principles:

- Clarifying the general needs of Ho Chi Minh City in climate change measures work;
- Selecting highly feasible projects to conduct in the 2016-2020 period.

The below steps will be followed to make the list of solutions/projects on climate change measures:

2.1. Making the overall list

This list includes all solutions/projects based on socio-economic development needs, integrated with Ho Chi Minh City climate change measures for the 2016-2020 period, with a view towards 2030 for 10 sectors. Through this list, domestic and foreign administrators and investors can learn about developments concerning climate change measures in development activities and cooperation and the investment needs of Ho Chi Minh City for the 2016–2020 period and beyond.

2.2. Making a short list for the 2016-2020 period

After making the overall list, certain solutions/projects will be selected for inclusion in short list. These projects will use the budget of Ho Chi Minh City and will be:

- ✓ Projects for the 2013-2015 period which are selected for inclusion for the 2016-2020 period
- ✓ Approved projects that have financial resources
- ✓ "No Regret" projects, in which all parties are benefited from call for investment
- ✓ Projects that will be completed within the 2016–2020 period

The short list will include the following groups of solutions:

(1). A group of solutions for developing a legal system on climate change measures in line with the conditions of Ho Chi Minh City;

(2). A group of solutions for improving the capabilities of state management staff, raising community awareness regarding climate change in each sector;

(3). A group of solutions for climate change adaptation and mitigation.

The solutions/projects in the Ho Chi Minh City Climate Change Action Plan for 2016–2020, with a View to 2030 are not commonly classified into the ***adaptation*** and ***mitigation*** group of solutions because most current infrastructure development projects seek to address both climate change adaptation and mitigation, or they have mutual support. Thus, the former method of classifying projects will not cover all the efficiencies and benefits of the solutions. On the other hand, not classifying the nature of adaptation or mitigation can help Ho Chi

Minh City be more flexible in calling for international financial resources for climate change without being limited by classification terms as prescribed in the Action Plan.

Thus, the Ho Chi Minh City Climate Change Action Plan for 2016–2020, with a View to 2030 will include two lists of solutions/projects as shown in Appendix 1 (List of solutions/projects on climate change measures for the 2016-2020 period using the city budget) and Appendix 2 (List of solutions/projects on climate change measures using other financing resources).

CHAPTER 3. IMPLEMENTATION

3.1. Finance

The financing resources for implementing the Action Plan are allocated as follows:

- Foreign investors’ funding: 50%.
- City budget: 25%
- Private economic sector’s funding: 15%
- Community funding: 10%

Financing resources will be reviewed and approved on an individual basis as follows:

3.1.1. Programs funded through HCMC’s economic operation expenditure

- Assigning the standing agency of the Steering Committee on the Implementation of Action Plan for Climate Change i.e. the Department of Natural Resources and Environment in collaboration, along with the Department of Finance to review tasks of departments in districts annually; making a list of programs to implement the Climate Change Action Plan annually; and submitting it to the city People’s Committee for approval.
- Assigning the Department of Finance to review, verify and submit the Action Plan to the HCMC People’s Committee for the allocation of funds for implementation in the annual budget estimate of the Office for Climate Change.

3.1.2. Programs funded by HCMC’s scientific operation expenditure

- Assigning the Department of Science and Technology in collaboration with departments in districts and related agencies to verify, approve, and monitor the implementation of scientific research projects and the outlook concerning technology related to climate change measures.
- Assigning the Steering Committee on the Implementation of Action Plan for Climate Change in collaboration with the Department of Science and Technology to register the implementation in accordance with regulations.

3.1.3. Programs and projects funded by HCMC’s development investment expenditure

Assigning the Department of Planning and Investment to summarize programs and projects under the Law on Investment to submit to the People’s Council for approval annually. Based on the approval of the People’s Council, the city budget will be balanced and allocated to these projects.

3.1.4. Programs and projects funded by other sources of expenditure (other than HCMC’s expenditure)

Assigning the Steering Committee on the implementation of Action Plan for Climate Change in collaboration with departments in districts and related agencies to actively find legal financing resources based on the approved list of programs and projects in order to mobilize the contributions of foreign and domestic communities, then submit to HCMC's People's Committee for approval.

3.2. Human resources

- Mobilizing all human resources of the Steering Committee (departments in districts) to jointly develop and implement the Action Plan effectively.

- Calling for –sociopolitical organizations, socio-professional organizations, mass organizations, non-governmental organizations, businesses, and communities to participate in climate change measures activities.

- Inviting foreign and domestic experts to support effective climate change measures models with their expertise.

3.3. Responsibilities for implementation

3.3.1. Responsibilities of the Standing Agency under the Steering Committee on the Implementation of Action Plan for Climate Change (Department of Natural Resources and Environment)

- Approving plans and funding estimates for programs according to regulations.

- Reporting program implementation results to the HCMC People's Committee and proposing plans for the next year.

3.3.2. Responsibilities of the Office for Climate Change under the Department of Natural Resources and Environment (assisting agency to the Standing Agency under the Steering Committee)

- Guiding the organization and executing projects; supervising climate change measures programs of all departments in all districts and related agencies.

- Entering into contracts with the departments responsible for assigned tasks and doing accounting according to regulations.

3.3.3. Responsibilities of departments in districts and related agencies

- Developing assigned tasks and planning funding estimates.

- Coordinating the implementation and execution of tasks and settling funds for implementation with the Office for Climate Change according to regulations.

- Taking responsibility for assigned tasks.

- Effectively conducting regular and irregular communication and reporting mechanisms at the request of the Steering Committee.

3.3.4. Responsibilities of sociopolitical organizations, socio-professional organizations, mass organizations, non-governmental organizations, businesses, communities, and related agencies

- Giving input on programs and projects concerning HCMC climate change measures.

- Collaborating and providing support in terms of human resources, finances and techniques (if any).

APPENDIX 1

List of climate change measures solutions for Ho Chi Minh City using the city budget for 2016–2020

No.	Area	Solution/Project	Responsible unit	Coordinating unit	Implementation progress	Funding	Notes
I-1	**Urban planning**	Develop regulations and activities in urban planning: Build a set of standards for Green Buildings which suit the natural and social conditions of Ho Chi Minh City.	Department of Planning and Architecture	Osaka City	2016–2017	VND 500,000,000	City budget
I-2	**Urban planning**	Increase green cover and water surface area for air conditioning: 1) Grow forests 2) Increase urban green cover (parks, roads, canal banks, pavements) 3) Increase green cover in industrial zones, export processing zones 4) Make green roofs/ walls: Pilot increasing green roofs and walls for high-rise buildings, hospitals, and schools.	1) Department of Agriculture and Rural Development; 2) Department of Transport; 3) HEPZA	Relevant units	Annually		City budget and socialization
II-1	**Energy**	Use energy-saving technologies in buildings: Pilot installing energy saving devices and smart control systems in some public service buildings and administrative head offices.	Department of Industry and Trade		2016–2017		City budget

II-2	**Energy**	Use energy saving devices in households: Continue to implement programs to encourage households to save electricity and raise community awareness about efficient electricity usage.	EVN HCMC	Relevant units	Annually		City budget
II-3	**Energy**	High energy efficient lighting: Replace existing lighting system with energy efficient CFL or LED lights.	Department of Industry and Trade		2016–2018		City budget
II-4	**Energy**	Encourage the use of solar energy systems (no CO2 emissions): Pilot installing solar energy systems in some buildings and administrative head offices.	EVN HCMC		2017–2019		City budget
II-5	**Energy**	Encourage the use of solar energy water heaters: Implement a model that supports and encourages the use of solar energy water heaters in households.	Department of Industry and Trade		2018–2020		City budget
II-6	**Energy**	Create and disseminate information about energy auditing systems and encouraging the use of devices for improving energy efficiency for small/medium-sized enterprises (for example, compressors and engines).	Department of Industry and Trade		2016–2017		City budget
II-7	**Energy**	Organize the PR info encouraging buildings to use high-performance air conditioners.	Department of Industry and Trade		2016–2017		City budget
II-8	**Energy**	Reduce electricity leakages.	EVN HCMC		2016–2020		Frequent tasks of EVN HCMC

III-1	**Transport**	Manage transport demands: Assess demands for transport and means of public transport and ensure efficient traffic circulation; develop a system for transport demand management.			2016–2018		City budget
III-2	**Transport**	Encourage environmentally friendly driving: Survey and assess current situation and develop a manual and training program for public drivers, taxi drivers, and lorry drivers to encourage environmentally friendly driving.	Department of Transport	Relevant units.	2016–2018		City budget
III-3	**Transport**	Provide information about, increase awareness of, and change habits of using private means of transport; promote the use of undergrounds and new means of public transport.	Department of Transport	Relevant units	2018–2020		City budget
III-4	**Transport**	Encourage the use of electric motorcycles and electric bicycles instead of gasoline-powered motorcycles: Look into constructing a charging station for bicycles and electric bicycles.	Department of Transport		2016-2018		City budget
III-5	**Transport**	Develop a regulations and education program to teach about safe and environmentally-friendly means of transport.	Department of Transport	HCMC Traffic Safety Committee; Department of Education and Training.	2016–2017		City budget
III-6	**Transport**	Increase frequency and routes of the bus system to improve the quality and convenience of public transport services: Plan the development of public transport in HCMC towards 2025.	HCMC Centre for Management and Operation of Public Passenger Transport	Consultant: Centre for Consulting Development of Public Transport-Hanoi University of Transport and Communications	2015–2016	VND 405,000,000	City budget

IV-1	**Industry**	Improve furnace operation techniques and technology: Implement a pilot project for using environmentally friendly fuels and reusing discharged heat and waste materials.	Department of Industry and Trade	HEPZA	2018–2020		City budget and socialization
V-1	**Water management**	Develop sample regulating pond in District 4.	Operation Centre – HCMC Flood Control Programme	Department of Planning and Architecture, Department of Transport, Office for Climate Change; District 4 People's Committee and other relevant units.	2016–2018		City budget and socialization
V-2	**Water management**	Develop a map of flooding risks: Show areas with anticipated flooding and calculated loss, as well as necessary evacuation information.	Operation Centre – HCMC Flood Control Programme	Relevant units	2016–2018		City budget
V-3	**Water management**	Develop a plan for collecting and reusing storm water. Implement a pilot model in some public service works.	Office for Climate Change	Relevant units	2016–2017	VND 4-5 billion	City budget
V-4	**Water management**	Pilot the installation of water-saving devices for some public service buildings.	Office for Climate Change	Relevant units	2018–2020		City budget and socialization
V-5	**Water management**	Implement a pilot model for reusing wastewater.	Department of Natural Resources and Environment	Relevant units	2017–2019		City budget

V-6	**Water management**	Build a management system for wastewater treatment works.	Operation Centre – HCMC Flood Control Programme	HCMC Urban Drainage Company Limited; Relevant units.	2018–2020		City budget
V-7	**Water management**	Use water-absorbent materials for pavement.	Department of Transport	Relevant units	Annually		City budget
V-8	**Water management**	Enhance the efficiency with which the water distribution system uses energy and resources.	Saigon Water Supply Corporation		Annually		City budget
VI-1	**Waste Management**	Classify solid waste at the source and collect (including final treatment phase).	Department of Natural Resources and Environment	Relevant units	Annually		City budget and socialization
VI-2	**Waste Management**	Develop a pilot model for waste treatment and production of electricity-generating biological gases: Electricity is produced from biological gases collected from the fermentation process of organic waste. Organic waste must be classified and collected separately.	Department of Natural Resources and Environment	Relevant units	2016–2017		City budget and socialization
VI-3	**Waste Management**	Build a pilot electricity generation system using remaining heat from solid waste burning plants.	Department of Natural Resources and Environment	Relevant units	2017–2018		City budget and call for support from international cooperation
VI-4	**Waste Management**	Classify and collect hazardous waste. Create regulations for the classification, collection, transport, and treatment of industrial solid waste from plants.	Department of Natural Resources and Environment	Relevant units	2018–2020		City budget

VI-5	**Waste Management**	Manage waste by electronic documents: The amount of industrial waste will be monitored through electronic documents and reports about categories and treatment processes which must be submitted by the waste generating units, and through reports on transport and final treatment. This ensures that waste is not disposed of illegally and appropriate industrial waste treatment methods are utilized.	Department of Natural Resources and Environment	Relevant units	Annually		City budget
VI-6	**Waste Management**	Reduce, reuse, and recycle sludge into construction materials.	Department of Natural Resources and Environment	Relevant units	2018–2020		City budget and socialization
VI-7	**Waste Management**	Adjust fee collection system for waste gathering.	Department of Natural Resources and Environment	Relevant units	2016–2017		City budget
VII-1	**Construction**	Enhance the capability of construction investment management and environmentally-friendly works management: Support the sharing of practical experience in applying New Energy Efficient, Environmentally-Friendly Construction Materials from the perspective of both state management and construction investors; support the development of documents guiding construction investment and management of energy efficient, environmentally-friendly works well suited to the specific characteristics of HCMC.	Department of Construction		2016–2017		City budget

VII-2	**Construction**	Enhance supervision of construction investment in works that meet requirements for energy efficient usage to adapt to climate change.	Department of Construction		By 2020		City budget
VII-3	**Construction**	Consult HCMC People's Committee in issuing regulations on ecological labeling of environmentally-friendly construction materials and green labeling for energy efficient works.	Department of Construction	Relevant units	2016–2017		City budget
VII-4	**Construction**	Provide training and enhance knowledge concerning the design, construction, supervision, management, and operation of energy efficient buildings and green works.	Department of Construction	Relevant units	2016-2020		City budget and call for support
VII-5	**Construction**	Develop a legal framework; Increase land use factor when planning projects to build environmentally-friendly works.	Department of Planning and Architecture	Department of Construction and relevant units.	2016–2017		City budget
VII-6	**Construction**	Implement a pilot project for efficient use of wastewater and waste at construction sites (recycling and reusing wastewater and solid waste at construction sites).	Department of Natural Resources and Environment	Department of Construction and relevant units.	2018–2020		City budget
VII-7	**Construction**	Study models and methods for construction planning that accounts for climate change.	Institute for Research and Development		2016–2017		City budget
VII-8	**Construction**	Program for innovating and applying advanced technologies to produce environmentally-friendly construction materials.	Department of Science and Technology	Department of Construction and relevant units.	2017–2018		City budget and call for support from international cooperation

VII-9	**Construction**	Consult HCMC People's Committee to issue policies to support and give preferential treatment to investments so that favorable conditions are created for projects focused on manufacturing environmentally-friendly construction materials and green works in the city.	Department of Planning and Investment	Department of Construction and relevant units.	2016–2017		City budget
VIII-1	**Health**	Train health staff for hospitals (organize short-term training courses overseas).	Department of Health		2016–2018		City budget and call for support from international cooperation
VIII-2	**Health**	Conduct scientific research on: - Countermeasures against existing diseases. - Countermeasures against new infectious diseases. - Countermeasures against rare diseases. - Reduce the incidence of diseases.	Department of Health	Department of Science and Technology	2018–2020		City budget and call for support from international cooperation
VIII-3	**Health, water and waste**	Implement a pilot model to improve hospital environments and sanitation such as separately treating different kinds of waste and wastewater while accounting for risks of infectious diseases generated from hospitals to ensure the good health of patients and residents in surrounding areas. - Improve the management of sanitation water from hospitals. - Treat medical waste and wastewater separately.	Department of Health	Relevant units.	2017–2018		City budget and call for support from international cooperation

IX-1	**Agriculture**	Study and develop urban agriculture: Study the effects of climate change on urban agriculture and look into countermeasures against epidemics of plants and domestic animals; suggest solutions for climate change measures.	Department of Agriculture and Rural Development	- Department of Science and Technology; - Research units	2016–2020	1,100,000,000	City budget
IX-2	**Agriculture**	Study, forecast, and assess the effects of climate change and sea level rise on the system of irrigation infrastructure; propose adaptation and mitigation solutions and appropriate construction methods.	Department of Agriculture and Rural Development	- HCMC Irrigation Service Exploit Management Company Limited; - Relevant Departments; - The people's committee of relevant districts.	2016–2020	3,000,000,000	City budget
IX-3	**Agriculture**	Study the effects of climate change on water (quality and quantity) used in agriculture production in Ho Chi Minh City.	Department of Agriculture and Rural Development	- Department of Science and Technology; - HCMC Irrigation Service Exploit Management Company Limited; - Research institute and school.	2016–2020	3,000,000,000	City budget
IX-4	**Agriculture**	Study, create, select, experiment, and apply new crops well-suited to areas suffering from adverse effects of climate change.	Department of Agriculture and Rural Development	- Crop variety manufacturing and trading enterprises; - Bio-technology center; - Research institute and school.	2016–2020	3,800,000,000	City budget

IX-5	**Agriculture**	Study, create, select, experiment with, and use forestry plants well-suited to areas suffering from adverse effects of climate change.	Department of Agriculture and Rural Development	Research institute and school.	2016–2020	500,000,000	City budget
IX-6	**Agriculture**	Study, create, and select certain productive vegetable and flower varieties capable of enduring high the high temperatures of Ho Chi Minh City.	Department of Agriculture and Rural Development		2016–2020	5,000,000,000	City budget
IX-7	**Agriculture**	Apply technical measures in cultivation that are suited to areas suffering from adverse effects of climate change.	Department of Agriculture and Rural Development	- HCMC University of Science; - People's Committee of Binh Chanh and Cu Chi Districts.	2016–2020	1,000,000,000	City budget
IX-8	**Agriculture**	Build a modernized watering model that saves water in combination with pumping devices which use renewable sources of energy.	Department of Agriculture and Rural Development	- HCMC Irrigation Service Exploit Management Company Limited; - People's Committee of Cu Chi District; research institutes & schools.	2016–2020	10,000,000,000	City budget and socialization
IX-9	**Agriculture**	Build an afforestation model for preventing Saigon River bank landslides.	Department of Agriculture and Rural Development	- People's Committee of Binh Thanh District; - Relevant Departments.	2016–2020	1,743,000,000	City budget

IX-10	**Agriculture**	Provide training to enhance the capability of climate change measures in the agriculture and rural development sectors.	Department of Agriculture and Rural Development		2016–2018	600,000,000	City budget
X-1	**Tourism and transport**	Improve waterway transport network: use boats to support road transport and develop waterway tourism.	Department of Transport	Department of Tourism	2016–2018		City budget and socialization
X-2	**Awareness raising**	Raise awareness and develop state management capability in climate change measures for staff in each sector.	All members of the Steering Board for implementation of the Climate Change Adaptation Action Plan	Relevant units	Annually		City budget
X-3	**Awareness raising**	Raise community awareness concerning solutions for climate change measures well-suited to the socioeconomic conditions of HCMC.	All members of the Steering Board for implementation of the Climate Change Adaptation Action Plan	Relevant units	Annually		City budget
X-4	**Awareness raising**	Spread knowledge concerning climate change measures for students at all levels.	Department of Education and Training	Relevant units	Annually		City budget
XI-1	**Other solutions**	Build a system of regulations for greenhouse gas inventory and a Monitoring-Reporting-Verification (MRV) system for greenhouse gas emissions at the city level.	Office for Climate Change	Relevant units	2016–2018		City budget
XI-2	**Other solutions**	Integrate climate change issues into the development strategies, planning, and plans of each industry and sector.	All members of the Steering Board for implementation of the Climate Change Action Plan		2016–2020		City budget

XI-3	**Other solutions**	Modernize observational system and meteorological forecast technologies for early weather forecasting and warning of extreme weather conditions and natural disasters; build a system for assessing and supervising climate change and sea level rise.	Department of Natural Resources and Environment	Relevant units	2016–2020		City budget
XI-4	**Other solutions**	Train and enhance the capability of search and rescue forces in managing natural disaster risks.	Department of Agriculture and Rural Development	HCMC High Command; HCMC Public Security	2016–2018		City budget
XI-5	**Other solutions**	Promote international cooperation, including the introduction of climate change measures activities and requests for cooperation from HCMC to the international community.	Office for Climate Change	Relevant units	Annually		City budget
XI-6	**Other solutions**	Organize conferences and workshops, and conduct frequent activities to support climate change measures.	Office for Climate Change	Relevant units	Annually		City budget
XI-7	**Other solutions**	Study and develop emission factors for some activities suited to the conditions of HCMC to assist greenhouse gas inventory activities.	Office for Climate Change	Relevant units	Annually		City budget
XI-8	**Other solutions**	Study the effects of climate change on programs for restructuring the economy and on economic growth models in HCMC.	Institute for Research and Development	Relevant units	2018–2020		City budget
XI-9	**Other solutions**	Assess the effects of climate change on changes to the socioeconomic development planning targets of HCMC.	Institute for Research and Development	Relevant units	2016–2017		City budget

XI-10	**Other solutions**	Study mechanism and solutions for improving state management capability and enhancing the role of the community in climate change measures and response strategies.	Institute for Research and Development	Relevant units	2018–2020		City budget
XI-11	**Other solutions**	Study HCMC’s urban management models that account for climate change.	Institute for Research and Development	Relevant units	2018–2020		City budget

APPENDIX 2

List of Climate Change measures solutions in HCMC for 2016-2020, with a view to 2030, with a call for investment and financial assistance

No.	Area	Solutions	Responsible unit	Coordinating unit	Implementation progress	Funding	Notes
I-1	**Urban planning**	Develop model urban areas to deploy climate change measures solutions.	Department of Planning and Architecture		By 2020		
I-2	**Urban planning**	Build ventilated corridors.	Department of Planning and Architecture		By 2020		
II-1	**Energy**	ESCO project: Expenses saved by reducing energy consumption will be used to install energy efficient devices. ESCO (energy service companies) will pay for initial installation expenses and make investments back through energy cost savings.	Department of Industry and Trade	EVN HCMC; Relevant units.	By 2020		
II-2	**Energy, Industry**	Use energy-improving devices (e.g. compressor and engines) at small/medium-sized enterprises.	Department of Industry and Trade	EVN HCMC; Relevant units.			

II-3	**Energy**	Install energy-saving glass: Energy efficient air conditioning systems will be improved by installing more energy efficient layers of adiabatic glass.	Department of Industry and Trade	Relevant units			
II-4	**Energy**	Regional energy supply system: Operate a highly efficient energy supply system for urban areas. The system tightly manages co-generated electricity and heat by taking advantage of buildings' surplus heat and river water at the scale of cluster of construction works.	EVN HCMC	Relevant units	By 2030		
II-5	**Energy**	Study and develop a system for producing hydroelectric energy at a super small scale by taking advantage of the pressure of water running into service reservoirs.	EVN HCMC	Relevant units	By 2030		
II-6	**Energy**	Encourage the use of non-CO2 wind energy systems.	Department of Industry and Trade				
III-1	**Transport**	Complete underground system.	Management Authority for Urban Railways (MAUR)	Department of Transport	By 2030		
III-2	**Transport**	Develop underground shopping center.	Department of Transport	Department of Planning and Architecture	By 2020		
III-3	**Transport**	Modernize road system: Improve traffic flow by creating dedicated lanes for motorcycles and automobiles. Develop regulations and training programs for traffic safety.	Department of Transport		By 2020		

III-4	**Transport**	Improve and innovate road systems (in order to reduce traffic congestion); improve traffic efficiency by building and expanding roads.	Department of Transport		By 2020		Decision No. 568/QD-TTg dated April 8, 2013 of the Prime Minister approving adjustment of the HCMC Transport Development Planning by 2020, with a view to post-2020.
III-5	**Transport**	Study and develop a system to connect private and public transport systems; build parking lots to improve public transport quality and convenience (e.g. using suburban shopping center parking lots as bus transit centers). Bus terminals will be developed based on Public-Private Partnerships (PPP) via the TOD method, which develops transport systems with a public focus. Project: New Mien Dong Bus Station under a PPP model.	Department of Transport	Relevant units	2015–2018	VND 1,500 billion	HCMC People's Committee has requested that capital be mobilized to implement project 2908/VP-QLDA dated April 3, 2015.
III-6	**Transport**	Develop bus rapid transit (BRT) system under the HCMC Green Transport Development Project.	Ho Chi Minh City's Urban Civil Works Construction Investment Management Authority	Department of Transport	2013–2018	USD 149.5 million	
III-7	**Transport**	Manufacture 300 buses that use compressed natural gases (CNG).	Department of Transport	Relevant units	2015–2017	VND 163.08 billion	HCMC People's Committee has requested the project be implemented. The procedures are being completed to extend the project until 2017.

IV-1	**Industry**	Improve techniques and technologies to operate furnaces: use environmentally-friendly fuel and reuse waste heat and waste materials.	Department of Industry and Trade	HEPZA			
V-1	**Water management**	- Deal with flooding in the Northern basin of Tau Hu, Doi and Te canals. - Collect all wastewater in basins and transport it to centralized wastewater treatment plants to improve water pollution in the city. - Dredge and embank Tau Hu, Doi, and Te dike banks; create landscape along the two dike banks. - Evacuate households living along the polluted dikes to cleaner and better places. - Deal with sunken areas that are frequently flooded (Thanh Da, Me Coc). Projects: 1) Project for Improving Water Environment - Phase 2 (Tau Hu, Ben Nghe, Doi and Te dike basins); 2) Flood Control Project with an Effort towards Climate Change, Phase 2.	Department of Transport	HCMC Steering Center of the Urban Flood Control Programme, HCMC Urban Drainage Company (UDC), Ho Chi Minh City's Urban Civil Works Construction Investment Management Authority (UCCI)	1) 2009─2018	USD 550 million	
V-2	**Water management**		Department of Transport	HCMC Steering Center of the Urban Flood Control Programme; HCMC Urban Drainage Company (UDC), Ho Chi Minh City's Urban Civil Works Construction Investment Management Authority (UCCI)	2) 2016─2018	VND 10,000 billion	The projects have been approved by the Prime Minister

V-3	**Waste management**	Complete, connect and synchronize drainage and waste treatment systems constructed in phase 1 and continued to be constructed in phase 2 in order to enhance the efficiency of investment capital, address flooding, and improve the environmental conditions of basins. - Improve the existing drainage system, build and expand drainage systems to improve drainage and reduce flooding. - Build wastewater treatment plants connected with the drainage system to treat and improve water environment hygiene. Project: 1) Project to Improve Water Environment - Phase 3 (Tau Hu, Doi, and Te canal basins); 2) ODA Project of Tham Luong and Ben Cat Basin.	Department of Transport	HCMC Steering Center of the Urban Flood Control Programme; HCMC Urban Drainage Company (UDC), Ho Chi Minh City's Urban Civil Works Construction Investment Management Authority (UCCI)	1) 2016—2023	USD 850 million	
V-4	**Water management**		Department of Transport	HCMC Steering Center of the Urban Flood Control Programme; HCMC Urban Drainage Company (UDC), Ho Chi Minh City's Urban Civil Works Construction Investment Management Authority (UCCI)	2) 2016—2020	USD 450 million	Loan from the World Bank
V-5	**Water management**	Reduce the rate of water loss to 25%.	Saigon Water Supply Corporation		2016–2020		Being implemented by SAWACO
V-6	**Water management**	Build a system for regulating ponds.	HCMC Steering Center of the Urban Flood Control Programme	Relevant units	By 2030		

VI-1	**Waste management**	Treat waste to produce biological gases for electricity generation: Electricity is produced from biological gases collected from the fermentation process of organic waste. Organic waste must be classified and collected separately. Project on Waste Treatment for Biological Gases Used in Electricity Generation.	Department of Natural Resources and Environment		2017–2020		
VI-2	**Waste management**	Electricity generation system that use surplus heat from solid waste burning plants. Project on Building Electricity Generation System that Use Heat from Solid Waste Burning Plants on a Large Scale.	Department of Natural Resources and Environment		2017–2020		
VI-3	**Waste management**	Collect gases from all dumping grounds for electricity generation.	Department of Natural Resources and Environment		2017–2020		
VII-1	**Construction**	Expand the model for efficiently using wastewater and waste at construction sites (recycling and reusing wastewater and solid waste at construction sites).	Department of Natural Resources and Environment	Department of Construction and relevant units	2020		
VIII-1	**Health**	Train health staff for hospitals (organize short-term training courses overseas).	Department of Health		2016–2018		

VIII-2	**Health**	- Countermeasures against existing diseases - Countermeasures against new infectious diseases - Countermeasures against unusual diseases - Reduce incidence of diseases.	Department of Health	Department of Science and Technology	2017–2020		
VIII-3	**Health, water and waste**	Implement projects on a large scale to promote better hospital hygiene, including the separate treatment of waste or wastewater at high risk of spreading infectious diseases to ensure good health of patients and nearby residents. - Improve hospital water and hygiene management. - Treat medical wastewater and waste separately.	Department of Health	Department of Natural Resources and Environment	2018–2020		
IX-1	**Agriculture**	Encourage the use of water saving pumps that use renewable energy.	Department of Agriculture and Rural Development		2017–2018		
IX-2	**Agriculture**	Produce biological gases and generate electricity from animal waste.	Department of Agriculture and Rural Development	Department of Natural Resources and Environment	2017–2020		
IX-3	**Agriculture**	Study models for generating solar power in rural areas.	Department of Agriculture and Rural Development	Department of Industry and Trade, EVN HCMC	2018–2020		
IX-4	**Agriculture**	Disseminate information about and encourage the limited use of chemical fertilizers.	Department of Agriculture and Rural Development		2016–2017		

APPENDIX 3

FINANCIAL INVESTMENT AND SUPPORT FUNDS FOR CLIMATE CHANGE MEASURES

No.	Name of Fund	Investment Type	Focus	Project Conditions	Funding
Support and Financial Investment Funds for Climate Change in Vietnam					
1	Global Climate Partnership Funds	Co-funding, making loans, ODA, risk management, technical support	Mitigation, energy, energy efficiency, infrastructure, CO_2 reduction, renewable energy	Energy efficiency, renewable energy, and technical support in focus countries: Brazil, Chile, China, India, Indonesia, Mexico, Morocco, South Africa, Philippines, Tunisia, Turkey, Ukraine, and Vietnam	$200 million
2	Clean Technology Funds (CTF)		Investment in low carbon in electricity, transport and industries.	Clean Technology Funds (CTF), one of the two trust funds with many sponsors in Climate Investment Funds (CIF): promoting and expanding support for demonstrations, and implementing and transferring low-carbon technologies with long-term potential for saving greenhouse gas emissions. Sent to African Development Bank, Asian Development Bank, Bank for Reconstruction and Development, Inter-American Development Bank, and World Bank Group. CTF sponsors 12 national programs and	CTF funding: USD 188.6 million Expected co-sponsored funding: USD 896.5 million Total: USD 1,085.1 million Number of projects: 4 MDB(s) implemented by: IFC, ADB, IBRD

				one regional program.	
3	ADB Carbon Market Initiative (CMI)	Carbon financing, co-sponsor, technical support	Mitigation, energy, energy efficiency, non-durable methanol, low carbon, Renewable Energy, Waste Management	Mitigation, Low Carbon, Renewable Energy, Energy Efficiency	USD 152 million (Asia-Pacific Carbon Funds) USD 115 million (Future Carbon Funds), Technical Support for Facility
4	Global Facility for Disaster Reduction and Recovery (GFDRR)	Co-sponsor, sponsor, other, risk management, technical support	Adaptation, capacity building, technology, agriculture, climate-elasticity, coastal area management, natural disaster risk mitigation, fishery, forestry, infrastructure, natural resource management, settlement, sustainable land management, tourism, transport, waste management, water	From under USD 100,000 (individual sponsor) to more than USD 1 million (national program)	GFDRR portfolio: USD 244,310,387

5	Forest Carbon Partnership Facility (FCPF)	Carbon financing, sponsor	Mitigation, Forestry	Member countries of the International Development Association (IDA) or International Bank for Reconstruction and Development (IBRD, World Bank), lying between the 35th parallel north and 35th parallel of south.	Approximately USD 160 million up to now (USD 110 million in Readiness Mechanism and USD 51 million in Carbon Finance Mechanism)
6	Fund Solutions for Climate Finance (KfW & Partners)	Giving loans	Mitigation, energy efficiency, Low Carbon, Renewable Energy	GCPF: Focus on countries that already have important industrial facilities and large populations, e.g. Brazil, Chile, China, India, Indonesia, Mexico, Morocco, Philippines, South Africa, Tunisia, Turkey, Ukraine, and Vietnam.	Global Climate Partnership Fund (GCPF): up to USD 500 million for global environment protection in the next five years
7	KfW Development & Climate Finance	Sponsor, loan, ODA, financial restructuring	Adaptation, capacity building, mitigation, Technology, Agriculture, climate-elasticity, coastal area management, energy, energy efficiency, Forestry, infrastructure, Low Carbon, material efficiency, natural resource management, renewable energy, sustainable land management, Transport, waste management, water management, water efficiency	Depends on contracts	Changes depending on contracts

8	NEFCO Carbon Finance and Funds	Carbon finance, sponsor, Technical Support	Adaptation, mitigation, energy, energy efficiency, Fuel Conversion, Non-Durable Methanol, Industry, Renewable Energy, Waste Management	Nordic Environment Finance Corporation (NEFCO) is a multilateral financial organization with extensive experience in financial projects with positive effects on the environment. NEFCO contributes to sustainable development and climate change adaptation and mitigation by supporting a variety of greenhouse gas emission mitigation methods (e.g. renewable energy, energy saving, and fuel conversion) in different parts of the world. NEFCO finances carbon with the costs saved from greenhouse gas mitigation resulting from using Kyoto mechanisms, specifically the implementation of mechanisms (JI) and Clean Development Mechanism (CDM). Credits from these projects should be used appropriately and in line with obligations to the Kyoto Protocol and with EU cap and trade projects. NEFCO manages two carbon facilities with sponsored resources of up to €135 million that originate from managing projects in countries of Eastern Europe, Asia, and Africa, on behalf of the 17 investors in the public and private sectors.	135 million EURO

9	Nordic Climate Facility	Sponsor	Adaptation, mitigation, agriculture, Carbon Capture and Storage (CCS), climate elasticity, energy, energy efficiency, Forestry, Fuel Conversion, Low Carbon, Renewable Energy, Transport, Waste Management, Water Management	Financial support can be provided for the activities of agencies, organizations, companies, and relevant agencies with organizational experience and registered in Denmark, Finland, Iceland, Norway, or Sweden. Applicants should have local partners in an eligible country for which a project has been proposed. Projects should have an implementation period of no more than 24 months and should focus on one of the two climate issues informed in proposals.	6 million euro (2011-2012)
10	Partnership for Market Readiness (PMR)	Sponsor	Capacity building, mitigation, Energy, Industry, Low Carbon, Transport, urban, waste management, water efficiency	Specific assistance with values from $ 3–8 million. Countries should be able to participate in PMR to request financial assistance.	USD 100 million (target capital); USD 85 million (current capital)
11	UN-REDD Programme (Reduced Emissions from Deforestation and Forest Degradation)	Sponsor, Technical Support	Capacity building, mitigation, Forestry, Natural Resource Management, sustainable land management	Phase 1 countries: Bolivia, DR Congo, Indonesia, Panama, Papua New Guinea, Paraguay, Tanzania, Vietnam, and Zambia	USD 97 million

12	Vietnam Green Credit Trust Fund	Sponsor, loan guarantee	Adaptation, mitigation, technology, energy, energy efficiency, Fuel Conversion, Industry, Low Carbon, service, water, water efficiency	GCTF is a financial assistance initiative of the Swiss State Secretariat for Economic Affairs (SECO) to promote mid-term and long-term investment in Vietnamese SMEs towards cleaner production technologies to achieve environmental improvement. Cleaner production aims to identify solutions for environmental issues and increasing company profits while at the same time reducing emissions. Cleaner production includes the choice of "low cost" (good practices) and investment opportunities (clean technologies).	Total budget: USD 5 million
13	IUCN				SMEs (private or public sector) with more than 50% Vietnamese ownership.
14	Rainforest Alliance				Scope of credit: USD 10,000 – USD 1 million
15	Rockefeller Foundation				USD 1 million for each city among 100 registered cities

Focused Funds for Adapting to and Mitigating Climate Change, Reducing Emissions from Deforestation and Forest Degradation, and Environmental Conservation (REDD+)			
1	Adaptation Fund	Multilateral funding source	Adaptation
2	Adaptation for Smallholder Agriculture Programme	Multilateral funding source	Adaptation
3	Clean Technology Fund	Multilateral funding source	Mitigation - in its entirety
4	Forest Carbon Partnership Facility	Multilateral funding source	Mitigation - REDD
5	Forest Investment Programme	Multilateral funding source	Mitigation - REDD
6	GEF Trust Fund - Climate Change focal area (GEF 6)	Multilateral funding source	Adaptation, Mitigation - in its entirety
7	Global Climate Change Alliance	Multilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD
8	Global Energy Efficiency and Renewable Energy Fund	Multilateral funding source	Mitigation - in its entirety
9	Green Climate Fund	Multilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD
10	UK's International Climate Fund	Bilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD
11	Germany's International Climate Initiative	Bilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD
12	Australia's International Forest Carbon Initiative	Bilateral funding source	Mitigation - REDD
13	Japan's Fast Start Finance - private sources	Bilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD
14	Japan's Fast Start Finance - public sources	Bilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD

15	MDG Achievement Fund – Environment and Climate Change thematic window	Multilateral funding source	Adaptation, Mitigation - in its entirety
16	Norway's International Climate and Forest Initiative	Bilateral funding source	Mitigation - REDD
17	Pilot Programme for Climate Resilience	Multilateral funding source	Adaptation
18	Scaling Up Renewable Energy Programme for Low Income Countries	Multilateral funding source	Mitigation - in its entirety
19	Strategic Climate Fund	Multilateral funding source	Adaptation, Mitigation - in its entirety, Mitigation - REDD
20	Strategic Priority on Adaptation	Multilateral funding source	Adaptation
21	UN-REDD Programme	Multilateral funding source	Mitigation - REDD

APPENDIX 4

LIST OF ANNUALLY UPDATED DATA FOR STATE MANAGEMENT OF CLIMATE CHANGE ADAPTATION IN HO CHI MINH CITY

No.	Sector	Data/Information	Unit	Information provider
1	**URBAN PLANNING**			
1.1	**Land use planning**			
		Land use planning up to 2025		Department of Natural Resources and Environment
		Annual updates on present condition of land use (2010–2015)		Department of Natural Resources and Environment
	Area of land with land use change	Forest land kept unchanged	1000 ha	Department of Natural Resources and Environment
		Other types of land changed to forest land	1000 ha	Department of Natural Resources and Environment
		Arable land kept unchanged	1000 ha	Department of Natural Resources and Environment
		Forest land changed to arable land	1000 ha	Department of Natural Resources and Environment
		Grassland changed to arable land	1000 ha	Department of Natural Resources and Environment
		Other types of land changed to arable land	1000 ha	Department of Natural Resources and Environment
		Grassland kept unchanged	1000 ha	Department of Natural Resources and Environment

		Wetland kept unchanged	1000 ha	Department of Natural Resources and Environment
		Forest land changed to residential land	1000 ha	Department of Natural Resources and Environment
		Arable land changed to residential land	1000 ha	Department of Natural Resources and Environment
		Grassland changed to residential land	1000 ha	Department of Natural Resources and Environment
		Salt-water wetland changed to residential land	1000 ha	Department of Natural Resources and Environment
		Other types of land changed to residential land	1000 ha	Department of Natural Resources and Environment
		Other types of land kept unchanged	1000 ha	Department of Natural Resources and Environment
		Rate of change of agricultural land to urban land	%/year	Department of Natural Resources and Environment
1.2	**Sector planning (by 2020, 2025, 2030)**			
		Socioeconomic development		
		Energy		Department of Industry and Trade
		Transport		Department of Transport
		Industry		Department of Industry and Trade
		Construction		Department of Construction
		Water supply		Department of Transport
		Drainage		Department of Transport
		Waste management		Department of Natural Resources and Environment
		Healthcare		Department of Health
		Agriculture		Department of Agriculture and Rural Development
		Culture and tourism		Department of Culture, Sports and Tourism

1.3	**Green space**			
	Area	Forest	ha	Department of Agriculture and Rural Development
		Trees and landscaped lawns and botanical gardens	ha	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
		Trees along the rivers, canals, and sea dikes	ha	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
		Street trees	ha	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
		Green space density per capita	m^2/person	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
	Number of trees	Forest	tree	Department of Agriculture and Rural Development
		Landscaped lawns and botanical gardens	tree	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
		Trees along the rivers, canals, and sea dikes	tree	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
		Street trees	tree	Department of Transport, Ho Chi Minh City Green Trees - Park Co., Ltd.
2	**ENERGY**			
2.1	**Electricity**			EVN HCMC
	Structure of amount of electricity supplied to Ho Chi Minh City	Total amount of electricity supplied to Ho Chi Minh City	MWh	EVN HCMC
		Hydropower	MWh	EVN HCMC
		Thermal power	MWh	EVN HCMC
		Wind power	MWh	EVN HCMC
		Biomass power	MWh	EVN HCMC

		Solar power	MWh	EVN HCMC
	Amount of electricity consumed by group of economic sectors	Total amount of electricity consumed	MWh	EVN HCMC
		Industry, construction	MWh	EVN HCMC
		Agriculture, forestry, fishery	MWh	EVN HCMC
		Trade, hotels, restaurants	MWh	EVN HCMC
		Residential management, consumption	MWh	EVN HCMC
		Others	MWh	EVN HCMC
	Detailed amounts of electricity consumed by each group	**Industry**		EVN HCMC
		The amount of electricity consumed by each industrial zone and processing zone	MWh	EVN HCMC
		Food processing industry	MWh	EVN HCMC
		Chemical industry	MWh	EVN HCMC
		Machinery and equipment manufacturing industry	MWh	EVN HCMC
		Electronics and information technology industry	MWh	EVN HCMC
		Textile industry	MWh	EVN HCMC
		Supply and distribution of gas, water	MWh	EVN HCMC
		Construction	MWh	EVN HCMC
		Civil utilities		EVN HCMC
		New residential buildings (with elevators)	MWh	EVN HCMC
		Administrative offices of departments acting as Climate Change Steering Committee members	**MWh**	EVN HCMC
		Department of Science and Technology	MWh	EVN HCMC
		Department of Finance	MWh	EVN HCMC
		Department of Culture and Sports	MWh	EVN HCMC
		Department of Tourism	MWh	EVN HCMC
		Department of Construction	MWh	EVN HCMC
		Department of Industry and Trade	MWh	EVN HCMC
		Department of Transport	MWh	EVN HCMC

		Department of Planning & Architecture	MWh	EVN HCMC
		Operating Centre for City Flood Control Programme	MWh	EVN HCMC
		Ho Chi Minh City Institute for Development Studies	MWh	EVN HCMC
		Ho Chi Minh City Sub-Directorate of Water Resource and Flood Control	MWh	EVN HCMC
		Ho Chi Minh City Public Security	MWh	EVN HCMC
		Department of Health	MWh	EVN HCMC
		Department of Information and Communications	MWh	EVN HCMC
		Department of Education and Training	MWh	EVN HCMC
		Ho Chi Minh City Military Commander	MWh	EVN HCMC
		Saigon Giai Phong Newspaper	MWh	EVN HCMC
		Hospital	MWh	EVN HCMC
		School	MWh	EVN HCMC
		Supermarket	MWh	EVN HCMC
		Public lighting (Electricity supplied for public lighting and other public activities)	MWh	EVN HCMC
	Loss of electricity	Loss of electricity in transmission	MWh	EVN HCMC
		Loss percentage	%	EVN HCMC
	Electricity saving	List of electricity saving programs managed by EVN HCMC		EVN HCMC
		The amount of saved electricity in each electricity saving program	kWh	EVN HCMC
2.2	**Fuel**			
	Supply amount	Kerosene oil (KO)	thousand liters/year	Department of Industry and Trade, General Department of Vietnam Customs
		Fuel oil (FO)	thousand liters/year	Department of Industry and Trade, General Department of Vietnam Customs

		Petrol	thousand liters/year	Department of Industry and Trade, General Department of Vietnam Customs
		Diesel (DO)	thousand liters/year	Department of Industry and Trade, General Department of Vietnam Customs
		Coal	ton/year	Department of Industry and Trade
	Consumption amount	**Fuel**		
		Kerosene oil (KO)	thousand liters /year	Department of Industry and Trade, Petrolimex, SGPetro
		Fuel oil (FO)	thousand liters /year	Department of Industry and Trade, Petrolimex, SGPetro
		Petrol	thousand liters /year	Department of Industry and Trade, Petrolimex, SGPetro
		Diesel (DO)	thousand liters /year	Department of Industry and Trade, Petrolimex, SGPetro
		Coal	ton/year	Department of Industry and Trade
		Liquefied petroleum gas (LPG)	**ton/year**	Department of Industry and Trade, Petrolimex, SGPetro
		Construction/trade	ton/year	Department of Industry and Trade
		Industry	ton/year	Department of Industry and Trade
		Transport	ton/year	Department of Industry and Trade
		Household	ton/year	Department of Industry and Trade
		Compressed natural gas (CNG)	**ton/year**	DIT, Petrolimex, SGPetro
		Construction/trade	ton/year	Department of Industry and Trade
		Industry	ton/year	Department of Industry and Trade
		Transport	ton/year	Department of Industry and Trade

		Household	ton/year	Department of Industry and Trade
2.3	**Structure of household energy consumption**			Department of Industry and Trade
		Electricity	%	Department of Industry and Trade
		Firewood	%	Department of Industry and Trade
		Liquefied petroleum gas	%	Department of Industry and Trade
		Kerosene oil	%	Department of Industry and Trade
		Petrol	%	Department of Industry and Trade
3	**TRANSPORT**			
3.1	**Passenger transport**			
		Trip/people/day	**Trip/people/day**	Department of Transport, UCCI
	Average transport distance for passenger transport	Walking	km/trip	Department of Transport, UCCI
		Bicycle	km/trip	Department of Transport, UCCI
		Electric bicycle	km/trip	Department of Transport, UCCI
		Motorcycle	km/trip	Department of Transport, UCCI
		Electric motorcycle	km/trip	Department of Transport, UCCI
		Personal car (less than 9 seats)	km/trip	Department of Transport, UCCI
		Taxi	km/trip	Department of Transport, UCCI
		Passenger car (more than 9 seats)	km/trip	Department of Transport, UCCI
		Bus	km/trip	Department of Transport, UCCI
		Train	km/trip	Department of Transport, UCCI, MAUR
		Passenger ferry	km/trip	Department of Transport

		Air plane	km/trip	Department of Transport, UCCI
	Possible number of transported passengers	Personal car (less than 9 seats)	million people/year	Department of Transport, UCCI
		Taxi	million people/year	Department of Transport, UCCI
		Passenger car (more than 9 seats)	million people/year	Department of Transport
		Bus	million people/year	Department of Transport, UCCI
		Train	million people/year	Department of Transport, UCCI, MAUR
		Passenger ferry	million people/year	Department of Transport
		Airplane	million people/year	Department of Transport, UCCI
	Possible number of transported passengers for each km	Bus	million people km/year	Department of Transport, UCCI
		Passenger ferry	million people km/year	Department of Transport
		Train	million people km/year	Department of Transport, UCCI, MAUR
	Needs for passenger transport	Walking	million people/km year	Department of Transport, UCCI
		Bicycle	million people/km year	Department of Transport, UCCI
		Electric bicycle	million people/km year	Department of Transport, UCCI
		Motorcycle	million people/km year	Department of Transport, UCCI
		Electric motorcycle	million people/km year	Department of Transport, UCCI
		Personal car (less than 9 seats)	million people/km year	Department of Transport, UCCI
		Taxi	million people/km year	

		Passenger car (more than 9 seats)	million people/km year	Department of Transport, UCCI
		Bus	million people/km year	Department of Transport, UCCI
		Train	million people/km year	Department of Transport, UCCI, MAUR
		Passenger ferry	million people/km year	Department of Transport
		Air plane	million people/km year	Department of Transport, UCCI
	Number of transport vehicles	Bicycle	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Electric bicycle	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Motorcycle	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Electric motorcycle	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Personal car (less than 9 seats)	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Taxi	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Passenger car (more than 9 seats)	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Bus	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Train	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Passenger ferry	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
		Airplane	thousand vehicles	Department of Transport, Public Security of Ho Chi Minh City
	Average possible number of passengers transported by each vehicle	Motorcycle	people/piece	Department of Transport, UCCI
		Car	people/piece	Department of Transport, UCCI
		Train	people/piece	Department of Transport, UCCI, MAUR

		Passenger ferry	people/piece	Department of Transport
	Structure of transport modes for passenger transport	Motorcycle	%	Department of Transport, UCCI
		Car	%	Department of Transport, UCCI
		Bus	%	Department of Transport, UCCI
		Train	%	Department of Transport, UCCI, MAUR
		Passenger ferry	%	Department of Transport
		Air plane	%	Department of Transport, UCCI
		Walking	%	Department of Transport, UCCI
		Bicycle	%	Department of Transport, UCCI
3.2	**Freight transport**			
	Average transport distance for freight transport	Truck lighter than or equal to 0.5 ton	km/ton	Department of Transport
		Truck heavier than 0.5 ton	km/ton	Department of Transport
		Train	km/ton	Department of Transport
		Ferry	km/ton	Department of Transport
		Air plane	km/ton	Department of Transport
	Structure of transport modes for freight transport	Truck lighter than or equal to 0.5 ton	%	Department of Transport
		Truck heavier than 0.5 ton	%	Department of Transport
		Train	%	Department of Transport
		Ferry	%	Department of Transport
		Air plane	%	Department of Transport
	Needs for freight transport	Truck lighter than or equal to 0.5 ton	million tons.km	Department of Transport
		Truck heavier than 0.5 ton	million tons.km	Department of Transport
		Train	million tons.km	Department of Transport
		Ferry	million tons.km	Department of Transport
		Air plane	million tons.km	Department of Transport
4	**INDUSTRY**			

		Report on progress of industry development planning (2010-2015)		DIT, HEPZA
		Energy efficiency programs in industry		DIT, HEPZA
		Water efficiency programs in industry		DIT, HEPZA
		Annual report on present conditions of waste discharge by industrial zones and processing zones		DIT, HEPZA, DONRE
5	**WATER RESOURCE MANAGEMENT**			
5.1	**Water supply**			SAWACO
	Overview	Total amount of water supply	m^3	SAWACO
		Rate of water loss	%	SAWACO
		Emission factor of HCMC water supply system	kg-CO_2/m^3	OFFICE FOR CLIMATE CHANGE
		Quality of input water (important indicators)		SAWACO
	Water plant	Amount of water supplied for production	m^3	SAWACO
		Amount of electricity consumed	kWh	SAWACO
		Amount of chemicals used	ton	SAWACO
		Amount of sewage sludge generated	ton/m3	SAWACO
		Sludge treatment method		SAWACO
		Amount of other fuels (if any)		SAWACO
		BOD, COD indicators of sewage sludge generated		
	Groundwater	Amount of groundwater exploited at rural water supply stations	m^3	SAWACO
		Amount of electricity consumed at rural water supply stations	kWh	SAWACO
		Amount of chemicals used at rural water supply stations	ton	SAWACO
		Amount of groundwater exploited at households	m^3	People's Committees of suburban districts
		Amount of groundwater exploited at industrial zones	kWh	HEPZA

5.2	**Flood control**			Department of Transport, SCFC, UDC
		Number of flooded points	point	Department of Transport, SCFC, UDC
		Total area of frequently flooded points	km^2	Department of Transport, SCFC, UDC
		Intensity of rain causing floods	mm/hour	Department of Transport, SCFC, UDC
		Number of rainfall events with high rainfall (>100 mm in 3hrs)	number of rainfall events	SCFC, UDC
		Implementation progress for flood control measures		Department of Transport, SCFC
		Implementation progress for drainage measures		Department of Transport, SCFC
		Total number of retention basins as planned	retention basin	Department of Transport, SCFC, UDC
		Number of existing retention basins (as of reporting year)	retention basin	Department of Transport, SCFC, UDC
		Total volume of stored water in basins as planned	m^3	Department of Transport, SCFC, UDC
		Total volume of stored water in existing basins (as of reporting year)	m^4	Department of Transport, SCFC, UDC
6	**WASTE MANAGEMENT**			
6.1	**Solid waste**			Department of Natural Resources and Environment
	Domestic solid waste			Department of Natural Resources and Environment
		Volume of domestic solid waste	**ton/year**	Department of Natural Resources and Environment
		Paper and cardboard	ton/day	Department of Natural Resources and Environment
		Cloth	ton/day	Department of Natural Resources and Environment
		Food waste	ton/day	Department of Natural Resources and Environment
		Wood	ton/day	Department of Natural

				Resources and Environment
		Garden waste	ton/day	Department of Natural Resources and Environment
		Cholera (stool)	ton/day	Department of Natural Resources and Environment
		Rubber and leather	ton/day	Department of Natural Resources and Environment
		Plastics	ton/day	Department of Natural Resources and Environment
		Metals	ton/day	Department of Natural Resources and Environment
		Glass	ton/day	Department of Natural Resources and Environment
		Sewage sludge	ton/day	Department of Natural Resources and Environment
		Others	ton/day	Department of Natural Resources and Environment
		Treatment methods		Department of Natural Resources and Environment
		Landfilling	%	Department of Natural Resources and Environment
		Making compost	%	Department of Natural Resources and Environment
		Anaerobic treatment	%	Department of Natural Resources and Environment
		Incineration	%	Department of Natural Resources and Environment
		Open burning	%	Department of Natural Resources and Environment
		Recycling	%	Department of Natural Resources and Environment
		Composition of domestic solid waste		Department of Natural Resources and Environment
		Food	%	Department of Natural Resources and Environment

		Garden waste	%	Department of Natural Resources and Environment
		Paper	%	Department of Natural Resources and Environment
		Wood	%	Department of Natural Resources and Environment
		Cloth	%	Department of Natural Resources and Environment
		Cholera (stool)	%	Department of Natural Resources and Environment
		Sewage sludge	%	Department of Natural Resources and Environment
		Plastics	%	Department of Natural Resources and Environment
		Amount of recovered CH_4		Department of Natural Resources and Environment
		Landfilling	ton/year	Department of Natural Resources and Environment
		Making compost	ton/year	Department of Natural Resources and Environment
		Anaerobic treatment	ton/year	Department of Natural Resources and Environment
		Incineration	ton/year	Department of Natural Resources and Environment
		Open burning	ton/year	Department of Natural Resources and Environment
		Recycling	ton/year	Department of Natural Resources and Environment
	Industrial solid waste			Department of Natural Resources and Environment
		Volume of industrial solid waste	**ton/year**	Department of Natural Resources and Environment
		Food, beverage, and cigarette industries	ton/year	Department of Natural Resources and Environment
		Weaving and dyeing industry	ton/year	Department of Natural Resources and Environment

		Wood production and wood product making industry	ton/year	Department of Natural Resources and Environment
		Papermaking	ton/year	Department of Natural Resources and Environment
		Petrol, oil, solvent, and plastic products making industry	ton/year	Department of Natural Resources and Environment
		Rubber industry	ton/year	Department of Natural Resources and Environment
		Construction and dismantling industry	ton/year	Department of Natural Resources and Environment
		Others	ton/year	Department of Natural Resources and Environment
		Treatment methods		Department of Natural Resources and Environment
		Landfilling	%	Department of Natural Resources and Environment
		Making compost	%	Department of Natural Resources and Environment
		Anaerobic treatment	%	Department of Natural Resources and Environment
		Incineration	%	Department of Natural Resources and Environment
		Open burning	%	Department of Natural Resources and Environment
		Recycling	%	Department of Natural Resources and Environment
		Amount of recovered CH_4		Department of Natural Resources and Environment
		Landfilling	ton/year	Department of Natural Resources and Environment
		Making compost	ton/year	Department of Natural Resources and Environment
		Anaerobic treatment	ton/year	Department of Natural Resources and Environment
		Incineration	ton/year	Department of Natural

				Resources and Environment
		Open burning	ton/year	Department of Natural Resources and Environment
		Recycling	ton/year	Department of Natural Resources and Environment
	Medical solid waste			Department of Natural Resources and Environment
		Volume of medical solid waste	**ton/year**	Department of Natural Resources and Environment
		Treatment methods		Department of Natural Resources and Environment
		Landfilling	%	Department of Natural Resources and Environment
		Making compost	%	Department of Natural Resources and Environment
		Anaerobic treatment	%	Department of Natural Resources and Environment
		Incineration	%	Department of Natural Resources and Environment
		Open burning	%	Department of Natural Resources and Environment
		Recycling	%	Department of Natural Resources and Environment
		Amount of recovered CH_4		Department of Natural Resources and Environment
		Landfilling	ton/year	Department of Natural Resources and Environment
		Making compost	ton/year	Department of Natural Resources and Environment
		Anaerobic treatment	ton/year	Department of Natural Resources and Environment
		Incineration	ton/year	Department of Natural Resources and Environment
		Open burning	ton/year	Department of Natural Resources and Environment
		Recycling	ton/year	Department of Natural

				Resources and Environment
	Hazardous waste			Department of Natural Resources and Environment
		Volume of hazardous waste	**ton/year**	Department of Natural Resources and Environment
		Treatment methods		Department of Natural Resources and Environment
		Landfilling	%	Department of Natural Resources and Environment
		Making compost	%	Department of Natural Resources and Environment
		Anaerobic treatment	%	Department of Natural Resources and Environment
		Incineration	%	Department of Natural Resources and Environment
		Open burning	%	Department of Natural Resources and Environment
		Recycling	%	Department of Natural Resources and Environment
		Amount of recovered CH_4		Department of Natural Resources and Environment
		Landfilling	ton/year	Department of Natural Resources and Environment
		Making compost	ton/year	Department of Natural Resources and Environment
		Anaerobic treatment	ton/year	Department of Natural Resources and Environment
		Incineration	ton/year	Department of Natural Resources and Environment
		Open burning	ton/year	Department of Natural Resources and Environment
		Recycling	ton/year	Department of Natural Resources and Environment
6.2	**Wastewater**			UDC
	Domestic wastewater	**Volume of wastewater generated**	**m^3/day**	UDC

		Treatment methods		UDC
		Direct discharge into rivers and lakes	%	UDC
		Stagnant sewer	%	UDC
		Flowing sewer	%	UDC
		Concentrated aerobic treatment plants (well managed)	%	UDC
		Concentrated aerobic treatment plants (poorly managed)	%	UDC
		Anaerobic sludge treatment	%	UDC
		Anaerobic reactions	%	UDC
		Anaerobic shallow lagoon	%	UDC
		Anaerobic deep lagoon	%	UDC
		Septic systems	%	UDC
		Latrine	%	UDC
		Latrine (regular sediment removal for fertilizer)	%	UDC
		Amount of collected sludge	**ton**	UDC
		Amount of recovered CH_4	**kg-CH_4**	UDC
	Industrial wastewater	**Volume of wastewater generated by each industry**	**m^3/day**	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA
		…. industry	m^3/day	UDC, HEPZA

		…. industry	m^3/day	UDC, HEPZA
		Treatment methods		UDC, HEPZA
		Direct discharge into rivers and lakes	%	UDC, HEPZA
		Concentrated aerobic treatment plants (well managed)	%	UDC, HEPZA
		Concentrated aerobic treatment plants (poorly managed)	%	UDC, HEPZA
		Anaerobic sludge treatment	%	UDC, HEPZA
		Anaerobic reactions	%	UDC, HEPZA
		Anaerobic shallow lagoon	%	UDC, HEPZA
		Anaerobic deep lagoon	%	UDC, HEPZA
		Amount of collected sludge	**ton**	UDC, HEPZA
		Amount of recovered CH4	**kg CH_4**	UDC, HEPZA
	Healthcare wastewater	**Volume of generated wastewater**	**m^3/day**	UDC, Department of Health
		Treatment methods		UDC, Department of Health
		Direct discharge into rivers and lakes	%	UDC, Department of Health
		Stagnant sewer	%	UDC, Department of Health
		Flowing sewer	%	UDC, Department of Health
		Concentrated aerobic treatment plants (well managed)	%	UDC, Department of Health
		Concentrated aerobic treatment plants (poorly managed)	%	UDC, Department of Health
		Anaerobic sludge treatment	%	UDC, Department of Health
		Anaerobic reactions	%	UDC, Department of Health
		Anaerobic shallow lagoon	%	UDC, Department of Health
		Anaerobic deep lagoon	%	UDC, Department of Health
		Septic systems	%	UDC, Department of Health

		Latrine	%	UDC, Department of Health
		Latrine (regular sediment removal for fertilizer)	%	UDC, Department of Health
		Amount of collected sludge	**ton**	UDC, Department of Health
		Amount of recovered CH_4	**kg-CH_4**	UDC, Department of Health
7	**CONSTRUCTION**			
7.1	**Building materials**	**Emission factor in production of building materials**		Department of Construction
		Cement	kg-CO_2/ton	Department of Construction
		Brick	kg-CO_2/ton	Department of Construction
		Adobe	kg-CO_2/ton	Department of Construction
		Steel	kg-CO_2/ton	Department of Construction
		Building glass	kg-CO_2/ton	Department of Construction
		Amount of building materials produced in Ho Chi Minh City		
		Cement	ton/year	Department of Construction
		Brick	ton/year	Department of Construction
		Adobe	ton/year	Department of Construction
		Steel	ton/year	Department of Construction
		Building glass	ton/year	Department of Construction
		Amount of building materials consumed in Ho Chi Minh City		
		Cement	ton/year	Department of Construction
		Brick	ton/year	Department of Construction
		Adobe	ton/year	Department of Construction
		Steel	ton/year	Department of Construction

7.2	**Civil construction activities**	Electricity consumption	kWh/m^2 floor	Surveys
		Water consumption	$m^3$of water/m^2 floor	Surveys
		Diesel oil consumption	litre/m^2 floor	Surveys
		Fuel oil consumption	litre/m^2 floor	Surveys
				Surveys
7.3	**Public works management**	Total floor area of housing construction	m^2	Department of Construction
		Housing construction density per capita	m^2/person	Department of Construction
		Total floor area of high-rise building construction	m^3	Department of Construction
		High-rise building construction density per capita	m^2/person	Department of Construction
		Total number of old residential buildings (without elevators)	building	Department of Construction
		Total floor area of old residential building (without elevators) construction	m^2	Department of Construction
		Old residential building construction density per capita	m^2/person	Department of Construction
		Total number of new residential buildings (with elevators)	building	Department of Construction
		Total floor area of new residential building (with elevators) construction	m^2	Department of Construction
		New residential building construction density per capita	m^2/person	Department of Construction
8	**Healthcare**			
		Number of hospitals	hospital	Department of Health
		Number of large hospitals (more than 100 beds)	hospital	Department of Health
		Number of local healthcare facilities	facility	Department of Health
		Total number of inpatients	person.day	Department of Health
		Total number of outpatients	person.day	Department of Health
		Emission factor calculated by number of inpatients	kg-CO_2/person.day	Department of Health
		Electricity consumption factor calculated by number of	kWh/person.day	Department of Health

		inpatients		
		Water consumption factor calculated by number of inpatients	m3 of water/person.day	Department of Health
		Emission factor calculated by number of outpatients	kg-CO_2/person.day	Department of Health
		Electricity consumption factor calculated by number of outpatients	kWh/person.day	Department of Health
		Water consumption factor calculated by number of outpatients	m3 of water/person.day	Department of Health
9	**AGRICULTURE**			
		Number of cattle and poultry by species		Department of Agriculture and Rural Development
		Dairy cattle	one animal	Department of Agriculture and Rural Development
		Other types of cattle (not dairy cattle)	one animal	Department of Agriculture and Rural Development
		Water buffalo	one animal	Department of Agriculture and Rural Development
		Sheep	one animal	Department of Agriculture and Rural Development
		Goat	one animal	Department of Agriculture and Rural Development
		Camel	one animal	Department of Agriculture and Rural Development
		Horse	one animal	Department of Agriculture and Rural Development
		Mule, donkey	one animal	Department of Agriculture and Rural Development
		Pig	one animal	Department of Agriculture and Rural Development
		Poultry	one animal	Department of Agriculture and Rural Development
		Others	one animal	Department of Agriculture and

				Rural Development
		Amount of waste generated by animal husbandry		Department of Agriculture and Rural Development
		Dairy cattle	kg/one animal/day	Department of Agriculture and Rural Development
		Other types of cattle (not dairy cattle)	kg/one animal/day	Department of Agriculture and Rural Development
		Water buffalo	kg/one animal/day	Department of Agriculture and Rural Development
		Sheep	kg/one animal/day	Department of Agriculture and Rural Development
		Goat	kg/one animal/day	Department of Agriculture and Rural Development
		Camel	kg/one animal/day	Department of Agriculture and Rural Development
		Horse	kg/one animal/day	Department of Agriculture and Rural Development
		Mule, donkey	kg/one animal/day	Department of Agriculture and Rural Development
		Pig	kg/one animal/day	Department of Agriculture and Rural Development
		Poultry	kg/one animal/day	Department of Agriculture and Rural Development
		Others	kg/one animal/day	Department of Agriculture and Rural Development
		Contributions of animal husbandry waste management methods		Department of Agriculture and Rural Development
		Daily dispersion	%	Department of Agriculture and Rural Development
		Aerobic treatment	%	Department of Agriculture and Rural Development
		Anaerobic digestion	%	Department of Agriculture and Rural Development
		Anaerobic digester tanks	%	Department of Agriculture and Rural Development

		Grassland	%	Department of Agriculture and Rural Development
		Rice growing area		Department of Agriculture and Rural Development
		Irrigation and drainage	ha	Department of Agriculture and Rural Development
		Rainwater irrigation	ha	Department of Agriculture and Rural Development
		Deep water area	ha	Department of Agriculture and Rural Development
		Others	ha	Department of Agriculture and Rural Development
		Cultivation area		Department of Agriculture and Rural Development
		Rice	ha	Department of Agriculture and Rural Development
		Vegetable	ha	Department of Agriculture and Rural Development
		Sugarcane	ha	Department of Agriculture and Rural Development
		Other cash crops	ha	Department of Agriculture and Rural Development
		N-fixing crops	ha	Department of Agriculture and Rural Development
		New grassland	ha	Department of Agriculture and Rural Development
		Cultivation yield		Department of Agriculture and Rural Development
		Rice	kg d.m./ha	Department of Agriculture and Rural Development
		Vegetable	kg d.m./ha	Department of Agriculture and Rural Development
		Sugarcane	kg d.m./ha	Department of Agriculture and Rural Development
		Other cash crops	kg d.m./ha	Department of Agriculture and Rural Development

		N-fixing crops	kg d.m./ha	Department of Agriculture and Rural Development
		New grassland	kg d.m./ha	Department of Agriculture and Rural Development
		Amount of N disposal in agricultural land		
		Synthetic fertilizer	kgN	
		NPK (16:16:8)	ton	
		NPK (30:15:10)	ton	
		Organic fertilizer	kgN	
		Cultivation waste	kgN	
		N mineralization generated by land use change activities	kgN	
10	**TOURISM – COMMUNITY AWARENESS IMPROVEMENT**			
10.1	**Tourism**			
10.2	**Community awareness improvement**			
11	**SOCIOECONOMY**			
11.1	**Economy**	Gross domestic product (GDP)	trillion dongs	
		Gross domestic product per capita (GDP/person)	dongs/person	
		Average GDP growth rate	%/year	
		GDP contribution by economic sectors		
		Industry - Construction	%	
		Trade - Service	%	

		Agriculture	%	
11.2	**Society**	Population	thousand people	Statistical Office in Ho Chi Minh City, HIDS
		Number of households	thousand households	Statistical Office in Ho Chi Minh City, HIDS
		Natural population growth rate	%/year	Statistical Office in Ho Chi Minh City, HIDS
		Mechanical population growth rate	%/year	Statistical Office in Ho Chi Minh City, HIDS
		Average household size	person/household	Statistical Office in Ho Chi Minh City, HIDS
		Population density	person/km^2	Statistical Office in Ho Chi Minh City, HIDS
12	**LEGAL DOCUMENTS**			
		Updating legal documents to include regulations, programs and projects related to adaptation to climate change in Ho Chi Minh City		
		Socioeconomy		HIDS
		Energy		Department of Industry and Trade, EVN HCMC
		Transport		Department of Transport, UCCI, MAUR
		Industry		Department of Industry and Trade
		Construction		Department of Construction
		Water supply		Department of Transport, SAWACO
		Drainage		Department of Transport, SCFC, UDC
		Waste management		Department of Natural Resources and Environment
		Healthcare		Department of Health

		Agriculture		Department of Agriculture and Rural Development
		Culture and tourism		Department of Culture, Sports and Tourism
13	**HYDROMETEOROLOGY AND CLIMATE CHANGE**			
13.1	**Meteorology/climate data**	Average temperature, maximum and minimum monthly temperatures, average monthly rainfall, highest monthly rainfall, number of rainy days, number of continuous rainy days, number of rainfall events with rainfall higher than 100mm	Celsius degree, mm, number of days, number of rainfall events	Hydrometeorological Observatory of Southern Region (2 + 14 +1 station), Ho Chi Minh City Sewerage Drainage Limited Company (11), National Steering Committee for Flood and Storm Prevention (6), Operating Centre for City Flood Control Programme (under investment), Ho Chi Minh City Sub-Directorate of Water Resource and Flood Control (under investment)
13.2	**Hydrology data**	Average monthly water level; highest and lowest monthly water levels	m	Hydrometeorological Observatory of Southern Region (2 +20), Department of Natural Resources and Environment (26), Ho Chi Minh City Irrigation Service Exploitation Management Company (17), Ho Chi Minh City Centre for Environmental Monitoring and Analysis, SAWACO (2), National Steering Committee for Flood and Storm Prevention (2), Operating Centre for City Flood Control Programme (under investment), Ho Chi Minh City Sub-Directorate of Water Resource and Flood Control

				(under investment)
13.3	**Climate change data**			
		Quality of surface water, urban canal water, groundwater, water for aquaculture		Department of Natural Resources and Environment (26 + 15 +3), Ho Chi Minh City Sub-Directorate for Seafood Resource Quality Management and Protection (26), National Agency for Water Resource Planning and Investigation (2), Vietnam National Institute for Oceanography (1)
		Air quality		Ho Chi Minh City Centre for Environmental Monitoring and Analysis (15)

Ⅳ. Presentation Materials

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1. International Symposium

ỦY BAN NHÂN DÂN THÀNH PHỐ HỒ CHÍ MINH

BAN CHỈ ĐẠO THỰC HIỆN KẾ HOẠCH HÀNH ĐỘNG ỨNG PHÓ VỚI BIẾN ĐỔI KHÍ HẬU

HOẠT ĐỘNG ỨNG PHÓ VỚI BIẾN ĐỔI KHÍ HẬU
Giai đoạn 2009-2015

TP.HCM, 06/11/2015

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NỘI DUNG TRÌNH BÀY

A. HOẠT ĐỘNG TRONG NƯỚC

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ

C. ĐỊNH HƯỚNG CÁC NHIỆM VỤ GIAI ĐOẠN 2016-2020

D. KẾT LUẬN

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A. CÁC HOẠT ĐỘNG TRONG NƯỚC

1. Triển khai chương trình mục têu quốc gia ứng phó BĐKH của thành phố 2010.

Thực hiện 14 nhiệm vụ/nhiều lĩnh vực, bao hàm các nội dung chính:

- Đánh giá mức độ nhận thức về BĐKH của cộng đồng.
- Nghiên cứu đánh giá ảnh hưởng của BĐKH đến ngành, lĩnh vực và đề xuất giải pháp ứng phó.
- Nâng cao nhận thức

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A. CÁC HOẠT ĐỘNG TRONG NƯỚC

2. Xây dựng và triển khai Kế hoạch hành động ứng phó BĐKH giai đoạn đến năm 2015

- Ban hành Kế hoạch hành động và bắt đầu triển khai năm 2013
- Thực hiện 41 chương trình, dự án/nhiều lĩnh vực
- Nội dung chính:

(1) Đánh giá mức độ ảnh hưởng của biến đổi khí hậu trên các lĩnh vực, đời sống kinh tế xã hội;

(2) Nâng cao nhận thức cộng đồng về biến đổi khí hậu;

(3) Nâng cao năng lực quản lý nhà nước để ứng phó biến đổi khí hậu;

(4) Xác định nhiệm vụ, dự án ưu tiên thích ứng và giảm thiểu biến đổi khí hậu.

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A. CÁC HOẠT ĐỘNG TRONG NƯỚC

2. Xây dựng và triển khai Kế hoạch hành động ứng phó BĐKH giai đoạn đến năm 2015

(5) Xây dựng trang thông tin điện tử

(6) Xây dựng hệ thống thông tin dữ liệu tích hợp

(7) Sổ tay hướng dẫn kỹ thuật quy hoạch, xây dựng

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A. CÁC HOẠT ĐỘNG TRONG NƯỚC

2. Xây dựng và triển khai Kế hoạch hành động ứng phó BĐKH giai đoạn đến năm 2015

(8) Xúc tiến đầu tư nước ngoài

(9) Kiểm kê khí nhà kính

(10) Đề án quản lý khí thải

(11) Thí điểm chiếu sang công cộng sử dụng đèn tiết kiệm năng lượng

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ 7

- TP.HCM là thành viên Tổ chức C40 (5/2009);
- Là thành viên Mạng lưới Kết nối các Thành phố Châu thổ (CDC);
- Là thành viên mạng lưới tăng trưởng xanh;

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ 8

Hợp tác với thành phố Rotterdam, Hà Lan (12/2009)

- Thực hiện *Chương trình TPHCM phát triển hướng về phía biển thích ứng với BĐKH* gđ 1 (2011-2013)
- Thực hiện *Chương trình TPHCM phát triển hướng về phía biển thích ứng với BĐKH* gđ 2 (2013-2015)

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ 9

Hợp tác với thành phố Osaka, Nhật Bản

1. Chương trình ***Quản lý tổng hợp chất thải bao gồm thu hồi năng lượng*** (giai đoạn 2011- 2013)

- Triển khai thí điểm chương trình phân loại chất thải rắn tại nguồn tại phường Bến Nghé quận 1.
- Tập huấn nâng cao năng lực cán bộ sở ngành, quận huyện (16 lượt cán bộ tham gia)
- Khảo sát, nghiên cứu hệ thống quản lý chất thải rắn trên địa bàn thành phố.

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ 10

Hợp tác với thành phố Osaka, Nhật Bản

1. Chương trình ***Quản lý tổng hợp chất thải bao gồm thu hồi năng lượng*** (giai đoạn 2011- 2013)

Kết quả: 2 dự án đề xuất ứng dụng cơ chế JCM được UBNDTP chấp thuận chủ trương làm nghiên cứu khả thi:

- Dự án sản xuất khí sinh học tái sinh năng lượng từ chất thải hữu cơ công suất 40-60 tấn/ngày tại Chợ đầu mối nông sản thực phẩm Bình Điền.
- Dự án xử lý chất thải rắn đô thị kết hợp tái sinh năng lượng (điện và nhiệt) công suất 400- 600 tấn/ngày.

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ 11

Hợp tác với thành phố Osaka, Nhật Bản

2. Chương trình ***Phát triển thành phố phát thải carbon thấp*** (giai đoạn 2014- 2015)

- Tập huấn nâng cao năng lực
- Xây dựng Kế hoạch hành ứng phó với biến đổi khí hậu TPHCM giai đoạn 2016-2020.

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ 12

Hợp tác với thành phố Osaka, Nhật Bản

2. Chương trình ***Phát triển thành phố phát thải carbon thấp*** (giai đoạn 2014- 2015)

Kết quả:

- Nâng cao năng lực: CCVC sở ngành TPHCM, được tập huấn các lĩnh vực: Quản lý chất thải, Quản lý nước thải, Thoát nước- chống ngập, Ứng phó BĐKH, Kiến thức về MRV, NAMA.

Trong đó có **37** lượt CCVC được gửi tập huấn ngắn hạn ở Nhật Bản với sự hỗ trợ tài chính của phía TP Osaka, GEC, IGES, Công ty Hitachi Zosen…

B. HOẠT ĐỘNG HỢP TÁC QUỐC TẾ

Hợp tác với thành phố Osaka, Nhật Bản

2. Chương trình ***Phát triển thành phố phát thải carbon thấp*** (giai đoạn 2014- 2015)

Kết quả:

- Xây dựng Kế hoạch hành ứng phó với biến đổi khí hậu TPHCM giai đoạn 2016-2020: với sự hỗ trợ của TP Osaka, GEC, nhóm AIM…
- Thu thập số liệu tính toán phát thải khí nhà kính cho năm cơ sở 2013: Với sự hỗ trợ của IGES-Kitakyushu, nhóm AIM

C. ĐỊNH HƯỚNG CÁC NHIỆM VỤ GIAI ĐOẠN 2016-2020

- Tiếp tục đẩy mạnh công tác tuyên truyền, nâng cao nhận thức cộng đồng về thích ứng và giảm thiểu tác động BĐKH.
- Tiếp tục đẩy mạnh chương trình nâng cao năng lực, phát triển nguồn nhân lực.
- Xây dựng và ban hành các chính sách hỗ trợ, các quy định đối với các dự án ứng phó BĐKH.

C. ĐỊNH HƯỚNG CÁC NHIỆM VỤ GIAI ĐOẠN 2016-2020

- Triển khai các dự án/chương trình trong KHHĐ 2016-2020. Trong đó chú trọng thực thi các dự án ứng dụng cơ chế JCM.
- Triển khai thí điểm các dự án công trình ứng phó BĐKH trên nhiều lĩnh vực.
- Xây dựng triển khai các dự án NAMA (Hành động giảm nhẹ phù hợp quốc gia).

D. KẾT LUẬN

- Xây dựng hoàn thiện và triển khai KHHĐ ứng phó BĐKH 2016-2020.
- Tăng cường hoạt động hợp tác quốc tế để hỗ trợ triển khai KHHĐ.
- Tiếp tục tăng cường và mở rộng hợp tác với Osaka, Nhật Bản trên nhiều lĩnh vực.

CÁM ƠN QUÝ VỊ ĐÃ THEO DÕI

DỰ THẢO

KẾ HOẠCH HÀNH ĐỘNG

ỨNG PHÓ VỚI BIẾN ĐỔI KHÍ HẬU TRÊN ĐỊA BÀN THÀNH PHỐ HỒ CHÍ MINH GIAI ĐOẠN 2016-2020, TẦM NHÌN ĐẾN 2030

Văn phòng Biến đổi khí hậu Thành phố Hồ Chí Minh
Tháng 11-2015

+ NỘI DUNG

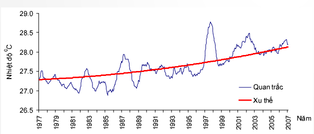
2

1. Nguyên tắc xây dựng Kế hoạch hành động ứng phó với BĐKH 2016-2020
2. Mục tiêu của KHHĐ 2016-2020
3. Định hướng xây dựng KHHĐ 2016-2020
4. Danh mục giải pháp ứng phó với BĐKH

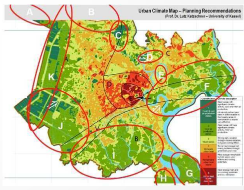
+ 1. Nguyên tắc xây dựng

3

- **2 yếu tố BĐKH quan trọng nhất đối với TP.HCM, kéo theo tất cả các hậu quả:**
  - Nhiệt độ trung bình tăng lên
  - Cường độ mưa lớn và cực đoan



Xu hướng gia tăng nhiệt độ trong giai đoạn 1977-2007.
Nguồn: DOST, 2010.



Phân bố nhiệt độ ở TP HCM
Nguồn: MegaCity Project, 2012.

+ 1. Nguyên tắc xây dựng

4

- **Lồng ghép các yếu tố biến đổi khí hậu** vào trong các Chiến lược, Qui hoạch, Chương trình, Kế hoạch và Dự án phát triển kinh tế và xã hội của thành phố.
- **Giảm thiểu BĐKH:** Giảm phát thải KNK hoặc tăng hiệu quả sử dụng năng lượng và tài nguyên.
- **Thích nghi với BĐKH:** chuyển dần theo hướng tận dụng các mặt mạnh của biến đổi khí hậu với chi phí nhỏ nhất.

+ 1. Nguyên tắc xây dựng

5

- Lựa chọn các lĩnh vực kinh tế và xã hội bị tác động do biến đổi khí hậu được dựa trên cơ sở kinh nghiệm các nước và thực tế tại thành phố Hồ Chí Minh.
- **Thứ tự ưu tiên của mỗi lĩnh vực** được xây dựng dựa trên cơ sở:
  1. Tầm quan trọng chi phối
  2. Đóng góp GDP
  3. Lượng phát thải KNK

+ 1. Nguyên tắc xây dựng

6

- **10 lĩnh vực trong kế hoạch ứng phó với BĐKH:**
  1. Quy hoạch đô thị
  2. Năng lượng
  3. Giao thông
  4. Công nghiệp
  5. Quản lý nước
  6. Quản lý chất thải
  7. Xây dựng
  8. Y tế
  9. Nông nghiệp
  10. Du lịch, văn hóa và nâng cao nhận thức cộng đồng

+ 1. Nguyên tắc xây dựng

7

- **Đánh giá tác động của BĐKH đến các lĩnh vực:**
  - ***Định tính*** *theo các lĩnh vực:* đơn giản và không cần nhiều số liệu.
  - ***Định lượng*** *theo các lĩnh vực:* rất phức tạp và cần rất nhiều số liệu của tất cả các lĩnh vực trong thời gian nhiều năm.

Ngân hàng dữ liệu và phương pháp tính toán về BĐKH của TP.HCM còn rất hạn chế.

→ Chọn đánh giá **định tính** trong giai đoạn này (triển khai nghiên cứu đánh giá định lượng trong giai đoạn 2016-2020).

+ 1. Nguyên tắc xây dựng

8

- **Hợp tác quốc tế -** hợp tác với thành phố Osaka thông qua *Chương trình Phát triển Thành phố phát thải cac-bon thấp*, trong đó có 2 nhóm hoạt động chính:
  - Tập huấn nâng cao năng lực đội ngũ cán bộ quản lý để xây dựng KHHĐ;
  - Hợp tác triển khai công tác kiểm kê KNK (IGES, 2013); dự báo phát thải KNK năm 2020, tính toán tiềm năng giảm phát thải và đề xuất mục tiêu giảm phát thải KNK cho năm 2020 (nhóm AIM, 2014 và 2015).

+ 2. Mục tiêu của KHHĐ 2016-2020

9

- **Tăng cường năng lực ứng phó với BĐKH** của TP.HCM khi triển khai các quy hoạch, kế hoạch phát triển kinh tế - xã hội.
- **Đóng góp vào mục tiêu giảm phát thải KNK** của quốc gia, qua đó nâng cao hiệu quả sử dụng năng lượng và tài nguyên.
- Nâng cao khả năng hợp tác quốc tế và thu hút đầu tư trong công tác ứng phó với BĐKH.

+ 2. Mục tiêu của KHHĐ 2016-2020

10

- **Mục tiêu giảm phát thải KNK năm 2020 so với kịch bản BaU*:**

MỤC TIÊU TỔNG THỂ	
Mức đóng góp vô điều kiện (tự đóng góp)	**10,5%**
Mức đóng góp có điều kiện (có hỗ trợ bên ngoài) - (nếu tính cả tiềm năng giảm phát thải từ lưới điện với 6,1%)	**19,1%**
MỤC TIÊU RIÊNG SO VỚI PHÁT THẢI CỦA NGÀNH	
Năng lượng	**18,5%**
Giao thông	**9,3%**
Công nghiệp	**7,9%**
Quản lý chất thải	**53%**
Nông nghiệp	**2%**

** Kết quả tính toán do nhóm AIM thực hiện dựa trên số liệu do TP.HCM cung cấp.*

+ 3. Định hướng xây dựng KHHĐ 2016-2020

11

- **Nâng cao hiệu quả sử dụng** năng lượng và tài nguyên trong các hoạt động phát triển KT-XH của TP.HCM.
- Thể hiện **tất cả nhu cầu tổng thể** của TP.HCM trong công tác ứng phó với BĐKH → Giúp các nhà quản lý, các nhà đầu tư trong và ngoài nước biết rõ định hướng và nhu cầu của thành phố Hồ Chí Minh.
- Triệt để tận dụng các nguồn tài chính quốc tế liên quan đến BĐKH và khai thác triệt để cơ chế hợp tác "Chính phủ/Thành phố với Thành phố" (Government/City to City).

+ 3. Định hướng xây dựng KHHĐ 2016-2020

12

- **2 vấn đề chính của KHHĐ 2016-2020:**
  - **Hệ thống văn bản pháp lý** cần phải xây dựng nhằm phục vụ cho công tác quản lý Nhà Nước trong các hoạt động ứng phó với BĐKH.
  - **Tích hợp yếu tố BĐKH** vào các Chiến lược, Chương trình, Kế hoạch phát triển KT-XH hiện hữu của TP.HCM và **đề xuất các dự án** ứng phó với BĐKH.

3. Định hướng xây dựng KHHĐ 2016-2020

13

- *Tiếp tục thực hiện và nâng cao hiệu quả các giải pháp **giảm thiểu** BĐKH:*
  - Lượng phát thải hoặc giảm phát thải CO_2 có thể là **chỉ tiêu gián tiếp** để **đánh giá hiệu quả hoạt động** của các lĩnh vực phát triển KT-XH.
  - Phải triển khai được những dự án cụ thể.

3. Định hướng xây dựng KHHĐ 2016-2020

14

- *Từng bước chuẩn bị và thực hiện các giải pháp **thích ứng** với BĐKH:*
  - Đẩy mạnh các giải pháp thích nghi theo hướng tận dụng các mặt mạnh của biến đổi khí hậu với chi phí nhỏ nhất và các giải pháp nâng cao nhận thức.
  - Xúc tiến tìm kiếm nguồn vốn hỗ trợ các dự án xây dựng cơ sở hạ tầng quy mô lớn.

4. Danh mục giải pháp ứng phó BĐKH

15

① **Phụ lục 1** - Danh mục giải pháp được thực hiện trong giai đoạn 2016-2020 sử dụng nguồn ngân sách thành phố do Ban Chỉ đạo thực hiện KHHĐ ứng phó với BĐKH điều phối

- tính khả thi cao,
- thí điểm quy mô nhỏ,
- thời gian thực hiện ngắn,
- kinh phí thấp.

4. Danh mục giải pháp ứng phó BĐKH

16

② **Phụ lục 2** - Danh mục giải pháp có nhu cầu kêu gọi đầu tư và hỗ trợ tài chính quốc tế để đóng góp vào hoạt động ứng phó BĐKH của TP.HCM

- phát triển cơ sở hạ tầng,
- quy mô lớn,
- thời gian thực hiện dài,
- kinh phí lớn,
- bao gồm cả các giải pháp xây dựng cơ sở hạ tầng lớn không thuộc phạm vi điều phối của Ban Chỉ đạo thực hiện KHHĐ ứng phó với BĐKH

CHÂN THÀNH CẢM ƠN QUÝ VỊ.

Ý kiến đóng góp sau cuộc họp vui lòng gửi về Văn phòng Biến đổi khí hậu hoặc qua hộp thư điện tử:
bdkh.stnmt@tphcm.gov.vn

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Osaka City

HỢP TÁC HƯỚNG ĐẾN XÂY DỰNG MÔ HÌNH THÀNH PHỐ CÓ LƯỢNG PHÁT THẢI CACBON THẤP GIỮA THÀNH PHỐ HỒ CHÍ MINH- THÀNH PHỐ OSAKA

Thành phố Osaka

Osaka City

QUAN HỆ HỢP TÁC THÀNH PHỐ OSAKA- HỒ CHÍ MINH

TRAO ĐỔI BẢN GHI NHỚ（Tháng 10 năm 2013）

1. Quyết định kế hoạch thực hiện đối sách phòng chống biến đổi khí hậu.
2. Thúc đẩy dự án liên kết giữa nhân dân và nhà nước
3. Thực hiện liên tục các buổi đối thoại chính sách

Osaka City

10 Lĩnh vực thuộc đối tượng nằm trong kế hoạch thực hiện chính sách phòng chống biến đổi khí hậu

- I Qui hoạch đô thị
- II Năng lượng
- III Giao thông vận tải
- IV Công nghiệp
- V Quản lý nước
- VI Quản lý chất thải
- VII Xây dựng
- VIII Y tế
- IX Nông nghiệp
- X Du lịch và nâng cao nhận thức cộng đồng

Osaka City

THÀNH LẬP DỰ ÁN MỚI TRÊN CƠ SỞ PHÁT HUY JCM (GIAO THÔNG)

（Nguồn: Công ty cổ phần vận tải Nhật bản ）

Osaka City

THÀNH LẬP DỰ ÁN MỚI TRÊN CƠ SỞ PHÁT HUY JCM (QUẢN LÝ RÁC THẢI)

（Nguồn: SATRA）

Osaka City

THÀNH LẬP DỰ ÁN MỚI TRÊN CƠ SỞ PHÁT HUY JCM (NĂNG LƯỢNG)

（Nguồn: Cơ quan phát triển tổng hợp kỹ thuật, sản xuất, năng lượng mới (phòng nghiên cứu quốc gia)

THỰC HIỆN ĐỐI THOẠI CHÍNH SÁCH CẤP THỊ TRƯỞNG THÀNH PHỐ OSAKA- HCM

Lần 1：Tháng 10 năm 2013, tại thành phố Osaka
Lần 2：Tháng 1 năm 2015, tại thành phố HCM
Lần 3：Tháng 11 năm 2015, tại thành phố HCM

TUYÊN TRUYỀN THÔNG TIN TRONG VÀ NGOÀI NƯỚC

(Nguồn: http://www.hls-esc.org/)

HOẠT ĐỘNG, XU HƯỚNG QUỐC TẾ

(Nguồn ENB)

TẦM QUAN TRỌNG CỦA QUẢN LÝ TIẾN TRIỂN CỦA KẾ HOẠCH

TẦM QUAN TRỌNG CỦA ĐIỀU HÀNH TỪ CHÍNH PHỦ

Soạn thảo sách hướng dẫn, sổ tay

HƯỚNG TỚI XÂY DỰNG THÀNH PHỐ HỒ CHÍ MINH VỚI LƯỢNG PHÁT THẢI CACBON THẤP


CÁM ƠN!
QUÝ VỊ ĐÃ LẮNG NGHE

Dự án hỗ trợ thiết bị cơ chế tín chỉ chung JCM (Joint Crediting Mechanism)

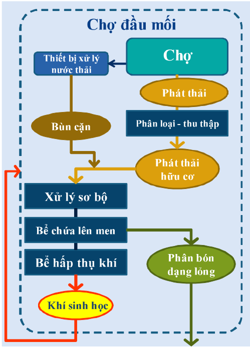
Dự án sử dụng khí và lên men metan đối với phát thải hữu cơ ở chợ đầu mối

Tháng 11 năm 2015

Bên thực hiện dự án:
(Phía Nhật Bản) Hitachi Zosen Corporation,
Satisfactory International Jsc
(Phía Việt Nam) Tổng công ty thương mại Sài Gòn (SATRA)

Hitz
Hitachi Zosen

Khái quát dự án

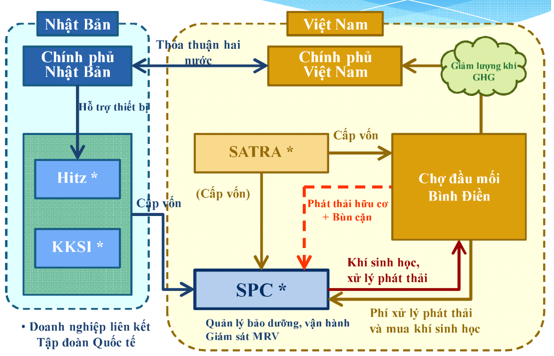


Bằng việc phân loại, thu thập rác thải hữu cơ từ phát thải ở chợ đầu mối Bình Điền trong thành phố Hồ Chí Minh, sau đó tiến hành xử lý kỵ khí bằng hệ thống lên men metan lắp đặt ở cùng địa điểm, khí sinh học thu được sẽ cung cấp cho nhà máy chế biến thủy sản.

Thực hiện giảm lượng rác thải hữu cơ được xử lý chôn lấp bằng cách xử lý ngay tại nguồn thải ra, sau đó phát thải hữu cơ sẽ được vận chuyển từ chợ đầu mối Bình Điền đến nơi xử lý cuối cùng, đến nay, dự án có thể giảm lượng khí metan thải ra từ các bãi chôn lấp.

Đồng thời, khí sinh học thu được sẽ cung cấp cho nhà máy chế biến thủy sản làm năng lượng thay thế dầu mỏ, đến nay, có thể giảm lượng sử dụng nhiên liệu hóa thạch đang được sử dụng trong nhà máy chế biến thủy sản.

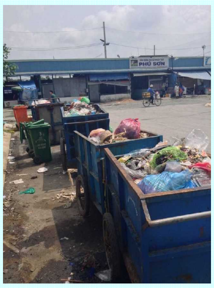
Cơ chế thực hiện dự án



Nội dung điều tra năm 2013

1. Điều tra lượng rác thải thải ra từ chợ đầu mối
   - Lượng rác thải thải ra
   - Tỷ lệ rác thải hữu cơ
2. Thí nghiệm kiểm chứng phân tích thành phần rác thải hữu cơ, lượng khí đốt phát sinh, v.v…
   - Phân tích thành phần
   - Thí nghiệm liên tục trong phòng
3. Phát triển phương pháp luận cơ chế tín chỉ chung JCM (Joint Crediting Mechanism)
4. Điều tra tìm hiểu về thiết kế cơ bản cơ sở, doanh nghiệp thực hiện ở địa phương - nhà sản xuất thiết bị

Điều tra rác thải ở chợ đầu mối: phần 1



Điều tra về lượng phát thải thải ra

Nắm bắt tổng khối lượng rác thải thải ra từ chợ đầu mối thông qua số lượng xe tải và xe đẩy tay chở rác.

Điều tra phát thải ở chợ đầu mối: phần 2

Điều tra về thành phần phát thải

Tiến hành phân loại - định lượng rác hữu cơ và rác không phù hợp lên men, ngoài ra định lượng rác không phù hợp lên men với mỗi thành phần như vỏ sò, tre, đồ nhựa, v.v…

Thí nghiệm trong phòng

Thiết bị thí nghiệm

Rác thải nhà bếp được dùng thí nghiệm

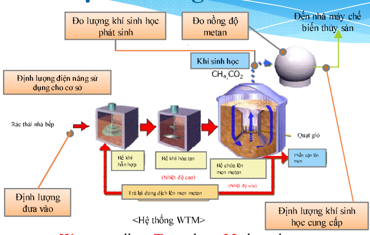
Kết quả điều tra năm 2013

Mục	Kết quả điều tra				
		Tổng khối lượng phát thải		Lượng phát thải hữu cơ	
Tổng khối lượng		46,8	Tấn/ngày	38,0	Tấn/ngày
Quầy rau quả		59,2	%	72,8	%
Quầy trái cây	13,5	13,5	%	16,6	%
Quầy hải sản	1,8	1,8	%	2,2	%
Quầy hoa tươi	0,9	0,9	%	1,1	%
Quầy thịt	1,3	1,3	%	1,6	%
Rác không phù hợp lên men	18,8	18,8	%	--	
Bùn cặn xử lý thoát nước	4,7	4,7	%	5,8	%

*Rác không phù hợp lên men:
Vỏ sò, tre, túi-dây ni lông, giấy thải, bìa cứng, cốc nhựa-ống hút, nhựa xốp polixtiren, các loại vải, túi bao cát, vỏ dừa,

Mục	Nhật Bản	Việt Nam
Thực phẩm - nguyên liệu	Rác thải nhà bếp hỗn hợp	Rác thải nhà bếp (Chủ yếu là rau)
Thời gian duy trì	15 ngày	15 ngày
Nồng độ đưa vào bể chứa lên men	Khoảng 10 %	Từ 10 % trở xuống
Hệ số tỷ lệ phát sinh khí sinh học	150 Nm^3/tấn	32,7 L/L
Tốc độ phân hủy nồng độ khí metan m^3/kg-CODcr	0,35	Cùng mức độ
Tốc độ phân hủy chất hữu cơ Quy đổi ra CODcr	70 ~ 75 %	Từ 75 % trở lên
Nồng độ metan	50 ~ 65 %	Khoảng 60 %

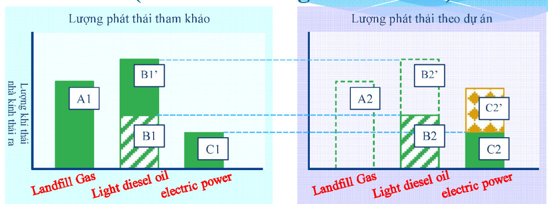
Giản đồ thiết bị và điểm giám sát



Water-needless Two-phase Methanation system

Mục định lượng	Nội dung giám sát
Lượng đưa vào	Lượng phát thải xử lý ở cơ sở (Lượng phát thải thay thế xử lý chôn lấp)
Lượng khí sinh học thu được	Lượng khí sinh học thu được bằng phương pháp lên men metan
Nồng độ metan	Nồng độ metan trong khí sinh học thu được
Lượng khí sinh học cung cấp	Lượng khí sinh học sử dụng ở nhà máy chế biến thủy sản (Ngoại trừ phần nhiệt sử dụng từ lượng khí sinh học thu được ở cơ sở)
Năng lượng điện sử dụng	Lượng điện năng đã sử dụng để vận hành thiết bị

Phương pháp luận cơ thế tín chỉ chung JCM (Joint Crediting Mechanism)



Lượng phát thải tham khảo = A1 + B1 + B1' + C1

Lượng phát thải theo dự án = B2 + C2 + C2'

*A1 = A2, B1 = B2 → B1' = B2', C1 = C2

*C1 (= C2): Lượng điện năng tiêu thụ của nhà máy chế biến thủy sản

C2': Lượng điện năng tiêu thụ của cơ sở lên men metan

Giảm lượng khí thải nhà kính
= A2 + B2' – C2'
= A1 + B1' – C2'

Thông số giám sát MRV:

A1: Khối lượng rác thải nhà bếp đưa vào

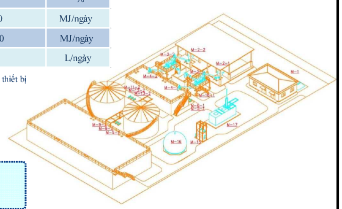
B1': Nồng độ metan và lượng khí sinh học sử dụng

C2': Lượng điện năng tiêu thụ ở cơ sở lên men metan

Điều kiện thiết kế cơ bản (Dự án hỗ trợ thiết bị)

Mục	Giá trị tính toán	Đơn vị
Đối tượng rác xử lý Rác thải nhà bếp Bùn cặn thải ra	50 (trong đó rác không thích hợp lên men chiếm 5 %) 3	Tấn/ngày Tấn/ngày
Lượng khí sinh học phát sinh	1.500	m^3/ngày
Nồng độ metan	55	%
Nhiệt lượng khí sinh học	30.000	MJ/ngày
Nhiệt lượng khí đốt cung cấp*1	25.740	MJ/ngày
Giá trị quy đổi dầu mỏ	672	L/ngày

*1 Ngoại trừ năng lượng tiêu thụ bên trong nhằm bảo quản thiết bị (Hiệu suất nồi hơi: 80%)

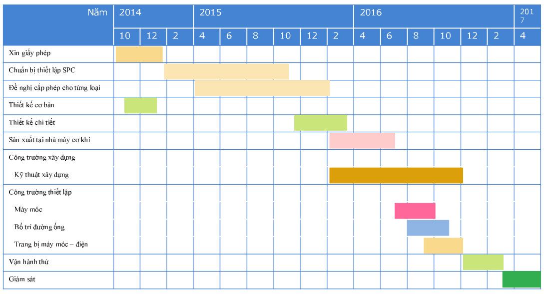


Tổng chi phí xây dựng: khoảng 340,000,000JPY

Nội dung thực hiện dự án hỗ trợ thiết bị (~2015/10)

1. Triển khai thiết kế cơ bản và một phần thiết kế chi tiết
2. Điều tra lại về những nơi sử dụng khí sinh học(Nhu cầu của nhà máy chế biến thủy sản)
3. Xây dựng kế hoạch đầu tư (IR) và đánh giá tác động đến môi trường (EIA)
4. Đồng ý với Phương pháp luận cơ thế tín chỉ chung JCM (Joint Crediting Mechanism)

Kế hoạch

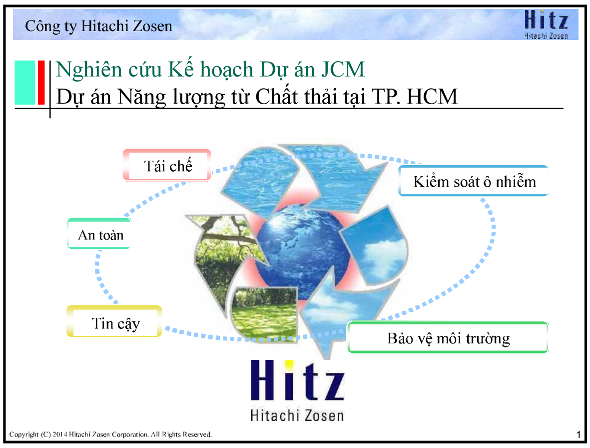


Các giới hạn thời gian của dự án hỗ trợ thiết bị

1. Trong năm nay thì thiết lập SPC
2. Trong năm nay đặt hàng máy móc
3. Đến tháng 3 năm sau, hoàn thành việc sản xuất máy móc

Cám ơn vì đã lắng nghe

Hitz
Hitachi Zosen
Water Treatment & Industrial Equipment Headquarters
Ninety Bldg., 5-3-28, Nishikujo, Konohana-ku, Osaka 554-0012, Japan
Phone: +81-6-6467-5725 http://www.hitachizosen.co.jp/english/index.html


Công ty Hitachi Zosen
Hitz
Nghiên cứu Kế hoạch Dự án JCM
Dự án Năng lượng từ Chất thải tại TP. HCM
Tái chế
Kiểm soát ô nhiễm
An toàn
Tin cậy
Bảo vệ môi trường
Hitz
Hitachi Zosen
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1


Quá trình triển khai
Hitz
Hitachi Zosen
<Trước 2014>
● Công ty Hitachi Zosen ("Hitz") đã thực hiện nghiên cứu khả thi về quản lý chất thải rắn tại TP. Hồ Chí Minh trong gần 03 năm qua kể từ khi ký kết Biên bản Thỏa thuận hợp tác giữa TP. Hồ Chí Minh và TP. Osaka và tổ chức Hội thảo khởi động về quản lý tổng hợp chất thải rắn ngày 16/02/2012.
● Ngày 5/8/2014 trình thư yêu cầu đồng ý về việc phát điện bằng chất thải lên UBND thành phố HCM. UBND thành phố HCM đã giới thiệu đoàn thẩm tra đến sở TNMT thành phố.
<Năm 2015>
● Ngày 3/2/2015, đã nhận được quy định về việc điều tra và HĐND đã thông qua Sở TNMT đã chỉ thị đưa ra báo cáo FS họp bàn về các điều kiện thực hiện công việc.
● 11/6/2015 và 21/7 đến gặp Sở TNMT, họp bàn về đối tượng rác thải, địa điểm xây dựng và trách nhiệm của các cán bộ liên quan.
●27/9/2015, Đưa ra báo cáo FS
● 2/10/2015 trong hội nghị giữa các ban ngành liên quan do Sở TNMT chủ trì, Sở TNMT đã chỉ thị sửa đổi những thông tin tương ứng trong báo cáo FS mà liên quan đến đối tượng rác thải, địa điểm đã được đề xuất với Sở TNMT.
LỄ PHÁT ĐỘNG
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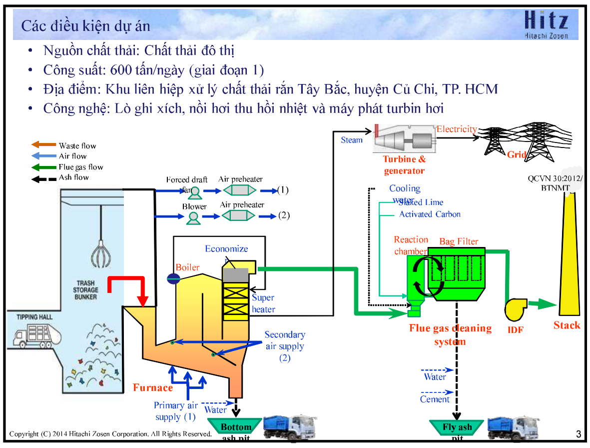
2


Các điều kiện dự án
Hitz
• Nguồn chất thải: Chất thải đô thị
• Công suất: 600 tấn/ngày (giai đoạn 1)
• Địa điểm: Khu liên hiệp xử lý chất thải rắn Tây Bắc, huyện Củ Chi, TP. HCM
• Công nghệ: Lò ghi xích, nồi hơi thu hồi nhiệt và máy phát turbin hơi
Waste flow
Air flow
Flue gas flow
Ash flow
Steam
Electricity
Turbine & generator
Grid
QCVN 30:2012/BTNMT
Forced draft fan
Air preheater
Blower
Cooling water
Slaked Lime
Activated Carbon
Economizer
Reaction chamber
Bag Filter
Boiler
TRASH STORAGE BUNKER
TIPPING HALL
Super heater
Secondary air supply (2)
Flue gas cleaning system
IDF
Stack
Furnace
Primary air supply (1)
Water
Cement
Bottom ash pit
Fly ash pit
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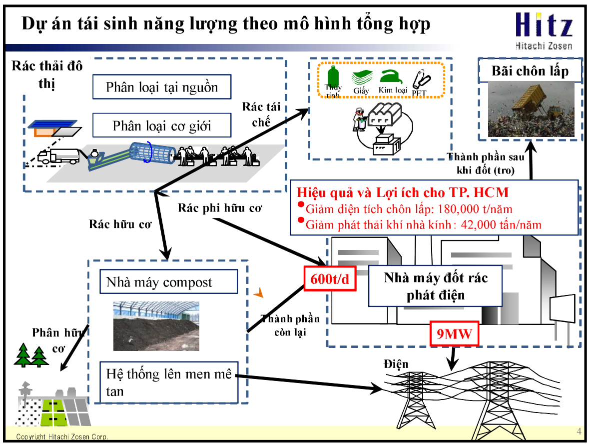
3


Dự án tái sinh năng lượng theo mô hình tổng hợp
Hitz
Hitachi Zosen
Rác thải đô thị
Phân loại tại nguồn
Phân loại cơ giới
Rác tái chế
Bãi chôn lấp
Thành phần sau khi đốt (tro)
Hiệu quả và Lợi ích cho TP. HCM
•Giảm diện tích chôn lấp: 180,000 t/năm
•Giảm phát thải khí nhà kính : 42,000 tấn/năm
Rác hữu cơ
Rác phi hữu cơ
Nhà máy compost
600t/d
Nhà máy đốt rác phát điện
Thành phần còn lại
9MW
Phân hữu cơ
Hệ thống lên men mê tan
Điện
Copyright Hitachi Zosen Corp.
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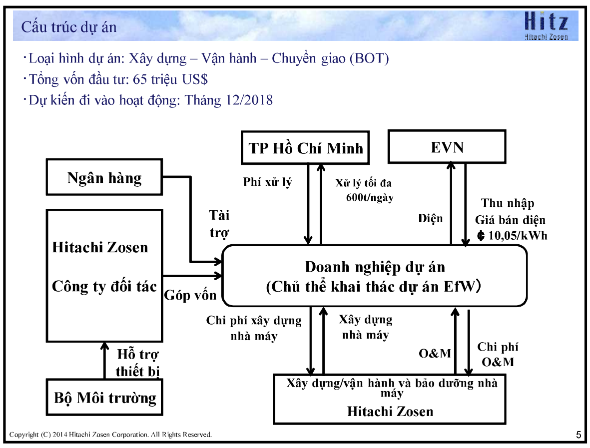
Cấu trúc dự án
Hitz
・Loại hình dự án: Xây dựng – Vận hành – Chuyển giao (BOT)
・Tổng vốn đầu tư: 65 triệu US$
・Dự kiến đi vào hoạt động: Tháng 12/2018
TP Hồ Chí Minh
EVN
Ngân hàng
Phí xử lý
Xử lý tối đa 600t/ngày
Thu nhập
Giá bán điện ₫ 10,05/kWh
Tài trợ
Điện
Hitachi Zosen
Công ty đối tác
Góp vốn
Doanh nghiệp dự án
(Chủ thể khai thác dự án EfW)
Chi phí xây dựng nhà máy
Xây dựng nhà máy
O&M
Chi phí O&M
Hỗ trợ thiết bị
Bộ Môi trường
Xây dựng/vận hành và bảo dưỡng nhà máy
Hitachi Zosen
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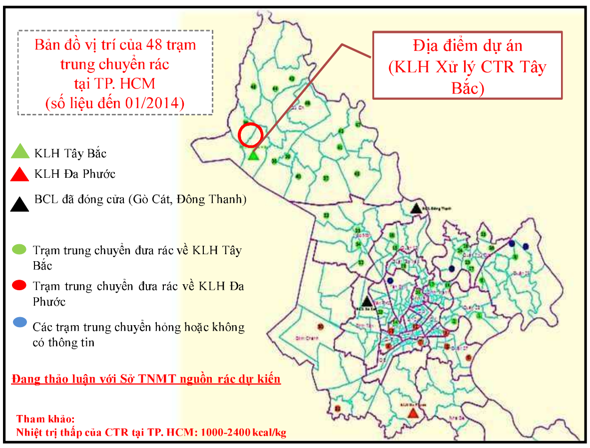
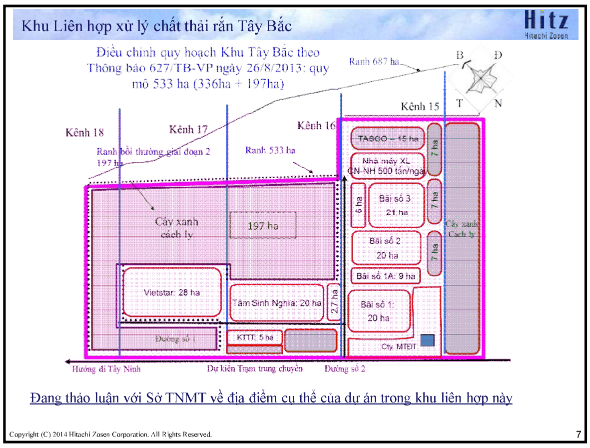
5


Bản đồ vị trí của 48 trạm trung chuyển rác tại TP. HCM (số liệu đến 01/2014)
Địa điểm dự án (KLH Xử lý CTR Tây Bắc)
KLH Tây Bắc
KLH Đa Phước
BCL đã đóng cửa (Gò Cát, Đông Thạnh)
Trạm trung chuyển đưa rác về KLH Tây Bắc
Trạm trung chuyển đưa rác về KLH Đa Phước
Các trạm trung chuyển hỏng hoặc không có thông tin
Đang thảo luận với Sở TNMT nguồn rác dự kiến
Tham khảo:
Nhiệt trị thấp của CTR tại TP. HCM: 1000-2400 kcal/kg



Khu Liên hợp xử lý chất thải rắn Tây Bắc
Hitz
Hitachi Zosen
Điều chỉnh quy hoạch Khu Tây Bắc theo Thông báo 627/TB-VP ngày 26/8/2013: quy mô 533 ha (336ha + 197ha)
Ranh 687 ha
B
Đ
T
N
Kênh 15
Kênh 16
Kênh 17
Kênh 18
Ranh bồi thường giai đoạn 2
197 ha
Ranh 533 ha
TASCO – 15 ha
Nhà máy XL CN-NH 500 tấn/ngày
7 ha
6 ha
Bãi số 3
21 ha
7 ha
Cây xanh cách ly
197 ha
Cây xanh Cách ly
Bãi số 2
20 ha
7 ha
Bãi số 1A: 9 ha
Vietstar: 28 ha
Tâm Sinh Nghĩa: 20 ha
2,7 ha
Bãi số 1:
20 ha
Đường số 1
KTTT: 5 ha
Cty. MTĐT
Hướng đi Tây Ninh
Dự kiến Trạm trung chuyển
Đường số 2
Đang thảo luận với Sở TNMT về địa điểm cụ thể của dự án trong khu liên hợp này
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7

Technology for People, the Earth, and the Future
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Hitachi Zosen
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8

CÔNG TY AEON VỚI GIẢI PHÁP GIẢM KHÍ THẢI CARBON

NGÀY 06 THÁNG 11 NĂM 2015

AEON

AEON MALL

GIỚI THIỆU CÔNG TY AEON

THÀNH LẬP — THÁNG 9 NĂM 1926
VỐN ĐẦU TƯ — 220 TỶ 7 TRIỆU YÊN
CÔNG TY LIÊN QUAN — 284 CÔNG TY

<NGÀNH NGHỀ CHÍNH>

- TRUNG TÂM BÁCH HOÁ
- SIÊU THỊ
- CỬA HÀNG GIẢM GIÁ
- CỬA HÀNG TIỆN LỢI
- CỬA HÀNG CHUYÊN DỤNG
- DỊCH VỤ TÀI CHÍNH
- KINH DOANH DỊCH VỤ
- HIỆU THUỐC

TỔNG SỐ CỬA HÀNG
18,008CỬA HÀNG(02/2015)

2

TRIẾT LÝ CƠ BẢN CỦA AEON

TRIẾT LÝ AEON

Từ "AEON" có nguồn gốc từ tiếng Latin, mang ý nghĩa "Sự trường tồn bất diệt". Trọng tâm trong triết lý của chúng tôi là khách hàng: tôn chỉ lấy Niềm tin và Ước muốn của khách hàng làm trọng tâm được AEON xem là yếu tố cốt lõi

"Hòa bình": Mọi hoạt động của AEON đều hướng đến mục đích theo đuổi sự phát triển thịnh vượng tạo nền hòa bình ổn định.

"Con người": AEON luôn tôn trọng và đề cao phẩm chất và giá trị của con người, cũng như luôn cố gắng thúc đẩy việc xây dựng những nhưng mối quan hệ gắn bó trong cùng một tập thể.

"Cộng đồng": AEON không ngừng cống hiến hết mình góp phần tạo nên sự gắn kết phát triển bền vững của cộng đồng.

3

AEON GROUP – SHOPING MALL

AEON GROUP MỞ RỘNG Ở 13 QUỐC GIA

70NGÀN 785TỶYÊN TỔNG DOANH THU

44VẠN TỔNG SỐ NHÂN VIÊN

10NGÀN 9,260TỶ円 THƯƠNG MẠI ĐIỆN TỬ DOANH THU /NĂM

3Tr567 THẺ THANH TOÁN DỊCH VỤ LIÊN QUAN SỐ LƯỢNG THẺ THÀNH VIÊN

NHẬT BẢN **142**CỬA HÀNG

TRUNG QUỐC **7** CỬA HÀNG

ASEAN **34** CỬA HÀNG

CHI NHÁNH ASIA	SL
AEON MALAYSIA	29
AEON VIETNAM	3
AEON CAMPUCHIA	1
AEON INDONESIA	1
TỔNG CỘNG	34

（SỐ LIỆU 10/2015）

4

CÁC HOẠT ĐỘNG XÃ HỘI VÀ MÔI TRƯỜNG

"ĐÓNG GÓP CHO ĐỊA PHƯƠNG THÔNG QUA THƯƠNG MẠI" ĐÃ BẮT ĐẦU TRONG TUYÊN BỐ SỨ MỆNH NĂM 1970

THỰC HIỆN QUẢN LÝ BỀN VỮNG

CHIẾN LƯỢC NĂNG LƯỢNG ĐẾN NĂM 2020

DỰ ÁN SINH THÁI AEON

NĂM 2020
- TRỒNG ĐẠT 10 TRIỆU CÂY
- PHÁT TRIỂN AEON THÔNG MINH

XÂY DỰNG CHÍNH SÁCH
CHÍNH SÁCH BỀN VỮNG
CHÍNH SÁCH ĐA DẠNG SINH HỌTIC
TUYÊN BỐ CHỐNG KHÍ HẬU NÓNG LÊN

NĂM 2011

NĂM 2008
- LẮP ĐẶT HỆ THỐNG SẠC CHO EV TẠI LAKETOWN

NỖ LỰC MỞ RỘNG
THÀNH LẬP AEONDE

NĂM 2007
- TRIỂN KHAI SỰ KIỆN NHẬN PHIẾU MUA HÀNG TRẢ QUÀ
- NHẬN CHỨNG CHỈ ISO

NĂM 2000

THÀNH LẬP
Câu Lạc Bộ AEON 1%
QUỸ MÔI TRƯỜNG AEON
ĐÓNG GÓP CHO MÔI TRƯỜNG VÀ XÃ HỘI

NĂM 1991

NĂM 1989
- BẮT ĐẦU TRIỂN KHAI CÁC HOẠT ĐỘNG CÂU LẠC BỘ AEON NHƯ PHONG TRÀO TRỒNG RỪNG AEON, PHONG TRÀO MANG TÚI MUA SẮM TÁI CHẾ , HOẠT ĐỘNG XANH VÀ SẠCH

NĂM 1981
- LẮP ĐẶT HỆ THỐNG NĂNG LƯỢNG MẶT TRỜI TẠI CỬA HÀNG JUSCO KURASHIKI

NĂM 1965
- TẶNG 1 NGÀN CÂY ANH ĐÀO CHO THÀNH PHỐ OKAZAKI TẠI LỄ KHAI MẠC OKADAYA

5

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CÙNG VỚI KHÁCH HÀNG ĐỊA PHƯƠNG TRỒNG CÂY

KHI KHAI TRƯƠNG TRUNG TÂM MỚI, TIẾN HÀNH TRỒNG CÂY TRONG KHUÔN VIÊN VỚI KHÁCH HÀNG ĐỊA PHƯƠNG

6

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

TÀI TRỢ XÂY TRƯỜNG HỌC

■TÀI TRỢ XÂY TRƯỜNG HỌC CHO CÁC NƯỚC ĐÔNG NAM Á
CAMPUCHIA 149 TRƯỜNG, NEPAL 57 TRƯỜNG, LÀO 120 TRƯỜNG, VIỆT NAM 30 TRƯỜNG, MYANMA 30 TRƯỜNG (DỰ KIẾN)


壁がないミャンマーの旧校舎


開校した新校舎に喜ぶ子どもたち

AEON - UNICEF CHƯƠNG TRÌNH NƯỚC SẠCH

■CAMPUCHIA VÀ AEON CUNG CẤP NƯỚC SẠCH AN TOÀN CHO TRẺ EM VỚI CHƯƠNG TRÌNH GÂY QUỸ MUA 1 CHAI NƯỚC TOPVALUE TẶNG 5 YÊN

TRONG 1 NĂM ĐÃ CUNG CẤP NƯỚC AN TOÀN CHO 40 NGÀN NGƯỜI


BÉ GÁI LẤY NƯỚC TỪ AO BÙN
CÁC CÔNG TRÌNH NƯỚC TÀI TRỢ

7

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CÁC HOẠT ĐỘNG XÃ HỘI TẠI VIỆT NAM

◆TRỒNG CÂY Ở HUẾ(2010～2012)

DỰ ÁN TRỒNG CÂY CHỐNG LŨ TẠI HUẾ , LẤY LẠI VẺ ĐẸP CỦA VÙNG VEN BIỂN LĂNG CÔ.

◆TRỒNG CÂY Ở HÀ NỘI(2014-2016)

DỰ ÁN TRỒNG CÂY TRONG VƯỜN QUỐC GIA BA VÌ, HÀ NỘI. HỖ TRỢ GIÁO DỤC MÔI TRƯỜNG CHO HỌC SINH ĐỊA PHƯƠNG. PHỤC HỒI HỆ SINH THÁI. KẾ HOẠCH THỰC HIỆN 3 NĂM

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CÁC HOẠT ĐỘNG XÃ HỘI TẠI VIỆT NAM

◆TÀI TRỢ XÂY TRƯỜNG HỌC (2010-2012, TẠI HUẾ)

SO VỚI SỐ LƯỢNG TRẺ EM Ở HUẾ, SỐ LƯỢNG TRƯỜNG LỚP CHƯA ĐỦ, HỌC SINH PHẢI HỌC 2 CA.

AEON TỪ NĂM 2010 TRONG 3 NĂM TÀI TRỢ XÂY DỰNG 30 TRƯỜNG HỌC TẠI VIỆT NAM

HUẾ NHIỀU MƯA, HAY XẢY RA LŨ LỤT,NÊN ĐÃ XÂY DỰNG TRƯỜNG HỌC 2 TẦNG, CÓ THỂ SỬ DỤNG CHO TRÚ ẨN CÔNG CỘNG KHI LỤT XẢY RA


TRƯỜNG CŨ


03/2012 KHAI TRƯƠNG TRƯỜNG "AEON-HOA SEN"

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CÁC HOẠT ĐỘNG XÃ HỘI TẠI VIỆT NAM

◆TRAO TẶNG HỆ THỐNG NĂNG LƯỢNG MẶT TRỜI CHO 10 TRƯỜNG THCS (HỒ CHÍ MINH – 2014)

VIỆT NAM VỚI SỰ TĂNG TRƯỞNG NHANH CHÓNG CỦA NHU CẦU SỬ DỤNG ĐIỆN TRONG PHÁT TRIỂN KINH TẾ, DẪN ĐẾN VẤN ĐỀ THIẾU HỤT NGHIÊM TRỌNG, ĐÓNG THỜI LÀ NƯỚC CHO PHÙ HỢP VỚI PHÁT TRIỂN NĂNG LƯỢNG MẶT TRỜI.

MAY MẮN LÀ NƯỚC CÓ HIỂU BIẾT VỀ NĂNG LƯỢNG TÁI TẠO,VÀ ĐỂ NÂNG CAO NHẬN THỨC VỀ MÔI TRƯỜNG, AEON TRAO TẶNG 10 HỆ THỐNG NĂNG LƯỢNG MẶT TRỜI CHO 10 TRƯỜNG TRUNG HỌC CƠ SỞ TẠI TP HỒ CHÍ MINH

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CÁC HOẠT ĐỘNG XÃ HỘI TẠI VIỆT NAM

◆TRAO TẶNG HỆ THỐNG NĂNG LƯỢNG MẶT TRỜI CHO 10 TRƯỜNG THCS (HỒ CHÍ MINH – 2014)

TÊN TRƯỜNG	ĐỊA CHỈ
Le Loi	47/22A Tay Thanh Street, Tay Thanh Ward, Tan Phu District.
Vo Thanh Trang	218 Tan Quy Street, Tan Quy Ward, Tan Phu District.
Phu My Hung	16 Phu Thuan Street, Phu Loi Hamlet, Phu My Hung Village, Cu Chi District
Tan Nhut	E10/207 B, Nguyen Dinh Kien Street, 7 Hamlet, Tan Nhut Village, Binh Chanh District
Binh Tan	173/171 An Duong Vuong Street, Quarter 4, An Lac Ward, Binh Tan District
Tam Dong 1	636 Trinh Thi Mieng Streeet, Trung Dong Hamlet, Thoi Tam Thon Village, Hoc Mon District
Truong Tho	Eight Street, Truong Tho Ward, Thu Duc District
Hiep Phuoc	1154 Nguyen Van Tao Street, Hamlet 3, Hiep Phuoc Village, Nha Be District
Hoa Lu	Quang Trung Street, Quarter 2, Tan Nhon Phu B Ward, District 9
Tam Thon Hiep	An Loc Hamlet, Tam Thon Hiep Village, Can Gio District

CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CHÍNH SÁCH BẢO TỒN NĂNG LƯỢNG

NGUỒN GỐC TỰ NHIÊN GIÓ - ÁNH SÁNG | NGUỒN GỐC TỰ NHIÊN XANH | TIẾT KIỆM NĂNG LƯỢNG | TIẾT KIỆM TÀI NGUYÊN | TRUYỀN TẢI THÔNG TIN

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CÁC HOẠT ĐỘNG MÔI TRƯỜNG CỦA AEON

CHÍNH SÁCH MÔI TRƯỜNG

CHIẾN LƯỢC GIẢM BỚT | CHIẾN LƯỢC TÁI TẠO | CHIẾN LƯỢC BẢO VỆ

へらそう作戦 | つくろう作戦 | まもろう作戦 | Smart ÆON

- NĂM 2008: AEON PHÁT BIỂU VỀ NÓNG LÊN TOÀN CẦU
- NĂM 2011: CHÍNH SÁCH PHÁT TRIỂN BỀN VỮNG
- NĂM 2012: DỰ ÁN SINH THÁI AEON
- NĂM 2013: AEON THÔNG MINH

■ KHÁI NIỆM AEON THÔNG MINH

あなたと育てる明日のまち。 Smart ÆON

13

PHÁT BIỂU NĂM 2012 "DỰ ÁN SINH THÁI AEON"

CHÍNH SÁCH NĂNG LƯỢNG MỚI
DỰ ÁN SINH THÁI AEON

CHIẾN LƯỢC GIẢM BỚT	CHIẾN LƯỢC TÁI TẠO	CHIẾN LƯỢC BẢO VỆ
へらそう作戦	つくろう作戦	まもろう作戦
GIẢM 50% NĂNG LƯỢNG TIÊU THỤ	TẠO RA 200,000kW NĂNG LƯỢNG TÁI TẠO	XÂY DỰNG 100 CỬA HÀNG TRÊN TOÀN QUỐC THÀNH NƠI CÓ THỂ PHÒNG CHỐNG THIÊN TAI



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ÆON

✔ DỰ ÁN TIÊU BIỂU PHÒNG CHỐNG THIÊN TAI Ở THÀNH PHỐ OSAKA

"CÁCH PHÒNG CHỐNG THIÊN TAI AEON THÔNG MINH"

AEON MALL OSAKA DOME CITY

QUAN HỆ VỚI TP OSAKA

- CUNG CẤP HÀNG CỨU TRỢ KHI CÓ THIÊN TAI
- CHỨNG NHẬN NƠI SƠ TÁN SÓNG THẦN
- NƠI ĐẶT TRUNG TÂM TRUYỀN THÔNG CỤC PHÒNG CHỐNG THIÊN TAI OSAKA

DỰ ÁN TIÊU BIỂU PHÒNG CHỐNG THIÊN TAI Ở THÀNH PHỐ OSAKA

"CÁCH PHÒNG CHỐNG THIÊN TAI AEON THÔNG MINH"

AEON MALL OSAKA DOME CITY

(BỘ XÂY DỰNG GIAO THÔNG TỪ NĂM 2011 CÁC CÔNG TRÌNH XÂY DỰNG PHẢI GIẢM LƯỢNG TIÊU THỤ KHÍ CO2 KHI XÂY DỰNG)

GIẢI THƯỞNG 2013 GIẢI XUẤT SẮC
CÁCH PHÒNG CHỐNG THIÊN TAI SỬ DỤNG HỆ THỐNG NĂNG LƯỢNG THÔNG MINH SỬ DỤNG ĐỘNG CƠ ĐỘNG PHÁT

CASBEE OSAKA OF THE YEAR 2013
(GIẢI ĐÁNH GIÁ TOÀN DIỆN THÀNH PHỐ OSAKA NĂM 2013)

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DỰ ÁN TIÊU BIỂU PHÒNG CHỐNG THIÊN TAI Ở THÀNH PHỐ OSAKA

KHÁI QUÁT DỰ ÁN

①BẢO VỆ KHU DÂN CƯ
XÂY DỰNG TRUNG TÂM THƯƠNG MẠI KHÔNG ẢNH HƯỞNG THIÊN TAI
- KIẾN TRÚC CHỊU ĐỊA CHẤN
- ĐIỂM PHÒNG CHỐNG THIÊN TAI
- THỎA THUẬN PHÒNG CHỐNG THIÊN TAI VỚI TP OSAKA
- NƠI SƠ TÁN SÓNG THẦN

ÆON 大阪ガス
「CÁCH PHÒNG CHỐNG THIÊN TAI」
AEON THÔNG MINH
TRUNG TÂM SỐ1!
DỰ ÁN GIẢM TIÊU THỤ CO2

③BẢO VỆ MÔI TRƯỜNG
HƯỚNG ĐẾN GIẢM 40% TIÊU THỤ CO2 BẰNG TIẾT KIỆM NĂNG LƯỢNG
- SỬ DỤNG THIẾT BỊ LÀM LẠNH LINH HOẠT
- KẾT HỢP ĐIỀU HÒA KHÔNG KHÍ BẰNG ÁNH SÁNG MẶT TRỜI VÀ GAS

②BẢO VỆ NĂNG LƯỢNG
BẢO ĐẢM NĂNG LƯỢNG KHI THIÊN TAI
- BẢO VỆ CẤP ĐIỆN
- CUNG CẤP GAS

④TRUYỀN TẢI
PHỔ BIẾN THÔNG TIN THIÊN TAI VÀ CHƯƠNG TRÌNH TIẾT KIỆM NĂNG LƯỢNG
- CUNG CẤP THÔNG TIN

ĐỒNG THỜI HƯỚNG ĐẾN「PHÒNG CHỐNG THIÊN TAI」VÀ「TIẾT KIỆM」、
TRUNG TÂM PHÒNG CHỐNG THIÊN TAI CHO KHU VỰC!

17

ÆON

✔ (DỰ KIẾN)AEON MALL BÌNH TÂN SHOPING MALL ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON

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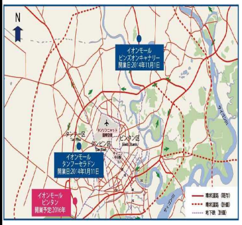
AEON BÌNH TÂN TỔNG QUAN



TÊN : AEON MALL BÌNH TÂN
ĐỊA CHỈ : Lot PT1, Hi-tech Healthcare Park, 532A Kinh Duong Vuong, Binh Tri Dong B ward, Binh Tan District, HCMC
DIỆN TÍCH KHUÔN VIÊN : 46,800㎡
TỔNG DIỆN TÍCH SÀN : 114,000㎡
DIỆN TÍCH CHO THUÊ : 59,000㎡
SỐ CHỖ ĐỖ XE : Ô TÔ: 1,500 XE XE MÁY: 4,000 CHIẾC
HÌNH THỨC CHÍNH : SIÊU THỊ TỔNG HỢP
CỬA HÀNG CHUYÊN BIỆT : 160 CỬA HÀNG
CHỦ ĐẦU TƯ : AEON VIETNAM CO.,LTD.
VẬN HÀNH, QUẢN LÝ : AEON MALL VIETNAM CO.,LTD.
DỰ ĐỊNH KHAI TRƯƠNG : MÙA HÈ 2016

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AEON BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON

Mục tiêu cắt giảm lượng khí CO2 : 5,000ton-CO2/năm
（tương đương lượng khí thải của khoảng 3,200 hộ dân ）
Cắt giảm được khoảng ▲40% so với trước đây

20

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ①

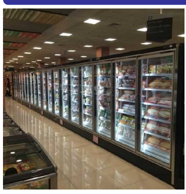
BẢO VỆ MÔI TRƯỜNG

CHỐNG NÓNG TỪ LỚP TƯỜNG BÊN NGOÀI

Dự trù giảm được khoảng 420 t-CO2

Tương đương khí thải của 263 hộ gia đình

TỦ TRƯNG BÀY TIẾT KIỆM NĂNG LƯỢNG



1. Sử dụng đèn LED
2. Sử dụng quạt DC
3. Sau khi đóng quầy vào buổi tối set chế độ tự động điều chỉnh nhiệt độ
4. Điều chỉnh tự động không đóng tuyết
5. Vận hành tái sử dụng máy nén
6. Chuyển tủ cấp đông -> dạng inverter
7. Kiểm soát không để nhiệt của bộ thu phát
8. Thể hiện rõ phần điện năng

Dự trù giảm được khoảng 242 t-CO2

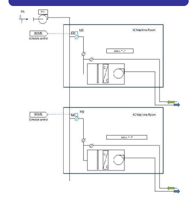
Tương đương khí thải của 151 hộ gia đình

21

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ②

HỆ THỐNG ĐIỀU HÒA KHÔNG KHÍ

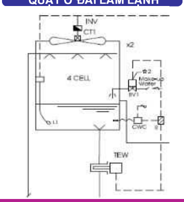
ĐIỀU KHIỂN NỒNG ĐỘ CO2



Dự trù giảm được khoảng 280 t-CO2

Tương đương khí thải của 175 hộ gia đình

KIỂM SOÁT VẬN HÀNH QUẠT Ở ĐÀI LÀM LẠNH



Dự trù giảm được khoảng 48 t-CO2

Tương đương khí thải của 30 hộ gia đình

MÁY LÀM LẠNH COP TURBO

Dự trù giảm được khoảng 276 t-CO2

Tương đương khí thải của 172 hộ gia đình

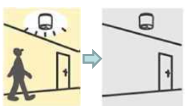
22

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ③

CHẾ ĐỘ TẮT MỞ ĐÈN

CẢM BIẾN NHẬN BIẾT CÓ NGƯỜI

Khi có người (Đèn sáng)　Khi không có người ((Đèn tắt)



Dự trù giảm được khoảng12 t-CO2

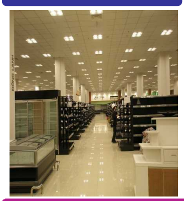
Tương đương khí thải của 8 hộ gia đình

ĐIỀU CHỈNH ÁNH SÁNG

Dự trù giảm được khoảng33 t-CO2

Tương đương khí thải của 12 hộ gia đình

DÙNG TOÀN BỘ BẰNG ĐÈN LED



Dự trù giảm được khoảng3596 t-CO2

Tương đương khí thải của 2248 hộ gia đình

23

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ④

Hệ thống phát điện dùng năng lượng mặt trời

- Dung lượng: 320KW　•Tấm pin: 1,424 tấm
- Thông số kỹ thuật của pin NERP156x156 - 60 - P SI 255W
- Power Conditioner 20KW(400 - 230V 3P4W) ×16 bộ
- Hệ thống giám sát ®

（TOÀN CẢNH: BÃI ĐỖ XE TẦNG 3） 24

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ④

Sử dụng điện năng lượng mặt trời giúp cắt giảm lượng CO2 thải

≒ **267ton-CO2/năm**

（Phát điện：504,000Kwh/ năm）

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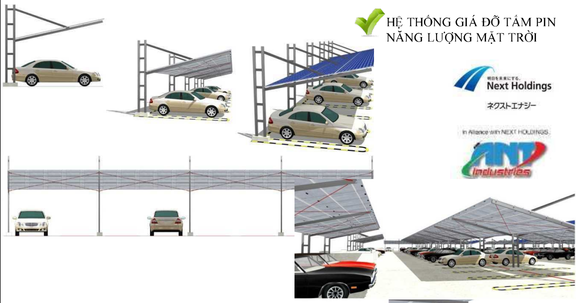
AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ④

HỆ THỐNG GIÁ ĐỠ TẤM PIN NĂNG LƯỢNG MẶT TRỜI

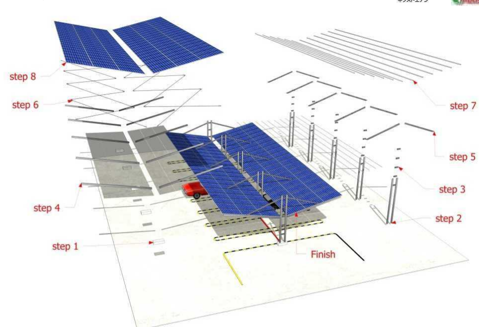


- ĐƯỢC CHẾ TẠO TẠI VIỆT NAM,KHUNG CHẤT LƯỢNG CAO
- DỄ DÀNG LẮP ĐẶT, ĐIỀU CHỈNH
- MẠ KẼM, SƠN CHỐNG ĂN MÒN

26

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ④

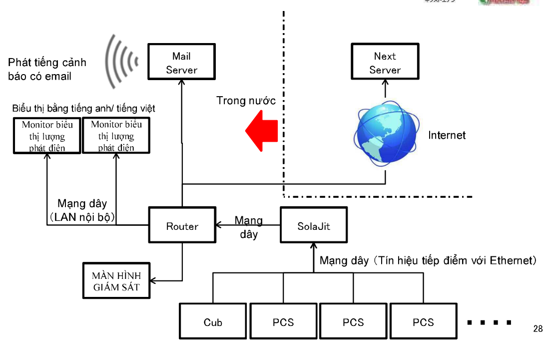
KẾ HOẠCH DI CHUYỂN PIN NĂNG LƯỢNG LÊN TẦNG CAO



27

AEON MALL BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON ④

Monitoring system năng lượng mặt trời



28

AEON BÌNH TÂN - ĐỐI SÁCH CẮT GIẢM LƯỢNG CARBON

Mục tiêu cắt giảm lượng khí CO2 **：5,000ton-CO2/năm**

（tương đương lượng khí thải của khoảng **3,200 hộ dân**）

Cắt giảm được khoảng **▲40%** so với trước đây

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AEON GROUP CHÚNG TÔI MỤC TIÊU XÂY DỰNG CHUỖI NHỮNG SIÊU THỊ THÂN THIỆN VỚI MÔI TRƯỜNG

XIN CHÂN THÀNH CÁM ƠN

Chương trình thúc đẩy cơ chế JCM của NEDO

Ngày 6 tháng 11 năm 2015
Cơ quan Phát triển Năng lượng mới và Công nghệ Công nghiệp (NEDO)

1

◆Nội dung trình bày

・Tổng quát về Chương trình đánh giá thực chứng JCM

・Trình tự thực hiện Chương trình đánh giá thực chứng JCM

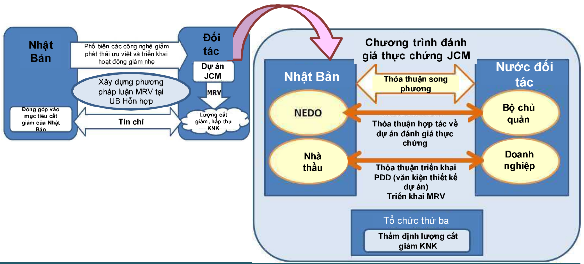
[Giới thiệu các dự án]

①Dự án thúc đẩy mô hình bệnh viện xanh thông qua tiết kiệm năng lượng/cải thiện môi trường tại các bệnh viện công Việt Nam

②Dự án thúc đẩy tiết kiệm năng lượng tại khách sạn thông qua phát triển Hệ thống quản lý năng lượng tòa nhà (phiên bản Việt Nam V-BEMS)

2

Chương trình đánh giá thực chứng JCM



Nội dung chương trình

- ■ Triển khai dự án cắt giảm phát thải KNK tại các quốc gia ký kết thỏa thuận song phương về JCM
- ■ Chương trình đánh giá thực chứng JCM là chương áp dụng phương pháp luận MRV vào các dự án triển khai công nghệ/hệ thống giảm thiểu carbon của Nhật Bản tại các nước đối tác, trải qua thủ tục thẩm tra của Ủy ban Hỗ Hợp JCM và thẩm định lượng phát thải KNK được cắt giảm thông qua một tổ chức thứ ba.

3

Trình tự thực hiện Chương trình đánh giá thực chứng JCM

① Nghiên cứu sơ bộ cho việc triển khai dự án đánh giá thực chứng JCM. Thống nhất bằng văn bản về nội dung chia sẻ vai trò, chi phí với các doanh nghiệp hợp tác của nước đối tác, việc thương mại hóa sau quá trình đánh giá thực chứng.
② Về nguyên tắc, sau 3 tháng thực hiện nghiên cứu sơ bộ sẽ tiến hành đánh giá tính khả thi của dự án bởi các chuyên gia độc lập để quyết định có chuyển sang dự án đánh giá thực chứng JCM hay không.
③ Sau khi chuyển sang dự án đánh giá thực chứng, bên cạnh việc được cung cấp công nghệ/hệ thống giảm phát thải, doanh nghiệp còn phải thực hiện một loạt các thủ tục gồm trình hồ sơ dự án, thẩm tra, đăng ký, đo đạc, thẩm định lượng cắt giảm của dự án.
④ Sau khi kết thúc dự án, về nguyên tắc các tài sản của dự án (máy móc thiết bị) sẽ thuộc về doanh nghiệp hợp tác nhằm duy trì tính kế tục của dự án cắt giảm phát thải.
*Xin phát hành tín chỉ tương ứng với lượng cắt giảm KNK phát sinh trong quá trình thực hiện đánh giá thực chứng tùy theo mô hình chế tới đây.

4

①Dự án thúc đẩy mô hình bệnh viện xanh thông qua tiết kiệm năng lượng/ cải thiện môi trường tại các bệnh viện công Việt Nam (2013~2016)

Nước thụ hưởng	Việt Nam
Nhà thầu	Mitsubishi Electric Mitsubishi Corporation Mitsubishi UFJ Morgan Stanley Securities
Địa điểm thực hiện	BV Nhân dân 115 (TP HCM) TVCI/IEMM (TP HN) BV Việt Đức (TP HN)
Cơ quan đối tác	MOIT (Bộ Công thương)
Hiệu quả cắt giảm KNK	Lượng cắt giảm dự kiến: khoảng 40% Quy đổi CO2: 1.749t-CO2/năm

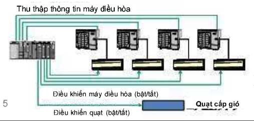
Khái quát dự án

Nâng cao sự thoải mái và chất lượng không khí trong các bệnh viện công tại Hà Nội và TP Hồ Chí Minh, Việt Nam nhờ hệ thống quản lý năng lượng (EMS) với cấu hình phù hợp với điều kiện sở tại, kết hợp hiệu quả điều hòa biến tần (có chức năng làm sạch không khí) đảm bảo độ tin cậy cùng hiệu suất cao và quạt thông gió trao đổi nhiệt toàn phần, đồng thời thúc đẩy mô hình "bệnh viện xanh" đạt mục tiêu TKNL tối đa.

Khái quát công nghệ

Khái quát về EMS dùng cho RAC

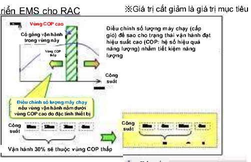
Áp dụng công nghệ điều hòa multi (dùng máy nén biến tần hiệu suất cao, có chức năng lọc không khí) đang rất phổ biến ở Nhật Bản, thực hiện việc điều khiển tối ưu cho từng máy nhờ thu thập dữ liệu về tình trạng vận hành (tần số, cường độ dòng, nhiệt độ ống, vận tốc gió v.v.) của cụm ngoài trời để xác định công suất. Đồng thời, cải thiện môi trường trong bệnh viện bằng quạt thông gió trao đổi nhiệt toàn phần và TKNL đáng kể nhờ giảm thất thoát nhiệt.



5

Phát triển EMS cho RAC

※Giá trị cắt giảm là giá trị mục tiêu



Đánh giá hiệu suất bằng thiết bị đo nhiệt lượng

Dùng thiết bị đo nhiệt lượng kiểu buồng cân bằng nhiệt (xem bảng bên phải) để giá hiệu quả một cách chính xác và minh bạch.

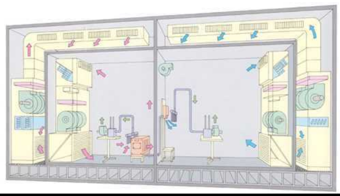
5

◆Cung cấp thiết bị đo nhiệt lượng (phương pháp cân bằng nhiệt)

・Địa điểm trang bị: TVCI/IEMM
(Trung tâm thử nghiệm và kiểm định công nghiệp, Viện cơ khí năng lượng và mỏ)
・Mục đích trang bị: nhằm đạt kết quả thẩm định có tính chính xác và minh bạch cao
⇒ Kiểm tra xem RAC được trang bị có thỏa mãn TCVN7830:2012 hay không.

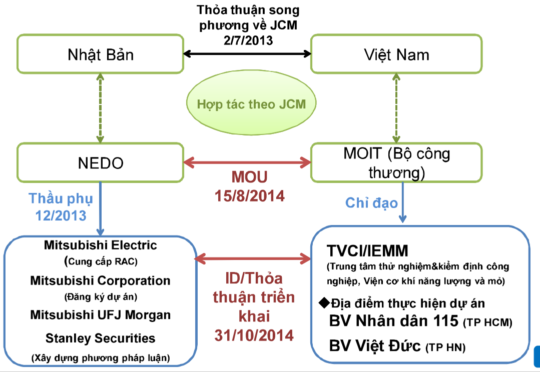
◆Đóng góp cho Chương trình dán nhãn năng lượng

・Tăng cường quy định từ tháng 7/2013
⇒ Nếu không được dán nhãn thì sản phẩm không được tiêu thụ trên thị trường.
⇒ Thiết bị đo nhiệt lượng được trang bị sẽ đóng góp cho hoạt động của tổ chức thử nghiệm thực hiện công tác chứng nhận tiêu chuẩn.



6

◆Cơ chế thực hiện dự án thúc đẩy bệnh viện xanh



7

◆Tiến độ dự án

(1) Trang bị RAC (2 bệnh viện: tổng cộng khoảng 1000 chiếc)
①Bệnh viện Nhân dân 115(TP HCM): hoàn tất trang bị toàn bộ số máy vào tháng 9/2015
②Bệnh viện Việt Đức (TP HN): hoàn tất trang bị toàn bộ số máy vào tháng 9/2015
(2)Xây dựng phương pháp luận
・Tên gọi phương pháp luận: VN_AM002
Introduction of Room Air Conditioners Equipped with Inverters
・Đăng ký phương pháp luận: ngày 15 tháng 1 năm 2014
(3) Đăng ký dự án JCM
・Đã hoàn tất lấy ý kiến rộng rãi (Public Input) cho Văn kiện thiết kế dự án (Project Designed Document)
・Đang xin đăng ký dự án
(4) MRV(giám sát)
①Bệnh viện Nhân dân 115(TP HCM): bắt đầu từ tháng 8/2015
②Bệnh viện Việt Đức (TP HN): bắt đầu từ tháng 10/2015
(5) Sử dụng thiết bị đo nhiệt lượng
・Thi công tòa nhà: trung tuần tháng 11/2015 (dự kiến)
・Bắt đầu hoạt động: tháng 2/2016 (dự kiến)

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②Dự án đánh giá thực chứng thúc đẩy tiết kiệm năng lượng tại khách sạn thông qua phát triển hệ thống V-BEMS phiên bản Việt Nam (2013~2016)

Khái quát dự án

Phát triển các sản phẩm có thể nhân rộng tại Việt Nam dựa trên các công cụ TKNL (BEMS, SLC, hệ thống cấp nước nóng) đã mang lại kết quả thực tế tại Nhật Bản, chứng minh hiệu quả TKNL thông qua sự tích hợp nhiều công nghệ khác nhau của Nhật Bản.

Triển khai hiệu quả giải pháp TKNL cho 3 yếu tố chiếm đến 85% tổng năng lượng tiêu thụ tại các khách sạn nói chung ở Việt Nam là: điều hòa, chiếu sáng, cấp nước nóng.

Nước đối tác	Việt Nam
Nhà thầu	Hibiya Engineering Mitsubishi UFJ Morgan Stanley Securities
Địa điểm triển khai	Renaissance Riverside (TP HCM) Nikko Hanoi (TP HN)
Cơ quan đối tác	MONRE, HCMUNRE
Hiệu quả cắt giảm KNK	Lượng cắt giảm dự kiến: khoảng 12% Quy đổi CO2: 605t-CO2/năm

Khái quát công nghệ

①Hệ thống quản lý nguồn nhiệt điều hòa (phát triển BEMS phiên bản Việt Nam)

Phát triển BEMS (V-BEMS) kết hợp giữa phần cứng giá rẻ và phần mềm tính năng cao dựa trên BEMS đã mang lại kết quả thực tế tại Nhật Bản, xây dựng sổ tay vận hành phù hợp với nhu cầu của Việt Nam và thúc đẩy việc nhân rộng.

②Hệ thống chiếu sáng (phát triển SLC phiên bản Việt Nam)

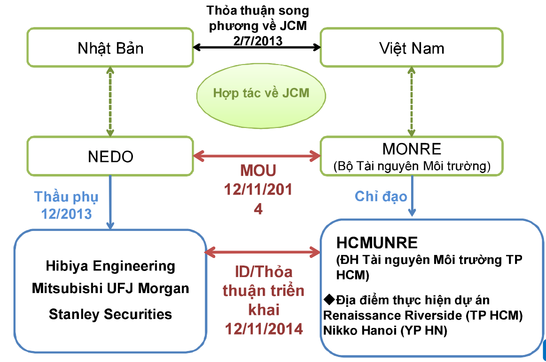
Phát triển hệ thống (V-SLC) kết hợp giữa các thiết bị điều khiển đáp ứng tiêu chuẩn quốc gia của Việt Nam và phần mềm quản lý dựa trên các hệ thống điều khiển chiếu sáng riêng biệt, nhằm thúc đẩy văn hóa TKNL và nhân rộng cách làm.

③Hệ thống cấp nước nóng (phát triển phương pháp xây dựng hệ thống tối ưu)

Thẩm định hiệu quả TKNL thông qua điều khiển phối hợp tối ưu của các sản phẩm TKNL xuất sắc của Nhật Bản như nồi hơi hiệu suất cao, bơm nhiệt v.v.

※Giá trị cắt giảm là giá trị mục tiêu

◆Cơ chế thực hiện dự án đánh giá thực chứng thúc đẩy tiết kiệm năng lượng tại khách sạn



Liên hệ:

●NEDO Nhóm JCM/BOCM, Ban thúc đẩy cơ chế Kyoto

Phụ trách: Kobayashi, Kawaguchi

E-mail: pkfs@ml.nedo.go.jp

●NEDO Văn phòng Bangkok

Phụ trách: Manabe

E-mail: manabeyus@nedo.go.jp

JCM Model Project | Host Country: Vietnam

Eco-driving by Utilizing Digital Tachograph System

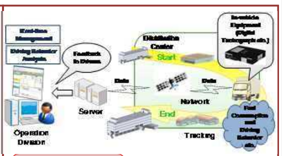
Project Owner: (Japan) NIPPON EXPRESS, (Host Country) NIPPON EXPRESS (VIETNAM)

Outline of GHG Mitigation Activity

In this project, 124 trucks in use by NIPPON EXPRESS (VIETNAM) are fitted with an eco-drive improving system using digital tachographs, so that the quantity of fuel consumption, running distance and relevant data on driving behavior of drivers are continuously analyzed with cloud network in Binh Duong and Hanoi city, Vietnam.

The drivers are given advice in order to improve their driving behavior based on the analyzed data, and feedback linked to the training outcome is provided for further improving the driving behavior.

This project contributes to realizing improvement of transportation quality as well as fuel efficiency, which is directly linked with reduction in CO_2 emissions.



Sites of Project

1) Binh Duong Province (70 trucks)

Song Than Logistics Center

21km to HCMC

2) Hanoi City (54 trucks)

Quang Minh Warehouse

Noi Bai International Airport

Expected GHG Emission Reductions

328tCO_2/year (1,776tCO_2 until 2020)

Dự án ủy thác điều tra tính khả thi hình thành dự án JCM nhằm mục tiêu xây dựng các thành phố cacbon thấp tại châu Á năm 2015
"Khảo sát hỗ trợ hình thành thành phố cacbon thấp thông qua sự liên kết giữa TP Osaka và TP HCM"
<Khảo sát khả năng thực hiện dự án JCM>

Dự án tiết kiệm năng lượng cho nhà máy trong các KCN tại TP HCM

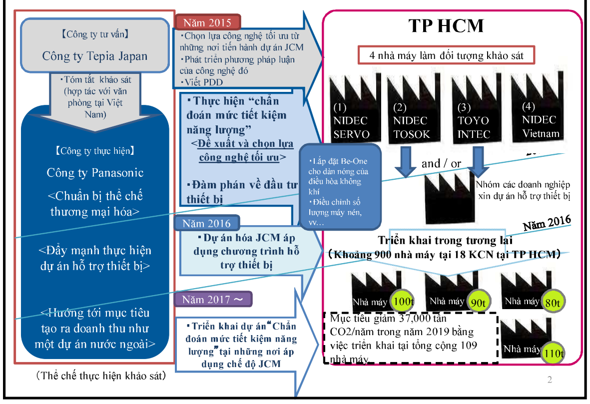
Ngày 6 tháng 11 năm 2015

Công ty Tepia Corporation Japan
Công ty Panasonic

1

1. Tổng thể dự án đã áp dụng JCM

2



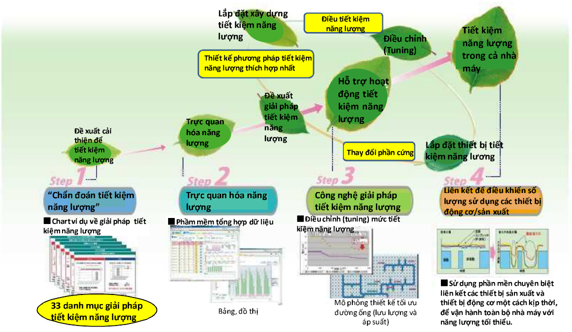
(Thể chế thực hiện khảo sát)

2

2. Đề xuất và lựa chọn đầu tư thiết bị tối ưu bằng "chẩn đoán tiết kiệm năng lượng"

3

Bằng việc sử dụng phương pháp tiết kiệm năng lượng mà nhóm công ty Panasonic đã xây dựng và thực hiện "chẩn đoán kiệm năng lượng", chúng tôi sẽ tiếp tục đưa ra các đề xuất tối ưu được rút ra từ những điểm mang lại hiệu quả cao nhất cho việc đầu tư.



3. Kết quả "chẩn đoán tiết kiệm năng lượng" (1)

4

●Công ty Nidec SERVO


Nguồn: http://www.nidec-servo.com/en/products/index.html

○Thành lập: Năm 2009 (Tính đến nay được 6 năm)
○Sản phẩm: Động cơ chính xác cỡ nhỏ dùng cho dân sinh và công ty, thiết bị sử dụng động cơ hoặc fan blower sensor
○Quy mô sử dụng năng lượng: quy mô vừa
○Công đoạn chính: die-cast (khuôn đúc), sơn, ép, gia công cơ khí, lắp ráp

【Kết quả "chẩn đoán"】
Số mục đề xuất: 30

① Lắp đặt Be-One cho dàn nóng bên ngoài hệ thống điều hòa không khí
・・・Có hiệu quả tiết kiệm năng lượng khoảng 22% đã được chứng thực tại nơi sản xuất. Nhiệt độ trung bình tại xưởng không thay đổi, vẫn ở mức 26.7℃

② Điều chỉnh số thiết bị máy nén
・・・Với việc đo điện năng và áp suất của 7 máy, kết quả cho thấy mức tiết kiệm đạt khoảng 4.6%

③Thu hồi được lượng nhiệt tỏa ra từ lò reflow,vv…


Đo điện năng của máy điều hòa không khí

3. Hoạt động "chẩn đoán tiết kiệm năng lượng" (2)

5

●Công ty Nidec TOSOK


Nguồn: http://www.nidec-tosok.co.jp/products/car_parts/products_lineup.html#S1

○Thành lập: Năm 1997 (Tính đến nay là 18 năm)
○Sản phẩm: Máy biến tốc tự động (AT), van điều khiển có vai trò phần trung tâm của máy biến tốc biến thiên liên tục, van điện từ, ống van, phụ tùng ô tô như harness module, vv…
○Quy mô tiêu thụ năng lượng: quy mô lớn
○Công đoạn chính: Xử lý nhiệt, gia công, lắp ráp (clean room)

【Kết quả "chẩn đoán"】
Số mục đề xuất: 18

① Tiết kiệm năng lượng dàn nóng của máy điều hòa không khí bằng Be-One (triển khai trên quy mô toàn nhà máy)
・・・Có hiệu quả tiết kiệm năng lượng đạt khoảng 21% đã được chứng thực tại nơi sản xuất. Nhiệt độ trung bình tại nhà máy giới hạn trong phạm vi ＋0.5℃


Đo điện năng của máy nén

② Vận hành điều chỉnh số máy nén (nâng cao hiệu suất vận hành)
・・・Phần lớn đã được đưa vào sử dụng

③ Nâng cao hiệu quả cung cấp khí sạch của Clean room vv..

3. Hoạt động "chẩn đoán tiết kiệm năng lượng" (3)

6

●Công ty TOYOITEC


Nguồn: http://www.toyoitec.com/develop.htm

○Thành lập: Năm 2010 (Tính đến nay là 5 năm)
○Sản phẩm: Bảng mạch in (PCBA, vv...)
○Quy mô tiêu thụ năng lượng: quy mô nhỏ
○Công đoạn chính: lắp ráp bảng mạch

【Kết quả "chẩn đoán"】
Số mục đề xuất: 6

① Thu hồi nhiệt tỏa ra từ lò reflow bằng cách lắp đặt máy thu hồi nhiệt tỏa ra.
・・・Có thể kỳ vọng vào kết quả thu hồi nhiệt tuy nhiên có vấn đề với hiệu quả đầu tư do công suất hoạt động không cao.


Đo điện năng của lò reflow

② Lắp Be-One cho dàn nóng của hệ thống điều hòa không khí
・・・Có hiệu quả nhưng số lượng cũng như thời gian hoạt động ít

③ Điều chỉnh số máy nén
・・・Giảm thiểu năng lượng cố định bằng biến tần khi sử dụng đơn chiếc.

3. Hoạt động "chẩn đoán tiết kiệm năng lượng" (4) 7

●Công ty Nidec VIETNAM

○Thành lập: Năm 2005 (Tính đến nay là 10 năm)
○Sản phẩm: Động cơ DCM, Quạt, Blower,
các loại động cơ đặc biệt, vv..
○Quy mô tiêu thụ năng lượng: quy mô vừa
○Công đoạn chính: Tạo hình/Ép, Sơn, Lắp ráp

Nguồn: http://www.nidec.com/en-NA/product/fan/

【Kết quả "chẩn đoán"】
Số mục đề xuất: 15

①Điều chỉnh hoạt động dàn nóng của điều hòa nhiệt độ bằng thiết bị Be-One
・・・Đang trong giai đoạn chứng thực hiệu quả tại xưởng sản xuất

②Nâng cao hiệu suất hoạt động bằng việc điều chỉnh số lượng máy nén
・・・Khi đo điện năng và áp suất của 4 máy, hiệu quả giảm năng lượng đạt 5.8%

③Thu hồi lượng nhiệt tỏa ra từ lò reflow
・・・Hoàn thành đo điện năng của 4 máy

④ Sử dụng đèn không điện cực

Đo điện năng của máy nén

4. Công nghệ được áp dụng 8

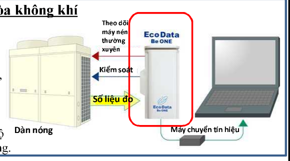
Dựa trên kết quả thực hiện xác định mức tiết kiệm năng lượng tại 4 nhà máy, tính dễ dàng trong việc triển khai phổ cập cũng như trong việc tiến hành dự án JCM và hiệu quả đối với chi phí, chúng tôi đã quyết định tiếp tục tiến hành dự án JCM bằng việc áp dụng hai thiết bị kiểm soát dưới đây.

①Lắp đặt Be-One cho dàn nóng máy điều hòa không khí

・Theo dõi thường xuyên tình trạng hoạt động của máy nén điều hòa không khí trong khi đo dòng điện.

・Để đảm bảo thời gian tối ưu tránh làm hư hại máy nén, cứ khoảng 30 phút 1 lần, dừng lại một số máy trong 4 – 5 phút.

・Đảm bảo cung cấp đủ gió mà không khiến cho nhiệt độ trở nên quá lạnh, do đó đạt hiệu quả tiết kiệm năng lượng.

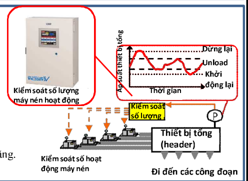


② Điều chỉnh số lượng máy nén

・Sử dụng thiết bị điều chỉnh số lượng máy nén, liên kết các máy nén với nhau.

・Điều chỉnh số lượng máy nén hoạt động/ngừng hoạt động theo áp suất của thiết bị tổng (header)
⇒Loại bỏ tình trạng Unload của các máy, đạt hiệu quả tiết kiệm năng lượng.

*Unload: Tình trạng máy dừng chờ thổi khí dẫn đến tiêu thụ điện năng.
Ở xe ô tô là chế độ Idling.



5. Quy mô đầu tư của các công ty và dự tính kết quả giảm thiểu CO2 (đang thực hiện) 9

(Dự án đã xác định)

Tiền điện (Yên/kWh)	9
CO2(kg-CO2/kWh)	0.6244

【Mức điện tiêu thụ của các công ty, số tiền đầu tư, tỷ lệ giảm thiểu CO2】

Địa điểm (Nidec)	Danh mục	Giai đoạn	Điện năng tiêu thụ (Mwh/năm)	Mức giảm thiểu (%)	Số tiền giảm thiểu (10 nghìn JPY /năm)	Lượng giảm thiểu CO2 (t/ năm)	Số máy móc đối tượng (Chiếc)	Số tiền đầu tư (10 nghìn JPY)	Thu hồi lại đầu tư (năm)	Năng xuất giảm thiểu CO2 (10 nghìn JPY/t)
TOSOK	Be-ONE cho dàn nóng	đã đo	16,121	21.4	3,108	2,156	238	6,426	2.1	0.21
SERVO	Be-ONE cho dàn nóng	đã đo	7,700	22.0	1,525	1,058	90	2,430	1.6	0.16
VIETNAM	Be-ONE cho dàn nóng	đang đo					50	1,350		
Tổng số								10,206		

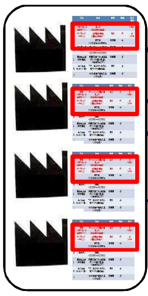
Dự kiến trong thời gian hữu dụng theo quy định pháp luật là 7 năm

・Việc lắp đặt Be-One chỉ mất tổng tiền đầu tư là 100 triệu yên cho 3 điểm (đang theo dõi)
・Mức giảm thiểu CO2 đạt mức rất cao 2,000 yên/tấn (đang theo dõi)

※Lần này, chúng tôi chọn 3 công ty của Nidec có mức giảm thiểu CO2 lớn để làm đối tượng.

6. Những vấn đề và phương hướng trong tương lai 10

<1>Thực hiện "chẩn đoán mức tiết kiệm năng lượng" → **<2>Lựa chọn công nghệ** → **<3>Phát triển phương pháp luận JCM, điều chỉnh chuẩn bị kế hoạch đầu tư**



Thiết bị kiểm soát lắp bên ngoài

1) Thiết bị kiểm soát hoạt động dàn nóng máy điều hòa không khí bằng việc lắp đặt Be-One.

2) Thiết bị điều chỉnh số lượng hoạt động máy nén.

<Tiêu chuẩn lựa chọn>
○ Dễ tiến hành phổ cập
○ Dễ thực hiện dự án JCM (Phương pháp luận, điều kiện MRV)
○Hiệu quả đối với chi phí được khách hàng nhận thấy

Giai đoạn hiện nay

●Phát triển phương pháp luận
(Tham khảo) Phương hướng tại giai đoạn hiện nay
・Sử dụng số liệu đo thực tế tại những lần "chẩn đoán mức tiết kiệm năng lượng"
・Để số liệu được đảm bảo hơn BaU, lấy số liệu thực tế đo được trừ đi 10% số liệu ở trên, để tính lượng điện tiêu thụ tham khảo
・Sau khi thực hiện dự án, tiến hành quan trắc lượng điện tiêu thụ của tất cả máy là đối tượng áp dụng trong dự án.

●Đàm phán và điều chỉnh kế hoạch đầu tư tại các nhà máy (bao gồm cả kế hoạch huy động vốn)

● Phối hợp hướng tới việc hình thành nhóm doanh nghiệp quốc tế.

TP. HỒ CHÍ MINH VÀ TP. OSAKA

「HỆ THỐNG CHIẾU SÁNG CÔNG CỘNG TẠI TP.HCM」

<JCM Feasibility Study>

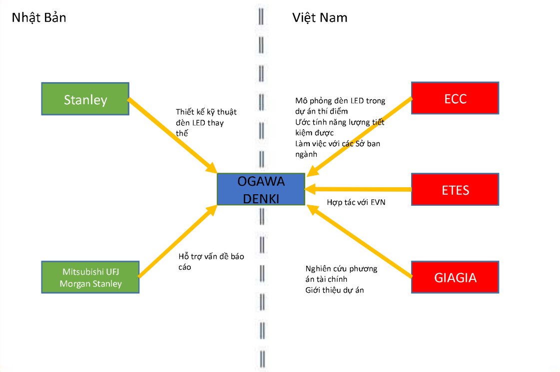
OGAWA

6th November 2015

OGAWA DENKI Co.,Ltd.
Bộ phận Đối ngoại
Takehiro OGAWA

content

1、Tổ chức thực hiện nghiên cứu

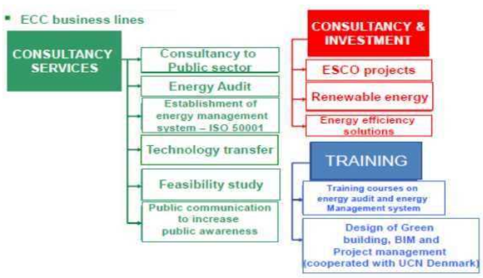


1-1 Tổng quan "OGAWA DENKI Co.,Ltd"

1, Tên Công ty : OGAWA DENKI CO.,LTD.
2, Ban điều hành : NORIO OGAWA (Chủ tịch) TAKEHIRO OGAWA(Trưởng Ban Đối ngoại)
3, Thành lập : Ngày 21 tháng 3 năm 1963
4, Trụ sở chính : Osaka, Nhật bản
5, Doanh thu hằng năm : 220,000,000 USD (1USD = 120JPY
6, Số nhân viên: 380
7, Số chi nhánh : 37
(Osaka, Nara ,Shiga,Wakayama and Tokyo)

1-2 Tổng quan "ECC HCMC"

1, Tên Tổ chức : Trung tâm tiết kiệm năng lượng TP HCM
2, Giám đốc : Huỳnh Kim Tước
3, Thành lập : Ngày 10 tháng 3 năm 2002
4, Trung tâm tiết kiệm năng lượng TP HCM thuộc Sở KHCN TP HCM



2、Kết quả nghiên cứu 2-1 Thực trạng

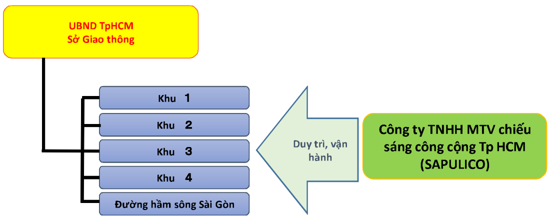
1、Có 137,869 đèn đường ở TpHCM. Tổng chiều dài của các tuyến đường là 4,000km. Số đèn đường LED hiện tại là 1,500 bộ.

2、Tổng công suất tiêu thụ hằng năm là 90 triệu kWh. Tiền điện bình quân hằng năm là 5.9 triệu USD.

3、2011-2012: 1 thương hiệu nước ngoài tặng 160 bộ đèn LED cho Tp HCM. Hiện nay, hơn 20 bộ hư hoàn toàn. 2012-2013: Hãng Philips thực hiện dự án thí điểm ở đường Hoa Lan, Q. Phu Nhuan. Một số đèn bị hư hỏng nhưng Philips đã khắc phục.

4、2014-2015: UBND Tp HCM đầu tư hơn 1,500 bộ đèn LED (1 nguồn hỗ trợ nhỏ từ Quỹ Bill Clinton) trên 12 tuyến đường (đặc biệt ở Thành Thái, Ngô Quyền, Tản Hoa, Lò Gốm, Luỹ Bán Bích, Nguyễn Huệ,...)

2-2 Cơ chế vận hành hệ thống chiếu sáng



1、Sở Giao thông thuộc UBND Tp HCM quản lý chung toàn bộ hệ thống chiếu sáng trên địa bàn thành phố. 5 khu quản lý trực tiếp hệ thống chiếu sáng trong khu vực.

2、SAPULICO cung cấp việc duy trì vận hành toàn bộ hệ thống chiếu sáng. Mỗi khu có vai trò xác nhận công việc SAPULICO đã tiến hành.

2-3 problem for changing to LED street light

1、Ở Việt Nam vẫn chưa có tiêu chiểu cho chiếu sáng công cộng

→JLMA ;Japan Lighting Manufacturers Association (Hiệp hội những nhà sản xuất thiết bị chiếu sáng Nhật Bản) sẽ hỗ trợ Việt Nam trong việc thiết kế tiêu chuẩn.

2、Chất lượng và cung cấp hệ thống đèn đường LED.

→ Dự án thí điểm ở tuyến đường 47 Quốc Hương Quận 2 Tp HCM sẽ lắp đặt 11 bộ đèn đường LED. Bộ đèn đường LED công suất 65W dùng để thay thế cho đèn HPS 100W

→ Nhà sản xuất Stanley có nhà máy ở Việt Nam và có thể sản xuất đèn phù hợp với thời tiết và môi trường tại khu vực lắp đặt

3、Cơ chế tài chính

→OGAWA JAPAN giới thiệu Cơ chế JCM và các Ngân hàng tham gia.

3、Dự án thí điểm 3-1 Lựa chọn tuyến đường

Stt	Tên đường	Quận	Dài (m)	Số lượng 250W	Số lượng 150W	Số lượng 100W	Khoảng cách từ bề mặt (m)	Cách chiếu sáng	Khoảng cách 2 đèn (m)	Độ rọi trung bình (lux)
1	LinhDong	ThuDuc	8	67			8	1 phía	40	14.5
2	NamLongArea	9	8	21	91		11	1 phía	25～35	17.1
3	No47QuocHuong	2	5～7			11	7.5	1 phía	30	12
4	No3HaiQuanArea	2	6～8			11	7.5	1 phía	30	12

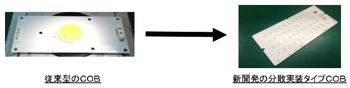
Được sự cho phép của Sở Giao thông Tp HCM, dự án chọn đường số 47 Quốc Hương để thay thế đèn HPS cũ sang đèn LED

3-2 specification of LED street light

Dự án chọn đèn LED của thương hiệu STANLEY

1、Stanley tiên phong chế tạo đầu đèn LED của xe hơi, xe gắn máy sử dụng trong các môi trường nóng – lạnh. Stanley vận dụng công nghệ cao để sản xuất đèn đường LED

2、Stanley sử dụng công nghệ chế tạo COB để tạo ra đèn đường LED với bộ tản nhiệt tốt.



3、Stanley có nhiều nhà máy trên thế giới và ở Việt Nam. Vì vậy Stanley có thể sản xuất và kinh doanh đèn LED với giá cả hợp lý.
(Stanley có 13 nhà máy trên thế giới và 1 nhà máy ở Hà Nội – Việt Nam)

3-3 simulation of before and after installing LED

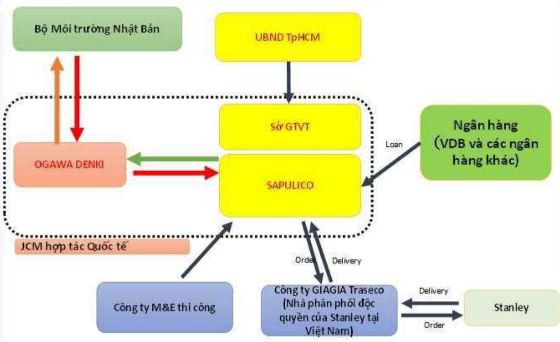
Đèn LED65W chiếu sáng tốt hơn đèn HPS100W thể hiện qua bảng số liệu mô phỏng độ rọi Lux bên dưới.
Độ rọi trung bình của đèn HPS 100W là 8.8lux và của đèn LED 65W là12lux.

Current lights	Innovated lights	Quantity	Current E_{tb} (lux)	E_{tc} (lux)	Innovated E_{tb} (lux)	Current P_0 (W/m)	Innovated P_0 (W/m)	P_{0tc} (W/m)
HPS 100W	LED 65W	11	8.8	12	15	4	2.17	<8

Lượng điện năng tiết kiệm được từ việc thay thế đèn HPS100W bằng đèn LED 65W vào khoảng 35%.

Đèn LED 65W sẽ được lắp đặt ngay khi Stanley hoàn thành khâu sản xuất sản phẩm và Sở Giao thông TP HCM chấp thuận.

4、Cơ chế JCM và Ngân hàng tham gia



1、Tỷ lệ hoàn vốn ROI ngắn hơn nhờ sự hỗ trợ của cơ chế JCM.
2、Chúng tôi đã làm việc với các công ty tài chính về thông tin liên quan dự án.

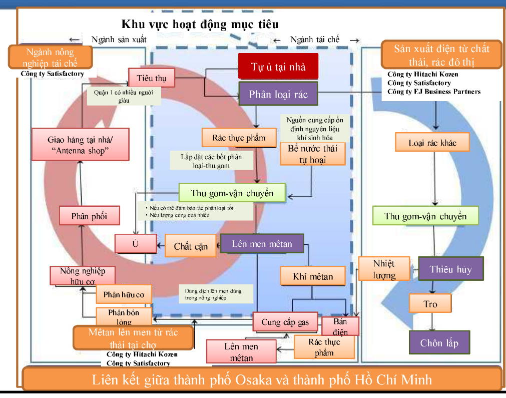
Cám ơn Quý vị đã theo dõi

Nghiệp vụ đánh giá tính hiệu quả của việc giảm phát thải khí CO2 mà được Nhật Bản mở rộng ngành công nghiệp tái chế ra thị trường thế giới năm 2015

Xây dựng hệ thống tái chế rác thực phẩm tại thành phố HCM, Việt Nam

6.11.2015
Công ty Cổ phần Hitachi Zosen

Tóm tắt dự án



Tổ chức triển khai dự án

Hitz Hitachi Zosen — Hitachi Zosen

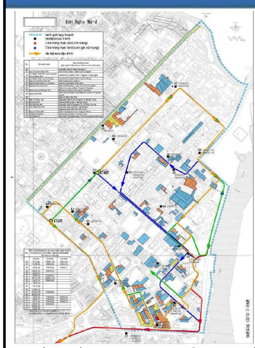
- Cục môi trường, thành phố Osaka
- Viện nghiên cứu môi trường quốc gia
- Trung tâm môi trường toàn cầu
- Viện nghiên cứu thông tin Mizuho

- Công ty Satisfactory International
- Công ty Phát triển công nghệ Eight-Japan

3

CÁCH THỨC PHÂN LOẠI RÁC THỰC PHẨM

THỰC TRẠNG PHÁT THẢI, THU GOM, VẬN CHUYỂN RÁC SINH HOẠT Ở TP. HỒ CHÍ MINH



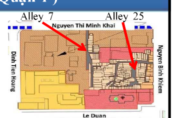
Sơ đồ: Hệ thống thu gom và vận chuyển rác tại p.Bến Nghé, Quận 1
(Kết quả khảo sát của EJEC)

Eight-Japan Engineering Consultants Inc.

TÌNH HÌNH THỰC HIỆN KẾ HOẠCH PHÂN LOẠI RÁC THỰC PHẨM Ở HỘ GIA ĐÌNH TẠI PHƯỜNG BẾN NGHÉ, QUẬN 1 (Tóm tắt số liệu báo cáo của Phòng TNMT Quận 1)

Tiến độ thực hiện chương trình phân loại rác thực phẩm tại các hộ gia đình thuộc ô phố Đinh Tiên Hoàng, Nguyễn Bỉnh Khiêm, Nguyễn Thị Minh Khai, Lê Duẩn như sau:

Hạng mục	Hẻm 7 (Nguyễn Thị Minh Khai)	Hẻm 25 (Nguyễn Bỉnh Khiêm)	Tổng số
Chủ nguồn thải	138 hộ gia đình, 42 cơ sở sản xuất		180 nguồn
(1) Phân loại rác thực phẩm tại các hộ gia đình:			
Bắt đầu phân loại	Từ tháng 5/2015 ～	Từ tháng 11/2013～	
Số thùng rác đã phát (2015)	45 Hộ gia đình (2 màu: xanh và xám)	38 Hộ gia đình (2 màu: xanh và xám)	83 hộ gia đình (Tổng 166 thùng)
Xe đẩy (660L)	Màu xanh: rác thực phẩm Màu xám: rác còn lại	Màu xanh: rác thực phẩm Màu xám: rác còn lại	10 xe
Tỷ lệ hộ tham gia	95%	70%	
Mức độ phân loại	70%		
(2) Phân loại rác tại các cửa hàng, cơ sở kinh doanh:			
Kế hoạch mở rộng	11 cơ sở đang thực hiện 31 cơ sở cam kết sẽ thực hiện		42 cơ sở



Eight-Japan Engineering Consultants Inc.

ĐỀ XUẤT CÁC PHƯƠNG PHÁP XÂY DỰNG KẾ HOẠCH THU GOM, PHÂN LOẠI RÁC THỰC PHẨM

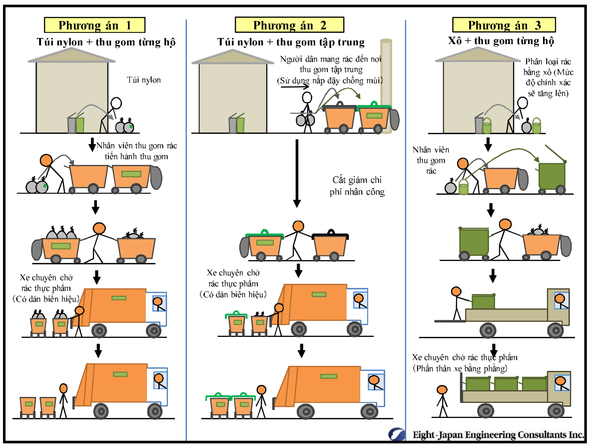
Cách thức thu gom / Cách thức chứa rác	Thu gom từng nhà	Thu gom tập trung (theo khu vực)
Dùng bao nylon	Phương án 1	Phương án 2
Dùng thùng / xô	Phương án 3	(Phương án 4)

CÁC TIÊU CHUẨN CHỌN LỰA TỪNG PHƯƠNG ÁN

1. Đánh giá tính khả thi: có thể áp dụng vào thực tế không?
2. Sự đồng tình và hợp tác từ người dân.
3. Tính hiệu quả liên quan đến chi phí vận chuyển, mua sắm trang thiết bị, nhân công.
4. Mức độ chính xác của rác thực phẩm sau khi phân loại.
5. Phí trợ cấp (tipping fee) để xử lý rác sau khi về khu xử lý.
6. Mức độ vất vả của nhân viên thu gom theo từng cách thức thu gom.
7. Ảnh hưởng đến môi trường xung quanh (mùi hôi, ruồi…)
8. Nơi bảo quản trang thiết bị.

Từ nay đến giữa năm 2016, các giải pháp đề xuất trên được kiến nghị đưa vào thí điểm để lựa chọn phương án phù hợp nhất dựa trên sự trao đổi, thảo luận với chính quyền và nhân dân Quận 1.

Eight-Japan Engineering Consultants Inc.



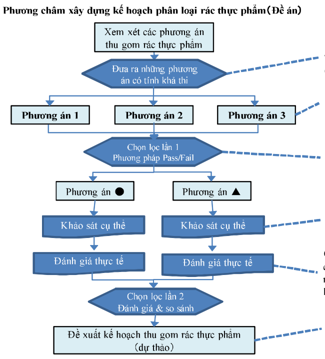
ƯU ĐIỂM VÀ NHƯỢC ĐIỂM CỦA 3 PHƯƠNG ÁN

	Phương án 1	Phương án 2	Phương án 3
Ưu điểm	Hầu hết giống với phương pháp phân loại rác thực phẩm hiện nay đang được thực hiện	✔ Không thay đổi nhiều so với phương pháp phân loại rác thực phẩm hiện nay đang thực hiện	✔ Độ phân loại chính xác cao hơn so với hiện tại
		✔ Giảm thiểu chi phí nhân công	
			✔ Chi phí xử lý rác thấp hơn so với phương án 1 và 2 ✔ ※Trường hợp lên men Metan và làm phân bón
Nhược điểm	✔ Độ phân loại chính xác không cao	✔ Độ phân loại chính xác không cao	✔ Đổi từ phương pháp thải rác bằng túi nylon sang dùng xô nhựa sẽ cần thay đổi toàn bộ hệ thống thu gom, vận chuyển.
		✔ Có khả năng người dân không mang rác đến địa điểm thu rác tập trung	✔ Người dân cần vệ sinh sạch sẽ và bảo quản xô
		✔ Phàn nàn từ những người dân sống xung quanh khu thu gom rác tập trung (NIMBY)	✔ Nguy cơ phát sinh các vấn đề về mùi hôi ✔ Nguy cơ rơi vãi khi vận chuyển/ vệ sinh
		✔ Cần trang bị thùng chứa rác tập trung	✔ Cần xe có đáy thùng bằng phẳng chuyên chở rác thực phẩm
	✔ Chi phí xử lý rác cao	✔ Chi phí xử lý rác cao	

Eight-Japan Engineering Consultants Inc.

PHƯƠNG CHÂM XÂY DỰNG KẾ HOẠCH PHÂN LOẠI RÁC THỰC PHẨM SAU NÀY (DỰ THẢO)

Phương châm xây dựng kế hoạch phân loại rác thực phẩm (Đề án)



Quy trình (Đề án)

●Lựa chọn dựa trên các kết quả khảo sát và lấy ý kiến từ Sở TNMT, Phòng TNMT Quận 1 và Công ty Dịch vụ công ích, được thực hiện vào tháng 7/2015. (dẫn đến 3 phương án)

●Nội dung chi tiết sẽ được trình bày tại cuộc họp giữa các thành viên nòng cốt lần tới (tháng 11).

●Sở TNMT, Phòng TNMT Quận 1 và Công ty Dịch vụ công ích Quận 1 cùng nhau chọn lựa.
(Nếu các phương án đều không hoàn hảo thì dùng những điều kiện bắt buộc phải nhận để phán định).

●Khảo sát cụ thể điều kiện hiện trạng để triển khai thí điểm các phương án được chọn từ nay đến giữa năm 2016.

●Bằng việc thí điểm tại p.Bến Nghé năm 2016, đưa ra căn cứ để tính toán chi phí, đánh giá và so sánh những mặt được và mất một cách cụ thể (do Quận 1 và các bên liên quan cùng tiến hành).

●Tháng 3/2017, đề xuất phương án phân loại và thu gom rác khả thi nhất cho p.Bến Nghé.

Eight-Japan Engineering Consultants Inc.

MÁY LÊN MEN METAN

PHÂN LOẠI PHƯƠNG THỨC XỬ LÝ LÊN MEN METAN

＜Phân loại dựa trên nồng độ chất rắn và đặc điểm từng loại＞

➢Dạng khô：

Nồng độ chất rắn từ 25～40%。

Có khả năng xử lý rác giấy thải, các loại cành cây. Phát sinh nhiều khí gas

➢Dạng ẩm：

Nồng độ chất rắn từ 6～10%。

Đối với rác thải gia đình, chỉ sử dụng cho rác thực phẩm. Vì vậy cần phân loại rác

Về THIếT Bị LÊN MEN KHÍ META ĐƯợC Sử DụNG TRONG Dự ÁN

＜Năm ngoái＞

- Xem xét kết quả thực tế mô hình máy sấy khô, năng suất 500kg/ ngày
- Thự c hiện đánh giá lượng lượng thu gom và chất rác thải thực phẩm đã được phân loại.

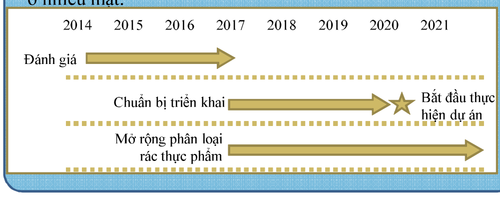
＜Năm nay＞

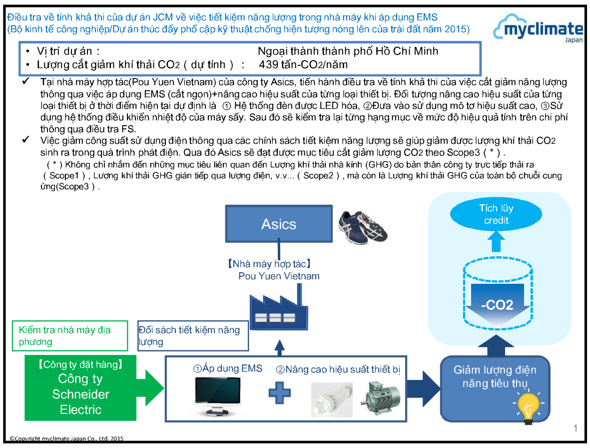
- Thay đổi sang kế hoạch thực tế mô hình máy sấy dạng ẩm, năng suất 200kg/ ngày.
- Về việc thiết lập thiết bị DEMO thì có kế hoạch thiết lập tại điểm xử lý cuối cùng Go Cat cùng với CITENCO
- Đặt mục tiêu hoàn thành quá trình chạy thử trong tháng 3 năm 2016 và bắt đầu đưa rác thực phẩm được phân loại vào từ tháng 4

Kế HOạCH TRIỂN KHAI

Kế HOạCH TRIỂN KHAI

- Dựa trên kết quả đánh giá trong 3 năm trở lại đây (Đánh giá tính chất công việc), từ năm 2017 bắt tay vào chuẩn bị thực hiện hóa công việc. (Sự phê chuẩn và công trường xây dựng)
- Cần thiết phải duy trì, thực hiện thúc đẩy cải thiện chất lượng rác phân loại và mở rộng việc phân loại rác thực phẩm ở nhiều mặt.





Điều tra về tính khả thi của dự án JCM về việc tiết kiệm năng lượng trong nhà máy khi áp dụng EMS
(Bộ kinh tế công nghiệp/Dự án thúc đẩy phổ cập kỹ thuật chống hiện tượng nóng lên của trái đất năm 2015)
myclimate Japan
• Vị trí dự án : Ngoại thành thành phố Hồ Chí Minh
• Lượng cắt giảm khí thải CO2 (dự tính) : 439 tấn-CO2/năm
✓ Tại nhà máy hợp tác(Pou Yuen Vietnam) của công ty Asics, tiến hành điều tra về tính khả thi của việc cắt giảm năng lượng thông qua việc áp dụng EMS (cắt ngọn)+nâng cao hiệu suất của từng loại thiết bị. Đối tượng nâng cao hiệu suất của từng loại thiết bị ở thời điểm hiện tại dự định là ① Hệ thống đèn được LED hóa, ②Đưa vào sử dụng mô tơ hiệu suất cao, ③Sử dụng hệ thống điều khiển nhiệt độ của máy sấy. Sau đó sẽ kiểm tra lại từng hạng mục về mức độ hiệu quả tính trên chi phí thông qua điều tra FS.
✓ Việc giảm công suất sử dụng điện thông qua các chính sách tiết kiệm năng lượng sẽ giúp giảm được lượng khí thải CO2 sinh ra trong quá trình phát điện. Qua đó Asics sẽ đạt được mục tiêu cắt giảm lượng CO2 theo Scope3 (*) .
(*) Không chỉ nhắm đến những mục tiêu liên quan đến Lượng khí thải nhà kính (GHG) do bản thân công ty trực tiếp thải ra (Scope1) , Lượng khí thải GHG gián tiếp qua lượng điện, v.v... (Scope2) , mà còn là Lượng khí thải GHG của toàn bộ chuỗi cung ứng(Scope3) .
Asics
【Nhà máy hợp tác】
Pou Yuen Vietnam
Tích lũy credit
-CO2
Kiểm tra nhà máy địa phương
Đối sách tiết kiệm năng lượng
【Công ty đặt hàng】
Công ty Schneider Electric
①Áp dụng EMS
②Nâng cao hiệu suất thiết bị
Giảm lượng điện năng tiêu thụ
1
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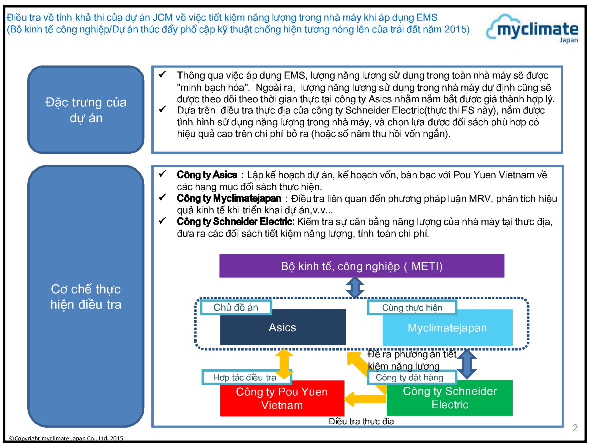

Điều tra về tính khả thi của dự án JCM về việc tiết kiệm năng lượng trong nhà máy khi áp dụng EMS
(Bộ kinh tế công nghiệp/Dự án thúc đẩy phổ cập kỹ thuật chống hiện tượng nóng lên của trái đất năm 2015)
myclimate Japan
Đặc trưng của dự án
✓ Thông qua việc áp dụng EMS, lượng năng lượng sử dụng trong toàn nhà máy sẽ được "minh bạch hóa". Ngoài ra, lượng năng lượng sử dụng trong nhà máy dự định cũng sẽ được theo dõi theo thời gian thực tại công ty Asics nhằm nắm bắt được giá thành hợp lý.
✓ Dựa trên điều tra thực địa của công ty Schneider Electric(thực thi FS này), nắm được tình hình sử dụng năng lượng trong nhà máy, và chọn lựa được đối sách phù hợp có hiệu quả cao trên chi phí bỏ ra (hoặc số năm thu hồi vốn ngắn).
Cơ chế thực hiện điều tra
✓ Công ty Asics : Lập kế hoạch dự án, kế hoạch vốn, bàn bạc với Pou Yuen Vietnam về các hạng mục đối sách thực hiện.
✓ Công ty Myclimatejapan : Điều tra liên quan đến phương pháp luận MRV, phân tích hiệu quả kinh tế khi triển khai dự án,v.v...
✓ Công ty Schneider Electric: Kiểm tra sự cân bằng năng lượng của nhà máy tại thực địa, đưa ra các đối sách tiết kiệm năng lượng, tính toán chi phí.
Bộ kinh tế, công nghiệp (METI)
Chủ đề án
Asics
Cùng thực hiện
Myclimatejapan
Đề ra phương án tiết kiệm năng lượng
Hợp tác điều tra
Công ty Pou Yuen Vietnam
Công ty đặt hàng
Công ty Schneider Electric
Điều tra thực địa
2
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PCKK

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Project to Support the Planning and Implementation of NAMAs in a MRV Manner

Draft Work Plan

JICA Short-Term Expert Team

November 2015

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株式会社オリエンタルコンサルタンツグローバル

SUR 株式会社 数理計画 Environment & Information

Introduction

1. Short-Term Expert Team is contracted by JICA to implement part of "Project to Support the Planning and Implementation of NAMAs in a MRV Manner"
2. Duration of contract is approximately two years from September 2015
3. Short-Term Expert Team is composed of three consulting companies: Pacific Consultants (PCKK), Oriental Consultants Global (OCG) and Suuri-Keikaku (SUR)
4. Short-Term Expert Team will collaborate with Long-Term Experts of Project

 2

Scope of Work 1

1. Conduct activities to attain Output 2 of Project
2. Contribute to attaining Output 1 by providing feedback

Project Outline

Project Purpose: Capacity of the Government of Vietnam concerning the planning and implementation of NAMAs is enhanced.

Output 1: Capacity of MONRE to facilitate the process of development and implementation of NAMAs is enhanced.

Output 2: Capacity of the line ministries and ***other stakeholders*** to plan and implement NAMAs is enhanced.

Feedback

 3

Scope of Work 2

Capacity enhancement on GHG inventory/ NAMA/ MRV using HCMC as model city

Cities of Vietnam
- ✓ Seminar/Training
- ✓ Guidelines/Publicity Material

Municipalities
- ✓ Seminar/Training
- ✓ Guidelines/Publicity Material

HCMC
- ✓ GHG inventory
- ✓ MRV piloting
- ✓ Seminar/Training
- ✓ Manual/Guidelines/Publicity Material

 4

Implementation Structure

Project to Support the Planning and Implementation of NAMAs in a MRV Manner

JICA Experts
Long-Term Experts

Short-Term Expert Team
JV of three consulting companies
- Pacific Consultants
- Oriental Consultants Global
- Suuri-Keikaku

MONRE
(DMHCC)

HCMC
(DONRE-CCB)

Local Consultant

 5

Short-Term Expert Team

Name	Role/Expertise	Company
Hirofumi Ishizaka	Team Leader/ MRV	PCKK
Fumihiko Kuwahara	GHG Inventory 1	SUR
Wataru Morimoto	GHG Inventory 2	OCG
Yoshihiro Mizuno	GHG Emission Quantification 1 (Energy)	PCKK
Yasuki Shirakawa	GHG Emission Quantification 2 (Transport)	PCKK
Tetsuya Yoshida	GHG Emission Quantification 3 (Waste)	OCG
Taiki Kuishi	Workshop Organization/ Coordinator	PCKK

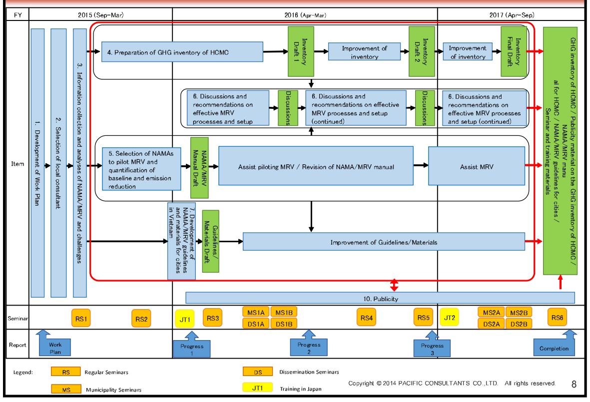
 6

Objectives

1. To assist the establishment and enhancement of the capacity of the cities in Vietnam to continuously quantify GHG emissions and reductions, taking HCMC as a model city.
2. To develop and recommend an MRV style applicable at the city level in Vietnam.
3. To promote the planning, implementation and management of NAMAs in Vietnam through the development and dissemination of materials to assist the capacity enhancement of the cities in Vietnam.

 7

Work Flow



 8

Main Activities

1. Preparation of GHG inventory with HCMC officials
2. Piloting MRV of NAMAs with HCMC officials
3. Manual and guidelines development
4. Seminars and trainings

Item	Target	Number*
a) Regular Seminar	HCMC officials	6
b) Municipality Seminar	Officials of other municipalities	2 per municipality
c) Dissemination Seminar	Officials outside municipalities	2 at 4 locations
d) Training in Japan	Officials engaged in GHG inventory, NAMA, MRV and low-carbon development	2

* Number of times in two year period

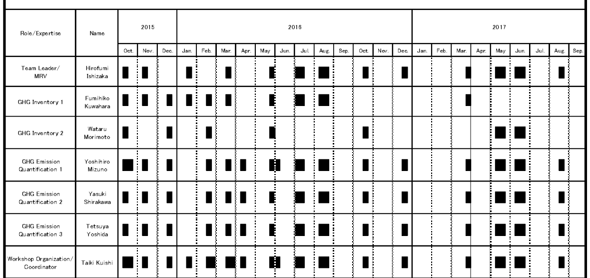
 9

Outputs

1. GHG Inventory of HCMC
2. Publicity Material on GHG Inventory of HCMC
3. NAMA/MRV Manual for HCMC
4. NAMA/MRV Guidelines for Cities of Vietnam
5. Seminar and Training Materials
6. Work Plan, Progress Reports and Completion Report

 10

Dispatch Plan



 11

Current task (1)

1. Selection of local consultant
2. Discussion with CCB about
   - Precise definition and responsible department /office of each of the ten sectors in CCAP of HCMC
   - Implementation structure of the project and responsible persons within HCMC for each of the ten sectors in CCAP
   - Work breakdown structure of the project

 12

Current task (2) Identify precise definition and responsible department /office of each of the ten sectors

Sector	Responsible department /office of HCMC	Target entity/facility/object	Precise definition	Emission sources to be considered					
				Fuel	Electricity	Solid waste	Waste water	Land use	Others
Land use						*		*	
Energy				*	*				
Transport				*	*	*	*		
Industry				*	*	*	*		
Water management					*		*		
Waste management				*	*	*			
Construction				*	*	*	*		
Public health				*	*	*	*		
Agriculture				*	*	*	*	*	*
Tourism				*	*	*	*		

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Thank you!

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2

NỘI DUNG TRÌNH BÀY

A. MỤC TIÊU

B. 10 LĨNH VỰC

C. KẾ HOẠCH

D. KIẾN NGHỊ

3

A. MỤC TIÊU

- Nâng cao hiệu quả quản lý nhà nước trên các lĩnh vực ứng phó với BĐKH.
- Tăng cường tính chủ động ở các ngành, lĩnh vực.
- Thu hút doanh nghiệp và cộng đồng cùng tham gia.

4

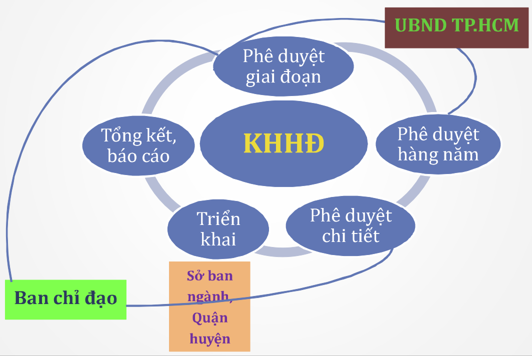
B. 10 LĨNH VỰC TRIỂN KHAI

1. Quy hoạch
2. Năng lượng
3. Giao thông
4. Công nghiệp
5. Quản lý nước
6. Quản lý chất thải
7. Xây dựng
8. Y tế
9. Nông nghiệp
10. Du lịch

5

C. KẾ HOẠCH

Quy trình thực hiện KHHĐ 2016-2020



6

C. KẾ HOẠCH

Tiến độ dự kiến thực hiện KHHĐ 2016-2020

- Dự kiến phê duyệt KHHĐ 2016-2020: Tháng 3/2016.
- Phê duyệt hàng năm: tên và nguồn tài chính thực hiện chương trình/dự án.
- Phê duyệt chi tiết: nội dung, phương án thực hiện các chương trình/dự án.
- Báo cáo tổng kết hàng năm và từng chương trình/dự án.
- Báo cáo tổng kết giai đoạn: Tháng 9/2020


D. KIẾN NGHỊ
7
TP.HCM chủ động triển khai KHHĐ 2016-2020 bằng nguồn lực của mình.
Tăng cường hoạt động hợp tác quốc tế để hỗ trợ triển khai KHHĐ.
Tiếp tục tăng cường và mở rộng hợp tác với Osaka, Nhật Bản và các nước khác trên nhiều lĩnh vực.


D. KIẾN NGHỊ
8
1
Nâng cao năng lực
2
Chương trình/dự án thí điểm
3
Dự án theo cơ chế JCM
Hợp tác với Osaka

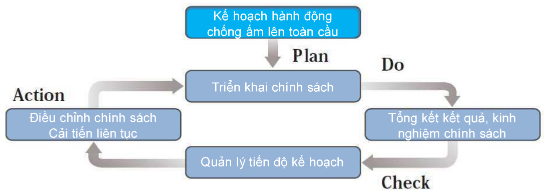

CHÂN THÀNH CẢM ƠN QUÝ VỊ.
Ý kiến đóng góp sau cuộc họp vui lòng gửi về Văn phòng Biến đổi khí hậu hoặc qua hộp thư điện tử: bdkh.stnmt@tphcm.gov.vn
9

Quản lý tiến độ kế hoạch (ví dụ của TP Osaka)

Sở môi trường, TP Osaka

Quản lý tiến độ kế hoạch

- Áp dụng PDCA
- Triển khai và điều chỉnh chính sách một cách thận trọng dưới sự chỉ đạo của thị trưởng



Điều chỉnh các chính sách trọng điểm

- **Phân tích nguyên nhân tăng giảm theo nguồn phát thải**
- **Xem xét các chính sách trọng điểm dựa trên phân tích nguyên nhân (lĩnh vực, tổ chức trọng điểm)**

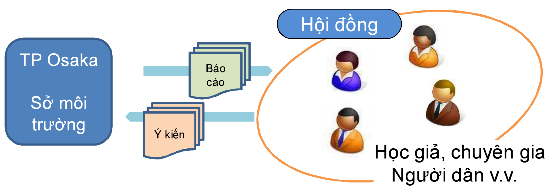
○Nguyên nhân tăng giảm lượng phát thải CO2 và chính sách của TP Osaka

【Hộ gia đình】
Biến động về số hộ, biến động về chủng loại và số lượng đồ điện gia dụng, sản phẩm điện gia dụng ngày càng tăng về kích thước, tính năng v.v.
⇒Đẩy mạnh nhân rộng mô hình nhà sinh thái
Đẩy mạnh nhân rộng thiết bị TKNL, cắt giảm CO2

【Lĩnh vực kinh doanh】
Gia tăng diện tích mặt bằng kinh doanh, オフィスのOA化, thời gian mở cửa của các cửa hàng kéo dài hơn v.v.
⇒Đẩy mạnh biện pháp tại các công trình công cộng
Đẩy mạnh nhân rộng thiết bị TKNL, cắt giảm CO2

Xu thế quốc tế

Tiếp thu ý kiến của các bên liên quan



Global Environment Centre Foundation

Khảo sát hỗ trợ phát triển thành phố phát thải carbon thấp hợp tác giữa TP Hồ Chí Minh và TP Osaka

Khái quát về công tác tổ chức và lịch trình tập huấn

【Tổ chức】	GEC, TP Hồ Chí Minh (VP biến đổi khí hậu), TP Osaka
【Đối tượng】	Các sở ban ngành có liên quan của TP HCM
【Mục đích】	Áp dụng chu trình PDCA tại TP Hồ Chí Minh nhằm phục vụ triển khai, quản lý CCAP—Thảo luận hướng tới triển khai kế hoạch từ năm 2016— ・ Xem xét phương hướng, cơ chế triển khai ・ Xem xét phương pháp giám sát, đánh giá ・ Xem xét phương án vốn để triển khai kế hoạch
【Chương trình】	10 lĩnh vực mỗi lĩnh vực khoảng nửa ngày
【Lịch trình】	Tuần cuối tháng 12, 3 ngày (5 lĩnh vực) Tuần cuối tháng 1, 3 ngày (5 lĩnh vực)

1

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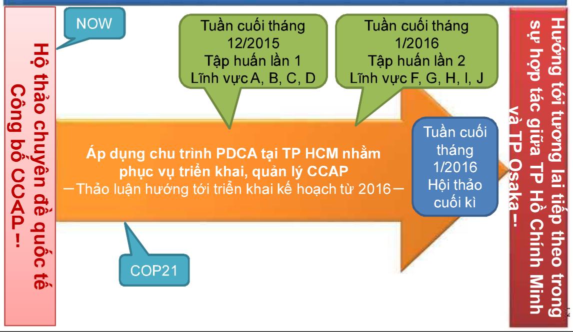
Khảo sát hỗ trợ phát triển thành phố phát thải carbon thấp hợp tác giữa TP Hồ Chí Minh và TP Osaka

Kế hoạch tập huấn



Global Environment Centre Foundation

http://gec.jp/citycoop/osaka-hcm-lcc/index.html

GEC
Global Environment Centre Foundation (GEC)
International Cooperation Division
(Contact person: Mr. Masaaki Tabo, tabo@gec.jp)
Tel : +81-6-6915-4126
Fax: +81-6-6915-0181
Email: HCMC-lc@gec.jp
Web: http://gec.jp

3

2. Final Reporting Workshop

Nghiệp vụ ủy thác dự án điều tra tính khả năng phát triển của dự án JCM để hiện thực hóa xã hội có các-bon thấp tại Châu Á trong năm 2015

Điều tra hỗ trợ phát triển đô thị có các-bon thấp bằng mối liên kết giữa thành phố Hồ Chí Minh và thành phố Osaka

Final Reporting Workshop FY2015
Ngày 25 tháng 02 năm 2016 (thứ Năm)

Đại diện điều tra: Global Environment Centre Foundation (GEC)
Đồng điều tra: Thành phố Osaka
Tepia Corporation Japan/ Panasonic Corporation
Ogawa Electric Co, Ltd.
Myclimate Japan Co., Ltd.
Next Energy & Resources Co., Ltd.

Global Environment Centre Foundation

Điều tra hỗ trợ phát triển đô thị có các-bon thấp bằng mối liên kết giữa thành phố Hồ Chí Minh và thành phố Osaka

Thành phố Hồ Chí Minh

- Thành phố Hồ Chí Minh có dân số và quy mô kinh tế thuộc hàng thành phố lớn nhất Việt nam
- Cùng với việc phát triển kinh tế và đô thị hóa cấp tốc đã kéo theo những lo ngại về sự gia tăng khí thải nhà kính và tác động môi trường

Hỗ trợ của Bộ Môi trường Nhật Bản

- Ký kết cơ chế tín dụng giữa 2 nước (JCM) Nhật Việt (tháng 07 năm 2013)
- Lựa chọn "Điều tra tính khả năng phát triển của dự án có quy mô lớn JCM" (2013-)

Hỗ trợ của thành phố Osaka

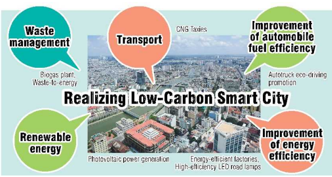
Ký kết "Biên bản ghi nhớ hướng đến việc phát triển đô thị có các-bon thấp thành phố Hồ Chí Minh và thành phố Osaka (tháng 10 năm 2013) bởi Thị trưởng của 2 thành phố

Phát triển đô thị có các-bon thấp thành phố Hồ Chí Minh bằng việc thực thi một cách nghiêm túc Biên bản ghi nhớ

Global Environment Centre Foundation

Mục đích của dự án

- Cung cấp, hỗ trợ hệ thống với cơ cấu của công nghệ môi trường và quản lý hành chính môi trường ưu việt của Osaka, Nhật Bản
- Lấy việc xây dựng đô thị có các-bon thấp trong thời gian dài làm nòng cốt nhằm thành lập cơ chế điều hành, quản lý duy trì như hoạch định kế hoạch thực hiện đối sách biến đổi khí hậu hay đào tạo nguồn nhân lực, v.v…
- Vận dụng nguồn vốn quan trọng JCM (Joint Crediting Mechanism) hướng đến việc áp dụng, chuyển giao kỹ thuật có các-bon thấp cho thành phố Hồ Chí Minh



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Dự án của nhóm Osaka

2 dự án hỗ trợ trang thiết bị JCM ra đời trong năm 2014

1. Lên men khí mê-tan và sử dụng gas từ chất thải hữu cơ tại chợ bán sỉ Bình Điền
   Phía Việt Nam: Tổng công ty Thương mại Sài gòn
   Phía Nhật Bản: Hitachi Zosen Corporation
   Thời gian xây dựng: Năm 2014 ~ 2016
   Lượng giảm phát thải: 3.355tCO2/năm

2. Dự án lái xe thân thiện môi trường bằng cách sử dụng đồng hồ tốc độ kỹ thuật số (Tp.HCM và Hà Nội)
   Phía Việt Nam: Công ty TNHH Nippon Express Việt Nam
   Phía Nhật Bản: Nippon Express
   Lượng giảm phát thải: 328tCO2/năm (※)
   ※Số liệu tổng hợp của Tp.HCM và Hà Nội

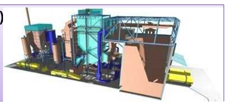
Đã đăng ký xong dự án JCM (tháng 08 năm 2015)
《Đăng ký số 1 tại nước Việt Nam》

Global Environment Centre Foundation

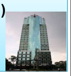
Mở rộng dự án của nhóm Osaka (năm 2014)

Thực thi 3 dự án FS, PS nhằm hướng đến dự án hỗ trợ trang thiết bị JCM

1. Phát điện từ chất thải tổng hợp tại Tp.HCM (PS)
   Phía Việt Nam: Công ty Vietstar
   Phía Nhật Bản: Hitachi Zosen Corporation



2. Áp dụng công nghệ tiết kiệm năng lượng cho công trình kiến trúc (FS)
   Phía Việt Nam: Sun Wah Tower
   Phía Nhật Bản: Shimizu Corporation



3. Xúc tiến chuyển đổi xe buýt sang Park-and-Ride và Eco-point với mô hình áp dụng cửa hàng (FS)
   Phía Việt Nam: Sở Giao thông vận tải thành Tp.HCM (DOT) (giả định)
   Phía Nhật Bản: Nikken Sekkei Research Institute

Tổng quan điều tra năm 2015

Global Environment Centre Foundation

Bối cảnh

【Năm 2013】Thị trưởng thành phố Hồ Chí Minh và thành phố Osaka đã ký kết "Biên bản ghi nhớ hướng đến việc phát triển đô thị có các-bon thấp" thể hiện rõ ràng việc áp dụng JCM, bắt đầu dự án liên quan đến phát triển đô thị có các-bon thấp theo mối liên kết giữa hai thành phố.
【Năm 2014】Hỗ trợ hoạch định "Kế hoạch thực hiện đối sách biến đổi khí hậu" + sáng tạo ra 2 dự án hỗ trợ trang thiết bị JCM nhằm thúc đẩy khai thác dự án JCM và phát triển ra quy mô lớn.

◆ Nội dung dự án chính ◆

Hoạch định kế hoạch thực hiện đối sách biến đổi khí hậu, hỗ trợ đào tạo nguồn nhân lực

Điều tra tính khả năng hiện thực hóa dự án JCM (bao gồm cả việc phát triển phương pháp JCM và tạo PDD)

Liên kết giữa các đô thị, liên kết công tư
Liên đoàn nhóm Osaka

Thực thi 4 dự án dưới đây được nhìn nhận là sẽ sớm hiện thực hóa việc để triển khai trực diện dự án JCM và phát triển dự án một cách liên tục.

Tên điều tra	Chủ thể điều tra
Dự án tiết kiệm năng lượng nhà máy tại các khu công nghiệp Tp.HCM	Tepia Corporation Japan, Panasonic Corporation
Dự án LED hóa nhằm tăng hiệu quả cao của đèn đường	Ogawa Electric Co, Ltd.
Dự án phổ cập taxi CNG	Myclimate Japan Co., Ltd.
Dự án xúc tiến phổ cập sử dụng năng lượng mặt trời cho ngành công nghiệp	Next Energy & Resources Co., Ltd.

☆Cung cấp hệ thống đã được hòa hợp cơ cấu của công nghệ môi trường và quản lý hành chính môi trường ưu việt của Osaka, khai phá, phát triển dự án quy mô lớn JCM một cách trực diện và trọn gói.
☆Lấy việc xây dựng đô thị có các-bon thấp trong thời gian dài làm nòng cốt nhằm thành lập cơ chế điều hành, quản lý duy trì như hoạch định kế hoạch thực hiện đối sách biến đổi khí hậu (dự định nhận được phê duyệt của nước Việt Nam trong năm 2016) hay đào tạo nguồn nhân lực, v.v…

Mô hình siêu đô thị ở Châu Á

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Hội thảo quốc tế liên quan đến dự án phát triển đô thị có các-bon thấp bằng mối liên kết giữa thành phố Hồ Chí Minh và thành phố Osaka (năm 2015)

[Ngày giờ] : 06/11/2015

[Hội trường] : Hotel Nikko Saigon

[Những người tham dự chính]:
Mr. Tat Thanh Cang
(Vice Chairman, HCMC)
Mr. Seigo Tanaka
(Vice Mayor, Osaka City)

7

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Đối thoại chính sách của 2 thành phố tại hội thảo quốc tế

Thành phố Hồ Chính Minh

Thông qua quá trình thực hiện CCAP, hướng đến việc phát triển đô thị có các-bon thấp, cùng với việc ý thức được những thứ cần phải làm, đã nhận thức được tầm quan trọng của việc hợp tác với các doanh nghiệp quốc doanh trong tương lai nhằm nhanh chóng hiện thực hóa dự án một cách chi tiết. Tiếp tục, mong muốn nhận được sự hỗ trợ quản lý tiến độ của CCAP bằng các công nghệ thực tế của thành phố Osaka, nâng cao ý thức người dân, hướng dẫn/ đào tạo nguồn nhân lực, v.v...

Thành phố Osaka

Thành phố Osaka cũng hợp tác chặt chẽ với Bộ Môi trường, phát triển dự án một cách chi tiết theo CCAP để tiếp tục hỗ trợ phát triển đô thị có các-bon thấp thành phố Hồ Chí Minh. Việc vận dụng khoa học công nghệ trong hoạt động sản xuất là rất quan trọng nên cũng muốn liên kết với các cơ quan nghiên cứu, v.v... (Viện Khoa học Môi trường thành phố Osaka, 4 đại học công lập ở Kansai, Viện Môi trường Quốc gia, đại học Kyoto, v.v...).

Chủ tịch Ủy ban nhân dân thành phố Hồ Chí Minh đã trao tận tay cho Thị trưởng thành phố Osaka thư yêu cầu tiếp tục hợp tác liên quan đến đạo tạo nguồn nhân lực và xúc tiến dự án.

8

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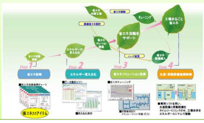
Dự án mới của nhóm Osaka (năm 2015)

2 dự án mới hỗ trợ trang thiết bị JCM ra đời trong năm 2015

1. Tiết kiệm năng lượng trong nhà máy bằng cách sử dụng hệ thống kiểm soát điều hòa không khí

Phía Việt Nam: 6 công ty con của Nidec Corporation
Phía Nhật Bản: Yuko-Keiso Co., Ltd.
Lượng giảm phát thải: 4.681tCO_2/năm
Bắt đầu hoạt động: Năm 2017 (dự định)



2. Sử dụng năng lượng mặt trời tại trung tâm mua sắm Thành phố Hồ Chí Minh

Phía Việt Nam: Aeon Việt Nam
Phía Nhật Bản: Aeon Retail Co., Ltd.
Lượng giảm phát thải: 274tCO_2/năm
Bắt đầu hoạt động: Năm 2016 (dự định)

9

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Xin cảm ơn quý vị đã lắng nghe!

http://gec.jp/citycoop/osaka-hcm-lcc/en/index.html

10

XÂY DỰNG

KẾ HOẠCH HÀNH ĐỘNG

ỨNG PHÓ VỚI BIẾN ĐỔI KHÍ HẬU TRÊN ĐỊA BÀN THÀNH PHỐ HỒ CHÍ MINH GIAI ĐOẠN 2016-2020, TẦM NHÌN ĐẾN 2030

Văn phòng Biến đổi khí hậu Thành phố Hồ Chí Minh
Tháng 02-2016

+ NỘI DUNG

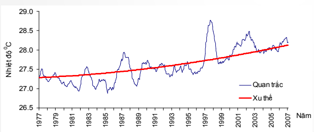
2

1. Nguyên tắc xây dựng Kế hoạch hành động ứng phó với BĐKH 2016-2020
2. Mục tiêu của KHHĐ 2016-2020
3. Định hướng xây dựng KHHĐ 2016-2020
4. Xây dựng danh mục giải pháp ứng phó với BĐKH

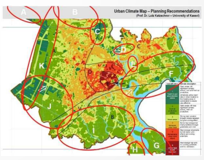
+ 1. Nguyên tắc xây dựng

3

- **Các yếu tố BĐKH quan trọng nhất (bên cạnh các yếu tố khác) đối với TP.HCM, kéo theo tất cả các hậu quả:**
  - *Nhiệt độ trung bình tăng lên, chênh lệch nhiệt độ giữa vùng lõi đô thị và vùng ven lớn dần*
  - *Mưa cực đoan + Nước biển dâng* → Ngập nặng mùa mưa, thiếu nước mùa khô, xâm nhập mặn, ...



Xu hướng gia tăng nhiệt độ trong giai đoạn 1977-2007.
Nguồn: DOST, 2010.



Phân bố nhiệt độ ở TP HCM
Nguồn: MegaCity Project, 2012.

+ 1. Nguyên tắc xây dựng

4

- **Lồng ghép các yếu tố biến đổi khí hậu** vào trong các Chiến lược, Qui hoạch, Chương trình, Kế hoạch và Dự án phát triển kinh tế và xã hội của thành phố.
- **Giảm thiểu BĐKH:** Giảm phát thải KNK hoặc tăng hiệu quả sử dụng năng lượng và tài nguyên.
- **Thích nghi với BĐKH:** chuyển dần theo hướng tận dụng các mặt mạnh của biến đổi khí hậu với chi phí nhỏ nhất.

+ 1. Nguyên tắc xây dựng

5

- Lựa chọn các lĩnh vực kinh tế và xã hội bị tác động do biến đổi khí hậu được dựa trên cơ sở kinh nghiệm các nước và thực tế tại thành phố Hồ Chí Minh.
- **Thứ tự ưu tiên của mỗi lĩnh vực** được xây dựng dựa trên cơ sở:
  1. Tầm quan trọng chi phối
  2. Đóng góp GDP
  3. Lượng phát thải KNK

+ 1. Nguyên tắc xây dựng

6

- **10 lĩnh vực trong kế hoạch ứng phó với BĐKH:**
  1. Quy hoạch đô thị
  2. Năng lượng
  3. Giao thông
  4. Công nghiệp
  5. Quản lý nước
  6. Quản lý chất thải
  7. Xây dựng
  8. Y tế
  9. Nông nghiệp
  10. Du lịch và Nâng cao nhận thức cộng đồng

+ 1. Nguyên tắc xây dựng

7

- **Đánh giá tác động của BĐKH đến các lĩnh vực:**
  - ***Định tính*** *theo các lĩnh vực:* đơn giản và không cần nhiều số liệu.
  - ***Định lượng*** *theo các lĩnh vực:* rất phức tạp và cần rất nhiều số liệu của tất cả các lĩnh vực trong thời gian nhiều năm.

Ngân hàng dữ liệu và phương pháp tính toán về BĐKH của TP.HCM còn rất hạn chế.

→ Chọn đánh giá **định tính** trong giai đoạn này (triển khai nghiên cứu đánh giá định lượng trong giai đoạn 2016-2020).

+ 1. Nguyên tắc xây dựng

8

- **Hợp tác quốc tế -** hợp tác với thành phố Osaka thông qua *Chương trình Phát triển Thành phố phát thải cac-bon thấp*, trong đó có 2 nhóm hoạt động chính:
  - Tập huấn nâng cao năng lực đội ngũ cán bộ quản lý để xây dựng KHHĐ;
  - Hợp tác triển khai công tác kiểm kê KNK (IGES, 2013); dự báo phát thải KNK năm 2020, tính toán tiềm năng giảm phát thải và đề xuất mục tiêu giảm phát thải KNK cho năm 2020 (nhóm AIM, 2014 và 2015).

+ 2. Mục tiêu của KHHĐ 2016-2020

9

- **Tăng cường năng lực ứng phó với BĐKH** của TP.HCM khi triển khai các quy hoạch, kế hoạch phát triển kinh tế - xã hội.
- **Đóng góp vào mục tiêu giảm phát thải KNK** của quốc gia, qua đó nâng cao hiệu quả sử dụng năng lượng và tài nguyên.
- Nâng cao khả năng hợp tác quốc tế và thu hút đầu tư trong công tác ứng phó với BĐKH.

+ 2. Mục tiêu của KHHĐ 2016-2020

10

- **Mục tiêu giảm phát thải KNK năm 2020 so với kịch bản BaU* (dự kiến, còn hiệu chỉnh):**

MỤC TIÊU TỔNG THỂ	
Mức đóng góp vô điều kiện (tự đóng góp)	**10,5%**
Mức đóng góp có điều kiện (có hỗ trợ bên ngoài) - (nếu tính cả tiềm năng giảm phát thải từ lưới điện với 6,1%)	**19,1%**
MỤC TIÊU RIÊNG SO VỚI PHÁT THẢI CỦA NGÀNH	
Năng lượng	**18,5%**
Giao thông	**9,3%**
Công nghiệp	**7,9%**
Quản lý chất thải	**53%**
Nông nghiệp	**2%**

** Kết quả tính toán do nhóm AIM thực hiện dựa trên số liệu do TP.HCM cung cấp.*

+ 3. Định hướng xây dựng KHHĐ 2016-2020

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- **Nâng cao hiệu quả sử dụng** năng lượng và tài nguyên trong các hoạt động phát triển KT-XH của TP.HCM.
- Thể hiện **tất cả nhu cầu tổng thể** của TP.HCM trong công tác ứng phó với BĐKH → Giúp các nhà quản lý, các nhà đầu tư trong và ngoài nước biết rõ định hướng và nhu cầu của thành phố Hồ Chí Minh.
- Triệt để tận dụng các nguồn tài chính quốc tế liên quan đến BĐKH và khai thác triệt để cơ chế hợp tác "Chính phủ/Thành phố với Thành phố" (Government/City to City).

+ 3. Định hướng xây dựng KHHĐ 2016-2020

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- **KHHĐ 2016-2020 sẽ tập trung vào:**
  - **Hệ thống văn bản pháp lý** cần phải xây dựng nhằm phục vụ cho công tác quản lý Nhà Nước trong các hoạt động ứng phó với BĐKH.
  - **Tích hợp yếu tố BĐKH** vào các Chiến lược, Chương trình, Kế hoạch phát triển KT-XH hiện hữu của TP.HCM và **đề xuất các dự án** ứng phó với BĐKH.

+ 3. Định hướng xây dựng KHHĐ 2016-2020

13

- *Tiếp tục thực hiện và nâng cao hiệu quả các giải pháp **giảm thiểu** BĐKH:*
  - Lượng phát thải hoặc giảm phát thải CO_2 có thể là **chỉ tiêu gián tiếp** để **đánh giá hiệu quả hoạt động** của các lĩnh vực phát triển KT-XH.
  - Phải triển khai được những dự án cụ thể.

+ 3. Định hướng xây dựng KHHĐ 2016-2020

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- *Từng bước chuẩn bị và thực hiện các giải pháp **thích ứng** với BĐKH:*
  - Đẩy mạnh các giải pháp thích nghi theo hướng tận dụng các mặt mạnh của biến đổi khí hậu với chi phí nhỏ nhất và các giải pháp nâng cao nhận thức.
  - Xúc tiến tìm kiếm nguồn vốn hỗ trợ các dự án xây dựng cơ sở hạ tầng quy mô lớn.

+ 4. Xây dựng danh mục giải pháp ứng phó BĐKH

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Nguyên tắc:

- Dựa trên định hướng chung và nhu cầu phát triển bền vững của từng lĩnh vực
- Phối hợp giữa các thành viên Ban Chỉ đạo BĐKH và các doanh nghiệp lớn ở TP.HCM, đẩy mạnh xã hội hóa và hợp tác quốc tế
- Rút kinh nghiệm từ giai đoạn trước

+ 4. Xây dựng danh mục giải pháp ứng phó BĐKH

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① **Phụ lục 1** - Danh mục giải pháp được thực hiện trong giai đoạn 2016-2020 có sử dụng nguồn ngân sách thành phố do Ban Chỉ đạo thực hiện KHHĐ ứng phó với BĐKH điều phối

- tính khả thi cao,
- thí điểm quy mô nhỏ,
- thời gian thực hiện ngắn,
- kinh phí thấp.

+ 4. Xây dựng danh mục giải pháp ứng phó BĐKH

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② **Phụ lục 2** - Danh mục giải pháp có nhu cầu kêu gọi đầu tư và hỗ trợ tài chính quốc tế để đóng góp vào hoạt động ứng phó BĐKH của TP.HCM

- phát triển cơ sở hạ tầng,
- quy mô lớn,
- thời gian thực hiện dài,
- kinh phí lớn,
- bao gồm cả các giải pháp xây dựng cơ sở hạ tầng lớn không thuộc phạm vi điều phối của Ban Chỉ đạo thực hiện KHHĐ ứng phó với BĐKH

+ CHÂN THÀNH CẢM ƠN QUÝ VỊ.

Ý kiến đóng góp sau cuộc họp vui lòng gửi về Văn phòng Biến đổi khí hậu hoặc qua hộp thư điện tử:
bdkh.stnmt@tphcm.gov.vn

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GHG emissions reduction for Ho Chi Minh City in 2020

- Updated results -

Research team:

VIETNAM

- HCMC Climate Change Bureau (HCCB)

AIM TEAM

- Kyoto University (KU)
- E-konzal
- National Institute for Environmental Studies, Japan (NIES)
  Center for Social and Environmental Systems Research
- Institute for Global Environmental Strategies (IGES) – LoCARNet
- Mizuho Information and Research Institute (MHIR)

TRAN Thanh Tu (thanhtu311083@gmail.com)

Content of this presentation

2

1. Introduction about the Ho Chi Minh City's research
2. Methodology: Integrated approach
3. Results
4. Related activities
5. Challenges

3

INTRODUCTION

Introduction about the research

4

➢**Objective:** To design and support the design of Low carbon city (or Climate Change Action Plan - CCAP) for Ho Chi Minh City (HCMC) by 2020. The GHG emissions reduction potential of each project in CCAP is quantified using AIM's methodology.

GHG emissions reduction follows the national target in
Decision 1393/Q-TTg (25/09/2012) **"Green growth strategy in Vietnam"**

"…Reduce the GHG emissions from energy-related activities
10 – 20% of BaU case"…

and

Vietnam's INDCs submitted to UNFCCC
"… reduce the GHG emissions by 8-25% compared to BaU" …

Introduction about the research

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➢**Research scope:**

- Base year: 2013
- Target year: 2020
- Greenhouse gases: CO_2, CH_4, N_2O
- Model's sector (m_sector): focus on

(1) energy-related activities

(Power generation, Industry (manufacturing and construction), Transportation, Household, and Commercial);

and **(2) non-energy-related activities**

(Agriculture and Waste)

Research procedure

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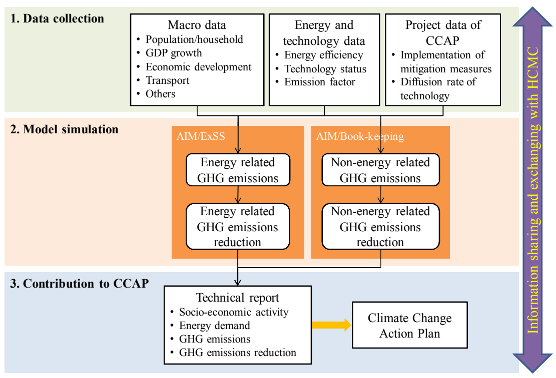
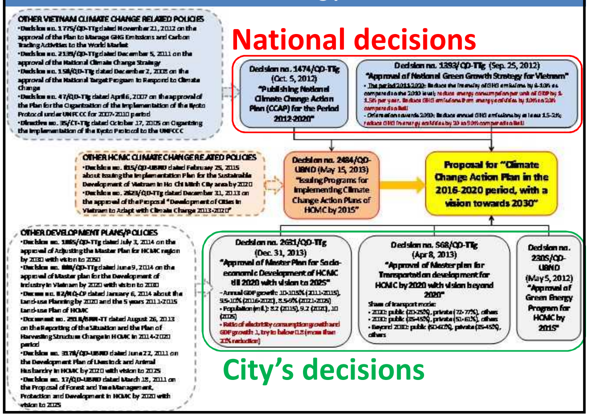


Related existing policies

7



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METHODOLOGY

Data used and references

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➢Base year 2013 **STATISTICS**

Data used	References
Population Number of households Gross output by sectors Value added by sectors Final demand Investment Transport volume Number of employee Crop plant area and production Amount of fertilizer consumption Livestock population	Statistical Yearbook 2013 of HCMC (2014) Statistical Yearbook 2013 of Vietnam (2014)
Energy Balance Table 2011, 2012 for Vietnam	IEA Energy Balances of non-OECD countries (2014)
Energy Balance Table 2005 for Vietnam	Vietnam Institute of Energy (2010)
Energy consumption by energy types (including electricity)	Various sources
Input-Output Table 2007 for HCMC	Statistical Office in HCMC (2012)
Solid waste and wastewater generation	Center for Environmental Technology and Management (ETM) reports (2014)
Emission factors	IPCC guidelines 2006 (2006)

Data used and references

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➢Target year 2020 **DEVELOPMENT PLANS**

Data used	References
GHG emissions reduction target	National Green Growth Strategy for Vietnam (Decision no. 1393/QD-TTg, 2012)
GDP growth (total, primary, secondary, tertiary) Population growth GDP per capita Economic structure Power supply Water supply	Master Plan for Socio-economic Development of HCMC till 2020 with a vision to 2025 (Decision no. 2631/QD-TTg, 2013)
Industry	Master plan for the Development of Industry in Vietnam by 2020 with vision to 2030 (Decision no. 880/QD-TTg, 2014)
Transport	Master plan for Transportation Development for HCMC by 2020 with vision beyond 2020 (Decision no. 568/QD-TTg, 2013)
Energy	Green Energy Program for HCMC by 2015 (Decision no. 2305/QD-UBND, 2012) National Master Plan for Power Development for the 2011-2020 period with the vision to 2030 (PDP7) (Decision no. 1208/QD-TTg, 2011)

Data used and references

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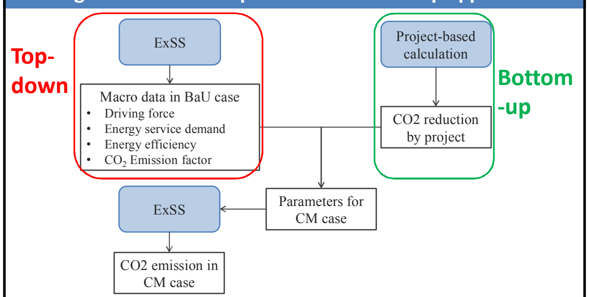
➢Target year (cont') **DEVELOPMENT PLANS**

Data used	References
Agriculture	Plan for Harvesting Structure Change in 2014-2020 period in HCMC (2910/BNN-TT, 2013)
Livestock and husbandry	Development Plan of Livestock and Animal Husbandry in HCMC by 2020 with vision to 2025 (Decision no. 3178/QD-UBND, 2011)
Solid waste	Solid Waste Treatment Plan by 2020 with vision to 2030 for HCMC (HCMC People Committee, 2012)

Integration between top-down and bottom-up approaches

12



- Top-down approach: **estimate socio-economic activities and energy demand and GHG emissions from a macroscopic point of view.**
- Bottom-up approach: **assume the technology-related information** based on the projects in CCAP

Extended Snapshot (ExSS) Tool

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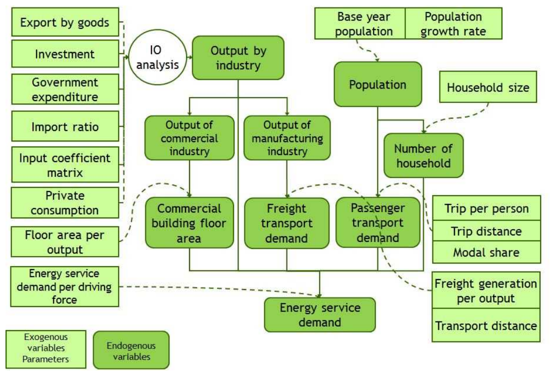
➢Socio-economic part of ExSS



AIM/ExSS

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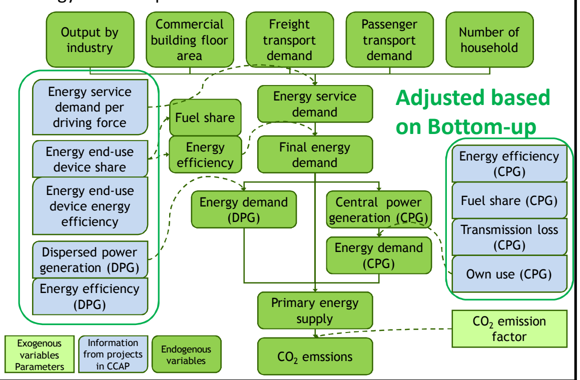
➢Energy and GHG part



AIM/Book-keeping

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➢Regarding non-energy related activities, we mainly apply the IPCC guideline to estimate the GHG emissions.

- **Agriculture (non-energy related)**
  - Harvest
  - Livestock
- **Waste management**
  - Landfill
  - Composting
  - Incineration
- **CO_2 absorption**

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RESULTS AND DISCUSSION

One Socio-Economic vision and Two mitigation scenarios

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- The Socio-economic Vision is mainly followed after **Decision 2631/QD-TTg**

	Unit	2013	2020	2020 /2013	CAGR 2013-2020
Population	persons	7,939,752	9,200,000	1.16	2.1%
No. of households	households	1,277,338	1,840,000	1.44	5.4%
GDP per capita	mil. Dongs	96	159	1.66	7.5%
GDP	bil. Dongs	764,560	1,467,160	1.92	9.8%
Passenger transport demand	mil.per.km	75,357	108,281	1.44	5.3%
Freight transport demand	mil.ton.km	57,434	101,107	1.76	8.4%

- Two scenarios are developed for the analysis

Scenario	Characteristics
Business as Usual (BaU)	- Socio-economic assumptions in the above table
Climate Change Action Plan (CCAP)	- Same socio-economic assumptions as BaU - Mitigation projects are implemented to achieve the GHG emissions reduction target

Final energy consumption

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- Rapid growth of driving forces (GDP, population, transport demand) leads to the increasing consumption of energy and CO_2 emission.

	2013	%	2020 BaU	%	2020 CCAP	%	BaU /2013	CCAP /BaU
Total	**6,972**	**100.0**	**12,056**	**100.0**	**10,849**	**100.0**	**1.73**	**0.90**
By sector								
Agriculture	8	0.1	11	0.1	11	0.1	1.47	1.00
Industry	3,921	56.2	7,166	59.4	6,569	60.5	1.83	0.92
Commercial	561	8.0	1,221	10.1	1,101	10.1	2.18	0.90
Residential	786	11.3	1,198	9.9	1,060	9.8	1.52	0.89
Passenger transport	1,256	18.0	1,684	14.0	1,438	13.3	1.34	0.85
Freight transport	441	6.3	776	6.4	670	6.2	1.76	0.86
By energy type								
Coal	1,916	27.5	3,501	29.0	3,083	28.4	1.83	0.88
Oil	2,837	40.7	4,577	38.0	3,819	35.2	1.61	0.83
Gas	135	1.9	247	2.1	285	2.6	1.83	1.15
Biomass	566	8.1	1,028	8.5	141	1.3		
Electricity	1,518	21.8	2,703	22.4	1,020	9.4	1.82	0.99
Energy intensity (toe/bil. Dongs)	9.1		8.2		7.4		0.90	0.90

GHG emissions

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GHG emissions	2013 ktCO$_2$eq	%	2020 BaU ktCO$_2$eq	%	2020 CCAP ktCO$_2$eq	%	BaU/2013	CCAP/BaU
Energy-related GHG emissions	**28,094**	**93.6**	**49,947**	**95.1**	**41,381**	**97.4**	**1.78**	**0.83**
Agricultural energy-related	26	0.1	38	0.1	36	0.1	1.48	0.95
Industry	15,001	50.0	27,811	52.9	23,940	56.4	1.85	0.86
Commercial	2,988	10.0	6,717	12.8	4,914	11.6	2.25	0.73
Residential	5,074	16.9	8,047	15.3	6,054	14.3	1.59	0.75
Passenger transport	3,705	12.3	5,044	9.6	4,458	10.5	1.36	0.88
Freight transport	1,301	4.3	2,289	4.4	1,978	4.7	1.76	0.86
Non-energy related GHG emissions	**1,918**	**6.4**	**2,583**	**4.9**	**1,425**	**3.4**	**1.35**	**0.55**
Agricultural non-energy related	635	2.1	406	0.8	399	0.9	0.64	0.98
Solid waste management	1,283	4.3	2,177	4.1	1,026	2.4	1.70	0.47
CO_2 absorption					**-334**	**-0.8**		
Total GHG emissions	**30,012**	**100.0**	**52,530**	**100.0**	**42,472**	**100.0**	**1.75**	**0.81**
GHG emissions per GDP (tCO$_2$eq/bil.Dongs)	39.3		35.8		28.9		0.91	0.81
GHG emissions per capita (tCO$_2$eq/person)	3.8		5.7		4.6		1.51	0.81

GHG emissions and reduction

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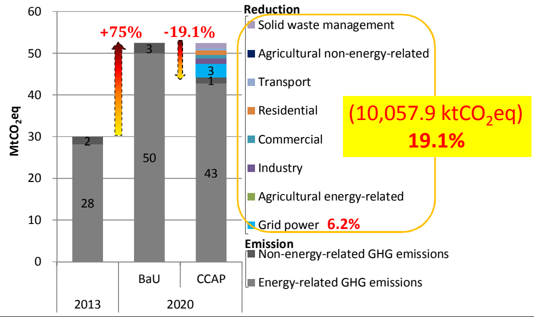
- **By the 2020CCAP scenario, the GHG emission reduction is 19.1% of total emission of Business as Usual (2020BaU)**
  (including 6.2% reduction is expected from the mitigation of grid power)



GHG emissions reduction

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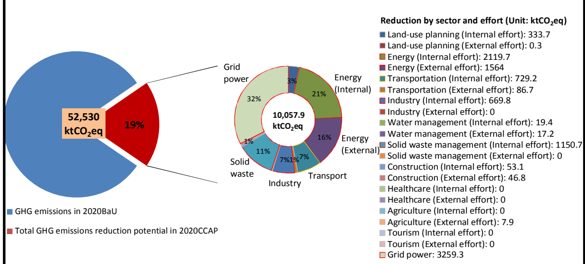

Project-based GHG emissions reduction

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				Amount (ktCO$_2$eq)	Share (%)
1. GHG emissions in 2020BaU				**52,530.0**	**100.0**
2. Total GHG emissions reduction potential in 2020CCAP				**10,057.9**	**19.1**
2a. Reduction by projects		**Effort** Internal	External	**Total by sector**	**Share by sector**
Sector	*Land-use planning*	*333.7*	*0.3*	**333.9**	**0.6**
	Energy	*2,119.7*	*1,564.0*	**3,683.7**	**7.0**
	Transportation	*729.2*	*86.7*	**816.0**	**1.6**
	Industry	*669.8*	*0.0*	**669.8**	**1.3**
	Water management	*19.4*	*17.2*	**36.6**	**0.1**
	Solid waste management	*1,150.7*	*0.0*	**1,150.7**	**2.2**
	Construction	*53.1*	*46.8*	**99.9**	**0.2**
	Healthcare	*0.0*	*0.0*	**0.0**	**0.0**
	Agriculture	*0.0*	*7.9*	**7.9**	**0.0**
	Tourism	*0.0*	*0.0*	**0.0**	**0.0**
Total by effort		**5,075.6**	**1,722.9**	**6,798.6**	**12.9**
Share by effort (%)		**9.7**	**3.3**	**12.9**	
2b. Reduction from grid power (internal)				**3,259.3**	**6.2**

Projects in Land-use planning

23

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
I	Land-use planning	I-3	Afforestation and greening (parks, roads, pedestrian spaces, riparian and coastal areas)	Internal	CO_2 absorption	333.7
			Build wind channels (green corridors)	External	Commercial	0.2
			TOTAL (I)			**333.9**

Projects in Energy

24

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
II	Energy	II-1	Energy efficiency technology applied to buildings	Internal	Commercial	55.2
		II-2	ESCO (Energy Saving COmpany) Project	External	Total II-2	1,123.7
		II-2	*ESCO (Energy Saving COmpany) Project for commercial buildings*	*External*	*Commercial*	*233.5*
		II-2	*ESCO (Energy Saving COmpany) Project for industries*	*External*	*Industry*	*890.2*
		II-3	High Efficiency Lighting	Internal	Total II-3	688.1
		II-3	*High Efficiency Lighting in public lighting*	*Internal*	*public lighting*	*3.9*
		II-3	*High Efficiency Lighting in commercial buildings*	*Internal*	*Commercial*	*397.3*
		II-3	*High Efficiency Lighting in households*	*Internal*	*Residential*	*287.0*
		II-4	High Efficiency Air Conditioners (such as Air Conditioners with Inverter Controllers)	Internal	Total II-4	176.1
		II-4	*High Efficiency Air Conditioners (such as Air Conditioners with Inverter Controllers) in commercial buildings*	*Internal*	*Commercial*	*47.7*
		II-4	*High Efficiency Air Conditioners (such as Air Conditioners with Inverter Controllers) in households*	*Internal*	*Residential*	*128.4*
		II-5	Energy Efficiency Improvement Facilities to be installed at Small/Medium Enterprises (Compressors, Motors)	Internal	Industry	603.6
		II-6	Introduction of Photovoltaic Power Generation	Internal	Total II-6	6.4
		II-6	*Introduction of Photovoltaic Power Generation to commercial buildings*	*Internal*	*Commercial*	*3.9*
		II-6	*Introduction of Photovoltaic Power Generation to households*	*Internal*	*Residential*	*2.5*
		II-7	Introduction of Solar Water Heater	Internal	Total II-7	315.0
		II-7	*Introduction of Solar Water Heater to commercial buildings*	*Internal*	*Commercial*	*199.6*
		II-7	*Introduction of Solar Water Heater to households*	*Internal*	*Residential*	*115.4*
		II-8	Installation of Energy Saving Glasses	External	Total II-8	129.5
		II-8	*Installation of Energy Saving Glasses to commercial buildings*	*External*	*Commercial*	*80.1*
		II-8	*Installation of Energy Saving Glasses to households*	*External*	*Residential*	*49.4*
		II-9	Regional Energy Supply System	External	Industry	301.3
		II-10	Introduction of Small-scale Hydropower Generation (at water distribution stations, canals)	External	Commercial	1.4
		II-11	Introduction of Wind Power Generation	External	Commercial	8.1
		II-12	Promotion of energy-efficient appliances	Internal	Residential	275.2
			Improvement of generation efficiency, Reduction of transmission loss	Internal	Grid	3,259.3
			TOTAL (II)			**6,943.0**

Projects in Transport

25

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
III	Transportation	III-2	Promotion of Eco-Driving with Digital Tachographs	Internal	Transport	20.3
		III-3	Construction of Subway	Internal	Transport	35.2
		III-7	Wide-range traffic control	Internal	Transport	17.6
		III-10	Expansion of Frequencies and Routes of Bus Transportation	Internal	Transport	69.7
		III-12	Development of Bus Rapid Transit (BRT)	External	Transport	69.7
		III-13	Shift to CNG bus	External	Transport	17.1
		III-14	Introduction of Electric Motorbikes and bicycles	Internal	Transport	52.2
			Promotion of energy-efficient vehicles	Internal	Transport	534.3
			TOTAL (III)			**816.0**

Projects in Industry

26

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
IV	Industry	IV-1	Improvement of Kiln Operation Techniques/Technologies	Internal	Industry	669.8
			TOTAL (IV)			**669.8**

Projects in Water management

27

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
V	Water management	V-1	Stable Water Intake Facility (regulation pond)	Internal	Total V-1	3.7
		V-1	*Stable Water Intake Facility (regulation pond) [Commercial]*	*Internal*	*Commercial*	*2.1*
		V-1	*Stable Water Intake Facility (regulation pond) [Residential]*	*Internal*	*Residential*	*1.6*
		V-6	Introduction of Rainfall Water Storage Facility	Internal	Commercial	0.0164
		V-8	Recycling of Rain Water (with Water Purification Equipment) Countermeasures for water storage and flood	Internal	Commercial	0.004
		V-10	Promotion and Distribution of Water-Saving Equipment	Internal	Commercial	10.9
			Improvement of Leakage from Clean Water Pipe Network	External	Commercial	17.2
			Introduction of Water Distribution Management to Improve Water Supply System	Internal	Commercial	4.8
			TOTAL (V)			**36.6**

Projects in Solid waste management

28

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
VI	Solid waste management		Reduction of waste generation	Internal	SW management	178.1
			Change of management options	Internal	SW management	40.3
		VI-2	Biogas-based Power Generation	Internal	SW management	85.7
		VI-3	Electricity Generation from Solid Waste Incineration	Internal	SW management	181.0
			CH_4 recovery from landfill and transferred to biogas	Internal	SW management	665.6
			TOTAL (VI)			**1,150.7**

Projects in Construction

29

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
VII	Construction	VII-1	Introduction of Incentive to Environmentally Sound Buildings	Internal	Commercial	9.1
		VII-5	Introduction of Energy Efficient Constructing Machine	Internal	Industry	44.1
			Introduction of Energy Efficient Building Materials	External	Residential	46.8
			TOTAL (VII)			**99.9**

Projects in Agriculture

30

Category code	Project category	Project code	Project name	Effort	Sector	Emission reduction
IX	Agriculture		Prevention of Mudslides by Planting Trees	External	Agricultural non-energy related	0.03
			Introduction of Water-saving Pumps with Utilization of Renewable Energy	External	Agricultural non-energy related	0.4
			Biogas-based Electric Power Generation from Livestock Manure	External	Agricultural non-energy related	6.3
			Reduction of Agricultural Chemicals and Fertilizers Usage	External	Agricultural non-energy related	0.8
			Photovoltaic Power Generation at Agricultural Communities	External	Agricultural non-energy related	0.4
			TOTAL (IX)			**7.9**

31

RELATED ACTIVITIES

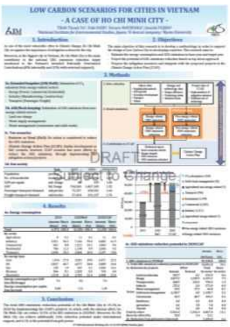
Recent activities

32

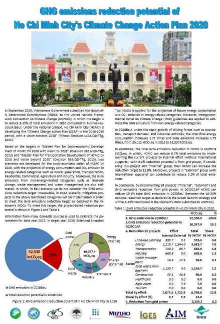
- **Finalize the GHG emission reduction target and potential of CCAP's projects**
- Distribute latest technical report and brochure of Low Carbon HCMC to HCCB

33

Thank you very much for your kind attention!



Poster at 21st AIM International workshop



Brochure of HCMC's CCAP

Hướng tới việc xúc tiến Kế hoạch hành động ứng phó với Biến đổi khí hậu

Thành phố Osaka

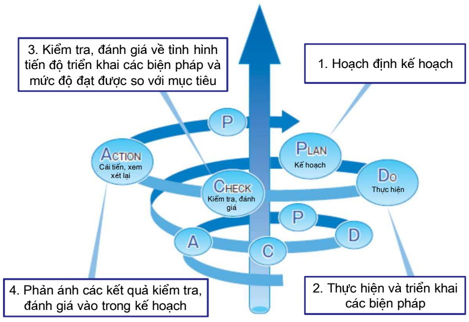
Khuôn khổ quốc tế mới cho việc ứng phó với sự nóng lên toàn cầu - Thông qua “Thỏa thuận Paris" COP21 -

Một khuôn khổ hành động mới để ứng phó với thay đổi khí hậu mà tất cả các nước sẽ tham gia

(Nguồn)
Thông tấn xã Việt Nam

Nỗ lực thực hiện một xã hội cacbon thấp của T.P Hồ Chí Minh, thành phố dẫn đầu Việt Nam, là một việc quan trọng

Tầm quan trọng của việc quản lý tiến độ thực hiện kế hoạch

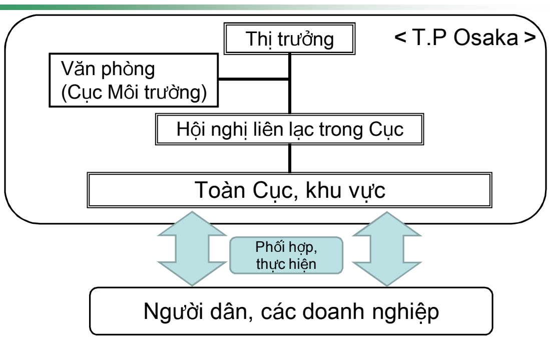


Áp dụng chu trình PDCA

1. Plan Phổ biến thông tin về CCAP đã được hoạch định

Chia sẻ kế hoạch cùng với các ban ngành, người dân và các doanh nghiệp

2 . Do Thực hiện và triển khai các biện pháp



Các ban ngành phối hợp cùng với người dân và các doanh nghiệp thành một thể thống nhất để thực hiện các biện pháp

2. Do Tiến hành các hoạt động thực tiễn ở mỗi chủ thể

Điều quan trọng là cần phải nâng cao ý thức của toàn thể thành phố Hồ Chí Minh trong việc nỗ lực hướng tới thực hiện một xã hội cacbon thấp

Osaka City

3. Check Kiểm tra, đánh giá mức độ đạt được so với mục tiêu

Lĩnh vực	Năm 1990 Lượng phát thải (vạn tấn CO_2)	Năm 2013 Lượng phát thải (vạn tấn CO_2)	Tỷ lệ tăng/ giảm (%)
Sản xuất	997	558	- 44%
Văn phòng	392	624	59%
Gia đình	285	439	54%
Giao thông vận tải	320	269	- 16%
Chất thải	67	49	- 27%

Nắm bắt tình hình và công bố về lượng phát thải Cacbon Điôxít

Osaka City

3. Check Kiểm tra, đánh giá về tình hình tiến độ triển khai các biện pháp

Các biện pháp chính	Tình hình tiến độ
Thúc đẩy việc phát điện bằng năng lượng mặt trời (Mục tiêu: 150.000 kW vào cuối năm 2020)	Tháng 4/2015, lượng phát điện bằng năng lượng mặt trời là 94.000 kW
Tận dụng nguồn năng lượng không sử dụng ở các nhà máy đốt rác và cơ sở xử lý nước thải	Năm 2014, lượng nhiệt dư được tận dụng tại các nhà máy đốt rác (lượng phát điện) là 480 triệu kWh
Thúc đẩy phổ biến nhà ở sinh thái	Cho đến năm 2013, số nhà ở sinh thái được thừa nhận là 2.836 căn
Xúc tiến các biện pháp đối với các cơ sở công cộng (Dự án ESCO)	Cho đến năm 2014, tiến hành nâng cấp 13 cơ sở
Thúc đẩy việc đưa vào sử dụng các loại xe thế hệ mới và xe sinh thái Eco-car	Tổng số xe ít gây phát thải trong thành phố là 57.436 chiếc (cuối tháng 3/2014)
Xúc tiến phủ xanh các không gian công cộng và đất tư nhân	Có tất cả 985 công viên trong thành phố với tổng diện tích 949,8ha (tháng 4/2014)
Xúc tiến các biện pháp về chất thải	Kế hoạch giảm lượng rác xử lý hàng năm của năm 2015 xuống dưới 1 triệu tấn đã đạt được mục tiêu trước thời hạn 1 năm

Đánh giá định lượng về tình hình thực hiện các biện pháp
Cần nỗ lực tiến hành các chương trình một cách chắc chắn

Osaka City

3. Check Phương pháp kiểm tra, đánh giá

Điều quan trọng là cần phải thực hiện kiểm tra, đánh giá ở từng ban ngành, đồng thời, chia sẻ thông tin và tiến hành thảo luận về những bước tiếp theo

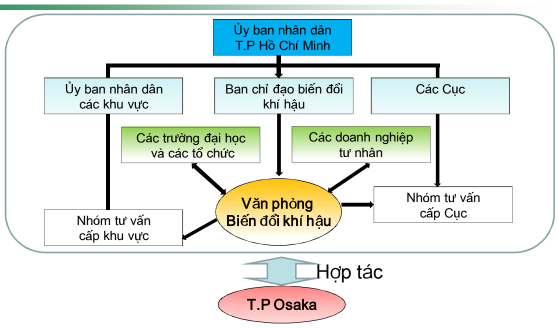
Osaka City

4. Action Xem xét lại kế hoạch một cách định kỳ

Hướng tới một xã hội cacbon thấp bền vững

Osaka City

Xúc tiến một thể chế phối hợp, hợp tác



Để tăng cường tính hiệu quả của kế hoạch thì cần phải thúc đẩy sự phối hợp với các cơ quan liên quan hay sự hợp tác giữa hai thành phố với nhau, chẳng hạn như hình thành các dự án cacbon thấp, v.v.

Cảm ơn quý vị đã chú ý lắng nghe!

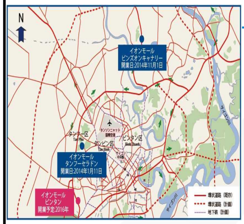
HỆ THỐNG PIN MẶT TRỜI VỚI CHƯƠNG TRÌNH JCM

TẠI

BÌNH TÂN, HỒ CHÍ MINH

Ngày 25 tháng 2 năm 2016

AEON BÌNH TÂN TỔNG QUAN



TÊN :AEON MALL BÌNH TÂN
ĐỊA CHỈ :Lot PT1, Hi-tech Healthcare Park, 532A Kinh Duong Vuong, Binh Tri Dong B ward, Binh Tan District, HCMC
DIỆN TÍCH KHUÔN VIÊN : 46,800m²
TỔNG DIỆN TÍCH SÀN :114,000m²
DIỆN TÍCH CHO THUÊ :59,000m²
SỐ CHỖ ĐỖ XE :Ô TÔ:1,500 XE XE MÁY: 4,000 CHIẾC

HÌNH THỨC CHÍNH :SIÊU THỊ TỔNG HỢP
CỬA HÀNG CHUYÊN BIỆT :160 CỬA HÀNG
CHỦ ĐẦU TƯ :AEON VIETNAM CO.,LTD.
VẬN HÀNH, QUẢN LÝ :
AEON MALL VIETNAM CO.,LTD.
DỰ ĐỊNH KHAI TRƯƠNG : MÙA HÈ 2016

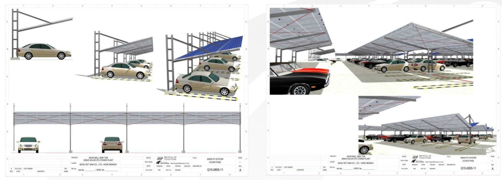
Hệ thống phát điện dùng năng lượng mặt trời

- **Dung lượng: 320KW** •**Tấm pin: 1,436 tấm**
- **Thông số kỹ thuật của pin NERP156x156 - 60 - P SI 255W**
- **Power Conditioner 20KW(400 - 230V 3P4W) ×16 bộ**
- **Hệ thống giám sát ®**

(TOÀN CẢNH: BÃI ĐỖ XE TẦNG 3)

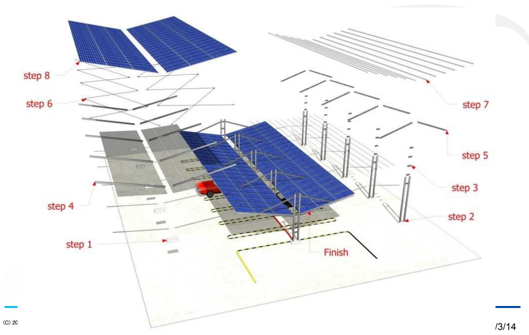
GIỚI THIỆU VỀ HỆ THỐNG PIN MẶT TRỜI [KẾT CẤU KHUNG]

HỆ KHUNG BẰNG THÉP KẾT CẤU

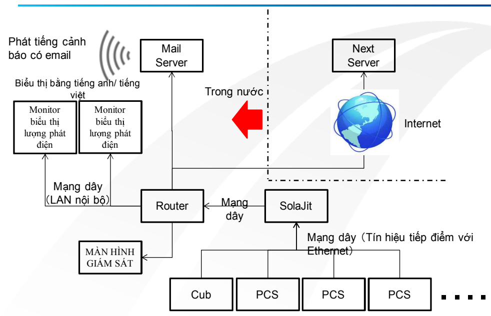


- ĐƯỢC CHẾ TẠO SẴN TẠI NHÀ MÁY VỚI ĐỘ CHÍNH XÁC CAO
- DỄ DÀNG LẮP ĐẶT, ĐIỀU CHỈNH VÀ THÁO DỠ
- KẾT CẤU THÉP ĐƯỢC TÍNH TOÁN ĐỂ CÓ THỂ DI CHUYỂN LÊN TẦNG 5 TRONG TƯƠNG LAI

LÀM THẾ NÀO ĐỂ DI CHUYỂN HỆ THỐNG PV LÊN TẦNG 5



Monitoring system năng lượng mặt trời



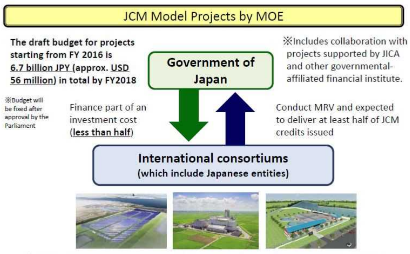
Giúp cắt giảm lượng CO2 thải

Sử dụng điện năng lượng mặt trời giúp cắt giảm lượng CO2 thải

≒ **267ton-CO_2/năm**

（**Phát điện：504,000Kwh/ năm**）

JCM Model Projects by MOE

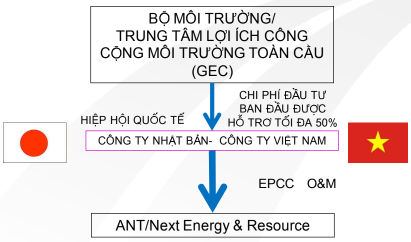


- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO_2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects : starting installation after the adoption of the financing and finishing installation within three years.

27

Source:New Mechanisms information Platform

Joint Crediting Mechanism (JCM)



GIỚI THIỆU
về
Next Energy & Resource Co., Ltd

http://www.nextenergy.jp/

Company Profile

Tên công ty : Next Energy & Resources Co., Ltd

Trụ sở chính : 11465-6, Akaho, Komagane, Nagano

Văn phòng Tokyo: 1-23-7, Nishishinjuku, Shinjuku, Tokyo

Năm thành lập : December,12, 2003

Vốn đầu tư : 268 triệu yên

Chủ tịch : Atsushi ITO

Số nhân viên : 180 people

SỨ MỆNH & TẦM NHÌN

SỨ MỆNH

Next Energy & Resources cam kết phổ biến sử dụng năng lượng tái tạo và nâng cao hiệu quả sử dụng;
do đó chúng tôi xây dựng một môi trường bền vững
cho
tương lai con em chúng ta

TẦM NHÌN

Next Energy & Resources tham gia để cung cấp hệ thống năng lượng tái tạo 500GW đến năm 2031 thông qua những nỗ lực tham gia của chúng tôi

DỊCH VỤ

- Giai đoạn lập kế hoạch
  Lập kế hoạch chính
  Nghiên cứu tính khả thi (F/S)
- Giai đoạn triển khai (EPCC)
  FEED (Thiết kế giai đoạn đầu)
  Kỹ thuật
  Sản xuất
  Xây dựng
  Nghiệm thu
- Vận hành & Bảo trì
- Dịch vụ tư vấn




Kinh doanh thiết bị cho hệ thống pin mặt trời

- Tấm pin mặt trời
- Biến tần
- Hệ thống điện
- Kết cấu khung cho hệ thống
- Hệ thống giám sát




Dự án đã hoàn thành (Loại lắp mái)

202kw
250w x 840 P
Tỉnh Nagano


168kw
195 w x 860P
Tỉnh Nagano

Dự án đã hoàn thành (Loại lắp mái)

216kw
240w x 900 P
Tỉnh Nagano

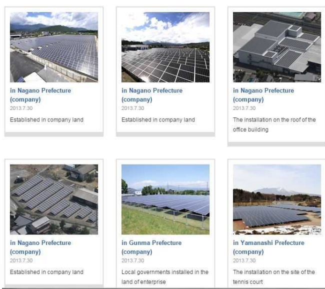

350 kw
245w x 1500 P
Tỉnh Nagano

Hệ thống dung lượng lớn

1.05MW
260w × 4,048P
Tỉnh Nagano


40MW
245w × 164,736P
Tỉnh Chiba

Project



Và còn nữa

GIỚI THIỆU
về
ANH THY Co., Ltd.
(ANT Industries)

http://www.ant.com.vn

GIỚI THIỆU về ANH THY Co., Ltd

Tên Công ty	:	ANH THY Co., Ltd. (ANT Industries)
Văn phòng	:	No. 10, road 17, Hiep Binh Phuoc Ward, Thu Duc District, Ho Chi Minh City
Nhà máy	:	Lot I1, road N1, Nam Tan Uyen IP, Binh Duong
Năm thành lập	:	Tháng 11 Năm 2005
Vốn đầu tư	:	50 tỷ đồng (2.25 triệu USD)
Sáng lập Cty	:	Mr. Nguyen The Tan
Số nhân viên	:	106 người

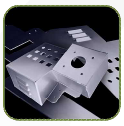
Ngành nghề chính

Gồm 2 ngành chính:

1/ Sản xuất tủ bảng điện động lực và điều khiển (trung và hạ áp); hệ thống thang máng cáp & phụ kiện.

2/ Công nghiệp hỗ trợ: sản xuất và cung cấp phụ tùng cơ khí kim loại tấm; OEM, ODM cho các nhà máy nước ngoài đóng tại VN và xuất khẩu; xử lý bề mặt kim loại; dịch vụ gia công cơ khí.






Nhà máy chính




Nhà máy 8000 m2, gồm:

- 04 dây chuyền sản xuất công nghệ CNC.
- 2 dây chuyền lắp ráp điện.
- 2 dây chuyền sơn tĩnh điện.

Khách hàng tiêu biểu

Kinden Vietnam, Yurtec, IHI, Mitsubishi Electric, Fujikura, Hitachi, Siemens, Posco E&C, Siplast, Organo Corporation

Đối tác chính

Mitsubishi Electric, LS Industrial Systems, Terasaki, Løgstrup

A/S Løgstrup-Steel
Egeskovvej 16-18, DK-3490 Kvistgård

In Alliance with NEXT HOLDINGS

Next Holdings ネクストエナジー

Chứng Nhận

ASTA Certificates | RoHS Conformity | ISO 9001:2008 | ISO 14001:2004

In Alliance with NEXT HOLDINGS

Next Holdings ネクストエナジー

Dự án tiêu biểu

- Panasonic Viet Nam (Hanoi, 2006 & 2012)
- Sumidenso Viet Nam Factory (Hai Duong, 2007)
- SP-PSA Intl' Sea Port (Thi Vai, BR-VT, 2008)
- Canon Factory No.3 (Hung Yen, 2009)
- Nidec Tosok, Nidec Copal Factory (Hi-Teck Park, HCMC, 2010)
- Sapporo Brewery Viet Nam (Long An, 2011)
- Consulate General of Japan in Hochiminh City (2011)
- Honda Factory No.3 (Ha Nam, 2012)
- Lixil Global Viet Nam Factory (2013)
- AEON Mall Canary (2014)
- Dong IL Spining Factory (Dong Nai, 2015)

In Alliance with NEXT HOLDINGS

Next Holdings ネクストエナジー

ANT - ĐỐI TÁC TIN CẬY CỦA BẠN

CHÂN THÀNH CÁM ƠN QUÝ KHÁCH

Next Holdings ネクストエナジー

CÁM ƠN QUÝ KHÁCH!

Dự án hỗ trợ thiết bị cơ chế tín chỉ chung JCM (Joint Crediting Mechanism)

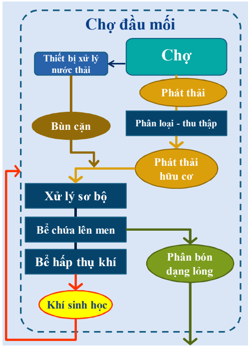
Dự án sử dụng khí và lên men metan đối với phát thải hữu cơ ở chợ đầu mối

Tháng 11 năm 2015

Bên thực hiện dự án:
(Phía Nhật Bản) Hitachi Zosen Corporation,
Satisfactory International Jsc
(Phía Việt Nam) Tổng công ty thương mại Sài Gòn (SATRA)

Hitz Hitachi Zosen

Khái quát dự án

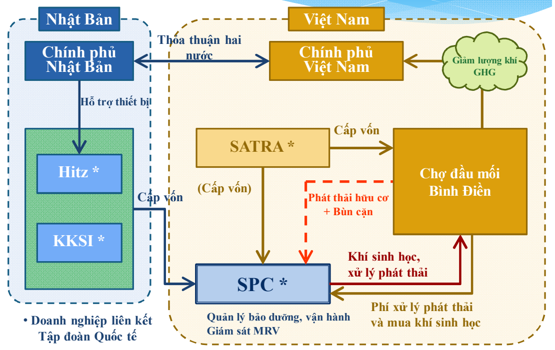


Bằng việc phân loại, thu thập rác thải hữu cơ từ phát thải ở chợ đầu mối Bình Điền trong thành phố Hồ Chí Minh, sau đó tiến hành xử lý kỵ khí bằng hệ thống lên men metan lắp đặt ở cùng địa điểm, khí sinh học thu được sẽ cung cấp cho nhà máy chế biến thủy sản.

Thực hiện giảm lượng rác thải hữu cơ được xử lý chôn lấp bằng cách xử lý ngay tại nguồn thải ra, sau đó phát thải hữu cơ sẽ được vận chuyển từ chợ đầu mối Bình Điền đến nơi xử lý cuối cùng, đến nay, dự án có thể giảm lượng khí metan thải ra từ các bãi chôn lấp.

Đồng thời, khí sinh học thu được sẽ cung cấp cho nhà máy chế biến thủy sản làm năng lượng thay thế dầu mỏ, đến nay, có thể giảm lượng sử dụng nhiên liệu hóa thạch đang được sử dụng trong nhà máy chế biến thủy sản.

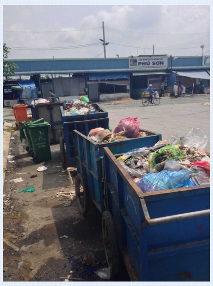
Cơ chế thực hiện dự án



Nội dung điều tra năm 2013

1. Điều tra lượng rác thải thải ra từ chợ đầu mối
   - Lượng rác thải thải ra
   - Tỷ lệ rác thải hữu cơ
2. Thí nghiệm kiểm chứng phân tích thành phần rác thải hữu cơ, lượng khí đốt phát sinh, v.v…
   - Phân tích thành phần
   - Thí nghiệm liên tục trong phòng
3. Phát triển phương pháp luận cơ chế tín chỉ chung JCM (Joint Crediting Mechanism)
4. Điều tra tìm hiểu về thiết kế cơ bản cơ sở, doanh nghiệp thực hiện ở địa phương - nhà sản xuất thiết bị

Điều tra rác thải ở chợ đầu mối: phần 1



Điều tra về lượng phát thải thải ra

Nắm bắt tổng khối lượng rác thải thải ra từ chợ đầu mối thông qua số lượng xe tải và xe đẩy tay chở rác.

Điều tra phát thải ở chợ đầu mối: phần 2

Điều tra về thành phần phát thải

Tiến hành phân loại - định lượng rác hữu cơ và rác không phù hợp lên men, ngoài ra định lượng rác không phù hợp lên men với mỗi thành phần như vỏ sò, tre, đồ nhựa, v.v…

Thí nghiệm trong phòng

Thiết bị thí nghiệm

Rác thải nhà bếp được dùng thí nghiệm

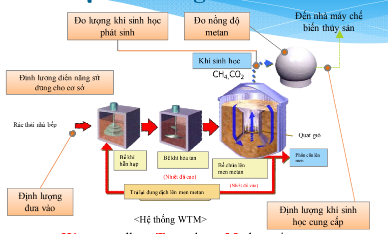
Kết quả điều tra năm 2013

Mục	Kết quả điều tra					
	Tổng khối lượng phát thải			Lượng phát thải hữu cơ	
Tổng khối lượng		46,8	Tấn/ngày	38,0	Tấn/ngày
Quầy rau quả		59,2	%	72,8	%
Quầy trái cây	13,5	13,5	%	16,6	%
Quầy hải sản	1,8	1,8	%	2,2	%
Quầy hoa tươi	0,9	0,9	%	1,1	%
Quầy thịt	1,3	1,3	%	1,6	%
Rác không phù hợp lên men	18,8	18,8	%	--	
Bùn cặn xử lý thoát nước	4,7	4,7	%	5,8	%

*Rác không phù hợp lên men:
Vỏ sò, tre, túi-dây ni lông, giấy thải, bìa cứng, cốc nhựa-ống hút, nhựa xốp polixtiren, các loại vải, túi bao cát, vỏ dừa,

Mục	Nhật Bản	Việt Nam
Thực phẩm - nguyên liệu	Rác thải nhà bếp hỗn hợp	Rác thải nhà bếp (Chủ yếu là rau)
Thời gian duy trì	15 ngày	15 ngày
Nồng độ đưa vào bể chứa lên men	Khoảng 10 %	Từ 10 % trở xuống
Hệ số tỷ lệ phát sinh khí sinh học	150 Nm^3/tấn	32,7 L/L
Tốc độ phân hủy nồng độ khí metan m^3/kg-CODcr	0,35	Cùng mức độ
Tốc độ phân hủy chất hữu cơ Quy đổi ra CODcr	70 ~ 75 %	Từ 75 % trở lên
Nồng độ metan	50 ~ 65 %	Khoảng 60 %

Giản đồ thiết bị và điểm giám sát

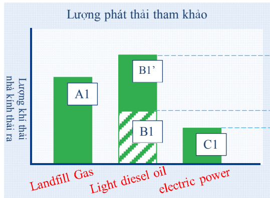


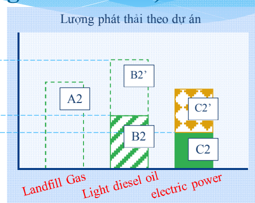
<Hệ thống WTM>

Water-needless Two-phase Methanation system

Mục định lượng	Nội dung giám sát
Lượng đưa vào	Lượng phát thải xử lý ở cơ sở (Lượng phát thải thay thế xử lý chôn lấp)
Lượng khí sinh học thu được	Lượng khí sinh học thu được bằng phương pháp lên men metan
Nồng độ metan	Nồng độ metan trong khí sinh học thu được
Lượng khí sinh học cung cấp	Lượng khí sinh học sử dụng ở nhà máy chế biến thủy sản (Ngoại trừ phần nhiệt sử dụng từ lượng khí sinh học thu được ở cơ sở)
Năng lượng điện sử dụng	Lượng điện năng đã sử dụng để vận hành thiết bị

Phương pháp luận cơ thế tín chỉ chung JCM (Joint Crediting Mechanism)





Lượng phát thải tham khảo = A1 + B1 + B1' + C1

Lượng phát thải theo dự án = B2 + C2 + C2'

*A1 = A2, B1 = B2 → B1' = B2', C1 = C2

*C1 (= C2): Lượng điện năng tiêu thụ của nhà máy chế biến thủy sản
C2': Lượng điện năng tiêu thụ của cơ sở lên men metan

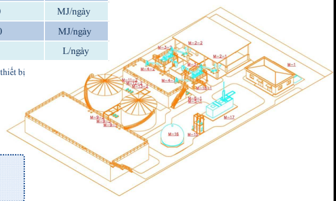
Giảm lượng khí thải nhà kính
= A2 + B2' – C2'
= A1 + B1' – C2'

Thông số giám sát MRV:
A1: Khối lượng rác thải nhà bếp đưa vào
B1': Nồng độ metan và lượng khí sinh học sử dụng
C2': Lượng điện năng tiêu thụ ở cơ sở lên men metan

Điều kiện thiết kế cơ bản (Dự án hỗ trợ thiết bị)

Mục	Giá trị tính toán	Đơn vị
Đối tượng rác xử lý Rác thải nhà bếp Bùn cặn thải ra	50 (trong đó rác không thích hợp lên men chiếm 5 %) 3	Tấn/ngày Tấn/ngày
Lượng khí sinh học phát sinh	1.500	m^3/ngày
Nồng độ metan	55	%
Nhiệt lượng khí sinh học	30.000	MJ/ngày
Nhiệt lượng khí đốt cung cấp*1	25.740	MJ/ngày
Giá trị quy đổi dầu mỏ	672	L/ngày

*1 Ngoại trừ năng lượng tiêu thụ bên trong nhằm bảo quản thiết bị (Hiệu suất nồi hơi: 80%)

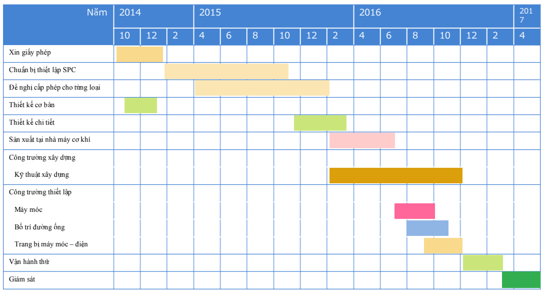


Tổng chi phí xây dựng: khoảng 340,000,000 JPY

Nội dung thực hiện dự án hỗ trợ thiết bị (~2015/10)

1. Triển khai thiết kế cơ bản và một phần thiết kế chi tiết
2. Điều tra lại về những nơi sử dụng khí sinh học(Nhu cầu của nhà máy chế biến thủy sản)
3. Xây dựng kế hoạch đầu tư （IR） và đánh giá tác động đến môi trường（EIA）
4. Đồng ý với Phương pháp luận cơ thế tín chỉ chung JCM (Joint Crediting Mechanism)

Kế hoạch



Các giới hạn thời gian của dự án hỗ trợ thiết bị

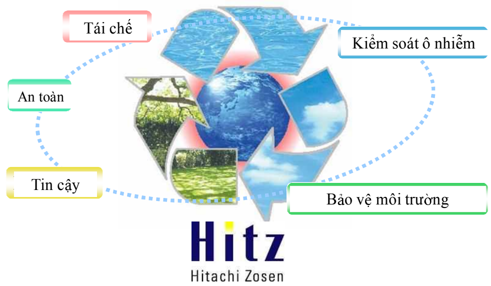
1. Trong năm nay thì thiết lập SPC
2. Trong năm nay đặt hàng máy móc
3. Đến tháng 3 năm sau, hoàn thành việc sản xuất máy móc

Cám ơn vì đã lắng nghe

Hitz
Hitachi Zosen
Water Treatment & Industrial Equipment Headquarters
Ninety Bldg., 5-3-28, Nishikujo, Konohana-ku, Osaka 554-0012, Japan
Phone: +81-6-6467-5725 http://www.hitachizosen.co.jp/english/index.html

Công ty Hitachi Zosen

Nghiên cứu Kế hoạch Dự án JCM
Dự án Năng lượng từ Chất thải tại TP. HCM



Quá trình triển khai

<Trước 2014>

● Công ty Hitachi Zosen ("Hitz") đã thực hiện nghiên cứu khả thi về quản lý chất thải rắn tại TP. Hồ Chí Minh trong gần 03 năm qua kể từ khi ký kết Biên bản Thỏa thuận hợp tác giữa TP. Hồ Chí Minh và TP. Osaka và tổ chức Hội thảo khởi động về quản lý tổng hợp chất thải rắn ngày 16/02/2012.

● Ngày 5/8/2014 trình thư yêu cầu đồng ý về việc phát điện bằng chất thải lên UBND thành phố HCM. UBND thành phố HCM đã giới thiệu đoàn thẩm tra đến sở TNMT thành phố.

<Năm 2015>

● Ngày 3/2/2015, đã nhận được quy định về việc điều tra và HĐND đã thông qua Sở TNMT đã chỉ thị đưa ra báo cáo FS họp bàn về các điều kiện thực hiện công việc.

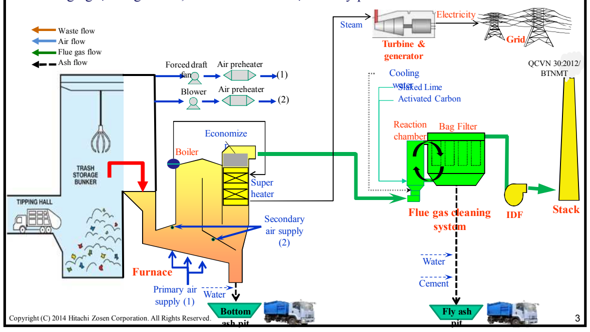
● 11/6/2015 và 21/7 đến gặp Sở TNMT, họp bàn về đối tượng rác thải, địa điểm xây dựng và trách nhiệm của các cán bộ liên quan.

●27/9/2015, Đưa ra báo cáo FS

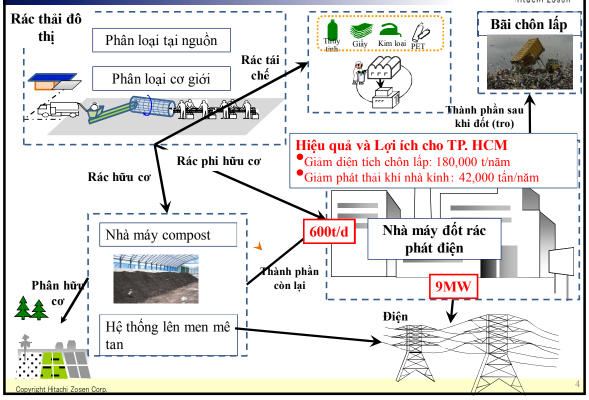
● 2/10/2015 trong hội nghị giữa các ban ngành liên quan do Sơ TNMT chủ trì, Sở TNMT đã chỉ thị sửa đổi những thông tin tương ứng trong báo cáo FS mà liên quan đến đối tượng rác thải, địa điểm đã được đề xuất với Sở TNMT.

Các điều kiện dự án

- Nguồn chất thải: Chất thải đô thị
- Công suất: 600 tấn/ngày (giai đoạn 1)
- Địa điểm: Khu liên hiệp xử lý chất thải rắn Tây Bắc, huyện Củ Chi, TP. HCM
- Công nghệ: Lò ghi xích, nồi hơi thu hồi nhiệt và máy phát turbin hơi

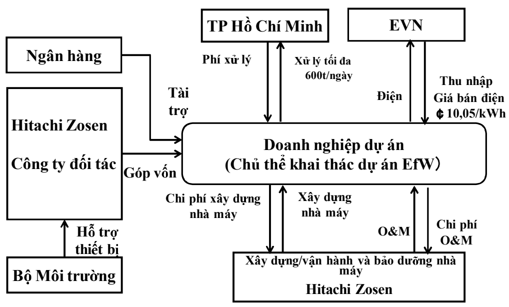


Dự án tái sinh năng lượng theo mô hình tổng hợp



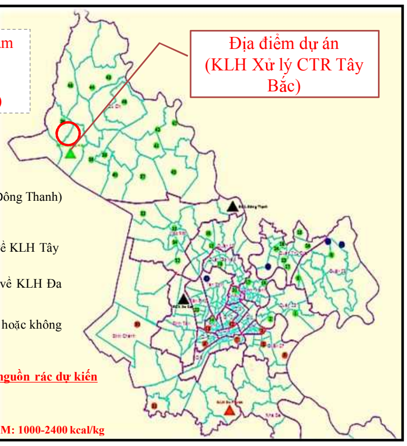
Cấu trúc dự án

- Loại hình dự án: Xây dựng – Vận hành – Chuyển giao (BOT)
- Tổng vốn đầu tư: 65 triệu US$
- Dự kiến đi vào hoạt động: Tháng 12/2018



Bản đồ vị trí của 48 trạm trung chuyển rác tại TP. HCM (số liệu đến 01/2014)

Địa điểm dự án (KLH Xử lý CTR Tây Bắc)



▲ KLH Tây Bắc

▲ KLH Đa Phước

▲ BCL đã đóng cửa (Gò Cát, Đông Thạnh)

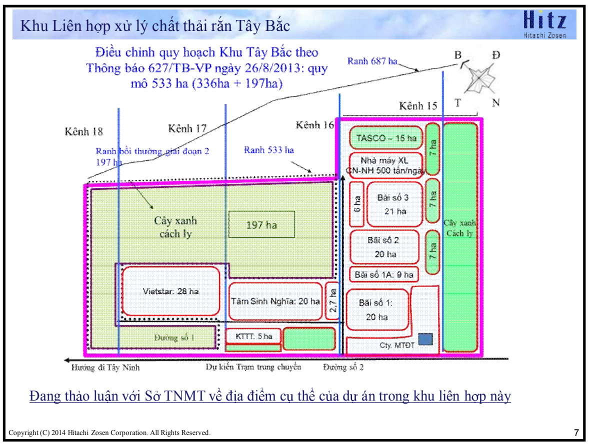
● Trạm trung chuyển đưa rác về KLH Tây Bắc

● Trạm trung chuyển đưa rác về KLH Đa Phước

● Các trạm trung chuyển hỏng hoặc không có thông tin

Đang thảo luận với Sở TNMT nguồn rác dự kiến

Tham khảo:
Nhiệt trị thấp của CTR tại TP. HCM: 1000-2400 kcal/kg


Khu Liên hợp xử lý chất thải rắn Tây Bắc
Hitz
Hitachi Zosen
Điều chỉnh quy hoạch Khu Tây Bắc theo Thông báo 627/TB-VP ngày 26/8/2013: quy mô 533 ha (336ha + 197ha)
Ranh 687 ha
B
Đ
T
N
Kênh 15
Kênh 18
Kênh 17
Kênh 16
Ranh bồi thường giai đoạn 2 197 ha
Ranh 533 ha
TASCO – 15 ha
7 ha
Nhà máy XL CN-NH 500 tấn/ngày
6 ha
Bãi số 3 21 ha
7 ha
Cây xanh cách ly
197 ha
Cây xanh Cách ly
Bãi số 2 20 ha
7 ha
Bãi số 1A: 9 ha
Vietstar: 28 ha
Tâm Sinh Nghĩa: 20 ha
2,7 ha
Bãi số 1: 20 ha
Đường số 1
KTTT: 5 ha
Cty. MTĐT
Hướng đi Tây Ninh
Dự kiến Trạm trung chuyển
Đường số 2
Đang thảo luận với Sở TNMT về địa điểm cụ thể của dự án trong khu liên hợp này
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7


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8

1

Dự án ủy thác điều tra tính khả thi hình thành dự án JCM nhằm mục tiêu xây dựng các thành phố cacbon thấp tại châu Á năm 2015
"Khảo sát hỗ trợ hình thành thành phố cacbon thấp thông qua sự liên kết giữa TP Osaka và TP HCM"
＜Khảo sát khả năng thực hiện dự án JCM＞

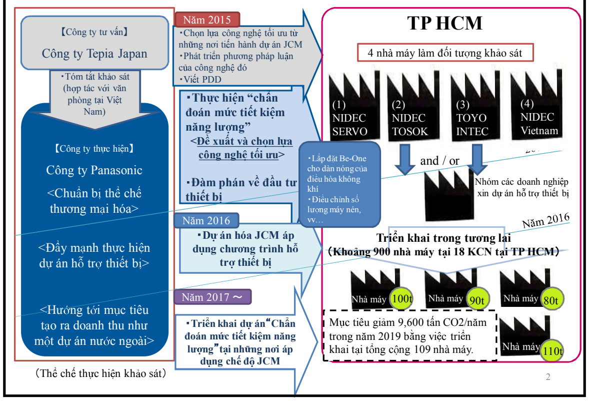
Dự án tiết kiệm năng lượng cho nhà máy trong các KCN tại TP HCM

Tháng 2 năm 2016
Công ty Tepia Corporation Japan
Công ty Panasonic

1

1. Tổng thể dự án đã áp dụng JCM

2



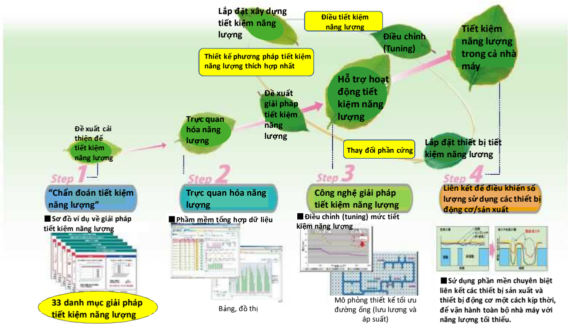
(Thể chế thực hiện khảo sát)

2

2. Đề xuất và lựa chọn đầu tư thiết bị tối ưu bằng "chẩn đoán tiết kiệm năng lượng"

3

Bằng việc sử dụng phương pháp tiết kiệm năng lượng mà nhóm công ty Panasonic đã xây dựng và thực hiện "chẩn đoán kiệm năng lượng", chúng tôi sẽ tiếp tục đưa ra các đề xuất tối ưu được rút ra từ những điểm mang lại hiệu quả cao nhất cho việc đầu tư.



3. Kết quả "chẩn đoán tiết kiệm năng lượng" (1)

4

●Công ty Nidec SERVO

〇Thành lập: Năm 2009 (Tính đến nay được 6 năm)
〇Sản phẩm: Động cơ chính xác cỡ nhỏ dùng cho dân sinh và công ty, thiết bị sử dụng động cơ hoặc fan blower sensor
〇Quy mô sử dụng năng lượng: quy mô vừa
〇Công đoạn chính: die-cast (khuôn đúc), sơn, ép, gia công cơ khí, lắp ráp

Nguồn: http://www.nidec-servo.com/en/products/index.html

【Kết quả "chẩn đoán"】

<u>Số mục đề xuất: 30</u>

① Lắp đặt Be-One cho dàn nóng bên ngoài hệ thống điều hòa không khí
・・・Có hiệu quả tiết kiệm năng lượng khoảng 22% đã được chứng thực tại nơi sản xuất. Nhiệt độ trung bình tại xưởng không thay đổi, vẫn ở mức 26.7℃

② Điều chỉnh số thiết bị máy nén
・・・Với việc đo điện năng và áp suất của 7 máy, kết quả cho thấy mức tiết kiệm đạt khoảng 4.6%

③Thu hồi được lượng nhiệt tỏa ra từ lò reflow, vv…

Đo điện năng của máy điều hòa không khí

3. Hoạt động "chẩn đoán tiết kiệm năng lượng" (2)

5

●Công ty Nidec TOSOK

〇Thành lập: Năm 1994 (Tính đến nay là 21 năm)
〇Sản phẩm: Máy biến tốc tự động (AT), van điều khiển có vai trò phần trung tâm của máy biến tốc biến thiên liên tục, van điện từ, ống van, phụ tùng ô tô như harness module, vv…
〇Quy mô tiêu thụ năng lượng: quy mô lớn
〇Công đoạn chính: Xử lý nhiệt, gia công, lắp ráp (clean room)

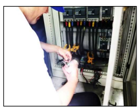
Nguồn: http://www.nidec-tosok.co.jp/products/car_parts/products_lineup.html#S1

【Kết quả "chẩn đoán"】

<u>Số mục đề xuất: 18</u>

① Tiết kiệm năng lượng dàn nóng của máy điều hòa không khí bằng Be-One (triển khai trên quy mô toàn nhà máy)
・・・Có hiệu quả tiết kiệm năng lượng đạt khoảng 21% đã được chứng thực tại nơi sản xuất. Nhiệt độ trung bình tại nhà máy giới hạn trong phạm vi ＋0.5℃

② Vận hành điều chỉnh số máy nén (nâng cao hiệu suất vận hành)
・・・Phần lớn đã được đưa vào sử dụng.



Đo điện năng của máy nén

③ Nâng cao hiệu quả cung cấp khí sạch của Clean room vv..

3. Hoạt động "chẩn đoán tiết kiệm năng lượng" (3)

6

●Công ty TOYOITEC

〇Thành lập: Năm 2010 (Tính đến nay là 5 năm)
〇Sản phẩm: Bảng mạch in (PCBA, vv...)
〇Quy mô tiêu thụ năng lượng: quy mô nhỏ
〇Công đoạn chính: lắp ráp bảng mạch

Nguồn: http://www.toyoitec.com/develop.htm

【Kết quả "chẩn đoán"】

<u>Số mục đề xuất: 6</u>

① Thu hồi nhiệt tỏa ra từ lò reflow bằng cách lắp đặt máy thu hồi nhiệt tỏa ra.
・・・Có thể kỳ vọng vào kết quả thu hồi nhiệt tuy nhiên có vấn đề với hiệu quả đầu tư do công suất hoạt động không cao.

② Lắp Be-One cho dàn nóng của hệ thống điều hòa không khí
・・・Có hiệu quả nhưng số lượng cũng như thời gian hoạt động ít

Đo điện năng của lò reflow

③ Điều chỉnh số máy nén
・・・Giảm thiểu năng lượng cố định bằng biến tần khi sử dụng đơn chiếc.

3. Hoạt động “chẩn đoán tiết kiệm năng lượng” (4) 7

●Công ty Nidec VIETNAM

〇Thành lập: Năm 2005 (Tính đến nay là 10 năm)
〇Sản phẩm: Động cơ DCM, Quạt, Blower, các loại động cơ đặc biệt, vv..
〇Quy mô tiêu thụ năng lượng: quy mô vừa
〇Công đoạn chính: Tạo hình/Ép, Sơn, Lắp ráp

Nguồn: http://www.nidec.com/en-NA/product/fan/

【Kết quả “chẩn đoán”】

<u>Số mục đề xuất: 15</u>

①Điều chỉnh hoạt động dàn nóng của điều hòa nhiệt độ bằng thiết bị Be-One
･･･Đang trong giai đoạn chứng thực hiệu quả tại xưởng sản xuất

②Nâng cao hiệu suất hoạt động bằng việc điều chỉnh số lượng máy nén
･･･Khi đo điện năng và áp suất của 4 máy, hiệu quả giảm năng lượng đạt 5.8%

③Thu hồi lượng nhiệt tỏa ra từ lò reflow
･･･Hoàn thành đo điện năng của 4 máy

④ Sử dụng đèn không điện cực

Đo điện năng của máy nén

4. Công nghệ được áp dụng 8

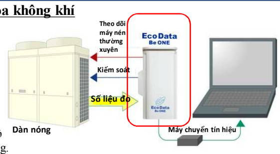
Dựa trên kết quả thực hiện xác định mức tiết kiệm năng lượng tại 4 nhà máy, tính dễ dàng trong việc triển khai phổ cập cũng như trong việc tiến hành dự án JCM và hiệu quả đối với chi phí, chúng tôi đã quyết định tiếp tục tiến hành dự án JCM bằng việc áp dụng hai thiết bị kiểm soát dưới đây.

①Lắp đặt Be-One cho dàn nóng máy điều hòa không khí

･Theo dõi thường xuyên tình trạng hoạt động của máy nén điều hòa không khí trong khi đo dòng điện.

･Để đảm bảo thời gian tối ưu tránh làm hư hại máy nén, cứ khoảng 30 phút 1 lần, dừng lại một số máy trong 4 – 5 phút.

･Đảm bảo cung cấp đủ gió mà không khiến cho nhiệt độ trở nên quá lạnh, do đó đạt hiệu quả tiết kiệm năng lượng.

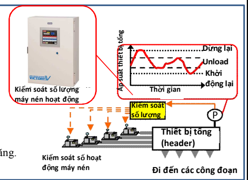


② Điều chỉnh số lượng máy nén

･Sử dụng thiết bị điều chỉnh số lượng máy nén, liên kết các máy nén với nhau.

･Điều chỉnh số lượng máy nén hoạt động/ngừng hoạt động theo áp suất của thiết bị tổng (header)
⇒Loại bỏ tình trạng Unload của các máy, đạt hiệu quả tiết kiệm năng lượng.

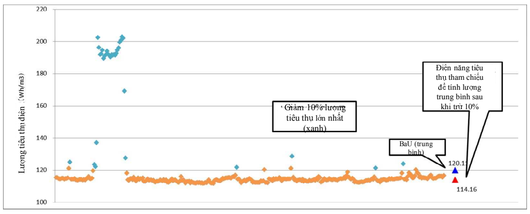
*Unload: Tình trạng máy dừng chờ thổi khí dẫn đến tiêu thụ điện năng.
Ở xe ô tô là chế độ Idling.



5. Kịch bản tham chiếu đã được kiểm tra 9

＜Kịch bản tham chiếu＞

Khi tính toán <u>lượng điện thiêu thụ trung bình,</u> lấy số liệu mẫu đối với máy nén và số liệu mẫu của lượng điện tiêu thụ đối với điều hòa không khí **<u>trừ đi 10 % số liệu cao nhất</u>** rồi tính ra trị số trung bình.



Có thể đánh giá một cách thận trọng rằng lượng giảm tiêu thụ điện lớn hơn sau khi lắp đặt và là giá trị tham chiếu có độ tin cậy cao hơn kịch bản BaU.

5. Dự đoán hiệu quả giảm CO2 và quy mô đầu tư tại các công ty 10

Dựa trên phương pháp luận bao gồm kịch bản tham chiếu này, lượng giảm thải CO2 được tính toán một cách thận trọng như dưới đây.

Lượng giảm thải của năm y＝Lượng thải ra trong dự án (sau khi lắp thiết bị) của năm y ①
－Lượng thải ra tham chiếu (trước khi lắp thiết bị) của năm y ②

＜Trường hợp lắp đặt Be One cho dàn nóng điều hòa không khí＞

① Lượng thải ra trong dự án (sau khi lắp thiết bị) trong năm y
＝**Tổng lượng điện tiêu thụ trong năm** của điều hòa không khí sau khi cải tiến × Hệ số phát thải CO2 của điện năng (giá trị được công bố bởi MONRE)

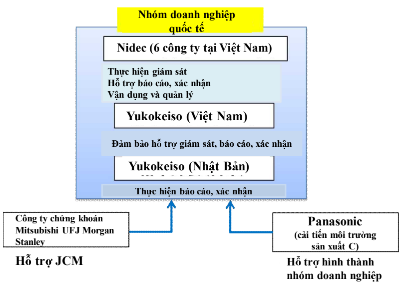
② Lượng thải ra tham chiếu của năm y
＝<u>Lượng điện thiêu thu tham chiếu trong 1h của điều hòa không khí</u> × **thời gian hoạt động của điều hòa không khí trong năm y** × Hệ số phát thải CO2 của điện năng

Tên công ty	Đối tượng	Lượng thải ra tham chiếu (tấn CO2/năm)	Lượng thải ra trong dự án (tấn CO2/năm)	Lượng giảm thải (tấn CO2/năm)	Chi phí đầu tư (vạn yên)	Hiệu suất giảm CO2 (vạn yên/tấn)
Nidec SERVO	Lắp Be One cho điều hòa không khí	3,973.3	3467.9	505.4	2,430	4.81
	Điều chỉnh số thiết bị máy nén	1,015.9	995.3	20.6	490	23.79
Nidec TOSOK	Lắp Be One cho điều hòa không khí	7,993.9	6,705.8	1,288.1	2,943	2.28
Nidec VIETNAM	Lắp Be One cho điều hòa không khí	1,569.6	1,209.5	360.1	1,863	5.17
	Điều chỉnh số thiết bị máy nén	1,032.2	979.1	53.1	390	7.34
Tổng cộng		15,584.9	13,357.6	2,227.3	8,116	3.64

※Vì không nhận thấy kết quả đầu tư tại công ty TOYO INTEC nên không thực hiện dự án

6. Phương hướng và các vấn đề tiếp theo 11

Dựa trên kết quả khảo sát, chúng tôi đã lựa chọn phương pháp áp dụng thiết bị Be-One mang lại hiệu suất giảm thải CO2 cao hơn. Mặt khác, có thêm 3 công ty trở thành đối tượng áp dụng. Với tổng số đối tượng lên 6 công ty, chúng tôi đã đề xuất dự án hỗ trợ thiết bị của Bộ Môi trường Nhật Bản (đợt tuyển chọn thứ 2) và vừa được thông qua. Từ đây chúng tôi dự định tiếp tục thực hiện dự án theo một quy trình cụ thể như ký kết hiệp định nhóm doanh nghiệp vv..



TP. HỒ CHÍ MINH VÀ TP. OSAKA

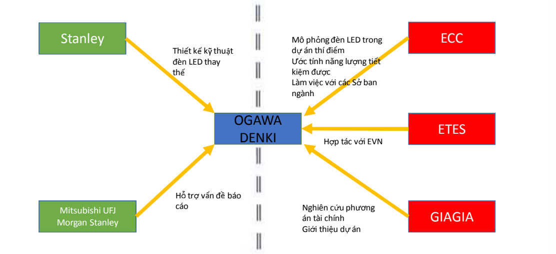
「HỆ THỐNG CHIẾU SÁNG CÔNG CỘNG TẠI TP.HCM」

<JCM Feasibility Study>

OGAWA DENKI Co.,Ltd.
Bộ phận Đối ngoại
Takehiro OGAWA

content

1、Tổ chức thực hiện nghiên cứu



1-1 Tổng quan “OGAWA DENKI Co.,Ltd”

1, Tên Công ty : OGAWA DENKI CO.,LTD.
2, Ban điều hành : NORIO OGAWA (Chủ tịch) TAKEHIRO OGAWA(Trưởng Ban Đối ngoại)
3, Thành lập : Ngày 21 tháng 3 năm 1963
4, Trụ sở chính : Osaka, Nhật bản
5, Doanh thu hằng năm : 220,000,000 USD (1USD = 120JPY
6, Số nhân viên: 380
7, Số chi nhánh : 37
(Osaka, Nara ,Shiga,Wakayama and Tokyo)

1-2 Tổng quan “ECC HCMC”

1, Tên Tổ chức : Trung tâm tiết kiệm năng lượng TP HCM
2, Giám đốc: Huỳnh Kim Tước
3, Thành lập : Ngày 10 tháng 3 năm 2002
4, Trung tâm tiết kiệm năng lượng TP HCM thuộc Sở KHCN TP HCM

2、Kết quả nghiên cứu 2-1 Thực trạng

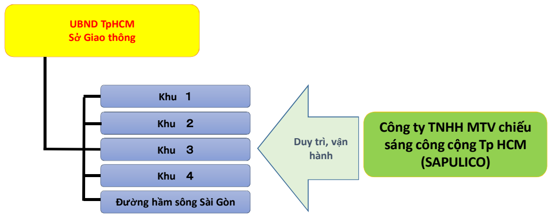
1、Có 137,869 đèn đường ở TpHCM. Tổng chiều dài của các tuyến đường là 4,000km. Số đèn đường LED hiện tại là 1,500 bộ.

2、Tổng công suất tiêu thụ hằng năm là 90 triệu kWh. Tiền điện bình quân hằng năm là 5.9 triệu USD.

3、2011-2012: 1 thương hiệu nước ngoài tặng 160 bộ đèn LED cho Tp HCM. Hiện nay, hơn 20 bộ hư hoàn toàn. 2012-2013: Hãng Philips thực hiện dự án thí điểm ở đường Hoa Lan, Q. Phu Nhuan. Một số đèn bị hư hỏng nhưng Philips đã khắc phục.

4、2014-2015: UBND Tp HCM đầu tư hơn 1,500 bộ đèn LED (1 nguồn hỗ trợ nhỏ từ Quỹ Bill Clinton) trên 12 tuyến đường (đặc biệt ở Thành Thái, Ngô Quyền, Tân Hoa, Lò Gốm, Luỹ Bán Bích, Nguyễn Huệ,...)

2-2 Cơ chế vận hành hệ thống chiếu sáng



1、Sở Giao thông thuộc UBND Tp HCM quản lý chung toàn bộ hệ thống chiếu sáng trên địa bàn thành phố. 5 khu quản lý trực tiếp hệ thống chiếu sáng trong khu vực.

2、SAPULICO cung cấp việc duy trì vận hành toàn bộ hệ thống chiếu sáng. Mỗi khu có vai trò xác nhận công việc SAPULICO đã tiến hành.

2-3 problem for changing to LED street light

1、Ở Việt Nam vẫn chưa có tiêu chiếu cho chiếu sáng công cộng

→JLMA ;Japan Lighting Manufacturers Association (Hiệp hội những nhà sản xuất thiết bị chiếu sáng Nhật Bản) sẽ hỗ trợ Việt Nam trong việc thiết kế tiêu chuẩn.

2、Chất lượng và cung cấp hệ thống đèn đường LED.

→ Dự án thí điểm ở tuyến đường 47 Quốc Hương Quận 2 Tp HCM sẽ lắp đặt 11 bộ đèn đường LED. Bộ đèn đường LED công suất 65W dùng đê thay thế cho đèn HPS 100W

→ Nhà sản xuất Stanley có nhà máy ở Việt Nam và có thể sản xuất đèn phù hợp với thời tiết và môi trường tại khu vực lắp đặt

3、Cơ chế tài chính

→OGAWA JAPAN giới thiệu Cơ chế JCM và các Ngân hàng tham gia.

3、Dự án thí điểm 3-1 Lựa chọn tuyến đường

Stt	Tên đường	Quận	Dài (m)	Số lượng 250W	Số lượng 150W	Số lượng 100W	Khoảng cách từ bề mặt (m)	Cách chiếu sáng	Khoảng cách 2 đèn (m)	Độ rọi trung bình (lux)
1	LinhDong	ThuDuc	8	67			8	1 phía	40	14.5
2	NamLongArea	9	8	21	91		11	1 phía	25～35	17.1
3	No47QuocHuong	2	5～7			11	7.5	1 phía	30	12
4	No3HaiQuanArea	2	6～8			11	7.5	1 phía	30	12

Được sự cho phép của Sở Giao thông Tp HCM, dự án chọn đường số 47 Quốc Hương để thay thế đèn HPS cũ sang đèn LED

3-2 specification of LED street light

Dự án chọn đèn LED của thương hiệu STANLEY

1、Stanley tiên phong chế tạo đầu đèn LED của xe hơi, xe gắn máy sử dụng trong các môi trường nóng – lạnh. Stanley vận dụng công nghệ cao để sản xuất đèn đường LED

2、Stanley sử dụng công nghệ chế tạo COB để tạo ra đèn đường LED với bộ tản nhiệt tốt.

従来型のCOB　新開発の分散実装タイプCOB

3、Stanley có nhiều nhà máy trên thế giới và ở Việt Nam. Vì vậy Stanley có thể sản xuất và kinh doanh đèn LED với giá cả hợp lý.
(Stanley có 13 nhà máy trên thế giới và 1 nhà máy ở Hà Nội – Việt Nam)

3-3 simulation of before and after installing LED

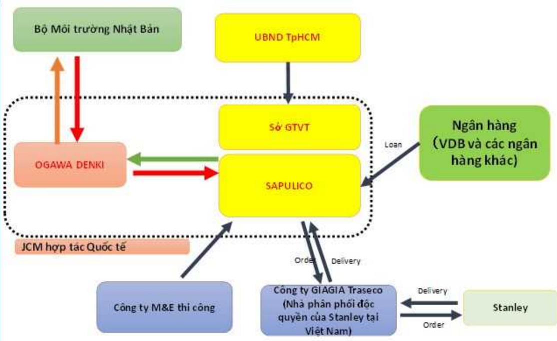
Đèn LED65W chiếu sáng tốt hơn đèn HPS100W thể hiện qua bảng số liệu mô phỏng độ rọi Lux bên dưới.
Độ rọi trung bình của đèn HPS 100W là 8.8lux và của đèn LED 65W là12lux.

Current lights	Innovated lights	Quantity	Current E_{tb} (lux)	E_{tc} (lux)	Innovated E_{tb} (lux)	Current P_0 (W/m)	Innovated P_0 (W/m)	P_{0tc} (W/m)
HPS 100W	LED 65W	11	8.8	12	15	4	2.17	<8

Lượng điện năng tiết kiệm được từ việc thay thế đèn HPS100W bằng đèn LED 65W vào khoảng 35%.

Đèn LED 65W sẽ được lắp đặt ngay khi Stanley hoàn thành khâu sản xuất sản phẩm và Sở Giao thông TP HCM chấp thuận.

4、Cơ chế JCM và Ngân hàng tham gia



1、Tỷ lệ hoàn vốn ROI ngắn hơn nhờ sự hỗ trợ của cơ chế JCM.
2、Chúng tôi đã làm việc với các công ty tài chính về thông tin liên quan dự án.

5、Tiến trình dự án

1, Vào ngày 20/1, Ông Châu (Phòng Biến đổi khí hậu TpHCM) đã hỗ trợ chúng tôi sắp xếp cuộc gặp với ông Trần Thế Kỷ – PGĐ Sở Giao thông TpHCM.

2, Chúng tôi đã thuyết minh về đèn đường LED và cơ chế JCM.

3, Sở Giao thông đề nghị chúng tôi thực hiện Đề xuất tài chính cho việc lắp đặt đèn đường LED tại TpHCM. Nội dung đề xuất bao gồm các phương án ESCO, vay vốn ngân hàng, cơ chế JCM,… Vì vậy, Sở giao thông sẽ cung cấp thông tin chi tiết về hiện trạng giao thông công cộng tại TpHCM.

4, Sở Giao thông vẫn chưa cung cấp thông tin cho chúng tôi. Chúng tôi liên hệ với ông Châu từ Phòng Biến đổi khí hậu để giúp đỡ trong việc xúc tiến Sở giao thông cung cấp thông tin sớm nhất có thể. Sau khi có đủ thông tin, chúng tôi sẽ tiến hành lập phương án tài chính cho phía Sở Giao thông.

Cám ơn Quý vị đã theo dõi

Ⅴ. JCM Proposed Methodology・Project Design Document

—Table of Contents —

1. Introduction of control devices to the air conditioners and compressors in factory

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Vietnam
Name of the methodology proponents submitting this form	Tepia Corporation Japan Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	Energy demand
Title of the proposed methodology, and version number	Introduction of control devices to the air conditioners in factory.
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☐Additional information
Date of completion	10/11/2015

History of the proposed methodology

Version	Date	Contents revised
1.0	10/11/2015	First Edition

A. Title of the methodology

Introduction of control devices to the air conditioners in factory.

B. Terms and definitions

Terms	Definitions
Target equipment	It refers to each outdoor unit of air conditioner to which a control device is introduced. It should be noted that air conditioner functioning only as a cooler is evaluated. Heater is not taken into consideration.
Control device	It refers to the operation control device of the air-conditioning compressor. It is an operation control device equipped with a program to manipulate the operation of the compressor within the range where the effect of the air conditioner does not fall.
Preliminary measurement	Power consumption should be measured prior to operation of control device introduced to the target equipment.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	GHG emission is reduced due to energy saving by introducing control device to the outdoor unit of air conditioner.
Calculation of reference emissions	Reference power consumption per hour is identified from the results of preliminary measurement carried out in the target equipment. Reference emission is calculated by multiplying the reference power consumption with CO^2 emission factor of electricity, and the operation time period of the target equipment monitored after project implementation.
Calculation of project emissions	Project emission is calculated by multiplying the power consumed by the target equipment monitored after project implementation with CO^2 emission factor of electricity.
Monitoring parameters	● Power consumed by target equipment after project implementation. ● Operation time period of the target equipment after project implementation.

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	Power consumed by target equipment is measured <u>more than once per hour</u> for <u>more than a week</u> before the control device is operational. Regarding the period of preliminary measurement, in the region where the average temperature difference every month is less than 10℃, any period more than a week can be considered for measurement. However, in the region where the average temperature difference is more than 10℃, more than a week period during winter season (November to February) is considered for measurement to calculate the power consumption. The temperature measured during the preliminary measurement is considered to be constant and no change is made in the temperature setting. <u>More than 100</u> valid data sample should be collected excluding those when

	the equipment is not operational. Note that if the air conditioning control system is common for all air conditioners, only one can be selected as a sample unit to conduct the measurement.
Criterion 2	After the project implementation, no change is made in the temperature setting if it exceeds ±3℃ from the temperature adopted during the preliminary measurement.
Criterion 3	After the project implementation, the power consumed by the target equipment and their operating time period can be monitored by the control device. In order to measure the amount of electricity by ammeter, the measurement results from electricity meter installed in 1 out of 10 target equipment is verified with the measurement result of ammeter. In case there is a deviation in the measurement results from the two meters, the measurement data from the ammeter is corrected by the ratio of the highest deviation ratio for a conservative result.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Power consumed by target equipment before introducing control device.	CO_2
Project emissions	
Emission sources	GHG types
Power consumed by target equipment after introducing control device.	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emission is the estimated GHG emissions by the target equipment if it is continuously operated without introducing any control device. More than 100 valid sample data of power consumed by the target equipment is collected through measurement that is conducted at least once per hour for more than one week period when the control device is not operated. In case, there are multiple units of air conditioners in the factory, only one air conditioner can be selected as a sample unit for measurement if the temperature control system is common for all other units. <u>The first 10% of higher values of power consumption</u> from the collected sample data are <u>neglected to set the reference scenario more conservatively than the BaU scenario.</u> Reference power consumption (pre-determined eigenvalues of the project) is the average power consumption per hour derived from the lower 90% of the sample data of power consumption. When taking one unit of air conditioner as a sample unit, the reference power consumption that is derived as above shall be proportionally distributed by the cooling capacity to identify the reference power consumption of the target air conditioner as follows. Reference power consumption of target equipment = Reference power consumption of sample unit × Sum of rated cooling capacity of the target equipment ÷ Rated cooling capacity of the sample unit. The reference power consumption derived as above is multiplied by the monitored operation time after the project implementation to calculate the reference emissions.

F.2. Calculation of reference emissions

Reference emissions is calculated from the following equation.

$$RE_y = EL_{RE,ac} * T_{ac,y} * CEF_{electricity} \tag{1}$$

$$EL_{RE,ac} = EL_{average,i} * F_i / 1 * RC_{ac} / RC_i \tag{2}$$

$$EL_{average,i} = \Sigma_{90\%}(EL_{i,n}) / (n_i * 0.9) \tag{3}$$

RE_y	Reference emissions in year *y*.	kWh/y
$EL_{RE,ac}$	Reference power consumption of the target equipment per hour.	kWh/h
$T_{ac,y}$	Operation time of the air conditioner in year *y*.	h/y
$CEF_{electricity}$	CO_2 emission factor of electricity. Default value published by the Ministry of Natural Resources and Environment (MONRE), the DNA of CDM in Vietnam is adopted as long as there is no further instruction from the Joint Committee regarding the power supply from the national grid.	tCO_2/kWh
$EL_{average,i}$	Average value of power consumed by sample unit *i* of air conditioner during the preliminary measurement.	kWh/no. of measurement
F_i	Sample size of preliminary measurements per hour.	
RC_{ac}	The sum of rated cooling capacity of the target equipment.	kW
RC_i	Rated cooling capacity of the sample unit *i* of air conditioner.	kW
$\Sigma_{90\%}(EL_{i,n})$	Sum of lower 90% of the smaller values of the power consumed by the sample unit *i* of air conditioner during the preliminary measurement.	kWh
n_i	Valid sample size of preliminary measurements of sample unit *i* of air conditioner.	

G. Calculation of project emissions

Project emission is calculated by the multiplication of the summation of power consumed by target equipment measured after the project implementation and the CO_2 emission factor of electricity.

The power consumed by all the target equipment after the project implementation is monitored

To measure the amount of electricity by ammeter, the measurement results from electricity meter installed in 1 out of 10 target equipment is verified with the measurement result of ammeter. In case there is a deviation in the measurement results from the two meters, the measurement data from the ammeter is corrected by the ratio of the highest deviation ratio for a conservative result.

$$PE_y = \Sigma_i (EL_{PJ,i,y}) * CEF_{electricity} \tag{4}$$

PE_y	Project emissions in year *y*.	tCO_2e/y
$\Sigma_i EL_{PJ,i,y}$	Summation of power consumed by sample unit *i* of the target equipment in year *y*. (It is the summation of measured values from each control device) To measure the amount of electricity by ammeter, 1 electricity meter is installed to every 10 target	kWh/y

	equipment to compare the results of both ammeter and electricity meter. In case there is a deviation in the measurement results from the two meters, the measurement data from the ammeter is corrected by the ratio of the highest deviation ratio for a conservative result.	
$CEF_{electricity}$	CO_2 emission factor of electricity. Default value published by the Ministry of Natural Resources and Environment (MONRE), the DNA of CDM in Vietnam is adopted as long as there is no further instruction from the Joint Committee regarding the power supply from the national grid.	tCO_2/kWh

H. Calculation of emissions reductions

Emission reduction is calculated from reference emissions and project emissions as follows.

$$ER_y = (RE_y - PE_y) \tag{5}$$

ER_y	Emission reduction in year y.	tCO_2e/y
RE_y	Reference emissions in year y.	tCO_2e/y
PE_y	Project emission in year y.	tCO_2e/y

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
RC_{ac}	The sum of rated cooling capacity of the target air conditioner.	Catalog or inscription board
RC_i	Rated cooling capacity of the sample air conditioner unit i.	Catalog or inscription board
F_i	Sample size of preliminary measurements per hour.	Pre-diagnosed result
$EL_{i,n}$	Valid sample size of power consumption obtained from preliminary measurement of the sample unit i.	Pre-diagnosed result
n_i	Valid sample size of preliminary measurements of sample unit i.	Pre-diagnosed result
$CEF_{electricity}$	CO_2 emission factor of electricity.	Default value published by the Ministry of Natural Resources and Environment (MONRE), the DNA of CDM in Vietnam is adopted as long as there is no further instruction from the Joint Committee regarding the power supply from the national grid.

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Vietnam
Name of the methodology proponents submitting this form	Tepia Corporation Japan Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	Energy demand
Title of the proposed methodology, and version number	Introduction of control devices to the compressors in factory.
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☐Additional information
Date of completion	10/11/2015

History of the proposed methodology

Version	Date	Contents revised
1.0	10/11/2015	First Edition

J. Title of the methodology

Introduction of control devices to the compressors in factory.

K. Terms and definitions

Terms	Definitions
Target equipment	It refers to the compressor of each compressed air generator to which a control device is introduced.
Control device	It refers to the device that controls number/unit of compressor to be operated.
Preliminary measurement	Following parameters should be measured prior to operation of control device introduced to the target equipment. ● Power consumed by the target equipment. ● Volume of compressed air generation (Air pressure)

L. Summary of the methodology

Items	Summary
GHG emission reduction measures	GHG emission is reduced due to energy saving by introducing control device to the compressors.
Calculation of reference emissions	Reference power consumption per hour is identified from the results of preliminary measurement carried out in the target equipment. Reference emission is calculated by multiplying the reference power consumption with CO^2 emission factor of electricity, and the operation time period of the target equipment monitored after project implementation.
Calculation of project emissions	Project emission is calculated by multiplying the power consumed by the target equipment monitored after project implementation with CO^2 emission factor of electricity.
Monitoring parameters	● Power consumed by target equipment after project implementation. ● Operation time period of the target equipment after project implementation. ● Air pressure after project implementation.

M. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	During the preliminary measurement conducted for a <u>period of at least one week</u>, following parameters should be measured <u>at least once per hour</u> prior to the operation of control device. <u>More than 100</u> valid data sample should be collected excluding those when the equipment is not in operation. ● Power consumed by target equipment. ● Volume of compressed air generated by the compressor (target equipment) The measured value of air pressure can be converted in to the volume of compressed air generated.
Criterion 2	The deviation in average air pressure measured before and after the project implementation should not exceed ±0.1MPa. After the project implementation, if the air pressure exceeds this range at any time period,

	it should be excluded from the operating time that is taken into account.
Criterion 3	After the project implementation, power consumption by the target equipment can be monitored by electricity meter.

N. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Power consumed by the target equipment before introducing control device.	CO_2
Project emissions	
Emission sources	GHG types
Power consumed by the target equipment after introducing control device	CO_2

O. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emission is the estimated amount of GHG emissions by the target equipment if it is continuously operated without introducing any control device.
100 valid sample data of power consumed and volume of compressed air generated by each target equipment are collected at least once per hour for more than one week period when the control device is not operated.
<u>The first 10% of higher values of power consumption per unit air volume from the collected sample data are neglected to set the reference scenario more conservatively than the BaU scenario.</u>
Reference power consumption (pre-determined eigenvalues of the project) is calculated by multiplication of average value of power consumption derived from lower 90% of the sample data and average of value of air flow volume per hour.
The reference power consumption derived as above is multiplied by the monitored operation time after the project implementation to calculate the reference emissions.

F.2. Calculation of reference emissions

Reference emissions is calculated from the following equation.

$$RE_y = EL_{RE,co} * T_{co,y} * CEF_{electricity} \quad (1)$$

$$EL_{RE,co} = EL_{average,co} * AF_{average,co} *F_{co} / 1 \quad (2)$$

$$EL_{average,co} = \Sigma_{90\%} (EL_{co,n} / AF_{co,n}) / (n_{co} * 0.9) \quad (3)$$

RE_y	Reference emissions in year y.	kWh/y
$EL_{RE,co}$	Reference power consumption of the target compressor per hour.	kWh/h
$T_{co,y}$	Operation time of the compressor in year y.	h/y
$CEF_{electricity}$	CO2 emission factor of electricity. Default value published by the Ministry of Natural Resources and Environment (MONRE), the DNA of CDM in Vietnam is adopted as long as there is no further instruction from the Joint Committee regarding the power supply from the national grid.	tCO_2/kWh
$EL_{average,co}$	Average value of power consumed by the target equipment per unit air volume during the preliminary measurement.	kWh/no. of measurement

$AF_{average,co}$	Average air flow volume in the target equipment during the preliminary measurement.	m^3/no. of measurement
F_{co}	Sample size of preliminary measurements per hour.	
$\Sigma_{90\%} (EL_{co,n} / AF_{co,n})$	Sum of lower 90% of the smaller values of the power consumption per unit air volume by the target equipment during preliminary measurement.	kWh
$EL_{co,n}$	Valid samples of power consumed by the target compressor during preliminary measurement.	kWh/no. of measurement
$AF_{co,n}$	Valid samples of air flow volume in the target compressor during preliminary measurement.	m^3/ no. of measurement
n_{co}	Valid sample size of preliminary measurements of the target compressor.	

P. Calculation of project emissions

Project emission is calculated from the multiplication of power consumed by the target equipment measured after the project implementation, and the CO_2 emission factor of electricity.

$$PE_y = EL_{PJ,y} * CEF_{electricity} \quad (4)$$

PE_y	Project emissions in year *y*.	tCO_2e/y
$EL_{PJ,j,y}$	Power consumed by the target equipment in year *y*.	kWh/y
$CEF_{electricity}$	CO_2 emission factor of electricity. Default value published by the Ministry of Natural Resources and Environment (MONRE), the DNA of CDM in Vietnam is adopted as long as there is no further instruction from the Joint Committee regarding the power supply from the national grid.	tCO_2/kWh

Q. Calculation of emissions reductions

Emission reduction is calculated from reference emissions and project emissions as follows.

$$ER_y = (RE_y - PE_y) \quad (5)$$

ER_y	Emission reduction in year *y*.	tCO_2e/y
RE_y	Reference emissions in year *y*.	tCO_2e/y
PE_y	Project emissions in year *y*.	tCO_2e/y

R. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
F_{co}	Sample size of preliminary measurement per hour.	Pre-diagnosed result
$AF_{average,co}$	Average air flow volume in the target equipment during the preliminary	Pre-diagnosed result

	measurement.	
$EL_{co,n}$	Valid samples of power consumed by the target equipment during preliminary measurement.	Pre-diagnosed result
$AF_{co,n}$	Valid samples of air flow volume in the target equipment during preliminary measurement.	Pre-diagnosed result
n_{co}	Valid sample size of preliminary measurements of the target compressor.	Pre-diagnosed result
$CEF_{electricity}$	CO_2 emission factor of electricity.	Default value published by the Ministry of Natural Resources and Environment (MONRE), the DNA of CDM in Vietnam is adopted as long as there is no further instruction from the Joint Committee regarding the power supply from the national grid.

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Introduction of control device to air conditioners and compressors in Nidec group factories.

A.2. General description of project and applied technologies and/or measures

Introduction of control device "Be-One" to the outdoor unit of air conditioner and control device for managing the number of compressors to be operated, in three factories of the Nidec Group in Ho Chi Minh City. The control device in the air conditioner constantly monitors the operation status of the compressor in the outdoor unit of the air conditioner by maintaining a suitable temperature and prevents super cooling. This reduces power consumption. In the case of compressors, the number of operating compressors is automatically controlled according to the load, such that only required number of compressors are operated and this will effectively reduce the power consumption during the off load period. Reduction in power consumption due to above method contributes in reduction of CO_2 in the factories.

In this project, the number of control devices to be introduced in the respective 3 factories is as follows.

Factory	Air conditioner control device	Compressor control device
[Location 1] Nidec SERVO VIETNAM CORPORATION	Introduced 90 units of control devices.	Introduced 1 control device to every 7 compressors.
[Location 2] NIDEC TOSOK (VIETNAM)　CO.,LTD.	Introduced 109 units of control devices.	No implementation.
[Location 3] Nidec Vietnam Corporation	Introduced 69 units of control devices.	Introduced 1 control device to every 4 compressors.

The expected annual CO_2 reduction due to this project in the three factories is about 2,038 tons.

A.3. Location of project, including coordinates

Country	The Socialist Republic of Viet Nam
Region/State/Province etc.:	N/A
City/Town/Community etc:	Ho Chi Minh City
Latitude, longitude	[Location 1]　Nidec SERVO Vietnam Corporation N10°51'20" and E106°47'49" Lot no. I 1.3-N1, Saigon High-tech Park, District 9, Ho Chi Minh City, Vietnam [Location 2]　Nidec TOSOK (VIETNAM) CO.,LTD. N10°45'42" and E106°44'36" Road 16, Tan Thuan Export Processing Zone, Tan Thuan Dong Ward, District 7, Ho Chi Minh City, Vietnam [Location 3]　Nidec Vietnam Corporation N10°51'18" and E106°47'40" Lot No I1-N2 Saigon High-tech Park, District 9, Ho Chi Minh City, Vietnam

A.4. Name of project participants

The Socialist Republic of Viet Nam	Nidec SERVO Vietnam Corporation Nidec TOSOK (VIETNAM) CO.,LTD. Nidec Vietnam Corporation
Japan	

A.5. Duration

Starting date of project operation	01/09/2016 (Tentative)
Expected operational lifetime of project	7 years

A.6. Contribution from developed countries

This project is expected to receive subsidy from the Ministry of Environment in Japan under the JCM collaborative financing program. The control devices to be introduced in this project are manufactured by Japanese companies.

B. Application of an approved methodology(ies)

B.1. Selection of methodology (ies)

Selected approved methodology No.	Undecided
Version number	Undecided

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

【Control of air conditioner】

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	Power consumed by target equipment is <u>measured more than once per hour</u> for <u>more than a week</u> before the control device is operational. Regarding the period of preliminary measurement, in the region where the average temperature difference every month is less than 10℃, any period more than a week can be considered for measurement. However, in the region where the average temperature difference is more than 10℃, more than a week period during winter season (November to February) is considered for measurement to calculate the power consumption. The temperature measured during the preliminary measurement is considered to be constant and no change is made in the temperature setting.	Factories from Location 1 to Location 3 are located in Ho Chi Minh City where the average annual temperature difference is less than 10℃. [Location 1] Nidec SERVO 393 valid data samples of power consumption were collected from one sample unit for 27days from June 11th, 2015 to June 27th, 2015 with the frequency of one reading per hour. [Location 2] Nidec TOSOK 344 valid data samples of power consumption were collected from 2 sample units for 23 days from June 10th, 2015 to July 2nd, 2015 with the frequency of one reading per hour. [Location 3] Nidec Vietnam 315 valid data samples of power consumption were collected from 2 sample units for 14 days from September 17th, 2015 to September 30th, 2015 with the frequency of one reading per hour.
Criterion 2	After the project implementation, no change is	After the project implementation, any change in predetermined temperature is

	made in the temperature setting if it exceeds ±3℃ from the temperature adopted during the preliminary measurement.	recorded and it is made sure that the difference of temperature does not exceed ±3℃.
Criterion 3	After the project implementation, the power consumed by the target equipment and their operating time period can be monitored by the control device. To measure the amount of electricity by ammeter, the measurement results from electricity meter installed in one out of ten control devices is verified with the measurement result of ammeter. In case there is a deviation in the measurement results from the two meters, the measurement data from the ammeter is corrected by the ratio of the highest deviation ratio for a conservative result.	After the project implementation, current flow in all the outdoor units of air conditioner is measured by the control devices. An ammeter for every 10 units shall be installed.

【Control of number of compressors to be operated】

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	During the preliminary measurement conducted for a period of <u>at least one week</u>, following parameters should be measured <u>at least once per hour</u> prior to the operation of control device. <u>More than 100</u> valid data sample should be collected excluding those when the equipment is not in operation. ● Power consumed by target equipment. ● Volume of compressed air generated by the compressor. The measurement of air pressure can be converted in to the volume of compressed air generated.	[Location 1] Nidec SERVO 336 valid data samples of power consumption and volume of compressed air were collected from 7 units of target equipment for 7 days from June 14th, 2015 to June 20th, 2015 with the frequency of 2 readings per hour. [Location 2] Nidec TOSOK Control of compressor is not conducted. [Location 3] Nidec Vietnam 203 valid data samples of power consumption and volume of compressed air were collected from 4 units of target equipment for 7 days from July 13th, 2015 to July 19th, 2015 with the frequency of 2 readings per hour.
Criterion 2	The deviation in average air pressure measured before and after the project implementation should not exceed ±0.1MPa. After the project implementation, if the air pressure exceeds this range at any time period, the time	After project implementation, pressure is monitored by pressure gauge and it is ensured that the pressure does not exceed 0.1MPa.

	period should be excluded from the operating time that is taken into account.	
Criterion 3	After the project implementation, power consumption by the target equipment can be monitored by electricity meter.	The power consumption is monitored by electricity meter in the control device after the project implementation.

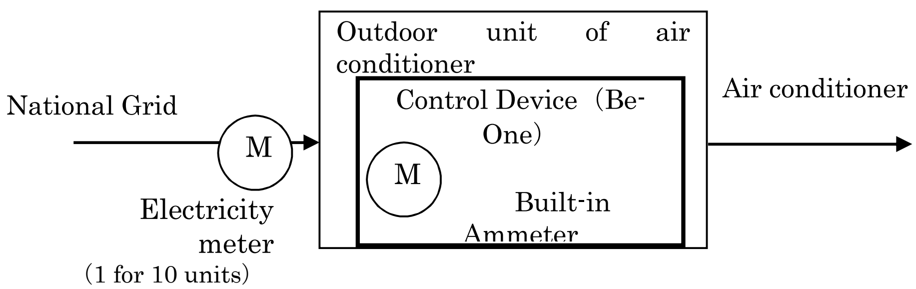
C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Power consumed by outdoor unit of air conditioner before the introduction of control device.	CO_2
Power consumed by compressor before the introduction of control device.	CO_2
Project emissions	
Emission sources	GHG type
Power consumed by outdoor unit of air conditioner after the introduction of control device.	CO_2
Power consumed by compressor after the introduction of control device.	CO_2

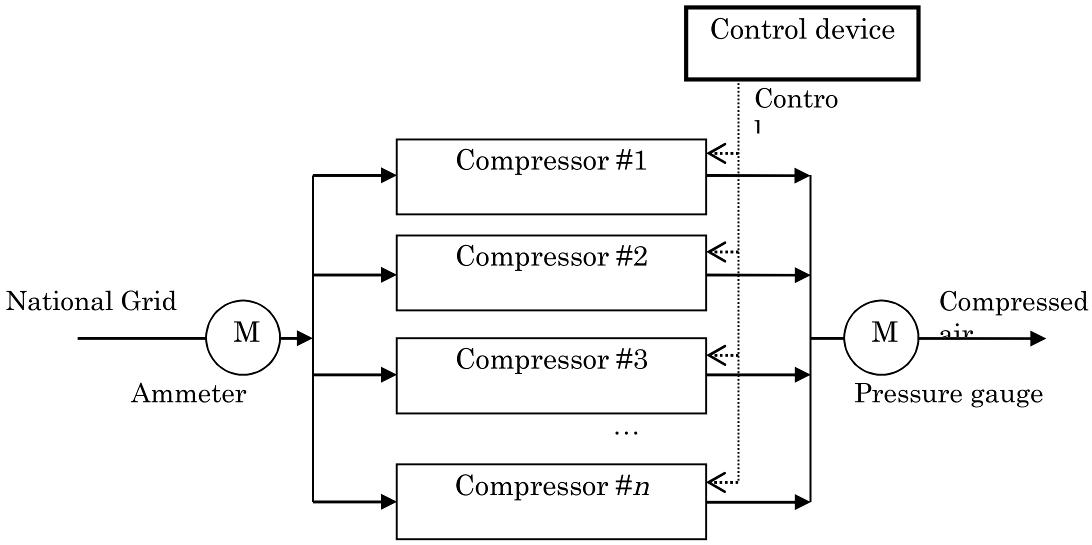
C.2. Figure of all emission sources and monitoring points relevant to the JCM project

【Control device for air conditioner】



1 control device is installed on each compressor of air conditioner outdoor unit. The electricity flow is measured by the built-in ammeter in the control device.
Moreover, electricity meter is also installed at the rate of one for every 10 units of equipment to compare the measurement results with that of the ammeter.
In case there is a deviation in the measurement results from the two meters, the measurement data from the ammeter is corrected by the ratio of the highest deviation ratio for a conservative result.

【Control of number of compressors to be operated】



One control device is installed for a multiple units of compressors. The amount of electricity flow to all compressors is measured by electricity meter and the volume of compressed air is measured by using pressure gauge.

C.3. Estimated emissions reductions in each year

【Control of air conditioner】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	4,864.1	4,137.5	726.6
2017	14,552.7	12,378.5	2,174.2
2018	14,552.7	12,378.5	2,174.2
2019	14,552.7	12,378.5	2,174.2
2020	14,552.7	12,378.5	2,174.2
Total (tCO_{2e})	63,074.9	53,651.5	9,423.4

【Control of number of compressors to be operated】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	684.6	659.9	24.7
2017	2,048.1	1,974.4	73.7
2018	2,048.1	1,974.4	73.7
2019	2,048.1	1,974.4	73.7
2020	2,048.1	1,974.4	73.7

Total (tCO_{2e})	8,877.0	8,557.5	319.5

【Total】

Year	Estimated Reference Emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	5,209.2	4,464.7	744.5
2017	15,584.9	13,357.6	2,227.3
2018	15,584.9	13,357.6	2,227.3
2019	15,584.9	13,357.6	2,227.3
2020	15,584.9	13,357.6	2,227.3
Total (tCO_{2e})	67,548.8	57,895.1	9,653.7

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	No

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

This is energy conservation (energy efficient) project to reduce power consumption in factories. This leads to reduction in electricity bills and contributes to the profit in each factory.
The 3 factories selected for this project are the stakeholders of this project and the representatives of each factory are interviewed during June and July, 2015.
In addition, an interview is also conducted at Ho Chi Minh Climate Change Bureau (DONRE-HCCB) on June 8th, 2015 because this project is formed under Ho Chi Minh City-Osaka City Cooperation Project for Developing Low Carbon City.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Nidec SERVO	There shall be no adverse effect in the production activities during the project implementation. Hope to get energy efficient results from the project.	No action is required
Nidec TOSOK	There shall be no adverse effect in the production activities during the project implementation. Hope to get energy efficient results from the project.	No action is required
Nidec Vietnam	There shall be no adverse effect in the production activities during the project implementation. Hope to get energy efficient results from the project.	No action is required
DONRE-HCCB	Expecting that this project also expands to other factories. The government will support the project.	No action is required

F. References

N/A

Reference lists to support descriptions in the PDD, if any.

Annex

Estimated emissions reductions in each year at each project location

[Location 1]　Nidec SERVO Vietnam Corporation

【Control of air conditioner】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	1,328.1	1,159.1	169.0
2017	3,973.3	3,467.9	505.4
2018	3,973.3	3,467.9	505.4
2019	3,973.3	3,467.9	505.4
2020	3,973.3	3,467.9	505.4
Total (tCO_{2e})	17,221.3	15,030.7	2,190.6

【Control of number of compressors to be operated】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	339.6	332.7	6.9
2017	1,015.9	995.3	20.6
2018	1,015.9	995.3	20.6
2019	1,015.9	995.3	20.6
2020	1,015.9	995.3	20.6
Total (tCO_{2e})	4,403.2	4,313.9	89.3

【Total】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	1,667.6	1,491.8	175.8
2017	4,989.2	4,463.2	526.0
2018	4,989.2	4,463.2	526.0

2019	4,989.2	4,463.2	526.0
2020	4,989.2	4,463.2	526.0
Total (tCO_{2e})	21,624.4	19,344.6	2,279.8

[Location 2]　Nidec TOSOK (VIETNAM) CO.,LTD.
【Control of air conditioner】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	2,671.9	2,241.4	430.5
2017	7,993.9	6,705.8	1,288.1
2018	7,993.9	6,705.8	1,288.1
2019	7,993.9	6,705.8	1,288.1
2020	7,993.9	6,705.8	1,288.1
Total (tCO_{2e})	34,647.5	29,064.6	5,582.9

【Control of number of compressors to be operated】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Total (tCO_{2e})	0.0	0.0	0.0

【Total】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	2,671.9	2,241.4	430.5
2017	7,993.9	6,705.8	1,288.1
2018	7,993.9	6,705.8	1,288.1
2019	7,993.9	6,705.8	1,288.1
2020	7,993.9	6,705.8	1,288.1
Total (tCO_{2e})	34,647.5	29,064.6	5,582.9

[Location 3]　Nidec Vietnam Corporation

【Control of air conditioner】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	524.6	404.3	120.3
2017	1,569.6	1,209.5	360.1
2018	1,569.6	1,209.5	360.1
2019	1,569.6	1,209.5	360.1
2020	1,569.6	1,209.5	360.1
Total (tCO_{2e})	6,803.0	5,242.3	1,560.7

【Control of number of compressors to be operated】

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	345.0	327.3	17.7
2017	1,032.2	979.1	53.1
2018	1,032.2	979.1	53.1
2019	1,032.2	979.1	53.1
2020	1,032.2	979.1	53.1
Total (tCO_{2e})	4,473.8	4,243.7	230.1

【Total】

Year	Estimated Reference Emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	869.6	731.5	138.1
2017	2,601.8	2,188.6	413.2
2018	2,601.8	2,188.6	413.2
2019	2,601.8	2,188.6	413.2
2020	2,601.8	2,188.6	413.2
Total (tCO_{2e})	11,276.8	9,485.9	1,790.9

Revision history of PDD		
Version	Date	Contents revised
1.0	11/11/2015	First edition

2. Installation of LED lamps for surface road lighting system

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Socialist Republic of Vietnam
Name of the methodology proponents submitting this form	Ogawa Denki Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	3. Energy demand
Title of the proposed methodology, and version number	Installation of LED lamps for surface road lighting system (Ver. 01)
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☐Additional information
Date of completion	

History of the proposed methodology

Version	Date	Contents revised
1.0	19 Feb. 2016	First development of the draft methdology

S. Title of the methodology

Installation of LED lamps for surface road lighting system (Ver. 01)

T. Terms and definitions

<table>
<tr><th>Terms</th><th>Definitions</th></tr>
<tr><td>LED</td><td>LED means light –emitting diode. LED. the high-efficiency and high-power technology makes LED to be lighting for street light , architectural lighting and so on. The lighting part of LED lighting is LED.</td></tr>
<tr><td>LED lamp for surface road lighting system</td><td>LED lamp for surface road lighting system is defined as the lamp to be installed in order to fulfill the demand to brighten the surface road (including pedestrian) to secure the people walking and the vehicle transportation in night time, with the application of LED. Its mirror lens surrounding lamp is arranged in angular wider. Average road surface luminance has to be appropriate by the following table. …
(Unit: cd/m²)
<table>
<tr><th colspan="2">External Conditions / Road Classification</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td colspan="2" rowspan="2">National expressway</td><td>1.0</td><td>1.0</td><td>0.7</td></tr>
<tr><td>-</td><td>0.7</td><td>0.5</td></tr>
<tr><td rowspan="4">National highway</td><td rowspan="2">Major arterial road</td><td>1.0</td><td>0.7</td><td>0.5</td></tr>
<tr><td>0.7</td><td>0.5</td><td>-</td></tr>
<tr><td rowspan="2">Arterial road/collector road</td><td>0.7</td><td>0.5</td><td>0.5</td></tr>
<tr><td>0.5</td><td>-</td><td>-</td></tr>
</table>
Note External conditions A, B, and C refer to the following:
A.........A roadside condition where there is continuous light that affects the road traffic
B.........A roadside condition where there is intermittent light that affects the road traffic
C.........A roadside condition where there is little light that affects the road traffic
It meets “Guidelines of LED Luminaires for Road/Tunnel Lighting ” was issued on September, 2011 by Japanese Ministry of Land, Infrastructure, Transport and Tourism</td></tr>
<tr><td>Power consumption</td><td>Power consumption is defined as the total of Ballast wattage and Lamp wattage.
In order to ensure the conservativeness, power consumption of reference lamp (PCre) is only Lamp wattage.</td></tr>
<tr><td>Electricity consumption</td><td>Electricity consumed by equipment (in this methodology, by reference and project lamps). Electricity consumptions can be directory measured through the lighting control system, or can be calculated by multiplying the power consumption and the operation hours.</td></tr>
</table>

U. Summary of the methodology

Items	Summary
GHG emission reduction measures	Installation of LED lamps for surface road lighting system reduces the consumptions of electricity provided from a electricity grid, which leads to the reduction of GHG emissions occurred in thermal power plants.
Calculation of reference emissions	Reference emissions are calculated by the electricity consumed by reference road lamps, and CO2 emission factor of the grid.
Calculation of project emissions	Project emissions are calculated by the electricity consumed by project LED road lamps, and CO2 emission factor of the grid.

Monitoring parameters	● Operation time of LED lamps for surface road lighting system (hour) ● Number of each type of LED lamps for surface road lighting to be replaced/installed ● Sum of power consumptions of reference lamps (W), determined before the project implementation based on the number of replacement by and/or new installation of project LED lamps for surface road lighting system ● Electricity consumed by project LED lamps for surface road lighting system (kWh)

V. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The project installs LED lamps for surface road lighting system in public areas, by replacing existing road lamps and/or newly introducing.
Criterion 2	The electricity to operate the surface road lighting system is supplied by the electricity grid.
Criterion 3	The project involves the lighting control system which measures the electricity consumptions of each LED lamp and which monitor the operation of each LED lamp.

W. Emission Sources and GHG types

Reference emissions	
Emission sources	**GHG types**
Consumed grid electricity used for the reference systems	CO2
Project emissions	
Emission sources	**GHG types**
Consumed grid electricity used for the project systems	CO2

X. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Existing road lamps are mercury lamps and high-pressure sodium vapor lamps, which consumes a large amount of grid electricity.
Compared to existing lamps, the reference road lamps should be set as efficiency high-pressure sodium vapor (HPS) lamps, whose specs are set as follows:

Type of reference lamp	Power consumption (W)		Guidelines of LED Luminaires for Road/Tunnel Lighting ”	To be replaced by project LED lamps
HPS 150W	Lamp wattage	150W		LED 65W
	Ballast wattage	30W		
HPS 250W	Lamp wattage	250W		LED 130W
	Ballast wattage	50W		
HPS 400W	Lamp wattage	400W		LED 250W

	Ballast wattage	75W		

Reference emissions are calculated by the sum of the electricity consumptions of total reference lamps. Total electricity consumptions of reference lamps are calculated by the multiplication of the sum of the power consumption (W), the operation hours (h), and the grid emission factor (GEF) (tCO_2/kWh). In order to secure the conservativeness of reference emissions, only the lamp wattage as the power consumption of reference lamps is used for the calculation. The operation hours of the reference lamps equals to the operation hours of the project LED lamps to be monitored through the lighting control system. The turn on/off of the lighting system is controlled by the lighting control system, whose timing is also monitored.

F.2. Calculation of reference emissions

$$REp = \sum (PCre) * Hpj * GEFvn/1000$$

REp: Reference emissions for period p (tCO_2)
PCre: Power consumption of each reference lamp (W)
Hpj: Operation hours of project LED lamps (hour), which is regarded as the same as operation hours of reference lamps
GEFvn: Grid emission factor of Vietnamese electricity grid (tCO_2/kWh)

Y. Calculation of project emissions

Project emissions are calculated by multiplying the total electricity consumptions of project LED lamps to be monitored by the lighting control system, and the grid emission factor (GEF).

Z. Calculation of emissions reductions

$$PEp = \sum (ECpj) * GEFvn$$

PEp: Project emissions for period p (tCO_2)
ECpj: Electricity consumptions of project LED lamp (kWh), to be monitored through the lighting control system (monitoring system)
GEFvn: Grid emission factor of Vietnamese electricity grid (tCO_2/kWh)

AA. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

<table>
<tr><th>Parameter</th><th>Description of data</th><th>Source</th></tr>
<tr><td>GEFvn</td><td>Grid emission factor of Vietnamese electricity grid.
Here <u>0.541tCO2/kWh</u> is applied.</td><td>Vietnamese government's official document</td></tr>
<tr><td>PCre</td><td><table><tr><td>Type of reference lamp</td><td>Power consumption (W) (only lamp wattage is used for the calculation to secure conservativeness)</td><td>Guidelines of LED Luminaires for Road/Tunnel Lighting ”</td><td>To be replaced by project LED lamps</td></tr></table></td><td></td></tr>
</table>

	HPS 150W	150W		LED 65W	
	HPS 250W	250W		LED 130W	
	HPS 400W	400W		LED 250W	
	In general power consumptions of lamps are composed of lamp wattage and ballast wattage. In this methodology, for the calculation of the reference emissions with conservativeness, only the lamp wattage of reference lamps is used.				

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

The saving energy project of LED street light made by new and special technology COB module in HoChiMinh city

A.2. General description of project and applied technologies and/or measures

The proposed JCM project aims to improve electricity consumption by changing high pressure sodium lamp to LED in Socialist Republic of Vietnam. In HoChiMinh city there are 140,000 pcs of high pressure sodium street light. This project we will renewal from HPS to LED of street light. LED street light will make energy saving 50%. The economy of Vietnam ,especially HoChiMinh grows rapidly. Therefore, it occurs power shortage. The Stanley has high-level LED technology because they have make so many LED headlight for motorbike and car. The technology can be used for LED street light.

A.3. Location of project, including coordinates

Country	The Socialist Republic of Vietnam
Region/State/Province etc.:	N/A
City/Town/Community etc:	HoChiMinh city
Latitude, longitude	Latitude 10° 49' 22 North Longitude 106° 37' 46 East

A.4. Name of project participants

The Socialist Republic of Viet Nam	The ministry of Transportation of HoChiMinh city
Japan	Not decided yet

A.5. Duration

Starting date of project operation	Not decided yet
Expected operational lifetime of project	Not decided yet

A.6. Contribution from developed countries

HoChiMinh people's committee can use high-technology LED street light. LED street light can make electric consumption and fee decreased. And they can use LED street light for a long time.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	No
Version number	No
Selected approved methodology No.	No
Version number	No
Selected approved methodology No.	No
Version number	No

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	The project installs LED lamps for surface road lighting system in public areas, by replacing existing road lamps and/or newly introducing.	In this project Stanley will check and make a simulation for newly LED street lights. The situation of road meets the standard "Guidelines of LED Luminaires for Road/Tunnel Lighting " was issued on September, 2011 by Japanese Ministry of Land, Infrastructure, Transport and Tourism
Criterion 2	The electricity to operate the surface road lighting system is supplied by the electricity grid.	The street light in HoCHiMinh city is supplied by EVN; Electric Vietnam. EVN is national company and supplied whole electric in Vietnam.
Criterion 3	The project involves the lighting control system which measures the electricity consumptions of each LED lamp and which monitor the operation of each LED lamp.	It will be used by Wi-Fi system of lighting control. This Wi-Fi system can control ON/OFF and schedule and can collect information power consumption.

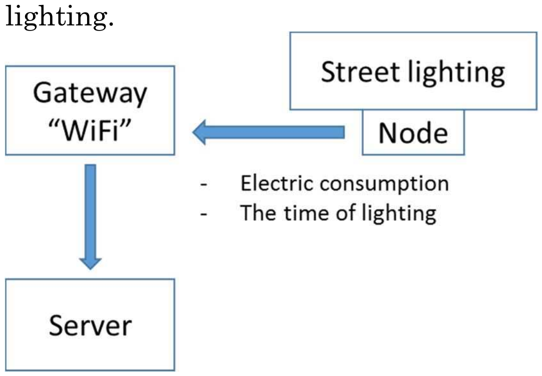
C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Electricity consumption by lighting	CO_2
Project emissions	
Emission sources	GHG type
Electricity consumption by lighting	CO_2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project

The monitoring system will check the time of lighting and power consumption of street lighting.



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	2,369	1,332	1,037
2017	2,369	1,332	1,037
2018	2,369	1,332	1,037
2019	2,369	1,332	1,037
2020	2,369	1,332	1,037
Total (tCO_{2e})	11,845	6,660	5,185

D. Environmental impact assessment

Legal requirement of environmental impact assessment for the proposed project	NO

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

Climate Change Steering Board HoChiMinh Climate Change Bureau introduce to us the transportation department of HoChiMinh people's committee. And we had a meeting with SAPLICO; Saigon Public Lighting company. That company maintain the street lights. Both of them are interested in JCM scheme.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
SAPLICO; Saigon Public Lighting company	The director of SAPLICO told us the street light is very important for design, safety and saving energy. In Vietnam there is no standard and rules for installing street lights. And SAPLICO worried about parts of LED street light and maintenance scheme.	Japan lighting manufacture association and Vietnam lighting association make a corporation for the standard or LED street light.

F. References
None

Reference lists to support descriptions in the PDD, if any.

Annex
None

Revision history of PDD		
Version	Date	Contents revised
01.0	19/02/2016	First edition

3. Installation of solar power generation system at a facility

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Vietnam
Name of the methodology proponents submitting this form	Next Energy and Resources Co., Ltd & Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
Sectoral scope(s) to which the Proposed Methodology applies	1. Energy Industries
Title of the proposed methodology, and version number	Installation of solar power generation system at a facility
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☐Additional information
Date of completion	--/--/2015

History of the proposed methodology

Version	Date	Contents revised
zero	--/--/2015	Zero version

BB. Title of the methodology

Installation of solar power system at a commercial or industrial facility

CC. Terms and definitions

Terms	Definitions
Solar power system	Solar power generation system uses photovoltaic cells to directly convert sunlight into direct current (DC) electricity. The system includes a power conditioning system (e.g. an inverter) to change DC to alternate current (AC) electricity.

DD. Summary of the methodology

Items	Summary
GHG emission reduction measures	Electricity generated by solar power system installed at a building is consumed within the facility and/or feed in to the connected grid.
Calculation of reference emissions	Reference emission is calculated as the product of amount of net electricity supplied to the building for consumption or to the connected grid and the CO2 emission factor of either captive or grid that the electricity is fed in to.
Calculation of project emissions	There are no project emissions except in a case where auxiliary equipment consumes electricity other than the one generated by the solar power system. The project emission is calculated by monitored amount of additional electricity consumed by the auxiliary equipment and the CO2 emission factor of either captive or grid that the electricity is fed in to.
Monitoring parameters	- Net quantity of electricity by the solar power system fed into the facility or fed into a connected grid. - Quantity of electricity consumption by the auxiliary equipment from either captive power or connected-grid

EE. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	A solar power system is newly installed at a commercial or industrial facility for own consumption and/or feed in to the connected-grid where there are no renewable electricity generation system operating prior to the project.
Criterion 2	The solar cells used in the system have obtained (i) certification of design and safety qualifications set by the IEC (International Electrotechnical Commission), and/or (ii) have other national certifications that are fully conform with the IEC. The qualification and type approval: IEC 61215 (silicon), IEC 61646 (thin-film), and IEC 62108 (CPV) - Safety qualification: IEC 61730-1 (construction) and IEC 61730-2 (testing)
Criterion 3	The project provides total maintenance and operation service by an engineering company.

FF. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Fossil fueled-sourced power consumption by the facility	CO2
Project emissions	
Emission sources	GHG types
Additional fossil fueled-sourced power consumption by auxiliary equipment	CO2

GG. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emissions are calculated by multiplying the amount of net electricity supplied to the facility and/or to the connected grid and the emission factor of either the captive power or connected-grid.

While project emissions are considered zero in methodologies applicable to solar power projects in the Clean Development Mechanism scheme, this methodology takes into account project emissions from auxiliary equipment installed as part of the project to ensure net emission reduction.

F.2. Calculation of reference emissions

The reference emissions are calculated by using the following equation:

$$RE_p = PEG_p \times EF_{elec}$$

RE_p : Reference emissions during the period p [tCO_2/p]

PEG_p : Net electricity supplied to the project facility and/or the connected-grid [MWh /p]

EF_{elec} : CO_2 emission factor for the electricity system to which project electricity is supplied [tCO_2/MWh]

HH. Calculation of project emissions

The project emissions are calculated if there is an additional consumption of fueled-sourced electricity.

$$PE_p = PEC_{AUX,p} \times EF_{elec}$$

PE_p : Project emissions during the period p [tCO_2/p]

$PEC_{AUX,p}$: Captive or grid electricity consumed by the project facility [MWh /p]

EF_{elec} : CO_2 emission factor of the electricity consumed by the solar power system [tCO_2/MWh]

II. Calculation of emissions reductions

$$ER_p = RE_p - PE_p$$

ER_p	: Emissions reductions during the period p [tCO_2/p]
RE_p	: Reference emissions during the period p [tCO_2/p]
PE_p	: Project emissions during the period p [tCO_2/p]

JJ. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source
EF_{elec}	CO_2 emission factor for the electricity consumed by the project. When captive power generation is not available at the project site, then the most recent Vietnamese national grid emission factor available at the time of validation is applied and fixed for the monitoring period thereafter. When captive power generation is available at the project site, then EF_{elec} is conservatively set and fixed for the monitoring period thereafter: $EF_{elec} = \min(EF_{grid}, EF_{captive})$ $EF_{captive} = 0.8\ tCO_2/MWh$* *The latest emission factor available from CDM approved small scale methodology AMS-I.A at the time of validation is applied.	[EF_{grid}] The data is officially published by the Vietnamese Ministry of Natural Resources and Environment unless otherwise instructed by the Joint Committee. [$EF_{captive}$] CDM approved small scale methodology: AMS-I.A

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Small scale solar power for a commercial facility

A.2. General description of project and applied technologies and/or measures

The proposed JCM project aims to reduce CO2 emissions by introducing a 320 kW solar photovoltaic (PV) systems on roof-top of the AEON Mall Binh Tan's parking structure. The solar PV systems replace the electricity import from fossil-fuel based grid electricity system. derived from diesel. The power generated by the solar PV system is to be consumed by the shopping mall.

A.3. Location of project, including coordinates

Country	Vietnam
Region/State/Province etc.:	n/a
City/Town/Community etc:	Ho Chi Minh City
Latitude, longitude	The location of the project site is as follows. Exact coordinates are to be obtained upon completion of the mall construction. Lot PT1, Hi-tech Healthcare Park, 532A Kinh Duong Vuong, Binh Tri Dong B ward, Binh Tan District, HCMC

A.4. Name of project participants

The Socialist Republic of Viet Nam	AEON Vietnam Co., Ltd.
Japan	AEON Retail Co., Ltd.

A.5. Duration

Starting date of project operation	1 June 2016
Expected operational lifetime of project	9 years

A.6. Contribution from developed countries

The proposed project was partially supported by the Ministry of the Environment, Japan through the financing programme for JCM model projects which provided financial supports up to 50% of initial investment for the projects in order to acquire JCM credits. As for technology transfer, solar PV was provided by a Japanese company, Next Energy and Resources Co., Ltd. through collaboration with a Vietnamese engineering company, ANT THY Co., Ltd.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	*To be filled in upon approval of the proposed methodology.*
Version number	
Selected approved methodology No.	

Version number	
Selected approved methodology No.	
Version number	

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

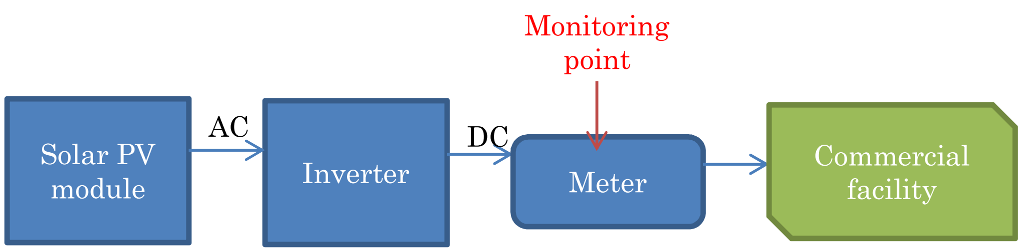
Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	A solar power system is newly installed at a commercial or industrial facility for own consumption.	The proposed project involves installation of solar PV system for use at a commercial facility.
Criterion 2	The solar cells used in the system have obtained (i) certification of design and safety qualifications set by the IEC (International Electrotechnical Commission), and/or (ii) have other national certifications that are fully conform with the IEC. The qualification and type approval: IEC 61215 (silicon), IEC 61646 (thin-film), and IEC 62108 (CPV) - Safety qualification: IEC 61730-1 (construction) and IEC 61730-2 (testing)	The technology introduced under the proposed project meets all the technical standards.
Criterion 3	The project provides total maintenance and operation service by an engineering company.	Next Energy and Resource Co., Ltd. together with local partner ANT THY, Co., Ltd. provide full maintenance and operation service for the project.
Criterion 4		

C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Fossil fueled-sourced power consumption by the facility	CO_2
Project emissions	
Emission sources	GHG type
None	

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016			286
2017			286
2018			286
2019			286
2020			286
2021			286
2022			286
2023			286
2024			286
Total (tCO_{2e})			2,574

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	None required.

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

Comments will be sought from local stakeholders prior to requesting registration.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received

F. References

Reference lists to support descriptions in the PDD, if any.

Annex

Revision history of PDD		
Version	Date	Contents revised
01.0	15/01/2016	Initial draft