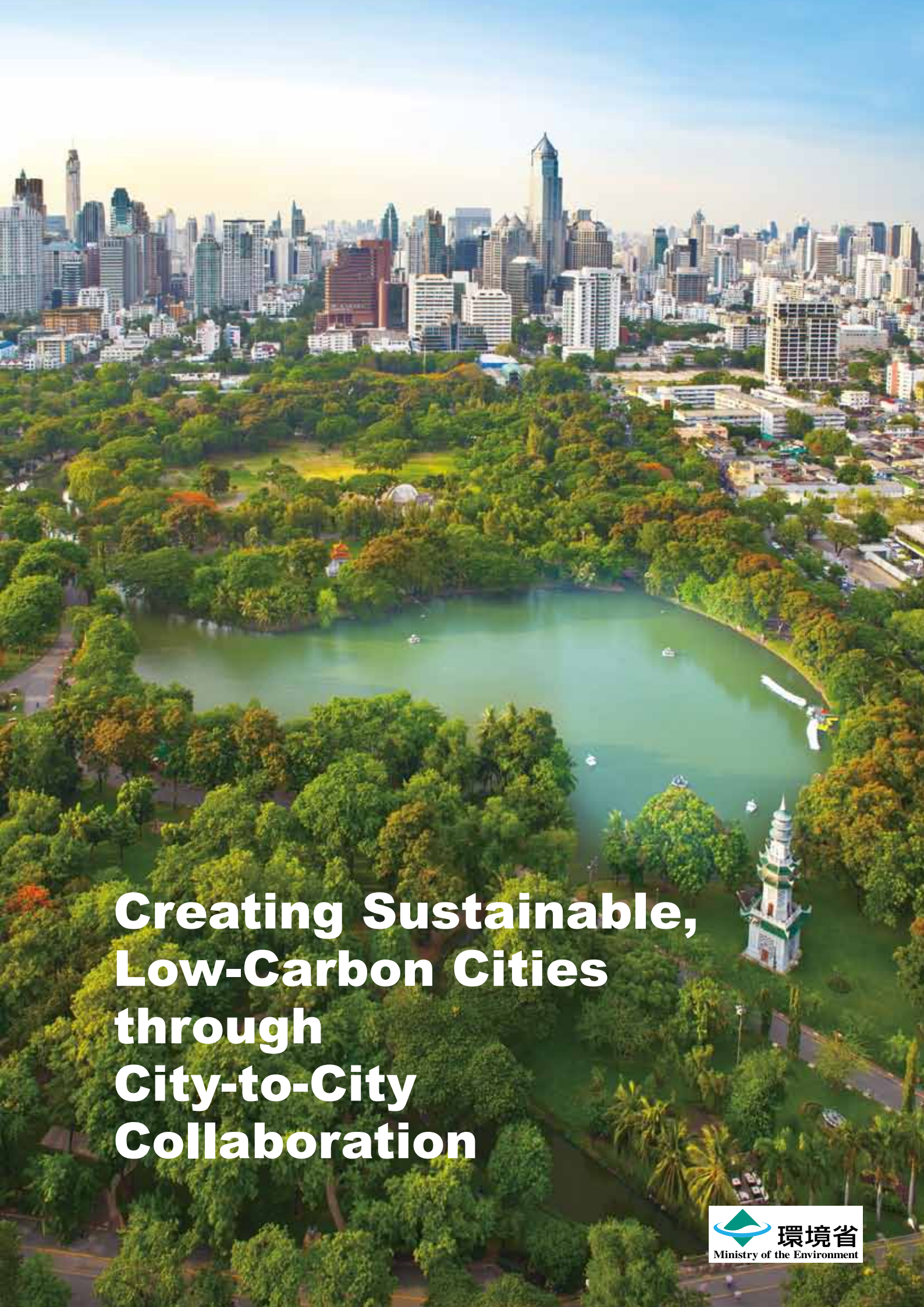


Creating Sustainable, Low-Carbon Cities through City-to-City Collaboration

環境省
Ministry of the Environment

Creating Sustainable, Low-Carbon Cities through City-to-City Collaboration

Editor: Institute for Global Environmental Strategies (IGES)
March 2017

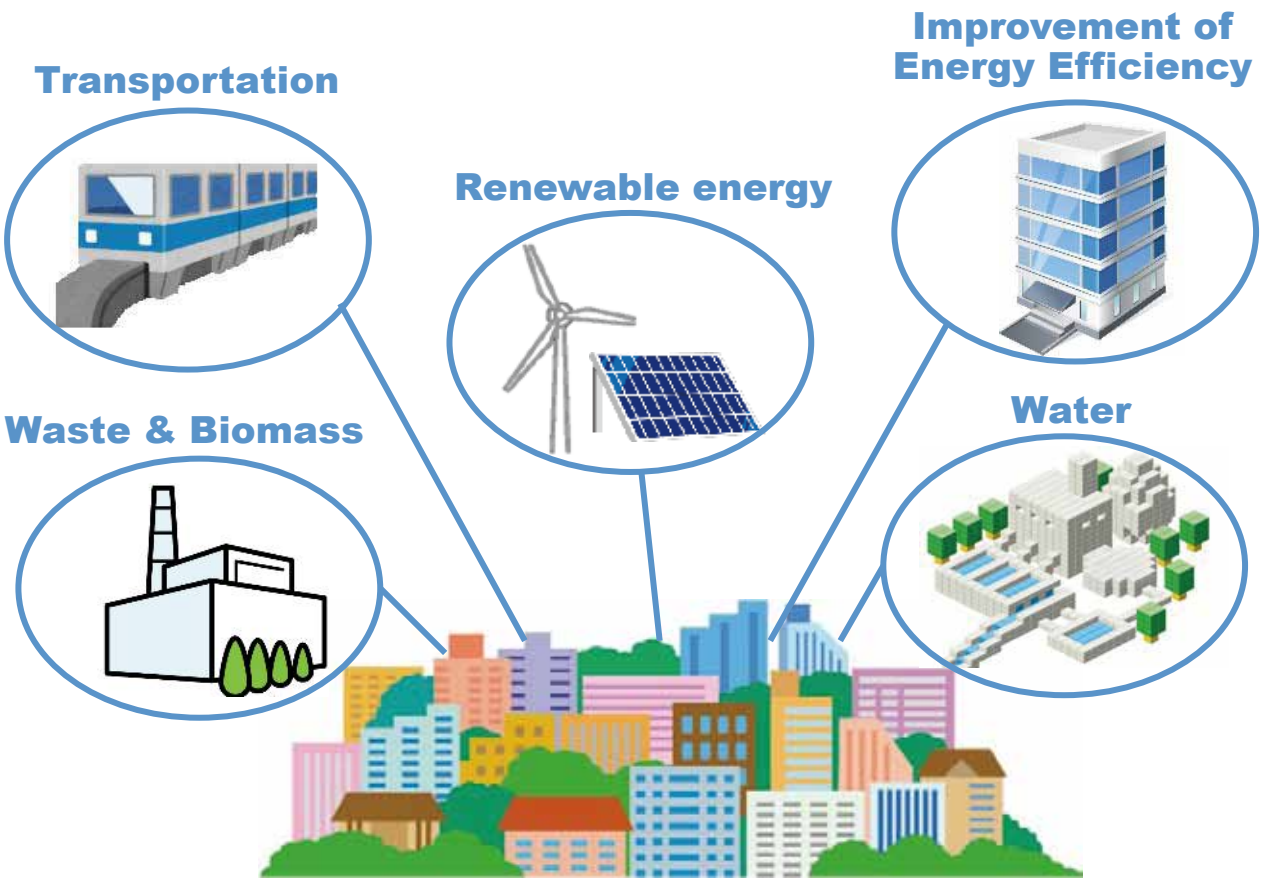
Foreword

Alongside the accelerated growth in population and urbanisation in Asia are the growing problems of road traffic, solid waste, and air and water pollution. Torrential rains, flooding, landslides and droughts are intensifying, all of which are considered impacts of global warming. Present estimates show that cities count for more than 70% of global CO_2 emissions, and that by 2050, Asia will be responsible for half of global energy consumption and CO_2 emissions. Sustainable, low-carbon development of Asian cities is therefore an urgent and global challenge.

With the above circumstances in mind, the Ministry of the Environment, Japan (MOEJ) implements support for low-carbon city development in developing countries through city-to-city collaboration, to enhance and promote decarbonisation. Entitled "City-to-City Collaboration for Low Carbon Society" (hereinafter "City-to-City Collaboration Programme"), the support programme involves partnering up cities in developing countries with cities in Japan that are experienced in sustainable, low-carbon development and city management, in order to effectively and efficiently bring about low-carbon cities. Any promising low-carbon technologies that are identified can then make use of the MOEJ's financing programme for Joint Crediting Mechanism (JCM), which contributes to greenhouse gas reduction in the partner country. Since cities are home to various types of infrastructure, advanced low-carbon technology, products and systems can be used to promote low-carbon development and create co-benefits for climate mitigation and improved urban environments and services.

This guidebook was prepared for city officials and the private sector within cities in developing countries interested in the City-to-City Collaboration Programme.

March 2017
Ministry of the Environment, Japan



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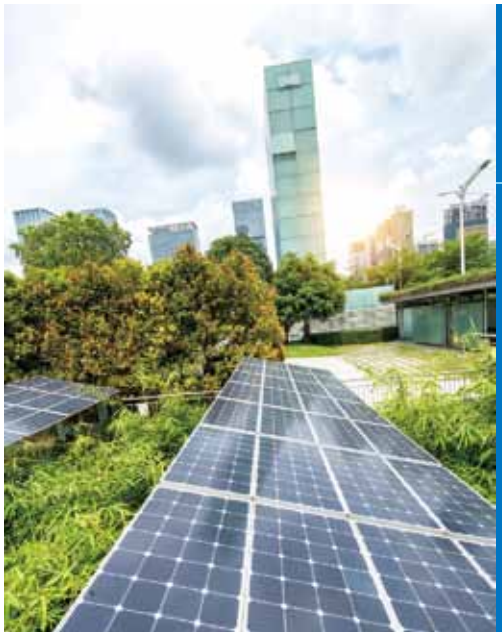
Abbreviations

A/C	air conditioning
ADB	Asian Development Bank
AIM	Asia-Pacific Integrated Model
BaU	business as usual
CDM	Clean Development Mechanism
CO_2	carbon dioxide
COP	Conference of Parties
DAWACO	Danang Water Supply Company (Viet Nam)
DIW	Department of Industry, Ministry of Industry, Thailand
DPI	Department of Planning and Investment (Viet Nam)
EMS	energy management system
FY	fiscal year*
GEC	Global Environment Centre Foundation
GHG	greenhouse gas
IEAT	Industrial Estate Authority of Thailand
JC	Joint Committee
JCM	Joint Crediting Mechanism
JFJCM	Japan Fund for Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
kW	kilowatt
MOEJ	Ministry of the Environment, Japan
MOU	Memorandum of Understanding
MW	megawatt
MWh	megawatt-hour
NDCs	Nationally Determined Contributions
OECD	Organisation for Economic Co-operation and Development
PDD	project design document
POISED	Preparing Outer Islands for Sustainable Energy Development
SPC	special purpose companies
TPE	third party entity
UNFCCC	United Nations Framework Convention of Climate Change
WTE	waste to energy

* FY in this publication refers to the Japanese financial fiscal year, which starts in April and ends in March.



Introduction

Transition to Decarbonised Society
— the role of cities —

From low-carbonisation to decarbonisation - the narrative underpinning international climate change negotiations

The Paris Agreement, adopted in December 2015 at the 21st Conference of Parties (COP21) of the United Nations Framework Convention of Climate Change (UNFCCC) in Paris-Bourget, France, offers an equitable and effective legal framework "bringing all nations into a common cause undertake ambitious efforts to combat climate change."

It aims to *"strengthen the global response to the threat of climate change by keeping the global temperature rise this century well below 2 degrees Celsius"* and *"to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius."* Its goals require an urgent "peak-out" of global greenhouse gas (GHG) emissions together with zero human-induced emissions in the latter half of the century – which means we urgently need to decarbonise. All signatories to the Agreement must develop Nationally Determined Contributions (NDCs), review the impact of their climate change actions every five years and make efforts to raise ambitions. Cities play a key role in all of this, but the Paris Agreement also mentions non-state actors.

The Marrakech Action Proclamation for Our Climate and Sustainable Development, adopted at COP22 in November 2016, emphasised that *"Our climate is warming at an alarming and unprecedented rate and we have an urgent duty to respond."* The Proclamation also recognised the irreversible momentum towards tackling climate change actions carried out not only by governments but also by science, business and global actors of all types and at all levels, including local governments, and that this transition in our economies provides "a substantial *"positive opportunity"* for increased prosperity and sustainable development."

City development patterns greatly affect global sustainability.

Urban areas, while only accounting for 2% of the world's land area, presently act as both homes and economic bases for over half of the world's population, but cities are projected to be home to 70% of the population in the future. Population growth is focused in Asia, as is energy consumption. Development paths taken by cities in developing countries, especially in Asia, will thus act as key drivers for global sustainable development.

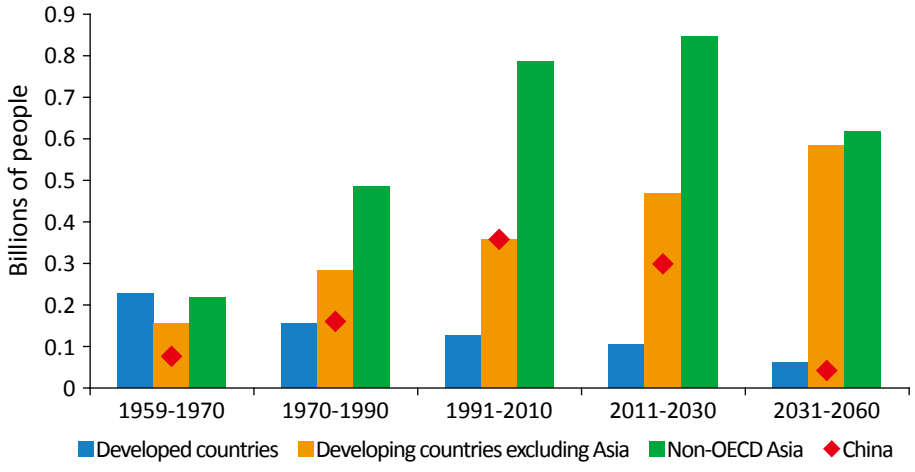


Figure 1. Rise in Urban Population
(OECD and Bloomberg Philantropies (2014). "Cities and Climate Change: National Governments Enabling Local Action")

Cities are responsible for 70% of Global GHG emissions.

In 2006, over 70% of global CO_2 emissions came from cities, a fact proving their key role in climate mitigation at the global level. In other words, climate mitigation actions and CO_2 reduction in expanding urban areas is very important in achieving the goals of the Paris Agreement. They are also known to be the areas most affected by climate change, due to rising sea levels, droughts, heat waves and floods, which has further implications for city development.

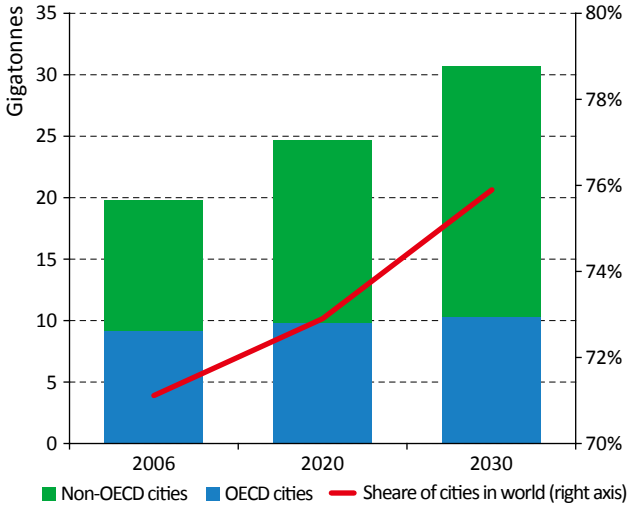


Figure 2. Ratio of CO_2 emissions from energy use of cities, globally (International Energy Agency (2008). "World Energy Outlook 2008")

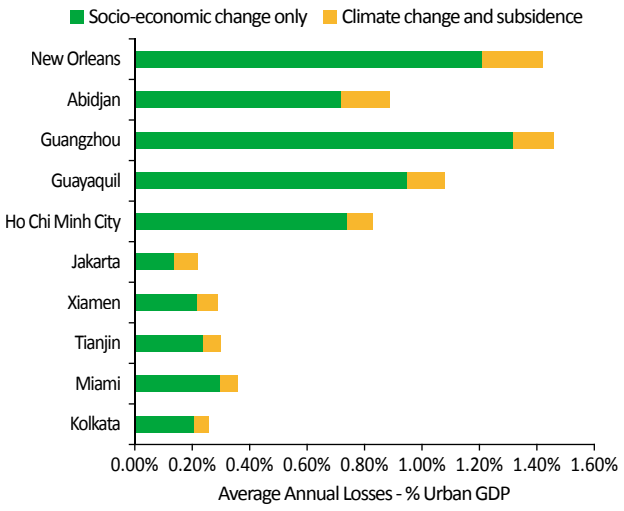


Figure 3. Ten cities with highest projected flood-related losses in 2050 (OECD and Bloomberg Philanthropies (2014). "Cities and Climate Change: National Governments Enabling Local Action")

Cities play a key role in international climate actions.

COP20, Lima, Peru, adopted the Lima-Paris Action Agenda (LPAA) to promote actions by non-state actors for climate mitigation and adaptation. The Non-state Actor Zone for Climate Action (NAZCA) was launched as *"a global platform that brings together the commitments to action by companies, cities, subnational regions, investors and civil society organisations to address climate change."* NAZCA provides information such as GHG emissions of cities as collated by different international city-related initiatives, such as the carbonn Climate Registry.

At COP21 many meetings related to cities took place in and outside of the conference venue. The Climate Summit for Local Leaders was attended by about 400 local and regional leaders from around the world, who adopted the "Paris City Hall Declaration". This is a pledge to produce and implement participatory resilience strategies and actions to adapt to the growing number of climate related hazards by 2020; to deliver up to 3.7 gigatonnes of urban GHG emissions reductions annually by 2030; and to support ambitious, long-term climate goals such as the transition to 100% renewable energy, or 80% reduction in GHG by 2050. Such momentum to promote climate actions that can be taken by cities is key to realising gloval sustainable development, and city-to-city collaboration is one of the key drivers to promote climate actions at the city level.

Figure 4. Climate Summit for Local Leaders at COP21
(© ICLEI e.V. /2015)

1 City-to-City Collaboration for Low-Carbon Society

The Ministry of the Environment, Japan (MOEJ) supports low-carbon development of cities in developing countries by partnering them up with cities in Japan experienced in low-carbon city development. This chapter introduces a form of MOEJ support called “City-to-City Collaboration for Low-Carbon Society” (hereinafter “City-to-City Collaboration Programme”).

Core concept

The City-to-City Collaboration Programme of MOEJ started in FY2013 and aims to realise low-carbon development of overseas cities (hereinafter "partner cities") in an effective and efficient manner under the partnership of Japanese cities and partner cities. By February 2017, 11 Japanese cities and 19 partner cities participated in the Programme. The Programme also aims to enhance the capacity of partner cities by drawing up a master plan, carrying out evaluation and selection of appropriate technologies, and sharing expertise in project management.

Furthermore, it aims to provide ongoing support to low-carbon development efforts and capacity development, as well as identifying low-carbon projects that can act as models for other cities and areas, so as to contribute to climate actions at the global level.

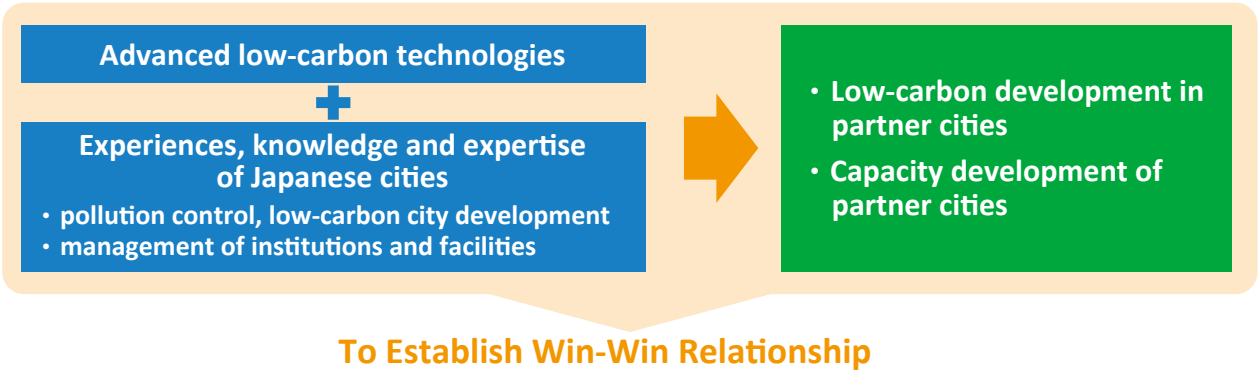


Figure 5. Core Concept of the City-to-City Collaboration Programme by MOEJ

Stakeholders involved and potential benefits

As well as Japanese cities and partner cities in developing countries, private sectors which possess advanced low-carbon technologies and those intending to introduce such technologies, participate in the City-to-City Collaboration Programme. The benefits for each stakeholder are summarised in the figure 6 below.

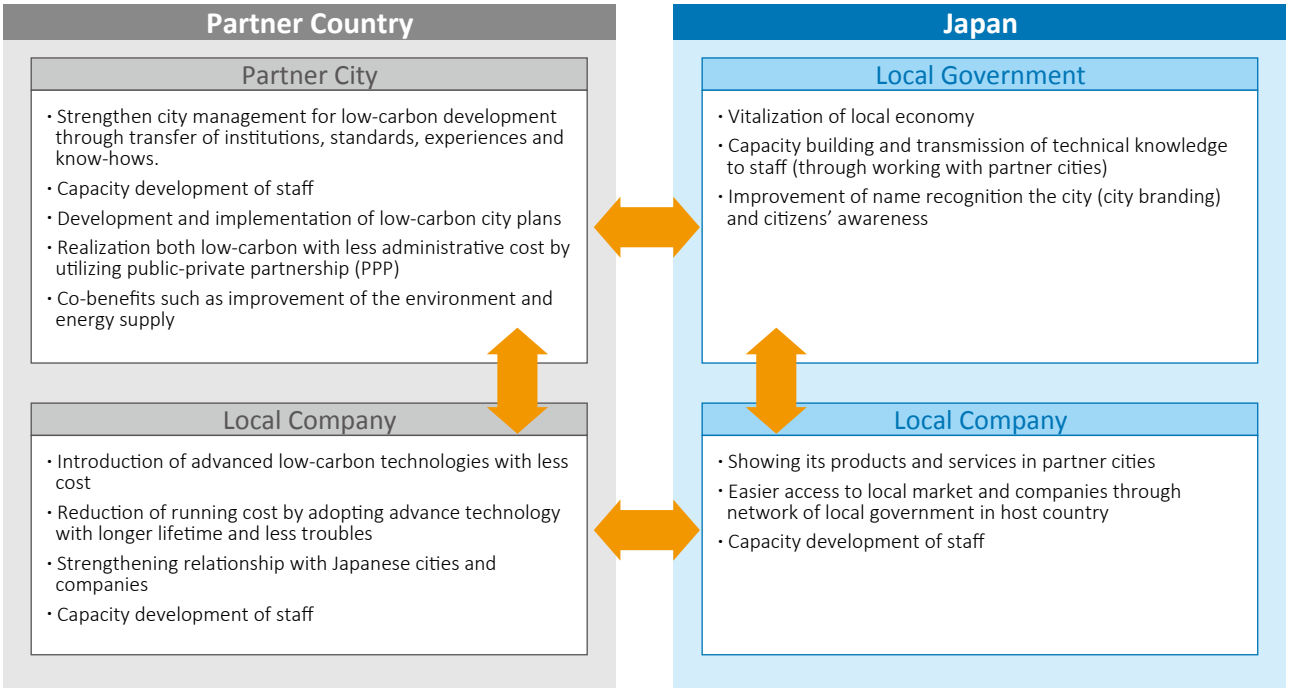


Figure 6. Benefits for stakeholders participating to the City-to-City Collaboration Programme

Which cities have been involved?

By February 2017, 11 Japanese cities and 19 partner cities and regions participated in the City-to-City Collaboration Programme (Table 1). More cities both in Japan and developing countries are expected to join the Programme in the future.

Table 1. Cities involved in the City-to-City Collaboration Programme

Japanese city	Partner city/region	Year of Implementation (Japanese fiscal year)
Hokkaido*	Ulaanbaatar, Mongolia	2016
Sapporo City*	Ulaanbaatar, Mongolia	2016
Fukushima City	Ayeyarwady, Myanmar	2015, 2016
Clean Authority of Tokyo	Bali, Indonesia	2016
Kanagawa Prefecture	Siem Reap, Cambodia	2015, 2016
Kawasaki City	Bandung, Indonesia	2014, 2015
	Penang, Malaysia	2013
	Yangon, Myanmar	2015, 2016
Yokohama City	Batam, Indonesia	2015, 2016
	Bangkok, Thailand	2014, 2015, 2016
	Bangalore, India	2015
	Da Nang, Viet Nam	2015
Kyoto City	Vientiane, Laos	2014, 2015
Osaka City	Ho Chi Minh City, Viet Nam	2013, 2014, 2015
Kobe City	Kien Giang, Viet Nam	2014
Kitakyushu City	Surabaya, Indonesia	2013, 2014, 2015
	Hai Phong, Viet Nam	2014, 2015, 2016
	Rayon-Map Ta Phut, Thailand	2015, 2016
	Iskandar, Malaysia	2014, 2015, 2016
	Phnom Penh, Cambodia	2013, 2016

* Hokkaido and Sapporo City jointly work with Ulaanbaatar.

Opportunities for building collaboration relationships between cities

There is a diverse range of opportunities available to build collaborative relationships between Japanese cities and other cities across Asia that joined the City-to-City Collaboration Programme. In some cases, this is in the form of sister city relationships. There are also cases where local governments in Japan and partner cities started collaboration, using opportunities for interaction facilitated through participation in environmental workshops, business forums, and human resources development programmes organised by international organisations, as well as technical cooperation in JICA projects, for example. Sometimes, Japanese local governments directly approached overseas cities and initiated collaboration. In any case, the driving force for city-to-city collaboration has been high levels of awareness for improving the environment and the active engagement of cities in both Japan and overseas.

Participation in the City-to-City-Collaboration Programme has also started collaborative relationships between Japanese and overseas cities.

Past examples have proved that important factors for successful collaboration are similarity of socio-economic conditions, and "compatibility," such as geographic similarities in the urban characteristics of both cities as well as agreements on similar interests.

NOTE: A requirement for applying to the City-to-City Collaboration Programme is a letter of intent from the participating cities. This indicates that the cities overseas and in Japan should agree to implement collaborative activities under the Programme prior to the application.

Figure 7. Signing ceremony for Memorandum of Understanding between the cities of Yokohama and Bangkok (2013) ©City of Yokohama

Figure 8. Ceremony concluding sister city agreement between the cities of Kitakyushu and Hai Phong (2014)

Expected outcomes

One of the expected outcomes of the City-to-City Collaboration Programme is to formulate projects that will reduce GHG emissions in partner cities in developing countries through continuous support. Enhancing capacity in partner cities should also result from activities under the Programme such as through the provision of support in formulating master plans, evaluation and selection methods for appropriate technologies, and project management.

The introduction of advanced low-carbon technologies, infrastructure, services, and other mitigation activities that have been identified as useful in the partner countries under the Programme, will contribute to the development of efficient low-carbon cities in partner countries. In the abovementioned projects, the development of low-carbon cities can be effectively promoted by using other programmes of MOEJ that financially support the introduction of low-carbon technologies and services that cannot otherwise be introduced because of high costs.

Chapter 2 introduces the JCM Model Project and the Japan Fund for JCM (JFJCM), which are JCM financing programmes offered by MOEJ. When planning and implementing the City-to-City Collaboration Programme, it is important to understand the requirements of financing opportunities such as Model Project and JFJCM.

Steps & timeframe

An open call for the City-to-City Collaboration Programme proposals usually starts between late February and early March. Before applying the Programme, it is necessary for both local governments to discuss the contents of the project and prepare letters of intent. The results are announced in late March, and collaborative activities under the Programme are implemented from April to March of the following year. Although the collaborative activities should be implemented over a single fiscal year of Japan, cities may apply again for the Programme in the following fiscal year, if it is expected that continuation of the collaborative activities can further enhance low-carbon development in the partner cities.

When promising low-carbon technologies to promote low-carbon society development are identified in partner countries under the Programme, in many cases, this will move on to the project implementation stage with the submission of an application to the JCM Model Project. Normally, the open call for proposals to the JCM Model Project is made in late April and an application for grants for financial assistance must be made within three months of the internal announcement of the adopted projects, which is made in June. In either case, applicants should note that this timeframe is executed in line with Japan's budgetary fiscal year (April to the following March). See Appendix for more details on the JCM Model Project.

Figure 9. Low-carbon project development under the City-to-City-Programme (an example)

Roles of local governments in the City-to-City Collaboration Programme

Both Japanese cities and their partner cities are expected to play the following roles to promote the implementation of city-to-city collaboration activities under the Programme and the subsequent formulation of projects.

- Coordination with existing urban planning and other plans/strategies: Local governments should confirm the positioning and consistency of proposed activities including policy development in exsiting related policies and plans. Local governments should also clarify the priorities of low-carbon development projects to be fomulated within exsting urban development plans.

  *Reference: MOEJ has been supporting the establishment of climate change master plan in Asia-Pacific countries and cities by introducing the Asia-Pacific Integrated Model (AIM), which is the large-scale scenario planning and calculation tool with aim to reduce GHG emissions and avoid impacts from climate change. AIM has been applied to many countries and cities in Asia in order to develop low-carbon policies. For details, please visit http://www-iam.nies.go.jp/aim/

- Mediation with Related Administrative Organisations: Local governments are expected to make appointments with related administrative agencies, including the central government, and carry out required mediation and coordination. This is because, for example, various administrative procedures may

be required, such as obtaining permission and approval for the introduction and operation of facilities.

- Matching with Local Companies: Local governments can directly or indirectly introduce local companies when Japanese companies are looking for appropriate local counterparts.
- Support for Administrative Procedures: Local governments should provide the support to acquire necessary permission and approval to introduce facilities, institutional improvements, immigration procedures, land selection, and explanations to local residents. In some cases, the national and local governments are expected to develop guidelines, rules/regulations and a bidding system, and to improve the environment to promote the introduction of advanced low-carbon technologies.
- Advice on Local Situations and Support in Responding to Issues: The impacts of city-to-city collaboration are expected to be generated in various scenarios that promote low-carbon development projects. Figure 10 below shows an example of how city-to-city collaboration can be effective from the planning to implementation stages.

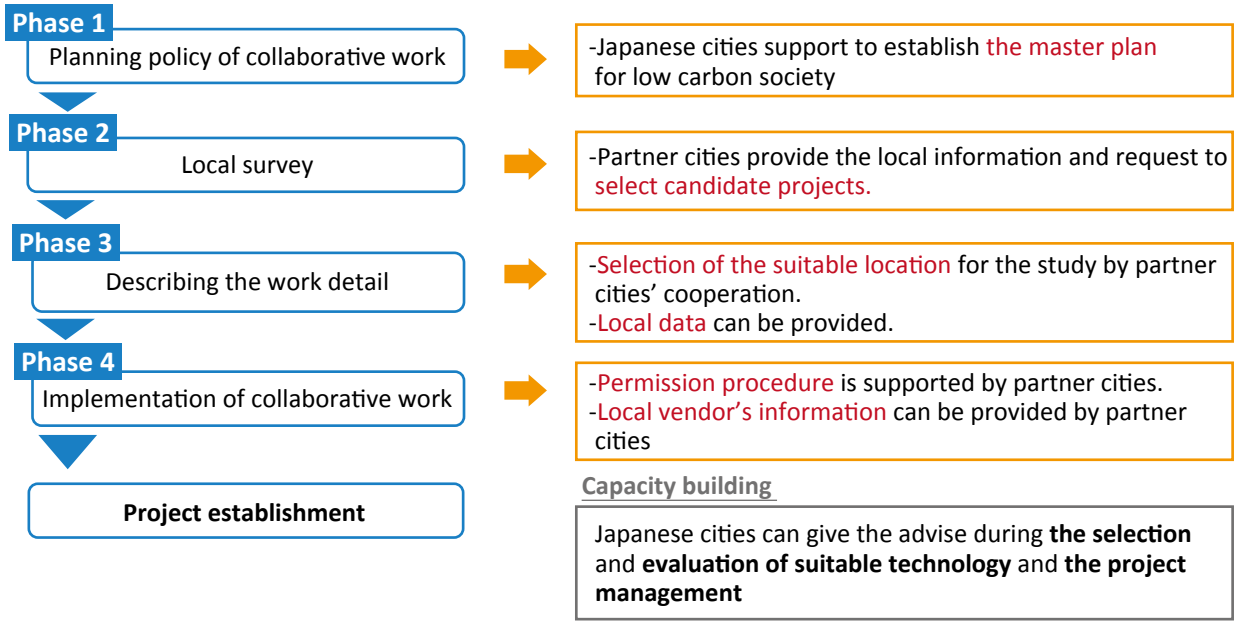


Figure 10. Example of benefits gained from city-to-city collaboration in each phase of the City-to-City Collaboration Programme

Reference: Knowledge exchange and dissemination of low-carbon city development projects through city-to-city collaboration

MOEJ provides learning opportunities for cities and other stakeholders participating in the City-to-City Collaboration Programme through publications and workshops held in Japan. The progress and outcomes of the Programme are shared with a wider audience on such occasions as side-events at the UNFCCC-COP and seminars in Japan.

Figure 11. Workshop held in Kitakyushu City, Japan in October 2016

2

Existing Strategies to
Implement Low-carbon Projects Identified
through the City-to-City Collaboration Programme

Joint Crediting Mechanism (JCM) and JCM Financing Programme

This chapter gives an overview of the Joint Crediting Mechanism (JCM) and two component of JCM Financing Programme (JCM Model Project and Japan Fund for JCM) provided by Ministry of the Environment, Japan as a means to promote low-carbon city development through the City-to-City Collaboration Programme.

What is the Joint Crediting Mechanism (JCM)?

Japan started the Joint Crediting Mechanism (JCM) in 2013, and along with JCM partner cities, established and implements the JCM with the following objectives.

- Facilitating diffusion of leading low-carbon technologies, products, systems, services and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- Appropriately evaluating contributions from Japan for GHG emission reductions or removals in a quantitative manner and use them such to achieve Japan's emission reduction target.
- Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals.

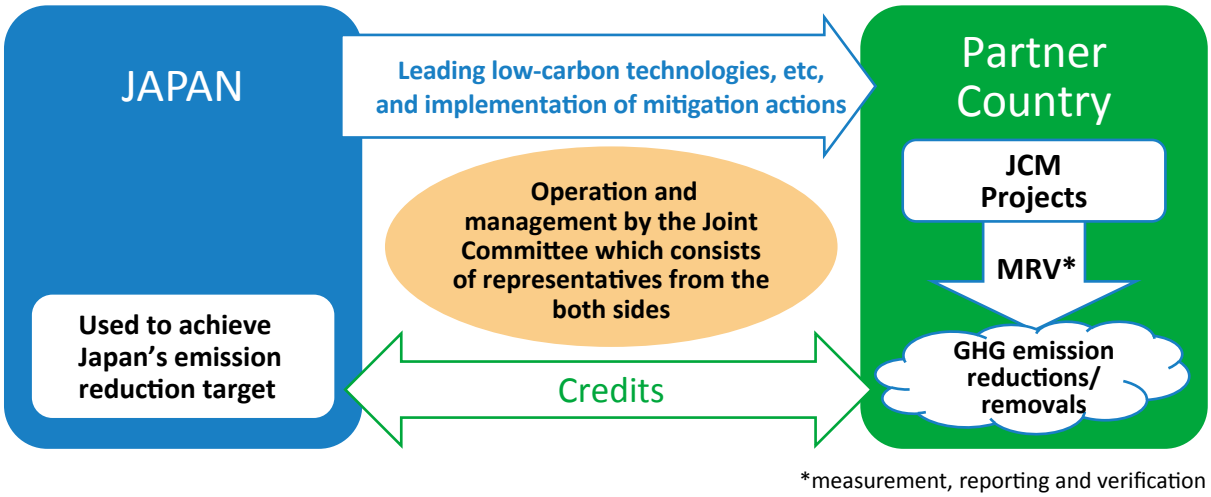


Figure 12. Basic Concept of Joint Crediting Mechanism (JCM)

Benefits of the JCM

In general, the initial cost of advanced low-carbon technologies and products in the environmental performance is relatively high. By using the JCM Financing Programme, barriers to the introduction of advanced low-carbon technologies and products can be removed. It is also expected that implementation of JCM projects will contribute to collaboration among relevant stakeholders including local governments and the private sector.

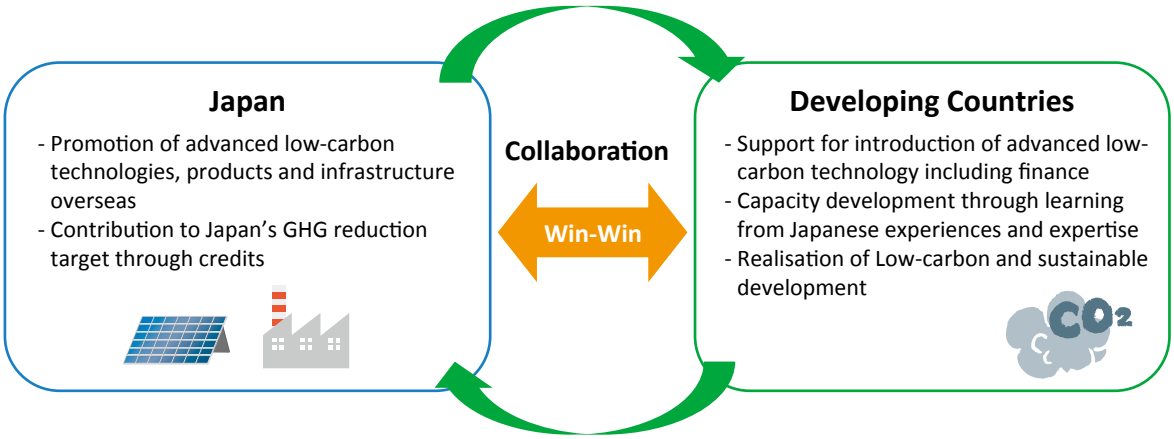


Figure 13. Benefits of JCM

Global position of the JCM

Under the Paris Agreement, countries are permitted to use the Internationally Transferred Mitigation Outcomes (ITMOs) to achieve their Nationally Determined Contributions (NDCs) by using emission reductions of other countries (Article 6, item 2). The JCM is one type of ITMOs.

A similar mechanism is the Clean Development Mechanism (CDM), developed at the time of the Kyoto Protocol adopted at UNFCCC-COP3. The JCM complements the CDM, offering efficiency and simplifying processes so as to allow parties to respond flexibly and promptly depending on the GHG emission reduction needs of developing countries.

JCM partner countries

JCM projects are implemented through bilateral agreements between Japan and individual partner countries, which numbered 17 as of January 2017.

Figure 14. JCM Partner Countries (as of January 2017)

Flow of project formation to credit acquisition

Figure 15 shows the general flow of JCM projects from project formation to credit acquisition. At the project formation stage, local surveys are conducted to understand and analyse needs, and the most appropriate project area and technologies are specified. Next, consultations are held with local counterparts to determine optimal specifications of low-carbon technology or equipment, and methods to procure funds are examined and confirmed. The project is then established and shifts to project implementation based on agreements with funders and concerned parties on permission and approval for sites, etc.

Project implementation, such as the introduction of technologies, services, and infrastructure, is expected to take several years, during which MRV methodologies are formulated and a project design document (PDD) is created.

After completion of all preparation for operation, including test runs, the project will be registered. Credits will be applied during the period of the useful operational life of facilities and equipment that contribute to low-carbon development as prescribed by law.

The rules and guidelines necessary to implement JCM projects are developed and approved by the Joint Committee, which comprises representatives from each partner country and Japan”

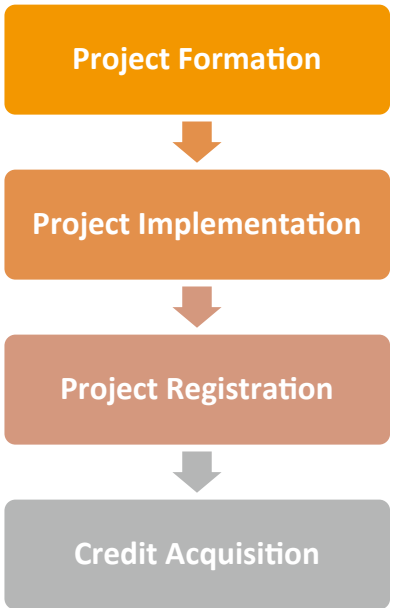


Figure 15. Flow of Project Formation to Credit Acquisition

JCM scheme

The Joint Committee acts as a governing body for the JCM in partner countries, and comprises representatives from Japan and the respective partner country. The Joint Committee handles development/ revision of rules, guidelines and methodologies as well as approval/rejection thereof; registration of JCM projects; accreditation of third party entities (TPE); approval/rejection of credit issuance.

Please refer to https://www.jcm.go.jp/rules_and_guidelines for the rules and guidelines of the JCM.

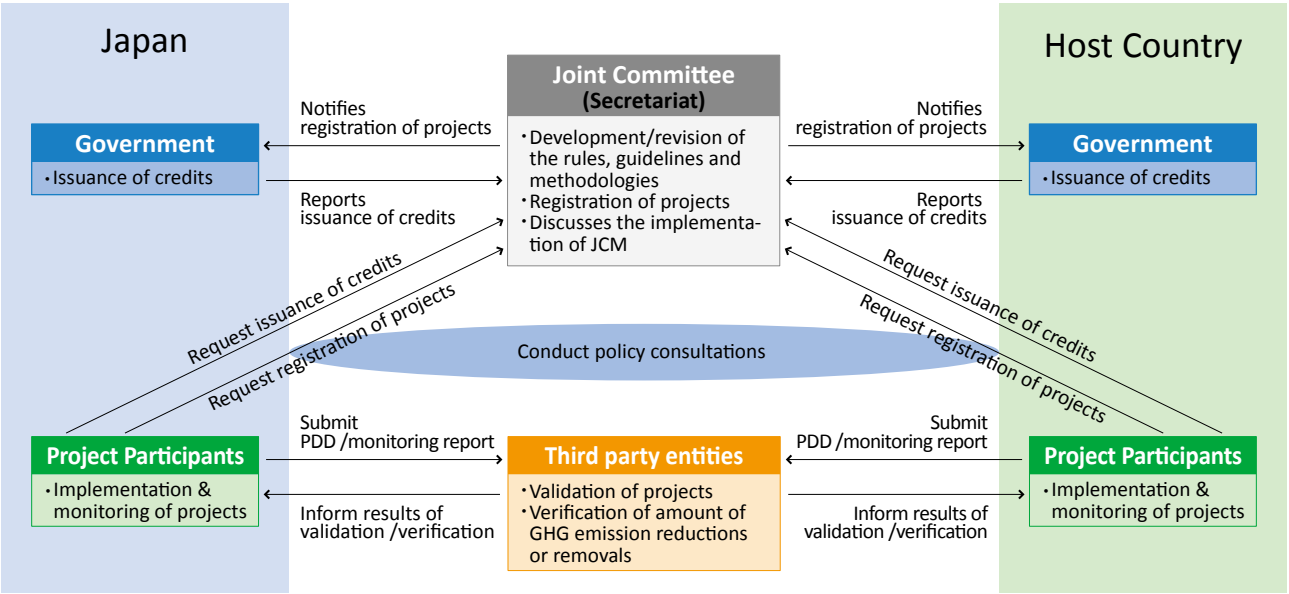


Figure 16. JCM Scheme

JCM's first emission reduction carbon credit issuance

Project of Introducing High Efficiency Refrigerator to a Frozen Food Processing Plant in Indonesia

[Project participants]
(in Indonesia) PT. Adib Global Food Supplier Indonesia
(in Japan) MAYEKAWA MFG. CO., LTD.

Figure 17. Equipment installed

Total emission reductions carbon credits issued:
40 t-CO_2
Emissions reduction obtained over 6 months

JCM credits were issued for the first time on 13 May, 2016 for a JCM project involving Indonesia and Japan. The credits were distributed as below:

- Project participant in Japan: 4 t (10%)
- Government of Japan: 27 t (68%)
- Project participant in Indonesia: 4 t (10%)
- Government of Indonesia: 5 t (12%).

JCM Model Project

The JCM Model Project is a financing programme provided by MOEJ to promote the JCM. It covers less than half of the initial costs in introducing facilities, equipment and vehicles that reduce CO_2 emissions derived from fossil fuel combustion.

The CO_2 emission reduction realised by the project – which is measured, reported and verified – releases JCM credits. The aim is to deliver at least half of JCM credits issued.

Projects should be proposed and implemented by an international consortium comprising Japanese and JCM partner country participants. One of the international consortium participants on the Japan side acts as representative in applying for the JCM Model Project.

Projects also need to meet basic eligibility criteria such as covering the type of project, applicants, partner countries and priority countries. Other factors are also considered in the selection process, such as soundness of business operation system, cost-effectiveness of GHG reduction, capacity of applicants, and strategies to promote diffusion of technologies and methodologies.

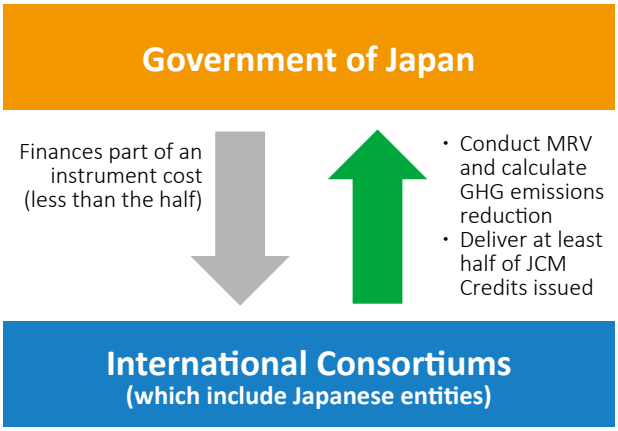


Figure 18. Outline of the JCM Model Projects

Evaluation criteria for JCM Model Project – Eligibility review

Before introducing a low-carbon technology identified as promising under the City-to-City Collaboration Programme to partner cities as a model project, the following criteria must be reviewed at the planning stage.

Table 2. Evaluation Criteria for JCM Model Project – Eligibility Review

	Eligibility Review
Evaluation Criteria	1. Does the applicant meet the criteria for an eligible participant? 2. Is the model project expected to reduce emissions of energy-related CO_2 and GHG through JCM? 3. Can the technology be introduced in the country where the model project is implemented, while the technology is internationally in practical use, but not yet adequately utilised in the partner country? 4. Can the applicant objectively show the superiority of the technology introduced in the model project? 5. Does the model project have no adverse effect on the environment or social-economic circumstance in the partner country? 6. Is the expense for the model project appropriately estimated? 7. Does the model project contribute to climate change mitigation in collaboration with JICA or other government-affiliated financial institutions? (for collaboration project with JICA etc. only) 8. The facility/equipment introduced by the model project shall not receive any other financial support or grant from the Government of Japan.

(Global Environment Centre Foundation (GEC), 2016. Guidelines for Submitting Proposals (tentative translation))

Evaluation criteria for JCM Model Project – Assessment review

Once a proposal for a JCM project has passed the above eligibility review, it is then subject to an "Assessment Review", as shown below. These criteria must also be satisfied in order for the project application to proceed.

Table 3. Evaluation Criteria for JCM Model Project – Assessment Review

Evaluation Criteria	(A) Robustness of Project Implementation	1. Management and operational capacities of a representative participant and partner participant(s)[*1] to implement the project 2. Appropriateness of the project plan 3. Profitability of the project, including economic performance, forecast of cash flow and payback period. 4. Status of the project implementation structure
	(B) Amount of emission reductions of energy-related CO_2, and cost-effectiveness of emission reductions of CO_2 and GHG	1. Emission reduction of energy-related CO_2 2. Cost-effectiveness of emission reductions of energy-related CO_2 in terms of financial support 3. Cost-effectiveness of emission reductions of GHG in terms of financial support 4. Cost-effectiveness of emission reductions of energy-related CO_2 in terms of total investment cost which is related to emission reductions.
	(C) Potential of the dissemination of the technology	This criteria includes size of the market for the technology in the partner country[*2], consistency in relation to the partner country's relevant policy[*3], system for supporting the entities in the partner county during the installation and operation of the facility/equipment.[*4]
	(D) Concept for developing JCM methodology and its developing status	Eligibility criteria, calculation of reference emissions, calculation of project emissions, and monitoring structure will be reviewed.

(Global Environment Centre Foundation (GEC), 2016. Guidelines for Submitting Proposals (tentative translation))

Notes for readers:

*1. National governments cannot act as a partner participant; however, nationally-owned companies and special purpose companies (SPC) established by national or local government can be partner participants.

*2. It is assumed that, based on the potential of a technology to be introduced (and supported by the JCM Model Project) to act as model for promotion and diffusion of the technology, a suitable market exists in the relevant partner country in terms of dissemination potential of the technology.

*3. It is desirable that the technologies, equipment and services to be introduced by the JCM conform to master plans or other relevant plans of the countries or cities, in order that not only the introducing company but also other citizens can receive benefits. In such a sense, the JCM can be utilised as a means of implementation of the existing plans. If no such master plan exists in a partner city, the City-to-City Collaboration Programme can support development of such via a Japanese city and its partner city, with the goal of promoting low-carbon development of the partner city. The process of drafting such plans under the city-to-city collaboration also provides an opportunity to identify and include other activities that could potentially utilise the JCM.

*4. Capacity development of the company introducing low-carbon technologies/facilities may be necessary, to ensure adequate operation and maintenance. In addition, the potential for support systems made available by Japanese partner companies as well as governments of partner cities and Japanese cities involved in the collaboration should also be considered.

ADB Trust Fund: Japan Fund for Joint Crediting Mechanism (JFJCM)

After an agreement (MOU) was reached between MOEJ and the Asian Development Bank (ADB), in June 2014, the Japan Fund for the Joint Crediting Mechanism (JFJCM) was established to implement and promote the JCM. JFJCM provides financial incentives for adoption of advanced low-carbon technologies superior in GHG emissions reduction that would be relatively costly to introduce, in an ADB-financed project.

One of the requirements for the JCM Model Project is to establish international consortiums including Japanese entities, but this is not required for JFJCM. Conversely, requirements related to MRV (monitoring, report and verification) and application procedure of credits are the same as for the JCM Model Project.

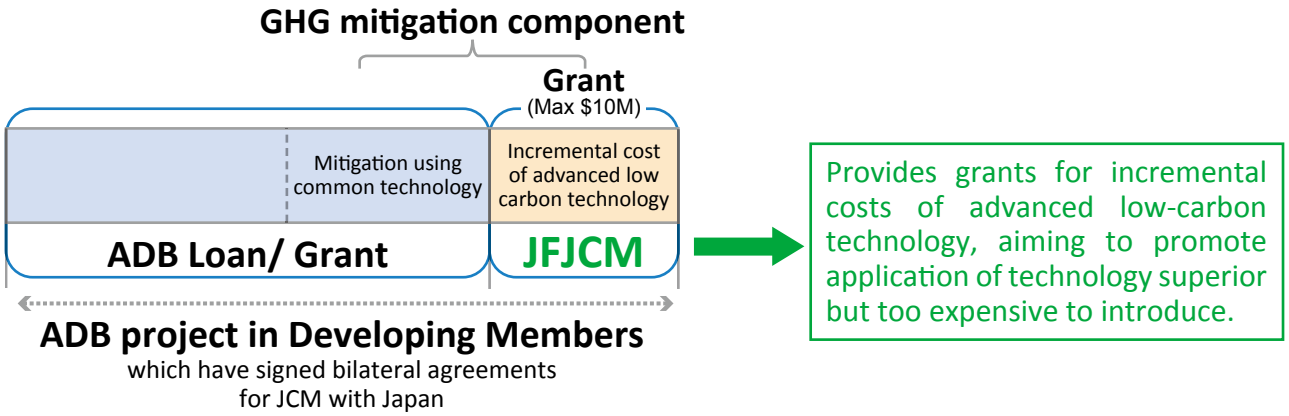


Figure 19. Outline of JFJCM

Example of JFJCM application

The first JFJCM project, “Smart Micro-Grid system for POISED Project in Addu Atoll, Maldives”, was approved in 2015. It was targeted at improving energy efficiency and CO_2 reduction through installation of lithium-ion batteries, as well as a high-efficiency energy management system (EMS) additionally introduced through JFJCM.

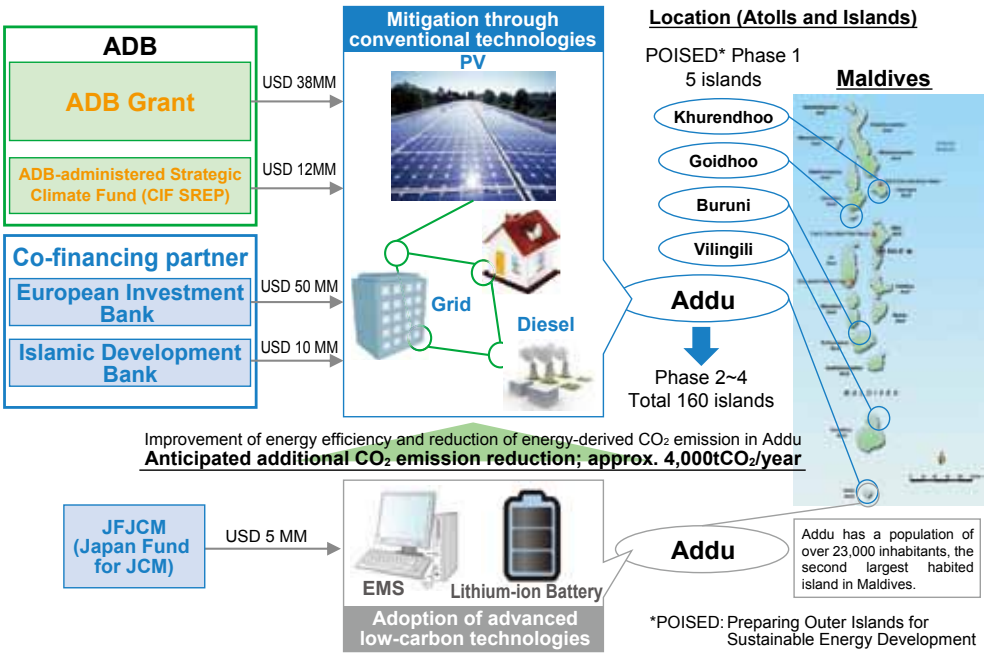


Figure 20. 1st JFJCM project: Smart Micro-Grid system for POISED Project in Addu atoll, Maldives-

Sectors supported by JCM Model Project

The following figure shows the sectors supported by 90 JCM Model Project. Most are in energy efficiency improvement, followed by renewable energy, energy efficiency-renewable energy generation (co-generation), waste-to-energy, heat recovery and transportation.

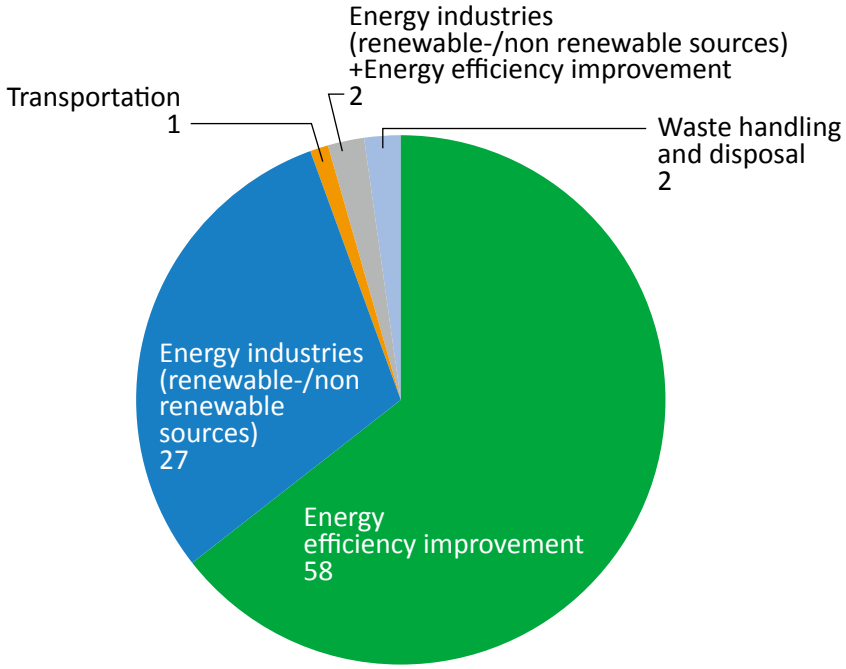
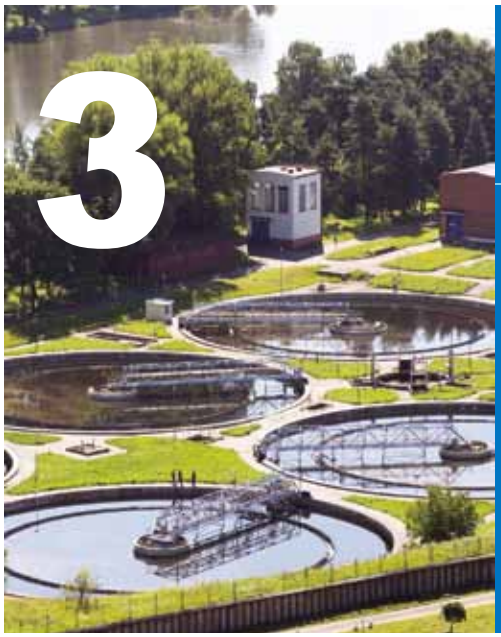


Figure 21. Outcomes of the JCM Model Project (FY2013-2016)
(Tango. A, "For further expansion of JCM project" (in Japanese), a presentation 23 January 2017
(http://gec.jp/jcm/jp/event/gwsympo2017/03gec.pdf)



3

Results of City-to-City Collaboration Programme

This chapter introduces examples of JCM model project established as a result of city-to-city collaboration as well as other cases, such as development of a plan for low-carbonisation of partner cities

Energy conservation in buildings and green building ordinance (Surabaya, Indonesia)

This was developed into a project through a city-to-city collaboration between the cities of Kitakyushu in Japan and Surabaya in Indonesia, and subsequently adopted under the JCM Model Project. In this project, existing air conditioning equipment in a large-scale shopping mall was updated to a Japanese-manufactured water-cooled turbo chiller (5 sets) and energy-saving cooling tower (8 sets). This update is expected to reduce GHG emissions by 996 tCO_2/year.

Under the City-to-City Collaboration Programme, formulation of a "Green Building Ordinance" of Surabaya City is supported, which can contribute to the expansion of green building that can be applied for the JCM Model Project. This ordinance requires that the thermal insulation performance of the outer walls and the equipment performance of lighting and air conditioning satisfy a set energy conservation performance level when facilities, such as buildings, are constructed in Surabaya. This is expected to result in the low-carbon development of the building sector, which accounts for a large proportion of CO_2 emissions in the city. The project itself is being carried out by private companies; however, through city-to-city collaboration in conjunction with this type of institutional design, the development of future projects can be expected.

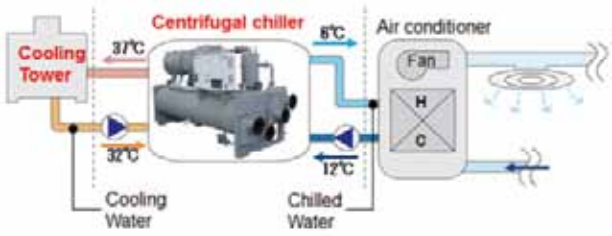


Figure 22. Centrifugal chiller in the A/C system (http://gec.jp/jcm/projects/15pro_ina_01.html)

Introduction of power generation system via waste heat recovery for cement plant (Rayong, Thailand)

This project was developed through cooperation between Kitakyushu City and Rayong Province under the City-to-City Collaboration Programme and adopted as a JCM model project. By introducing a waste heat recovery power generation system to a cement factory, this project reduced the use of grid-supplied power at the factory as well as reducing CO_2 emissions. The estimated GHG emissions reduction is 31,180 tCO_2/year.

Collaborating with the Department of Industry (DIW) of Thailand, IRPC (company), and the Industrial Estate Authority of Thailand (IEAT), Kitakyushu City investigated the potential of improving the energy efficiency of industrial estates in Rayong Province and surrounding factories. The study also examined the specifications of the waste heat recovery power generation equipment in factories and estimated CO_2 emissions reduction.

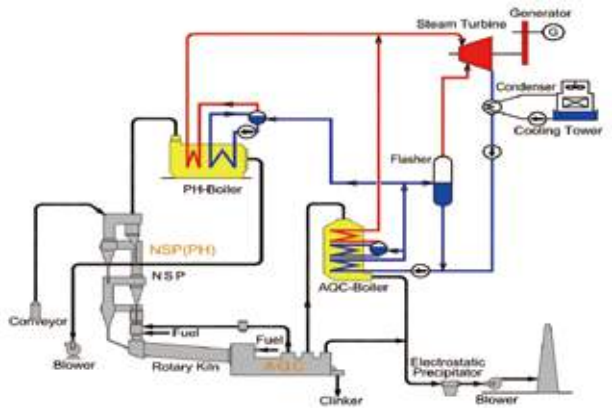


Figure 23. Outline of the System Installed (MOEJ, JCM Feasibility Study through City-to-City Collaboration 2016)

Eco-driving via digital tachograph system (Ho Chi Minh City, Viet Nam)

This project involved 130 NIPPON EXPRESS (VIETNAM) trucks being fitted out with an “eco-drive” system that made use of digital tachographs, in order to continually monitor fuel consumption, running distance and other relevant data on driving behaviour for analysis using a cloud network. Results of the monitoring are used to provide suitable advice to drivers in order to improve their driving habits, and the feedback obtained from the drivers enabled further improvements in driving behaviour.

This project contributes to realising improvements in transportation quality as well as fuel efficiency, both of which directly lead to emissions reductions of 328tCO_2/year.

This project was developed under city-to-city collaboration between Ho Chi Minh City and Osaka City, and adopted as a JCM model project in FY2014 as the first project in the transportation sector.

Figure 24. Outline of the project (http://gec.jp/jcm/projects/14pro_vie_02.html)

Introduction of high efficiency water pumps in Da Nang City (Da Nang, Viet Nam)

This project aimed at achieving higher energy efficiency and GHG emission reductions by replacing the existing water pumps with highly efficient ones in a water treatment plant owned by Da Nang Water Supply Company (DAWACO). As the replacement pumps can be controlled according to local conditions, they can be made to run in accordance with flow volume at the water treatment plant, thus can be operated at high efficiency. The expected GHG emissions reduction is 1,145tCO_2/year.

Based on a MOU for technical cooperation between the City of Yokohama and City of Da Nang, this model project was realised with support from Da Nang City’s Department of Planning and Investment (DPI). This support included inspection of the current operation status of existing pumps in DAWACO; identification of high efficiency pumps based on system requirements and estimated CO_2 emissions reductions; and clarification of the processes including tenders for procuring new equipment.

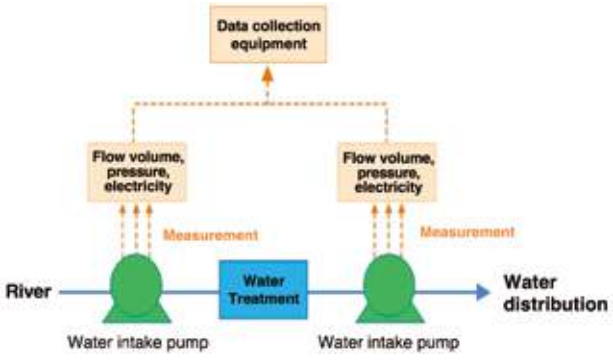


Figure 25. Outline of the project (http://gec.jp/jcm/jp/projects/16pro_vie_01.html)

Introduction of waste-to-energy plant (Yangon, Myanmar)

This project introduced a small waste-to-energy plant (stocker furnace) that incinerates 60 tonnes/day of municipal solid waste that is currently dumped into two adjacent temporary waste dumping sites – Mingalardon and Shwe Pyi Thar. The aim of the plant was to reduce waste volume and improve sanitary conditions. The waste heat from the incinerator is utilised to generate electricity through a steam turbine generator (700 kW; 5,200 MWh/year), which contributes to reduced methane (CH_4) emissions from the landfill sites, and substitutes for electricity generated through fossil fuel combustion and thereby further reduces GHG emissions. The expected GHG emission reduction is 4,663tCO_2/year (in the 4th year).

The feasibility of this project was studied via support from MOEJ's "Feasibility Study of Installation, Operation and Maintenance of Waste to Energy (WTE) Plant in Greater Yangon (FY2012, FY2013)" and through another scheme utilising city-to-city collaboration in FY2014. Although the actual project was not carried out via the City-to-City Collaboration Programme, it was heavily supported by Yangon City (Yangon City Development Committee).

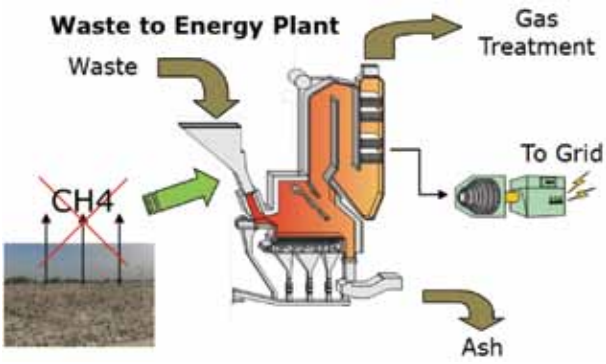


Figure 26. Outline of Waste-to-Energy Plant
(http://gec.jp/jcm/projects/14fs_mya_02/2014FS216_12_sum.pdf)

JCM projects established via city-to-city collaboration

The following figure shows JCM projects that have been established under city-to-city collaboration.

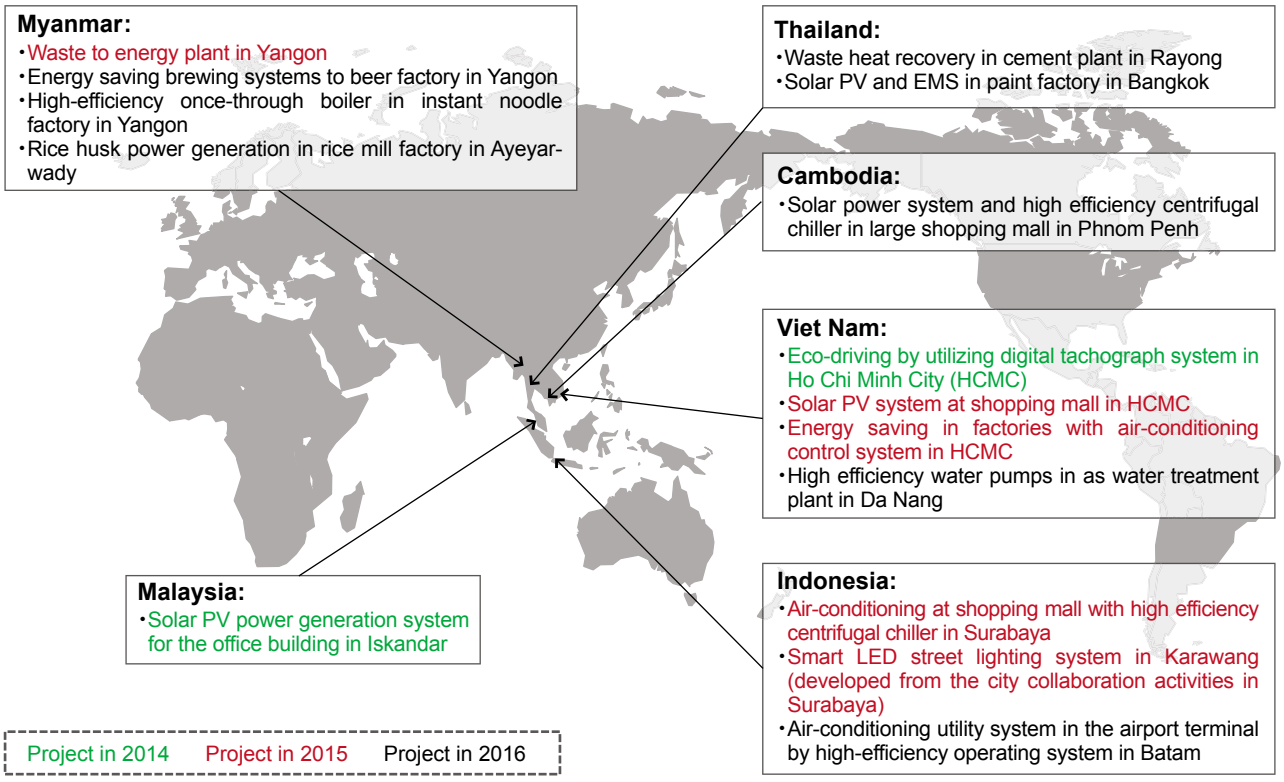


Figure 27. JCM Model Projects established under City-to-City Collaboration (as of 31 January 2017)

Formulation of the green growth promotion plan (Hai Phong, Viet Nam)

The cities of Kitakyushu and Hai Phong in Viet Nam collaborated in the formulation of the Hai Phong Green Growth Promotion Plan in FY2014 under the City-to-City Collaboration Programme. The plan includes a variety of measures that may result in the development of JCM projects. From FY2015, surveys and other activities have been implemented to formulate detailed project proposals in line with the overall plan.

The plan outlines four major areas (waste, energy, transportation, and Cat Ba island) and other sectors (water and sewage, stormwater drainage, environmental conservation, and green production), and includes 15 specific pilot projects in each sector that have been identified based on an understanding of the current situation in the city.

This project is a good example of comprehensive support for the creation of low-carbon urban development plans through cooperation between cities based on city-to-city collaboration.

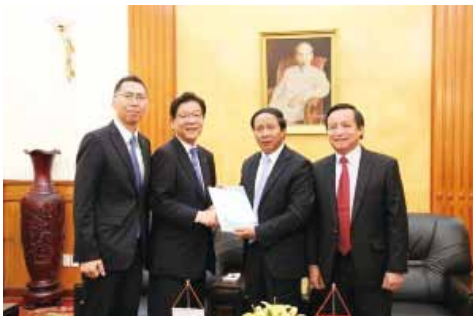


Figure 28. Hai Phong Green Growth Promotion Plan proposed by the City of Kitakyushu

Implementation of a climate change master plan (Bangkok, Thailand)

The cities of Yokohama and Bangkok concluded a Memorandum of Understanding on urban development in 2013. Between 2013 and 2015, the cities formulated the Bangkok Master Plan on Climate Change (2013-2023) as a model of Yokohama City's Action Plan for Global Warming Countermeasures through a JICA technical cooperation project. The master plan is a comprehensive plan for climate change measures consisting of: (1) sustainable transportation measures; (2) promotion of energy conservation and renewable energy measures; (3) measures for the waste and wastewater sector; (4) urban greening; and (5) adaptation plans. Collaborative activities under the City-to-City Collaboration Programme were implemented in FY2014 and FY2015 to give shape to the contents of the master plan.

An initiative was carried out to match up local companies in Bangkok with Japanese companies, resulting in a project using the JCM Model Project to supply power with the application of a 1.5 MW photovoltaic power generation facility and advanced EMS installed on the roof of a paint factory by Fine Tech Co., Ltd., a company located in Yokohama. This is expected to reduce emissions by 1,344t-CO_2/year.

This project is a good example of making effective use of existing urban planning formulated through city-to-city collaboration and utilising JCM financing programmes to shape low-carbon development measures in plans.

Figure 29. PV power generation facility on the roof of a factory (©Fine Tech Co., Ltd.)

Related websites

Name of the website	Outline	URL
JCM Homepage	JCM Homepage, jointly managed by Ministry of Trade and Industry and Ministry of the Environment, Japan	https://www.jcm.go.jp/
Web Portal for Low Carbon Development in Asia	Portal site for low carbon development of Asia provided by Ministry of the Environment, Japan	http://www.env.go.jp/earth/coop/lowcarbon-asia/english/index.html
New Mechanisms Information Platform	Contains information on New Mechanisms, including JCM, managed by the Oversea Environment Cooperation Centre (OECC)	http://www.mmechanisms.org/e/index.html
The Joint Crediting Mechanism	Provides details of the JCM Model Projects, managed by Global Environment Centre Foundation (GEC)	http://gec.jp/jcm/index.html

(as of January 2017)

Appendix

JCM Model Project

The JCM Model Project can be used as part of follow-up actions in the City-to-City Collaboration Programme. This financing programme provides partial financial support for the initial cost of introducing facilities, equipment, and vehicles that reduce CO2 from energy sources in developing countries. This section provides additional information on the JCM Model Project, including examples of technologies in sectors (energy efficiency, renewable energy, wastes/biomass, and transportation) installed under the JCM Model Project.

For more details on the JCM Model Project, please visit: http://gec.jp/jcm/projects/index.html

Eligible projects

A project eligible as a model project needs to satisfy requirements (a) to (d) listed below:

(a) Projects that reduce energy-related CO_2 emissions with leading low-carbon technologies in developing countries with which Japan has established or has been consulting to establish JCM, and that are expected to contribute to achieving Japan's emission reduction target through the JCM;
(b) Implementation of projects will not adversely affect the environment and society of countries where projects are implemented;
(c) Reduction of GHG emissions achieved by the projects can be quantitatively calculated and verified; and
(d) Facilities installed by the projects do not receive any other subsidy by the Government of Japan.

(Global Environment Centre Foundation (GEC), 2016. Guidelines for Submitting Proposals (tentative translation), 5 September 2016)

A project eligible as a model project needs to satisfy requirements (a) to (d) listed below:

The JCM Model Project targets advanced, low-carbon technologies that are at the practical stage of use but not fully disseminated in the partner country in which the project is to be implemented. If the technology satisfies certain criteria, such as high-energy efficiency, Japanese technologies may not be needed. It needs to be understood that the JCM Model Project only targets reduction of energy-related CO_2 that would otherwise be released by fuel combustion or electricity/heat provided by other entities.

Details of financial support

Some of the key points of the financial support are shown below, but please feel free to contact Global Environment Centre Foundation (GEC) or Japanese partners (local government, private sector) for more detailed information on the support provided by the JCM Model Project. Please also check the open call to be posted on the GEC website to obtain more and updated information (http://gec.jp/jcm/index.html).

Costs covered:

The JCM Model Project covers the following costs. Note that financial support is limited only to those costs that can be verified as having been incurred for implementation of eligible projects:

(a) Cost of main construction work
(b) Cost of ancillary work
(c) Cost of machinery and appliances
(d) Cost of surveying and testing
(e) Cost of facilities (including monitoring equipment)
(f) Cost of administrative work; and
(g) Other necessary costs approved by GEC

It does not cover costs such as cost of removing of existing facilities, equipment necessary to introduce technologies/facilities, expendable supplies, cost of civil engineering, as well as buildings, equipment or facilities that do not directly contribute to energy-related CO_2 emission reduction.

Grant rate:

The maximum amount of financial support available is 50%, but this varies depending on factors such as level of innovation of the technology to be introduced in the country in which the project is to be implemented. The open call in FY2016 capped the grant ratio based on "categorisation by applied technology type", and "number of JCM model projects implemented in each country" using the actual number of already selected projects.

Table A-1. Grand rate of financial support

Number of already selected project(s) using a similar technology in each partner country	Percentage of financial support
None (0)	less than 50% (determined by participants)
Up to 3 (1 – 3)	less than 40% (determined by participants)
More than 3 (>3)	less than 30% (determined by participants)

(Based on Global Environment Centre Foundation (GEC), 2016. Guidelines for Submitting Proposals (tentative translation))

Notes: Sound Management of Project Members:

During screening, it is necessary to submit accounting status briefs for all project members, including local companies that will introduce facilities (audited balance sheets, income statements, and cash flow statements from the last three fiscal years). For this reason, the project members that will be introducing these facilities should be companies that have a high level of sound management and can submit this documentation. Care should be taken when dealing with small and medium-sized companies because these documents may not be available.

Reduction of CO_2 emissions and cost effectiveness

CO_2 Emission Reductions: The JCM aims at the development of large-scale projects with high CO_2 emission reduction potential and acquisition of credits. However, the JCM Model Project does not indicate specific CO_2 emission reduction standards. There is a wide range of examples of model projects that have been adopted to date, from small-scale projects with estimated GHG emission reductions of about 100t-CO_2/year to large-scale projects exceeding 100,000t-CO_2/year, with roughly 1,000t-CO_2/year used as a guideline. Screening will be a comprehensive evaluation of not only CO_2 emission reductions, but also cost effectiveness, target countries, and the type of technology introduced.

Cost Effectiveness: When project proposals for the JCM Model Project are reviewed, the cost effectiveness of the proposed project is included as an evaluation item, using "JPY 4,000t-CO_2" as a guide. Cost effectiveness in this case would be shown as the result of "subsidies divided by cumulative GHG emission reductions during the service life of equipment introduced as determined by Japanese law (CO_2 equivalent) = subsidies for the reduction of 1 tonne of GHG (CO_2 equivalent)."

Project cycle of the JCM

Projects identified via preliminary studies are subject to the following registration procedure as a JCM project and to issue credits:

1. Develop MRV methodology if there are no applicable methodologies. The methodology developed should be submitted to the JCM Joint Committee (hereinafter "JC") for approval.
2. Develop a PDD. The PDD developed should be subject to review by the Third Party Entity (TPE) selected by the JC for confirmation of validity. After the validation process, the PDD is submitted to JC and registered as a JCM project after JC's approval.
3. Projects registered as a JCM project should be monitored according to the methodology. GHG reduction and absorption are calculated based on the monitoring data, which is used to produce reports. TPE reviews the GHG reduction and absorption volumes.

An application for issuance of credits is then submitted to JC based on the TPE review result. JC then determines the volume of JCM credits, which are then issued by the governments of Japan and the partner country.

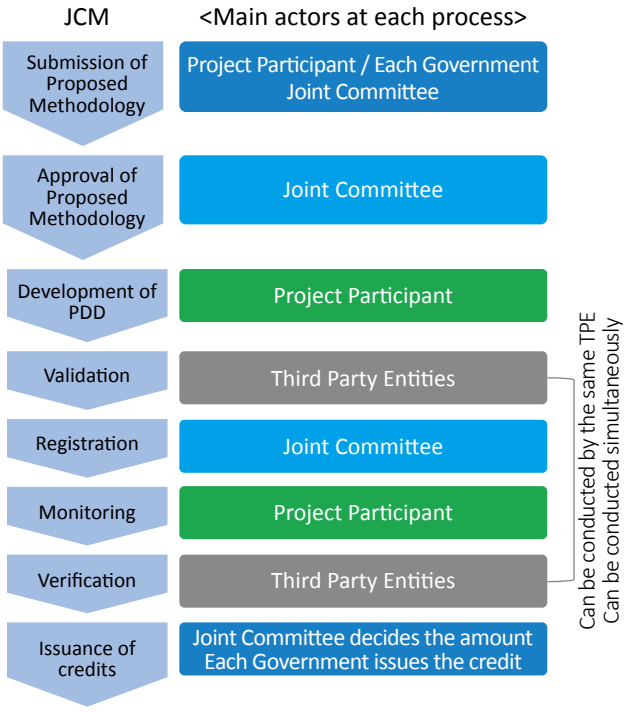


Figure A-1. Project cycle of JCM

MRV methodology and issuance of credits

To appropriately evaluate contributions to GHG emission reductions or removals in a quantitative manner, appropriate measurement, reporting and verification (MRV) methodologies need to be developed. Those of JCM are designed with user-friendliness in mind for project proponents, TPE and data verifiers. Applicability of methodology to a project can be easily identified based on the JCM project eligibility criteria, which reduces the risk of proposals being turned down.

In the JCM, emission reductions to be credited are defined as the difference between "reference emissions" and "project" emissions. Reference emissions are calculated based on business-as-usual (BaU) emissions to represent plausible emissions in providing the same level of output or service of the proposed JCM project in the partner country. This approach ensures a net decrease and/or avoidance of GHG emissions and also reduces the burden of monitoring.

For all JCM model projects, monitoring continues during the useful life as designated by law, and in principle at least 50% of the issued JCM credits earmarked for the Government of Japan need to be delivered.

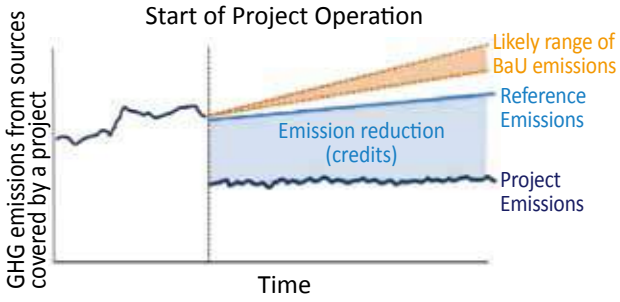


Figure A-2. Calculation of Emission Reductions Using Reference Emissions

Examples of technology: Energy efficiency

There is a high need to introduce higher energy efficient equipment, replace ageing facilities or reduce operational costs for buildings and industrial estates. The cost-effectiveness of doing so in this sector is relatively high and the related lead times are short due to the general lack of lengthy administrative procedures. Hence, this sector has seen a high rate of installations.

Technologies/Equipment installed by the JCM Model Project

- Energy saving equipment for buildings (turbo refrigerating machine systems, air conditioners, heat pumps, chillers, co-generation systems, exhaust heat utilisation, boilers, LEDs)
- Energy saving at factories (air conditioning, co-generation, boilers, exhaust heat utilisation, heat pumps, freezer machines, burners, looms, etc.)
- Others (LEDs for street lights, high-efficiency transformers in power distribution systems)

Technologies/Equipment for future application of the JCM Model Project

- Energy Service Companies (ESCO)
- Systems to promote comprehensive energy-saving through management of energy use in more than two facilities; Building Energy Management Systems (BEMS), Factory Energy Management Systems (FEMS), Community Energy Management Systems (CEMS)

Examples of technology: Renewable energy

Renewable energy needs are high in inhabited areas with no or unstable electricity supply and areas where power sources are dispersed, such as island countries. Here, use of photovoltaic power generation (PV) is growing due to the relative ease of introducing the technology. The simple combination of solar power generation module and inverter allows control systems and smart grids to be built in the future, to connect them up.

Technologies/Equipment installed by the JCM Model Project

- Photovoltaic power generation (combination of PV module and invertor system as a back-up of grid; off-grid and smart-grid in island countries and areas without grid; hybrid system combined with in-house generation facility)
- Geo-thermal (Mexico)

Technologies/Equipment for future application to the JCM Model Project

- Wind-power generation
- Small hydropower generation

Examples of technology: Solid waste/biomass

Open dumping is a common practice for many cities in developing countries. Many cities also face problems in waste management such as increased waste volume, shortage of land for landfills, sanitation and pollution problems, which has drawn attention to waste-to-energy facilities owing to their efficient treatment of waste and ability to generate energy. On the other hand, few model projects have been implemented due to the lengthy process of negotiations with local stakeholders, acquisition of land and administrative procedures such as bidding. Biomass energy is also receiving more attention as a carbon-neutral energy source in tropical and sub-tropical areas, due to the high potential biomass volume.

Technologies/Equipment installed by the JCM Model Project

- Incineration of municipal solid waste (Myanmar)
- Biomass boiler and co-generation (Ethiopia)
- Methane fermentation of organic waste and gas utilisation (Viet Nam)Recovery of methane gas and generation (Mexico)

Technologies/Equipment for future application to the JCM Model Projects

- Biomass utilisation as coal fuel alternative
- Co-combustion of coal and biomass High-efficiency steam-turbine power generation and co-generation system utilising rice husk.

Examples of technology: Transportation

In the course of urbanisation, many cities in developing countries suffer from transportation-related problems such as chronic traffic congestion and air pollution from vehicle emissions, and therefore the need to improve transportation systems is high in such cities. However, no model projects have been adopted due to the huge investment cost, protracted administrative procedures and overall length of time required for infrastructural development. No model projects exist for introducing electric vehicles either, due to the low cost-effectiveness associated with creating new infrastructure, such as charging stations.

Technologies/Equipment installed by the JCM Model Project

- Eco-driving via use of Digital Tachograph System

Technologies/Equipment for future application to the JCM Model Project

- Electric Vehicles, Electric power generation device for vehicles, Park-and-ride bus systems, Eco-point systems for transportation
- Natural gas vehicles
- Bus Rapid Transit: BRT

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