

### Kick-off Meeting of City-to-City Collaboration Programme in Davao City

Date: May 15<sup>th</sup> 2018 (Tuesday)

Time: 9:30~12:00

Venue: Function room at Grand Men Seng Hotel

No	Time	Programme	Presenter
1	9:30~9:35	Opening remarks	Atty. Tristan Dwight P. Domingo, Asst. City Administrator, Davao City
2	9:35~9:40	Opening remarks	Ms. Emiko Murakami Director, Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu
3	9:40~9:50	Photo session	
4	9:50~10:10	Background of a cooperation between Davao City and City of Kitakyushu	Ms. Emiko Murakami Director, Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu
5	10:10~10:30	Low-carbon policy of Davao City and the progress of Local Climate Change Action Plan (LCCAP) (tentative)	Ms. Marivic L. Reyes Officer-In-Charge, City Environment & Natural Resources Office (CENRO) of Davao City (t.b.c.)
6	10:30~10:50	A framework of City-to-City Collaboration Programme between Davao City and City of Kitakyushu on low carbon development	Mr. Shiko Hayashi Programme Director, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
7	10:50~11:10	Support for a development of Local Climate Change Action Plan (LCCAP) of Davao City	Dr. Junko Akagi Research Manager, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
8	11:10~11:40	Q&A and discussions on possible low- carbon project applying to JCM fund	
9	11:40~11:50	Closing Remarks	Japan side
10	11:50~12:00	Closing Remarks	Atty. Tristan Dwight P. Domingo, Asst. City Administrator, Davao City

\* The kick-off meeting will be held in English (A consecutive translator between English and Japanese will be available)

## Tentative list of participants

- Atty. Tristan Dwight P. Domingo, Asst. City Administrator, Davao City
- Ms. Marvic L. Reyes, Officer-In-Charge, City Environment & Natural Resources Office (CENRO) of Davao City
- Related departments and CENRO staffs
- Dr. Doris B. Montecastro, Chairperson, Environmental Science Department, Ateneo de Davao University
- Consular Office of Japan in Davao (t.b.c.)
- Ms. Emiko Murakami, Director, Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu
- Mr. Noboru Kawai, Project Development Manager (Waste to Energy) , Nippon Steel & Sumikin Engineering Co., Ltd. (NSENGI)
- Engr. Archelez G. Dumandan, Managing Director, PNS Construction, Inc.
- Ms. Lea-Chris Tan, Nippon Steel & Sumikin Engineering Co., Ltd. (NSENGI)
- Mr. Rudy Q. Corro Jr. VP for Business Development, Carbon Footprint Solutions Inc.
- Mr. Shiko Hayashi, Programme Director, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
- Ms. Junko Akagi, Research Manager, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
- An interpreter
  
- Fr. Daniel Mcnamara, SJ, University Research Council, Ateneo de Davao University
- Dr. Doris B. Montecastro, Chairperson, Environmental Science Department, Ateneo de Davao University
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# Background of a cooperation between City of Davao and City of Kitakyushu

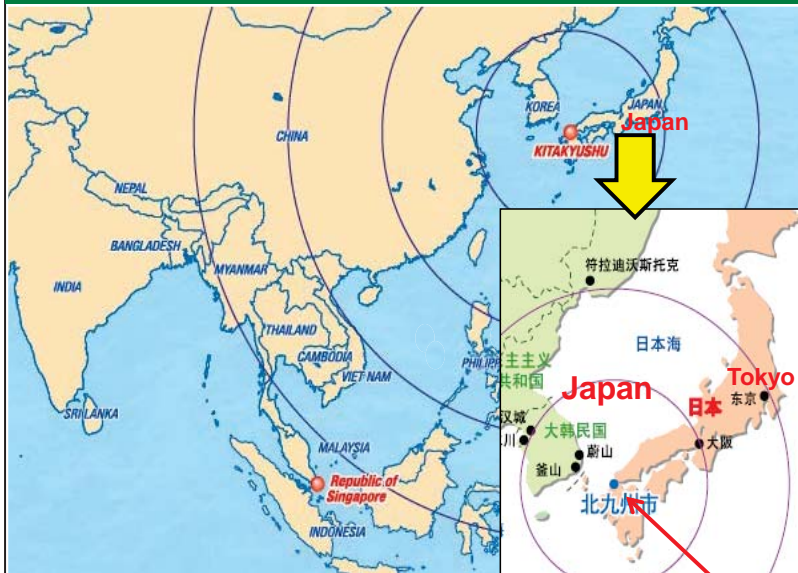


**Green Frontier**  
環境モデル都市 北九州市

**Kitakyushu Asian Center for Low Carbon Society**  
**Environment Bureau, City of Kitakyushu**  
**Director, Emiko MURAKAMI**

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## City located near to other Asian nations, rich in nature, and developed as a manufacturing area



■ **Kitakyushu City**  
Population: 977,000 (2010) Area: 487.88 Km<sup>2</sup>  
GDP: 3,430 billion yen (2010)

**Kitakyushu City**

### Rich nature and branded food materials



Karst Plateau Hiraodai



Wakamatsuhoku Beach



Ouma Bamboo Shoots



Kanmon Straits Octopuses



Kokura Beef



Buzen-Sea Oysters



Wakamatsu Special Tomatoes

### Major companies in Kitakyushu area



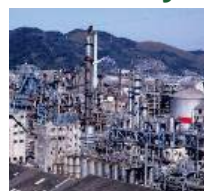
Nippon Steel Corporation



Yaskawa Electric Corporation



TOTO Ltd.



Mitsubishi Chemical Corporation



Toyota Motor Corporation · Nissan Motor Co., Ltd.



Mitsubishi Materials Corporation

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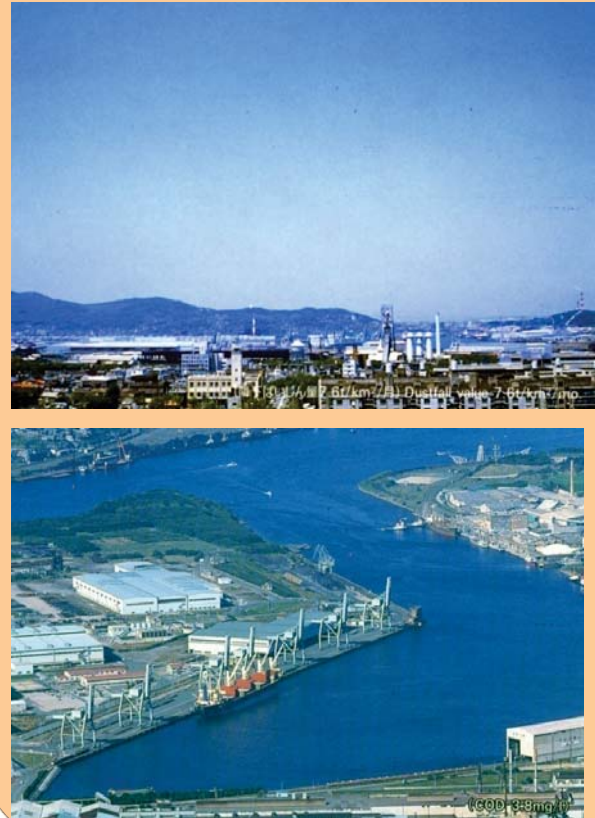


# Overcoming Severe Pollution: Kitakyushu's Experience

**1960s**



**Today**



3

## Key Factors: Partnerships among Multi-Stakeholders



**Residents**

Residents observing a private company



Study session on air pollution measures with university professors

**Partnership**



Environmental supervision & environmental infrastructure

**Local Government**



Cleaner Production & pollution control equipment

**Private Enterprises**

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# Low-Carbon Technologies in Kitakyushu



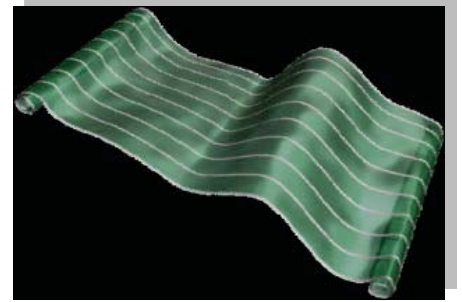
## Mitsubishi Materials

15 types of waste treatment and recycling, such as metal waste and sludge



## Nippon Coke & Engineering

CDQ (Coke Dry Quenching Process)  
Supply power and steam to neighboring factories  
Power generation capacity: 27,900kW

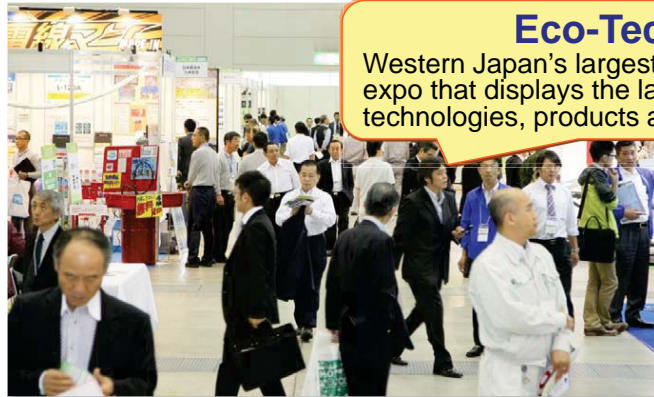


## Mitsubishi Chemical

Processable organic photovoltaics  
Next-generation flexible and lightweight photovoltaic modules



**Yaskawa Electric**  
Energy saving, inverters



## Eco-Techno

Western Japan's largest eco-technology expo that displays the latest eco-technologies, products and information

# Low-Carbon Activities in Kitakyushu - 1



Solar Panel

Lighting

JR Kokura Station  
North Pedestrian Deck



Solar Panel



Solar Panel

Katsuyama Bridge Solar  
Powered Roof

Uomachi Eco-Roof



## Low-Carbon Activities in Kitakyushu - 2



Bicycles in Use  
(Front of City Hall)



Bicycle Station  
(Kokura Kita-ku Ward Office)

## Introduction of Eco-Cars such as Electric Vehicles



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## Low-Carbon Activities in Kitakyushu - 3

夏がめじるしだよ  
カードでシールと特典をGET!  
「まちなか避暑地」カード  
まちなか避暑地  
夏の節電キャンペーン  
家の電気を消して、まちに出かけよう!  
まちなか避暑地。  
夏は13時～17時の取り組み（ピークカット）が重要!  
夏場の節電を徹底することで、エアコン・テレビ・照明の消費電力の約70%を占めます。つまり、エアコン・テレビ・照明を消すと、約70%の節電になります。

Peak cut activity of  
electric power consumed

Turn off the light  
during afternoon break

Water  
Sprinkling

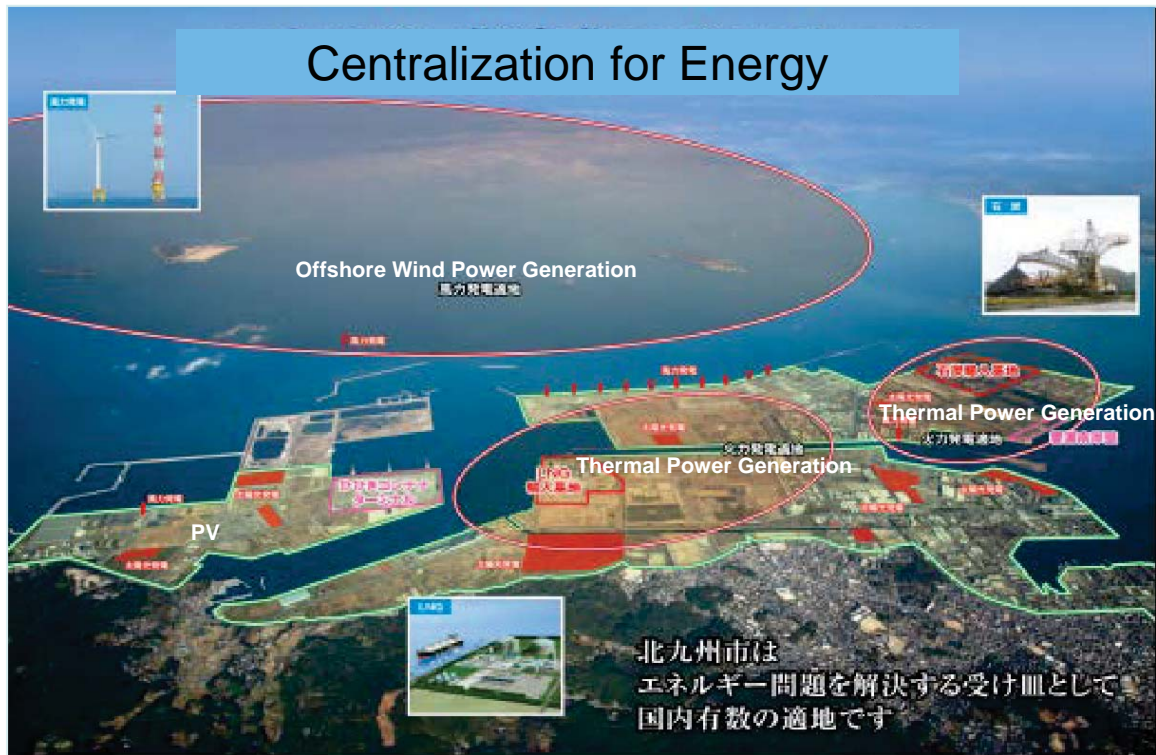


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# Energy Policy in Kitakyushu (Kitakyushu Power)-1

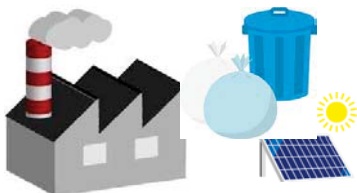
Make Hibikinada Area a Base for Energy  
 ~ Invitation of Solar Photovoltaics, Biomass Power Generation and Offshore Wind Power Generation



# Energy Policy in Kitakyushu (Kitakyushu Power)-2

Utilizing local low-carbon power source starting in Waste-to-Energy. Expand procurement power supply in conjunction with status of inviting power generation facilities and expansion of supply scale.

Step1 Waste to Energy



Step2 Biomass Power Generation



Step3 Offshore Wind Power Generation and so on



Kitakyushu Power Co., Ltd.

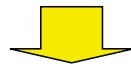


# Kitakyushu Asian Center for Low Carbon Society

Kitakyushu Asian Center for Low Carbon Society opened in June 2010.



Utilization of the environmental technologies developed through the solution of pollution problems and manufacturing processes, and the inter-city network established by international cooperation in the past

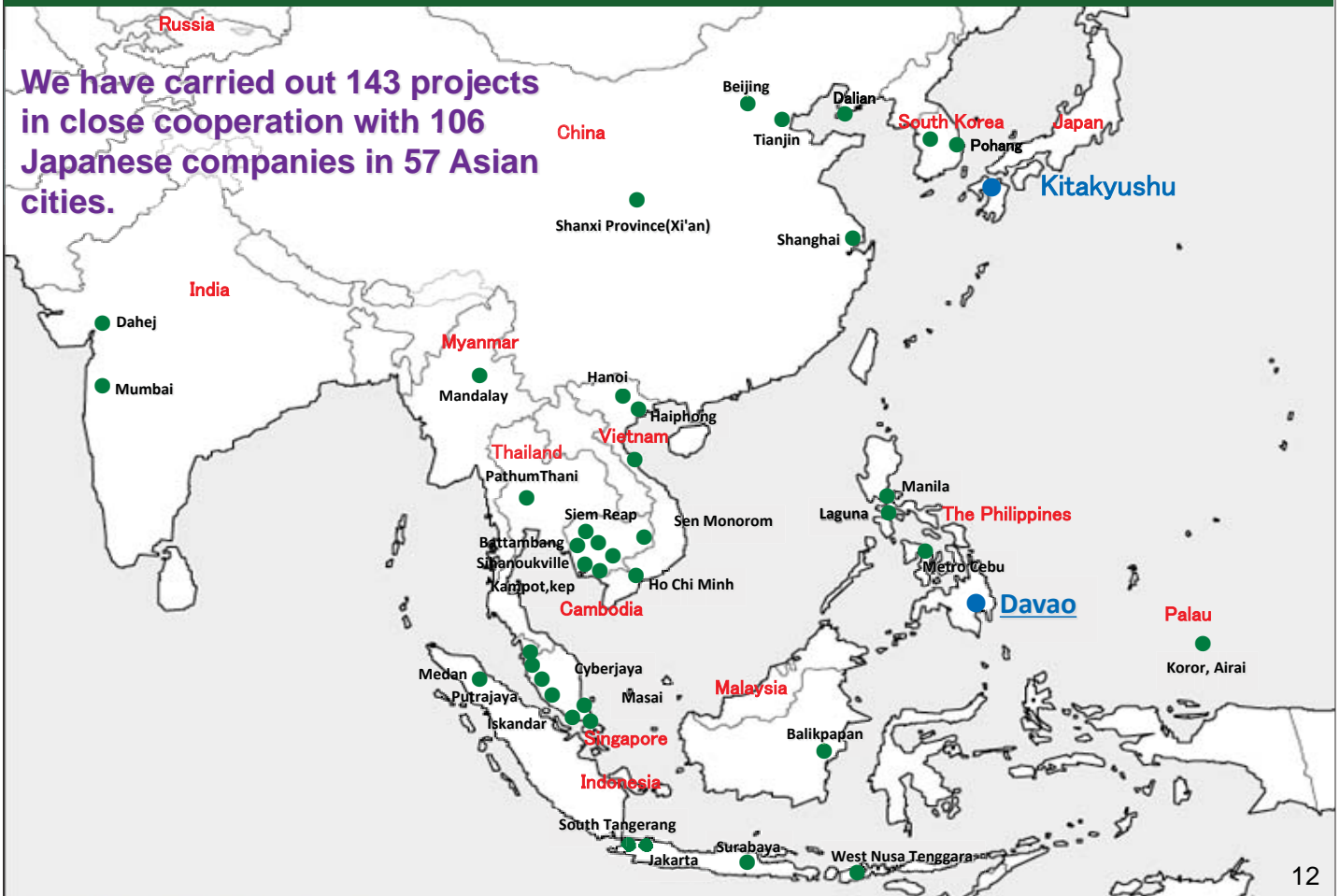


Accumulating **environmental technologies** in Kitakyushu City and throughout Japan, for building low carbon societies in Asia through environmental business skills

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## Diverse Project Development Map

We have carried out 143 projects in close cooperation with 106 Japanese companies in 57 Asian cities.



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# Cooperation for E-Waste Recycling with Cebu City in the Philippines

Supporting Cebu City's Ordinance since 2014 (supported by METI, Japan)

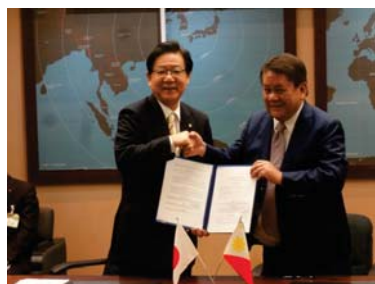


## Ordinance No. 2450

“AN ORDINANCE PROVIDING FOR THE MANAGEMENT OF SPECIAL WASTES IN THE CITY OF CEBU, PROVIDING FEES AND IMPOSING PENALTIES FOR NON-COMPLIANCE THEROF” in 2016.

**[Extract]**

- This ordinance obligates household and commercial facilities must bring special wastes including E-waste to collection points designated by Barangay.
- All transporter and TSD facilities operating within the City must register with the Cebu City Solid Waste management Board with requirement of DENR-EMB accreditation, Business permit.
- Any person found guilty of violating any prohibited Acts should be imposed fine for first and second offence. For the third business license shall be suspended .



## Memorandum of Understanding for Environmental Technical Cooperation in February 9<sup>th</sup> in 2017

### Article1 Objective

The objective of this MoU is to establish an Environmental Technical Cooperation in order to promote and expand effective and mutually beneficial cooperation in the development of the two cities.

### Article2 Scope

Promotion of resource recycling by proceeding with the management of special waste Development of a green economy and environment conservation with pollution control of water, air and soil.

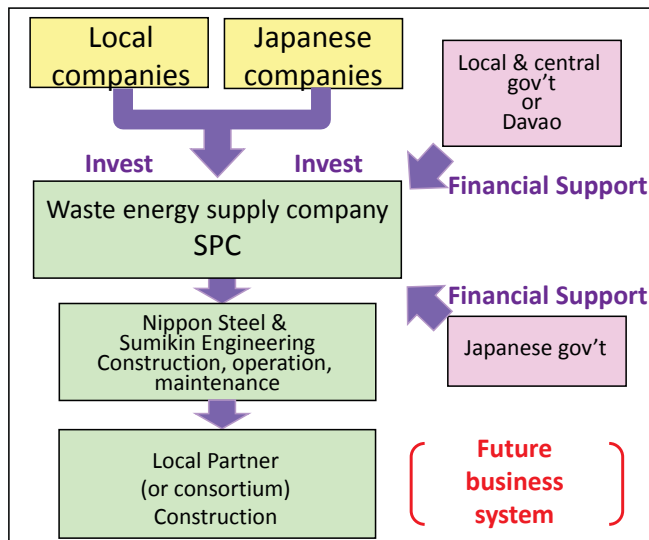
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# Investigation for Installation of Waste-to-Energy Facility in Davao City

JICA, MoEJ (FY 2015 - up to present)

## <Project Overview>

Davao is the central city in the south section of the Philippines and is facing issues of increased waste generation due to the expansion of economic activities and reducing pressure on final disposal sites. Therefore, this project aims to implement a “waste-to-power project” with the aims of both achieving significant reductions of waste and using this energy. Surveys will also be carried out on waste treatment situations and related legal systems.



## <Project Implementation System and Main Role>

### [Nippon Steel & Sumikin Engineering]

- Business Entity

### [City of Kitakyushu]

- City to City Cooperation

### [KITA]

- Technology Transfer of Solid Waste Management

### [Kitakyushu Environmental Preservation Association]

- Waste Analysis

### [IGES]

- Hold the Public Consultation

## Stoker-incineration furnace

- Can respond to large-scale waste treatment needs (minimization)
- Large-scale, high-efficiency power generation is possible with the use of waste.



Kogasaki Waste-to-Energy Plant in Kitakyushu

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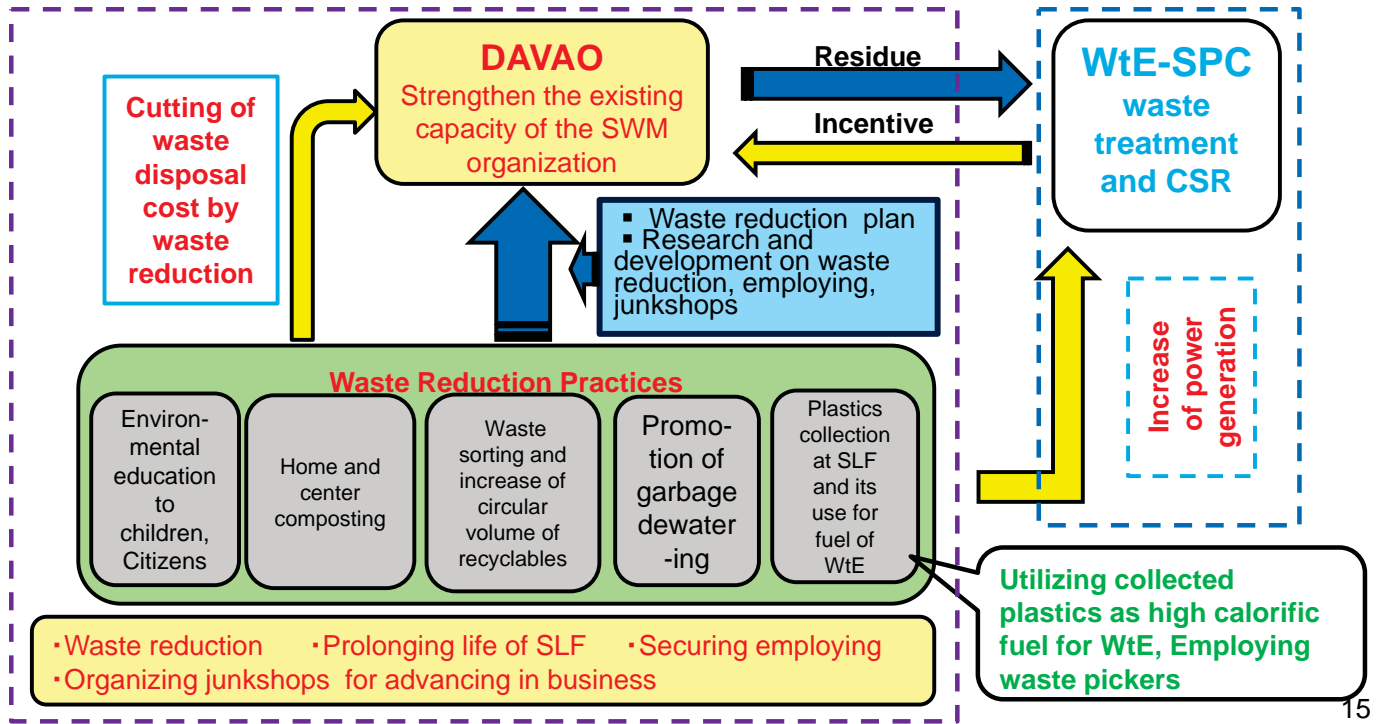
# Solid Waste Management in Davao for JICA Grassroots Project

JICA「Grass Roots Project」(FY 2017-2020)

## <Project Output>

1. Establishing a system for waste analysis in CENRO
2. Setting up preparatory body to develop an organization to promote waste reduction
3. Pilot activities on waste reduction in business sector and barangay to be conducted

## Solid Waste Reduction Mechanism



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## JCM City-to-city Cooperation Project between City of Kitakyushu and Davao City

Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan (MoEJ : FY 2018)



### Support for a development of Local Climate Change Action Plan of Davao City

- A development of GHG inventory (supported by IGES)
- A development of mitigation measures (supported by Kitakyushu City and IGES)
- A development of adaptation measures (supported by Ateneo De Davao Uni.)

### An implementation of concrete mitigation measures

#### Study on a feasibility of renewable energy project (for JCM model project)

- Waste-to-Energy (WtE) project (Nippon Steel & Sumikin Engineering Co., Ltd.)
- Feasibility study on other low-carbon projects (renewable energy and energy saving projects)
- Coordination with related-stakeholders for an implementation, technical study, evaluation of the amount of CO2 reduction, etc.
- Supporting for a preparation of applying JCM model project

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# Executives of Davao City Government Visit to Kitakyushu City



Atty. Domingo (March 2016)



Atty. Ropez (May 2017)



Mayor Sara (November 2017)



Atty. Bantiding (February 2018)

# Signing of a Memorandum of Understanding for a Green Sister City Relationship with Davao, The Republic of the Philippines

On November 28<sup>th</sup>, 2017, the City of Kitakyushu and the City of Davao, in the Republic of the Philippines, signed a Memorandum of Understanding creating a Green Sister City relationship between the cities that aims to create cooperative partnerships in the environmental field for the purpose of expanding mutual benefits and positively driving development through low-carbon societal initiatives, resource circulation projects, and development of local human resources.

The City of Davao is the City of Kitakyushu's second Green Sister City, and its first since Surabaya in the Republic of Indonesia, in November of 2012. Through the signing of a Memorandum of Understanding, cooperation between the public and private sectors can strongly support the export of city infrastructure systems, create a path for regional revitalization, and drive national growth strategies.



Map of the Philippines

Map data: Esri, HERE, DeLorme, FAO, NOAA, USGS

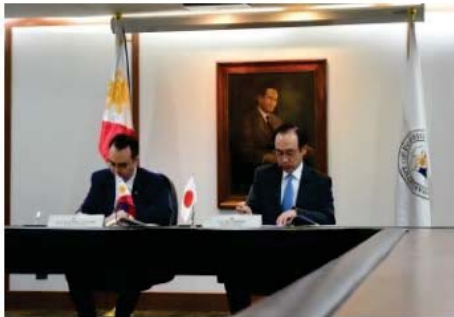


Signing of the Memorandum of Understanding:

Mayors Sara Duterte of Davao and Kenji Kitahashi of Kitakyushu 18

# the Signing Ceremony of the Exchanges of Notes for the Waste-to-Energy Facilities in Davao City

On March 20<sup>th</sup> 2018, Ambassador Koji Haneda, with Department of Foreign Affairs Secretary Mr. Alan Peter Cayetano, attended the signing ceremony of Exchanges of Notes. Exchange of Notes signed will provide a JPY 5.013 billion (PHP 2.5 billion) grant for the development of waste-to-energy facilities in Davao City. Japan's grant will be used to construct and manage waste-to-energy facilities to significantly reduce solid wastes and convert it into usable energy. This project is expected to serve as an innovative example of sustainable waste management to other cities in the Philippines.



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## Priority Fields in Technological Transfer

### Energy management

Regional management of energy by placing city and regional electricity plants at the core

Kitakyushu Smart Community Project (Higashida Area)



Yahata Higashida District, where an environmentally conscious town is under construction



Cooperation between government and the private sector

Transferring a package on environmental technologies and social systems

### Water business

Water recycling demonstration plant combining sewage water membrane treatment and seawater desalination

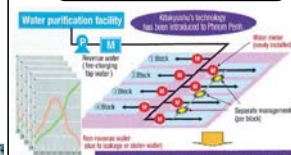


Water Plaza

Water created from sewage: 1,000 m<sup>3</sup>/day  
Water created from seawater: 400 m<sup>3</sup>/day



How to maintain and manage a water distribution network



Non-revenue water rate is improved. 72% (1993) → 8% (2006)

### Recycling and waste treatment



Kitakyushu Eco-Town



Home appliance recycling



Bicycle recycling

Most advanced facilities for waste treatment

Shaft-gasification furnace



Shin-Moji Plant  
Safe facilities that achieved recycling of waste and effective utilization of heat energy

Economic effects (25 projects)  
\* Direct investment: approx. 60 billion yen  
\* Generated employment: approx. 1,300 jobs  
\* CO<sub>2</sub> reduction: approx. 200,000 tons/year

### Cleaner production and prevention of pollution

#### Introduction of cleaner production (CP)

- \* Evaluation and improvement of raw material and fuel use
- \* Improvement of manufacturing processes
- \* Thorough implementation of maintenance and management
- \* Human resources development, etc.

Achievement of energy saving and resource saving  
Reduction of environmental loads  
+ Higher productivity

End-of-Pipe (EOP) measures



Electric dust collector    Flue-gas desulfurization facilities    Waste water treatment facilities

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# Thank you for your attention



My name is **Teitan**.

I came from North Pole.

Global warming causes melting ice there, and we have less and less places to live every day.

So I came to Environmental model city, Kitakyushu to protect my family and North Pole.

I am hoping that we all learn the importance of Environmental and ecology more, so that we will be able to stop the global warming together!

*Kitakyushu City Environmental Mascot Character*

## **Teitan**

低炭素 (tei tanso) = Low Carbon



# A framework of City-to-City Collaboration Programme on low carbon development between Davao City and City of Kitakyushu

May 15<sup>th</sup>, 2018

Shiko Hayashi

Programme Director, Kitakyushu Urban Centre



**IGES**  
Institute for Global  
Environmental Strategies

## City-to-City Collaboration Programme on low carbon development

### The Programme aims

- to conduct a feasibility study (FS) of possible introduction of low-carbon technologies as well as enhance the capacity of partner cities by drawing up a master plan and/or action plan and sharing expertise in project management in the cities in an effective and efficient manner **under the partnership of Japanese cities and partner cities.**

- Support to create low carbon project
- Support to design the local policies/plans to promote low carbon projects (ex: Local Climate Change Action Plan)
- Capacity building for the above mentioned activities

Source: Ministry of the Environment, Japan

### JCM Model project

- When promising low-carbon projects are identified, the programme will move on to the project implementation stage with the submission of an application to the JCM Model Project.
- JCM Model Project is a financing programme provided by MOEJ.
- Normally, the open call for proposals to the JCM Model Project is made in late April and an application must be made within three months of the internal announcement of the adopted projects, which is in June.

## Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan



### Support for a development of Local Climate Change Action Plan of Davao City

- A development of GHG inventory (supported by IGES)
- A development of mitigation measures (supported by Kitakyushu City and IGES)
- A development of adaptation measures (supported by Ateneo De Davao Uni.)

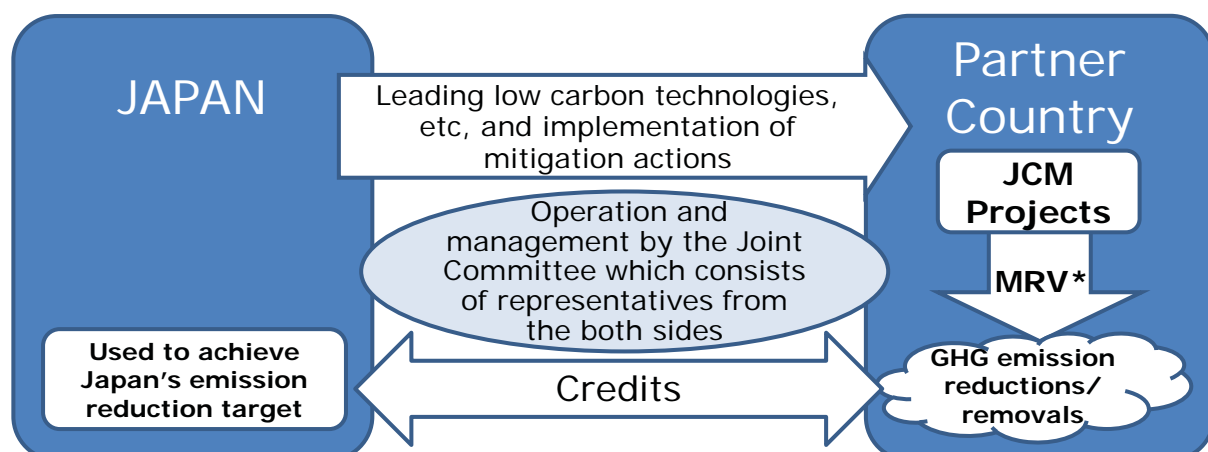
#### An implementation of concrete mitigation measures

#### Study on a feasibility of renewable energy project (for JCM model project)

- Waste-to-Energy (WtE) project (Nippon Steel & Sumikin Engineering Co., Ltd.)
- Feasibility study on other low-carbon projects (renewable energy and energy saving projects)
- Coordination with related-stakeholders for an implementation, technical study, evaluation of the amount of CO2 reduction, etc.
- Supporting for a preparation of applying JCM model project

## Basic Concept of Joint Crediting Mechanism (JCM)

- 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 to **GHG emission reductions or removals in a quantitative manner** and use them 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.



\*measurement, reporting and verification



## Study on possible application of JCM Model Project

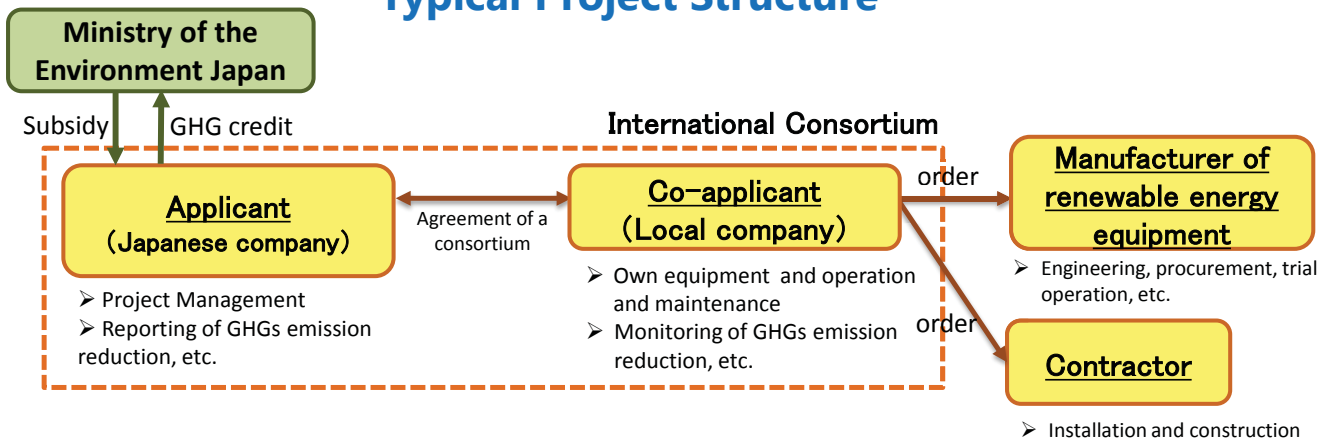
Possible low-carbon projects in Davao City:

- 1) Study on a possible application of the WtE project to JCM Model Project
- 2) Feasibility study on other low-carbon projects in Davao City

Components will be checked for a feasibility study on low-carbon projects:

- Forming an international consortium
- Coordination on a timing and condition of a procurement of a low-carbon project in Davao City with related organizations, etc.
- Coordination with manufacturers of renewable energy equipment as well as contractors
- Selection of equipment, calculate the amount CO<sub>2</sub> reduction, support for a preparation to apply for JCM Model Project

### Typical Project Structure



## Possible ideas of low-carbon projects in Davao City

Possible **public** projects:

- Solar panel on a roof of a public market located in Toril, Davao City
  - ✓ need to consult with MOEJ if it is regarded as a leading low-carbon technologies
  - ✓ The rate of a subsidy on an installation costs provided from MOEJ would be less than 50% (30 projects approved (2 in the Philippines) among 106 )
- Exchange of street lights to LED lights
  - ✓ need to further consult with Davao City and Davao lights
  - ✓ If it is a public project, need a open tender (matters of schedule & selection)
- Introduction of a few electronic buses for the High Priority Bus System
  - ✓ There is a case introduced an electronic bus and electronic charging station under a C2C Collaboration Programme under Kitakyushu and Hai Phong, VN.

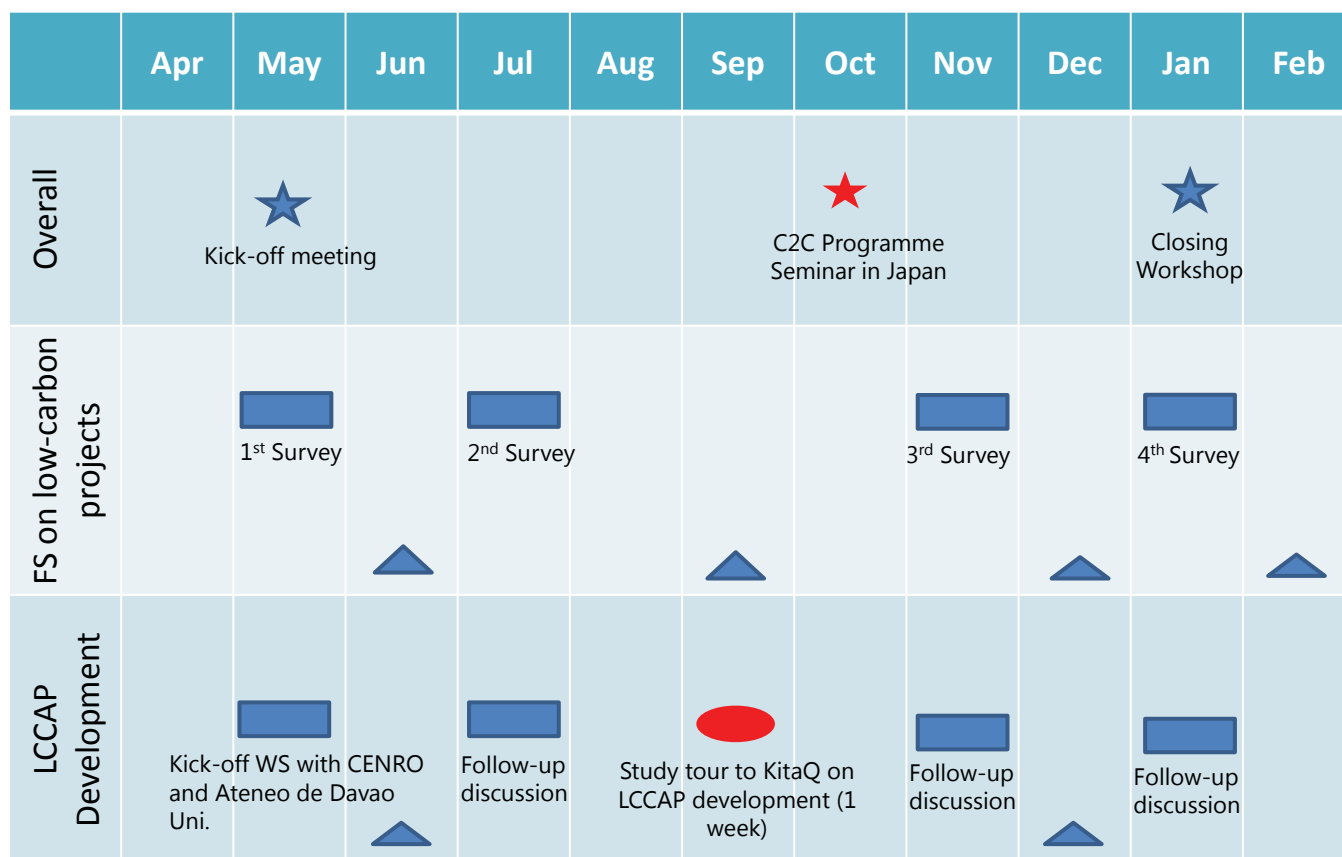


Possible **private** projects:

- Waste heat recovery-system to a cement facility
- High-efficiency chiller for air-conditioning to hotel or shopping mall, etc.
- High-efficiency boiler system to factories, etc.

Note: You can check the past approved JCM Model Projects at <http://gpc.jp/jcm/projects/>

## Schedule for the City-to-City Collaboration Programme



## Reference: Some conditions for JCM Model Project

- Finance rate will be determined based on the number of already selected JCM Model Projects using a similar technology in each country. The scope of the similar technology will be defined by MOEJ, as appropriately.
- Regardless of the finance rate, selected entities in JCM Model Project are expected to deliver at least half of JCM credits issued to Government of Japan.

Number of already selected projects using a similar technology in each partner country	None (0)	Up to 3 (<3, except 0)	More than 3 (> 3)
Maximum finance rate	50%	40%	30%

### Cost effectiveness (JPY/t-CO<sub>2</sub>)

- Dividing “the amount of proposed subsidy” by “the accumulated emission reduction” achieved during “the legal durable years” (under Japanese tax law).
- **5,000 JPY/t-CO<sub>2</sub> if the subsidy is more than 500mJPY (5mUSD) and 10,000 JPY-t-CO<sub>2</sub> if the subsidy is less than 500mJPY (5mUSD)**

**Payback period** (year) 
$$\frac{(\text{Total initial cost}) - (\text{Amount of subsidy})}{(\text{Reduction for annual operation cost})}$$

- Payback period of a proposed project should be more than 3 years.



# Support for a Development of Local Climate Change Action Plan (LCCAP) of Davao City

Junko Akagi

Kitakyushu Urban Centre

Institute for Global Environmental Strategies (IGES)

15.05.2018, Davao City

## Paris Agreement & SDGs

- Paris Agreement:
  - All Parties agreed to commit to suppress the temperature rise well below 2 °C and realize so-called “de-carbonized” society.
- INDCs of the Philippines:
  - 70% from the BAU scenario by 2030 (conditional) (Relative emission reduction)
  - Note that the Philippines government will declare NDCs by 2020.



# National Policy for Local Climate Actions

- Section 14 of The Climate Change Act specifically recognizes the role that LGUs play in mainstreaming climate change efforts within the government and requires them to **formulate and implement local climate change action plans (LCCAP)** that is consistent with local and national policies and frameworks.
- Section 3.3.5 of the Guidelines for the Formulation of the LCCAP strongly suggests **LGUs to identify mitigation options** to help reduce their carbon footprints and contribute to efforts in addressing climate change.

## Adaptation

Seeks to lower the risks posed by the consequences of climatic changes

Obligated

## Mitigation

Human intervention to reduce sources or enhance sinks of GHGs

Encouraged

## LGUs' Initiatives

- Large-scale cities are developing LCCAP with mitigation options:
  - Quezon
    - LCCAP was published in 2017.
    - GHG inventory is under improvement.
  - Davao
    - LCCAP with a focus on adaptation has been developed with Ateneo De Davao University.
    - GHG inventory and mitigation options will be incorporated in the LCCAP in collaboration with IGES and City of Kitakyushu.

Scope of our project

(Collaboration among Davao City, Ateneo De Davao University, and IGES)

**Strategy for low carbon City development**

**Quezon City Local Climate Change Action Plan (LCCAP) 2017 - 2027**

**The Quezon City Local Climate Change Action Plan (QC LCCAP) 2017-2027 is the consolidation of following documents:**

- Legal Mandates
- Background on Quezon City
- Climate Change Vulnerability
- Mission, Vision and Objectives
- Climate Change Vulnerability/Sensitivity Analysis (CC)
- GHG Emissions and Opportunities for Reductions
- Situation Analysis
- Climate Change Adaptation and Mitigation Programs, Projects and Activities

May 2017

Quezon City Government & UP Planning and Development Research Foundation, Inc

\*The above documents are the outputs of the workshops and forums conduct with direct and indirect stakeholders of Quezon City Government (QCG) during the Project period.

Source: Capili J. Presentation by Quezon city at the Seminar on City-to-City Collaboration for Creating Low-Carbon Society. Jan 2018.



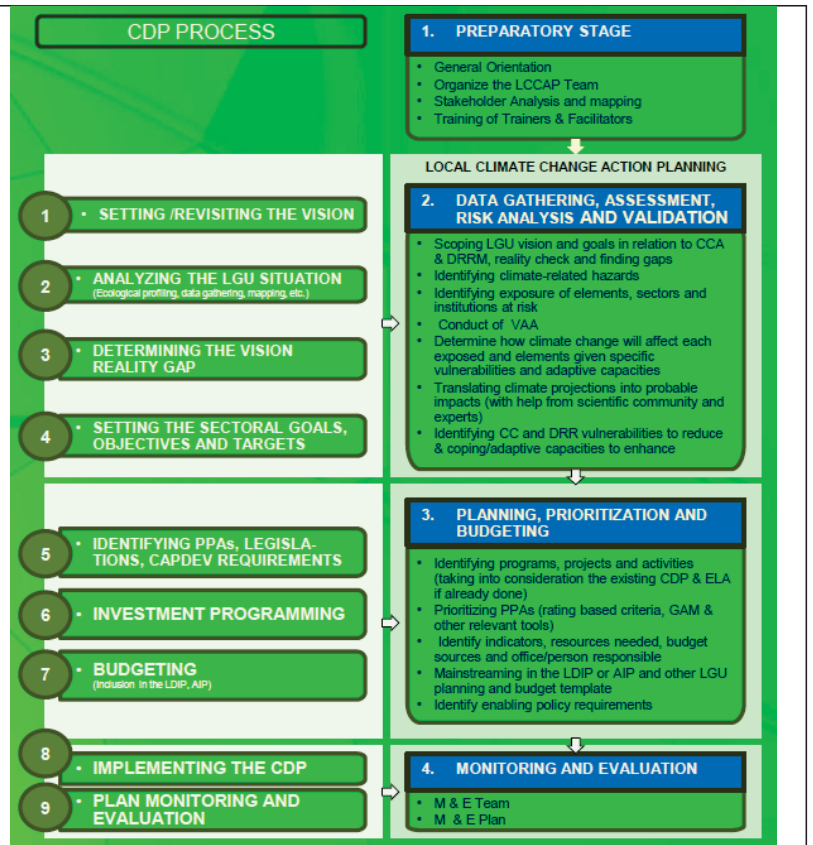
Pilot Training Workshop: "Climate Change Strategies for Local Governments: Low-Carbon City Policy Development and Implementation" (2017)



# Steps for the LCCAP Development

With a focus on adaptation

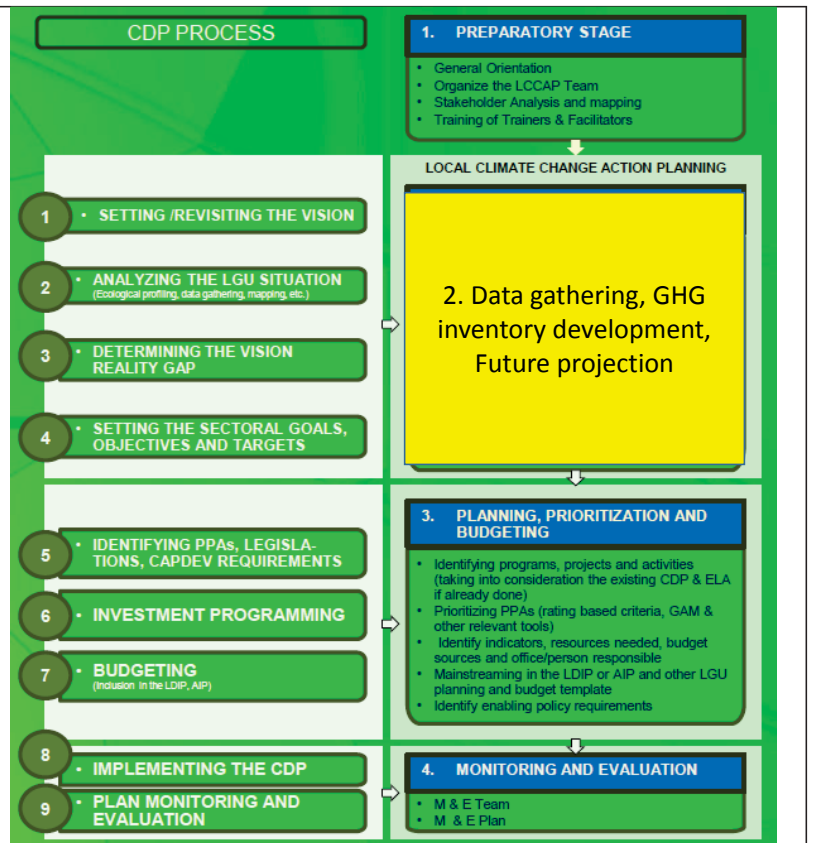
Source: Guidelines on the Formulation of Local Climate Change Action Plan (LCCAP) A LGA-DILG Presentation for Communities for Resilience (CORE) Convergence Forum for the Buayan-Malungon, Cagayan de Oro, Davao & Tagoloan River Basins, June 8-9, 2016, Cagayan de Oro City



# Steps for the LCCAP Development

With a focus on mitigation

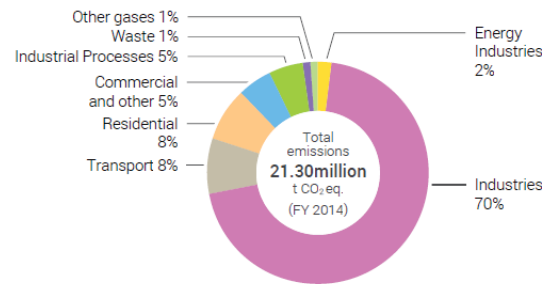
In order to set a target and reduce GHG emissions, we need to know how much GHGs are released from where.



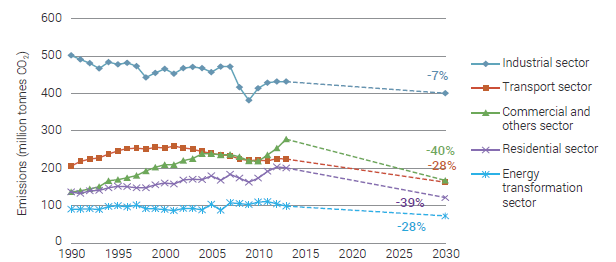
# GHG Inventory

GHG inventory is developed ...

- To know current emission status of the city
- To serve as a basis for future projection
- To consider appropriate mitigation options
- To prioritize mitigation options by recognizing key emission sources
- To monitor the progress of low-carbonization



Emission profile of Kitakyushu



Time-series data of Japan

# Assessment Boundaries

Any anthropogenic activities are the subject of estimation.

Example of assessment boundaries

<Time period>

- One year

<Greenhouse gases>

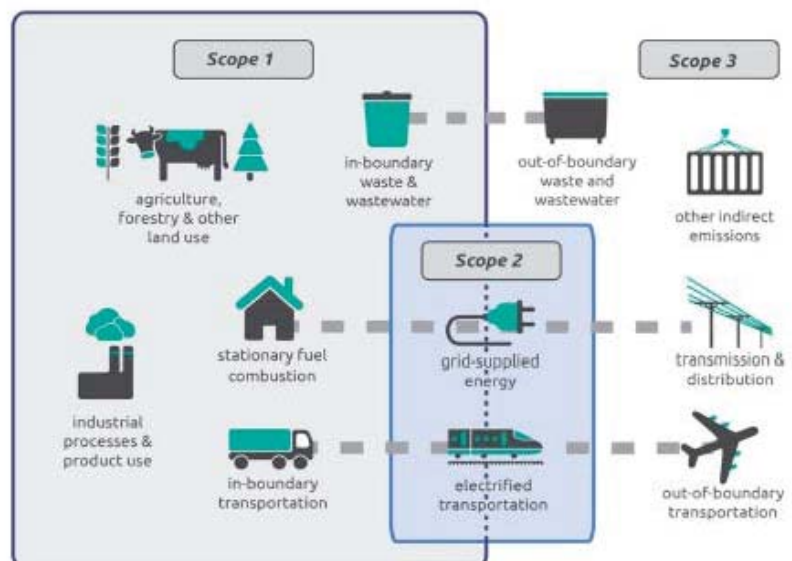
- CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, NF<sub>3</sub>

<Geographical boundaries>

- City's jurisdiction

<Emission sources>

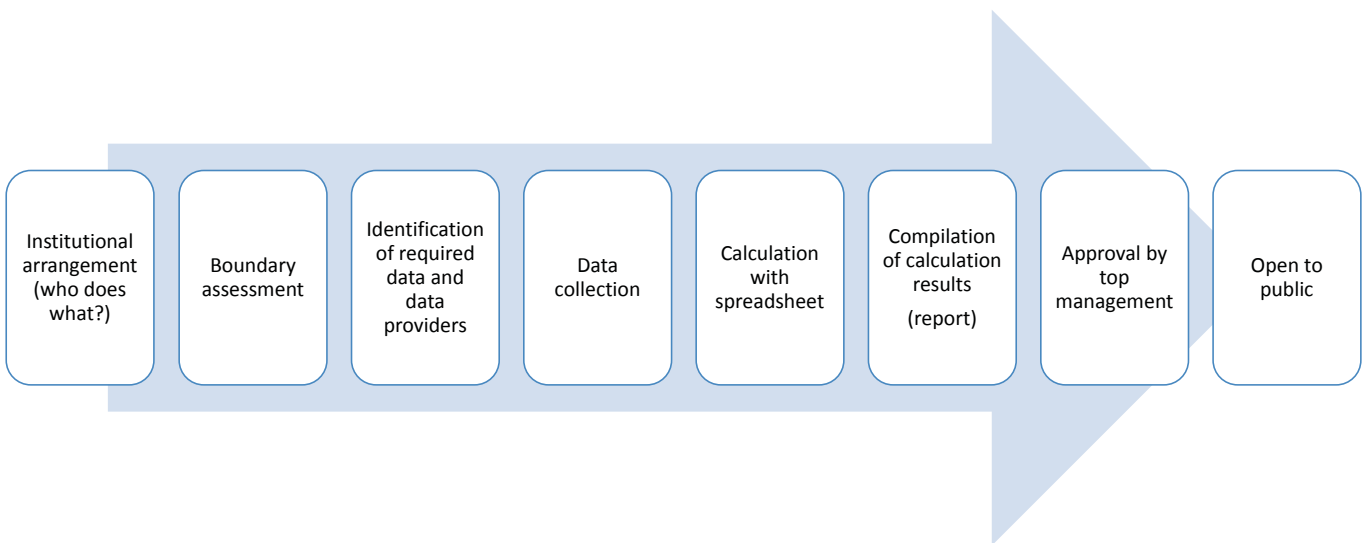
- Stationary Energy Sources, Transportation, IPPU, Waste, AFOLU



Source: GPC



# Development Procedure of GHG Inventory

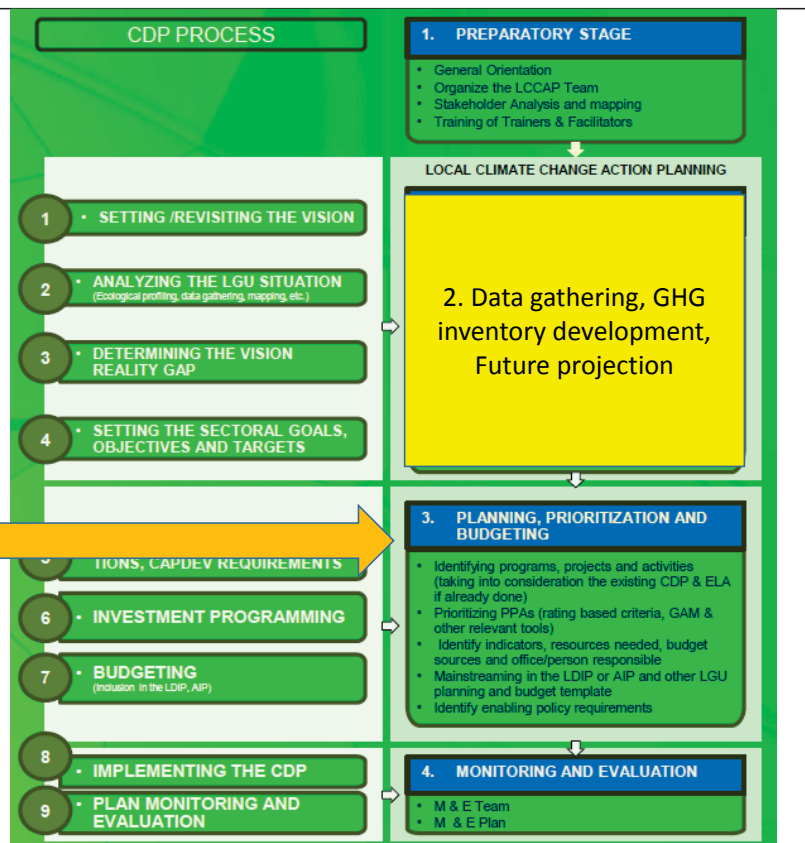


## Steps for the LCCAP Development

With a focus on mitigation

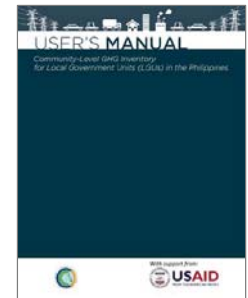
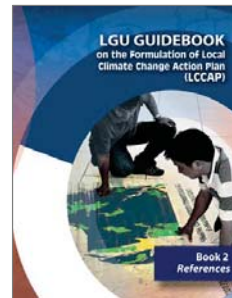
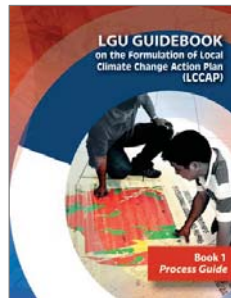
Identifying mitigation options

Measures implemented for different purposes can often be regarded as mitigation options.



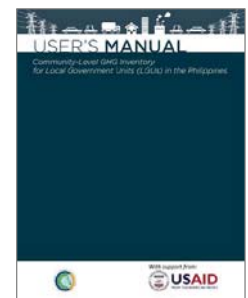
# Guidebooks in the Philippines

- LGU Guidebook 1 & 2  
(Developed by Local Government Academy (LGA)  
Department of Interior and Local Government)
- GHG Inventory Manual  
(Developed by Climate Change Commission (CCC)  
with support from USAID)



- Supplementary documents (where applicable):
  - Philippines National Communications,
  - Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC),
  - IPCC 2006 Guidelines,
  - Guidelines for developing local action plans in Japan,
  - Kitakyushu case study (New Green Frontier Plan, etc.)

# Spreadsheets for Calculation



For data input

Emission Source	GHG Emissions (tonnes CO <sub>2</sub> e)	Proportion of Total Emissions	Weighted Uncertainty
<b>Scope 1 Emissions (Net of Forestry and Land Use)</b>			
GHG Emissions from Community-Level Residential Stationary Fuel Use	0.00	0.00%	
GHG Emissions from Community-Level Commercial Stationary Fuel Use	0.00	0.00%	
GHG Emissions from Community Mobile Combustion	0.00	0.00%	
GHG Emissions from Solid Waste Disposal - IPCC FOD Method*	0.00	0.00%	
GHG Emissions from Other Solid Waste Treatment (ICLEI)*	0.00	0.00%	
GHG Emissions from Solid Waste Open Burning (ICLEI)*	0.00	0.00%	
GHG Emissions from Wastewater Treatment and Discharge	0.00	0.00%	
GHG Emissions from Community-Level Agriculture (Crops)	0.00	0.00%	
GHG Emissions from Community-Level Agriculture (Livestock)	0.00	0.00%	
GHG Emissions from Solid Waste Disposal - Inside LGU Geopolitical Boundaries (ICLEI)	0.00	0.00%	
GHG Emissions from Wastewater Treatment and Discharge (Other Sources)	0.00	0.00%	
GHG Emissions from Industrial Processes and Product Use	0.00	0.00%	
<b>Scope 1 Emissions/Removal (Forestry and Land Use)</b>			
GHG Emissions from Forestry and Land Use			
GHG Removal from Sink			
<b>Total Scope 1 Emissions</b>			
<b>Scope 2 Emissions</b>			
GHG Emissions from Purchased Electricity at Community-Level Residential Sites			
GHG Emissions from Purchased Electricity at Community-Level Commercial Sites			
GHG Emissions from Purchased Electricity at Community-Level for All Other Sources			
<b>Total Scope 2 Emissions</b>			
<b>Scope 3 Emissions</b>			
GHG Emissions from Solid Waste Disposal - Outside LGU Geopolitical Boundaries (ICLEI)			
<b>Total Scope 3 Emissions</b>			
<b>Total Emissions and Uncertainty</b>			
<b>Overall Certainty of Inventory</b>			

Data Collection Guidance: Residential Stationary Combustion (Scope 1) Activity Data									
Activity	Units	Year	Conversion Factor	GHG Emissions (tonnes CO <sub>2</sub> e)	Uncertainty (%)	Notes	Update	Check to update for "Direct and Indirect" emissions list below	Additional Data Collection and Quality Management Information
Residential Stationary Combustion	Units	Year	Conversion Factor	GHG Emissions (tonnes CO <sub>2</sub> e)	Uncertainty (%)	Notes	Update	Check to update for "Direct and Indirect" emissions list below	Additional Data Collection and Quality Management Information
Residential Stationary Combustion	Units	Year	Conversion Factor	GHG Emissions (tonnes CO <sub>2</sub> e)	Uncertainty (%)	Notes	Update	Check to update for "Direct and Indirect" emissions list below	Additional Data Collection and Quality Management Information

Summary



# Goal of our Project

Three components are incorporated into the LCCAP of Davao City.

## GHG Inventory

- ✓ Davao City gov. determines the assessment boundaries and collect necessary information and data for accounting.
- ✓ IGES provides technical assistance for developing a GHG inventory.

### Assessment boundaries

- Time period
- Greenhouse gases
- Geographic boundaries
- Emission sources

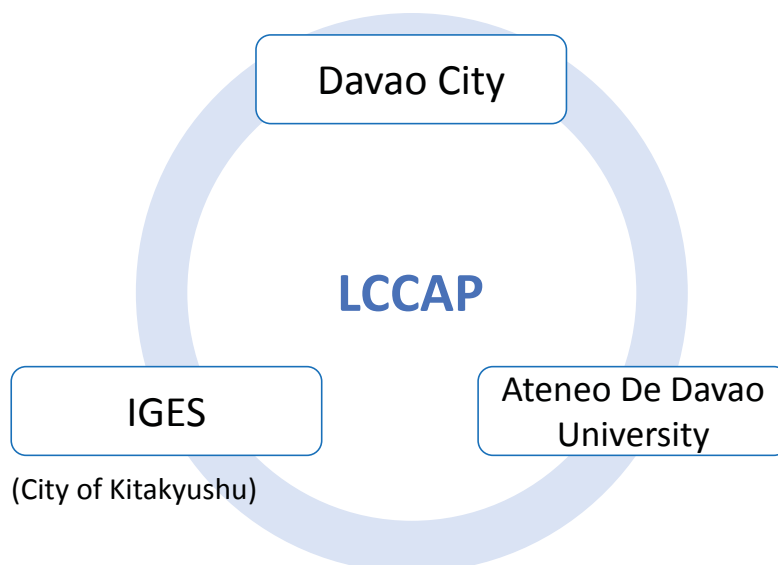
## Mitigation Options

- ✓ Davao City gov. collects information on mitigation options which are being or to be implemented for a different purpose.
- ✓ IGES and Kitakyushu City share ideas of potential mitigation options for Davao City (e.g., JCM projects).
- ✓ Know-how on implementation and management is shared between two cities.

## Adaptation Measures

- ✓ Davao City gov., Ateneo De Davao University and IGES work together on the adaptation measures.

# Collaboration among Three Entities





# Training Workshop in Japan



Scenes from workshop held last year

**Thank you for your attention!**





Option 2 (Fuel consumption)		Application If Using Fuel Consumption-Based Method	Annual Fuel Consumption or Fuel Sold by Fuel Supplier	Units	Data Uncertainty
<p><b>Electricity</b></p> <p>City Planning Dept.</p>	Tab	Community-Level Mobile Combustion (Scope 1) Activity Data <i>Mobile Comb-Community-All Data</i>	Mobile combustion - all applications	litres	
			100% Biodiesel	litres	
			Aviation Gasoline	litres	
			B20 Biodiesel/Diesel	litres	
			CNG	m <sup>3</sup>	
			E85 Ethanol/Gasoline	litres	
			Ethanol	litres	
			Gasoline/Petrol	litres	
			Jet Fuel	litres	
			LNG	m <sup>3</sup>	
			LPG	kg	
			On-Road Diesel Fuel	litres	
		Residual Fuel Oil (3s 5 and 6)	litres		
<p><b>Electricity</b></p> <p>City Planning Dept.</p>	Tab	Actual Annual Electricity Consumption	Actual Annual Electricity Consumption	Units	Data Uncertainty
		Residential Electricity Consumption (Scope 2) Activity Data <i>Elec-Residential Data</i>		kWh	
		Commercial Electricity Consumption (Scope 2) Activity Data <i>Elec-Commercial Data</i>			
		All Other (Scope 2) Activity Data (e.g. MRT, Streetlights, etc.) <i>Elec-Other</i>			
	Tab	Agriculture (Crops) Activity Data <i>Agriculture-Crops Data</i>	Total Hectares Under Production	Units	Data Uncertainty
			Rice (Dry Season, Irrigated)	ha	
		Rice (Dry Season, Rainfed)	ha		

Heavy Duty Vehicle - Rigid - Gasoline - Year 2004

Heavy Duty Vehicle - Rigid - Gasoline - Year 2005-present

Heavy Duty Vehicle - Rigid - LNG

Light Goods Vehicle - Diesel - Year 1983-1995

Light Goods Vehicle - Diesel - Year 1996-present

Light Goods Vehicle - Ethanol

Light Goods Vehicle - Gasoline - Year 1987-1993

Light Goods Vehicle - Gasoline - Year 1994

Light Goods Vehicle - Gasoline - Year 1995

Light Goods Vehicle - Gasoline - Year 1996

Light Goods Vehicle - Gasoline - Year 1997

Light Goods Vehicle - Gasoline - Year 1998

Light Goods Vehicle - Gasoline - Year 1999

Light Goods Vehicle - Gasoline - Year 2000

Light Goods Vehicle - Gasoline - Year 2001

Light Goods Vehicle - Gasoline - Year 2002

Light Goods Vehicle - Gasoline - Year 2003

Light Goods Vehicle - Gasoline - Year 2004

Light Goods Vehicle - Gasoline - Year 2005-present

Light Goods Vehicle - LPG

Motorbike - Control Unknown

Motorbike - Non-Catalyst Control

Motorbike - Uncatalyzed

Passenger Car - Diesel - Year 1960-1982

Passenger Car - Diesel - Year 1983-present

Passenger Car - Gasoline - Year 1984-1993

Passenger Car - Gasoline - Year 1994

Passenger Car - Gasoline - Year 1995

Passenger Car - Gasoline - Year 1996

Passenger Car - Gasoline - Year 1997

Passenger Car - Gasoline - Year 1998

Passenger Car - Gasoline - Year 1999

Passenger Car - Gasoline - Year 2000

Passenger Car - Gasoline - Year 2001

Passenger Car - Gasoline - Year 2002

Passenger Car - Gasoline - Year 2003

Passenger Car - Gasoline - Year 2004

Passenger Car - Gasoline - Year 2005-present

			Total Headcount	Units	Data Uncertainty
		Rice (Wet Season, Irrigated)		ha	
		Rice (Wet Season, Rainfed)		ha	
		Other Crop Type		ha	
		Buffalo		head	
		Cattle		head	
		Goat		head	
		Horse		head	
		Other		head	
		Poultry		head	
		Swine		head	
		Starting year of SWDS		Units	Data Uncertainty
		Unmanaged, shallow		%	
		Unmanaged, deep		%	
		Managed		%	
		Managed, semi-aerobic		%	
		Uncategorised		%	
		Population (LGU)		inhabitants	
		Waste per capita (tonnes/capita/yr)		tonnes/capita/yr	
		% to Solid Waste Disposal Site (SWDS)		%	
		% MSW Composted		%	
		% MSW Sent to Anaerobic Digestion		%	
		% MSW Open Burned		%	
		% Total MSW Other/Unspecified		%	
		Application of Using Fuel Consumption-Based Method		Units	Data Uncertainty
		Total Solid Waste (Actual) for District/Barangay		t	
		Fraction of Total Waste Sent to Specific Landfill Type		%	
		Total Population		inhabitants	
		Total Solid Waste (Actual) for District/Barangay		t	
		Fraction of Total Solid Waste Sent for Anaerobic Digestion		%	
		Fraction of Total Solid Waste Sent for Open Burning		%	
		Total Population		inhabitants	
		Total Solid Waste (Actual) for District/Barangay		t	
		Amount of Total Solid Waste Open Burned		inhabitants	
		Total population in LGU		%	
		% population using the system		%	
		Total population in LGU		inhabitants	
		% population using the system		%	
		Wood and Wood Products Harvesting		Units	Data Uncertainty
		Fuelwood		t	
		Charcoal		t	
		Construction		t	
		Novelties		t	
		Used for Agriculture		ha	
		Used as Grasslands		ha	
		Left as Barren Areas		ha	
		Annual Total Consumption		Units	Data Uncertainty
		Protection Forest/Old Growth/Mossy/Pine/Submarginal Mangrove		ha	
		Secondary Growth		ha	
		Brushland - for wood		ha	
		Grassland		ha	
		Tree Plantation - S. macrophylla		ha	
		Barren to Forestland		ha	
		Grassland to Forestland		ha	
		Wetlands to Forestland		ha	
		Settlement to Forestland		ha	
		Cropland to Forestland		ha	
		Annual Total Removal		Units	Data Uncertainty
		Mineral Industry - Yes		Units	Data Uncertainty
		Cement Production - Portland		t	
		Cement Production - Blended		t	
		Lime Production		t	
		Glass Production		t	
		Ammonia Production		t	
		Chemical Industry - Almost no		NO	
		Industrial Processes Emission Activity Data		Units	Data Uncertainty
		Industrial Processes Emission Activity Data		t	
		Lime Production		t	
		Glass Production		t	
		Ammonia Production		t	
		Coordination with an association?		NO	

**Solid waste**

Option 1 (IPCC FOD)

CENRO

Solid Waste Disposal Parameters (IPCC FOD Method, Scope 1)

Solid Waste-Parameters-IPCC FOD

Solid Waste Disposal Methane Correction Factor (MCF) Calculation (If Distribution of Waste by Waste Management Type - Annex A1.1)

Solid Waste-MCF-IPCC FOD

MSW Activity Data Input (IPCC FOD Method)

Solid Waste-Activity-IPCC FOD

Waste Diversion (Destination) Rates (%) and Amounts (tonnes)

% to Solid Waste Disposal Site (SWDS)

% MSW Composted

% MSW Sent to Anaerobic Digestion

% MSW Open Burned

% Total MSW Other/Unspecified

Application of Using Fuel Consumption-Based Method

Total Solid Waste (Actual) for District/Barangay

Fraction of Total Waste Sent to Specific Landfill Type

Total Population

Total Solid Waste (Actual) for District/Barangay

Fraction of Total Solid Waste Sent for Anaerobic Digestion

Fraction of Total Solid Waste Sent for Open Burning

Total Population

Total Solid Waste (Actual) for District/Barangay

Amount of Total Solid Waste Open Burned

Total population in LGU

% population using the system

Total population in LGU

% population using the system

Wood and Wood Products Harvesting

Fuelwood

Charcoal

Construction

Novelties

Used for Agriculture

Used as Grasslands

Left as Barren Areas

Annual Total Consumption

Protection Forest/Old Growth/Mossy/Pine/Submarginal Mangrove

Secondary Growth

Brushland - for wood

Grassland

Tree Plantation - S. macrophylla

Barren to Forestland

Grassland to Forestland

Wetlands to Forestland

Settlement to Forestland

Cropland to Forestland

Annual Total Removal

Mineral Industry - Yes

Cement Production - Portland

Cement Production - Blended

Lime Production

Glass Production

Ammonia Production

Chemical Industry - Almost no

Industrial Processes Emission Activity Data

Industrial Processes Emission Activity Data

Lime Production

Glass Production

Ammonia Production

Coordination with an association?

NO

**Industrial processes**

Industrial Processes Emission Activity Data

Industrial Processes Emission Activity Data

Lime Production

Glass Production

Ammonia Production

Coordination with an association?

NO



City Planning Dept.

	Soda Ash Production	t
	Petrochemical and Carbon Black Production - Methanol	t
	Petrochemical and Carbon Black Production - Ethylene	t
	Petrochemical and Carbon Black Production - Ethylene Dichloride and Vinyl Chloride Monomer	t
	Petrochemical and Carbon Black Production - Ethylene Oxide	t
	Petrochemical and Carbon Black Production - Acrylonitrile	t
	Petrochemical and Carbon Black Production - Carbon Black	t
Metal Industry - Yes	Iron and Steel Production from Integrated Facilities	t
	Iron and Steel Production from Non-integrated Facilities	t
Electronics Industry	Integrated Circuit or Semiconductor	t
	TFT Flat Panel Display	t
	Photovoltaics	t
	Heat Transfer Fluid	t
Others	Pulp and Paper Industry	t
	Food and Beverages Industry	t
	Other	t

**Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan**

**Program for the Training Workshop on Local GHG Inventory**

Date: 6 (Tue) – 8 (Thu) November 2018  
 Place: Station Hotel Kokura (1-1-1, Asano, Kokura-kita-ku, Kitakyushu City, Japan)  
 Invitees: 5 representatives from Davao City government and relevant stakeholders  
 Objectives: To learn Kitakyushu's practice on the LCCAP development;  
 To visit the sites where Kitakyushu's mitigation measures are implemented.

Date	Actions	Venue
11/5 (Mon)	<a href="#">Fly from Davao to Fukuoka</a> <a href="#">Move from Fukuoka to Station Hotel Kokura</a>	
11/6 (Tue)	09:30 Opening remarks (IGES) 09:35 Explanation of the overview of training course (IGES) 09:50 Self-introduction by participants 10:00 <b>Lecture: Low-carbon city development – Kitakyushu's energy strategy – (City of Kitakyushu)</b> 12:00 Lunch 14:00 <b>Lecture: LCCAP development including GHGI (City of Kitakyushu)</b> 15:30 Break 15:40 <b>Presentation: Overview of master plan &amp; LCCAP (Davao)</b> 16:40 Discussion 17:00 End of the day 17:30 Reception (Agura)	Hotel 5F Kazashi          Kajimachi 1-2-3
11/7 (Wed)	09:30 <b>Lecture: How to estimate GHG emissions (IGES)</b> 11:00 <b>Hands-on training: Calculation by participants</b> 12:00 Lunch 13:30 <b>Hands-on training: Calculation by participants (Cont.) &amp; presentations on the results of GHG emissions by participants</b> 15:00 Break 15:20 <b>Discussion: Future development of JCM projects in Davao (IGES)</b> 17:00 End of the day	Hotel 5F Kazashi   
11/8 (Thu)	09:30 <b>Site visit: Kogasaki waste-to-energy facility, Honjo can and bottle recycling center</b> 12:30 Lunch 13:30 <b>Overall discussions</b> 15:00 Closing remarks (Asian Center for Low Carbon Society)	Kogasaki, Honjo   Hotel 4F Katsuyama
11/9 (Fri)	<a href="#">Move from Station Hotel Kokura to Fukuoka</a> <a href="#">Fly from Fukuoka to Davao</a>	

Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan

## Training Workshop on Local GHG Inventory - List of Participants

6 (Tue) – 8 (Thu) November 2018, Station Hotel Kokura

Davao City				
		Name	Job title	Affiliation
1	Ms	Bing Dela Victoria	Economist IV	City Planning Development Office (CPDO)
2	Ms	Jo Ann Esguerra	Project Evaluation Officer III	City Planning Development Office (CPDO)
3	Ms	Melody Samuya Dapusala	Engineer II	Davao City Environment and Resources Office (CENRO)
4	Mr	Rodrigo Camarista Bustillo	Local DRRM Officer III	Disaster Risk Reduction Management Office (DRRMO)
5	Mr	Lyndon Leovic Leal Ancajas	Local DRRM Officer II	Disaster Risk Reduction Management Office (DRRMO)

City of Kitakyushu (International Environmental Economic Affairs Department, Environment Bureau)				
		Name	Job title	Affiliation
1	Mr	Michiya Hirayama	Assistant Manager	Regional Energy Promotion Division
2	Mr	Yosuke Mitoma	Assistant Manager	Global Warming Prevention Division
3	Mr	Yasuhiko Takatsuka	Manager	Kitakyushu Asian Center for Low Carbon Society

Institute for Global Environmental Strategies (IGES)				
		Name	Job title	Affiliation
1	Mr	Shiko Hayashi	Programme Director	Kitakyushu Urban Centre
2	Ms	Junko Akagi	Research Manager	Kitakyushu Urban Centre
3	Ms	Shino Horizono	Programme Coordinator	Kitakyushu Urban Centre
4	Ms	Larissa de Miranda Alem	Intern	Kitakyushu Urban Centre

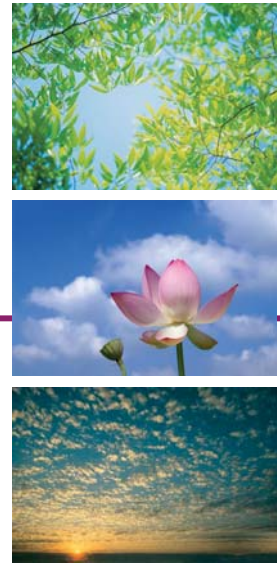


# Training Workshop on Local GHG Inventory

## Orientation

Junko Akagi  
Research Manager  
Kitakyushu Urban Centre

06-08 Nov. 2018



## ORGANIZERS

### ORGANIZER

- Institute for Global Environmental Strategies (IGES)

### MAIN COLLABORATOR

- Kitakyushu City Government

### SPONSERSHIP

- Ministry of the Environment, Japan (MOEJ)



## Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan



### Support for a development of Local Climate Change Action Plan of Davao City

- A development of GHG inventory (supported by IGES)
- A development of mitigation measures (supported by Kitakyushu City and IGES)
- A development of adaptation measures (supported by Ateneo De Davao Uni.)

#### An implementation of concrete mitigation measures

#### Study on a feasibility of renewable energy project (for JCM model project)

- Waste-to-Energy (WtE) project (Nippon Steel & Sumikin Engineering Co., Ltd.)
- Feasibility study on other low-carbon projects (renewable energy and energy saving projects)
- Coordination with related-stakeholders for an implementation, technical study, evaluation of the amount of CO2 reduction, etc.
- Supporting for a preparation of applying JCM model project

## Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan

### 1. Kick-off meeting

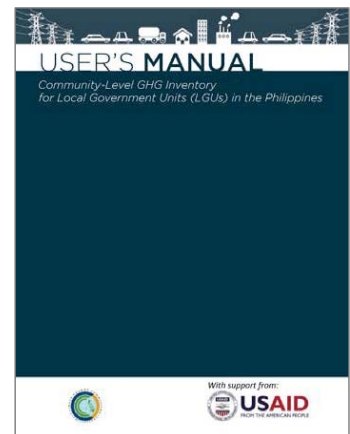
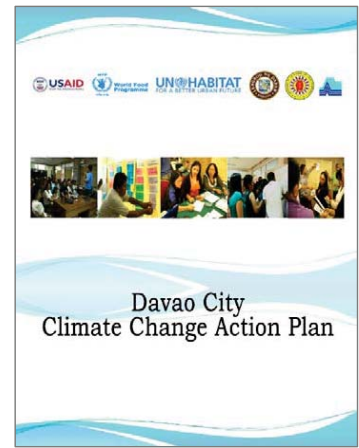
- 15 May 2018, 9:30~12:00
- Participation from Davao City government:  
 Mr. Domingo, Assistant City Administrator ,  
 Mr. Ivan Cortez, head of CPDO,  
 Ms. Marvic Reyes, head of CENRO, and others
- Participation from Japan side:  
 Mr. Yoshiaki Miwa, Counsellor & Director of  
 Consular Office in Davao Embassy of Japan
- Meeting with Vice Mayor Bernie Al-ag followed by the kick-off meeting.
- Prof. Doris Montecastro from Ateneo de Davao University
- In the afternoon, a workshop was held for CENRO staffs on the data collection for a GHG inventory.



**Project to realize low carbon society in Davao City  
through a support for a development of Local Climate Action Plan**

**2. Support for a LCCAP development**

- Current LCCAP of Davao covers mainly adaptation aspect supported by UN-HABITAT.
- GHG inventory will be produced in line with the Community-Level GHG Inventory for Local Government Units (LGUs) in the Philippines (USAID)
- In Davao, CPDO, CENRO and other relevant departments are involved in the data collection process.
- Ateneo de Davao University supports Davao City government.



**Project to realize low carbon society in Davao City  
through a support for a development of Local Climate Action Plan**

**Schedule for the project**

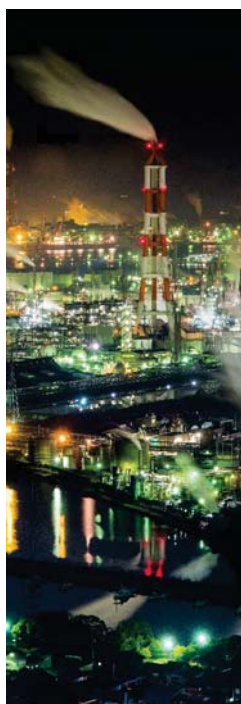
- Schedule?

	2018					2019				
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Kick-off MTG (Today)	★									
Internal discussion 1										
Data collection 1		★								
Progress check					★					
Data collection 2										
Hands-on training in Japan										
Emission estimation										
Internal discussion 2										
GHG inventory finalization										
Consider mitigation options										
Documentation as LCCAP										★
LCCAP finalization										

MTG in Japan



# OBJECTIVES



<http://free-images.gatag.net/>

The training workshop aims to:

- learn Kitakyushu's practice on the LCCAP development;
- learn how to estimate GHG emissions & emission reduction potential (MRV);
- learn overview of JCM scheme;
- visit the sites where Kitakyushu's mitigation measures are implemented; and
- promote city-to-city collaboration for low-carbon, resilient and sustainable cities.

# OUTLINE OF THE WORKSHOP

**DAY 1**  
6 Nov.

## Opening and introduction

Lecture: Low-carbon city development – Kitakyushu's energy strategy –

Lecture: LCCAP development including GHGI

Presentation by Davao City: Overview of master plan & LCCAP

*\* Social event: Reception*

**DAY 2**  
7 Nov.

Lecture: How to estimate GHG emissions & emission reduction potential

Discussion: Future development of JCM projects in Davao

**DAY 3**  
8 Nov.

Site visit: Kogasaki WtE facility, Honjo can and bottle recycling center

Overall discussion, wrap-up and closing

# WELCOME TO KITAKYUSHU!

Name	Affiliation
Ms. Bing Dela Victoria	City Planning Development Office (CPDO)
Ms. Jo Ann Esguerra	City Planning Development Office (CPDO)
Ms. Melody Samuya Dapusala	Davao City Environment and Resources Office (CENRO)
Mr. Rodrigo Camarista Bustillo	Disaster Risk Reduction Management Office (DRRMO)
Mr. Lyndon Leovic Leal Ancajas	Disaster Risk Reduction Management Office (DRRMO)



# LOCAL CLIMATE CHANGE ACTION PLAN



## Order of Presentation

- I. Vulnerability Assessment
  - Exposure
  - Sensitivity
  - Adaptive Capacity
- II. Key Adaptive Options
  - Social Sector
  - Economic Sector
  - Environment Sector
  - Infrastructure
  - Land Use
- III. GHG Inventory: Davao City Experience
- IV. Institutional Arrangement
- V. Availability of GHG Indicators
- VI. Issues and Concerns



## V&AA: Determinants of Vulnerability



$$\text{Vulnerability} = f(\text{Exposure, Sensitivity, Adaptive Capacity})$$

## CITY-WIDE EXPOSURE ANALYSIS

Climate Change Drivers and Biophysical Effects  
(Hazards)

## Davao City is experiencing climate changes

*Changes in  
Average/means*



- Increasing Temperature
- Increase & Decrease in average rainfall

*Occurrence of  
Extreme Events*



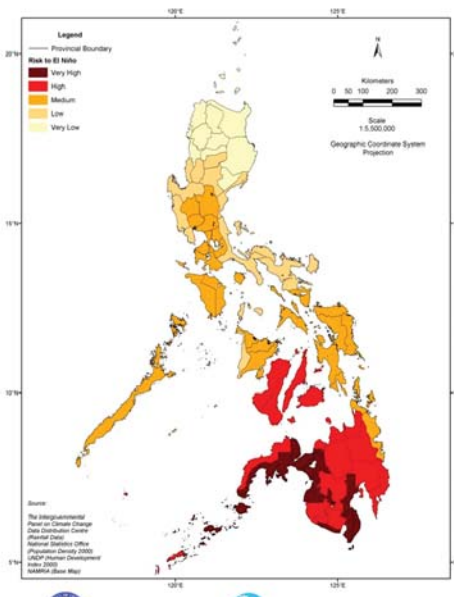
- Increase in Temp. higher than 35°C
- Episodes of El Nino and La Nina
- Increase in Days without rain (dry days)
- Increase in Rainfall more than 150 mm

Source: PAGASA

EXPOSURE

Mapping Philippine Vulnerability to Environmental Disasters

### Risk to El Niño



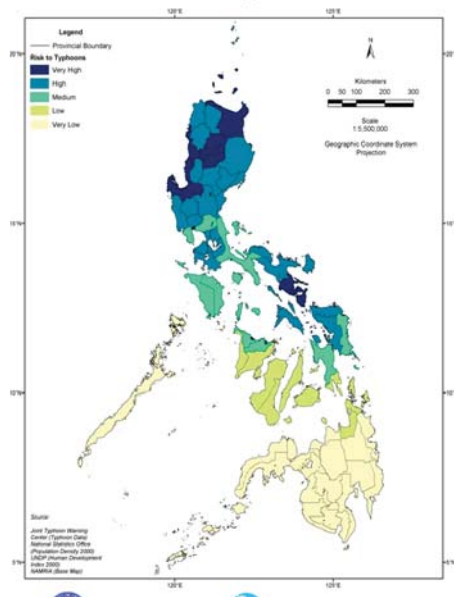
MANILA OBSERVATORY



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Mapping Philippine Vulnerability to Environmental Disasters

### Risk to Typhoons



MANILA OBSERVATORY

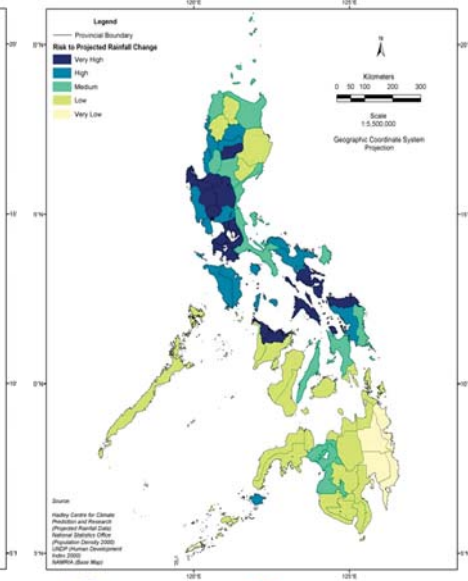
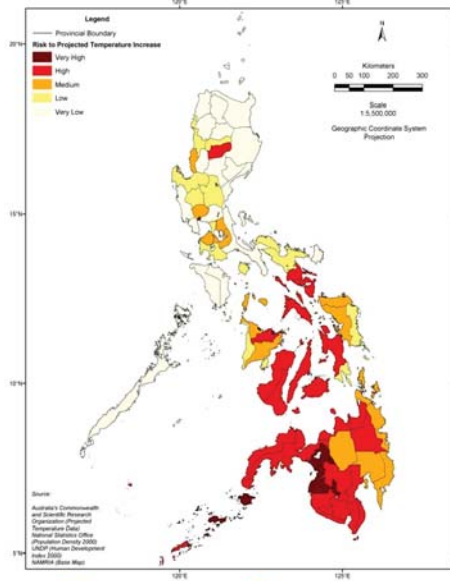


DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

EXPOSURE

**Risk to Projected Temperature Increase**

**Risk to Projected Rainfall Change**



MANILA OBSERVATORY DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

MANILA OBSERVATORY DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

**EXPOSURE**

**Climate Change-Induced Hazards in Davao City**

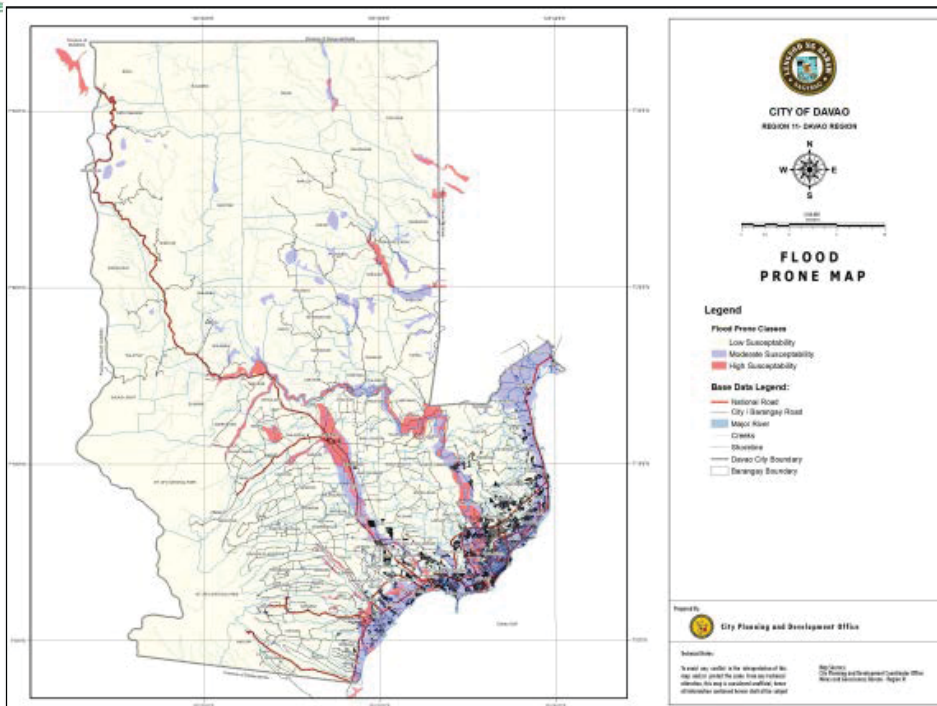


**EXPOSURE**

# Flooding



**EXPOSURE**

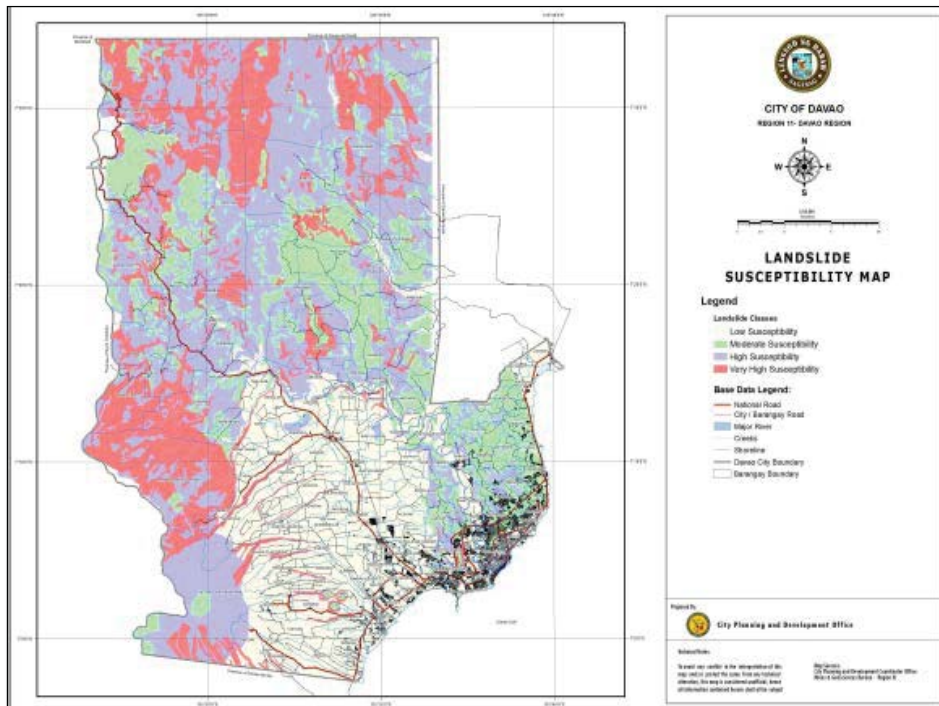




## Rain Induced Landslide



**EXPOSURE**



## Monsoon Waves



EXPOSURE

## Strong Wind



EXPOSURE

## Drought



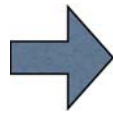
EXPOSURE

## Sea level Rise



EXPOSURE

# SENSITIVITY ANALYSIS



## Five (5) Development Sectors

- (a) Social
- (b) Economic
- (c) Environment
- (d) Infrastructure
- (e) Land Use

## Sectoral SENSITIVITIES to Climate Change Exposure

### Social

- Settlements in areas that are highly susceptible to hazards
- Informal settlers in danger zones
- Under privileged (PWD, children, senior citizens)
- Social/health/educational facilities in hazard areas

### Economic

- Agricultural crops/livestock
- Businesses/industries
- Tourism sites/attractions

### Land Use

- Residential
- Commercial

- Industrial
- Institutional
- Agricultural

### Infrastructure

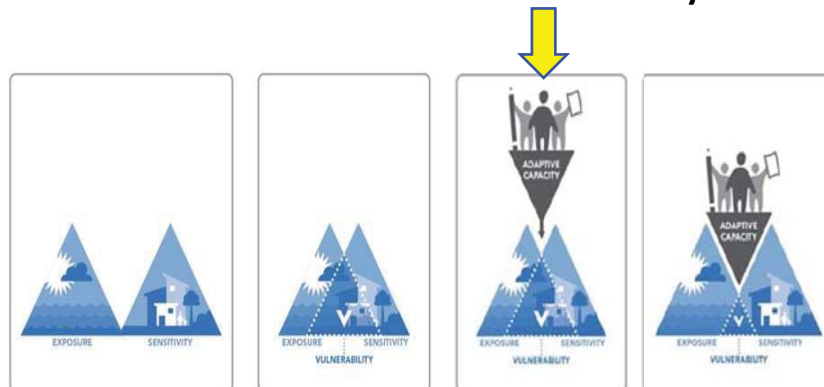
- Roads and bridges
- Water ,power & Telecommunication facilities
- Irrigation system
- Transportation system (ports, terminals, etc.)
- Drainage system
- Public buildings (city hall, Market, etc.)

### Environment

- Coastal /marine resources
- Flora and fauna habitat
- Water bodies



## V&AA: Determinants of Vulnerability



$$\text{Vulnerability} = f(\text{Exposure}, \text{Sensitivity}, \text{Adaptive Capacity})$$

## ADAPTIVE CAPACITY ANALYSIS

- Wealth
- Information
- Technology
- Institution and Governance
- Social Capital
- Infrastructure

## ADAPTIVE CAPACITY ANALYSIS

### Wealth

- **Level of Education**
  - ✓ literacy rate of 98.30% in 2012
- **Employment Opportunities**
  - ✓ employment rate is at 92.54% of for 2010
- **Investments for Health**



### Information

- **DRRM Plan** (Davao City Risk Reduction Management Plan)
- **CIPH** (City-wide Investment Plan for Health)

### Technology

- **182 barangays** have access to internet connection
- Established **Central 911** in similar to U.S and Canada, services are free 24 hours a day, 7 days a week.

ADAPTIVE CAPACITY

### Institution and Governance

#### A. Functional Committees:

- Local Health Board (LHB),
- Local School Board (LSB),
- Brgy. Risk Reduction & Management Council (BDRRMC)
- Davao City Disaster Risk Reduction & Management Council (DCDRRMC)
- Peace & Order Council

#### B. Programs

- Cash for Work
- Food for Work Programs
- Emergency Assistance Program was specially created to assist disaster victims in the city benefitting 16,674 families
- Collaboration between the DSWD & CSSDO
- Lingap sa Mahirap
- NGAs, NGOs, Sectoral Groups such as Women Federation, PWD Federation, Youth Federation, Solo Parents Federation, Religious Sector and other Civil Society Organization (CSOs)
- Shelter Code

ADAPTIVE CAPACITY

### Social Capital

- CSOs and POs
- Gawad Kalinga
- TUPAD or Tulong Pangkabuhayan
- Cooperatives and Banks
- Lending Institutions
- labor pool has grown dramatically over the last 15 years
- ✓ Unemployment rates in the city have dropped from 8.3% in 1995 to 6% in 2009.

### Infrastructure

- 33 hospitals
- 538 Day Care Centers, 106 Home-Base, 1 Child-Minding Center for the children of government employees and 2 mobile ECCDs for the far-flung barangays and disaster affected areas.
- 428 Elementary schools 286 of these are public while 142 are private.
- A total of 151 Secondary schools (70 public and 81 are privately owned).
- 97% of 270,638 households have access to safe drinking water (2010)
- 82.69% have access to sanitary toilet.
- Identified Evacuation Centers :
  - ✓ 72 covered courts/ gyms
  - ✓ 14 Brgy. Hall/ Multi-Purpose Hall
  - ✓ 5 chapels/ churches
  - ✓ 3 Day Care Centers
  - ✓ 9 Government-owned infrastructures.

### KEY ADAPTATION OPTIONS

Intro to: Key Issues Identified, Objective Setting, Options ID

### Social Sector

OBJECTIVES	ADAPTATION OPTIONS		
	PROGRAMS	PROJECTS	LEGISLATIONS
1. To ensure a safer, adaptive and resilient shelter to families living in high risk areas.	1. Local Shelter Plan	1. Updating/validating of families in high risk areas. 2. Assessment of appropriate new relocation sites 3. Provision of sustainable livelihood program for relocatees 4. Introduce architecturally appropriate design of houses resilient to climate change(e.g. houses on stilt)	1. Comprehensive Shelter Code 2. DILG-MC2011-17
2. To promote awareness among families on climate change adaptation(CCA)	1. Barangay based information dissemination	1. Customize Information and Education Campaign (IEC) at all levels 2. Continuous advocacy and awareness raising on their adaptive capacity on the impact of climate change	1. RA 10121
3. To increase social protection on families living in high risk areas.	1. Community Organization	1. Capacity building to empower HHS in relocation sites 2. Mobilized volunteers in various disaster prevention and mitigation 3. Provision of EWS and establishment of community-based disaster volunteers or responders 4. Sustained Livelihood Program	1. No habitation policy



## Economic Sector

Objectives	Adaptation Options		
	Program	Projects	Legislations
To improve economic governance that support entrepreneurship, business and industry promotions	1. Financial assistance to open opportunities that will give access to wealth and credit 2. Make available technologies that will improve their capabilities in adapting to climate change	1. Credit facilitation programs 2. Trainings on new technologies on adaptation	1. Adoption of the MSMED Plan thru an ordinance
To strengthen institutional support structures for the development of start up and existing MSMEs	1. Infrastructure support systems that are resilient to climate change	1. Upgrading of existing infrastructure to support marketing of MSMEs	
To strengthen agricultural support to farmers	1. Increase awareness of farmers to climate change adaptation thru establishing alternative farming system as a new technology	1. Establish nurseries to reinforce production	1. Establishment of Barangay Disaster Risk Reduction Management Councils 2. Drafting of IRR for the implementation of the Organic Farming ordinance

ADAPTIVE CAPACITY



## Environment Sector

Objectives	Adaptation Options		
	Programs	Projects	Legislations
Sea-level Rise			
Install / Enhance capacity to monitor sea-level rise in the city as part of an island-wide network	Climate-Change Monitoring Program	1. Procurement/ Installation of monitoring equipment 2. Technical / Skills Training for equipment 3. Community Training	Climate Change Adaptation Ordinance
Establish protection zone	Environment Management Program	1. Set-back zone / buffer zone Delineation 2. Beach Reforestation Project	Coastal Zoning Ordinance
Minimize saltwater intrusion			
Increase / Enhance recharge rate of aquifers / Minimize extraction rate	Water Conservation / Management Program	1. Surface water development 2. River easement protection 3. Strict implementation of rain-harvesting ordinance	Surface / Ground water use Ordinance
Drought			
Enhance / increase vegetation or forest cover for wildlife (flora and fauna)	Environment Management Program	1. Biodiversity inventory project 2. Reforestation project	Declaration of Environmentally Critical Areas
General			
Minimize green-house gas emissions	Environment Management Program	1. Intensify implementation of Anti-Smoke Belching Ordinance	Air Quality Management Ordinance
Increase use of renewable energy in the city	Clean Energy Program	1. Renewable Energy IEC 2. Formulate Renewable Energy Plan 3. Investment Promotion (for renewable energy providers)	Carbon Sink Ordinance

ADAPTIVE CAPACITY



## Infrastructure Sector

Objectives	Adaptation Options		
	Programs	Projects	Legislations
<b>Flooding</b>			
1. To provide climate change resilient flood protection infrastructures without compromising the natural water flow system.	<ul style="list-style-type: none"> <li>– Formulation of an Updated DRAINAGE MASTERPLAN</li> <li>– Implementation of the required buffer/easement zones for rivers, creeks and coastlines</li> <li>– Development of drainage system's engineering design to manage risks from natural hazards and climate change</li> </ul>	<ul style="list-style-type: none"> <li>– Inventory of storm drainage system on engineering design vis a vis holding capacity of runoff water.</li> <li>– Construction of Concrete Revetment Bank Protection</li> <li>– Rehabilitate and improve all existing drainage structures</li> <li>– Maintenance of drainage canals by desilting &amp; declogging.</li> </ul>	<ul style="list-style-type: none"> <li>– All development structures should be assessed to ensure flow alterations are acceptable in relation to flood risk and environmental flows.</li> <li>– Non-buildable areas to slope and areas with geo-hazards</li> </ul>
2. To provide adequate, safe and potable water supply to all Davao City residents (both rural and urban).	<ul style="list-style-type: none"> <li>– Management of the development of projects and activities that pose danger to the city's water resources.</li> <li>– Strict implementation of Rain Water Harvesting Ordinance which will provide additional water resources and easing the pressure of groundwater extraction</li> </ul>	<ul style="list-style-type: none"> <li>– Monitoring of Level II water system from spring, rivers and deep wells sources that were installed to rural barangays.</li> <li>– Provision of Level II Water System to all outlying district or barangays short of such utility.</li> <li>– Conservation undertakings for all watershed areas</li> </ul>	<ul style="list-style-type: none"> <li>– Establishment of Wastes Water treatment Facility</li> <li>– Augmentation of Ground Water Sources through Surface Water Development to supply the future generations</li> </ul>

ADAPTIVE CAPACITY

## Infrastructure Sector

Objectives	Adaptation Options		
	Programs	Projects	Legislations
<b>Flooding</b>			
3. To ensure adequate power supply	<ul style="list-style-type: none"> <li>– Engage a sustainable approach to rural household electrification</li> </ul>	<ul style="list-style-type: none"> <li>– Promote Barangay Associations for Renewable Power Supply Management</li> <li>– Partnership with existing Renewable Energy provider</li> </ul>	<ul style="list-style-type: none"> <li>– Identify and prioritize additional electricity transmission lines, substations and auxiliary Infrastructure required supporting the preferred pattern of development.</li> <li>– Prioritize grid infrastructure development and reinforcement to ensure the massive uptake of Renewable energy technologies.</li> </ul>
<b>Sea-level Rise/Monsoon Waves</b>			
1. To provide protective infrastructure facilities that are resistant to potential climate change hazards and pursues to maintain the natural flow of the city's drainage system.	<ul style="list-style-type: none"> <li>– Crafting of a Sea- Level-Rise profile of Davao City</li> <li>– Updating of 1998 Drainage Master plan</li> </ul>	<ul style="list-style-type: none"> <li>– Installation of equipment/tool to monitor sea level rise</li> <li>– Rehabilitate and improve existing sea walls</li> <li>– Construction of additional sea walls</li> <li>– Fastract the implementation of the Sasa Port Upgrading master plan</li> <li>– Improve outfall structures, and provide flap gates</li> <li>– Realign outfall in higher elevated areas to other waterways in the low lying parts (overflow weirs)</li> </ul>	<ul style="list-style-type: none"> <li>– Restoration/Re-opening/Re-establishment of natural waterways/creeks traversing private properties</li> <li>– Strict implementation of the required buffer zones on the rivers, creeks and beaches</li> </ul>

ADAPTIVE CAPACITY

## Land Use Sector

Objectives	Adaptation Options		
	Programs	Projects	Legislations
Sea-level Rise			
Establish protection zone	Environment Management Program	1. Set-back zone / buffer zone Delineation	Coastal Zoning Ordinance
Minimize saltwater intrusion		2. Beach Reforestation Project	
Drought			
Enhance / increase vegetation or forest cover for wildlife (flora and fauna)	Environment Management Program	1. Biodiversity inventory project 2. Reforestation project	Declaration of Environmentally Critical Areas
General			
Enhance adaptation plan (to be adaptive)		1. Review adaptation plan (every 5 years)	

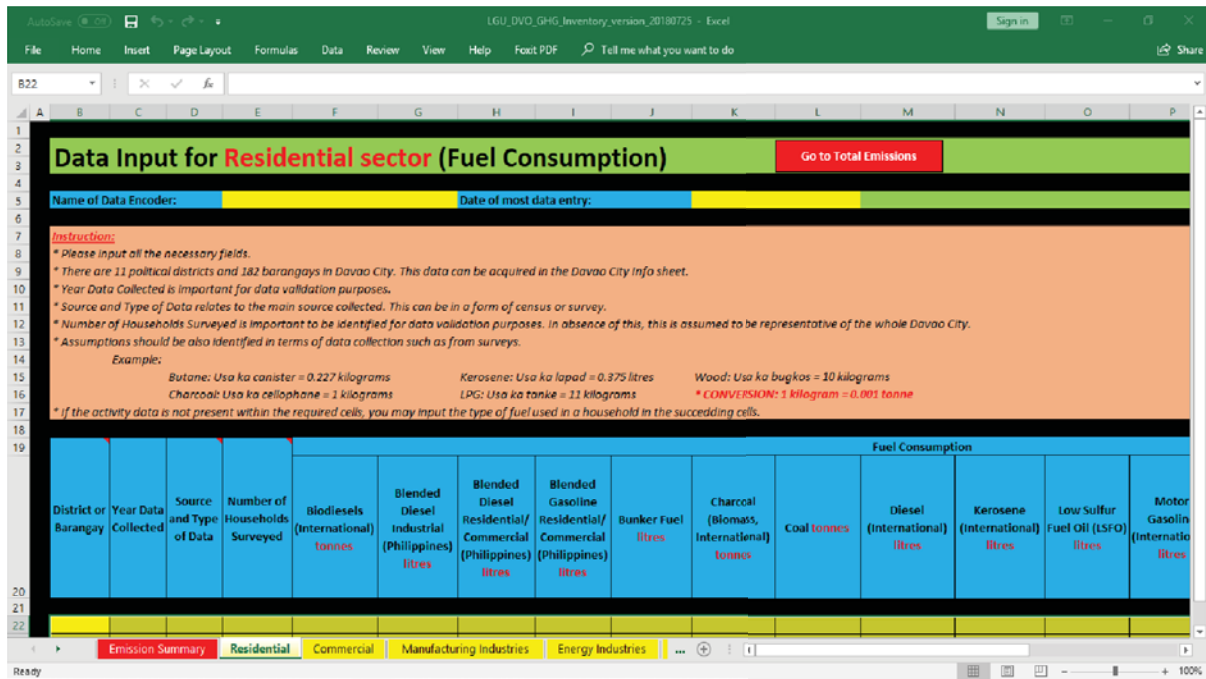
ADAPTIVE CAPACITY



## GHG Inventory

- Estimates of all emissions and removals of greenhouse gases (GHG) from given sources or sinks from a defined region in a specific period of time (IPCC, 2015).
- Help identify the major source of air pollution so that mitigation measures can be made

Reference: US EPA. (2016). Climate and Energy Resources for State, Local and Tribal Governments



## EMISSION SOURCES

### Area Sources

- Commercial Cooking
- Generator Sets
- Landfill
- Residential Cooking
- Residential Lighting
- Agricultural Lands

### Point Sources

- Coal
- Bunker
- Low Sulphur Fuel Oil
- Wood
- Power plant
- Cement

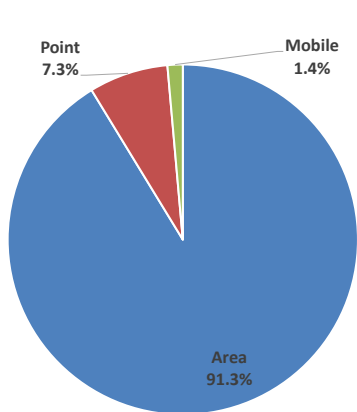
### Mobile Sources

- Jeepney
- Motorcycle
- Tricycle
- Taxi
- Utility Vehicles (UV)
- Sports Utility Vehicles (SUV)
- Car
- Light Duty Vehicles (LDV)
- Truck, Trailer

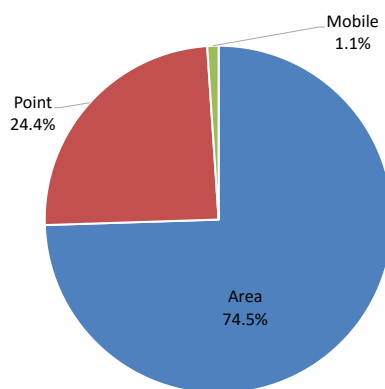
## SUMMARY OF ACTIVITY DATA

Area Sources	Value	Unit
From Landfill, Commercial & Residential Cooking	214,056	metric tons/year
Generator Sets	17,724,574	liters/year
Agricultural Lands	91,082	hectares
Forest Cover	134,380	hectares
Point Sources	Value	Unit
Coal & Wood	1,117,011	metric tons/year
LSFO & Bunker	17,247,459	liters/year
Mobile Sources	Value	Unit
Vehicle Kilometers Travelled (VKT)	2,859,368,067	kilometers
Total Idling Time	57,762,702	hours

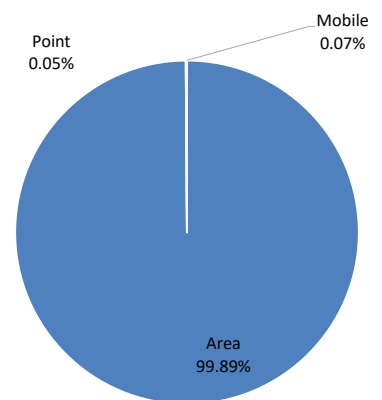
## GHG Emissions



**CO2**  
**25,829,211 metric tonnes**



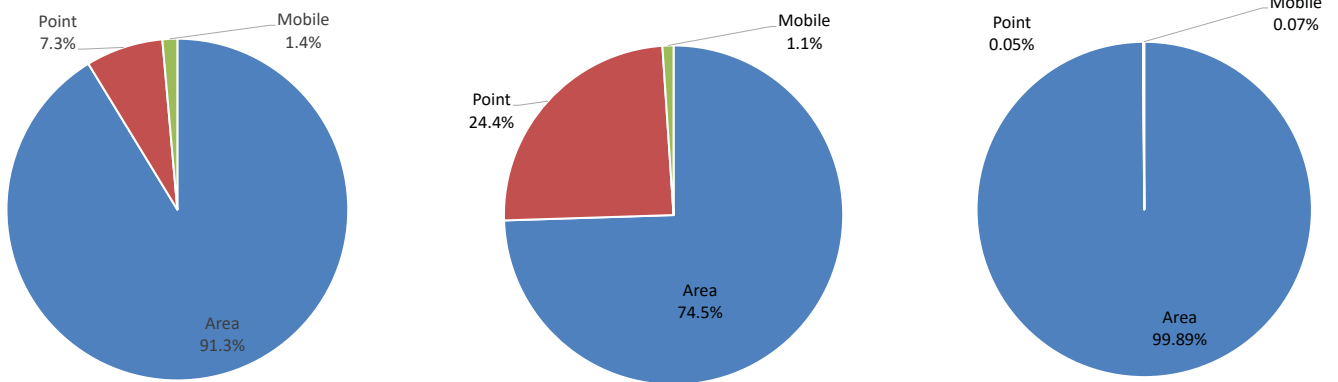
**N2O**  
**709 metric tonnes**



**CH4**  
**125,071 metric tonnes**

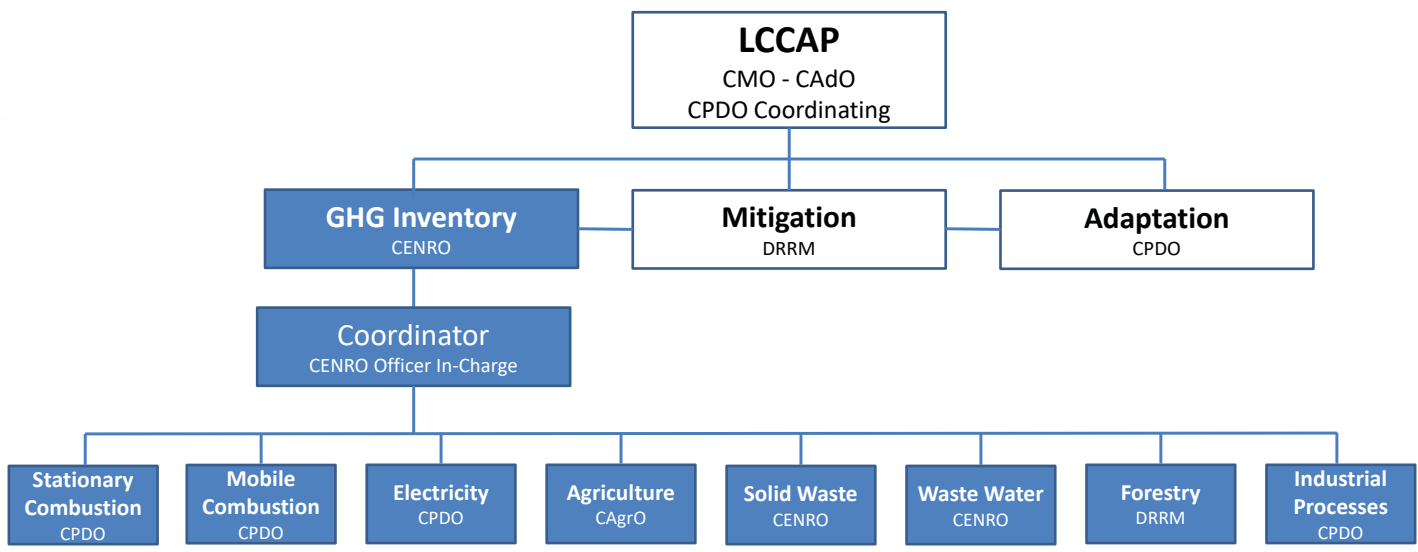


# GHG Emissions



**TOTAL CO2 EMISSIONS = 28,675,586 metric tonnes**

# DAVAO CITY CORE TEAM





# INVENTORY OF DATA



SECTOR/SUB-SECTOR	APPLICATIONS	AVAILABLE DATA	SOURCE OF DATA
<b>STATIONARY COMBUSTION</b>			
• Residential	Cooking	No. of HHs by type of cooking , 2010	PRA-CPDO
• Commercial		No. of commercial establishments/business lines	PRA-CPDO
	Generators	No. of HHs using generator for energy, 2015	PRA-CPDO
	Lighting	No data available	
	HVAC	No data available	
<b>MOBILE COMBUSTION</b>			
• Option I – Distance (Community Mobile Combustion)	Buses	Registered public & private vehicles, by type 2017	CPDO, LTO, LTRFB
	Heavy Duty Vehicles		
	Light Goods Vehicle		
	Motorbike		
	Passenger Car		

SECTOR/SUB-SECTOR	APPLICATIONS	AVAILABLE DATA	SOURCE OF DATA
<ul style="list-style-type: none"> <li>Option II – Fuel Consumption (Community Mobile Combustion)</li> </ul>	All applications	No data available	
<b>ELECTRICITY</b>			
<ul style="list-style-type: none"> <li>Residential Electricity Consumption</li> </ul>		Annual energy production, 2017	CPDO
<ul style="list-style-type: none"> <li>Commercial Electricity Consumption</li> </ul>		Annual energy consumption per category, 2017	CPDO
<b>AGRICULTURE</b>			
<ul style="list-style-type: none"> <li>Crops</li> </ul>		All types of crop production, in hectare, 2017	CPDO, CAgrO
<ul style="list-style-type: none"> <li>Livestock</li> </ul>		No. of heads, 2017	CPDO, CAgrO
<b>SOLID WASTE</b>			
Option 1 <ul style="list-style-type: none"> <li>Solid Waste Disposal Parameters (IPCC-Intergovernmental Panel on Climate Change FOD Method)</li> <li>Solid Waste Disposal Methane Factor (MCF) Calculate Distribution of Waste Management Type</li> <li>MSW Activity Data Input</li> </ul>		Volume of garbage collected at Sanitary Landfill, by category, 2017	CENRO

SECTOR/SUB-SECTOR	APPLICATIONS	AVAILABLE DATA	SOURCE OF DATA
Option 2 <ul style="list-style-type: none"> <li>Solid Waste Disposal (Landfill)</li> <li>Other Solid Waste Disposal (Composting, Anaerobic Digestion, Other)</li> <li>Solid Waste Disposal (Open Burning)</li> </ul>		Volume of garbage collected at Sanitary Landfill, by category, 2017	CENRO
<b>WASTEWATER</b>			
<ul style="list-style-type: none"> <li>Wastewater</li> </ul>		No available data	
<b>FORESTRY</b>			
<ul style="list-style-type: none"> <li>Forestry Emission</li> <li>Forestry Removal</li> </ul>		Data requirement very specific at Barangay level, figures not available. Wood for fuel trading is an informal economic activity	DENR
<b>INDUSTRIAL PROCESSES</b>			
<ul style="list-style-type: none"> <li>Emission</li> </ul>		No. of establishments engaged in industrial activities	Business Bureau



#### ISSUES AND CONCERNS:

- Need to strengthen institutional arrangements.  
(Executive Order/ Memo for TWG)
- Need to strengthen arrangements by academe/partners in sharing data/technology.
- Inavailability of required data.
- Need for standard units of measure in quantifying GHG emissions for proxy indicators.
- Need for capacity building of TWG on GHG emission inventory.



**Daghang Salamat!**

ありがとうございました



### Workshop on Greenhouse Gas Inventory Development of Davao City

Date: Jan 22<sup>nd</sup> 2019 (Tuesday)

Time: 9:30~11:45

Venue: City Accountant's Conference Room

No	Time	Programme	Presenter
1	9:30~9:35	Opening remarks	Mr. Ivan Cortes Head, City Planning and Development Office, Davao City
2	9:35~9:40	Opening remarks	Mr. Yasuhiko Takatsuka Deputy Director, Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu
3	9:40~9:50	Photo session	
4	9:50~10:20	Current situation of an development of GHGI of Davao City: Progress and Challenges	Ms. Melody S. Dapusala City Environment and Natural Resources Office (CENRO), Davao City
5	10:20~10:50	Introduction of an guideline for local GHGI development and other cities' experiences on GHGI development in the Philippines	Ms. Sandee G. Recabar Implementation Oversight Division, Climate Change Commission of the Philippines
6	10:50~11:40	Q&A and discussions on GHGI development of Davao City	Facilitator: Dr. Junko Akagi, Research Manager, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
7	11:40~11:45	Closing Remarks	Mr. Tristan D. Domingo Assistant City Administrator, Davao City

\* The kick-off meeting will be held in English (A consecutive translator between English and Japanese will be available)

## List of participants

- Mr. Tristan D. Domingo, Assistant City Administrator, Davao City
- Mr. Ivan Cortes, Head, City Planning and Development Office, Davao City
- Ms. Melody S. Dapusala, City Environment and Natural Resources Office (CENRO), Davao City
- Dr. Doris B. Montecastro, Chairperson, Environmental Science Department, Ateneo de Davao University and other relevant staffs from Davao City
- Ms. Sandee G. Recabar, Implementation Oversight Division, Climate Change Commission of the Philippines
- Mr. Shiko Hayashi, Programme Director, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
- Ms. Junko Akagi, Research Manager, Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)
- Mr. Yasuhiko Takatsuka, Deputy Director, Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu
- Mr. Noboru Kawai, Senior Manager, Nippon Steel & Sumikin Engineering Co., Ltd. / Representative of Davao Office, PNS Construction, Inc.
- An interpreter



## DAVAO CITY GREENHOUSE GAS INVENTORY (GHGI) PROGRESS AND CHALLENGES

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### **BACKGROUND:**

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- November 28, 2017 Memorandum of Understanding (MOU) between Davao City and Kitakyushu City.
- May 15, 2018 City to City Collaboration kick-off meeting for LCCAP preparation.
- June 26, 2018; July 17, 2018.... Series of GHGI Training Workshop conducted by Ateneo de Davao University.
- November 5 to 9, 2018 Training Workshop on Local GHGI in Kitakyushu City, Japan.



**CHALLENGES:**

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- Need to strengthen institutional arrangements. (Executive Order/Memo for TWG)
- Need to strengthen arrangement by academe/partners in sharing data/technology.
- Unavailability of required data.
- Need for capacity building of TWG on GHG emission inventory.



**PROGRESS:**

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- Coordination with Ateneo de Davao University – done, awaiting feedback from ADDU.
- Draft Memorandum of Understanding between ADDU and Davao City Gov. – done
- Executive Order No. 40, Series of 2018, signed by the City Mayor Sara Z. Duterte last December 28, 2018.







Republic of the Philippines  
**OFFICE OF THE CITY MAYOR**  
City of Davao

**EXECUTIVE ORDER NO. 40**  
Series of 2018

**"AN ORDER CREATING A TECHNICAL WORKING GROUP (TWG) TO FACILITATE IN THE PREPARATION OF THE LOCAL CLIMATE ACTION PLAN OF DAVAO CITY FOCUSING ON GREENHOUSE GAS (GHG) INVENTORY, MITIGATION AND ADAPTATION."**

**WHEREAS**, In November 28, 2017 a Memorandum of Understanding was signed creating a Green Sister City relationship between Davao City and the City of Kitakyushu. The objective of the Memorandum of Understanding is to establish Green Sister City Cooperation in order to promote and expand effective and mutually beneficial cooperation in the development of the two cities. The parties shall undertake to implement the MOU in accordance with the laws and regulation of their respective countries in the environment fields as follows:

- a.) Low Carbon Society
- b.) Resource Recycling
- c.) Capacity Building for the Officials of each City
- d.) Other fields of cooperation as mutually agreed upon by the Parties in writing.

**WHEREAS**, a kick-off meeting of the City to City collaboration was conducted in May 15, 2018 at Grand MenSeng Hotel regarding the preparation of the Davao City Local Climate Change Action Plan (LCCAP);

**WHEREAS**, pursuant to Section 14 of Republic Act No. 9729 or also known as the Climate Change Act of 2009; the Local Government Units (LGU's) shall be the frontline agencies in the formulation, planning and implementation of climate change action plans in their respective areas;

**WHEREAS**, pursuant to Section 18 of Republic Act No. 7160 or the "Local Government Code of 1991" authorizes local government units to establish an organization that shall be responsible for the efficient and effective implementation of their development plans, programs, objectives and priorities;

**NOW, THEREFORE, I, SARA Z. DUTERTE**, Mayor of the City of Davao, by virtue of the powers vested in me by law, do hereby order the following:

**SECTION 1. CREATION AND COMPOSITION.** There is hereby created a **TECHNICAL WORKING GROUP (TWG)** to facilitate in the preparation of the Local Climate Action Plan of Davao City focusing on greenhouse gas (GHG) inventory, mitigation and adaptation.



The Technical Working Group (TWG) shall be composed of the following City Government of Davao (CGD) personnel:

Head- City Mayor's Office (CMO)  
Permanent Representative - Assistant City Administrator for Administration (ACAAdO)

Assistant Head - Office of the City Planning and Development Coordinator (OCPDC)

Members:

1. City Environment and Natural Resources Office (CENRO)
2. City Transport and Traffic Management Office (CTTMO)
3. City Engineer's Office (CEO)
4. City Agriculturist's Office (CAgO)
5. City Veterinarian's Office (CVO)
6. Disaster Risk and Reduction Management Office (DRRMO)
7. Department of Environment and Natural Resources - Environmental Management Bureau (DENR-EMB)
8. One (1) Representative from the Local Academe

For this purpose, the aforementioned offices shall name a permanent representative to the TWG herein created.

The City Administrator may hereinafter designate additional CGD employees and/or identify qualified personnel, including those under job order or contract of services, representatives from the academe, private sector and other stakeholders, to support the group herein created in preparation of the LCCAP.

**SECTION 2. DUTIES AND FUNCTIONS.** The Technical Working Group shall perform the functions as follows:

- Directly coordinate, collaborate and work with Japanese government representatives, national government offices, CGD agencies and private entities as may be required for the preparation of the LCCAP;
- Provide technical expertise and render administrative decision support to the City Mayor; and
- Manage the implementation schedule of the LCCAP preparation, data collection, reporting process, as well as document key decisions.

**SECTION 3. FUNDING/OPERATING COSTS.** All costs pertaining to the operation of the TWG shall be taken from the available funds of the City Government of Davao subject to the usual accounting and auditing rules and regulations.

**SECTION 4. SUPPORT.** All City Government of Davao (CGD) offices are hereby directed to provide their full and active support, and utmost cooperation to the preparation of the LCCAP focusing on Greenhouse Gas (GHG) inventory, mitigation and adaptation. The City Administrator and/or the respective heads of the offices to which the members of the TWG belong shall endeavor to allow the said members to prioritize the performance of their functions herein for the success of the plan.

All national government offices within the territorial jurisdiction of Davao City are likewise requested to extend their support and assistance to the endeavors of the TWG and the plan.

**SECTION 5. SUNSET CLAUSE.** The TWG shall function as a special unit that exists only for the duration of the LCCAP preparation and shall be discontinued thereafter, or as may be determined by the City Mayor.

**SECTION 6. SEPARABILITY CLAUSE.** If any provision of this Executive Order is declared invalid or unconstitutional, the other provisions not affected thereby shall remain valid and subsisting.

**SECTION 7. REPEALING CLAUSE.** All orders or parts thereof which are inconsistent with the provisions of this Executive Order are hereby repealed or modified accordingly.

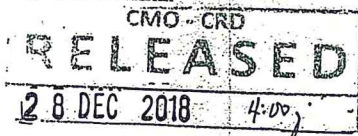
**SECTION 8. EFFECTIVITY.** This Executive Order shall take effect immediately.

Done on 28 DEC 2018 at Davao City, Philippines.

  
SARA Z. DUTERTE  
City Mayor

Attested by:

  
ATTY. ZULEIKA T. LOPEZ  
City Administrator



条例 0409-18 号

2018 年通番

ダバオ市管轄域内の街路灯設備として発光ダイオード (LED) を設置するダバオ市自治体街路灯効率プログラムを、ダバオ電灯電力会社 (DLPC) が遵守することを要求する条例

ダバオ市の Sanggunian Palungsod の招集議会により、以下の通り規定するもの：

第1条 名称 — 本条例は「ダバオ市管轄域内の街路灯設備として発光ダイオード(LED)を設置するダバオ市自治体街路灯効率プログラムを、ダバオ電灯電力会社(DLPC)が遵守することを要求する条例」として周知する；

第2条 短縮名称 — 本条例は「ダバオ市 LED 条例」として周知する；

第3条 用語の定義 — 本条例に使われる用語は以下の通り定義する：

- a. セントラルビジネス地区 (CBD) — とは、市内の商業・ビジネス中心部を指す。市の金融街、市の中心街、繁華街、歴史地区である。
- b. 設置 — ある物を使用できるように所定の位置に置く行為。本条例の趣旨においては、新しい発光ダイオード (LED) へ変更する/交換するまたは置くことが含まれる。
- c. 高圧ナトリウム (HPS) 灯 — 励磁状態のナトリウムを利用した広域スペクトル、気体放電型のランプで、589 nm に近い特徴的な波長で発光する。
- d. 発光ダイオード (LED) 照明 — 導線 2 本式半導体照明光源。駆動時に発光する p-n 接合ダイオードである。導線に適切な電圧をかけると、自由電子が装置内の正孔と再結合し、光子の形態でエネルギーを放出する。

第4条 適用範囲 — 本条例は、ダバオ市の管轄域内の街路灯すべてを適用範囲とする。

第5条 目的 — 本条例は、以下のような目的で発効する。

- a. エネルギー消費量とメンテナンスコストを削減し、結果的に当市の貯蓄を生む；
- b. 道路の安全性、環境負荷、エネルギーおよびコストパフォーマンスの観点から街路灯の効率を改善する。

第6条 実施 — 本条例の実施は、以下のような 5 年実施計画スケジュールに従うものとする：

- a. 初期フェーズ：当市のセントラルビジネス地区（CBD）域内での、設置または HPS から LED 一式への変更については、この市条例の承認後、直ちに開始する；
- b. 後続の実施フェーズ：CBD 域内での設置完了後、当市のその他の地域の街路灯についても同様に全数 LED 一式へと更新する。近郊から開始し、遠方へと進める。

第7条 経費 — LED 照明の設置は、照明の焦点改善装置等を含め、ダバオ電灯電力会社（DLPC）がその経費を全額負担する。既存の街路灯の交換品として設置するのは、タイプの適合する LED 照明のみとし、その規定は第 8 条に記載するとおりである；

第8条 LED 街路照明の要件 — LED 照明の設置では下記を最小限の仕様として考慮すること。

- a. 照明器具は、半導体技術（LED）をベースにした光源を利用することに特化して設計されていけばよい。他のタイプの光源用に設計された製品、LED 光源向けに適応させたかまたは改造した製品は認めない。
- b. 光および制御装置コンパートメントの密閉性は、最低レベルで IP66 である。
- c. 破壊に対する耐衝撃性の最低レベルは IK08（10 段階評価で）とする。
- d. 照明性能の寿命は、焼き付け時間 10 万時間で L80B10 を最低限満たすこと（10 万時間で 80%のルーメンを維持したランプが 90%存在する）。これは、照明器具の光の出力の急速な減衰を防止するため。
- e. 電気安全等級： クラス I、絶縁線を二重に配置
- f. 力率： >90、100%負荷で
- g. 使用時周囲温度（Ta）： 45°C以上
- h. 主電圧公差： 120V – 227V
- i. 色温度 CCT： 3000k
- j. 演色評価数 CRI： >70
- k. ワット当たりのルーメン： 最低値 85
- l. 筐体は、ダイカストアルミニウム合金製で透明でフラットな強化ガラス保護付き（ポリカーボネイトやそれに類する材質は認めない）。
- m. サージ保護装置： 10kV
- n. 照明器具傾斜角システム： 最小で +5 ~ -10 度
- o. メーカー保証： 6年以上
- p. IEC 苦情認証は次のものに付与が必要：IP、IK、フラグメンテーション、EMC、LM80 試験



- q. すべての測定作業は ISO17025 認証済みの試験設備で行う。
- r. CCTV セキュリティ監視設備で捉える物の外観が、これらの照明の使用によって妨害されたり損なわれたりしてはならない。

第9条 LED 街路灯タスクフォース — LED 街路灯タスクフォースを下記のメンバーで編成する：

- 委員長                  ： 市長、またはシティ・アドミニストレーター
- 共同委員長          ： ダバオ電灯電力会社（DLPC）
- 副委員長              ： 市のエンジニア
- メンバー              ： 都市計画・開発担当官（CPDO）
- ： エネルギー委員会委員長

第10条 機能 — LED 街路灯タスクフォースは、本条例の実施と施行を監督する。

第11条 分離条項 — 何らかの理由で本条例のいずれかの条項や規定が違憲または無効であると断定された場合、本条例の他の条項や規定でそのような断定に影響を受けないものについては、その効力を維持する；

第12条 有効性 — 本条例は承認後直ちに発効する；

2018年2月27日、Sanggunian の定数を満たす議会にて全会一致で成立した。

# Low Carbon Development under City-to-City Collaboration Programme between Davao City and City of Kitakyushu

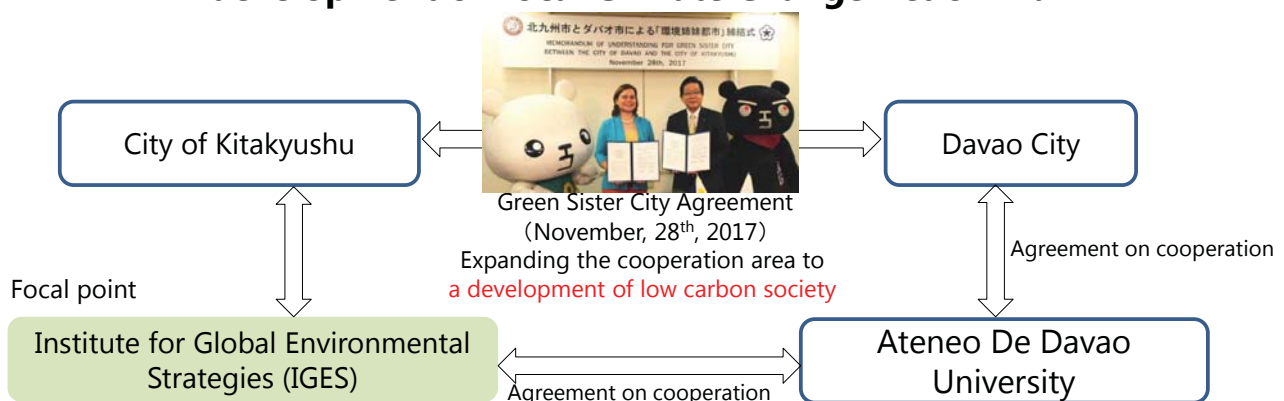
February 19<sup>th</sup>, 2019

Shiko Hayashi

Programme Director, Kitakyushu Urban Centre



## Project to realize low carbon society in Davao City through a support for a development of Local Climate Change Action Plan



### Support for a development of Local Climate Change Action Plan of Davao City

- A development of GHG inventory (supported by IGES)
- A development of mitigation measures (supported by Kitakyushu City and IGES)
- A development of adaptation measures (supported by Ateneo De Davao Uni.)

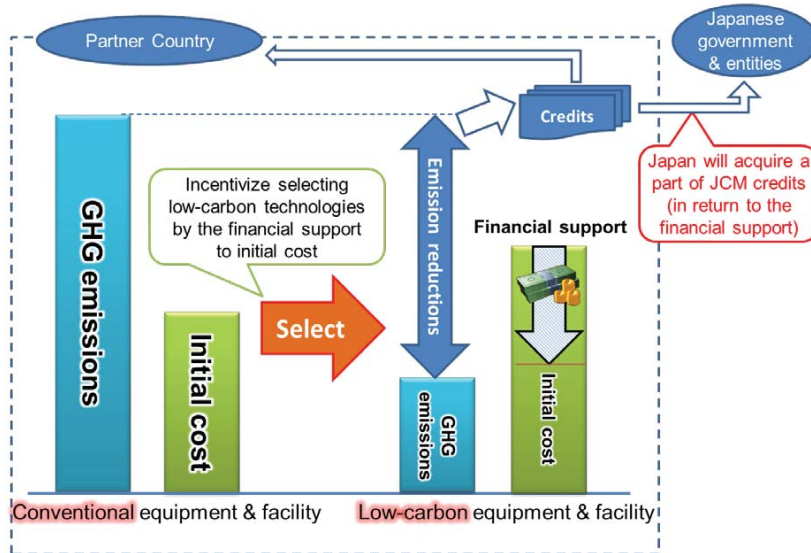
An implementation of concrete mitigation measures

### Study on a feasibility of low-carbon project (for JCM Model Project)

- Feasibility study on other low-carbon projects (renewable energy and energy saving projects)
- Coordination with related-stakeholders for an implementation, technical study, evaluation of the amount of CO2 reduction, etc.
- Supporting for a preparation of applying JCM Model Project

## Financing Programme for Joint Crediting Mechanism (JCM)

- Facilitating diffusion of **leading low carbon technologies, products, systems, services, and infrastructure** as well as implementation of mitigation actions of partner countries.
- Evaluating contributions from Japan to **GHG emission reductions or removals from fossil fuel combustion in a quantitative manner** by MRV.
- Contributing to achieve Japan’s emission reduction target of the UNFCCC by facilitating global actions for GHG emission reductions.



\* measurement, reporting and verification

**17 Countries**  
(signed with the Philippines in Jan 2017)

Source: Ministry of the Environment, Japan

## Some conditions for JCM Model Project

- Finance rate will be determined based on the number of already selected JCM Model Projects using a similar technology in each country.
- Regardless of the finance rate, selected entities in JCM Model Project are expected to deliver at least half of JCM credits issued to Government of Japan.

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

### Cost effectiveness (JPY/t-CO<sub>2</sub>e)

- Dividing “the amount of proposed subsidy” by “the accumulated emission reduction” achieved during “the legal durable years” (under Japanese tax law).
- **Below 4,000 JPY/t-CO<sub>2</sub>e** (Energy saving projects: 10,000 JPY/t-CO<sub>2</sub>e in FY2016)

**Payback period** (year)  $\frac{\text{(Total initial cost)} - \text{(Amount of subsidy)}}{\text{(Reduction for annual operation cost)}}$  \* **Average: 3,500 JPY/t-CO<sub>2</sub>e**

- Payback (or Return of Investment) period of should be more than 3 years with the financial support.

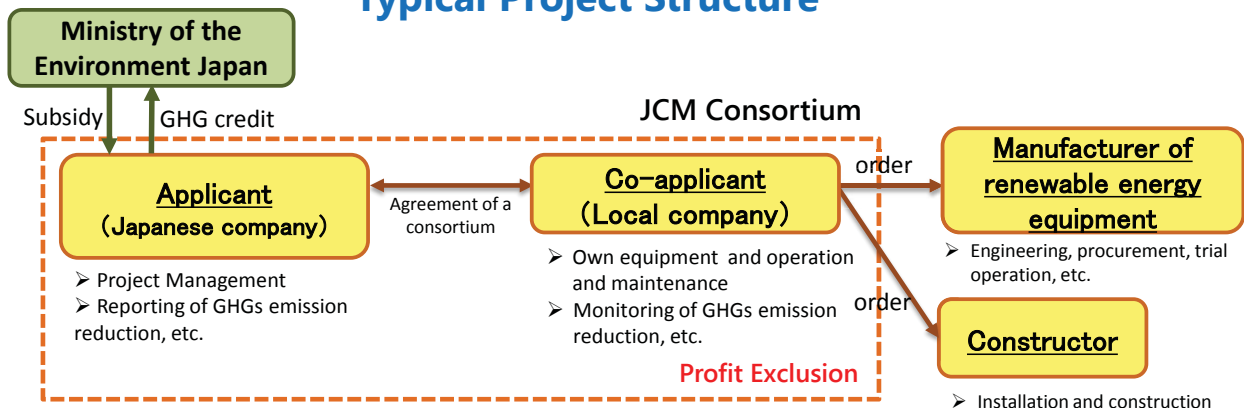
Source: Ministry of the Environment, Japan

## Study on possible application of JCM Model Project

Components will be checked for a feasibility study on low-carbon projects :

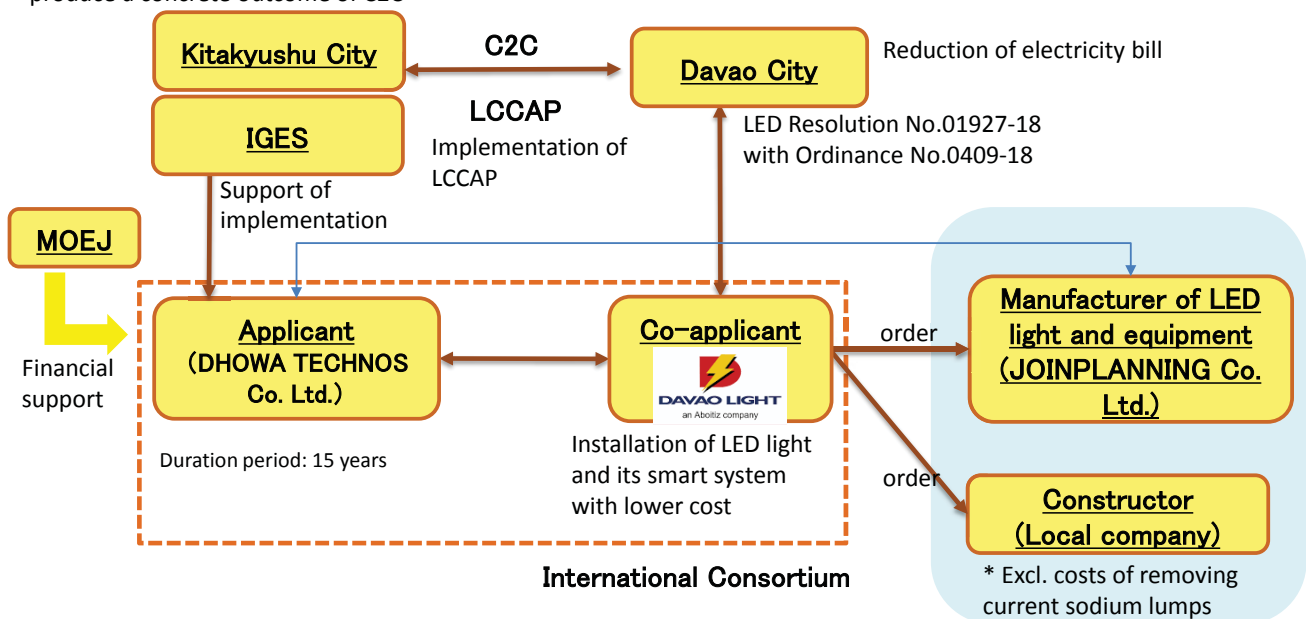
- Forming an **international consortium** including both a owner and user of the equipment, etc.
- Coordination on a **timing and condition** of a procurement of a low-carbon project in Davao City with related organizations, etc.
- Coordination with **manufacturers** of renewable energy equipment as well as **constructors**
- **Selection of equipment**, calculate the amount CO2 reduction, support for a preparation to apply for JCM Model Project

### Typical Project Structure



## Possible Project Structure (draft as of 2019.1.21)

Boost local economy and produce a concrete outcome of C2C



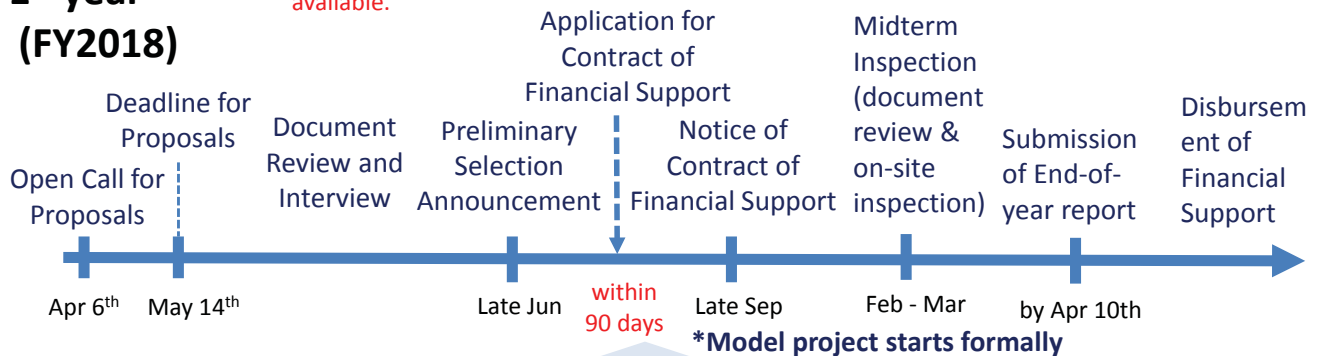


## Schedule for Applying JCM Model Project

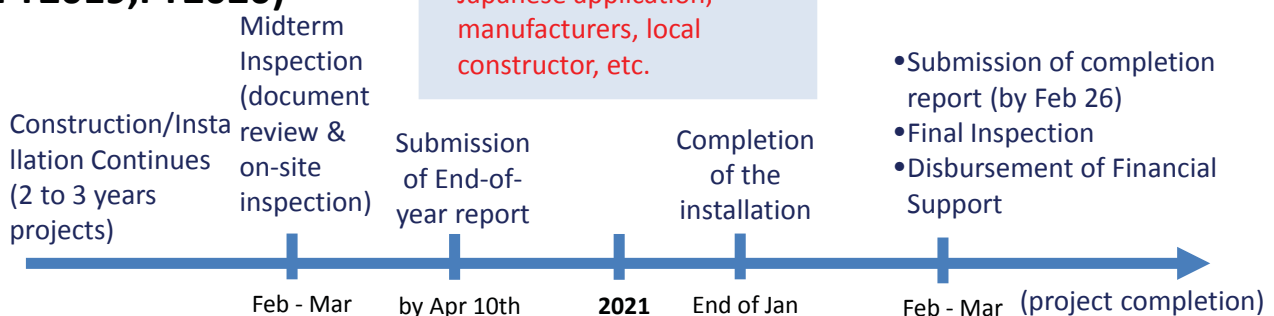
\* The schedule is followed to Japanese fiscal year (April - March)

\* Second call process will start in August if the budget is still available.

### 1<sup>st</sup> year (FY2018)



### 2<sup>nd</sup> ~3<sup>rd</sup> year (FY2019, FY2020)



## Discussion points today

➤ Safety standard: PSE (Product Safety Electrical Appliance & Materials) in Japan

→ Is this compatible with the Philippines standard, PS standard?

➤ Ordering system

### Proposal A

- **Pattern 1: a full-spec as proposed today (supplying LED lights with arm parts)**
- Pattern 2-1: supplying LED units and arm parts are designed by Japan-side but manufactured by local companies
- **Pattern 2-2: supplying LED units but utilizing existing arm parts**
- Pattern 3: selling as ready made product (products shown in a catalogue)

➤ Return of Investment

How long term will be set by DLPC for recovering the investment costs for LED replacement project?

## Calculation of GHG emission reduction

$$ER_p = RE_p - PE_p$$

$ER_p$  Emissions reduction during the period  $p$  (tCO<sub>2</sub>/p)  
 $RE_p$  Reference emissions during the period  $p$  (tCO<sub>2</sub>/p)  
 $PE_p$  Project emissions during the period  $p$  (tCO<sub>2</sub>/p)

Criterion 1	The project installs LED street lighting system utilizing wireless network control, which is connected to an electricity grid system.
Criterion 2	All lighting equipment in one lighting system has the same specifications.
Criterion 3	Wireless network technology enables controlling of the volume of lighting.

$$RE_p = \sum_i P_i \times (\eta_{PJ,i} \div \eta_{RE}) \times PO_{i,p} \times EF_{grid} \times 10^{-6}$$

- $RE_p$  Reference emissions during the period  $p$  (tCO<sub>2</sub>/p)
- $P_i$  Rated power consumption of a lighting equipment used in the project lighting system  $i$  (W)
- $\eta_{PJ,i}$  Luminaire efficiency of a lighting equipment used in the project lighting system  $i$  (lm/W)
- $\eta_{RE}$  Luminaire efficiency of the reference lighting system (lm/W)
- $PO_{i,p}$  Total operating hours of project lighting system  $i$  during the period  $p$  (hrs/p)
- $EF_{grid}$  Grid emission factor of Mindanao grid (tCO<sub>2</sub>/MWh)
- $i$  Identification number of the lighting system

$$PE_p = \sum_i PEC_{i,p} \times EF_{grid} \times 10^{-6}$$

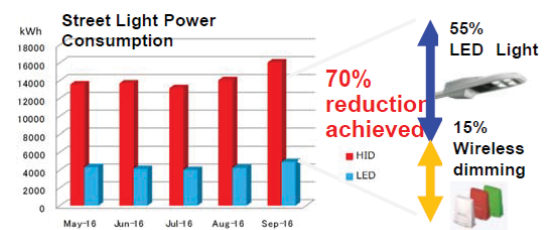
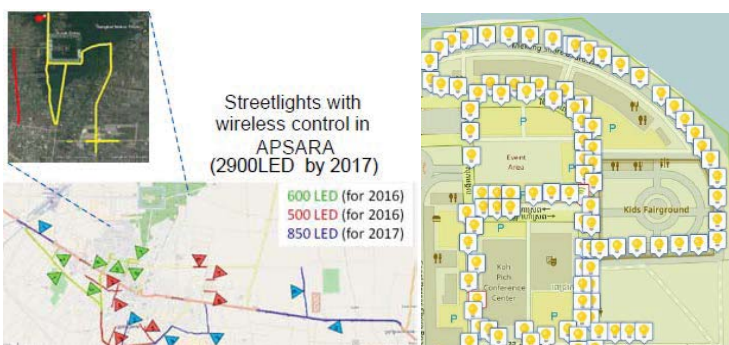
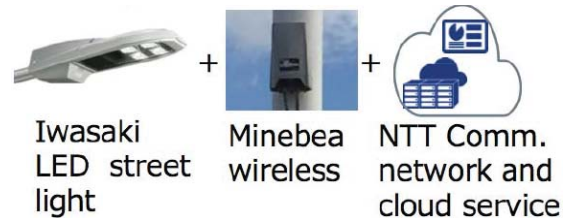
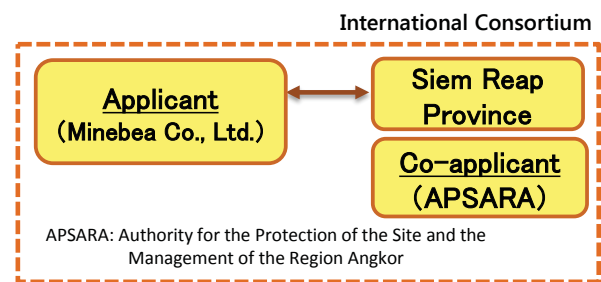
- $PE_p$  Project emissions during the period  $p$  (tCO<sub>2</sub>/p)
- $PEC_{i,p}$  Total amount of electricity consumed in the project lighting system  $i$  during the period  $p$  (Wh/p)
- $EF_{grid}$  Grid emission factor of Mindanao grid (tCO<sub>2</sub>/MWh)
- $i$  Identification number of the lighting system

Source: <https://www.jcm.go.jp/kh-jp/methodologies/34>

## REFERENCE: LED light projects for JCM Model Project: Example 1

### Introduction of High Efficiency LED Lighting Utilizing Wireless Network (Cambodia)

- Introducing total of 9,755 units of high efficiency LED Lighting utilizing wireless network technology
- Also, using smart lighting system with wireless network and dimmer adjustment
- Expected GHG emission reduction: 4,190 tCO<sub>2</sub>/year (70% of energy reduction)

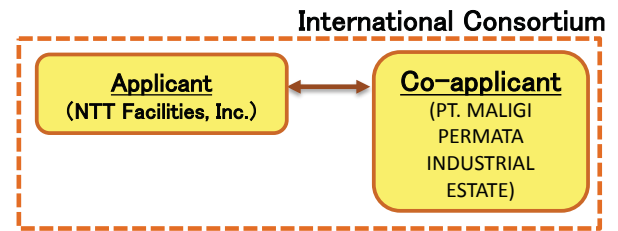


Source: [http://gcej.jp/jcm/jp/projects/15pro\\_cam\\_01/](http://gcej.jp/jcm/jp/projects/15pro_cam_01/)

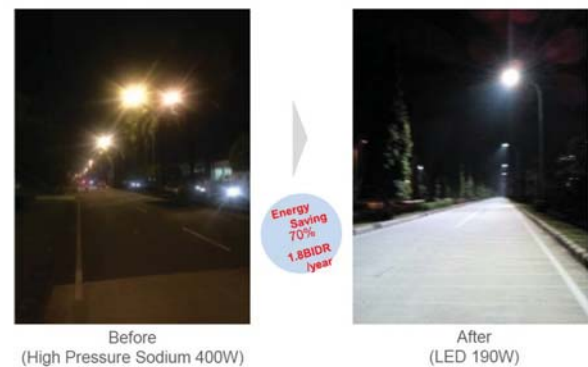
## REFERENCE: LED light projects for JCM Model Project: Example 2

### Energy Saving for Industrial Park with Smart LED Street Lighting System (Indonesia)

- Replacement of existing street lights with high efficient LED lights
- Dimmable High Efficient LED: 95W for 660 pcs and 190W for 600 pcs
- Smart Lighting System: 14 smart boxes and 1,260 Outdoor Lighting Controllers
- Power line communication, Remote controlling, Remote monitoring, Cloud based service
- Expected GHG emission reduction: 1,016 tCO<sub>2</sub>/year (70% energy saving)



Before and After



Source: [http://gec.jp/jcm/projects/15pro\\_ina\\_02/](http://gec.jp/jcm/projects/15pro_ina_02/)

# 1. Actions taken by your city's/region's for the C2C collaboration project up to now and future prospects

## Milestones in the implementation of C2C collaboration between Kitakyushu City and Davao City.

- ✓ Signing of Green Sister City Agreement by both parties on November 17, 2016 and November 28, 2017 in Davao City and Kitakyushu City respectively.



Nov. 28, 2017



Nov. 17, 2016

- ✓ Learning visits of Davao City Government to City of Kitakyushu on best practices of solid waste mgt.



May, 2017



Nov, 2017



Feb, 2018

# 1. Actions taken by your city's/region's for the C2C collaboration project up to now and future prospects

## Milestones in the implementation of C2C collaboration between Kitakyushu City and Davao City.

- ✓ Jointly worked with Japan Project Team:

- Data acquisition and conduct of Waste analysis. (Waste-to-energy Feasibility Study)
- Establishing links and acquiring permissions for visits to business establishments. (recyclers, food establishments, malls, bus companies and etc.)
- Upgrading of city's solid waste management system through JICA Grassroots Project.
  1. Establishing a system for waste analysis in CENRO
  2. Setting up preparatory body to develop an organization to promote waste reduction
  3. Pilot activities on waste reduction in business sector and barangay to be conducted





## 1. Actions taken by your city's/region's for the C2C collaboration project up to now and future prospects

### Milestones in the implementation of C2C collaboration between Kitakyushu City and Davao City.

- ✓ Adopting Waste-to-Energy (WTE) as part of City's 10-yr. Solid Waste Management Plan (2018 – 2027).
- ✓ Creation of "Waste-to-Energy – Project Management Team" through Executive Order No. 18. (City Admin., CEO, City Legal Office, CPDO, City Budget Office, CENRO)
- ✓ Creation of Inter-Agency Team for the development of LCCAP. (City DRRMO, CPDO, CENRO, Ateneo de Davao University)
- ✓ Jointly worked with Japan Project Team:
  - Project to realize low carbon society in Davao City through a support for a development of Local Climate Change Action Plan (LCCAP).
    - 1.A development of GHG inventory (supported by IGES)
    - 2.A development of mitigation measures (supported by Kitakyushu City and IGES)
    - 3.A development of adaptation measures (supported by Ateneo De Davao University)



3

## 1. Actions taken by your city's/region's for the C2C collaboration project up to now and future prospects

### Future Prospects:

- ✓ Part of the Objectives is to come up with a Waste analysis manual for the city being crucial in the implementation of Waste-to-energy facility in Davao.
- ✓ Promotion of waste reduction and recycling activities in communities and businesses and other preparations for WTE.
- ✓ Construction of Waste-to-energy (WTE) facility in Davao City.
- ✓ Development of City Greenhouse Gas Inventory and Local Climate Change Action Plan.
- ✓ Investigate and promote a potential JCM model project in Davao based on the needs and proposed mitigating plans enumerated in the LCCAP. .



Kogasaki Waste-to - Energy Plant in Kitakyushu

4



## 2. What kinds of challenges does your city/region face in the C2C collaboration project?

- Implementation schedules and expected results were delayed or didn't went as planned.  
(Barangay elections, delays in selection of WTE sites, and etc.)
- Available systems and facilities crucial to the attainment of Solid Waste reduction and recycling are limited or lacking.  
(Lack of Segregated collection, Solid waste management facilities e.g. Material Recovery Facilites, Composting, Recycling facilities and Industries)
- Paradigm and behavioral shift in adopting to new Solid Waste Mgt. methods takes time to show positive effects.

THANK YOU!