Asia-Pacific
Economic Cooperation

Advancing Free Trade
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Initiative for Realizing Sustainable Cities Focusing on Improvement of Resource Circulation and Waste Management

APEC SOM Steering Committee on Economic and Technical Cooperation

September 2022

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1. Introduction

1.1 Background and purpose

In the Asia-Pacific region, there have been growing concerns regarding the impacts of ongoing rapid economic growth and urbanization on the environment. This includes increased greenhouse gas emissions, worsened waste treatment problems, pollution, and tightened supply-demand situation for energy, resources, water and food. These factors are posing serious threats that may shake the basis of economic growth and the social infrastructure of the Asia-Pacific region. The environmental burden is increasing in line with economic growth and urbanization. The problem is that the consumption, especially in urban regions, exceeds the capacity of the waste management systems and the surpluses are inducing environmental problems such as marine plastic litter. However, it is difficult for local governments to define precisely and find solutions because these problems are entwined with each other and connected to local business practices and even cultural aspects.

As an outcome of the project titled “Developing the Methodology for Measuring and Realizing the Sustainability of Cities in the APEC Region” [SOM 01 2016S], Japan developed the “Guidebook for the Development of Sustainable Cities Focusing on Resource Circulation and Waste Management” (the Guidebook) which was endorsed by SOM on March 29, 2018. The Guidebook was made for local government officials who are in charge of waste management. By following the steps described in the Guidebook, it outlines a city’s own problems and showcases possible solutions to achieve efficient circulation of resources. The Guidebook provides a toolkit for the evaluation of the current situation such as the amount of the waste in the city, whether there is a legislative system regarding waste disposal, and whether there is a recycling system for End-of-Life Vehicle (ELV), e-waste, or construction waste.

In this project, the issues identified in the process of using the Guidebook have been collected and experiences of each city shared through a two-day workshop. The case studies of using the Guidebook were provided from cities that have already implemented some of the suggested approaches detailed in the Guidebook.

This report is organized as follows. In the Section 1.2, the summary of the Guidebook is presented. Chapter 2 provides the collected results of the case studies to share experiences with APEC members. Chapter 3 shows the practical guideline which summarizes the issues and possible directions identified in the process of the Guidebook’s application to the case study cities. In Chapter 4, the outline of the Workshop is provided.

1.2 Summary of the Guidebook

1.2.1 Assumed user and composition

The Guidebook is for use by local governments in the Asia-Pacific region seeking to address some of the environmental problems arising from rapid urbanization. Moreover, this Guidebook can be used not only by local governments in urban areas, but also by those in other areas such as rural areas, mountainous areas, and islands.

The Guidebook is composed as shown in the figure below.

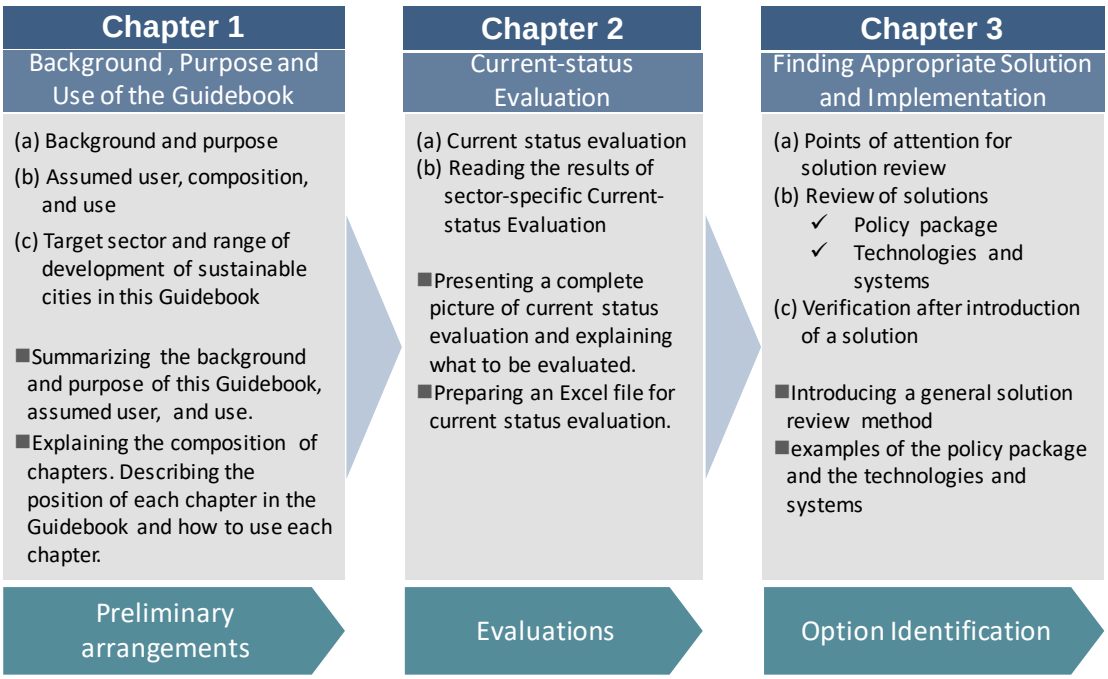


Figure 1-1 Composition and use of the Guidebook

1.2.2 Target sectors of the Guidebook

Beyond the health and wellbeing of city residents, the goal of sustainable cities also includes environmental aspects. To realize this goal, it is essential to deploy appropriate, environmentally sustainable solutions to seven sectors: 1. Resource Circulation; 2. Air; 3. Water; 4. Transportation; 5. Energy; 6. Soil; and 7. ICT. This idea comes from ISO37151, which specifies five elements for improving urban environmental infrastructure: energy, water, transportation, waste, and ICT. The Guidebook adds two more elements—air and soil—because both are indispensable in improving and maintaining living environment.

The Guidebook is aimed to help solve the problems specific to the resource circulation and waste management sector. However, once you start the development of sustainable cities in the resource circulation and waste management sector, it may affect other sectors.

Therefore, the Reference and the Excel sheet attached to the Guidebook also provide the evaluation toolkit for closely related items in other sectors (water, air, soil, and energy sectors) and solutions to improve these items.

＜Seven sectors for realizing sustainable cities＞

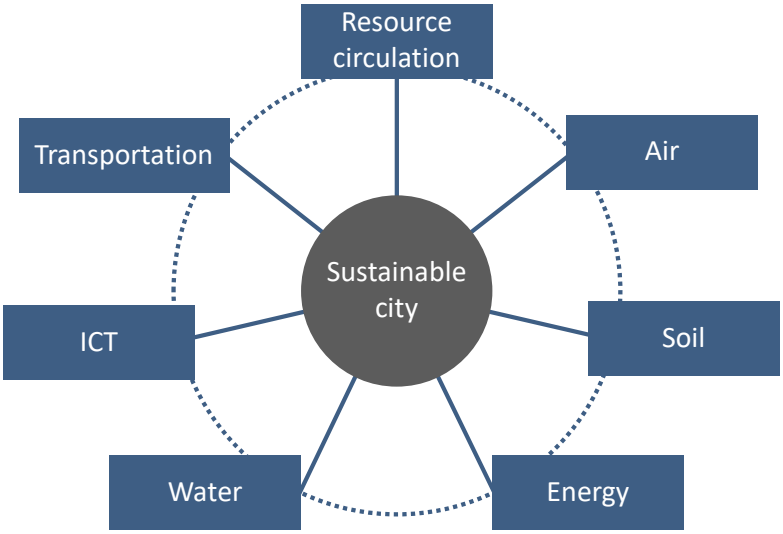


Figure 1-2　Seven sectors for achieving the development of sustainable cities

1.2.3 Current-status evaluation

Current-status evaluation can be implemented by entering the city's information and data in the Excel sheet attached to the Guidebook. A radar chart is produced and presented as the result of the evaluation. The evaluation can be implemented for both resource circulation and waste management sector and the relevant sectors (energy sector, water sector, air sector, and soil sector).

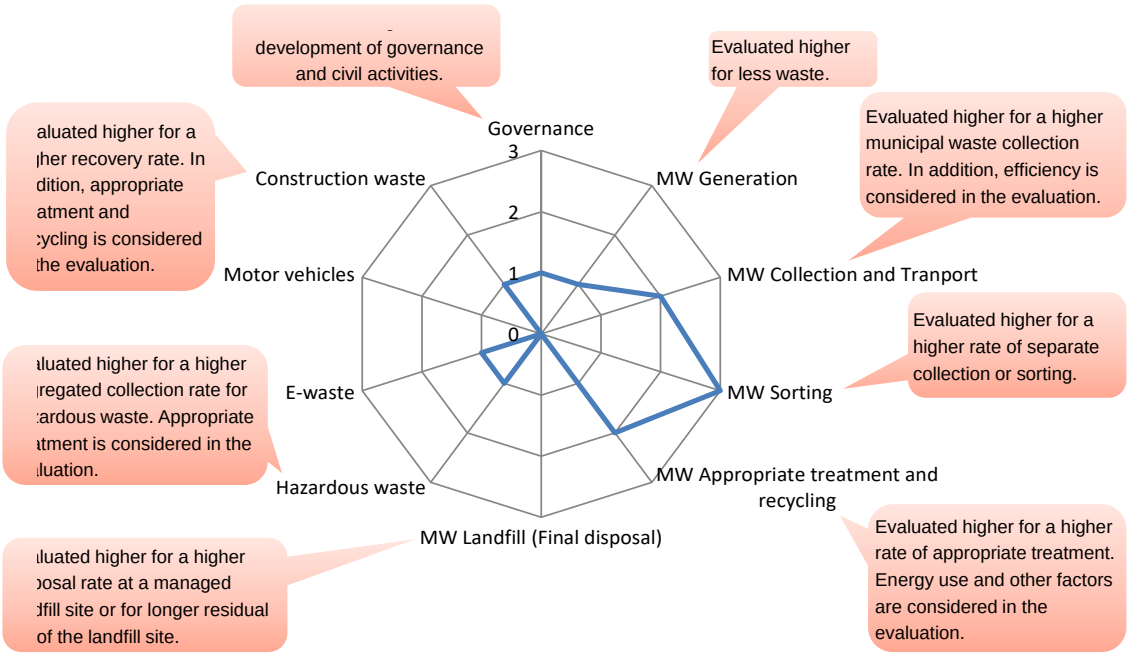


Figure 1-1 Example of a radar chart of evaluation results for resource circulation and waste management sector

1.2.4 Considering Solutions

Based on the Current-status Evaluation, the Guidebook provides how to identify solutions to improve the scores. The following points to consider in solution selection are presented in the Guidebook.

- Preparation for adapting a solution
- Preconditions for the introduction of a solution
- Development of a quality solution (such as consideration of lifecycle cost)
- Integrity of the whole
- Cooperation with other cities and the government
- Setting goals of verifying the effect after the introduction of a solution

2. Best practices for more efficient use of the Guidebook

As a case study of the utilization of the Guidebook developed by the Japan's Ministry of Economy, Trade and Industry (METI), a METI's project contractor (Japanese consulting company) conducted a study in the Batam City of Indonesia from October 2017 to February 2018. The contractor and the Batam City evaluated the current status for the resource circulation and waste management sector and considered appropriate solutions. Also, as a part of the project of New Energy and Industrial Technology Development Organization (NEDO) conducted from December 2019 to March 2020, a NEDO's project contractor (Japanese consulting company) evaluated the current status for the resource circulation and waste management sector of Mandaue City of Philippines and Surabaya City of Indonesia.

This chapter summarizes those best practices with a view towards serving as a reference for local government officials who seek to develop a sustainable city and engage in intercity cooperation, as well as for companies with technologies that can be utilized as solutions. Sharing the experiences in other cities can be helpful for the potential users to obtain an insight to use the Guidebook more efficiently towards developing a sustainable city.

Main findings and results of using the Guidebook in the case study cities are shown in the Table 2-2.

Table 2-1 Best practices of using the Guidebook summarized in this chapter

Case	City, Economy	Year evaluated
No. 1	Batam city, Indonesia	FY2017
No. 2	Mandaue city, Philippines	FY2019
No. 3	Surabaya city, Indonesia	FY2019

Table 2-2 Summary of the result of using the Guidebook in the case study cities

	Evaluation	Proposed Solution
Case study # 1 Batam City	● The scores for the following items were relatively low: ➢ Municipal Waste (MW) (collection and transport) ➢ MW (sorting) ➢ MW (appropriate treatment and recycling) ➢ MW landfill (final disposal) ➢ Hazardous waste	● The following solutions were proposed: ➢ Introduction of compaction trucks ➢ Separation of recyclable waste and development of a sorting center ➢ Introduction of Waste-to-Energy (WtE) approaches ➢ Measures for making the present facility longer operated and consideration of a new final disposal site ➢ Introduction of technology for properly treating spent bleaching earth
Case study # 2 Mandaue City	● The scores for the following items were relatively low: ➢ MW (collection and transport) ➢ MW (appropriate treatment and recycling) ➢ Hazardous waste ➢ Motor vehicles ➢ Construction waste	● The following solutions were proposed: ➢ Permit system for collection and transportation companies ➢ Incineration / reuse of incineration residue ➢ Technology for treating hazardous waste ➢ Inspection and assembly technology for reused parts of automobiles ➢ Concrete block and asphalt reuse technology, etc.
Case study # 3 Surabaya city	● The scores for the following items were relatively low: ➢ MW (generation) ➢ MW (sorting) ➢ MW (appropriate treatment and recycling) ➢ MW landfill (final disposal) ➢ Hazardous waste ➢ E-Waste ➢ Motor vehicles ➢ Construction waste	● The following solutions were proposed: ➢ Data collection in cooperation with waste banks and transfer stations to understand the amount of waste generated ➢ Introduction of catalyst-based waste plastic conversion technology ➢ Introduction of a small incinerator for medical waste ➢ Plastic material recycling ➢ Inspection and assembly technology for reused parts of motor vehicles ➢ Concrete block and asphalt reuse technology, etc.

2.1 Batam

2.1.1 Background of using the guidebook

(1) Background

Since Batam City of Indonesia is located near Singapore and designated as Free Trade Zone (FTZ), the city also serves as a business hub. However, population increases due to rapid urbanization and industrial development have resulted in waste treatment issues and other various environmental problems for the city.

Similarly, the city of Yokohama has worked to address challenges related to rapid industrial development and population growth and as a result the City has developed and publicized policies, technologies, and know-how to address these issues.

Therefore, Batam City and City of Yokohama concluded the Letter of Intent on Technical Cooperation for Sustainable Urban Development in Batam with the aim of developing an environmentally conscious sustainable urban city in Batam City to create a collaborative relationship in a number of areas.

This time, Batam City clarified the current status of waste sector and utilized the Guidebook to consider what solutions should be introduced with the cooperation and support of the City of Yokohama.

(2) Flow of Guidebook Utilization

Following the below flow chart, solutions were considered from October 2017 to February 2018. During that time, face-to-face meetings were held twice to evaluate the current status of Batam City and consider what kind of solutions Batam City should introduce.

The flow of Guidebook utilization			The case of Batam City
Step 1	Confirming the flow of utilization	First of all, all the stakeholders confirm the flow of Guidebook utilization.	• On October 2017, all the stakeholders held a meeting in Batam City to confirm the flow of Guidebook utilization. • In addition, Japanese entities explained to Batam City how to evaluate the current status. They tentatively evaluated a part of items with Batam City and asked the city to evaluate all the items.
Step 2	Grasping the current status of the city	Through visits and interviews, the stakeholders confirm the current status of waste treatment in the city.	• Batam City generally explained how they managed waste in the meeting on October 2017. • They visited to see a waste collection site, collection vehicles, and a landfill site.
Step 3	Implementing Current-status Evaluation	City officials implement the Current-status Evaluation by themselves.	• During November 2017, Batam City implemented the Current-status Evaluation and shared the results with the stakeholders. • On the basis of the results, they considered questions and what kind of solutions Batam City should introduce.
Step 4	Discussing on the results of evaluation	Stakeholders discuss on the results of evaluation and modify them as needed.	• On December 2017, they held a meeting again in Batam City to confirm the results of the Current-status Evaluation. • On that occasion, they discussed to bridge the perception gap between them.
Step 5	Considering solutions	On the basis of the results of the Current-status Evaluation, stakeholders consider solutions.	• On the basis of the results of the Current-status Evaluation, they considered solutions especially for points which have issues. • On that occasion, they confirmed the harmonization with other policies which had already been considered in Batam City.

Figure 2-1 The flow of Guidebook utilization in Batam

2.1.2 Overview of Batam City

(1) Basic information

Batam Island is one of Free Trade Zones (FTZs) together with Bintan and Karimun islands. Batam develops infrastructure to attract and invite foreign investment. Singaporean, Japanese and many other foreign companies have established production and processing bases in Batam Island as a bonded processing area.

On June 25, 2006, both Indonesia and Singapore signed the Framework Agreement on Economic Cooperation in the Islands of Batam, Bintan, and Karimun, with the aim of cooperating to develop the above islands as Special Economic Zones (SEZs). The actual scope of cooperation covers seven areas: investment, finance, tax, customs and sales tax, immigration, human resources, and capacity building. On August 2007, the two economies also have designated not only the entire island of Batam, but Bintan and Karimun islands as FTZs by establishing industrial zones.

Basic information on Batam City	
Population	1,037,187 people (as of 2015)
Area	The area of the whole Batam City is 3,990km2. Of which, land is 1,040km2.
Ethnicity	Malays (85%) and Chinese (14%)
Religion	Muslims are the majority, followed by Christians, Buddhists, and others.
Climate	• Tropical climate • Average temperature is between 26 and 28℃. • Average humidity is between 75 and 86%.
Language	Indonesian (Official language)
Currency	Indonesian rupiah Singapore Dollar is also used in some parts of Batam City.
Location	Batam is a city of Riau Islands Province of Indonesia, located on the southern part of Singapore. (It takes one hour from Singapore to the main Batam Island.) It is made up of 400 or more islands. 

(2) Waste Management of Batam City

The municipal waste (MW) generation in Batam City is 1,200 tons per day. Household MW is 70% while industrial MW is 30%. The MW amount per citizen per day is around 0.7 to 0.9 kg. Less than 90% of the household MW comes from households, and the rest comes from markets and public facilities. MW generation is growing year by year and expected to grow in the future. The composition of MW in Batam City is shown as follows.

Table 2-3 The composition of MW in Batam City

No.	Composition	Household MW (%)			Industrial MW (%)	
		Household	Market	Public facility	Business facility	Other commercial facilities
1	Organics	61.95	76.85	17.27	8.70	27.23
2	Paper	12.26	11.90	33.27	20.85	34.65
3	Wood	1.37	0.29	0.64	8.93	0.14
4	Textile	1.55	0.64	0.36	2.24	3.44
5	Rubber	0.50	0.01	0.45	-	0.23
6	Plastic	13.39	7.18	19.91	37.81	17.76
7	Metal	1.80	0.15	3.27	11.99	4.42
8	Glasses	1.72	0.95	5.82	0.05	8.90
9	Other	5.46	2.03	19.01	10.38	3.23

Source: Batam City

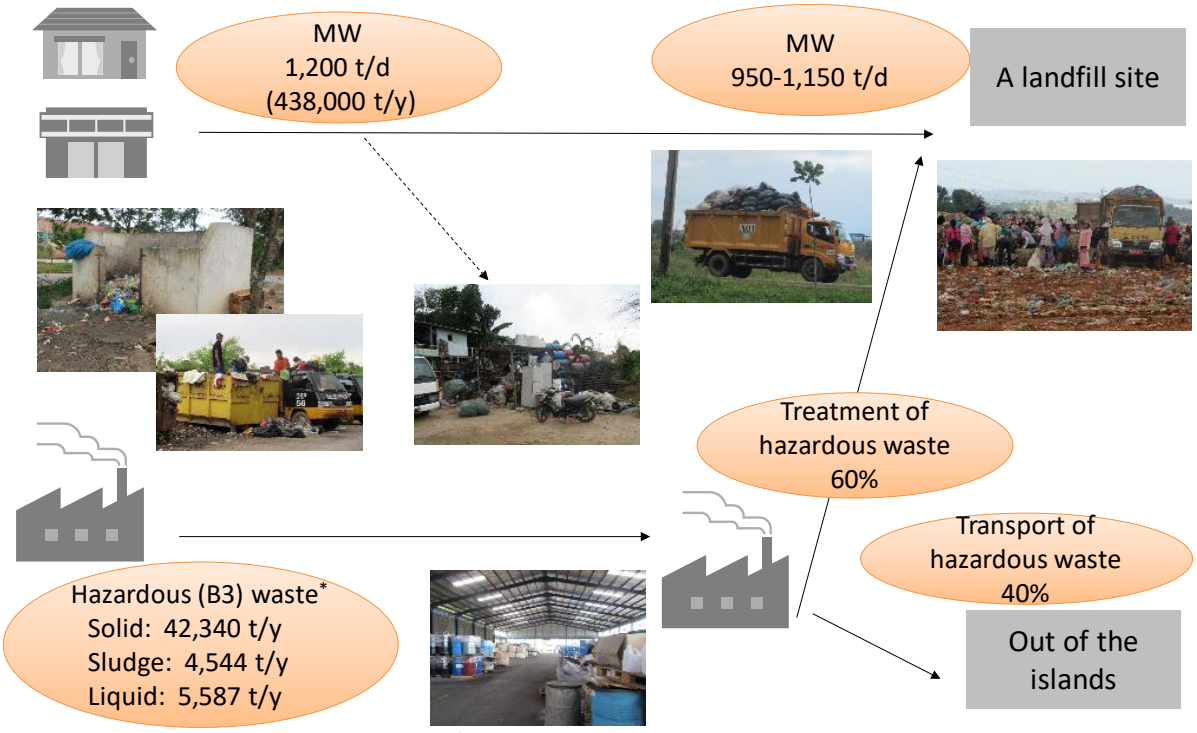
In Batam City, citizens are responsible for transporting household waste to a depot that is close to their community. The city collects the waste, while often selling valuable resources to recycling operators.

The collected waste is transported to a landfill site, which can receive 950 to 1,150 tons per day. The city directly landfills waste in the landfill site without any pretreatment. Waste pickers, called scavenger in Indonesia, sort valuables such as plastics.

In Batam City, MW recycling rate is around 5 to 7%. As 3R (Reduce, Reuse, and Recycle) programs in community, there are recycling systems through waste banks and waste pickers. A waste bank buys resource waste and delivers it to recycling operators. It has a scheme that the resource waste is not immediately converted into cash, but saved in an account. Although some citizens bring household resource waste to a waste bank, the rate is around 1 to 2%. On the other hand, waste pickers recycle resource waste at MW generation sources (e.g. households, business facilities) as well as a landfill site. The recycling rate is around 4 to 5%. Recycled waste are transparent plastic (PET and HDPE),

paper, and scrap metal discharged from ships. Some communities conduct composting at home.

Some hazardous waste designated by the government are treated by designated hazardous waste treatment operators. Batam-Indonesia Free Zone Authority (BIFZA) supervises the management of hazardous waste, and the BIFZA monitors the amount of hazardous waste generated and treated. According to the BIFZA, among the hazardous waste in 2016, solid, sludge, and liquid waste were about 42,340, 4,544, and 5,587 tons, respectively. Produced hazardous waste was disposed of by hazardous waste treatment operators in the city. However, only 60% of the hazardous waste could be landfilled in the city, while the remaining 40% was treated out of the city (the islands).



*Hazardous (B3) waste: This waste has explosive, flammable, and/or toxic properties. It is listed in the appendix of Government Regulation Number 85 Year 1999. It includes chemical substance, sludge, scrap, and e-waste.

Figure 2-2 Waste Management of Batam City

2.1.3 The Results of Current-status Evaluation

On the basis of the current situation of waste treatment and recycling in Batam City, municipal officials input data into the Current-status Evaluation sheet to produce radar charts.

(1) Resource Circulation and Waste Management Sector

The results of evaluation for the resource circulation and waste management sector are shown in the following Figure.

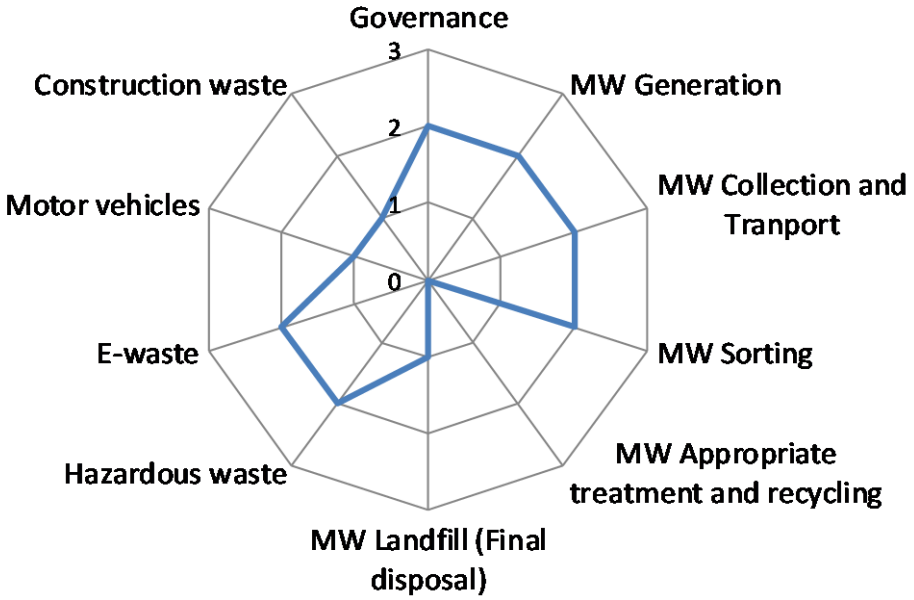


Figure 2-3 Radar chart of the evaluation results on Batam City for the resource circulation and waste management sector

The detailed evaluation results of individual axes are shown as follows:

Governance

As regards the waste management governance sector, some legislation is formulated by the Indonesian government system and enforced by the local government. Regardless of the formulating entity and the enforcing entity, the appropriateness of the enforcement of waste management was evaluated. In Batam City, although the waste management governance system is appropriately operated, detailed regulations other than the ones of waste collections are not developed enough. Regarding 3R (Reduce, Reuse, and Recycle), systems to encourage people's awareness are not well established. The recycling rate is not high as well. A waste bank system and other 3R activities by communities are expanding but not enough at this point. On the basis of the above, this axis gained two points.

MW (generation)

Batam city's daily MW disposal amount is 1,200 tons, so that annual MW amount per citizen will be 329 kg/person/year. In view of Indonesia's annual GDP per capita, which is about 3,600 USD, this axis gained two points.

MW (collection and transport)

MW collection is operated almost everywhere in Batam City through relay transportation system using containers, thereby increasing the collection rate. However, garbage compactor trucks are not well prepared. Promoting the efficiency of MW collection and transport is not enough, so that this axis gained two points.

MW (sorting)

Through a waste bank system, about 30% of all the households separate waste when it is generated. In addition, at the MW collection and disposal processes, waste pickers implement sorting. The sorting rate is considered to be around 70% of MW generation. However, the current separation and sorting do not achieve enough recycling rate. This axis gained two points.

MW (appropriate treatment and recycling)

Batam City promotes composting at home through a subsidy for introducing composting containers, so that about 30% of all households use composting. Waste pickers recycle plastic and metal, but their labor environment in the recycling process is not safe enough. In addition, collected MW is directly landfilled in a managed landfill site without reducing the amount of MW through any biological treatment, incineration treatment, or recycling. Although the introduction of composting was positively evaluated, comprehensive evaluation of this axis was zero point.

Points to discuss

Batam City originally recognized that resources collected by waste pickers were properly recycled, because resource waste can be sold, and thus they evaluated this axis as one point. During discussion, they understood that in order to be evaluated as environmentally proper, the appropriateness of work and hygienic environment for waste pickers as well as management situation of sorting facilities are needed, and recognized that their original evaluation result did not appropriately reflected the current status. Therefore, Batam City changed their views and recognized that the current way of recycling resources is not environmentally appropriate. As a result, comprehensive evaluation of this axis became zero point.

MW landfill (final disposal)

Collected MW is disposed of at a landfill site. However, ways of managing and operating the landfill site are not proper enough. In addition, the residual life years are about 9 years, which are short for the landfill site. On the basis of the above, this axis gained one point.

Hazardous waste

On the basis of the regulations of the Indonesian law, hazardous waste is separated at the time of generation and sorted after the collection. Although about 60% of the collected hazardous waste is treated by hazardous waste treatment operators in Batam City, inside the Batam Island, some operators cannot achieve the level of the Indonesian standards. On the other hand, the remaining 40% of the collected hazardous waste is transported and treated out of the Batam Island, so that this axis gained two points.

E-Waste

Although e-waste must be delivered to hazardous waste treatment operators, household e-waste has not been properly delivered to them, so that the collection rate is about 50%. The reuse of e-waste is basically delegated to private companies. In addition, secondhand retailers properly repair collected e-waste and sell it with a warranty as needed. Therefore, the reuse process is considered to be properly operated. On the basis of the above, this axis gained two points.

Motor vehicles

The reuse of motor vehicles is basically delegated to private companies. Secondhand

retailers properly repair collected motor vehicles and sell them with a warranty as needed. Therefore, the reuse process is considered to be properly operated. On the other hand, collection and disposal methods of waste motor vehicles are not established. At this point, the only way of recycling resources from them is carried out by waste pickers. This is not proper treatment and recycling. On the basis of the above, this axis gained one point.

Points to discuss

Batam City originally recognized that there was no issue on the treatment of waste motor vehicles, because waste pickers collect resources, and thus they evaluated this axis as two points. However, they understood that waste motor vehicles contain hazardous and harmful substances, and therefore need to be properly treated soon after they are disposed of, and recognized that their original evaluation result did not appropriately reflected the current status. In the end, Batam City changed their views and recognized that the current ways of treating and recycling waste motor vehicles are not properly implemented. As a result, this axis became one point.

Construction waste

It is stipulated that construction waste generated after demolishing a house should be brought into a landfill site. However, the collection rate is about 50%. Waste pickers recycle resources, but it is not a proper recycling. This axis gained one point.

Points to discuss

Same as the MW appropriate treatment and recycling, Batam City changed their views on the appropriateness of resource collection by waste pickers, and recognized that their original evaluation result did not appropriately reflected the current status. The final evaluation was one point, changed from the original two points.

(2) The Relevant Items in Other Sectors

The results of evaluation for the relevant items in other sectors are shown in the following figure.

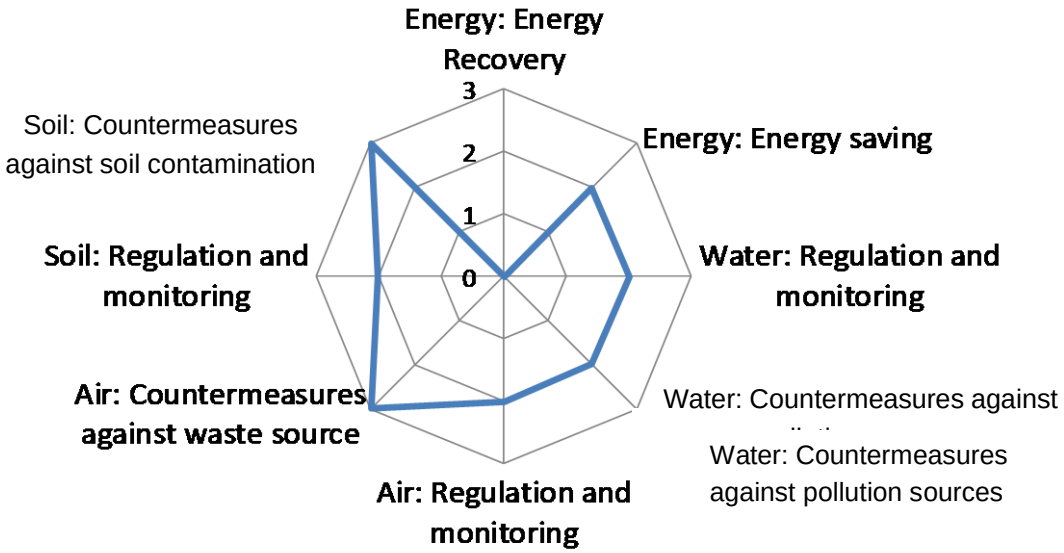


Figure 2-4 Radar chart of the evaluation results on Batam City for the relevant items in other sectors

The detailed evaluation results of individual axes are shown as follows:

Energy（energy recovery）

Incineration treatment is not introduced yet. In addition, biological treatment is limited to composting and excludes fuel utilization. Therefore, this axis was evaluated as zero point. Although the city has already considered the introduction of incineration facilities, it is preferable that it should also consider energy recovery.

Energy（energy saving）

Batam City makes efforts for energy saving through saving electricity at waste treatment facilities. In addition, it promotes energy saving activities, such as the renewal of vehicles and facilities. However, the city does not grasp energy consumption at waste treatment and recycling facilities. It is using the old facilities without major renovation. On the basis of the above, this axis gained two points.

Water（regulation and monitoring）

Control criteria of water quality are established. In addition, about 70% of waste treatment and recycling facilities implement monitoring of waste water. As a result, this axis gained two points.

Water（countermeasures against pollution sources）

About 70% monitoring facilities take countermeasures against waste water, so that this axis gained two points.

Air（regulation and monitoring）

Control criteria of air pollution are established. In addition, about 70% of waste treatment and recycling facilities implement monitoring of exhaust gases. As a result, it gained two points.

Air（countermeasures against pollution sources）

About 70% monitoring facilities take countermeasures against exhaust gases. In addition, measures against exhaust gases generated from relevant vehicles are taken. As a result, this axis was evaluated as three points.

Points to discuss

Batam City originally evaluated their municipal policy only. However, the evaluation utilizing this Guidebook covers not only municipal policies, but other existing policies implemented by responsible entities other than the city. That is why they could evaluate measures against exhaust gases at the time of car inspection carried out by Indonesia's Ministry of Environment. As a result, this axis was evaluated as three points.

Soil（regulation and monitoring）

Control criteria of soil contamination are established. In addition, about 70% of waste treatment and recycling facilities implement monitoring. As a result, this axis gained two points.

Soil（countermeasures against soil contamination）

Soil contamination is not detected through the survey, so this axis gained three points.

Points to discuss

Batam City originally evaluated this axis as two points because they did not take countermeasures against soil contamination. However, the fact that soil contamination is not detected through the survey requires no measures. As a result, this axis was evaluated as three points.

Column: Changes in Evaluation Results through Discussion

As shown in the above points to discuss, the evaluations of some axes have changed based on the discussions. In addition, a number of evaluation items have changed their answers resulted from the discussions, even though the scores of the axes did not change.

The reason why evaluations were changed is a perception gap over the appropriateness and coverage of evaluation items between the intention of the Guidebook and Batam City. This fact teaches us that the actual conditions can be reflected in evaluation axes through not only the Current-status Evaluation conducted by a local city but also through discussions with entities with expertise in addressing waste management issues and an understanding of the proposed evaluation methods.

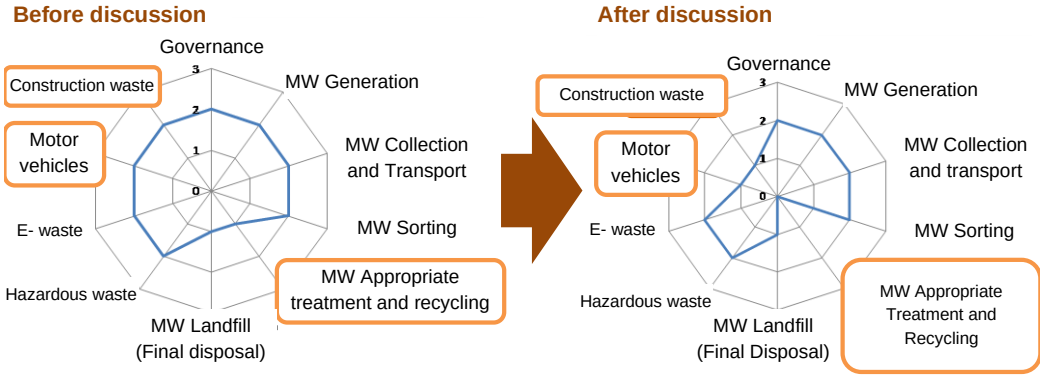


Figure 2-5 A change in evaluation results through discussion for the resource circulation and waste management sector

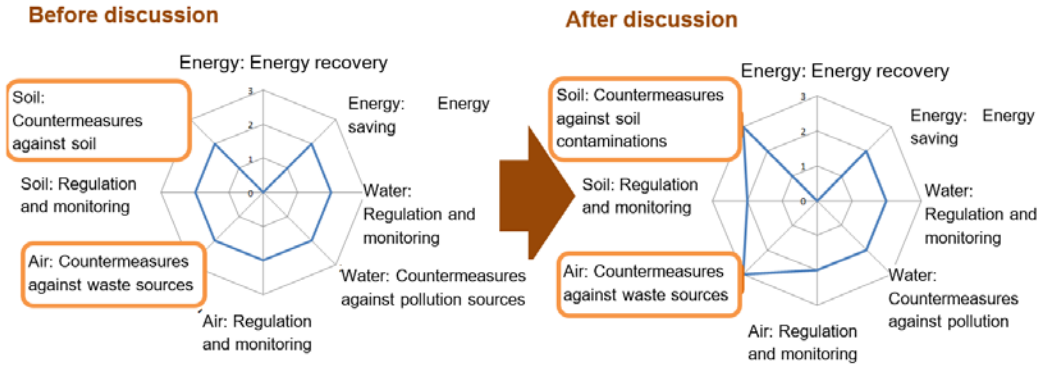


Figure 2-6 A change in evaluation results through discussion for the relevant items in other sectors

Since evaluation results can be seen in the above radar charts, you can grasp what evaluation axes are higher or lower in the current situation. Although a lower score of an axis means that measures are not taken enough at this point, it does not necessarily mean that no measures are taken. Therefore, when some axes gain lower scores, you should put additional statement that the current measures may not be enough. Once you look at radar charts, you could understand that the charts are useful for considering actual solutions.

2.1.4 Considering Solutions to be Introduced

On the basis of the results of the Current-status Evaluation, Japanese entities considered solutions to axes with lower scores in order to address issues of Batam City. The details of the proposed solutions and the feasibility in Batam City are shown as follows:

MW (collection and transport)

Although Batam City conducts MW collection, the efficiency of MW collection is not improved yet. Japanese entities proposed solutions: introduction of compaction trucks and improvement of the efficiency by introducing IoT (e.g. a smart garbage system).

Regarding the feasibility, municipal policy agrees with the introduction of compaction trucks, because Batam City thinks of replacing all the collection vehicles with compaction trucks in the future. On the other hand, the city cannot introduce IoT soon to improve the efficiency of MW collection but hopes to introduce it in the future.

MW (sorting)

Since the recycling rate is low due to inadequate separation and sorting, Japanese entities proposed solutions: separating recyclable waste and introducing a sorting center.

Regarding the feasibility, Batam City has promoted the efforts to separate recyclable waste by utilizing a waste bank system since 2015. The city plans to expand the system in the future, which is consistent with an existing policy. To promote the policy, the city suggested a solution, such as the introduction of an application for smartphone to input the amount of collected waste and organize the data. The idea of introducing a sorting center agreed with a municipal policy that the city has considered the introduction of belt conveyors in addition to manual sorting at a landfill site.

MW (appropriate treatment and recycling)

On the basis of the facts that almost all waste is not currently treated by reducing the amount and that the energy recovery axis scored zero-point, Japanese entities proposed a solution, which is the introduction of Waste-to-Energy (WtE). They also suggested another solution, the introduction of recycling treatment facilities targeted for organic waste and e-waste.

Regarding the feasibility, Batam City has already considered the introduction of WtE. On December 2017, they held a workshop where the stakeholders gathered. During the workshop, they confirmed that they need to address not only technological issues but also social issues, such as the lack of a legal background for waste treatment costs (tipping fee), stagnation of the price of sold electricity, and securing investment in the construction of facilities. WtE is a technology of balancing waste reduction and energy utilization. To operate a stable WtE business, it requires revenues from both waste treatment costs and sales of electricity. If such social conditions are not secured, it would be difficult to attract the investment in the construction of facilities. To address those social issues, it is preferable that the stakeholders will have meetings to create a law and legal systems and introduce sustainable WtE facilities.

Regarding the introduction of recycling treatment facilities, there is also has a vision of developing recycling areas. To treat organic waste properly, the city will promote composting at home through a subsidy system. (Since Batam City has no agriculture business, a large scale of composting is not probable. That is why the city considers the introduction of composting at home.)

MW landfill (final disposal)

Since the residual life years of the landfill site are short, about 9 years, Japanese entities proposed solutions: measures for making the present facility longer operated by improving recycling rate and implementing pretreatment to reduce the amount of waste and consideration of a new landfill (final disposal) site.

Regarding the feasibility, Batam City has already considered both the measures for making the present facility longer operated and a new landfill site. The new landfill site can be expanded into the neighboring area (13ha) and will be scheduled to establish. Therefore, it is confirmed that the suggested solutions agree with the municipal policies.

Hazardous waste

Although about 60% of hazardous waste is treated inside the island, there are some cases where proper treatment cannot be secured. In addition, the rest 40% is treated out of the island. Therefore, Japanese entities proposed solutions: the introduction of technology for properly treating spent bleaching earth and internal treatment of waste which will be transported out of the island.

Regarding the feasibility, Batam City started a feasibility study for the introduction of actual proper treatment technology for spent bleaching earth in collaboration with the

City of Yokohama. Regarding the internal treatment of waste which will be transported out of the island, they consider the introduction of proper technology into the currently conceived recycling areas to treat the hazardous waste.

2.1.5 Conclusion

The draft solutions for the resource circulation and waste management sector from the results of utilizing the Guidebook are consistent with the policies that Batam City has already considered. For Batam City, they could not only confirm the validity of their policies from the third-party perspective but found the issues that they had not recognized before, such as labor environment for waste pickers.

Comment from Batam city

Applying the Guidebook to Batam City, we could confirm the problems of waste management in Batam City. In particular, as the evaluation result of the Guidebook indicates, energy recovery is a big problem for waste management in Batam City. Regarding Energy (energy recovery), actually Batam city with support from central government has done hard work for waste to energy project since 2006 for first FS, but unfortunately twice failed in bidding process because of tipping fee being not approved by Batam city council yet. In this hard effort, we are facing the issue to clarify the value of energy recovery. We will still continue efforts to introduce energy recovery and to advance waste management in Batam City.

Comment from Yokohama City

For City of Yokohama, which promotes intercity cooperation with Batam City, it was an outcome that we were able to learn issues on waste management in Batam City efficiently. Even under the insufficient chances to travel and under time constraint, we made it through the focused questions utilizing the Guidebook, qualitative self-evaluation, and the discussion in the analysis process. In addition, we were able to share this result with Japanese companies through open seminars and other events. We expect to see the effect of leading to solution proposal early through applying this Guidebook.

2.2 Mandaue

2.2.1 Background of using the guidebook

(1) Background

Mandaue City is a major city that forms the center of "Metro Cebu", the second largest metropolitan area in the Philippines after Metro Manila. Due to rapid urbanization and an increase in tourists, various issues including waste disposal are emerging.

Mandaue City and Yokohama City have been building cooperative relationships in many fields with the aim of creating an environmentally friendly and sustainable city in Mandaue City.

Mandaue City conducted a study using the Guidebook with the cooperation of Yokohama City in order to clarify the current situation in the waste management and resource circulation sector and to consider solutions to be introduced.

(2) Flow of Guidebook Utilization

From December 2019 to March 2020, a study was conducted according to the flow shown in the figure below. Through two face-to-face discussions and one online discussion during the period, an evaluation of the current situation of Mandaue City was conducted and the direction of solutions the city should introduce was considered.

The flow of Guidebook utilization			The case of Mandaue City
Step 1	Confirming the flow of utilization	First of all, all the stakeholders confirm the flow of Guidebook utilization.	• On November 2019, all the stakeholders held a meeting in Mandaue City to confirm the flow of Guidebook utilization. • In addition, Japanese entities explained to Mandaue City how to evaluate the current status. They discussed the current situation and asked the city to evaluate all the items.
Step 2	Grasping the current status of the city	Through visits and interviews, the stakeholders confirm the current status of waste treatment in the city.	• Mandaue City generally explained how they managed waste in the meeting on November 2019. • They visited to see collection vehicles, a plastic recycling facility, and a final disposal site.
Step 3	Implementing Current-status Evaluation	City officials implement the Current-status Evaluation by themselves.	• During December 2019, Mandaue City implemented the Current-status Evaluation and shared the results with the stakeholders. • On the basis of the results, they considered questions and what kind of solutions Mandaue City should introduce.
Step 4	Discussing on the results of evaluation	Stakeholders discuss on the results of evaluation and modify them as needed.	• On February 2020, they held a meeting again in Mandaue City to confirm the results of the Current-status Evaluation. • On that occasion, they discussed to bridge the perception gap between them.
Step 5	Considering solutions	On the basis of the results of the Current-status Evaluation, stakeholders consider solutions.	• On the basis of the results of the Current-status Evaluation, they considered solutions especially for points which have issues. • On February 2020, they held a web-meeting and confirmed the harmonization with other policies which were planned to be implemented in Mandaue City.

Figure 2-7 The flow of Guidebook utilization in Mandaue

2.2.2 Overview of Mandaue City

(1) Basic information

Mandaue City is one of the major cities of the second largest metropolitan area "Metro Cebu" in the Philippines after Metro Manila.

Metro Cebu is made up of 13 municipalities and has a population of approximately 2.85 million as of 2015 and is expected to grow to approximately 5 million by 2050. The population of Mandaue City is expected to be 445,000 in 2030 and 507,000 in 2050, and due to rapid urbanization and population growth, traffic congestion and a shortage of waste treatment and drainage facilities are serious problems.

Although Mandaue City is located in the famous resort area of Cebu, it is an industrial city where the ratio of industrial area accounts for about half of the land use. There are about 2,000 companies in Mandaue City for food, beverages, furniture, metal processing, etc., and more than half of the furniture exporters in the Philippines are based in Mandaue City. The total sales of the companies registered in Mandaue City in 2017 were 210.1 billion pesos, and the amount of new business investment in 2017 was 5.1 billion pesos.

In Mandaue City, there are two bridges connecting to Cebu International Airport, which has the second largest number of passengers in Philippines (over 1.67 million passengers for international flights and over 5.16 million passengers for domestic flights in 2014) and Mactan Island, which has an industrial park with many Japanese companies. The city is popular as a gateway to Cebu Island, where houses and businesses are concentrated, and is a major transportation hub. The city, which is located just 3.3 km away from Cebu International Port (Cebu City), home of many domestic shipping companies in the Philippines' major ports, is a center of international trade.

Cebu International Port (Cebu City), which is the main port of the Philippines and is the home port of many domestic shipping companies, is close to 3.3 km and is also the center of international trade. Construction of the Cebu Cordoba Bridge, the third bridge connecting Cebu City and Mactan Island, will begin in July 2018 and is scheduled to be completed in March 2021 in order to eliminate traffic congestion.

Basic information on Mandaue City	
Population	362,654 people (as of 2015)
Area	34.87km^2
Religion	More than 90% of the population are Christians, most of whom are Roman Catholics.
Climate	• Tropical climate • Average temperature is between 27 and 30 ℃. • June-November is the rainy season, December-May is the dry season
Language	• Tagalog (official language) • Cebuano (common language of the Visayas) • English (common language)
Currency	Philippine peso
Location	The city of Mandaue is located on the central-eastern coastal region of Cebu Island in the Republic of the Philippines. 

(2) Waste Management of Mandaue City

In the Philippines, the Ecological Solid Waste Management Act was enacted in 2001, and the local government is responsible for collecting and disposing of solid waste. The annual amount of municipal waste generated per citizen of Mandaue City is 228.9 kg / person / year. This value is estimated based on the amount of waste generated as of 2016 and its details are shown in the table below.

Table 2-4 The composition of MW in Mandaue City

2016 Waste generation per day Unit: kg			Composition				
			Biodegradable waste	Resource materials	Final disposal waste		Special waste (Danger waste)
					Convertible *	Others	
		Weight ratio	27%	35%	20%	15%	2%
source	Household	86.1%	56,245	73,492	40,442	31,728	5,140
	Commercial	12.4%	8,111	10,598	5,832	4,575	741
	Facilities / Organizations	1.0%	644	842	463	363	59
	Industries	0.5%	295	386	212	167	27
	Agriculture	0.1% or less	1	1	0	0	0
Total		100%	65,296	85,318	46,950	36,833	5,967

* Convertible residue（Residuals with potential for diversion）are wastes that can avoid landfilled in the future by treatment such as sorting.

Source: Mandaue City WACS Waste Diversion Projection

The waste treatment flow in Mandaue City is shown in the figure below. The smallest local government unit that makes up the town of the Philippines is called a barangay, and in Mandaue City, the barangay collects and disposes of municipal waste.

Household waste and waste generated by small businesses are collected by barangay trucks and transported to the final disposal site without going through an intermediate treatment facility. A barangay truck is accompanied by a waste picker, and valuable resources are sorted during transportation and sent to junk shops registered in Mandaue City. Also, only on Tuesdays and Thursdays, the trucks stop by a factory that was established by a Yokohama company in Cebu City, thereby plastics and other materials are handed over and used to manufacture fluff fuels. Finally, the remaining waste is transported to the final disposal site.

The city of Mandaue once owned a final disposal site, but it was officially closed because it exceeded its capacity. Since May 2019, municipal wastes are transported to the final disposal site newly established by a private company in Cebu City. In addition, a

large amount of wastes such as industrial wastes are transported to an appropriate treatment facility such as a final disposal site operated by a private company by concluding a contract with a waste transportation company. According to the city of Mandaue, junk shops and waste disposal companies are monitoring the amount of waste collected, but it seems that the city of Mandaue does not have a mechanism to collect the data.

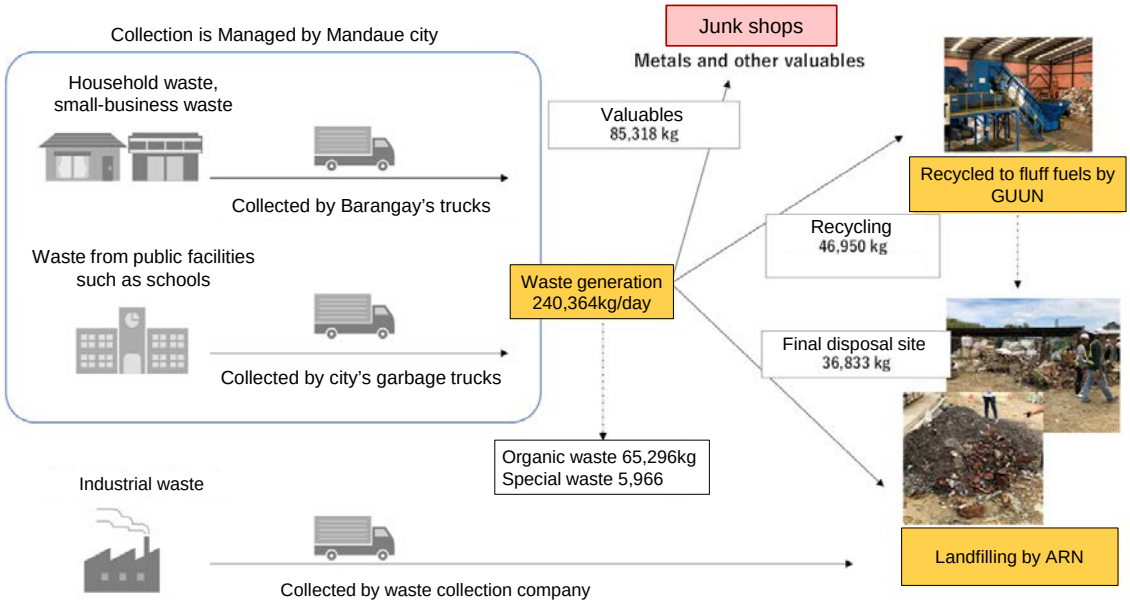


Figure 2-8 Waste Management of Mandaue City

2.2.3 The Results of Current-status Evaluation

Based on the current situation of waste treatment and recycling in Mandaue City, they input data into the “Current-status Evaluation Sheet” to produce radar charts.

(1) Resource Circulation and Waste Management Sector

The results of evaluation for the resource circulation and waste management sector are shown in the following figure.

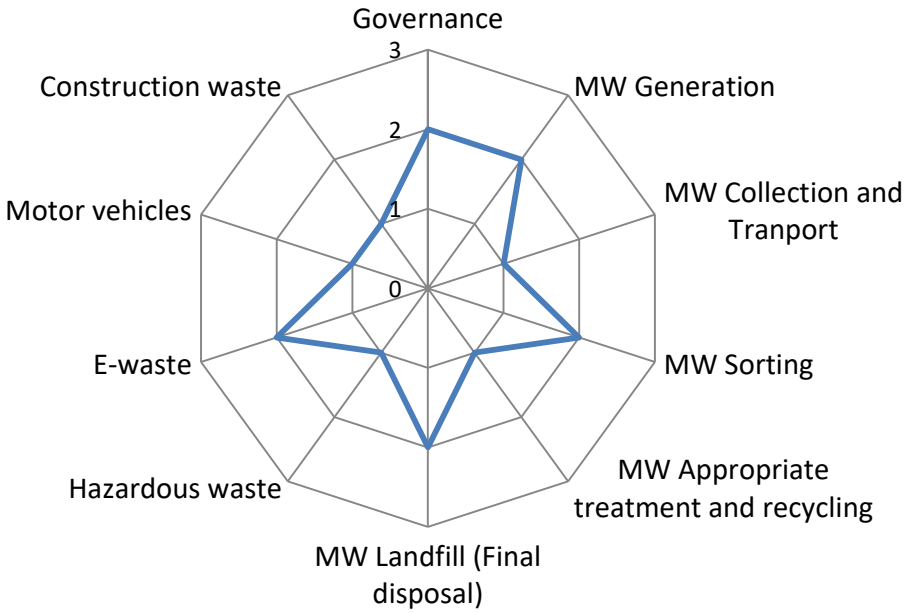


Figure 2-9 Radar chart of the evaluation results on Mandaue City for the resource circulation and waste management sector

The details of the evaluation results for each axis are as follows.

Governance

In the Philippines, the Ecological Solid Waste Management Act enacted in 2001 places the responsibility of collecting and disposing of solid waste on local governments. While the city of Mandaue stipulates the separation and collection of waste in ordinances, it says that there is room for improvement from the perspective of proper implementation of measures. Based on the above, this axis gained two points.

MW (generation)

The annual amount of municipal waste generated in Mandaue City is estimated as 228.9 kg / person / year. This value is estimated based on the population growth and the amount of waste generated in 2016. Furthermore, considering the annual GDP per capita in the Philippines at 3,022 USD, the evaluation score was 2 points.

MW (collection and transport)

The collection and transportation of municipal waste is carried out by the smallest local government unit (barangay). On the other hand, the introduction of garbage compaction vehicles is limited to some public facilities, and there is room for improvement in efficient collection and transportation. Thus, the evaluation score was 1 point.

MW (sorting)

After the MW is collected, it is sorted by the waste picker in the truck and the valuables are sent to the junk shop designated by the city. In addition, in front of the gate of GUUN and ARN, Mandaue City officials check the sorting status and instruct the barangay to re-sort if the sorting is insufficient. Moreover, GUUN and ARN are also sorted after collection. In this way, proper sorting is implemented at various places before the collected waste goes to the final disposal site. However, according to the self-evaluation of Mandaue City officials that there is still room for improvement, the score was evaluated as 2 points.

MW (appropriate treatment and recycling)

Mandaue City does not have a biological treatment or incineration treatment facility. It is seemed that there is room for improvement in the future, so that the evaluation score was 1 point.

MW landfill (final disposal)

The city of Mandaue outsources the waste disposal to a private company that manages a final disposal site. The newly established disposal site has 50 years remaining. However, the final disposal site owned by the city of Mandaue had been closed, so that the evaluation score was 2 points.

Hazardous waste

Medical waste is treated by a specific designated medical facility. For other hazardous wastes, there is no data to grasp whether they were properly managed, so that the evaluation score was 1 point.

E-waste

E-waste is brought by individuals to junk shops registered by the city. Although the business operator records the amount of disposal, there is no mechanism to report the data to Mandaue City on a regular basis. Also, Mandaue City has not been able to grasp the processing status, so that the evaluation score was 2 points.

Motor vehicles

Most people in Mandaue City manage to reuse parts even if the car becomes unusable. In addition, the frames left after removing valuable resources are collected and reused as iron and plastic. Based on the above, the processing system for automobiles has not yet been set up, and there is room for improvement in the future, so that the evaluation score was 1 point.

Construction waste

A designated disposal company has a direct contract with a construction company, etc. to collect construction waste throughout the Philippines. However, the city of Mandaue does not know the data on the amount of processing, so that the evaluation score was 1 point.

(2) The Relevant Items in Other Sectors

The results of evaluation for the relevant items in other sectors are shown in the following figure.

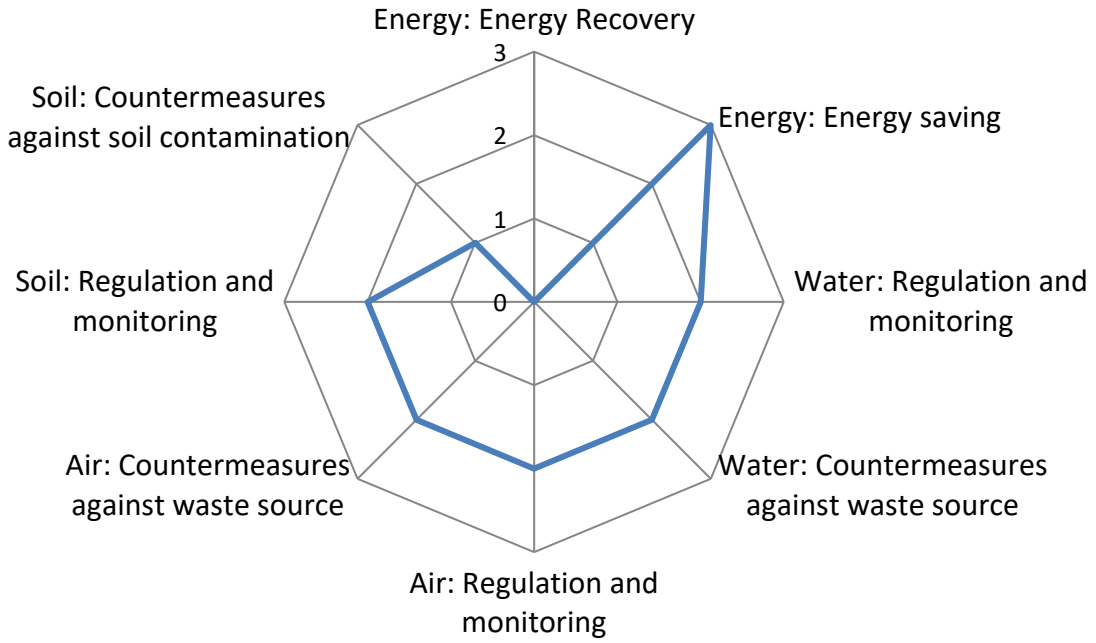


Figure 2-10 Radar chart of the evaluation results on Mandaue City for the relevant items in other sectors

Energy (energy recovery)

Since incineration or biological treatment with energy recovery has not been introduced, the evaluation score was 0 point. When considering the introduction of incineration, it is desirable to consider energy recovery as well.

Energy (energy saving)

Based on the self-evaluation of the person in charge of Mandaue City that each related facility is conscious of energy saving and has already implemented the efforts, the evaluation score was 3 points.

Water (regulation and monitoring)

Regulations on water quality have been set, and wastewater is monitored at about 70% of waste treatment and recycling facilities, so that the evaluation score was 2 points.

Water (countermeasures against pollution sources)

The facilities that monitor water quality have been implementing drainage measures, so the evaluation score was 2 points.

Air (regulation and monitoring)

Regulations on air pollution have been set, and emission monitoring is being carried out at about 70% of waste treatment and recycling facilities, so that the evaluation score was 2 points.

Air (countermeasures against pollution sources)

The facilities that monitor its gas emission are implementing measures against gas emission, so the evaluation score was 2 points.

Soil (regulation and monitoring)

Regulations regarding soil pollution have been set, and monitoring is being carried out at about 70% of waste treatment and recycling facilities, so the evaluation score was 2 points.

Soil (countermeasures against soil contamination)

Although soil pollution has occurred, the evaluation score was 2 points because countermeasures are already taken.

2.2.4 Considering Solutions to be Introduced

Based on the results of the current situation evaluation, solutions that meet the challenges of Mandaue City for axes with relatively low scores are comprehensively examined. The solutions proposed are as follows.

In discussions with Mandaue City, the degree of interest and feasibility based on the situation in Mandaue City were also considered. The city was particularly interested in the incineration of medical waste among hazardous wastes.

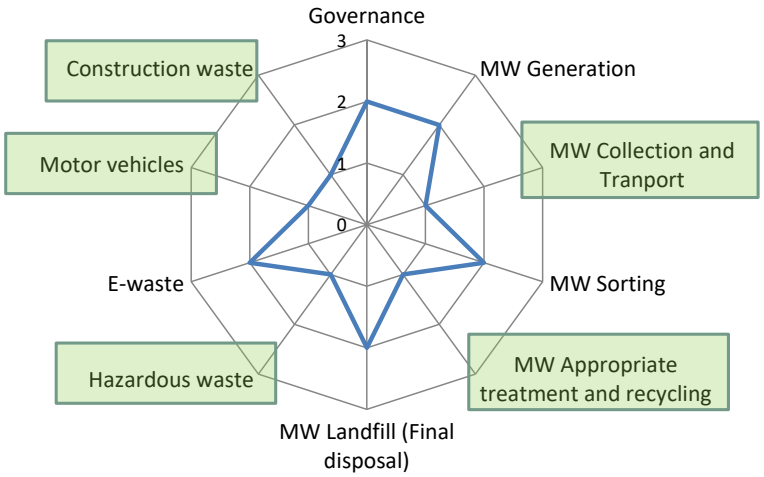


Figure 2-11 Proposed sulutions for the resource circulation and waste management sector for Mandaue City

MW (collection and transport)

Although collection by truck is carried out in Mandaue City, the separation is left to the waste picker and its efficiency is not high. Thus, “permit system for collection and transportation companies” and “garbage-compaction truck” are proposed as solutions.

MW (appropriate treatment and recycling)

While recycling of plastics such as fluff fuel is progressing, there were no plans to establish a new incineration treatment, so that "incineration treatment / reuse of incineration residue" and "composting" were proposed as solutions.

Hazardous waste

For hazardous waste, a collection and treatment system was not established, so both the system and treatment technology were proposed as solutions. Specifically, "establishment of a mechanism for recovering hazardous wastes," and "legal system for waste management and treatment," and "technology for treating hazardous waste" were proposed as solutions.

Motor vehicles

Vehicles are never scrapped because people manage to reuse valuables and available parts. For this reason, “inspection and assembly technology for reused parts of automobiles” was proposed as a solution.

Construction waste

Since concrete and asphalt were finally disposed of without being recycled, “concrete block and asphalt reuse technology” was proposed as a solution.

2.2.5 Conclusion

As a result of using the guidebook, some challenges that had not been particularly conscious of waste management in Mandaue City were clarified. The Guidebook enabled the city to evaluate their current status and helped the discussion for the implementation of measures for further improvement. Also, the results suggested the areas that could be technologically cooperated by other entities such as Yokohama City for further improvement.

Comment from Yokohama city

For Yokohama City, which is promoting intercity cooperation with Metro Cebu, it was a helpful opportunity to objectively evaluate Mandaue City, which is taking an advanced approach to waste management. Issues such as the treatment of medical waste and efficient collection and transportation, which had been recognized in the past, was re-recognized and shared both in Yokohama City and Mandaue City through the utilization of the Guidebook.

We hope that the city of Mandaue will expand the Guidebook to other cities, towns and villages in Metro Cebu, which will lead to the improvement of the environment of Metro Cebu as a whole. In the future, we would like to propose solutions that will lead to an improvement of the current status by sharing the results of this analysis with Japanese companies at workshops.

2.3 Surabaya

2.3.1 Background of using the guidebook

(1) Background

Surabaya, Indonesia's second largest city, is making various efforts to solve waste disposal issues as its economy develops and its population grows. Surabaya City has been cooperating with Kitakyushu City in the field of waste for about 20 years, and Kitakyushu City is implementing a number of projects such as accepting trainees from Surabaya City and transferring food waste composting technology. From December 2019 to March 2020, in order to clarify the current situation in the waste field of Surabaya City and to consider the solutions to be introduced, a study using the Guidebook was conducted with the cooperation of Kitakyushu City.

(2) Flow of Guidebook utilization

From December 2019 to March 2020, a study was conducted according to the flow shown in the figure below. Through two face-to-face discussions during the period, an evaluation of the current situation of Surabaya City was conducted and the direction of solutions the city should introduce was considered.

The flow of Guidebook utilization			The case of Surabaya City
Step 1	Confirming the flow of utilization	First of all, all the stakeholders confirm the flow of Guidebook utilization.	• On November 2019, all the stakeholders held a meeting in Surabaya City to confirm the flow of Guidebook utilization. • In addition, Japanese entities explained to Surabaya City how to evaluate the current status and asked the city to evaluate all the items.
Step 2	Grasping the current status of the city	Through visits and interviews, the stakeholders confirm the current status of waste treatment in the city.	• Surabaya City generally explained how they managed waste in the meeting on December 2019. • They visited to see “depo”, composting facility.
Step 3	Implementing Current-status Evaluation	City officials implement the Current-status Evaluation by themselves.	• From January 2020 to February 2020, Surabaya City implemented the Current-status Evaluation. • At the same time, Japanese entities collected related information on evaluation.
Step 4	Discussing on the results of evaluation	Stakeholders discuss on the results of evaluation and modify them as needed.	• On February 2020, they held a meeting again in Surabaya City to confirm the results of the Current-status Evaluation. • On that occasion, they discussed to bridge the perception gap between them.
Step 5	Considering solutions	On the basis of the results of the Current-status Evaluation, stakeholders consider solutions.	• On the basis of the results of the Current-status Evaluation, they considered solutions especially for points which have issues.

Figure: Flow of using guidebooks in Surabaya

2.3.2 About Surabaya City

(1) Basic information

Surabaya, the capital of the Indonesian province of East Java, is the second most populous city after Jakarta, the capital of the Republic of Indonesia. The Brantas River, which has a basin in a major city of the province, has abundant water and has been a transportation route for a long time, and the basin has developed as a fertile area centered on rice cultivation.

The area around Surabaya is one of Indonesia's important industrial areas, with various industries such as textiles, machinery, ships, and oil refineries. The industrial area accounts for 29.6 km2, which is about 8.5% of the total area of the city, and many Japanese companies are operating due to the good access to the domestic large consumer market. Among them, SIER (Surabaya Industrial Estate at Rungkut), located in the southern part of the city, is the largest heavy industrial park in the economy, and is jointly managed and operated by the city of Surabaya, East Java, and the central government, with several Japanese companies located within the park. In recent years, there has been a shortage of industrial park in Jakarta, and Surabaya is drawing attention as an investment destination, despite a higher minimum wage than Jakarta and increasing land prices. In 2016, Surabaya City's GDP in the region was IDR 451.5 trillion.

Basic information on Surabaya City	
Population	2.87 million people (as of 2017)
Area	350.5 km^2
Religion	The majority are Muslims
Climate	Tropical climate Average temperature is 27 ℃. May-October is the dry season, November-April is the rainy season
Language	Indonesian (official language) Javanese, Madurese
Currency	Indonesia Rupiah
Location	A port city in the northeastern part of Java Island. It is located at the mouth of the Karimas River, a tributary of the Brantas River, facing Madura Island across a narrow strait. 

(2) Waste management in Surabaya city

The figure below shows the waste treatment flow in Surabaya City. In Surabaya, wastes are collected by each local community, and the collected wastes are brought to a transfer facility called a Depo. Wastes collected in the Depo are transported by collection trucks of the Surabaya City and are brought to the Benowo final disposal site to be placed in the landfill. Although the amount of waste generated has not been measured, the amount of waste received at the Benowo final disposal site are measured, approximately 1,500 tons per day.

Each household does not separate wastes at source and the normal Depo does not have a sorting function, but there are 9 transfer facilities that have a sorting function, and such transfer facilities are called Super Depo. Depo Sutorejo, the first Super Depo, was introduced by Nishihara Shoji, a private company in Kitakyushu City, with the support of JICA. It started operation in 2013 and is now owned by Surabaya City, including its operation.

At Depo Sutorejo, valuable resources such as plastics, PET bottles, glass, cans, etc. are separated from the wastes brought in and recycled. Of the wastes that are not valuable, organic wastes are brought to the composting facility, and the remaining wastes such as dirty packaging plastics are brought to the final disposal site.

There are 28 organic waste composting facilities in Surabaya. The Wonorojo composting facility, which is the largest facility, was introduced by Nishihara Shoji with the support of JICA. It started operation in 2014 and is currently owned by Surabaya City, including its operation. Wonorojo processes organic waste brought in from Depo Sutorejo, and also accepts large organic waste such as pruned roadside trees to compost. The compost produced at Wonorojo is used in parks in the city.

Apart from the recycling via Super Depo mentioned above, the city of Surabaya also carries out community-based recycling by the “Waste Bank”. At the waste bank, the value of the materials such as plastics brought in by the residents is recorded in the passbook, and when the amount comes to large, it can be withdrawn like a bank deposit. There are waste banks operated by private companies and waste banks operated by community leaders on a regional basis, the latter of which is licensed and supervised by the city.

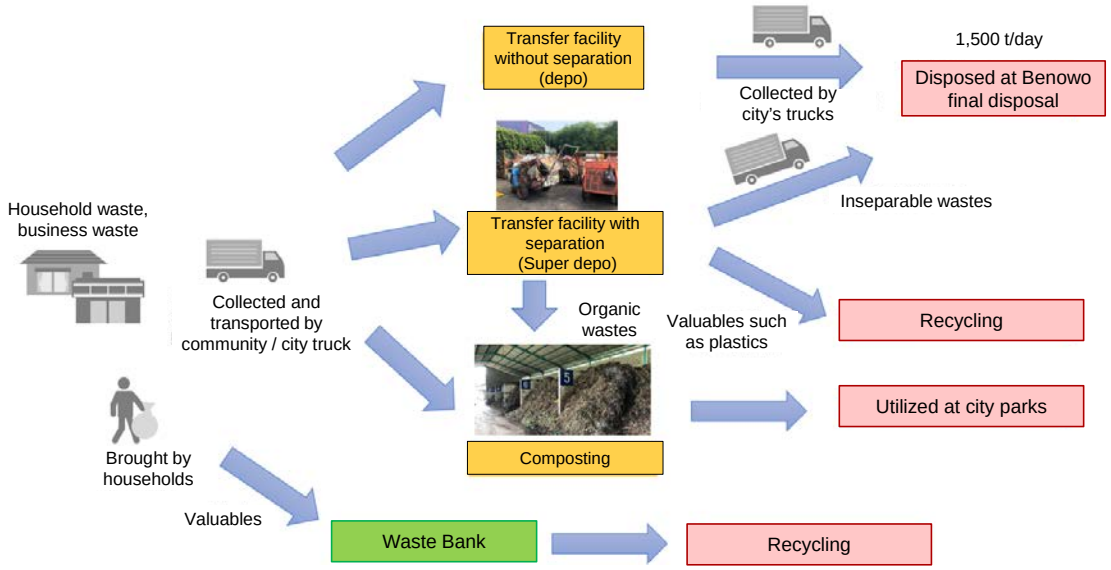


Figure 2-12 Waste Management of Surabaya City

2.3.3 The Results of Current-status Evaluation

Based on the current situation of waste treatment and recycling in Surabaya City, they input data into the “Current-status Evaluation Sheet” to produce radar charts.

(1) Resource Circulation and Waste Management Sector

The results of evaluation for the resource circulation and waste management sector are shown in the following figure.

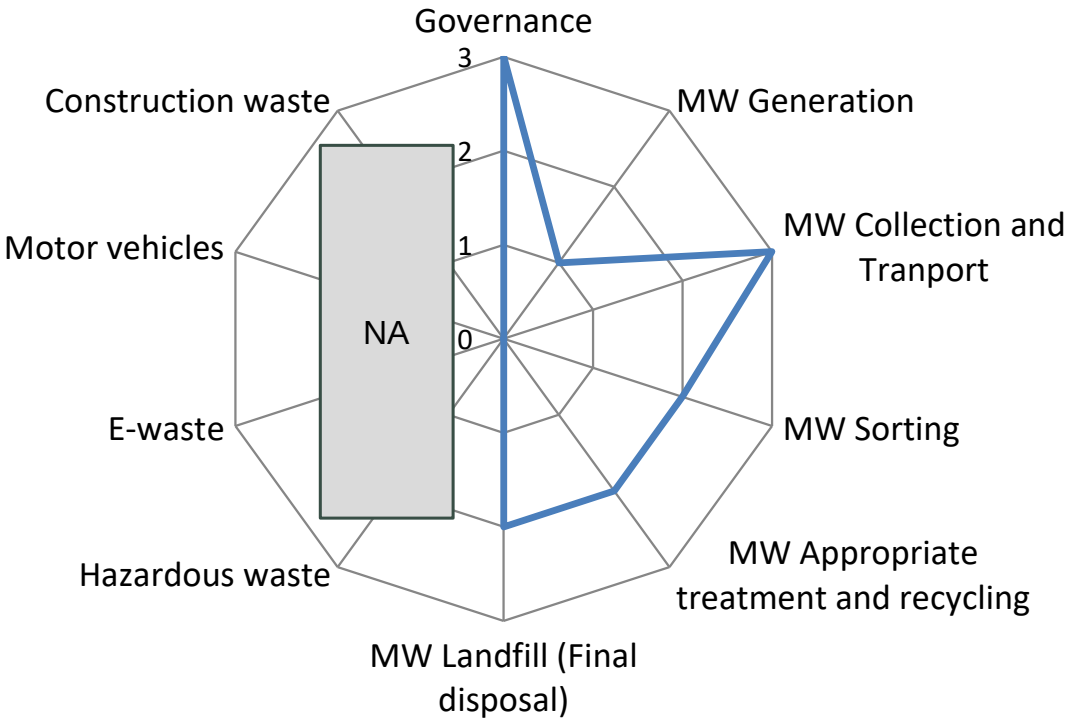


Figure 2-13 Radar chart of the evaluation results on Surabaya City for the resource circulation and waste management sector

Governance

Indonesia has enacted legislation on waste, and the city of Surabaya has enacted city ordinances based on it. The city officials in charge recognized that the laws and regulations were basically properly enforced, so the evaluation score was 3 points.

MW (generation)

In Surabaya City, the amount brought into the final disposal site is measured in detail, but the amount generated is not measured. Therefore, the evaluation score was 1 point. The amount brought into the final disposal site is 1,500 tons / day, which is quite small for the population, and it is suggested that a considerable amount is brought to recycling companies, composting, waste banks on the way.

MW (collection and transport)

Waste collection is carried out by each community, and each community brings waste to a nearby transfer facility (Depo). After that, wastes are transported from Depo to the final disposal site by trucks of Surabaya City. According to the city official, the collection rate is more than 95% on a population basis, so the evaluation score was 3 points.

MW (sorting)

In Surabaya City, the separation at source is not conducted for collection in the community, but some voluntary sorting to bring valuables to a waste bank is carried out. At the transfer point, although the normal Depo does not have a sorting function, sorting is done at a depo with a sorting function called Super depo, and according to the city official, about 30% of the waste is sorted after collection. As a result, the evaluation score was 2 points.

MW (appropriate treatment and recycling)

In Surabaya City, there are 28 facilities for composting organic waste, from small to large, and about 30% of the organic waste is composted. The incinerator was currently under construction, but it was not completed at the time of evaluation, so although valuable resources are being recycled, the evaluation score was 2 points.

MW landfill (final disposal)

In Surabaya City, disposal is carried out at one final disposal site. There are no plans for expansion of the disposal site, but it is operated in a way that secures the remaining years without accepting waste from other cities, so the evaluation score was 2 points.

Hazardous waste

Hazardous waste is basically treated according to the domestic legal system with the

responsibility of the business operator. However, this item was excluded from the evaluation because the amount of hazardous waste generated is not monitored in Surabaya City.

E-waste

Since the city of Surabaya does not know the amount of E-waste generated, this item was excluded from the evaluation.

Motor vehicles

Since the city of Surabaya does not know the amount of automobile waste generated, this item was excluded from the evaluation.

Construction waste

Since the city of Surabaya does not know the amount of construction waste generated, this item was excluded from the evaluation.

(2) The Relevant Items in Other Sectors

The results of evaluation for the relevant items in other sectors are shown in the following figure.

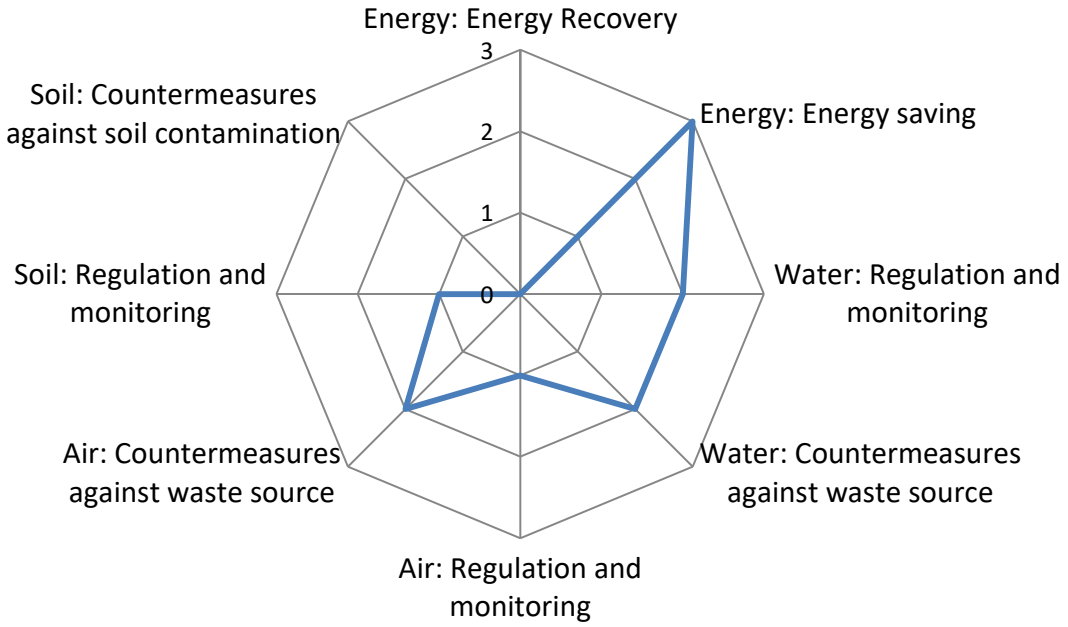


Figure 2-14 Radar chart of the evaluation results on Surabaya City for the relevant items in other sectors

Energy (energy recovery)

In Surabaya City, incineration was not introduced at the time of evaluation, and no other energy recovery mechanism was introduced, so the evaluation score was 0 points. However, if the WtE facility, which was under construction at the time of the evaluation, starts operation, the evaluation is expected to increase.

Energy (energy saving)

Since each facility in Surabaya was working on energy saving measures such as the use of LEDs and the temperature control of air conditioning settings, the evaluation score was 3 points.

Water (regulation and monitoring)

There are regulations on water quality, and wastewater is monitored at about 70% of waste treatment and recycling facilities, so the evaluation score was 2 points.

Water (countermeasures against pollution sources)

Since water quality is monitored at about 70% of the facilities, the evaluation score was 2 points.

Air (regulation and monitoring)

Although there is a regulation for air pollution, only about 30% of the facilities are being monitored, so the evaluation score was 1.

Air (countermeasures against pollution sources)

Since the emission gas is monitored by more than 95% of the transportation vehicles, the evaluation score was 2 points, though about only 30% of the facilities are monitored.

Soil (regulation and monitoring)

Although there is a regulation for soil pollution, the evaluation score was 1 because no monitoring was carried out.

Soil (countermeasures against soil contamination)

Soil pollution was not monitored and the situation was unknown, so the evaluation score was 0.

2.3.4 Considering Solutions to be Introduced

Based on the results of the current situation evaluation, solutions that meet the challenges of Surabaya City for axes with relatively low scores are comprehensively examined. The solutions proposed are as follows.

Regarding E-Waste, motor vehicles, and construction waste, it became clear that the city of Surabaya is not in a state of management at this stage, but as a reference for future studies, technologies that can be introduced are listed and proposed.

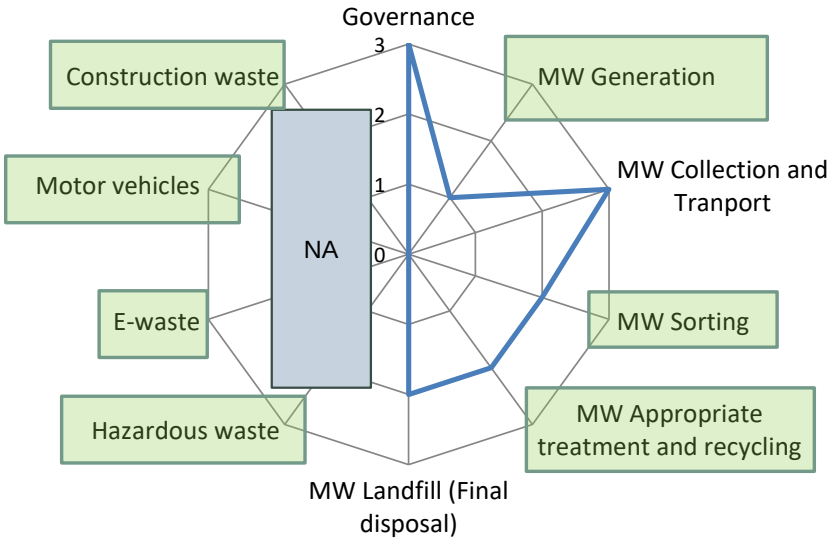


Figure 2-15 Proposed sulutions for the resource circulation and waste management sector for Surabaya City

MW (generation)

Although data on the amount of waste generated is not known in Surabaya City, the data on the amount of waste generated is very important when considering future waste management policies. For this reason, it was proposed to manage waste generation data in cooperation with waste banks and transfer points already operated in Surabaya City.

MW (sorting)

In Surabaya City, the separation at source is not carried out except for the sorting that is partially carried out by the residents to bring recyclable waste to the waste bank. However, since it is possible that the recycling rate can be greatly increased by the separation at source, it was proposed to introduce as a solution.

MW (appropriate treatment and recycling)

The city of Surabaya has already made many efforts for proper disposal and recycling

of municipal waste. Although the city officials have an interest in a way to shorten the time required for composting organic waste, it was proposed that finding more compost users should be prioritized.

MW landfill (final disposal)

In order to reduce the amount of wastes landfilled at the final disposal site, the introduction of catalyst-based waste plastic conversion technology was proposed. This makes it possible to dispose of dirty plastic that was previously difficult to recycle and was disposed of at the final disposal site.

Hazardous waste

Hazardous wastes, especially medical wastes, are currently transported to a distant disposal site. For this reason, the introduction of a small incinerator was proposed as a solution.

E-Waste

In Surabaya, E-Wastes are currently transported out of the city as reusable items. For this reason, the city is not currently considering waste management, but the following technologies was proposed for reference when considering treatment methods in the future.

- ✓ Plastic material recycling
- ✓ Compression processing and crushing processing technology
- ✓ Advanced sorting technology

Motor vehicles

In Surabaya, motor vehicle wastes are currently transported out of the city as reusable items. For this reason, the city is not currently considering waste management, but the following technologies was proposed for reference when considering treatment methods in the future.

- ✓ Inspection and assembly technology for reused parts of automobiles
- ✓ Material recycling of plastics automobile
- ✓ ASR material recycling or energy recovery
- ✓ Compression processing and crushing processing technology
- ✓ Advanced sorting technology

Construction waste

In Surabaya, the city is not currently considering construction waste management, but the following technologies was proposed for reference when considering treatment

methods in the future.

- ✓ Concrete block and asphalt reuse technology
- ✓ Wood reuse technology
- ✓ Construction sludge reuse technology
- ✓ Compression processing and crushing processing technology

2.3.5 Conclusion

As a result of using the Guidebook, it has become clear that the efforts of Surabaya City have been highly evaluated and that there are some items to be improved in the future, including areas that were not particularly conscious of in Surabaya City. The city of Surabaya has a lot of greenery and is actively working on environmental protection, including waste disposal. Since there are evaluation items that will raise the score if the equipment currently under construction starts operation, the city will be able to objectively assess its effect if the evaluation using the Guidebook is carried out again.

Comment from Kitakyushu city

The Kitakyushu city has been cooperating with Surabaya for more than 20 years, and is currently a sister city on environmental issues. the two cities have mainly worked on waste management and water resource environment improvement. In particular, with regard to municipal waste management, the introduction of collection / separation facilities and organic waste composting facilities were realized together with the companies in Kitakyushu, leading to the formation of an environmental business.

On the evaluation using the Guidebook, the absolute evaluation of each item was carried out through careful discussions with the relevant departments of Surabaya City, so that the current situation and issues in the waste management field of Surabaya could be grasped.

The Guidebook is useful not only for grasping the issues to be solved but also for grasping the potential needs of the evaluated city. We expect that it will help raise awareness for the next steps.

Based on the evaluation results of the Guidebook, we would like to link it to the proposal of new solutions and utilize it for further international cooperation and environmental business.

3. How to use the Guidebook

The detailed information on how to evaluate a city and find a solution by using the Guidebook is presented in the Guidebook itself or in the attached materials (Reference and the Current-status Evaluation Sheet). However, in the process of actual evaluation, users may face challenges for which no explanation has been specifically presented in the Guidebook. In this situation, they may find it difficult to proceed with the evaluation.

A number of issues were identified while applying the approach outlined in the Guidebook to the case study cities. For instance, in some cities there were not enough statistical data or related information on waste management to fulfill the evaluation Excel sheet attached to the Guidebook. Another issue was a perception gap over the appropriateness of the evaluation results between the intention of the Guidebook and a view of the target city.

Thus, this chapter provides an overview of some of the common pitfalls found in the process of evaluating the case study cities using the Guidebook. This chapter may serve as an explanation[1] for potential users to support their use of the Guidebook and apply it to their own city in a practical way.

Table 3-1 Example of issues found in the case study of the Guidebook application

No	Issue	Answer / Direction to overcome
1	What should be done if the data required for radar chart evaluation is not available?	If the city has no data, it is assumed that no treatments are carried out. Or it can be excluded from evaluation.
2	How should it be evaluated if wastes are collected or recycled by the waste picker and/or informal sector?	The evaluation score depends on the judgment of whether the treatment is environmentally appropriate.
3	What if the evaluation result from the radar chart is different from the actual feeling of the city?	Results can be updated through discussion among stakeholders.

[1] The explanation provided in the next sections are translation and reorganization of the guidance originally presented by the study of NEDO (2020) “Examination of application of ‘the Guidebook for Development of Sustainable Cities’ to cities in the Asia-Pacific region” (in Japanese)

3.1 How to evaluate Current-status

At the time of the evaluation questions arose regarding the practical application evaluation framework against the unique circumstances of case study cities. With this in mind, the table below seeks to clarify and provide further guidance to assist users in completing the current status evaluation.

Table 3-2 How to fill in the current status evaluation sheet

Evaluation axis	ID	Issue	Answer / Direction to overcome
0. Governance	012, 022	Criteria for appropriate enforcement of the legal system is unclear	Since the appropriateness of enforcement depends on the policy of each city, it can be evaluated based on the city's self-evaluation (because it is an absolute evaluation, and the purpose is not to compare it with other cities)
	031	The city doesn't manage waste generation from all sources, and it is difficult to evaluate.	Evaluate based on the wastes that should be monitored by the city. (note that the range of waste to be monitored differs depending on the economy or city).
1. MW (generation)	111	It is unclear whether the amount of industrial waste should be included in "municipal waste".	Include only household waste in this item, because the amount of industrial waste generated depends on the industrial situation of the city and is difficult to evaluate statistically,
2. MW (Collection and transport)	222	It is unclear what kind of collection trucks are included in compaction trucks.	If the upper part of the collection truck is not open, it is evaluated as equivalent to a compaction truck.
4. MW (Appropriate treatment and recycling)	431~ 433	When the informal sector is involved in the processing, it is unclear that it could be evaluated as recycling.	Appropriateness of treatment by the informal sector should be included in the evaluation, including the working environment, hygiene, and management status of sorting facilities. It is necessary to evaluate whether it is environmentally appropriate or not based on the situation of each city.
6. Hazardous waste 7. E-Waste 8. Motor vehicles 9. Construction waste	-	It is unclear how it is evaluated in case that the treatment is carried out under the responsibility of a private business operator, and the city is unknown of the actual situation.	If the amount of waste generated and the amount of waste to be treated are not known in the city, basically it is assumed that the waste is not treated. However, since some cities are not responsible for the management of hazardous waste / E-Waste / motor vehicles, it can be flexibly evaluated based on the situation of each city. (it is possible to exclude this item from the evaluation target)
8. Motor	-	It is unclear	Waste automobiles contain harmful substances,

Evaluation axis	ID	Issue	Answer / Direction to overcome
vehicles 9. Construction waste		whether the assessment include the resource recovery of waste pickers.	and when they are scrapped, they should be treated promptly and appropriately. In general, the resource recovery and recycling of waste pickers are not considered appropriate.

3.2 How to select solutions

While how to interpret the current status evaluation results is described in the Guidebook, it may be difficult for a city to select the best solutions from a wide range of options. For this reason, the table below summarizes how to interpret the current status evaluation results and how to select solutions.

Table 3-3 How to interpret the evaluation and the solution selection
< Resource Circulation and Waste Management Sector >

Evaluation axis		Interpretation of the evaluation results	Direction of solution selection
Governance		It is highly evaluated if the legal system is in place and properly enforced.	• It is desirable to consider and improve the legal system for waste management / treatment and effective use of resources at the Economy and city levels. • If the legal system is in place, it is important to grasp the enforcement status first. • If appropriate enforcement is not carried out in light of the purpose of the legal system, review the legal system itself and improve the operation method.
MW	Generation	If the amount of waste generated is small, the evaluation is high.	• It takes a certain amount of time to control the amount of waste generated, and in many cases solutions need to be introduced in the long term. • It may be considered in parallel with solutions on other axes.
	Collection and transport	It is highly evaluated if the collection implementation rate of municipal waste is high and measures are taken to improve the efficiency of collection and transportation.	• It is important to improve the collection implementation rate of municipal waste. • Collection and transportation costs often account for a large proportion of the total cost of waste treatment. For this reason, if the cost of collection and transportation is high, review measures to improve its efficiency and the mechanism to bear the costs.
	Sorting	The higher the implementation rate of waste source separation and post-collection sorting, the higher the evaluation.	• For effective use of resources and proper disposal of hazardous waste, it is desirable that waste be separated as much as possible before disposal. • Separation at the time of waste generation is important, but separate collection requires the cooperation of residents and takes time to settle, so it is necessary to consider the acceptance of

Evaluation axis		Interpretation of the evaluation results	Direction of solution selection
			residents. • There are various ways of sorting (manual sorting and a wide range of mechanical sorting). Select the method in consideration of the selection target, efficiency, ease of introduction, etc.
	Appropriate treatment and recycling	It is highly evaluated that the implementation rate of treatment before landfilling waste is high and the treatment residue is effectively used.	• Due to the limited capacity of landfill sites, it is important to pre-treat waste instead of landfilling it directly. • Pretreatment methods include biological treatment and incineration. The city has to choose a method, considering the various factors, such as the amount of waste, the composition of waste, the climate, industry, and the awareness of residents. • In many cases, the residue from pretreatment can be effectively used and it is favorable that it is utilized as effectively as possible without landfilling. • To improve recycling, it is also important to consider the market where the recycled products are sold.
	Final disposal	It is highly evaluated when the disposal rate at the controlled landfill disposal site is high and the remaining years of the disposal site are long.	• From the viewpoint of hygiene and environmental protection, it is important to dispose of waste at a controlled landfill disposal site instead of open dumping, and it is also important to prepare the disposal site that has sufficient capacity to accommodate the expected waste volume. • If the remaining years of the disposal site are short, it is necessary to develop a new disposal site, but it is also important to consider measures that contribute to the reduction of the landfilled wastes (such as reduction of waste generation and recycling).
Hazardous waste		It is highly evaluated that the implementation rate of the source separation of hazardous waste is high and that it is properly processed and disposed of in landfill.	• It is important to investigate the generation and discharge of hazardous waste in order to understand the current situation. • it is important to increase the implementation rate of segregated collection of hazardous wastes so that wastes designated as hazardous by domestic laws and/or the Basel Convention can be removed at the time of collection as much as possible and treated in a separate flow. • Treatment of hazardous wastes require the high level of technology and costs, and efficient operation may be difficult because the amount generated is smaller than that of non-hazardous waste • After preparing proper storages and processing, consider the technologies that can be introduced one by one.
E-Waste		It is highly evaluated	• It is important to investigate the generation and

Evaluation axis	Interpretation of the evaluation results	Direction of solution selection
	that the implementation rate of separated E-Waste collection is high and there are many mechanisms to promote proper reuse. In addition, the high implementation rate of proper disposal of hazardous waste and resource recycling is highly evaluated.	discharge of E-waste in order to understand the current situation. • E-Waste is composed of useful resources but it also contains harmful substances, so that it is important to separately collect E-Waste. After that, consider methods to properly process E-Waste. • Preparing guidelines on appropriate methods of inspection, repair, and management for reuse products. • It is important to consider a mechanism to ensure the safety of reused products, and to properly handle items that cannot be reused. • Parts or materials that are easy to be recycled in terms of technology and cost should be recycled first. • When recycling, it is also important to consider the market where the recycled products are sold.
Motor vehicles	It is highly evaluated that the implementation rate of separated motor vehicles collection is high and there are many mechanisms to promote proper reuse. In addition, the high implementation rate of proper disposal of hazardous waste and resource recycling is highly evaluated.	• It is important to investigate the generation and discharge of motor vehicle wastes in order to understand the current situation. • Motor vehicles are composed of many of useful resources but it also contains harmful substances, so that it is important to separately collect motor vehicles. After that, consider methods for proper processing. • Preparing guidelines on appropriate methods of inspection, repair, and management for reuse products. • It is important to consider a mechanism to ensure the safety of reused products, and to properly handle items that cannot be reused. • Parts or materials that are easy to be recycled in terms of technology and cost should be recycled first. • When recycling, it is also important to consider the market where the recycled products are sold.
Construction waste	The evaluation rate is high when the collection rate of construction waste is high and the implementation rate of proper disposal of hazardous waste and resource recycling is high.	• It is important to investigate the generation and discharge of construction waste in order to understand the current situation. • Since a large amount of construction waste is generated in a mixed state of various type of wastes, it is important to separate it at the time of generation. • In addition, since it contains harmful substances, it is prioritized to secure means for proper disposal. • Then, recycle from the ones that are easy to implement in terms of technology and cost. • When recycling, it is also important to consider the market where the recycled products are sold.

4. Workshop

4.1 Outline of the event

The virtual workshop titled "Workshop for Finding Appropriate Solution and Implementation based on the 'Guidebook for the Development of Sustainable Cities Focusing on Resource Circulation and Waste Management'" was held in 19th and 20th April 2022. It was a two-day event to share the current problems on the resource circulation and waste management in the APEC economies and discuss how to reveal city's own problems and find the appropriate solutions based on the Guidebook. The workshop included several sessions with varying dynamics such as presentations of case studies, sharing of the experiences of each city, and presentation of how to use the Guidebook.

The agenda of the Workshop is shown in the following table.

Table 4-1 Agenda of the Workshop

JST	Time	Event	Speakers
	Day1		
10:00	10min	Opening remark	METI
10:10	10min	**Presentation1** Background of the WS and introduction of the Guidebook	MURC
10:20	5min	**Q & A**	(Facilitator: MURC)
10:25	30min	**Presentation2** Current problems in waste management and Circular economy in Thailand	Officers of Thailand (Thailand Institute of Scientific and Technological Research (TISTR))
10:55	15min	**Q & A, Discussion**	(Facilitator: MURC)
11:10	10min	Coffee break	
11:20	30min	**Presentation3** Current problems in waste management and Circular economy in Indonesia	Officers of Indonesia (Ministry of Environment and Forestry)
11:50	15min	**Q & A, Discussion**	(Facilitator: MURC)
12:05	25min	**Presentation4** Summary of the Guidebook and Introduction of the Practical Guideline for Users	MURC
12:30	10min	**Q & A, Discussion**	(Facilitator: MURC)
12:40	5min	Coffee break	-
12:45	10min	Wrap up of Day1	MURC
12:55	5min	Closing of Day1	-
	Day2		
10:00	5min	Opening of Day2	-
10:05	15min	**Presentation1** Introduction of the Summary Report on the case studies	MURC
10:20	10min	**Q & A**	(Facilitator: MURC)

10:30	30min	**Presentation2** Case study (best practice) 1: Surabaya	Officers of Surabaya
11:00	10min	**Q & A, Discussion**	(Facilitator: MURC)
11:10	30min	**Presentation3** Case study (best practice) 2: Kitakyushu	Officers of Kitakyushu
11:40	10min	**Q & A, Discussion**	(Facilitator: MURC)
11:50	10min	Coffee break	-
12:00	30min	**Presentation4** Case study (best practice) 3: Yokohama and Mandaue	MURC
12:30	10min	Coffee break	-
12:40	10min	Wrap up of Day2	MURC
12:50	10min	Closing remark	METI

4.2 Results

There were 28 participants from 7 economies in the Workshop. To assess the results of the Workshop, participants were required to answer to the questions provided in the online survey form after the event. The number of respondents to this online survey is seven.

The evaluation results of the workshop are shown in Figure 4-1 and Table 4-2. Overall, the participants are well satisfied with this event. Towards increasing the future use the Guidebook, it is suggested that this Workshop was a great opportunity for government officials to enhance their knowledge about the methods to evaluate and realize the sustainable waste management in the city.

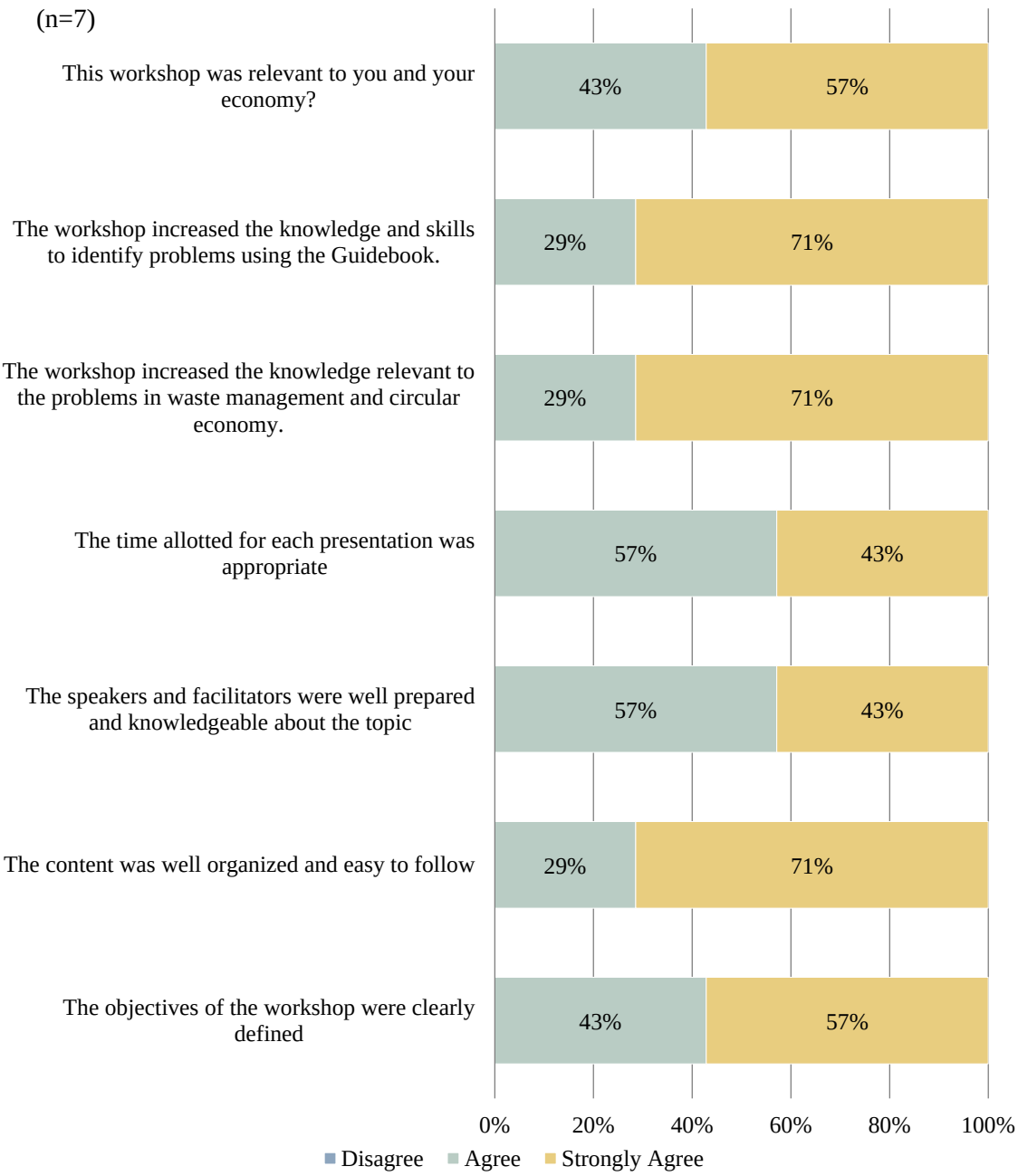


Figure 4-1 Evaluation result of the Workshop

Table 4-2 Results of the Workshop (open-ended questions)

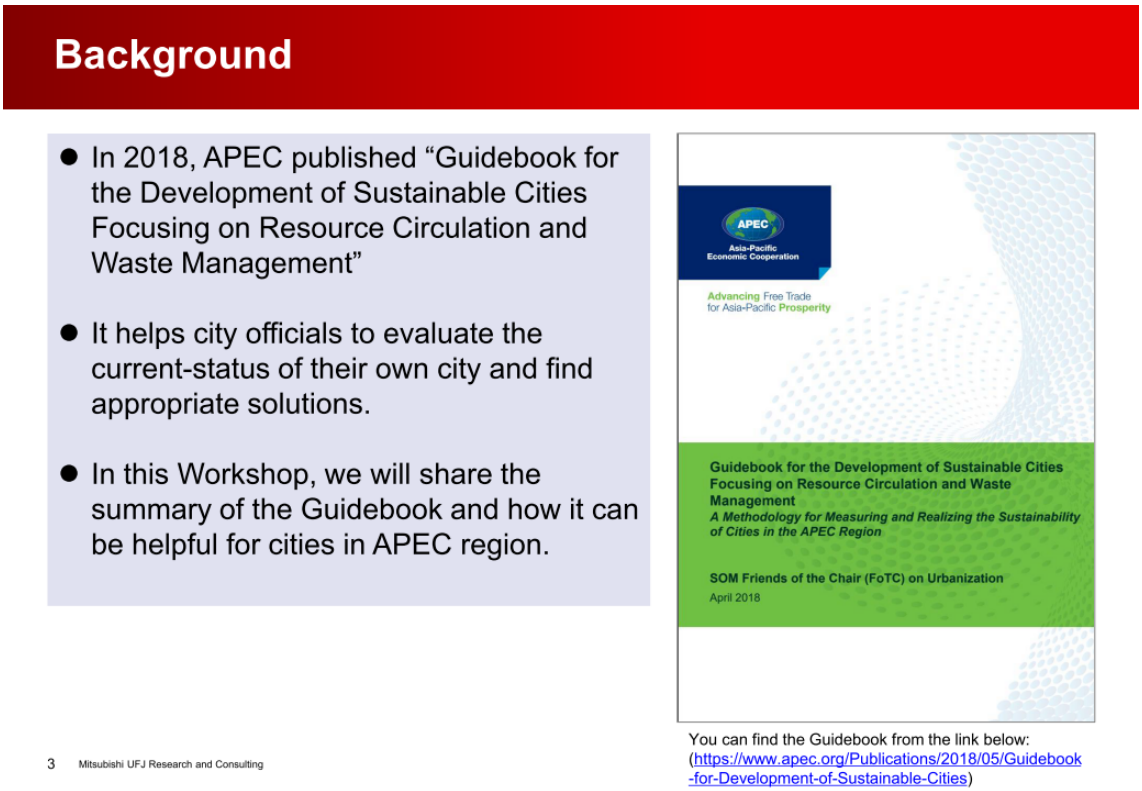
Question	Answer
What new skills and knowledge did you gain from this workshop?	✓ Knowledge on implementation of resource circulation. ✓ The fact that participation from private sector is crucial in establishing a great waste management ecosystem in a city. It inspires us to think of a vast potential in terms of promoting private sector to invest and contribute with reducing urban waste. ✓ Knowledge on how other economies handle issues on waste management with examples given during presentations. ✓ Knowing so many best practice and regulation. ✓ Technology ✓ It was meaningful that this workshop gathered some economies from developing regions to share their experience and practice.
How will you apply the workshop's content and knowledge gained at your workplace?	✓ Will input in the ongoing crafting EPR law with resource circulation including the implementation of National Plan of Action for Marine litters. ✓ Develop a new strategy and best conducting adopted a new pilot project develop work plans/strategies. ✓ Sharing the knowledge learnt from this workshop with my colleagues.
How could this guidebook have been improved? Please provide comments on how to improve the project, if relevant.	✓ Very much improved. ✓ Hoping to provide a solution to the problem of waste management in remote areas. ✓ This guidebook can be more effective if the reviewing workshop can be held periodically even that organized by different economies in turn, showcasing the achievement and making this guidebook's contributions long-lasting.
Please write your comments on the workshop if any.	✓ It is always a great thing to organize since it opens ways for various stakeholders to share and gain insights on waste management, which is, an important issue in every regional government. ✓ Comprehensive workshop ✓ Very Good and Thank you very much.

4.3 Summary of the presentations

4.3.1 DAY1

(1) Presentation1

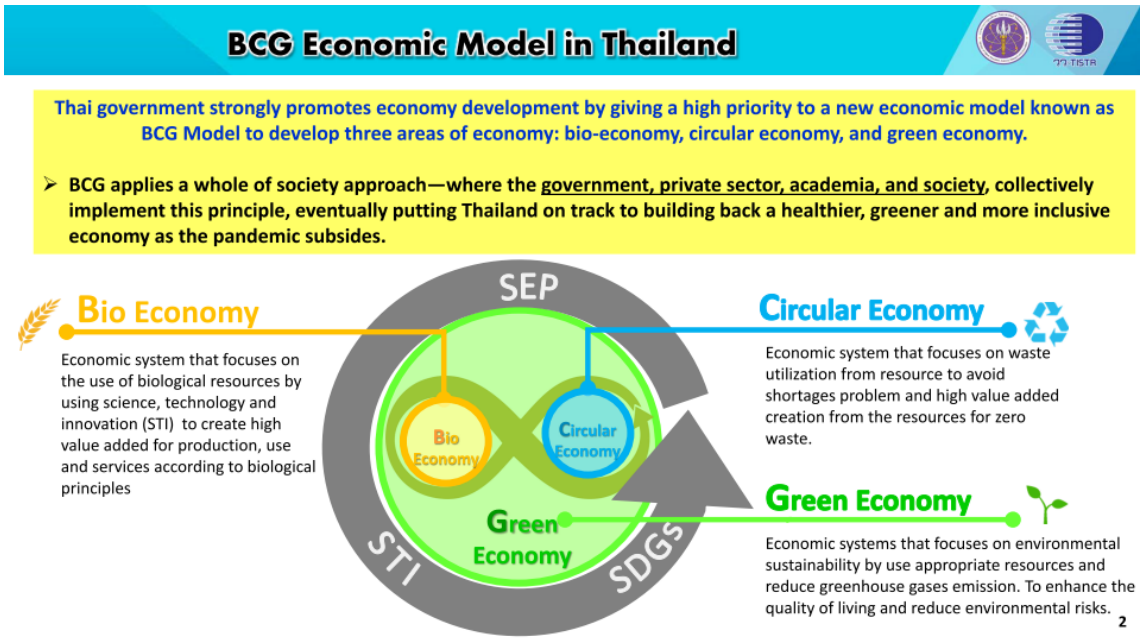
- In the first session, the Secretariat presented the background of the Workshop and the brief introduction of the Guidebook.



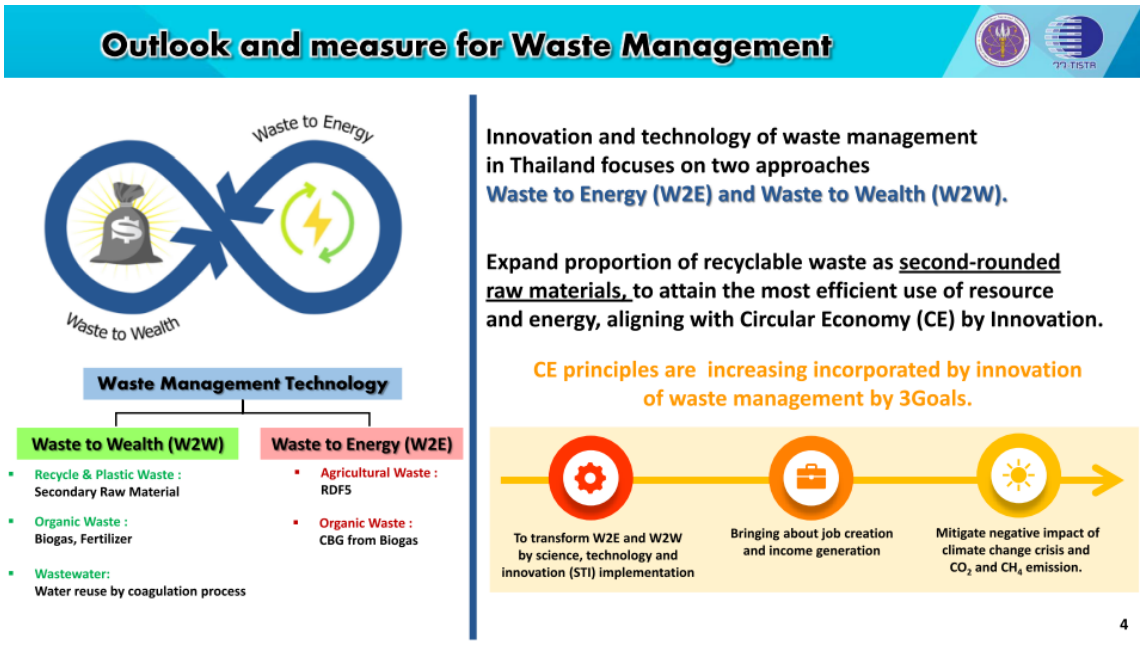
You can find the Guidebook from the link below:
(https://www.apec.org/Publications/2018/05/Guidebook-for-Development-of-Sustainable-Cities)

(2) Presentation2

- In the second session, an official from Thailand made a presentation titled "Current problems in waste management and Circular economy in Thailand".
- BCG Economic model and Circular Economy in Thailand gave a lot of suggestions to the audience for achieving a better and more sustainable future.
- Also, interesting best practices for the circular economy in Thailand were introduced.
- The speaker pointed out that the lack of information is one of the critical issues in the transition to the circular economy in Thailand.



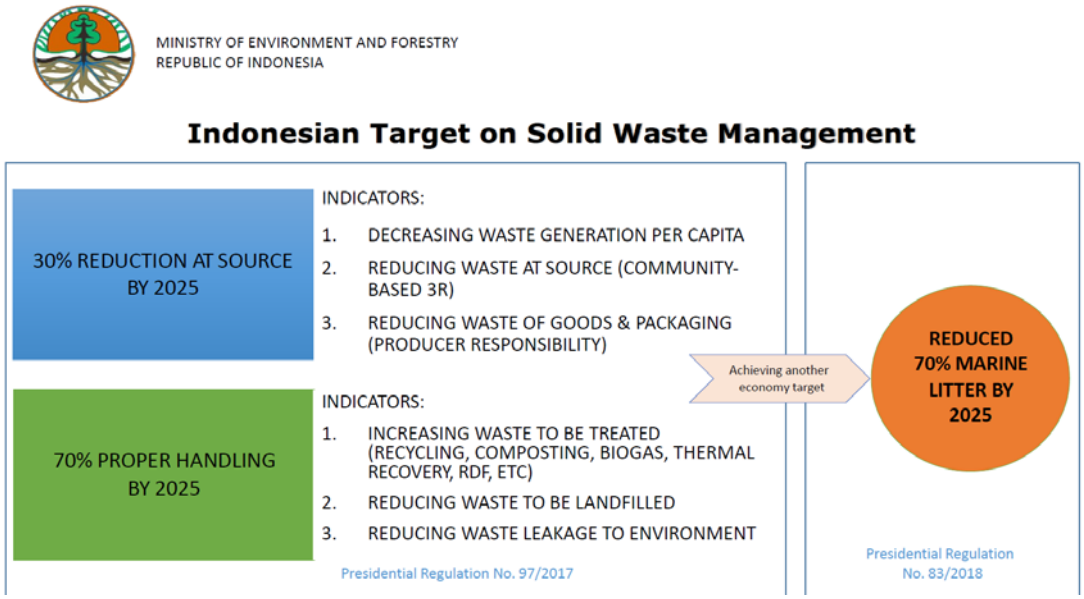
- Thai government promotes economic development by giving a high priority to BCG Model to develop three areas of economy: bio-economy, circular economy, and green economy.
- BCG applies a whole of society approach, where the government, private sector, academia, and society collectively implement this principle.



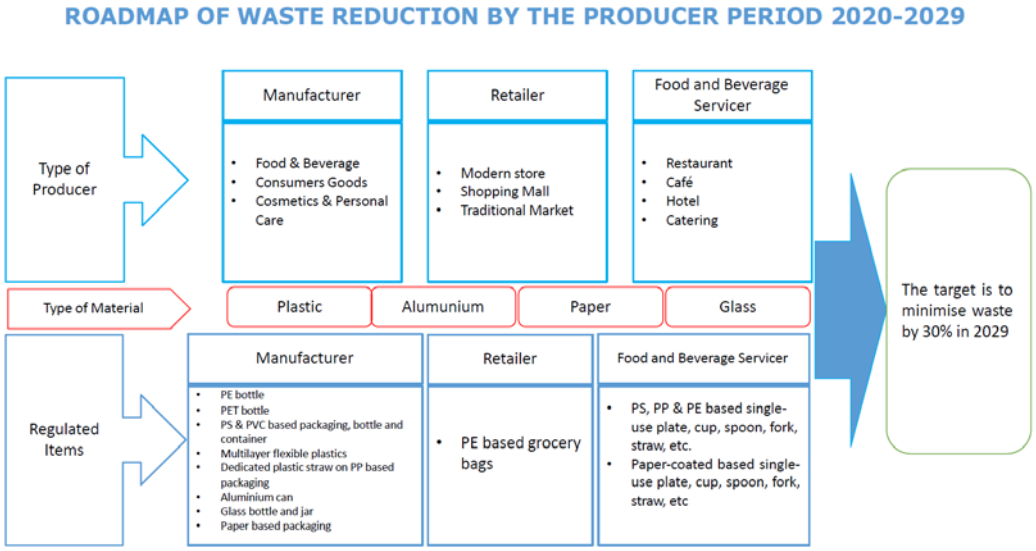
- Innovation and technology of waste management in Thailand focuses on two approaches: Waste to Energy (W2E) and Waste to Wealth (W2W).
- Thailand is expanding proportion of recyclable waste to attain the most efficient use of resource and energy, aligning with Circular Economy (CE).

(3) Presentation3

- In the third session, an official from Indonesia made a presentation titled “Policy and Strategy: Reducing and Circulating the waste”.
- The presentation shows the latest policy efforts in Indonesia especially for reducing plastics and other packages based on the EPR principle.
- It was a great lesson for the audience to understand how policy packages are important to realize a sustainable future.
- Indonesia is implementing a full lifecycle approach to end plastic pollution.



- Indonesia has set a goal of solid waste management with a 30% reduction at sources and 70% proper handling, towards a goal of 70% marine litter reduction by 2025.



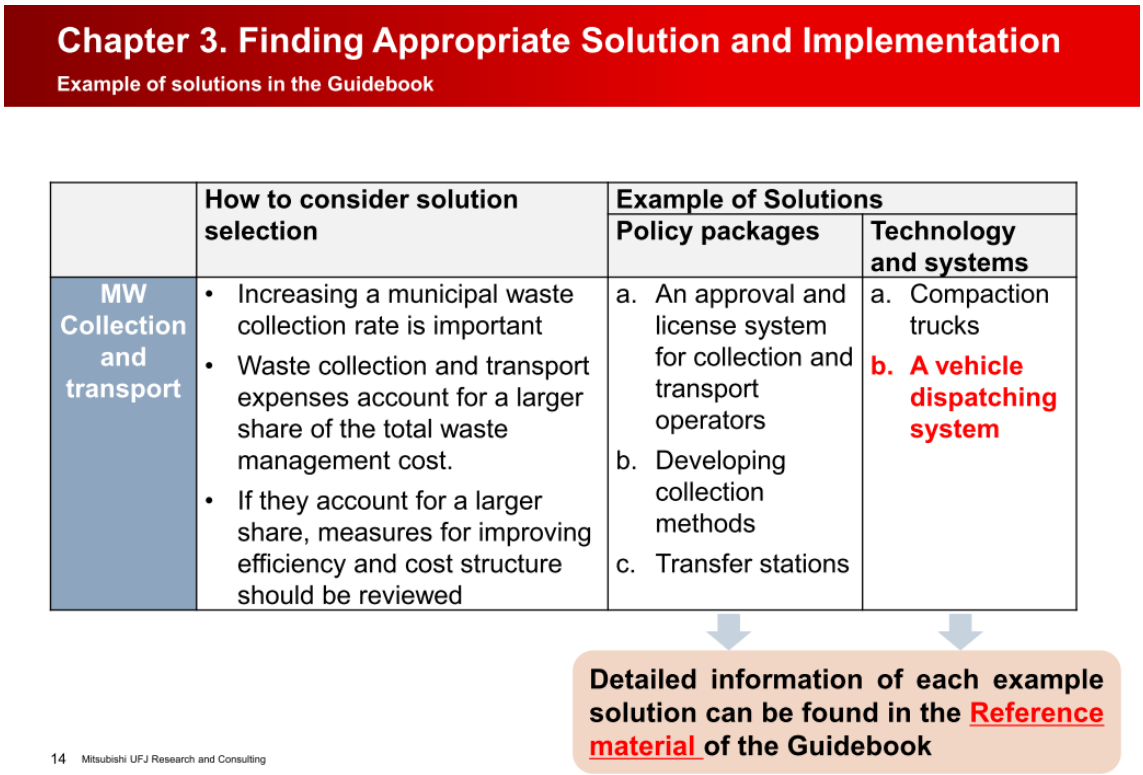
- Indonesia is implementing the Roadmap of Waste reduction in the period 2020-2029 with the cooperation of the brand owner manufacturers, retail and food /

beverage services sectors, targeting to phase out disposable plastic items by 2029.

- The goal of its Roadmap is to reduce waste by 30% by 2029.

(4) Presentation4

- In the last session of Day 1, the Secretariat made a presentation titled “Summary of the Guidebook and Introduction of the Practical Guideline for Users”.
- The presentation and demonstration of creating a radar chart showed how to use the Guidebook to evaluate a city and find a solution.
- Practical guideline for the Guidebook users was also introduced.



Chapter 3. Finding Appropriate Solution and Implementation

Example of solutions in the Guidebook

	How to consider solution selection	Example of Solutions	
		Policy packages	Technology and systems
MW Collection and transport	• Increasing a municipal waste collection rate is important • Waste collection and transport expenses account for a larger share of the total waste management cost. • If they account for a larger share, measures for improving efficiency and cost structure should be reviewed	a. An approval and license system for collection and transport operators b. Developing collection methods c. Transfer stations	a. Compaction trucks **b. A vehicle dispatching system**

Detailed information of each example solution can be found in the Reference material of the Guidebook

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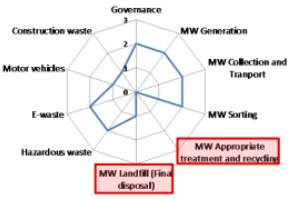
4.3.2 DAY2

(1) Presentation1

- In the first session of Day 2, the Secretariat made a presentation titled “Introduction of the Summary Report on the case studies”.
- The presentation introduced the summary report on the case studies using the Guidebook.
- The case study of Batam city was presented as an example to evaluate a city with the radar chart and find solutions to improve the current-status.

3. The Results of Current-status Evaluation

Axis	Summary of evaluation
MW (appropriate treatment and recycling)	• About 30% of households are composting at home using composting containers that are subsidized by the Batam City. • Waste pickers recycle plastic and metal, but their **working environment** in the recycling process is **not safe enough**. • Collected MW is **directly landfilled without any reducing process** (biological treatment, incineration, or recycling). • Although the composting was positively evaluated, comprehensive evaluation of this axis was **zero point**.
MW landfill (final disposal)	• Collected MW is disposed of at a landfill site. However, ways of managing and operating the landfill site are not proper enough. • In addition, the residual life years are about 9 years, which are short for the landfill site. • This axis gained **one point**.



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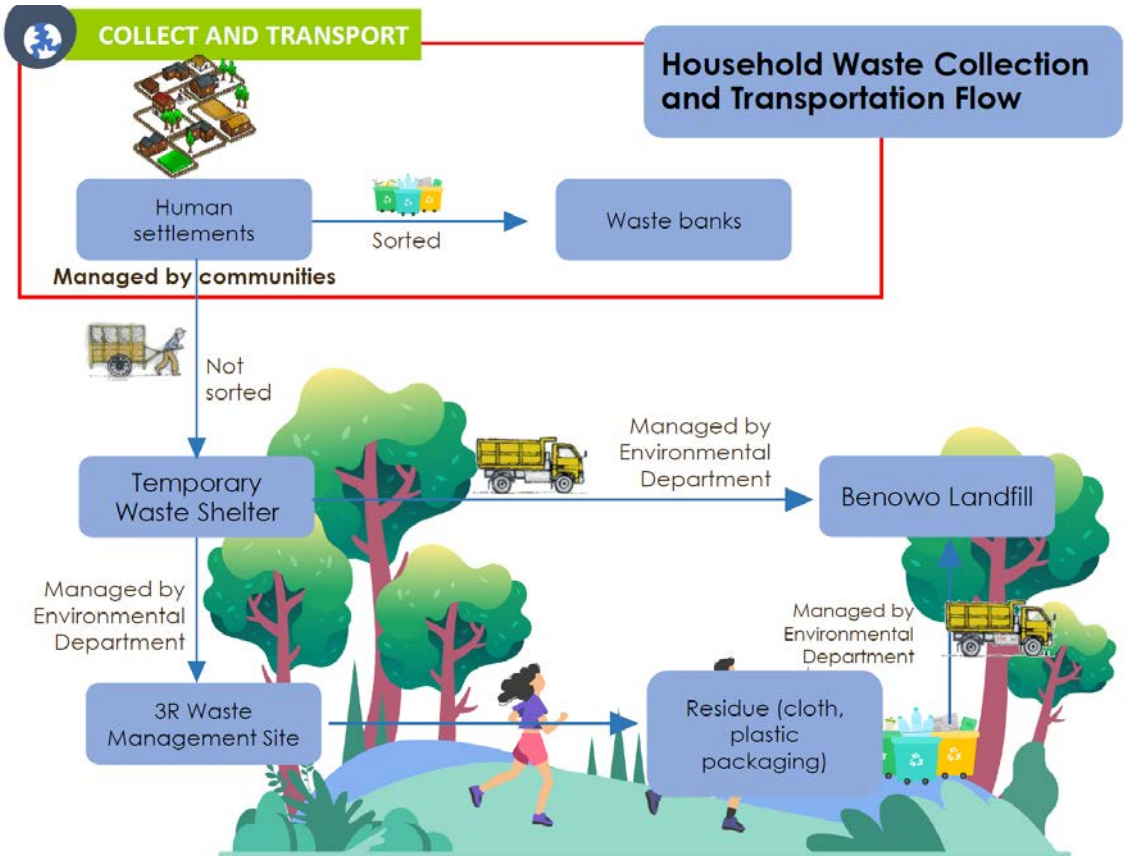
MUFG

(2) Presentation2

- In the second session, an official from Surabaya made a presentation titled “Guidebook for Sustainable Cities Asia Pacific Economic Cooperation: Surabaya City Government”.
- The presentation showed various kind of interesting latest efforts in Surabaya, with the latest radar chart evaluation compared to the past evaluation in 2019.
- It was a great example of making a city more sustainable with a PDCA cycle using the radar chart evaluation.
- As a challenge of using the Guidebook, it was suggested that Guidebook should be improved so that it can clearly handle the case that wastes were coming from outside of the city



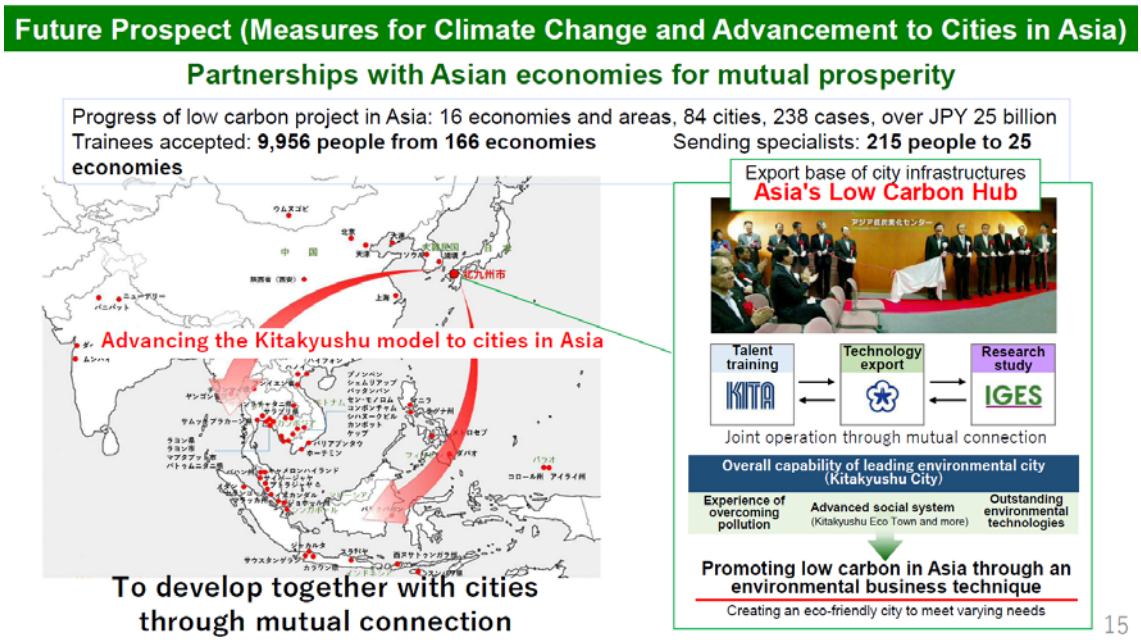
- The waste transportation system in Surabaya is well organized. Some inorganic household wastes such as plastics are collected in the waste bank, and the others are processed at nine 3R waste management sites or 26 compost centers.

- Sorting of medical waste such as masks begins with the separation of the waste at source. Medical wastes are properly handled and transported to the disposing process.

(3) Presentation3

- In the third session, an official from Kitakyushu made a presentation titled “Application of Guidebook for Development of Sustainable Cities to Kitakyushu City”.
- The presentation and the fantastic movie showed how Kitakyushu has overcome the environmental problems in the last two decades.
- Their experiences and the change in the radar chart gave the audience a lot of suggestions for how we can realize a sustainable city with appropriate solutions.
- It was suggested that the key success factor of an intercity cooperation project is to grasp the needs of the city and who is the key person.

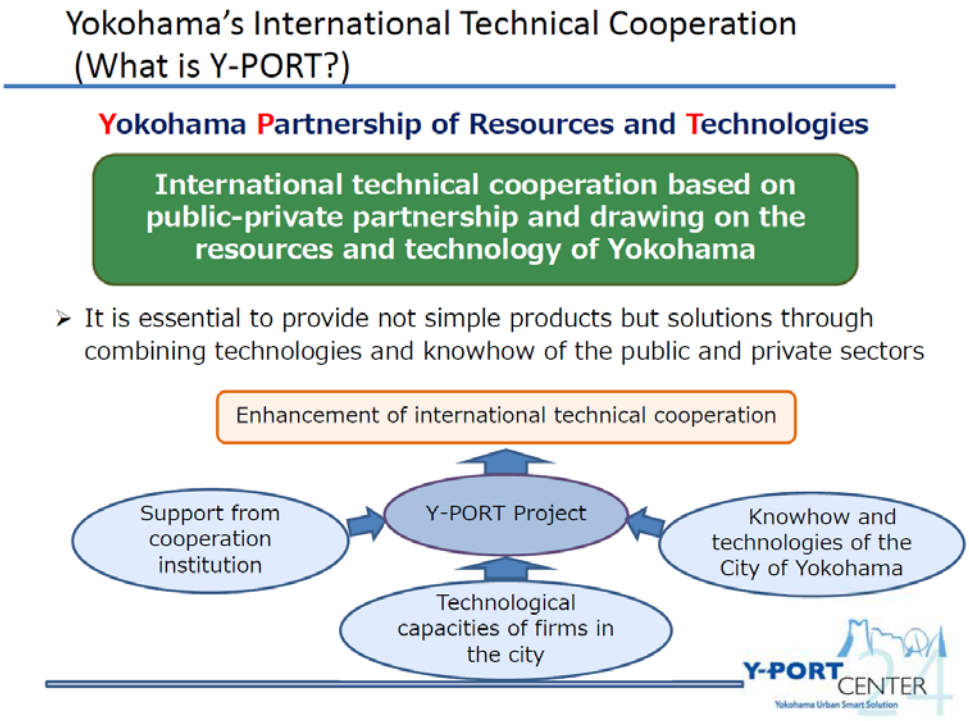
- The "Kitakyushu Eco-Town Project" is a trinity of efforts by companies, governments, and residents. From 1997 to 2021, the types of garbage sorting has been gradually increasing, and the price of garbage bags was set according to the type of garbage. A number of meetings/seminars were held to gain the understanding of the residents.



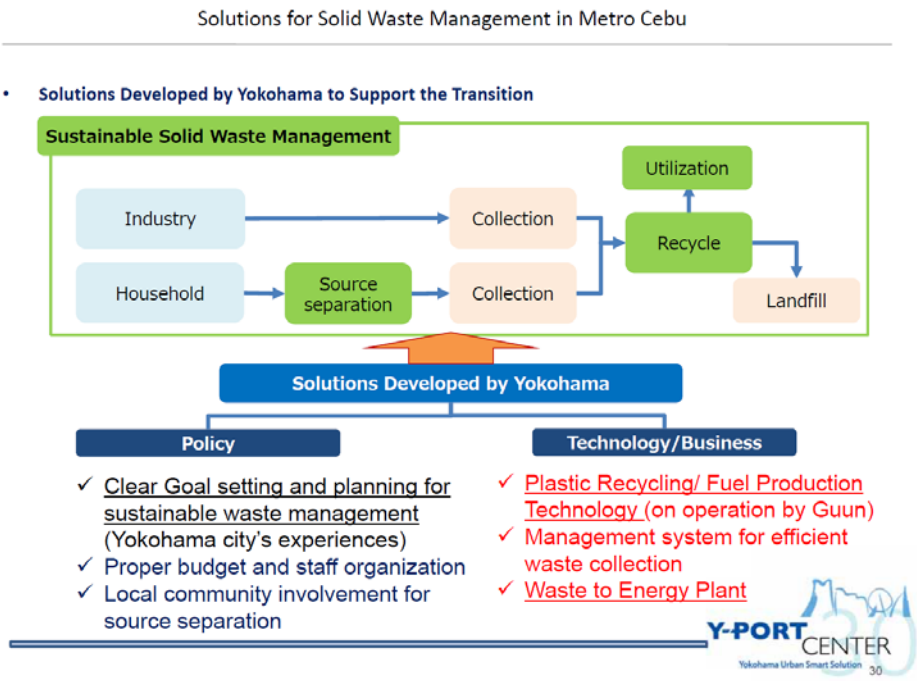
- Kitakyushu has been Conducting a number of activities to build partnerships with the Asian economy for mutual prosperity.

(4) Presentation4

- In the last session of Day 2, the Secretariat made a presentation on behalf of Yokohama city.
- The presentation showed the case study of applying the Guidebook to Mandaue city with a cooperation of Yokohama city.
- Also, interesting strategies and initiatives on solid waste management in Yokohama were introduced.
- The decrease in the waste volumes in the last two decades shows how Yokohama has been successful in the waste management.



- "Y-PORT" is an international technical cooperation based on public-private partnership and drawing on the resources and technology of Yokohama.
- It is essential to provide not simple products but solutions through combining technologies and knowhow of the public and private sectors.



- Yokohama City has developed a recycling technologies and clear policy goal setting for sustainable waste management, which has been provided as solutions for a solid waste management for Metro Cebu.

4.3.3 Question and Discussion

(For Presentation 2 of Day 1)

- We understand the overview of the BCG economy policy in Thailand. The circular economy is a very comprehensive concept, and some new approaches are necessary for the transition to the circular economy. What is a new challenge for the transition to the circular economy in Thailand?
  - ✓ Circular economy requires the treatment of the different type of wastes such as infection waste and the community wastes, so the information on the waste management is very important in Thailand.

(For Presentation 3 of Day 1)

- I understand that plastic pollution is one of the big issues in Indonesia. I think that Indonesia is taking the life-cycle approach. What process in the life cycle is prioritized in your economy?
  - ✓ We are going to start to implement our roadmap for waste reduction by the producer, because this legalization is mandates for the producer.
  - ✓ We are pushing the producers and businesses to do design for environment

from the upstream. So, this is the EPR approach that are going to be implemented for the first time in Indonesia.

(For Presentation 2 of Day 2)

- Are there any challenges to evaluate your city using the Guidebook?
  - ✓ We had a trouble with the wastes coming from other cities. So the Guidebook should be improved so that it can clearly handle the case that wastes were coming from outside of the city.

(For Presentation 3 of Day 2)

- To achieve the goals of circular economy, I think the industries or private sectors must spearhead the recycling aspect of waste management
  - ✓ Thank you for your comment. it is very true.
- According to the presentation, Kitakyushu already has a lot of cooperation projects with cities in APEC region. But what is the main challenge when Kitakyushu collaborates with other cities in an intercity cooperation project? I think that your city's experiences would be so helpful to improve the Guidebook and the radar chart evaluation.
  - ✓ The key success factor of an intercity cooperation project is to grasp the needs of the city correctly by identifying who is the key person who can represent what they want.
- Do you have any collaboration with cities of Latin America?
  - ✓ As far as we know, we have no collaboration project with cities of Latin America, but we have experiences of studying in some economies in Latin America.
- Regarding waste management, is there any example or pilot project for appropriate solution on small island waste management and circular economy?
  - ✓ We have just started a pilot project in an island in Thailand focusing on plastic waste.
- For the implementation of a circular economy, could you share the experience in building cooperation with all stakeholders so that an integrated implementation can be realized? Are incentive schemes in the community also implemented?
  - ✓ In order to build cooperation with all stakeholders, a number of briefing sessions with stakeholders has been held and understanding of them has been gradually fostered.
  - ✓ Since we have increased the price of the garbage bag, the residents have an incentive for separation at source.