FY2020 Project for Ministry of the Environment Government of Japan

FY2020 City-to-City Collaboration Program

for Creating a Zero-carbon Society

(Promoting of carbon-free society and co-benefits through the implementation of EV vehicles

in the state of Koror, Republic of Palau)

〔Kitakyushu City- Koror state Collaboration Project〕

Survey Report

March 2021

ATGREEN Co., Ltd.

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Chapter 1　Purpose and overview

1.1　Purpose

This survey project will be consigned based on the Ministry of the Environment 2020 “City-to-City Collaboration for Creating a Zero-carbon Society”.

In 2020, under the Paris Agreement, the central government, local governments, and cities need to take the lead in implementing climate change measures. Cities and local governments are key players in considering and implementing specific regional climate change measures.

The movement to support urban efforts internationally for the realization of a carbon-free society throughout the world has been strengthened.　" City to City Collaboration Program for the Realization of Low-Carbon Society " and this project operated by the Ministry of the Environment is research studies and capacity building programs for the realization of a carbon-free society in Japan. This is promoted mainly in Southeast Asia countries and West Asia countries.

A research team consisting of Japanese private companies, research institutes, and Japanese city conducts a feasibility survey toward for forming a Zero-carbon or low-carbon society in Koror, Republic of Palau in this project. In addition, our team conducts a research project for the introduction of equipment that will contribute to the formation of a decarbonized and low-carbon society in the future.

1.2　Overview

1.2.1　Overview of survey

(1)Survey Target 調査内容

Our team conducts a feasibility study in the following fields toward for making JCM equipment subsidy projects. (Table 1-1 and Fig.1-1)

Table 1-1：Overview of survey

調査対象分野	概要
Tourism sector	Survey for improving renewable energy utilization rate and Zero-carbon through promotion of electric vehicles such as sightseeing buses
Waste collection and transportation sector	Survey for promoting of electric vehicles such as waste collection and transportation vehicles to improve the utilization rate of renewable energy in waste resource recycling
Other projects that contribute to Zero-carbon society	Survey for technology seeds and know-how that companies in Kitakyushu city can provide for local issues. In addition, our team take a survey for new project for the future.

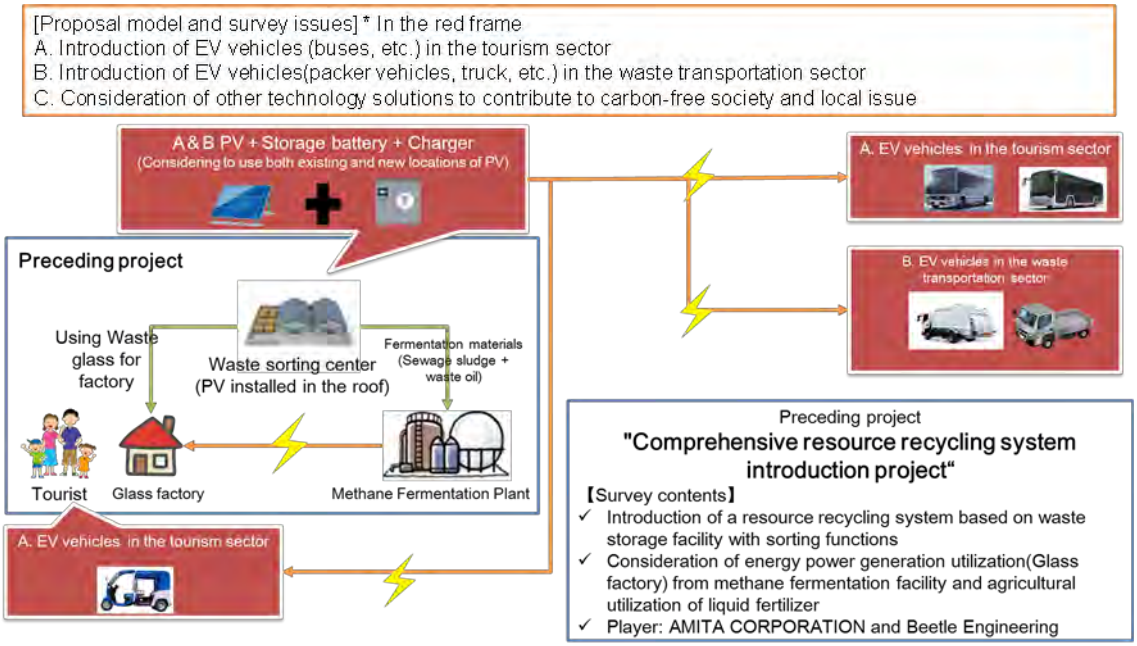


Figure1-1：Outline of this work

(2) Target area of survey

Republic of Palau, Koror states and surrounding areas

1.2.2 Project implementation scheme

(1) Survey items

The survey items of “Tourism sector”, “Waste collection and transportation sector”, “Other projects that contribute to Zero-carbon society” are as follows.

Table 1-2：Specific survey items

Tourism sector
1) Survey for the possibility of procuring electricity from existing photovoltaic power generation facilities and examination of candidate sites for charging electric vehicles Information on photovoltaic power generation facilities introduced in past JCM and ODA projects was organized. We also conducted an interview survey with state government officials regarding the availability of new photovoltaic power generation facilities that are being considered for introduction. 2) Possibility of introducing public transportation using electric vehicles in Koror Exchanged opinions with local international airport officials and the state government (tourism department). Furthermore, we confirmed the laws and regulations that should be kept in mind when introducing and operating electric vehicles and charging equipment. Since there are still few cases of introducing commercial electric vehicles in Palau, we investigated cases in Japan and around the world as advanced cases, and analyzed the characteristics of vehicle specifications and possible issues. 3) Possibility of cooperation with local tourism industry companies (hotels, tourism associations, etc.) We conducted an interview survey with local government officials, hotels, and tourism association officials regarding the situation and issues related to passenger transportation. In addition, we conducted an interview survey with local international airport officials and government officials regarding the possibility of collaboration with the Palau International Airport management project, in which Japanese companies are currently collaborating with the local government. 4) Examination of project necessary cost model, implementation system, investment recovery model Based on the local needs identified in the interview survey, the business feasibility was evaluated after setting the driving route and the hypothesis of the electric vehicle. We also

examined the implementation system.

5) Examination of local needs and effectiveness related to co-benefits

We conducted an interview survey with local tourism industry companies and airport officials on the need for cost reduction, low environmental impact, and image improvement by electric vehicles.

6) Preparation for application to JCM equipment subsidy project / Examination of MRV methodology

Based on the survey contents of 1) to 5), we considered applying for equipment subsidy projects and other funds. We also examined a proposal for the MRV methodology.

Waste collection and transportation sector

1) Survey for electric vehicle introduction model in collaboration with the preliminary Investigation project

We exchanged opinions with the Koror State Solid Waste Management Office on the confirmation of the progress of the investigation project (Ministry of the Environment 2019 Comprehensive resource recycling system introduction project) and the possibility of cooperation with the electric vehicle introduction project.

2) Consideration for realization with potential stakeholders such as Koror state

We conducted a precedent case study on the use of electric vehicles for waste collection and transportation in Japan and around the world, and sorted out possible issues and factors. After that, the Koror State Solid Waste Management Office and the issues for realization were organized.

3) Examination of local needs and effectiveness related to co-benefits

We interviewed the Koror State Solid Waste Management Office about needs such as cost reduction and low environmental load by utilizing electric vehicles.

4) Examination of project necessary cost model, implementation system, investment recovery model

Discussions were held with the Koror State Solid Waste Management Office on the possibility of cooperation with the local policy plan for the formation of an integrated resource recycling society and the hypothesis of securing funds.

5) Preparation for application to JCM equipment subsidy project / Examination of MRV methodology

Based on the survey contents of 1) to 4), we considered applying for equipment subsidy projects and other funds. We also examined a proposal for the MRV methodology.
Other projects that contribute to Zero-carbon society
1) Zero-carbon -related technology needs and corresponding technology seeds survey and project discovery A list of know-how and seeds related to environmental technology that can be provided by companies in Kitakyushu City was carried out. In addition, we selected projects with high local issues and interests from the state of Koror, or projects that are considered to be highly feasible. Then organize based on information from local consultants and businesses. 2) Conducting and participating in online discussion meetings and workshops Participated in the coordination of participation in the international ocean conference "Our Ocean Conference" (postponed due to the spread of COVID-19), the presentation at the JCM webinar, and the panel discussion, and exchanged opinions. 3) Presentation and coordination at online conferences designated by the Ministry of the Environment We carried out a report at an intercity cooperation seminar for the construction of the Zero-carbon city.

1.2.3 Survey term

From 18th September 2020 to 10th March 2021

Due to the COVID-19 pandemic, the contract details were changed, including surveys involving overseas travel and cancellation of invitations of local government staff to Japan.

1.2.4 Scheme of survey

Scheme of survey is shown in Fig.1-2, Tables 1-3 and 1-4 below.

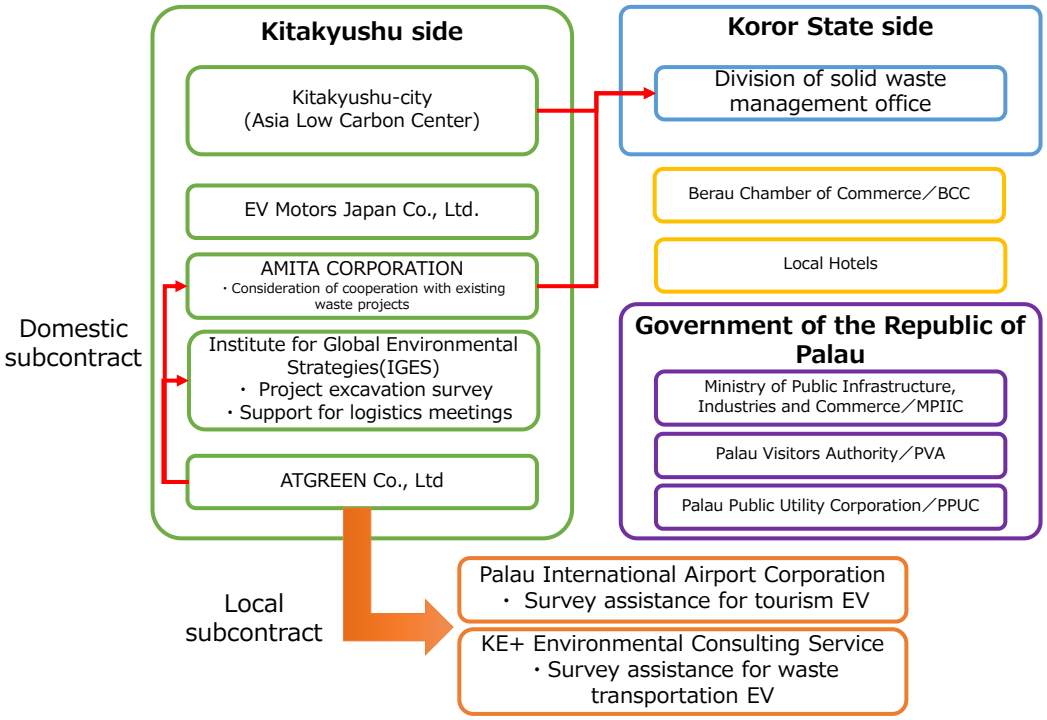


Figure1-2 ： Scheme of survey

Table 1-3　Domestic project members and role in this survey

Organization	Activity	Role in this project
ATGREEN Co., Ltd	Consulting service business for the environment, energy, waste sector	・Summary of the survey ・Business model examination ・MRV methodology creation
Kitakyushu City (Asian Center for Low Carbon Society)	・OECD selection “World model city for promoting SDGs" ・Promote advanced initiatives in resource recycling, carbon-free, renewable energy utilization, social welfare, SDGs, etc.	・Overall coordination of city to city collaboration ・Sharing experience and knowledge regarding the environment and SDGs
EV Motors Japan Co., Ltd	Manufacture, sales and maintenance of EV vehicles (commercial vehicles such as buses and trucks) and charging stations	・Consideration of locally adapted technology and equipment ・Business model examination
AMITA CORPORATION	・Solution provider for sustainability ・Waste recycling business	・Consideration of adding value to existing resource recycling project
Institute for Global Environmental Strategies (IGES)	An international research institute that conducts strategic policy research related to the environment and SDGs	・Consideration of other technology solutions to contribute to carbon-free society and local issue ・Support for holding local workshops

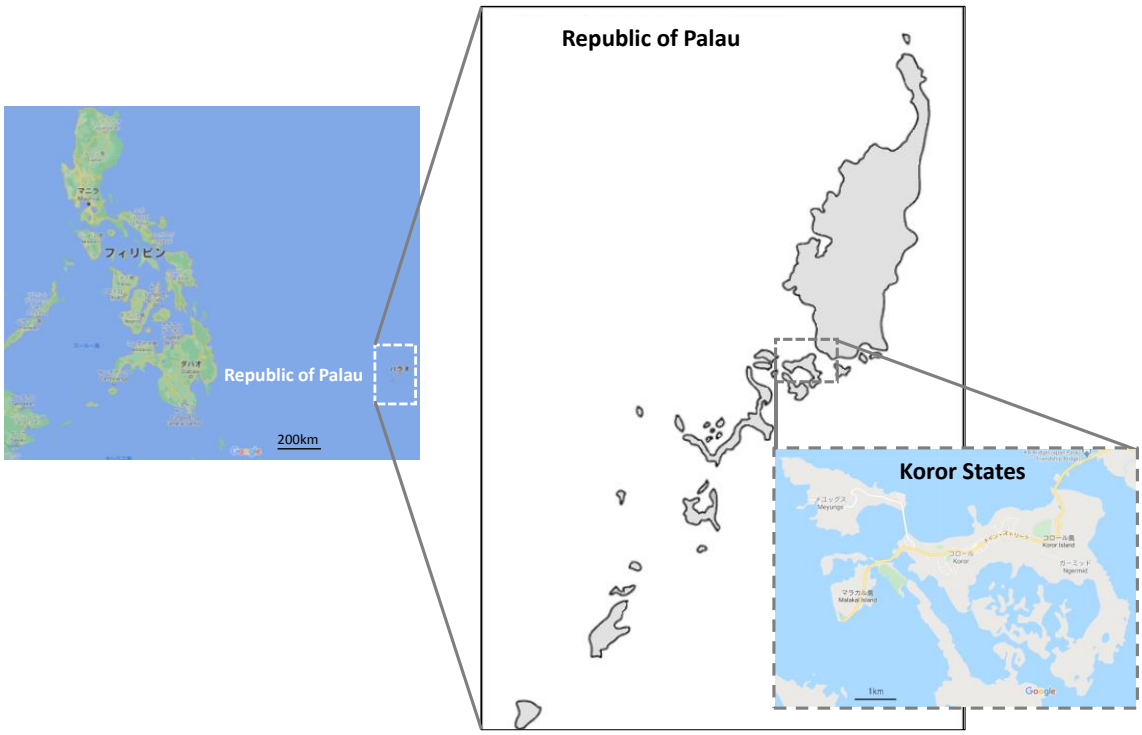
Table 1-4　Local subcontractors and their role in this survey

Organization	Activity	Role in this work
Palau International Airport Corporation	・Sojitz Corporation and Japan Airport Terminal Co., Ltd. (“Japan Airport Terminal”), through an intermediate holding company already established by the two companies, have set up Palau International Airport Corporation—a joint venture to manage operations at Palau International Airport—together with the government of Palau. ・Furthermore, the companies have concluded a contract with the government which will entrust them with airport operations for a 20-year period. ・Work to increase the added value of Palau International Airport and increase its value as a tourist destination.	・Investigate assistance regarding the introduction of electric vehicles for transporting passengers in the tourism field ・Arrangement of introduction conditions and issues when introducing tourist transportation electric vehicles and charging equipment at Palau International Airport
KE+ Environmental Consulting Service	・Local consulting company ・Has a large number of achievements in waste-related research in collaboration with the Koror State Solid Waste Management Office.	・Survey assistance for local government officials and Koror State Solid Waste Management Office for the introduction of electric vehicles in the field of waste collection and transportation

1.3 Background of survey

1.3.1 Outline of Koror states in republic of Palau

The Republic of Palau is located on the northern hemisphere side of the western Pacific Ocean at latitudes 2-8 degrees north and longitude 131-135 degrees east. The capital was relocated from the city of Koror to the state of Melekeok in 2006. The total population is 17,501 (as of 2012), and the state of Koror, which is the subject of this investigate, has a concentration of 11,655, which is 66.7% of the total population. Due to its characteristics as an island nation, there are various problems such as waste disposal problems and dependence on food, energy, and economy overseas. The tourism industry accounts for more than 50% of GDP. Environmental protection is regarded as important because the marine environment such as the rich coral reefs and fish species peculiar to the tropics is the centerpiece.



(Source：Tabi-no-tomo, ZenTech. Google Map)

Figure1-3：Republic of Palau and Koror States

【Climate change measures】

Republic of Palau belongs to the Secretariat of the Pacific Regional Environment Program (SPREP) and promotes climate change countermeasures. Intended Nationally Determined

Contributions (INDC) were formulated in November 2015. The outline of INDC is as follows.

Table 1-4：INDC overview[1]

Item	Contents
Period	Started in 2020. Ends in 2025
Target sectors to work on emission reduction	Energy sector emission reduction targets with additional reductions from the transport and waste sector
Base year and emission	2005(88,000t-CO_2)
Reduction target	Aim for the following goals by 2025 ・ Reduced GHG emissions by 22% compared to 2005 ・ Increase renewable energy utilization rate to 45% ・ Set the energy saving target at 35% compared to 2005

【Energy policy / plan】

In Palau, the "Pacific islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP)" has been implemented since 2007 as a mitigation project in the energy field, promoting the use of renewable energy.

Practical mitigation measures in the country include moving away from energy that relies on fossil fuel power generation.

This is an important issue in terms of power generation costs for Palau, which cannot be secured without importing fossil fuels from overseas. Palau is planning to shift from diesel power generation, which accounts for about 98-99% of the total electricity so far, to renewable energy. Specifically, by 2021 (abandoning the original plan of 2020), 20% of the generated power will be covered by renewable energy, and by 2025, 45% of the generated power will be covered by it.

To this end, five solar power generation projects (2.5 MW in total) have been introduced by the JCM equipment subsidy project, and support has been received from the other countries (New Zealand government and the South Korean government). In addition, the Palau government is conducting an international competitive bidding on a microgrid construction project centered on

[1] Republic of Palau INDC (http://prdrse4all.spc.int/system/files/palau_indc.final_copy.pdf)

solar power generation under the auspices of the Asian Development Bank (ADB).

However, such a large-scale photovoltaic power generation system connection has problems of short-period fluctuation and long-period fluctuation, and it is a problem to level surplus power and sudden output fluctuation. Power outages are occurring frequently in existing diesel power generation facilities due to aging, lack of maintenance, and lack of operational capacity.

Because of these reasons, there is a risk that the introduction of the microgrid will lead to further power instability.

From these points, it is urgently necessary to utilize renewable energy on the premise of self-consumption to reduce the load on the grid in Palau.

【Tourism sector】

Palau's main industry is the tourism sector, which attracts about 120,000 to 160,000 tourists annually. At the same time, it is affecting environmental issues such as global warming.

In addition, public transportation is not developed in the country, and taxis and hotel pick-up services must be used for transportation. Furthermore, there is only one main street on Koror Island, and traffic jam occurs frequently mainly in the morning and evening.

【Waste treatment sector】

The Koror provincial government attaches great importance to the 3R perspective and established a recycling center in 2004 to strengthen waste management. So far, they have introduced composting equipment for organic waste and sells compost.

In addition, they have built a deposit system that collects tariffs when importing beverages and allocates them to the collection and processing costs of empty cans, empty bottles, and PET bottles. They are actively promoting waste recycling, including the introduction of plastic oil liquefaction equipment in 2015. However, because of lack of industry in Palau that can use waste, only some types of waste can be recycled in Palau. On the other hand, it has been reported that the amount of waste has increased to over 27 tons / day[2], partly due to the increase in imported goods and the

[2] Kennchikugiken International (FY2018) , Palau National Waste Disposal Site Construction Plan Preparatory Survey Report, Japan International Cooperation Agency

increase in tourists.

The landfill site (M-Dock), which finally disposes of waste in Palau, has continued to prolong its life through several works, but its limit is approaching.

Currently, a new final disposal site constructed in Aimeliik state with Japanese grant aid, which was completed in August 2020.

Until now, each state operated a disposal site and landfilled the waste in each state, but the new disposal site is planned to landfill all the waste in Palau except for remote islands.

In order to effectively utilize the limited landfill capacity of the new disposal site, it is an urgent issue to promote further waste reduction by the 3R.

In addition, the Koror state government needs to further improve the efficiency of waste treatment because shifting waste treatment to the new final disposal site in Aimeliik will lead to an increase in transportation costs.

The state of Koror is envisioning a facility that can simultaneously improve the recycling rate and reduce waste disposal costs, and is a waste collection and resource recycling project based on a separate transshipment and storage facility. At the same time, it is desired to build an international recycling system to solve the problem of waste that cannot be treated domestically.

1.3.2 Cooperative relationship between Kitakyushu City and Koror states

The city to city cooperation between Kitakyushu City and Koror Province has been ongoing since 2015, centered on the construction of a resource recycling system. The efforts so far are shown in Table 1-5 below.

Table1-5：Past efforts regarding city to city cooperation between Kitakyushu City(and companies in the Kitakyushu city) and Koror State

Year	Project name	**Project Activities**
FY2015 ～ FY2017	Survey of waste treatment in islands (Ministry of the Environment Japan Project)	・Survey for landfill site (current waste treatment volume and processable volume) ・Survey for recycling facility specifications and costs ・Survey for waste treatment system design, estimation, preparation items for construction ・Signing of partnership agreement (between AMITA Institute for Sustainable Economies Co.,Ltd. and Koror State)
FY2017 ～ FY2018	Feasibility Survey of introduction of small size methane fermentation plant in islands (JICA Project)	・Survey for raw biomass materials (garbage, resource crops, etc.) ・Survey for methods of waste separation and collection scheme ・Promotion for using liquid fertilizer ・Survey for methane fermentation facility specifications and operational design
FY2019 ～ FY2020	Feasibility Survey on introduction of resource sorting and storage facilities in Koror State (Ministry of the Environment Japan Project)	・Survey for introduction of resource sorting and storage facilities in Koror State ・Survey for international recycling

In this way, exchanges between the two cities are progressing, mainly in the waste field. In addition, Kitakyushu City has been selected as the "SDGs Future City" selected by the Cabinet Office, and has also been selected as the OECD's "World Model City for the Promotion of SDGs" through the promotion of activities to achieve the SDGs. Similarly, the state of Koror, which is promoting activities to achieve the SDGs, has also set up a department related to the SDGs, and exchanges are being held with the expectation of sharing knowledge from Kitakyushu City. In addition, the two cities are also in the process of deepening exchanges, such as discussions on the conclusion of brother and sister cities.

Chapter2 Feasibility study toward for Project formation about improvement of renewable energy ratio and decarbonization by introducing EV vehicle for tourism sector.

There is no public transportation in Palau, and tourists use no-licensed taxis, shuttle buses, and hotel shuttles (all fossil fuel vehicles). Therefore, by transform for tourist transportation with large EV vehicles, such as bus, not only decarbonization by reducing fossil fuel consumption, but also co-benefit effects such as reduction of exhaust gas emissions and alleviation of traffic congestion will be expected. We conduct a survey for the purpose of this. We assume using renewable energy of existing or new solar power generation as a power source for EV vehicles.

2.1 Understanding local issues and needs

2.1.1 Identifying local stakeholders

The assumed stakeholders of this project are summarized in Table 2-1 below. We conducted a hearing survey with them on issues related to tourist transportation in Palau, needs for EV vehicles, and the possibility of cooperation with this project.

Table2-1 : Assumer local stakeholders (Tourism sector)

Organization name	Abbreviation	Overview explanation
Ministry of Public Infrastructure, Industries & Commerce	MPIIC	Palau government ministries. Palau government ministries. It consists of six departments: Bureau of Aviation, Bureau of Public Works, Bureau of Land and Survey, Bureau of Commercial Development, Small Business Development Center, and Palau Energy Office.
Palau Visitors Authority	PVA	An independent organization established to promote tourism in Palau. A part of the Presidential Office of the Republic of Palau.
Berau Chamber of Commerce	BCC	An organization integrated by the Palau Travel Association (PTA), which was a group of the tourism industry such as travel agencies and hotels.
Palau Public Utility Corporation	PPUC	A public corporation established in February 1994 for the purpose of managing and operating Palau's electric power system. We own power generation facilities in various parts of Palau.
Palau International Airport Corporation	PIAC	PIAC operates the Palau International Airport Terminal Building. PIAC is renovating and expanding the airport terminal. Support for this survey.
U.B.D.I. Belau Tour	—	Travel agency (for Japanese and Asians)
Impac Tour	IMPAC	Travel agency (for Japanese and Asians)
Palasia Hotel	—	One of the three major local hotels (approximately 160 guest rooms). Taiwanese.
Palau Pacific Resort	PPR	One of the three major local hotels (approximately 160 guest rooms). Tokyu-Construction is the parent company.
Palau Royal Resort	PRR	One of the three major local hotels (approximately 160 guest rooms). Although it is Taiwanese, it is operated by Okura Nikko Hotels.
Cove Resort	—	A medium-sized hotel (about 70 guest rooms). Japanese staff are engaged.

		Australian hotel.
Garden Palace	—	A small hotel (12 guest rooms). Japanese staff are engaged.

In addition, there are travel agencies of Taiwan, China, South Korea, and Europe and the United States. However, due to the COVID-19 pandemic, many agencies have returned their expatriates to their home countries, so we could not hear from them this time.

2.1.2 Traffic conditions

(1) Current tourist transportation method and status

Public transportation is not well-developed in Palau, and tourists mainly travel by bus or minivan owned by a hotel or tour company, or by rental car driven by the traveler himself. Taxi using is limited. (The number of taxis is not officially known because they are operated without permission, but according to local information, there are about 10 taxis in the whole country.

The market price for either method is around 20 to 30 USD between the airport and the hotel in the center of Koror Island.

According to the interview with BCC, private companies tried to consider of the implementation of public projects related to passenger transportation, but it was not realized due to lack of operation technology and experience. In addition, before the COVIS-19 pandemic, Belau Tour operated a city circulation bus (Circulate hotels-restaurants-supermarkets.) using the free time of the shuttle bus to transport tourists.

However, it was not profitable as a bus business at all, and it was implemented to attract the interest of tourists.

In addition, when waiting for time at the bus stop, problems such as trouble (obstruction) with stores near the bus stop and delays due to traffic jams always occurred. It was undecided whether to provide the service again after the COVID-19 pandemic was over.

Figure 2-1 shows the results of interviews with a total of 10 organizations, including PVA, BCC, and other hotel and tour companies, regarding each issue that we feel about current passenger transportation. From the results, it was found that there are general problems with drivers, vehicles, road surface conditions, maintenance costs, and purchase funds.

In addition, from the viewpoint of large vehicles, the fact that parking spaces can be secured on the island is limited (there is no bus parking lot in the airport facility, etc.) is an issue obtained from multiple hearing destinations.

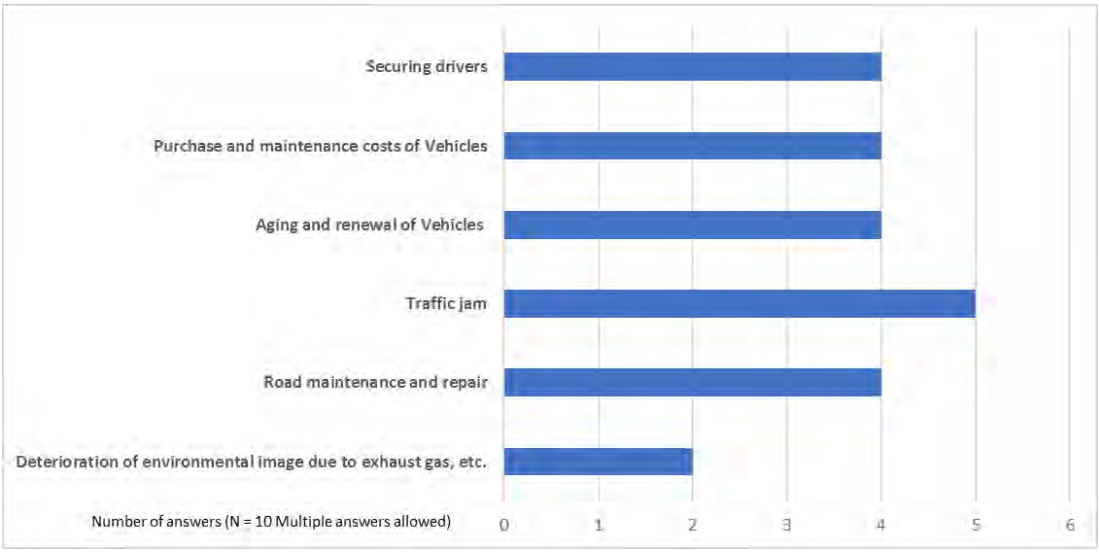


Figure 2-1 : [Hearing results] Current issues regarding passenger transportation

(2) Road Conditions and traffic jam

Figure 2-2 shows the main road from Palau International Airport to Koror.

Figure 2-3 shows the results of interviews with a total of 10 organizations, including PVA, BCC, and other hotel and tour companies, regarding the hourly congestion status of this road. As a result, it was found that traffic congestion was observed from daytime, and that there was a peak of traffic jam from 6:00 to 8:00 and from 16:00 to 18:00 in the early morning. According to some interviewees, this factor is not due to the movement of tourists, but to the commuting and returning home of the islanders. Transfers between the airport and the hotel are not considered to be the cause of traffic jam, as most Palau flights are late-night flights.

From this information, it is expected that the public transportation business by large vehicles targeting islanders will contribute to the alleviation of traffic jam, regardless of whether it is an EV vehicle or not.

(Source：Google Map)

Figure2-2：Main roads in Koror Island

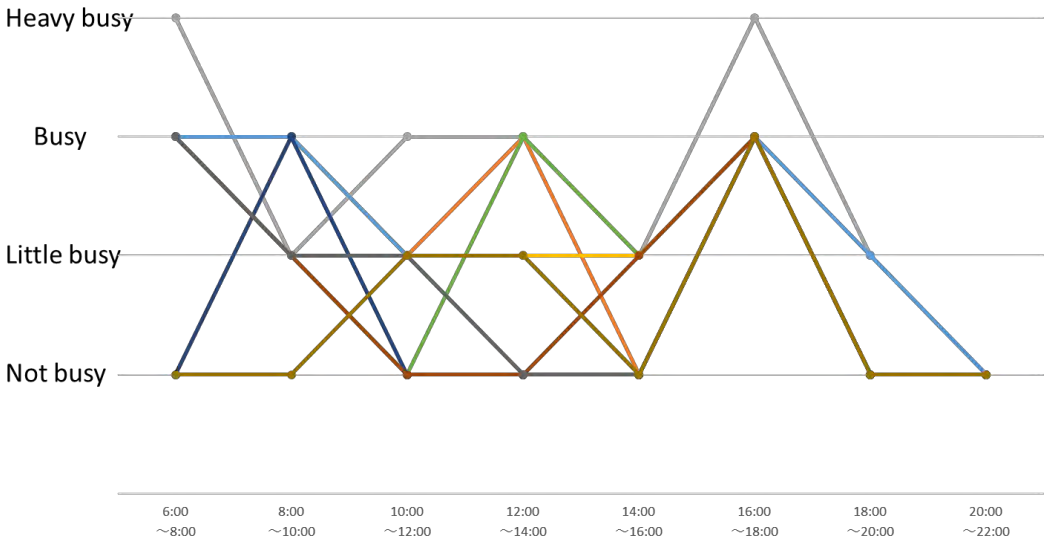


Figure2-3：Traffic congestion status of major roads by time zone (hearing results)

2.1.3 Laws and regulations related to the introduction and operation of EV vehicles

We interviewed the Bureau of Customs and Border Protection of Palau about the import tariff rates of EV vehicles and charging equipment and the laws and regulations that should be noted when driving EV vehicles in Palau.

(1) About tariffs

The tariff rate for EV vehicles is the same as for ordinary fuel vehicles. In the latest local tariff table "TARIFF SCHEDULE HS 2017", it is regarded as "another vehicle equipped only

with an electric motor for propulsion".

The tariff code is 8703.80.10 (new car) or 8703.80.20 (used car), and the tariff rate is fixed at 5% + $ 250.00.

Although the EV charging equipment is not strictly setting, Customs was said that it would be regarded as "other machinery / equipment" on TARIFF SCHEDULE HS 2017 in the on-site hearing. In this case, the tariff code is 8543.70.00 and the tariff rate is fixed at 3%.

(2) Domestic driving laws and regulations

Currently, the only domestic automobile regulation is the vehicle road use tax, which classifies vehicle registration fees based on weight. MPIIC commented that EV vehicles are likely to be treated in the same way as fossil fuel cars because there are few cases. (Comments from MPIIC also suggested that future rule setting is needed).

From MPIIC comments, the vehicle must be equipped with light functions (headlights, parking lights, brake lights, signal lights) and horns to ensure driving safety and allow registration and operation of public road driving. However, this point is a general requirement, and it is considered that there is no special problem.

MPIIC recognizes that there are no original regulations for EV vehicles regarding vehicle maintenance, and MPIIC recognize it is necessary to consider in the future.

In the case of fossil fuel car vehicles, once a year, when renewing the vehicle registration, a simple inspection that takes about 5 minutes is performed (lights are on, stop lights are on, etc.).

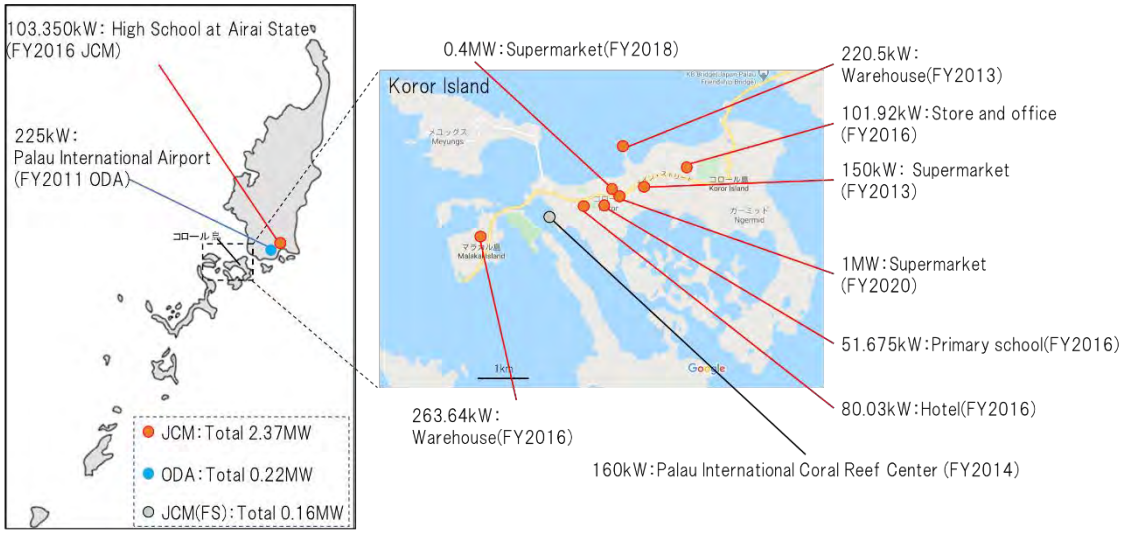
Since there are few cases of EV charging equipment, the regulations are currently the same as for ordinary electrical equipment. In addition, it was confirmed that there are currently no special regulations regarding the sale and supply of energy using charging equipment.

2.1.4 Status of Installation and operation about solar power generation equipment

Figure 2-4 shows the installation destination, power generation scale, and installation location of PV in Palau and Koror, which have been introduced by utilizing the JCM equipment subsidy project and ODA project. The total power generation output is 2.37 MW.

The solar power generation installed at the airport is managed by PPUC, and it is possible to consider connection cooperation with EV vehicle chargers.

Other solar power generation facilities provided by JCM foundation are under the control of each business operator and are not involved in the operation by the government, so consultation with each business operator is required when linking with EV chargers.



(出所：Google Map)

Figure2-4：Solar power plants installed or considered on Koror Island and Airai state with Japanese subsidies

2.1.5 Local needs for introduction of EV vehicles

(1) Expectations and issues when introducing EV vehicles for passenger transportation

Minister of Public Infrastructure and Trade (MPIIC) Mr. Obichang made the following comments regarding the relationship between this project and the policy of the Republic of Palau.

The Republic of Palau (ROP) has the following three environmental policy goals.

1) Reduce CO_2 emissions by 22% by 2025 (compared to 2005)

2) Use 45% of the power source as renewable energy

3) Energy saving reduction of 35% compared to 2005

The Minister commented that our project concept is the use of solar power (PV) for tourist transportation EV buses, and it would be in line with the government policy. This is also consistent with what was said in the INDC section.

The chairman of the Belau Chamber of Commerce (BCC), Palau Visitors Authority (PVA), and several hotels have made similar comments. In particular, the BCC chairman has mentioned a positive response that if you can get financial support from Pristine Paradise Environmental Tax (tax collected from tourists, 100 USD per person) and other national resources, the state government can consider participation in a passenger transportation

business with private sector cooperation. In addition, MPIIC responded that the possibility of private sector collaboration can be considered depending on the business model to be constructed.

Figures 2-5 and 2-6 show the results of hearings from the 10 organizations listed in Table 2-1 regarding their expectations and concerns regarding the realization of this project. The expected merits are the effect of reducing the environmental load and the improvement of the image, and on the contrary, the concern about the construction of the maintenance system and the response to the trouble was conspicuous. Currently, in Palau, where only a few EV vehicles have been introduced and know-how construction is not sufficient, it is essential to enhance the system construction including remote support for maintenance including charging equipment.

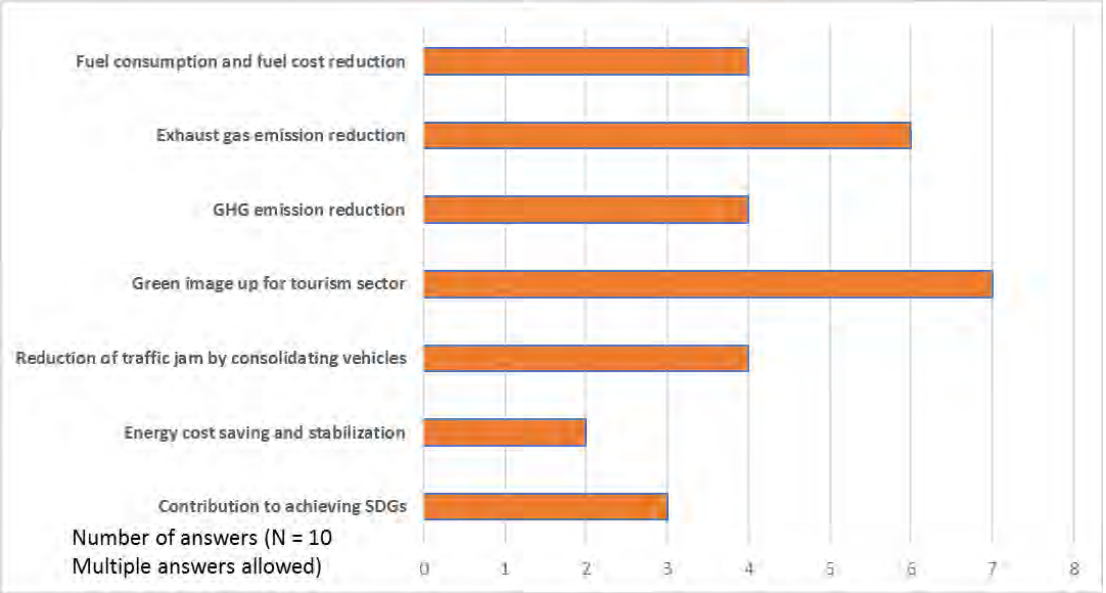


Figure2-5：[Hearing results] Benefits expected when introducing EV vehicles to tourist transportation

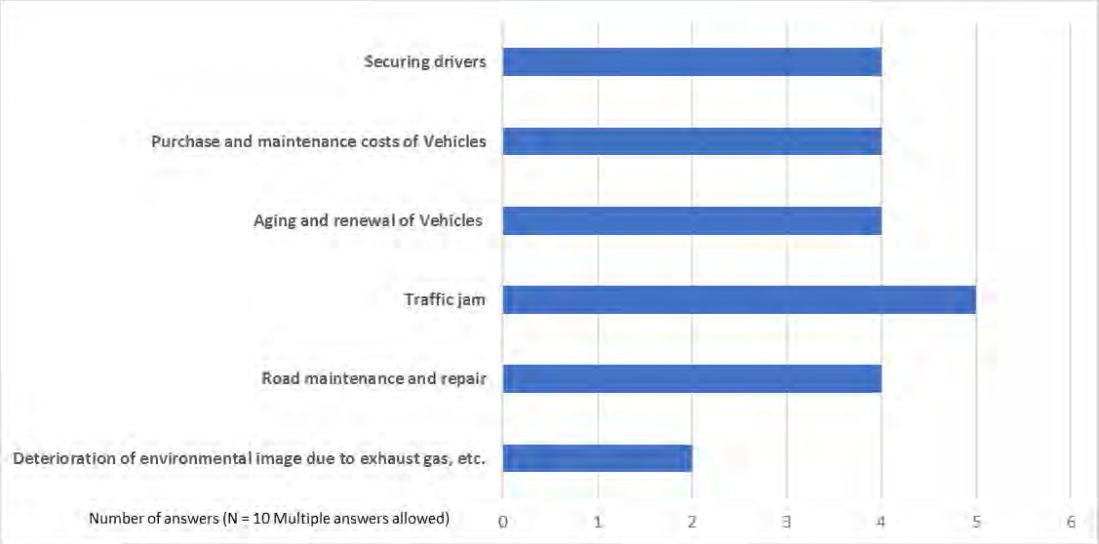


Figure2-6：[Hearing results] Challenges in introducing EV vehicles to tourist transportation

(2) Important points when introducing sightseeing buses and EV vehicles

Figures 2-7 and 2-8 show the results obtained from the eight organizations that responded to the interviews listed in Table 2-1 regarding the specification items that are important when introducing sightseeing buses and EV vehicles.

From the viewpoint of a bus, it was found that initials and running costs are important, of course, and there are certain needs for the number of passengers, safety, and salt damage countermeasures unique to island countries. Regarding salt damage, among the concerns about vehicle maintenance costs and aging in the current passenger transportation issues in Figure 2-1 and the introduction of EV vehicles in Figure 2-6, the durability of vehicles and charging equipment and troubleshooting. It may be related to the concentration of opinions. Also, from the perspective of an EV vehicle, opinions on durability and safety were concentrated.

This point is related to the fact that there are virtually no EV vehicles in Palau at present, and there is a sense of insecurity in the reliability of technology and the construction of maintenance systems.

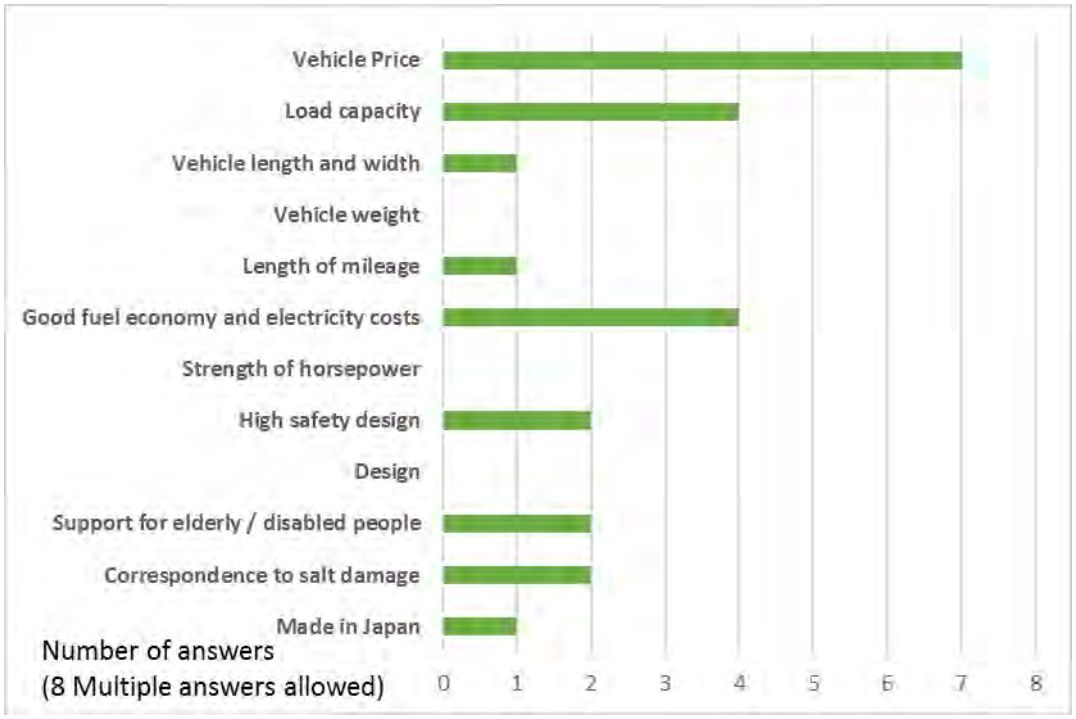


Figure2-7：【Hearing result】Important matters when considering the introduction of tourism bus vehicles

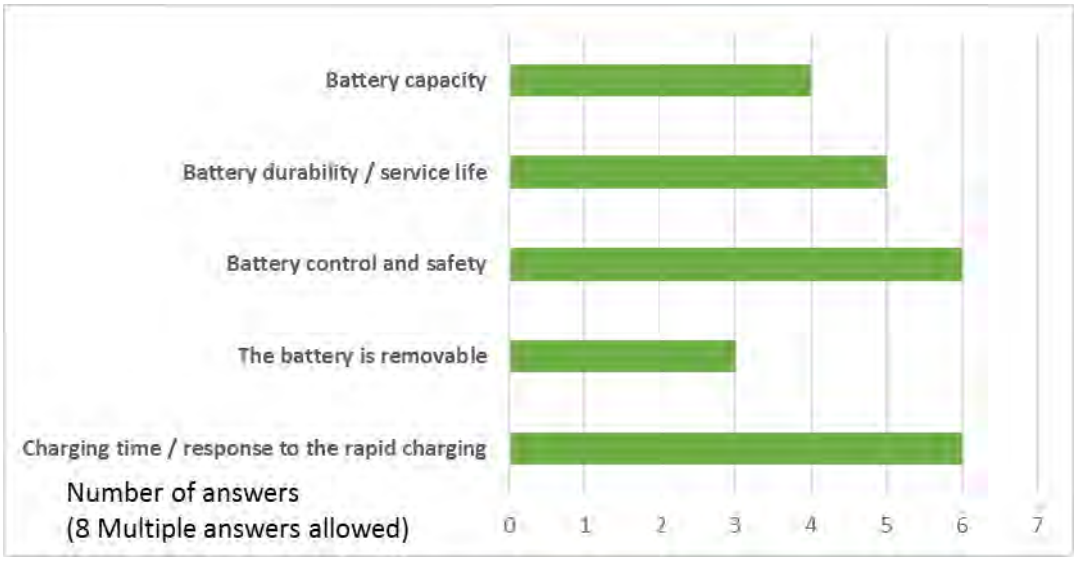


Figure2-8：【Hearing result】Important matters when considering the introduction of EV bus vehicles

2.2 Survey for preceding case

Since there are still few cases of commercial EV vehicles being introduced in Japan, this section describes the results of a survey of domestic and overseas cases where EV vehicles are introduced and used in large commercial vehicles (buses) in advance.

The purpose of this survey is to analyze the specifications of EV vehicles and charging equipment introduced for the purpose of passenger transportation, and the effects and issues in the introduction and utilization, and to provide feedback to the study of this project.

(1) Vehicle classification: Short-distance driving frequent charging type and long-distance driving night charging type

According to the Ministry of Land, Infrastructure, Transport and Tourism Automobile Bureau "Electric Bus Introduction Guidelines (December 2018)", EV bus vehicles are classified into "short-distance driving frequent charging type" and "long-distance driving night charging type" depending on the storage battery capacity and operation method. (Figure. 2-9).

The former is supposed to be charged multiple times a day, and is suitable for use as a patrol bus in urban areas. The latter has a large battery capacity and can be operated without charging during business hours by charging it in the garage outside business hours, so it is possible to extend the operating range to the suburbs.

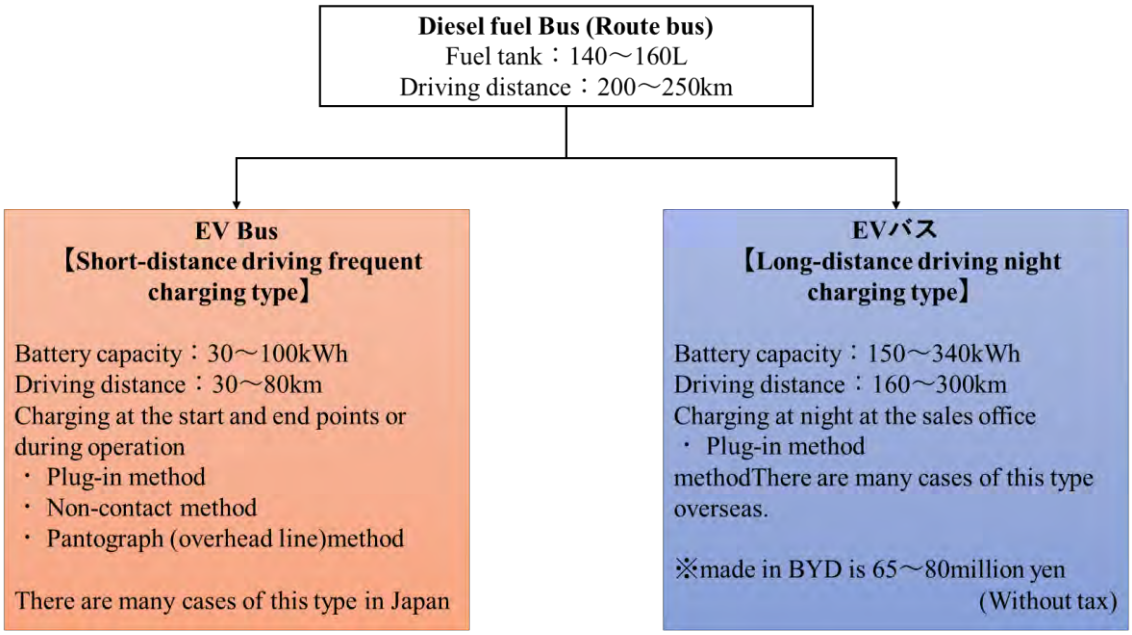


Figure2-9：EV bus vehicle classification[3]

[3] Created after adding to the survey team with reference to Ministry of Land, Infrastructure, Transport and

Table 2-2 shows the cases collected this time, classified according to the above conditions. It can be seen that the short-distance driving frequent charging type is mostly domestically modified vehicles, and the long-distance driving night charging type is mostly made by BYD of China.

In addition, there are cases in which charging is carried out once every few days when the daily mileage is short (10km level, etc.), even though the long-distance driving night charging type is adopted (cf. Naha City, Okinawa Prefecture).

Short-distance driving frequent charging type	Long-distance driving night charging type
・Kesnnuma, Miyagi (Isuzu remodeling) ・Ise, Mie (Isuzu remodeling) ・Sumida, Tokyo (Hino remodeling) ・Hamura, Tokyo (Hino remodeling) ・Komatsu, Ishikawa (Hino remodeling) ・Minato, Tokyo (Hino remodeling) ・Miyako, Ishikawa (Hino remodeling) ・Kawasaki, Kanagawa(Isuzu remodeling) ・Satuma sendai, Kagoshima (Korea fiber remodeling) ・Kitakyushu, Fukuoka (Korea fiber remodeling) ・Near Seattle, USA (Unknown) ・Amsterdam, the Netherlands (VLD)	・Naha, Okinawa (BYD) ・Kyoto, Kyoto (BYD) ・Aizuwakamatsu, Fukushima (BYD) ・Morioka, Iwate (BYD) ・Minamitsuru, Yamanashi (BYD) ・Kunigami, Okinawa (BYD) ・London, England (BYD) ・Shenzhen, China (Unknown) ・Beijing, China (Unknown) ・Washington, USA (BYD)

＊() Is the vehicle manufacturer name

Table2-2：Case studies of EV buses by classification

(2) Effects and issues expected from the cases and their countermeasures

Table 2-3 summarizes the effects observed in the advanced case studies. Improvement of environmental image, improvement of running performance and in-vehicle environment, reduction of running cost, simplification of maintenance, and securing of emergency power supply in the event of a disaster were mentioned.

Tourism Automobile Bureau "Electric Bus Introduction Guidelines (December 2018)"

Table 2-3: Effects listed in advanced case studies

Effect	Contents
Environment and image	・ Regional revitalization such as improving the image of companies and regions and promoting tourism [Hamura City] ・ Because there is no exhaust gas or engine noise, the roadside environment can be improved [Hamura City] ・ Black smoke is not emitted when departing or accelerating [Kitakyushu City]
Drivability / in-car environment	・ Brake effectiveness, less noise and vibration inside the car [Hamura City] ・ Compared to fossi fuel cars, it has stronger horsepower and better acceleration. There is no problem even on steep roads [Kesennuma City / Kitakyushu City] ・ Drivers are less likely to feel tired [Kitakyushu City] ・Since there is no need to change gears, there is very little shaking of the car body and running is smooth [Morioka City]
cost	・ Reduction of running costs (40% reduction compared to diesel vehicles excluding basic electricity charges) [Miyako City] ・ Reduction of maintenance cost (repair cost is about half that of diesel vehicles, oil replacement is unnecessary, there are few replacement parts. Also, since there are few inspection items, there is also an effect of reducing the time cost of maintenance personnel [Miyako City / Minato Ward]
Maitnenance	・Daily inspection and maintenance is easier than diesel buses [Minato Ward]
Disaster countermeasures	・Equipped with an outlet in the car, the bus itself can be used as an emergency power source in the event of a disaster [Kawasaki City]

Issues and countermeasures are summarized in Table 2-4 by vehicle classification. Major issues common to both types include the creation of a system that enables constant maintenance and inspection and prompt response in the event of a failure.

Compared to diesel vehicles, the factors of storage batteries and charging equipment will increase, so there will be more stakeholders such as vehicle manufacturers, heavy electrical equipment manufacturers, and storage battery manufacturers. Even in some cases, the existing diesel vehicle maintenance department cannot handle it (cf. Hamura City, Tokyo), so the solid and established system construction of EV vehicle maintenance in Palau must be overcome for introduction. It can be said to be a barrier.

Table 2-4: Issues assumed from cases by vehicle classification and their countermeasures

Items	Assumed issues	Countermeasures
Common to EV vehicles (Comparison with diesel vehicles)	・When a failure occurs, it takes time to procure parts and recovery may be delayed. ・It may take time to recover from the trouble of the charger.	・It is necessary to establish a system that can respond to maintenance and troubles by monitoring the operation status of EV buses, the charging status of storage batteries, and the deterioration status of storage batteries by automobile manufacturers, charger manufacturers, and modified manufacturers.
	・When using air conditioner, the power consumption of the storage battery increases and the mileage becomes shorter.	・If heavy use of air conditioners is expected, consider a storage battery capacity with a margin.
	・ The center of gravity of the car body is high, and the car body tilts greatly when driving on curves.	・Confirmation of assumed operation route ・Driving training training for flight attendants
Short-distance driving frequent charging type	・It is difficult to select an operation route because the cruising range is short. ・Operating time is limited by additional charging ・If there is only one charging facility, you must return to the sales office each time you charge.	・It is necessary to devise ways to reduce the forwarding distance from the introduction route to the charging location while considering the installation of charging equipment at the starting and ending points, bus stops on the way, and parking lots.
Long-distance driving night charging type	・Because the weight of the vehicle increases with the battery capacity, it may not be suitable for the local road surface strength or may conflict with the Road Traffic Act.	・Confirmation of local laws and regulations (Kyoto City is certified as relaxed by the Ministry of Land, Infrastructure, Transport and Tourism)

2.3 Examination of introduction technology

In this item, we will examine the technology for introducing EV buses for tourism, estimate the cost, and grasp the issues for further examination in the future.

2.3.1 Contents of introduced technology

The buses to be considered are the models shown in Figure 2-11 below and Table 2-5 below. See Table 2-6 below for chargers.

Figure 2-11: EV bus and charging system to be considered for introduction

Table 2-5: Specifications and features of EV buses to be considered for introduction

Items	Contents
Model	F8 siries4-mini BUS
Size	Overall length: 6,990 mm Overall width: 2,100 mm Overall height: 3,050mm
Number of seats	14 seats (including driver), 30 people
Battery capacity	114kWh
Cruising range	230km
Other features	Adoption of lightweight EV chassis frame Can also be used as a large-capacity battery in the event of a disaster Flexible solar panels can be installed on the ceiling as an option

Table 2-6: Specifications and features of charger to be considered for introduction

Items	Contents
Model	750V CHAdeMO Ⅱ Charging equipment
Maximum output	120kW
Output voltage	750V
Charging standard	Compatible with CHAdeMO, CCS1. CCS2, BGT standards
Other features	IP65 waterproof

The bus to be introduced is a model equipped with a 114kWh battery and has a cruising range of 230km. This time, we are aiming to promote decarbonization by using all the electric power to be charged as a renewable energy power source, and the capacity of the photovoltaic power generation equipment required to charge this battery is 40 kW and the storage battery is 136 kWh. (Assuming that the amount of power generated is about 1.2 times that of the battery and the entire amount is charged to the storage battery)

2.3.2 Introduction / operation model

The EV bus to be introduced this time is a sightseeing bus, and it is thought that Palau International Airport, which is the gateway to international tourists, should be considered as a transmission base for sightseeing buses. Therefore, in this estimation, we decided to travel from Palau International Airport through Central Road, which is the main trunk road, and take two routes, Route A to PPR and Route B to the scenic Icebox Park. See Figure 2-12 below for routes.

(Source：Google Map)

Figure 2-12: EV bus travel route to be examined

<Planned driving route>

Route A (Palau International Airport-Palau Pacific Resort Hotel / 14.6km)

Route B (Palau International Airport-Icebox Park / 13.1km)

<Fare>

The fare will be 800 Japanese-yen for a round trip from the airport to each destination. Since the cost of the current transfer service to the hotel and taxi transfer is about 20 to 30 dollars, and in the case of bus transfer, the fee will be collected individually, the above transfer fee will be apportioned by 3 people. Furthermore, the bus transfer fee per person is set as the above price, taking into consideration the viewpoint of giving incentives for bus selection due to time constraints. In addition, a trial calculation was made assuming that 20% of local tourists (122,000 in 2017 x 20% = 24,400) will use the bus.

2.3.3 Profitability

Under the conditions described in 2.3.1 to 2.3.2, one EV bus, a charger, a solar panel (including a power conditioner), and a storage battery were installed, and the business profitability was evaluated. The evaluation was carried out when the initial cost was 100% self-paid and when 50% self-paid. Other trial calculation conditions are as follows.

<Common calculation conditions>

- Vehicle / equipment costs

  (Approximately 85 million yen / Various equipment, tariffs, engineering costs, training costs, etc. recorded)
- Revenue from tourists (assuming annual sales of about 20 million yen)
- 5 year borrowing
- Equipment transportation costs are not included
- Maintenance costs (5% of equipment costs are recorded every year)
- Driver costs are recorded
- Transportation business consignment costs from hotels, etc. have not been recorded.
- It was decided to reserve about 5 million yen every year as a reserve for equipment renewal.

＜Case of No subsidy: 100% self-pay project implementation＞

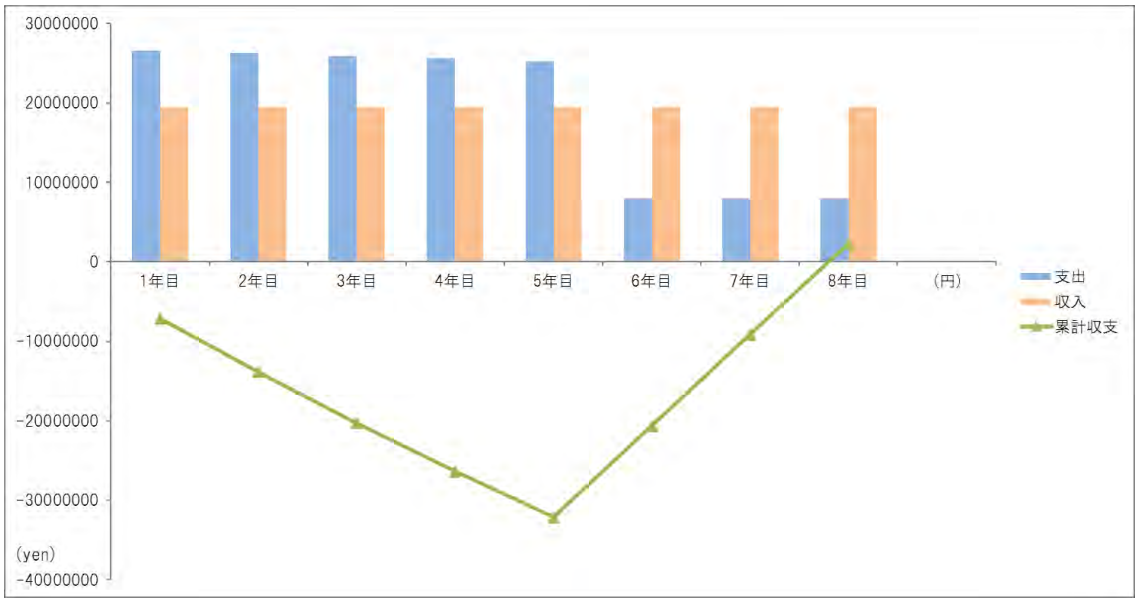
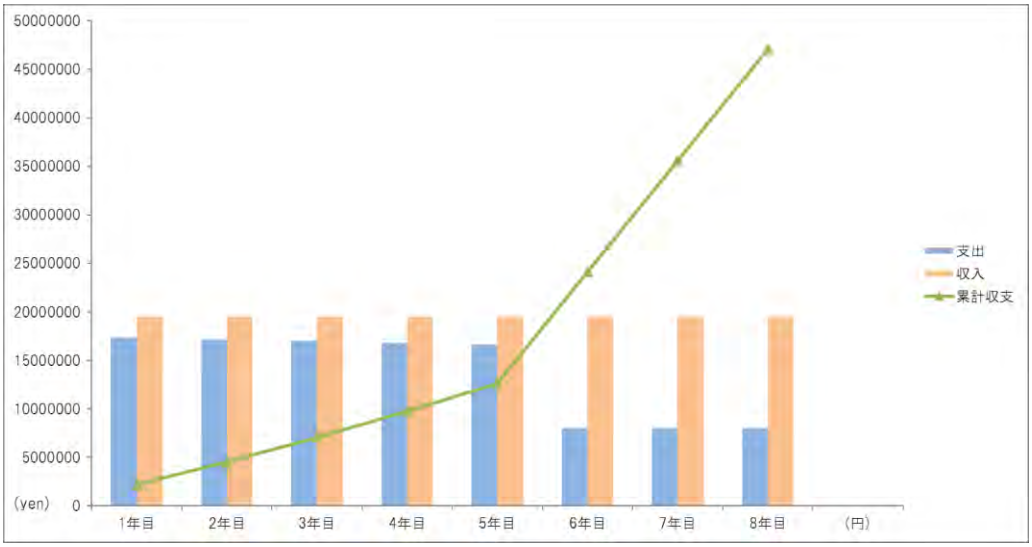


Figure2-13：No subsidy for introducing one EV bus for tourism sector

In this case, it is expected that the company will be profitable in a single year after the 6th year when the borrowing is completed, and the cumulative balance will be expected to be profitable in the 8th year. Since the burden of repayment of the initial cost is relatively large, it is considered

necessary to take measures to reduce it. Specifically, it is conceivable to reconsider the battery



capacity according to the mileage, charge one charger with two buses every other day when introducing multiple units, and use it.

＜Case of 50% subsidy and:50% self-pay project implementation＞

Figure2-14：50% subsidy for introducing one EV bus for tourism sector

In this case, the result was expected to be profitable from the first year. In order to establish this model, it is important to obtain user income as expected, and it is expected that the acquisition of subsidies will greatly contribute to the improvement of profitability in this project.

2.3.4 CO_2 reduction effect

We referred to J Credit System Methodology EN-S-012 Ver2.0 “Introduction of Electric Vehicles or Plug-in Hybrid Vehicles” for the effect of reducing greenhouse gas emissions associated with the conversion of tourism buses to EVs.

$$ER = EM_{BL} - EM_{PJ}$$

Table 2-7: Concept of emission reduction

Sign	Definition	Unit
ER	Emission reduction	tCO_2/year
EM_{BL}	Baseline emissions	tCO_2/year
EM_{PJ}	Post project Emissions	tCO_2/year

Since this project is the introduction of electric vehicles, baseline emissions will be emissions from the use of fossil fuels associated with the use of (conventional) vehicles, and post-project

emissions will be emissions from the use of electricity from the use of electric vehicles.

Post-project emissions are calculated by the following formula.

$$EM_{PJ} = EL_{PJ} \times CEF_{electricity.t}$$

Table 2-8: Calculation of post-project emissions

Sign	Definition	Unit
EM_{PJ}	Post project Emissions	tCO_2/year
EL_{PJ}	Electricity consumption in electric vehicles post project	kWh/year
$CEF_{electricity.t}$	CO_2 emission factor of electric power	tCO_2/kWh

Baseline emissions are organized according to the following concept.

$$D_{BL} = D_{PJ}$$

$$D_{PJ} = EL_{PJ} \times BU_{PJ}$$

Table 2-9: Concept of baseline emissions

Sign	Definition	Unit
D_{BL}	Baseline car mileage	km/year
D_{PJ}	Post project car mileage	km/year
EL_{PJ}	Post project electricity consumption in electric vehicles	kWh/year
BU_{PJ}	Post project energy consumption efficiency electricity of electric vehicles	km/kWh

The calculation of baseline emissions is carried out based on the following concept.

$$EM_{BL} = D_{BL} \times 1 \div BU_{BL} \times HV_{BL,fuel} \times CEF_{BL,fuel}$$

Table 2-10: Calculation of baseline emissions

Sign	Definition	Unit
EM_{BL}	Baseline emissions	tCO_2/year
D_{BL}	Baseline car mileage	km/year
BU_{BL}	Baseline energy consumption efficiency of fossil fuel vehicles	km/kL etc.
$HV_{BL,fuel}$	Unit calorific value of fuel used in baseline automobiles	GJ/kL etc.
$CEF_{BL,fuel}$	CO_2 emission factor per unit calorific value of fuel used in baseline automobiles	tCO_2/GJ

Based on these assumptions, the CO2 reduction effect of EV bus driving when the annual mileage is about 75,000 km is as follows.

Table2-11 : CO_2 reduction amount by introducing EV bus

Number of EV buses introduced	Expected CO_2 reduction
1bus	44t-CO_2/year
10 buses	435t-CO_2/year
30 buses	1,306t-CO_2/year

If the number of EV buses introduced increases and economies of scale can be achieved, the unit price per bus will decrease, and it is expected that the cost-effectiveness of reducing CO2 emissions per t when applying for JCM equipment subsidy will also improve. If the number of buses increases, it is expected that other necessary chargers, solar panels, and storage batteries will be operated efficiently (eg, one charger will be used alternately by two buses). Therefore, a business design based on the number of vehicles required locally is required from the next fiscal year onward.

2.4 Monitoring method

Regarding the methodology used to calculate the amount of reduction in certification due to the conversion of vehicles to EV, the "Promotion of Electric Vehicle Use for Taxi in Costa Rica (2014 JCM F / S)" project and the methodology in the J-credit system in Japan " Refer to "EN-S-012 Ver.2.0 Introduction of electric vehicles or plug-in hybrid vehicles".

The target is project activities that introduce EV vehicles and replace ICE vehicles (internal combustion engine vehicles). The general monitoring parameters are shown in Table 2-12 below.

Table 2-12: Monitoring items

Items	Unit
Car mileage	km
Energy consumption efficiency electricity of electric vehicles	km/kWh
Power consumption for driving	kWh
Energy consumption efficiency of fossil fuel vehicles	km/L

In this project, it is assumed that the power source for EV vehicles will be a renewable energy power source. However, there is a possibility of using a backup power source from the local grid power when the capacity is insufficient due to a failure of solar power or a power conditioner or unseasonable weather.

Therefore, when conducting a reduction evaluation of greenhouse gas emissions, it is necessary to understand where the charged power is generated (renewable energy or non-renewable energy).

Regarding this point, it is assumed that driving data in EV vehicles and charging data from chargers will be recorded and managed by data loggers, etc., but the detailed design of monitoring will be examined again in the next fiscal year.

2.5 Project implementation system

This project has also received favorable comments from Minister of Public Infrastructure and Trade (MPIIC) Mr. Obichang, as it is in line with national policies. PIAC, which operates Palau International

Airport, also intends to consider cooperation with this project from the perspective of working to add value to the airport and the country's tourism industry. Therefore, regarding the implementation system of the project, it is necessary to consider the implementation system of this project, including the possibility of maintenance as public transportation.

We were not able to travel to the site this year due to the influence of the global pandemic of COVID-19, and there are still issues in improving the implementation system and establishing communication with related parties.

In the next fiscal year, we would like to proceed with the examination of a concrete implementation system with stakeholders again.

2.6 Project financing method

Mr. Obichang, Minister of MPIIC, said that there is a possibility of public-private partnership depending on the business model, and there is a possibility of financing through public-private partnership. However, in the Republic of Palau, the tourism industry, which is the basic industry, has been seriously affected by the COVID-19 pandemic, and it is considered difficult to generate public funds. On the other hand, it is considered essential to add value to the tourism sector for the economic recovery of Palau after the COVID-19 pandemic.

It is necessary to consider multifaceted support schemes, including JICA and ADB funds, from the aspect of infrastructure development as well as JCM equipment subsidies. We would like to proceed with further studies in the next fiscal year along with the construction of the implementation system.

2.7 Project implementation schedule

Table 2-13 is assumed for the project implementation schedule of the tourism EV project based on the survey results of this year.

Table2-13：Examination of future project implementation schedule

Items	FY2021		FY2022		FY2023	
	1st half	2nd half	1st half	2nd half	1st half	2nd half
Examination and construction of project implementation system						
Scrutiny of cost / introduction model						
Examination for acquisition of various subsidies						
Support application such as JCM equipment assistance						

Based on the interviews with stakeholders this year, we will proceed with discussions with local stakeholders on the implementation system of the project in the first half of the next year to build the system, and by further examining the cost estimation, we will acquire various subsidy programs. Aiming to acquire a subsidy program in the second half of 2022 or 2023.

2.8 Summary / Challenges to overcome in the future

The following is a summary of the survey for the introduction of tourist EV vehicles and future issues.

＜Summary＞

- Considering a shuttle bus operation model from the airport to the hotel
- Since there is no public transportation in Palau, it was found that profitability can be expected if a certain percentage of tourists can be used.
- Local stakeholders in Palau expressed their expectations for this project, which is in line with national policy.
- Cooperation with the international airport, which is the starting point for tourists, is important, and we will continue to consider it in the future.

＜Challenges to overcome in the future＞

- Reduction of initial cost
- While the tourism industry is the basic industry in Palau, the COVID-19 pandemic has been hit hard by the economy. It is also necessary to secure a support menu from the perspective of green recovery.
- Building a maintenance system is an issue.
- There is little know-how in public transportation, and it is necessary to have a capacity building for the operation system. In addition, an operation system with these know-how is required.

Regarding maintenance issues, we will consider building a remote maintenance system with the locals by utilizing the tools of a startup company (Quando Co., Ltd.) that has communication tools that support remote maintenance for companies in Kitakyushu City. We also plan to consider building a program for training engineers.

Figure2-15：Image of using remote maintenance tools

Chapter3 Feasibility study toward for Project formation about improvement of renewable energy ratio and decarbonization by introducing EV vehicle for waste treatment sector.

3.1 Understanding local issues and needs

3.1.1 Identifying local stakeholders

Table 3-1 summarizes the groups that are assumed to be interested parties in this study. We conducted a hearing survey of these parties regarding their local needs and the possibility of cooperation with this project.

Table3-1 Assumer local stakeholders (Waste transportation sector)

Organization name	Abbreviation	Overview explanation
Solid Waste Management Division, Public works Department, Koror State Government	—	It belongs to the state's Public Works Department and is responsible for Koror's recycling projects, waste collection and transportation, waste research, composting and education programs and material recovery.
Solid Waste Management Office	SWMO	An organization that aims to reduce landfill waste generated in Koror through the 3Rs and resource recovery. It consists of the Bureau of Public Services System and Ministry of Health of Palau, the Environmental Quality Protection Commission, and the State Solid Waste Management Division.
Ministry of Public Infrastructure, Industries & Commerce	MPIIC	Palau government ministries. Palau government ministries. It consists of six departments: Bureau of Aviation, Bureau of Public Works, Bureau of Land and Survey, Bureau of Commercial Development, Small Business Development Center, and Palau Energy Office.

3.1.2 Status of waste collection and transportation

We conducted a hearing survey with Mr. Selby Etibek, the manager of the Waste Management Office in Koror, and Mr. Katsuo Fuji, the consultant of the same place, about the current situation of waste collection and transportation. The results are summarized here.

(1) Waste collection and transportation vehicle

[Garbage truck]

Currently, waste from ordinary households, parks, schools, and government offices in Koror is collected and transported by four garbage trucks (2t vehicle, manufactured by ISUZU). The daily mileage is about 25-40km and varies depending on the amount of waste. The compression mechanism of all four units is a press type, and the discharge mechanism is an extrusion type.

[Recycle dump truck]

Pruned garbage, kitchen waste, waste plastic, and beverage containers are transported to compost centers, waste plastic oil conversion facilities, and beverage container recycling facilities for recycling, respectively, but four dump trucks (2t trucks and 3t vehicles) are transported. The car (manufactured by ISUZU) is used. The daily mileage is about 10 to 15km.

[Multipurpose dump truck]

Two 5t vehicles (manufactured by ISUZU) are used to collect and transport large-volume waste such as construction waste and disaster waste. Data on mileage has not been collected in particular because their collection and transportation is not regular and there is no specific travel route.

Figure3-1：Garbage truck(left) and Recycle dump truck(right)

(2) Waste collection and transportation area

The location of the current waste collection and transportation area and the existing final disposal site (M-Dock) in Koror is shown in Figure 3-2. The M-Dock was developed with the support of JICA in 2005, and the Fukuoka method of semi-aerobic landfill structure was introduced. It has been used for many years, and it has been raised several times to prolong its life, but the remaining years are still several years when the amount that can be processed is tight. In

August 2020, a new final disposal site was constructed and started operation in Aimeliik, which is located in the northern part of Koror, with Japan's grant aid.

Figure3-2：Figure 3-2: Location map of waste collection and transportation area and M-Dock

(3) Current issues in waste collection and transportation

There are no major problems or issues regarding the functions and operations of the vehicle.

A local maintenance system has been established for machine troubles, and missing parts are dealt with by ordering them locally or overseas. Specifically, local problems were the rapid deterioration of vehicles due to salt damage and the increase in the frequency of breakdowns. This situation imposes both operational and financial burdens on the smooth progress of the waste collection and transportation business

3.1.2 Preliminary study project "Resource segregation type transshipment storage facility" and its progress

(1) Project background and outline

In Palau, the resident population, corporate offices, hotels and stores are concentrated in Koror, and its high environmental load has been an issue for Koror. SWMO has been planning and developing a recycling center that contributes to the collection and recycling of specified waste in collaboration with Amita Co., Ltd., which is a member of this business implementation system, in order to reduce the environmental burden Since 2014. (Table3-2)。

Table3-2: Past collaboration and survey results between Koror and AMITA CORPORATION

Year	Phase	Activity
2014-15	Basic survey	Waste composition survey Demonstration of waste separate collection
2015-16	MOEJ project of Promoting Overseas Expansion Commercialization	F/S for Business plan Demonstration of liquid fertilizer Partnership agreement signed
2016-17	MOEJ project of Promoting Overseas Expansion Commercialization	Specification design of biogas plant
2017-18	JICA Knowledge co-creation program (private partnership) under the SDGs business model formulation survey (Feasibility survey)	F/S for small biogas plant Specification design of plant
2019-20	MOEJ project of Promoting Overseas Expansion Commercialization	F/S for resource-separated transshipment storage facility

Koror State and Amita CORPORATION will use a public-private partnership (PPP) to consider the construction of a "storage facility", where is separate and sort waste using the site of the M-Dock. The relocation spot of final disposal site is the Aimeliik (located in northside in Palau) (Figure3-3)。 The reason for this consideration is that the new final disposal site in Aimeliik will be far away (about 15 km from the M-Dock) and will incur tipping fee, so it will be efficient in the state to reduce the amount of landfill waste through the implementation of waste disposal and the expansion of recycled items and quantities. Furthermore, the goal of this project is not limited to waste recycling, but ultimately it is a project that aims to create a wide range of value such as agricultural development, creation of tourism industry (green tourism), zero emission management by renewable energy (Figure 3-4).

Figure3-3：layout design of resource separation and Transshipment storage facility

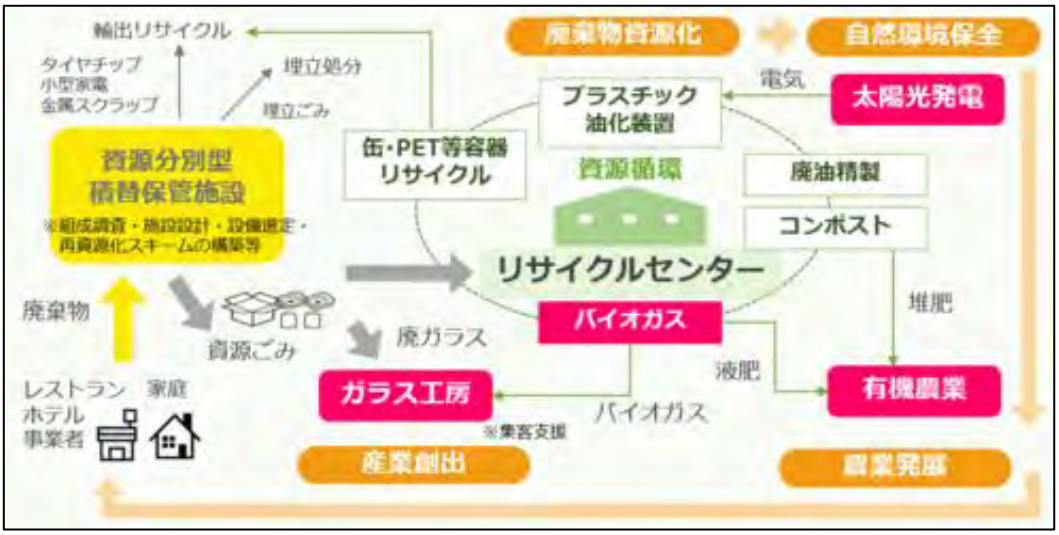


Figure3-4：Concept for resource circular recycling model

From an energy point of view, there are several projects.

1)self-use of power generated from plastic oiling,

2)self-use of power generated by the introduction of solar power generation

3)generated gas from a biogas refining facility is used for tourists in glass workshop

The glass studio plans to use sorted and sorted waste glass, and is considering attracting tourists.

(2) Progress

The recycling center has already been stably operated as an initiative activity of the state of Koror, and has already been introduced except for the methane fermentation facility and the solid fuel conversion / gasification facility.

In addition, the glass workshop has completed the demonstration at the test workshop, and the construction work of this operation facility was completed in July 2020.

However, due to the serious economic impact of Covid-19 (due to the fact that about 50% of GDP depends on the tourism industry), PPP's consideration of "resource-separated transshipment storage facilities" is pending.

It is expected to resume with the convergence of Covid-19 and the resurgence of tourists.

3.1.3 Positioning of this EV introduction survey in the Koror State Policy Plan

The state of Koror has been considering the ideal way of "building a comprehensive resource recycling society" to promote resource recycling in the state, triggered by the consideration of "resource-separated transshipment storage facility" by PPP with Amita CORPORATION. The study project for the introduction of the EV waste collection and transportation vehicle is also being

positively consideration in this whole project. (See Figure 3-5)

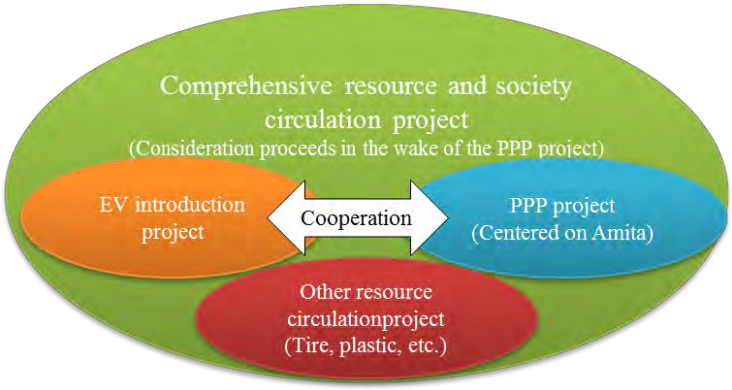


Figure 3-5: Relationship of each project in Koror State

3.1.4 Laws and regulations related to the introduction and operation of EV vehicles

As in Chapter 2.1.3, we conducted hearings to related departments such as the Bureau of Customs and Border Protection in Palau about import and transport EV vehicles and charging equipment for waste collection and transportation in Palau.

In addition, we conducted hearings on laws and regulations related to the EV vehicle using.

(1) About tariffs

The tariff rate for EV vehicles is the same as for ordinary fuel vehicles. In the latest local tariff table "TARIFF SCHEDULE HS 2017", it is regarded as "Other special purpose using vehicle". The tariff code is 8705.90.10 (new car) or 8705.90.20 (used car), and the tariff rate is fixed at 5% + $ 250.00.

Although the EV charging equipment is not strictly setting, Customs was said that it would be regarded as "other machinery / equipment" on TARIFF SCHEDULE HS 2017 in the on-site hearing. In this case, the tariff code is 8543.70.00 and the tariff rate is fixed at 3%.

(2) Laws and regulations related to domestic driving

As in Chapter 2.1.3, vehicles are treated in the same way as current fuel cells, and charging equipment is treated in the same way as ordinary electrical equipment.

However, this handling is since there are a few cases in Palau at this time.

When the number of EV vehicles is expected to increase in the country, there is a high possibility that new regulations and laws will be considered and enacted.

3.1.5 Local needs for EV conversion

We will summarize the results of interviews with Mr. Selby and Mr. Fuji regarding the impression of the concept of this project and the needs for specifications of waste collection and transportation vehicles, EV vehicles, and charging equipment.

(1) Project concept

The merits that the local government expects from this project are as follows.

1) Reduce reliance on fossil fuels and reduce fuel costs when renewable energy is the source of charging.

2) Improving the image of environmental consideration in the waste management department and building a zero carbon society.

3) There are three points that contribute to the achievement of the SDGs in terms of waste management.

While these merits will lead to the creation of a clean and safe environment for the state, the following are the issues for introduction.

1) High initial cost burden required for acquisition and installation of equipment to maintain the operation of EV vehicles

2) Concerns about maintaining the durability and safety of vehicles and charging stations

3) Establishing a maintenance system in case of emergency

(2) Specifications of waste transportation vehicles, EV vehicles and charging equipment

The points when procuring a waste collection and transportation vehicle are as follows.

1) Economic efficiency of vehicles and systems

2) Loadable capacity

3) Resistance to salt damage

The points when procuring EV waste collection and transportation vehicles are as follows.

1) Battery capacity

2) Battery durability and service life

3) Battery control and safety (control against overheating)

4) Convenience of quick charging

5) Vehicle load capacity and salt damage countermeasures

From the above points, it can be seen the local stakeholder interests are not only economic efficiency but also durability to vehicles and equipment and construction of maintenance system.

Since it is an island country, it is particularly sensitive to salt damage, and it should be important

point as a matter that matches the hearing results of tourist EV vehicles.

3.2 Survey for preceding case

Since there are still few cases of commercial EV vehicles being introduced in all over the world, this section describes the results of a survey of domestic and overseas cases where EV vehicles are introduced and used in waste collection and transportation vehicles in advance.

The purpose of this survey is to analyze the specifications of EV vehicles and charging equipment introduced for the purpose of waste collection and transportation, and the effects and issues in the introduction and utilization, and to provide feedback to the study of this project.

(1) Outline of the preceding case

Table 3-3 summarizes the cases obtained from the survey.

There are fewer cases in Japan and overseas compared to large commercial vehicles (buses), so it can be said that the conversion of waste collection and transportation vehicles to EV is a pioneering attempt in the world.

There are two cases of introducing EV waste collection and transportation vehicles in cities in Japan: Kawasaki City, Kanagawa Prefecture, and Tokorozawa City, Saitama Prefecture. (Osaka City also has a demonstration test) Both cities started operation in 2019, and are characterized by adopting a battery exchange type (manufactured by JFE Engineering Corporation).

The earliest American case found in the survey was in 2014 in Chicago, Illinois, followed by Sacramento, California in 2017, and Los Angeles, California in 2018. The state of New York is in the process of proof-of-concept testing for introduction in 2021.

Japan	Oversea
・Kawasaki, Kanagawa (JFE Engineering) ・Tokorozawa, Saitama (JFE Engineering) ・Osaka, Osaka(Verification test)	Chicago, Illinois, USA (Loadmaster and Motiv partner) Sacramento, California, USA (Motiv Power Systems) Los Angeles, California, USA (Motiv Power Systems) Seattle, Washington, USA (BYD) ＊ Private business New York, USA (demonstration test) Ocala, Florida, USA (Plan) Basel, Switzerland (planned)

＊ () Indicates the vehicle manufacturer name

Table3-3：preceding case of EV waste collection and transportation Vehicle

(2) Effects and issues expected from the preceding cases

Table 3-4 summarizes the effects found in the survey cases. The results are similar to those of large commercial vehicles (buses), and the effects caused by low environmental load, low noise, and low vibration are conspicuous.

Table3-4：Effects listed in the survey preceding case

Field of effect	Effect content [Case]
Environment / image	・ Zero CO2 and NOx emissions [Kawasaki City] ・ 2,688 gallons (about 10,175L) per year, 23t-CO2 / year carbon dioxide can be reduced compared to diesel vehicles [Chicago]
Operation / drivability / in-vehicle environment	・ Batteries can be replaced automatically in about 3 minutes [Kawasaki City] ・ Because there is little noise, it is possible to collect at night even in the city center [New York] ・ Noise is 70% or less of the conventional one [Okara]
cost	・ Fuel costs are expected to be reduced by 80% compared to diesel vehicles [Okara]
maintenance	・ Because the power train vibrates less than diesel vehicles, it has an excellent service life [Seattle] -Electrical systems that use electric motors instead of mechanical brakes can reduce brake wear [Seattle] ・ Since there are few moving parts, maintenance frequency is low [Okara]
Disaster countermeasures	・ Can be used as an emergency power source [Kawasaki City]

The issues are almost the same as for large commercial vehicles (buses).

Due to the weight of the battery, the weight of the vehicle body is heavier than that of diesel vehicles, so it is necessary to review the balance between the loadable amount of waste and the estimated waste weight on the collection route (Table 3-5).

Table3-5：Issues assumed from cases and their countermeasures

Issue	Contents [Case]	Countermeasures(Plan)
Body weight	・There are operational restrictions because the weight of garbage that can be collected is reduced by the weight of the battery [Kawasaki City]	・Understanding the weight of collected garbage on the assumed route ・Scrutiny of the required number of EV vehicles
	・ Due to the weight of the battery, the body weight is limited to 10t vehicles, the maximum speed is 104km / h, the collection range is 90km, and the number of collected garbage is limited to about 600 [Seattle].	
Cost	Initial cost is higher than fossil fuel vehicle (even if the pilot project is successful, it is difficult to secure a budget due to the influence of the COVID-19 pandemic) [New York]	・Secure budget from various fields

3.3 Examination of introduction technology

In this item, we will examine the technology for introducing waste collection and transportation EV vehicle, estimate the cost, and grasp the issues for further examination in the future.

3.3.1 Contents of introduced technology

The waste collection and transportation vehicles to be considered are the models shown in Figures 3-6 and Table 3-6. See Table 3-7 for chargers.

Figure 3-6: EV waste transportation vehicle and charging system to be considered for introduction

Table 3-6: Specifications and features of EV waste transportation vehicle to be considered for introduction

Items	Contents
Model	pure electric compression type garbage truck
Size	Overall length: 6,795mm Overall width: 2,100 mm Overall height: 2,400mm
Vehicle total weight	8,280kg
Load capacity	1,995kg
Battery capacity	110kWh
Cruising range	Less than 180km
Other features	Compression method: Press type

Table3-7: Specifications and features of charger to be considered for introduction

Items	Contents
Model	750V CHAdeMO Ⅱ Charging equipment
Maximum output	120kW
Output voltage	750V
Charging standard	Compatible with CHAdeMO, CCS1. CCS2, BGT standards
Other features	IP65 waterproof

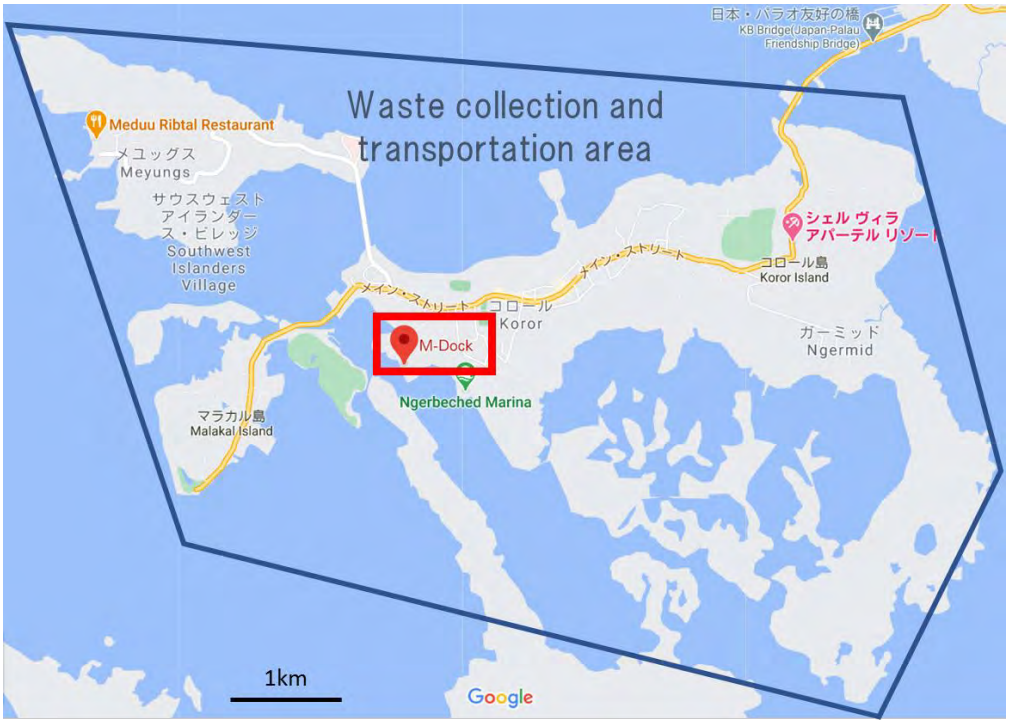
The EV waste collection and transportation vehicle that is expected to be introduced is a packer vehicle model equipped with a 110kWh battery, and has a cruising range of less than 180km.

This time, we are aiming to promote decarbonization by using all the electric power to be charged as a renewable energy power source, and the capacity of the photovoltaic power generation equipment required to charge this battery is 40 kW and the storage battery is 132 kWh. (Assuming that the amount of power generated is about 1.2 times that of the battery and the entire amount is

charged to the storage battery)

3.3.2 Introduction / operation model

We assumed the collection and transportation route for EV garbage truck was transported to the new final disposal site of Aimeliik. But the comment of the local side obtained through hearings was the same route as packer of the current internal combustion engine vehicle (diesel oil). It is natural to think of the charging station for EV waste collection and transportation vehicles as the M-Dock, considering efficiency. The M-Dock is the destination for the collected waste and the starting point at the time of waste collection. See Figure 3-7 below for the collection area.



(Source：Google Map)

Figure 3-7: Waste collection and transportation area for vehicles to be considered for introduction

3.3.3 Profitability

Under the conditions described in 3.3.1 to 3.3.2, one EV garbage truck, a charger, a solar panel (including a power conditioner), and a storage battery were installed, and the business profitability was evaluated. The evaluation was carried out when the initial cost was 50% self-paid and when 0% self-paid. Other trial calculation conditions are as follows.

<Common calculation conditions>

- Vehicle / equipment costs

  (Approximately 73 million yen / Various equipment, tariffs, engineering costs, training costs, etc. recorded)
- 5 year borrowing
- Contribution to fuel cost reduction is recorded
- Equipment transportation costs are not included
- Maintenance costs (5% of equipment costs are recorded every year)
- Transportation business consignment costs from hotels, etc. have not been recorded.
- It was decided to reserve about 3 million yen every year as a reserve for equipment renewal.

＜Case of 50% subsidy and:50% self-pay project implementation＞

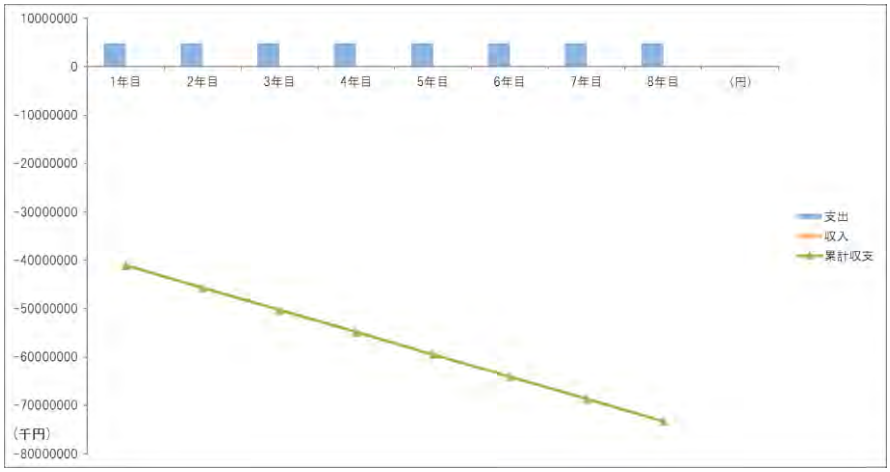


Figure3-8：50% subsidy for introducing one EV garbage truck

＜Case of 100% subsidy for initial cost＞

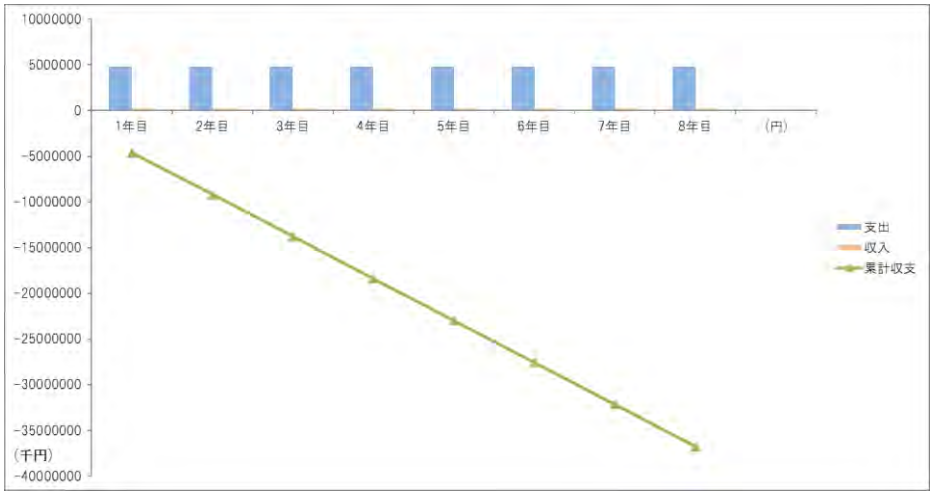


Figure3-9：100% subsidy for introducing one EV garbage truck

In each case, it is a public project and it is difficult to secure profitability only by reducing energy costs because EV vehicles are introduced while it is not a profitable project. It would be difficult to implement this project without obtaining subsidies to reduce initial costs. (In addition, if 100% assistance is received and maintenance and equipment renewal are not accumulated, it will be a positive calculation).

At the same time, it is necessary to consider cooperation with the Container Deposit Legislation (CDL) program implemented in Koror and the launch of a similar new program in waste treatment.(This program has been implemented since 2011, and a deposit of 10 cents is collected for each beverage container, and when the container is brought in, it is purchased for 5 cents. Of the remaining 5 cents, 2.5 cents will be used for operating the recycling center. The remaining 2.5 cents are contributed to the recycling fund and used by the national waste management administration, so the state of Koror has its own budget in addition to the regular budget.)

It is necessary to consider whether the benefits of introducing EV vehicles, including maintenance costs, can be further expanded in the future.

3.3.4 CO_2 reduction effect

We also referred to J Credit System Methodology EN-S-012 Ver2.0 “Introduction of Electric Vehicles or Plug-in Hybrid Vehicles” for the effect of reducing greenhouse gas emissions associated with the conversion of waste transportation vehicles to EV.

Based on the concept of this methodology, the CO2 reduction effect of EV waste collection and transportation vehicle running when the annual mileage is set to about 6,000 km based on the results of hearings in Koror is as follows.

Table3-8：Amount of CO_2 reduction when introducing EV waste collection and transportation vehicles

The number of EV waste collection and transportation vehicles introduction	Expected CO2 reduction
1 car	4.35t-CO_2/year
4 cars	17t-CO_2/year

Unlike sightseeing buses, it is not a profitable business and there is no economies of scale, so it is difficult to secure the cost-effectiveness of reducing CO2 emissions per t when applying for JCM equipment subsidies. On the other hand, this initiative is in line with the effects of co-benefits and the philosophy of building a comprehensive resource-recycling society in the region. Therefore, it is required to design the business from the next fiscal year onward with a view to funding the deposit

system and forming various project finance.

3.4 Monitoring method

Regarding the methodology used to calculate the amount of reduction in certification due to the conversion of vehicles to EV, the "Promotion of Electric Vehicle Use for Taxi in Costa Rica (2014 JCM F / S)" project and the methodology in the J-credit system in Japan " Refer to "EN-S-012 Ver.2.0 Introduction of electric vehicles or plug-in hybrid vehicles".

The target is project activities that introduce EV vehicles and replace ICE vehicles (internal combustion engine vehicles). The general monitoring parameters are shown in Table 3-9 below.

Table 3-9: Monitoring items

Items	Unit
Car mileage	km
Energy consumption efficiency electricity of electric vehicles	km/kWh
Power consumption for driving	kWh
Energy consumption efficiency of fossil fuel vehicles	km/L

In this project, it is assumed that the power source for EV vehicles will be a renewable energy power source. However, there is a possibility of using a backup power source from the local grid power when the capacity is insufficient due to a failure of solar power or a power conditioner or unseasonable weather.

Therefore, when conducting a reduction evaluation of greenhouse gas emissions, it is necessary to understand where the charged power is generated (renewable energy or non-renewable energy).

Regarding this point, it is assumed that driving data in EV vehicles and charging data from chargers will be recorded and managed by data loggers, etc., but the detailed design of monitoring will be examined again in the next fiscal year.

3.5 Project implementation system

Since the waste management office in Koror has indicated that it intends to proceed with positive consideration in the resource recycling society construction project. So, we will work with them to form implementation system of the project while reducing the financial burden. In addition, it is necessary to consider the implementation system of this project that can be implemented.

3.6 Project financing method

It is essential to secure subsidies to reduce initial costs, and it is necessary to consider multifaceted support schemes, including JICA and ADB funds from the aspect of infrastructure development as well as JCM equipment subsidies We would like to proceed with further studies in the next fiscal year, including the use of financial resources to reduce the burden of running costs.

3.7 Project implementation schedule

Table3-10 is assumed for the project implementation schedule of the waste collection and transportation EV project based on the survey results of this year.

Table3-10：Examination of future project implementation schedule

Items	FY2021		FY2022		FY2023	
	1st half	2nd half	1st half	2nd half	1st half	2nd half
Examination and construction of project implementation system						
Scrutiny of cost / introduction model						
Examination for acquisition of various subsidies						
Support application such as JCM equipment assistance						

Based on the on-site hearings this year, we will move toward the acquisition of various subsidy programs by scrutinizing the cost estimation in the first half of the next year, aiming to acquire the subsidy programs in 2022 or 2023.

3.8 Summary / Challenges to overcome in the future

The following is a summary of the survey for the introduction of waste collection and transportation EV vehicles and future issues

＜Summary＞

- Considered the introduction of a waste collection and transportation EV vehicle (garbage truck) based on the M-Dock.
- It was supposed to be transported to a new landfill site (Aimeliik final disposal site), but there were expectations from the site for EV operation in the nearby collection and transportation area similar to the current packer vehicle.
- The state of Koror expressed expectations for cooperation with the state's comprehensive resource recycling society construction project.

＜Challenges to overcome in the future＞

- Reduction of initial cost
- Optimal driving model and battery capacity selection
- Since it is a public project and not a profitable project, it is necessary to secure subsidies as much as possible to reduce the financial burden.
- The challenge is to build a maintenance system

We plan to build a remote maintenance system in the same way as tourist EV vehicles.

Chapter 4　Feasibility Survey on Collaboration in Promoting Carbon-free Projects in Koror State and Other Locations

In the future, a variety of candidate proposals must be investigated to formulate projects in order to promote the progress and development of initiatives to identify solutions to environmental issues in Koror through city-to-city collaboration between Kitakyushu City and Koror State. This will include the formation of projects other than for EV vehicles, as well as those that may not lead directly to carbon-free and low-carbon development. In this respect, the synergistic effects of individual projects will contribute not only to the formation of a carbon-free society, but also to the achievement of the SDGs.

In this study, interviews were first conducted in Kitakyushu, and information was compiled on expertise and "seeds" (or solution-oriented ideas, products and services) related to environmental technologies that could potentially be offered primarily by local companies in the city. Next, projects in which Koror State had a strong interest or that were considered to be highly feasible were selected based on information obtained through discussions with Koror and the results of field surveys conducted through separate studies.[4] These projects were organized through the collection of information on local conditions through local consultants and information from related companies.

Interviews were also conducted with two of Palau's leading major tourist hotels (PPR, PRR), both of which consume a large amount of energy and are equipped with their own power generation facilities, to study energy issues and the feasibility of updating facilities.

【Potentially available candidates related to expertise and seeds for environmental technologies】

Taking into account the current situation and features of Palau as a small island nation, potential candidates for environmental technology-related expertise and seeds that may be available were divided into four areas: (1) waste and agriculture, (2) renewable energies, (3) energy management and energy efficiency, and (4) transportation (Table 4-1).

[4] Institute for Global Environmental Strategies (2020). FY2019 Report on the development, operation and management of a city-to-city collaboration platform for the realization of a low-carbon society. Ministry of the Environment, Japan.

Table 4-1: List of candidates for environmental technology-related expertise and seeds that are potentially available through city-to-city collaboration between Kitakyushu City and Koror State

(*) indicates items that were investigated in depth in this study.

	Potential expertise	Potential seeds
Waste & agriculture	• Waste composition analysis • Waste separation and collection • Takakura Composting Method • Utilization of fertilizer in agriculture and greenhouse horticulture • Methane fermentation + use of liquid fertilizer • Renewable energy + agriculture	• Composters • Conversion of waste plastic into oil • Production of raw fuel for cement manufacturing • Carbonization of scrap tires(*) • Treatment systems for highly concentrated organic wastewater • Recycling of home appliance resin • Waste plastic mixed with wood (Recycled Plastic Lumber) • Recycling of solar PV panels • Recycling of circuit boards from small home appliance waste • Recycling of fluorescent tubes • Reuse of automobile parts
Renewable energy		• LED street lights(*)
Energy management and energy efficiency		• Inverters • Water-efficient plumbing/water facilities
Transportation		• Electric-powered • ships (e-ships)(*)

4.1 Creating added value through the carbonization of waste tires

(1) Issues and needs

Although the number of tires used in Palau is extensive due to the widespread use of automobiles, most are disposed in final disposal sites because there is no demand for recycling scrap tires. The cumulative number of scrap tires is unknown; however, based on the number of vehicles in Palau and the number of imported tires, estimates stand at more than 100,000. There are concerns about environmental impacts from the illegal dumping of scrap tires, and their bulk is a major factor behind the shortened lifespan of final disposal sites. In addition, the disposal of scrap tires has posed a major issue for Koror State, as they are considered to be a source of vector-borne infectious diseases such as dengue fever as their structures allow rainwater to accumulate inside, creating an ideal environment for mosquitoes to breed.

Koror State has taken steps since 2017 to solve issues associated with the disposal of scrap tires. The state widely encourages individuals and businesses to bring used tires to the former final disposal site (M-DOCK) in Koror instead of illegally dumping them. In addition, a processing

facility for used tires was installed on the same site to launch a project to shred scrap tires into chips (Fig. 4-1). Capital[5] and operating costs for the processing facility are funded by the National Recycling Fund under the Container Deposit Legislation (CDL), a system passed in 2006 as a law on recycling beverage containers (RPPL No. 7-24), which came into effect in 2011. Importers charge 10 cents for every beverage container (aluminum cans, PET bottles, glass bottles, Tetra Packs), and when consumers bring them to a recycling center (processing facility for beverage containers), they are purchased for five cents. From the remainder, 2.5 cents is allocated to the operating costs of the recycling center, while the other 2.5 cents is contributed to a recycling fund to be used for waste management administration at the national level. This initiative helped Palau reach a 90.34% recycling rate for beverage containers in 2018.

However, the blades of crushing machines wear out quickly because tires contain wires and other metals; replacement blades are expensive, resulting in annual operating costs of approximately USD 52,000[6], including electricity and labor costs, which pose a major challenge.

Scrap tires collected at M-DOCK are basically provided free of charge to any individual or business that wants them. They are also used in playground equipment at parks, flowerpots, car stops, boat stops and for other purposes. However, the amount claimed is only a fraction of the total.

In order to solve problems related to the burden of costs for disposal and illegal dumping of scrap tires, the Palau government is considering proposals to include used tires in the CDL and charging a deposit fee to increase collection rates and cover the costs of disposal.

Figure4-1 ： Scrap tire processing facility in Koror State at M-DOCK's former final disposal site(Left) Shredder and conveyor belt, (Right) Shredded tire chips

(2) Technology and concept

[5] Equipment costs for scrap tire processing facilities (including buildings, crushing machines, belt conveyors, electrical equipment, etc.): USD 335,000 (Source: Bureau of Public Works, Government of Palau)

[6] Breakdown of operating costs (approx. USD 52,000/year) for scrap tire processing facilities: USD 35,000 in personnel costs for four staff, USD 5,000 for electricity and water, USD 10,000 for consumables, USD 2,000 for fuel (Source: Bureau of Public Works, Government of Palau)

Tires are composed of raw rubber (synthetic rubber, natural rubber) and bead wire.[7] One world Japan's superheated steam carbonizing system (Urban Rig[8]) can be used to break down scrap tires into oil, charcoal and metals, such as bead wire. Metal components may be recycled in Taiwan through sales to Palau Waste Collection (capital from Taiwan), which collects and exports automobile scrap and beverage cans at M-DOCK. Oil can be used as fuel for power generators (one owned by Koror State), while charcoal can be processed into high value-add nanocarbons that can be used as raw materials for magnesium batteries and other items. Since there is demand for this, they can be exported to Japan for recycling with cooperation from regular cargo ships between Japan and Palau (Kyowa Shipping Co., Ltd.). (Fig. 4-2)

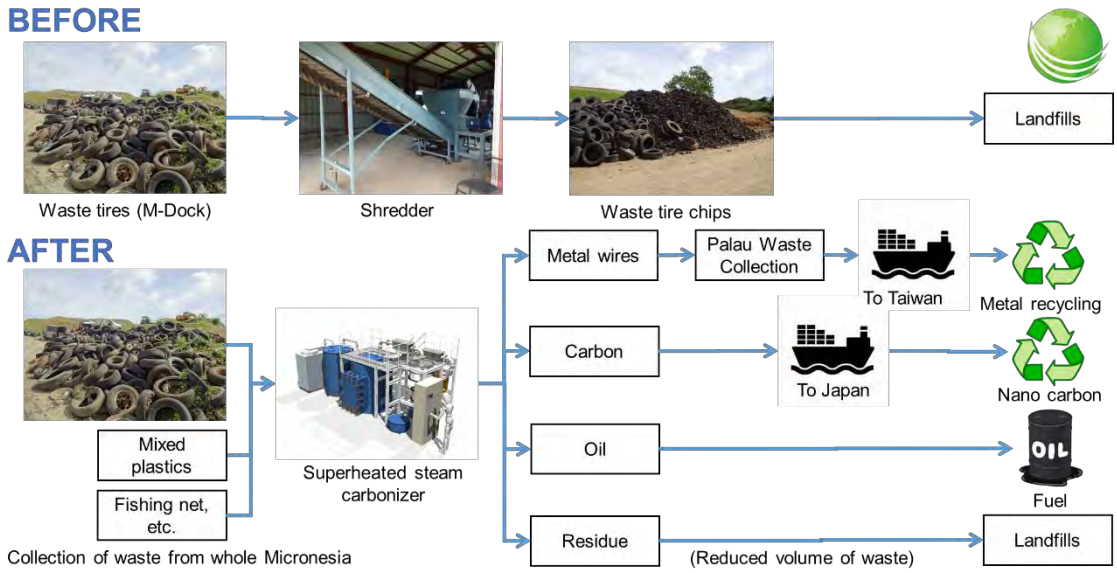


Figure4-2：Conceptual diagram (before/after) of the concept for recycling scrap tires using a superheated steam carbonizing system at M-DOCK

The superheated steam carbonizing system is suitable not only for scrap tires, but for other types of waste in which it may be difficult to separate metals and other valuable materials. For example, the disposal and treatment of ghost nets (floating fishing nets), which have become a major issue around the world as marine plastics, also pose a challenge for Palau; however, the superheated steam carbonizing system is expected to be able to separate charcoal from lead and other metal parts. Koror State has also already introduced a waste plastic pyrolysis oil production plant (Recycle

[7] Percentage of raw materials used in tires (Goodyear Japan, Ltd.): https://www.goodyear.co.jp/knowledge/rawmaterial.html

[8] "Urban Rig" resource recovery and collection plant (Oneworld Japan Corporation): https://www.oneworld-jp.co/html/products.html

Energy Co., Ltd., processing capacity of 500 kg/day), but it is capable of only processing certain types of waste plastic (PE, PP, PS). With the introduction of a superheated steam carbonizing system, it will be possible to carbonize scrap tires, as well as other types of plastic that are not suitable for conversion into oil and composite materials that contain metals. This system will make it possible to extract valuable materials and reduce the volume of a wide range of waste simultaneously, which will expand the scope of treatment.

There are two types of Urban Rigs: batch and continuous operation. There are several models with different throughputs available in the lineup of each type of Urban Rig. The annual volume of scrap tires at M-DOCK is estimated to be about 4,000 to 5,000 tires/year (about 540 kg/day),[9] so a batch-type system with a processing capacity of one ton per day (Fig. 4-3) or 5 tons per day (Fig. 4-4) may be used.

(Source: One world Japan Corporation)

Figure4-3：Urban Rig (UARBAN-RIG / URC-150, Processing capacity of 15 t/15m3 per day)

(Source: One world Japan Corporation)

Figure4-4：Urban Rig (UARBAN-RIG / URC-50, Processing capacity of 5 t/5m^3 per day)

[9] Amita CORPORATION (2020). FY 2019 Report on the project to establish a waste collection, separation and recycling system based on waste collection and storage facilities with resource-separation, trans-shipment and storage facilities in the State of Koror, Republic of Palau. Ministry of the Environment, Japan.

(3) Co-benefits

The introduction of a superheated steam carbonizing system will not only significantly reduce the volume of scrap tires, which have traditionally been regarded as a type of "nuisance" waste, but will also reduce processing and disposal costs for scrap tires, which have become a financial burden for the state, and enable the extraction of high value-add resources, such as metals, oil, and nanocarbons. This is expected to increase the profit balance for the processing/disposal of scrap tires. The challenge of processing and disposing scrap tires and fishing nets is not unique to Palau; it is a universal issue for all marine island nations and is directly related to the problem of marine plastics.

Therefore, the establishment of an "inter-regional collaborative" system in which scrap tires, fishing nets and composite materials including metals are collected from all areas in Micronesia, sent for intermediate processing in the region, and then recycled in Japan and Taiwan, which have regular shipping routes and recycling technologies, would be groundbreaking at the international level and could significantly contribute to sustainable development in island nations.

(4) Expected implementation structure and project composition

Since scrap tires are concentrated at M-DOCK, the superheated steam carbonizing system would be more effective if it were installed at the crushing facility at M-DOCK or at the recycling center in neighboring Koror State, and then managed and operated by the Koror State Solid Waste Management Office.

The processing capacity of the superheated steam carbonizing system is assumed to be 5 t/day in a small batch-type unit for use as a pilot.

This project is not suited for the JCM because of its low GHG reduction effect. However, it may be possible to conduct a feasibility study (FS) and formulate projects with the use of funding from JICA, ADB and other international funds, or the global Alliance to End Plastic Waste (AEPW), which supports measures to address marine plastics, in order to contribute to solutions for universal waste issues and marine plastics in island nations.

The production of smaller superheated steam carbonizing systems is planned in Thailand, Indonesia and other countries, which may make it possible to purchase equipment at lower costs than those produced in Japan. It may also be possible to consider the local production of the system in Palau, with a focus on local maintenance and roll-outs across the Micronesia region in the future.

The export of carbonized materials to Japan requires coordination at the bilateral level, so that they can be treated as recyclable materials (traded for value and certified as non-hazardous waste) in accordance with the Basel Convention. There must also be stable demand from Japanese

companies that recycle nanocarbons and there must be agreement on pricing. Cooperation from Kyowa Shipping, which operates a regular shipping route, is also an essential element of this scheme.

(5) Local interest

Through discussions with Koror State, it was clear that local parties had a strong interest in this project. The project is a candidate for the development of a “comprehensive resource recycling system” which is being implemented separately in conjunction with a PPP project on the construction of a waste separation, collection and storage facility at the former final waste disposal site (M-DOCK) and that is currently being promoted by Amita Corporation through ADB. The possibility of a sovereign loan from ADB or the use of JICA’s grant aid for projects and operation rights is being considered for financing the project.

With this, waste from Palau and other Micronesian island countries can be collected in Palau. An oil conversion unit is expected to be able to convert waste plastics into oil and the superheated steam carbonizing system to process PET bottles into flakes and treat scrap tires, fishing nets and other composite plastics that are difficult to process with this equipment to create a comprehensive recycling system.

4.2 LED street lights

(1) Issues and needs

The government of Palau is in the process of converting street lights to LED lighting, with Koror State the first candidate site for this project as it has the highest concentration of the population. The Palau Public Utilities Corporation (PPUC), which supplies electricity, is carrying out the street lighting project in Palau.

About 600 LED street lights have already been installed in Koror with ODA from the Taiwanese government, most of which are connected to the grid. Off-grid, stand-alone LED street lights equipped with photovoltaic panels (Fig. 4-5) have been installed in some areas (ports, coastal areas, parks, secondary roads) that are not served by power lines; however, this number is negligible (about 100). According to a field survey, about 250 additional stand-alone LED street lights are expected to be installed in Koror State.

Figure. 4-5: Stand-alone photovoltaic LED street lights in

A field survey will be required in the next fiscal year or later, but it is expected that there will be demand for both grid-connected and stand-alone LED street lights in states other than Koror, as there are a number of areas in other states where power lines have not yet been

(2) Technology and concept

Since the needs for LED street lights in Palau are unique, businesses must have not only special components, such as off-grid, stand-alone models equipped with photovoltaic panels for areas not served by power lines but must also be able to customize models to serve local needs. Dhowa Technos Co., Ltd. and JOIN PLANNING Co., Ltd. have redesigned their products from scratch based on technical specifications required by the Davao Light and Power Commission (DLPC) and presented a customized sample product for bidding (Fig. 4-6) in a project to convert approximately 40,000 streetlights to LED lighting that is being promoted by DLPC under a city-to-city collaboration project in Davao City.[10]

Figure4-6：LED product sample proposed to DLPC

[10] Institute for Global Environmental Strategies (2021). FY2019 Report on commissioned work for the city-to-city collaboration project for the realization of a carbon-free society (Project to promote the development of a low-carbon society through support for the formulation of a climate change action plan in Davao City). Ministry of the Environment, Japan.

JOIN PLANNING also produces and supplies stand-alone LED lighting (Table 4-2, Fig. 4-7) equipped with a combination of photovoltaic panels and storage batteries (lithium-ion). The company has installed and sold these systems in several provinces and cities in Vietnam through other companies. The unique features of this product are the photovoltaic panels that can generate power on both sunny and cloudy days and a built-in, 5-step time zone dimming system that allows light intensity to be adjusted between 10% and 100%, which makes it possible for stored electricity to be used for long periods of time at night when power consumption is adjusted during the evening hours.

These photovoltaic LED lights that are in wide use in Vietnam can be customized and shared as needed in Palau to adapt to the specific conditions and needs of local communities.

FIgure4-7：External view of LED Solar Light (Source: JOIN PLANNING Co.. Ltd.)LED Solar

Table 4-2: LED Solar Light specifications (Source: JOIN PLANNING Co., Ltd.)

Lithium Ion Battery

Model	NBT-24V50AH-SPT
Battery Capacity	1,200 WH
System Voltage	24 V/ 54 Ah
Short Circuit Protective Electric Current	40 A
Over Current Protection Current	20 A
Working Temperature	-10℃ ~ 55℃
Recycle Life	2,000 times
IP Level	IP65

Solar Panel

Model	NSolar120-36MPL
Power Output	120 W
Voltage at Pmax	18.60 V
Current at Pmax	6.45 A
Open-Circuit Voltage	22.80 V
Shot-Circuit Current	6.97 V
Module Efficiency	15.02%
Max System Voltage	1,000 V DC
Operating Temp.	-40℃ ~ 80℃
Dimension (mm)	1,000 x 665 x 30
IP Level	IP66
Cell	Monocrystalline
Weight (kg)	9.0

LED Light

Model	NST60-40EVSL	NST80-40EVSL
Power Consumption	60 W	80 W
Weight (kg)	3.6	3.6
Luminous flux	8,000 lm	10,500 lm
CRI	Ra70	Ra70
CCT	4,000K	4,000K
Input AC	42 V DC	42 V DC
Operation Temp.	-30℃ ~ 60℃	-30℃ ~ 60℃
Dimension (mm)	144 x 255 x 650	144 x 255 x 650
Lifespan	50,000 hours	50,000 hours
Material	Aluminum Alloy	Aluminum Alloy
IP Level	IP66	IP66
Warranty	5 years	5 years

(3) Expected implementation structure and project composition

If the level of demand LED street lights is expected to be on a particular scale, it may be possible to apply for designation as a JCM Model Project. Since there are no JCM projects in operation in Palau other than solar power technologies, a high subsidy rate can be applied to the project as it would be classified as a new type of technology, and thereby is expected to be highly feasible.

This study estimated that there would be demand for 250 stand-alone LED lights in Koror State, but this number does not allow for much economy of scale for commercialization. Therefore, it may be realistic to consider applying for the JCM Model Project scheme by combining demand in other states. This would require multi-coordination between central government agencies, multiple municipalities and the PPUC, since the project would include areas outside the jurisdiction of Koror State, which is expected to be more complicated to coordinate than a project that involves only a single municipality.

Street lights in Palau are generally installed and management by the PPUC which supplies electricity, but off-grid models do not necessarily need to be managed by the PPUC and, in some cases, can be expected to be managed by the states themselves. In either case, the assumption is that bidding is a possibility, as it is a public project. The key point would be whether the bidding process can be avoided on the premise of applying for the JCM Model Project scheme. In project formation studies for the next and subsequent fiscal years, it will be necessary to closely examine the feasibility of financing through electricity fees, in addition to the scale of demand, government commitment, and the existence of a bidding process. There will also be a need to consider the representative party in Japan.

4.3 Electric-powered ships (e-ships)

(1) Issues and needs

Palau is an island nation with numerous large and small islands. The country has a thriving tourism industry centered around marine leisure activities, which means that ships are an important means of transportation. Vessels are powered by diesel or gasoline engines, and as such, with vehicles powered by internal combustion engines, they face the burden of high fuel costs and GHG emissions.

(2) Technology and concept

EV Motors Japan is developing EV vehicles, as well as components for electric-powered ships (e-ships). For example, the e-ship “Vibes One” (Fig. 4-8), developed in collaboration with Bandai Namco Entertainment Inc. and others, is an existing catamaran-type sightseeing boat that has been converted into an e-ship and is equipped with two 55-kW motors that is capable of sailing at 10 knots.

Fig. 4-8: Catamaran-type e-ship
(Vibes One)

The use of lead-acid batteries instead of the more costly lithium-ion batteries results in a longer life at a lower cost. In addition, with the installation of foldable, flexible solar panels, the panels can be easily put out and stowed away depending on the situation, and power generation efficiency can be maintained by adjusting the panels according to the angle of the sun. The system is expected to not only reduce GHG emissions but to also improve fuel efficiency (one-tenth of the amount of fuel consumed by an engine-powered vessel) and safety.

In principle, any ship that is powered by an engine (not an outboard motor) can be converted into an e-ship. These e-ships can be used as tourist boats for eco-tourism, especially for observing creatures such as dugongs that are sensitive to the noise from the engines of diesel- or gasoline-powered vessels.

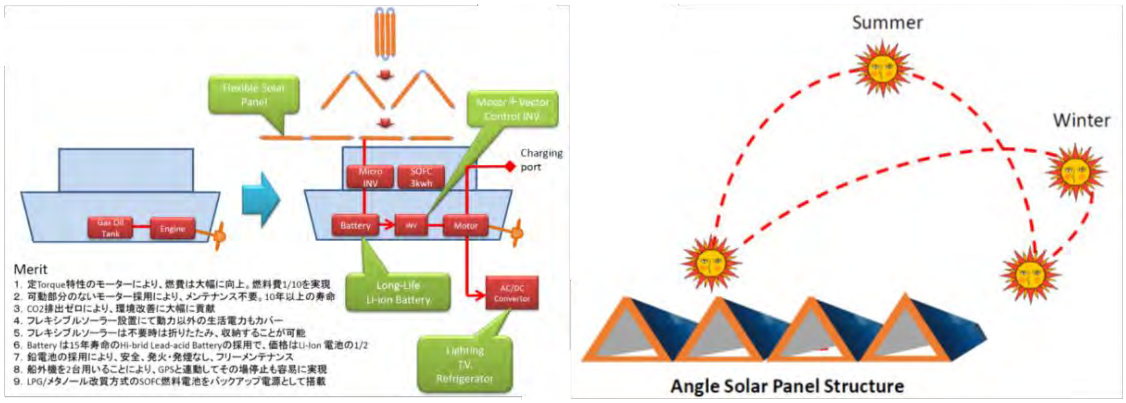


Figure4-9：Concept of the functions of an e-ship (left) and flexible solar power systems (right)

(3) Expected implementation structure and project composition

Since e-ships are based on the concept of retrofitting an existing vessel rather than delivering a new, packaged vehicle like an EV, there are no costs involved for the ship itself; initial investment would only be required for the motor, battery, flexible solar power system and other electrical components. The major advantage of this system is that it is expected to be highly cost effective. This is similar to a JCM Model Project implemented in Semarang, Indonesia, where the diesel engine of a bus used for public transportation was converted into a hybrid engine capable of using CNG.[11] In addition, since there are no JCM Model Projects in place in Palau other than for solar power generation technologies, a high subsidy rate can be applied to the project as it would be classified as a new type of technology, and thereby is expected to be highly feasible.

[11] Project on the introduction of CNG-diesel co-firing equipment in public buses in Semarang: http://gec.jp/jcm/jp/projects/18pro_ina_03/

Since the retrofit will use core components from EV Motors Japan, it is assumed that the project would be coordinated with EV vehicles with the aim of developing a JCM Model Project. Local project owners are expected to be mainly eco-conscious tourism companies.

A detailed study on the cost effectiveness of formulating this project would be best implemented in the next and subsequent fiscal years. Since it will be important to establish a maintenance and after-sales service system, it will also be necessary to coordinate with EV vehicles on the same points and investigate the impact of local systems on converting vessels and periodic inspections.

4.4 Potential for developing projects in large tourist hotels

In Palau, where tourism accounts for a large percentage of the country's GDP and there are a number of small-scale businesses, large tourist hotels can be found within the major energy consumption sector. Of these, Palau Pacific Resort (PPR) and Palau Royal Resort (PRR) are two of the largest hotels in the country, although both are unique in that they generate their own electricity for private use. These two hotels were interviewed about energy issues and the possibility of introducing equipment using the JCM Model Project scheme in the future.

During the interviews, PRR indicated that they have no immediate plans to update their facilities and equipment because they are relatively new, while PPR has plans to update the generator and chiller because the equipment is older.

Although there are currently no prospects for future tourism demand because of the impact of the COVID-19 pandemic, a more detailed study should be conducted over the next and subsequent fiscal years on the potential for formulating projects for these facilities.

1) Palau Pacific Resort (PPR)

【Date】Friday, January 29, 2021
【Location】Email
【Attendees】
- Palau Pacific Resort: Seiji Sone (Facility operations manager)
- Institute for Global Environmental Strategies: Kohei Hibino

【Summary of interview】

Examples of energy-efficiency measures (installed equipment, initiatives, etc.)

- PPR opened 35 years ago. Since the beginning, the resort has been using waste heat from generators for hot water supply. A co-generation steam boiler is used for laundry only.
- Photovoltaic power (26.1 kW) has already been installed as part of the resort's energy-conservation initiatives.

Energy issues

- The resort has two diesel-powered generators to supply electricity. The 600-kW generator is 35 years old and has a mechanical governor that is not fuel efficient. The 1,250-kW

generator is equipped with a motor-type governor, but is not capable of handling low loads, such as at night, because of its large capacity.
- Price reductions cannot be expected because there are only two fuel suppliers in Palau.
- Commercial power is also being supplied by the Palau Public Utilities Corporation (PPUC) as a response to COVID-19. Since the generator is being overhauled by an overseas company, it is for emergency use in case of a generator failure.

Plans to update energy-intensive facilities and interest in the introduction of renewable energy/energy-efficient equipment

- The resort has plans to install a new generator in the future once COVID-19 is under control.
- Currently, two air-cooling chillers and one water-cooling turbo chiller are in operation, and plans are in place to add one air-cooling chiller in the future (Palau experiences droughts once ever few years, so water is a precious commodity.)

Collecting information on updating/installing equipment and equipment installation methods

- New energy-efficient equipment and renovation work is mainly carried out under the guidance of facility consultants exclusively from Japan.
- There are few equipment installation companies in Palau, and they are not capable of handling various types of construction work, which is why overseas companies are used (including Japanese businesses).

2) Palau Royal Resort (PRR)

【Date & Time】February 19, 2021, 13:30-14:30
【Location】 Zoom online meeting
【Attendees】
- Palau Royal Resort: Yoshinari Fujii (General Manager), Koki Ozaki, Tony Pena's Chief Engineer
- Embassy of Japan in Palau: Hajime Sugimura
- Koror State Solid Waste Management Office: Katsuo Fuji
- ATGREEN Co., Ltd.: Sho Koizumi
- Institute for Global Environmental Strategies: Kohei Hibino

【Summary of interview】

Existing energy-related facilities and energy-efficient measures

- The Palau Royal Resort (PRR) started operating in 2005. Initially, the hotel generated its own electricity using two diesel generators and was also connected to the grid as backup. However, in 2008, the grid connection was dissolved. The hotel added one more diesel generator and is now operating with three generators to produce their own electricity.
- The hotel uses three diesel generators: two 860-kW generators (manufactured by Mitsubishi Heavy Industries, since 2005), and one 1,015-kW generator (manufactured by Caterpillar, since 2009).
- The diesel generators are designed for co-generation to supply hot water through a heat exchanger. The hotel considered installing an exhaust heat recovery system for a boiler, but the estimate was too expensive, and PRR decided against installation.
- Two large air-conditioning chillers are installed in the building (capacity: 280 tons, since 2005).
- The hotel considered installing photovoltaic panels (80 to 100 kW) but decided to postpone the installation because the existing generators would be sufficient to cover electricity needs.

Possibility of installing equipment in the future

- Since the existing facilities are not yet up for renewal and the hotel has no problems with power supply, they have no plans to introduce or update facilities in the immediate future.
- However, they have started to consider the timing for updating facilities in about five years (approximate).

Other related matters

- The hotel generates 20 to 30 gallons of kitchen waste a day, which is picked up by a designated company. This waste is mainly consumed as pig feed, so there is little left over for use as fuel for biogas.
- About 200 gallons of waste oil from the diesel generators is discharged every 10 days. The hotel pays PPUC a processing fee (USD 80/100 gallons) for treatment.
- Since there are no consultants for procuring equipment in Palau, it is customary to outsource this task to overseas consultants (in the U.S., Taiwan, Japan, etc.) when installing large-scale equipment.

Chapter 5　Participation in Workshops, International Conferences and Seminars

A kick-off meeting was organized after the study was launched (November 25, 2020) and a final meeting was held at the conclusion of the study (March 3, 2021). Both meetings were conducted online and offered attendees an opportunity to share details and exchange ideas on the study. Internal meetings were also held separately with the Koror State Solid Waste Management Office several times since the adoption of the project.

The study team also provided support for the preparation of a side event for the Our Ocean Conference, which was scheduled to be held in Palau in August 2020, with the aim of disseminating information and publicizing the project. Due to the impacts of COVID-19, this meeting has been postponed to 2021. Workshops and other events are outlined in this chapter.

5.1　Kickoff meeting (Minutes)

【Purpose】A kick-off meeting was organized to bring together key stakeholders from both countries to confirm and discuss the direction of the project under the city-to-city collaboration project between Koror State and Kitakyushu City. The meeting was originally scheduled to be held on-site, but travel was not possible due to the impacts of COVID-19, and the meeting was moved online.

【Date & Time】November 25, 2020, 10:00-11:46

【Location】Online (Zoom) meeting

【Languages】Japanese, English (consecutive interpretation by interpreter)

【Attendees】10

- Solid Waste Management Office, Department of Public Works, Koror State: Selby P. Etibek (Manager), Katsuo Fuji (Consultant)
- Kitakyushu Asian Center for Low Carbon Society: Yuichi Arita (Director, International Cooperation), Hiroshi Yasutake (Deputy Director, International Cooperation), Kazumasa Miura (Chief, International Cooperation)
- EV Motors Japan: Hidenobu Sumi (Chief Financial Officer)
- Amita Corporation Overseas Business Group: Eiichi Yamato (Team Leader), Takashi Hasegawa (Task Leader)
- ATGREEN Co., Ltd.: Seiya Tominaga (Senior Manager), Sho Koizumi (Consultant)
- Institute for Global Environmental Strategies, Kitakyushu Urban Center: Kohei Hibino (Programme Manager)

Figure5-1：Kick-off meeting (online)

【Summary of discussions】

1. Opening remarks
   - (Kitakyushu) Since 2013, Kitakyushu City and Koror State have developed a collaborative relationship through the implementation of a project formation study by Amita Corporation with the aim of establishing a resource-recycling “island model” (JICA, Ministry of the Environment, Japan). Through the implementation of this project, we hope to contribute to promoting the island model based on the achievements and relationship of trust that has been built between our two areas.

2. Self-introductions by attendees
   - Each attendee introduced themselves briefly.

3. Explanation of project outline
   - (ATGREEN) Used slides (Reference 2) to provide an overview of the project.
   - (EVM) Provided additional informaiton on EV vehicles. EV Motors Japan (EVM) handles special EV vehicles in Japan, such as garbage collection trucks, buses, trucks and easily-maneuverable three-wheelers. EVM would like to consider introducing large garbage collection trucks on the main roads that are wide, and easily-maneuverable three-wheelers in the suburbs where the roads are more narrow in ways that are most suitable to the local area. As regulations on engine-powered vehicles are becoming stricter around the world, we hope to contribute to the introduction of EV vehicles in Palau as a model EV conversion project.

4. Q&A

- (Koror) Palau's economy has been severely damaged as a result of the impacts of COVID-19. However, we believe that this is an opportune time to break away from the traditional dependence on the tourism industry and transform the economy so that it is more sustainable. Our newly-elected president is focusing on environmental protection and economic recovery and has a policy in place for the development of new industries. We believe that the foundation of this idea is the establishment of a resource-recycling society, which Koror State has been engaged in over the years.
- (Koror) This afternoon, Jolene, a key member of the transition team for the new president (Whipps), has been asked to brief you on our resource recycling initiatives. During her visit to Kyoto two years ago, Jolene mentioned the need for a public transportation system with the belief that the economy could be revitalized with the development of such a system. Palau has also announced a global goal of using renewable energy sources to provide 45% of the electricity it consumes by 2025 and has committed to reducing its consumption of fossil fuels. We believe that this proposal to switch to EVs through this city-to-city collaboration project is compatible with Jolene's original vision and the need to use renewable energy. During this afternoon's briefing, we will present reference materials on the project for the formation of an integrated resource-recycling society, which includes the development of agriculture and fisheries (positioned in the overall plan) and will consider positioning this EV project within this overall plan. We plan to submit and introduce the materials that provide an overview of the city-to-city collaboration project sharted by the survey team today.
- (Koror) Palau is experiencing serious economic damage as a result of COVID-19, but ADB is providing support in terms of financing. Sovereign loans from ADB have already been dispersed to Palau twice this year, with more planned for the following year. The governments of friendly countries, such as the U.S., Japan, Australia and Taiwan, for example, have provided various forms of support. However, ADB's sovereign loans play an important role in terms of finance. Palau currently has plans to construct a mega-solar power plant through a public-private partnership (PPP) to realize the goal of increasing the percentage of renewable energy to 45% by 2025. However, since there is no basic law on the books on PPP, ADB is providing legal consultation so that the PPP project can be implemented based on existing laws. A PPP project for a resource separation trans-shipment and storage facility, which Koror State and Amita Corporation have worked on for many years, has been delayed because the PPP proejct is being structured in consultation with ADB. Going forward, as the first step, we will promote the PPP project

with Amita Corporation (expected to be completed by the end of next year), and in the second step, we will implement the overall plan for the formation of a resource-recycling society. Conversion to EVs and the development of a JCM project will be included in step 2. This is an illustration of the importance of ADB's relationship with Palau.

- (Koror) The Koror State government is currently being reorganized. The Solid Waste Management Office in the Department of Public Works, to which I belong, has 85 staff, making it the largest department in the state government. However, as was mentioned earlier, the issues being addressed cover a wide range of issues that go beyond waste management. In this respect, we are considering elevating the status of the Solid Waste Management Office to a bureau, renaming it the Research and Development Bureau, and including the SDGs as a sub-title. This reorganization will also be explained to the new president's transition team.
- (Kitakyushu) Kitakyushu is promoting an initiative called the SDGs FutureCity. What specific areas is Koror State planning to focus on?
  - (Koror) We think that we will focus on five to seven targets, including direct and indirect targets for health, agriculture, waste, environment, energy, and industry.
- (Kitakyushu) Kitakyushu is working across a wide range of targets for the SDGs as a whole, so we hope to be able to collaborate not only in the waste and energy fields, but others as well.
- (Koror) Sometime between this week and next, there will be a ceremony to hand over the equipment at M-DOCK (tire shredder, bulldozer, etc.) with the transfer of the functions of the former final disposal site (M-DOCK) to the new site at Aimeliik. Once the facilities are transferred, the site will be vacant, which means that the PPP project with Amita Corporation (resource-separation trans-shipment and storage facility) will change from simply being an idea to becoming a concrete project that must be implemented. Therefore, we will be considering the specifics of how and on what scale this will be done, including conversion to EVs.
- (IGES) What is the timeline for the PPP project on the mega-solar power plant that is being carried out in consultation with ADB?
  - (Koror) We have heard that the first phase of construction will be carried out over a period of one to two years, following by the second phase which will be completed by 2025. ADB is in charge of the bidding process, and a decision has been made on the location (Surangel) and successful bidder (not yet announced by ADB), which are now waiting on approval from Congress.
- (Amita) Do you have any information on the progress of the PPP project on the resource-separation trans-shipment and storage facility?

- (Koror) The situation is being overseen in consultation with ADB. The construction site is scheduled to be transferred sometime between this week and next. Once the site is secured, we can move on to examining the specifics of the construction of the facility. Since the M-DOCK site wil continue receiving household waste from Koror State, the recycling center in Koror will be in charge of the operations at the M-DOCK site. All facilities, such as the tires and shredders, will be transferred to Koror State, and operators (about 5) are currently being trained.
- (Koror) ADB is in the process of discussing the possiblity of utilizing the Japan International Cooperation System scheme, and the Palau JICA Office will also be involved. Koror State only provides ADB with the necessary information and leaves the negotiations up to ADB. Once JICA concludes its current project on the final disposal site, we expect that the next step will be to develop a power transmission and distribution network as part of an ODA project for related infrastructure for the mega-solar power plant. We expect that the next step for the power transmission and distribution network will lead to a project to create a resource-recycling society. Koror State cannot handle this type of large-scale project on its own, so the state is working with various donors in consultation with ADB. We hold regular meetings with ADB (headquarted in Manila) every Saturday. We would like Amita Corporation to attend these regular meetings with ADB, when necessary. In our discussions with ADB, the topic has shifted from the PPP project on a resource-separation trans-shipment and storage facility to more holistic projects on the formation of a resource-recycling society. Agricultural-related activities are being promoted with the support of the Minister of Agriculture, Forestry and Fisheries.

5. Closing

(Kitakyushu) We are starting this project with new partners, ATGREEN and EV Motors Japan. At the base of this project are the efforts to create a resource-recycling society that we have worked on with Amita Corporation since 2013. I would like to express my gratitude to Mr. Fuji from Koror State for his considerable cooperation in leading to today's successful outcomes. It is a great honor to know that the project for a resource-recycling society has developed into a national-level project in Palau through the cooperation of all involved. This year, Kitakyushu declared its goal to become a Zero-Carbon City. I believe that this action will further enhance the role of the Kitakyushu Asian Center for Low Carbon Society for carbon-free and low-carbon development. Although activities have been limited due to COVID-19, we consider this to be an important project and will continue to work together in the future to realize an SDGs society.

5.2 Final meeting (Briefing session on outcomes/minutes)

【Purpose】A final meeting was held, bringing together the key stakeholders from both countries, to share and discuss the outcomes and future development of the city-to-city collaboration project between Koror State and Kitakyushu City. The meeting was originally scheduled to be held on-site, but travel was not possible due to the impacts of COVID-19, and the meeting was moved online.

【Date & Time】March 3, 2021, 14:30-16:15

【Location】Online (Zoom) meeting

【Languages】Japanese, English (consecutive interpretation by interpreters)

【Attendees】10

- Solid Waste Management Office, Department of Public Works, Koror State: Selby P. Etibek (Manager), Katsuo Fuji (Consultant)
- Kitakyushu Asian Center for Low Carbon Society: Yuichi Arita (Director, International Cooperation), Hiroshi Yasutake (Deputy Director, International Cooperation), Kazumasa Miura (Chief, International Cooperation), Naoko Mori (Chief, International Cooperation)
- EV Motors Japan: Hidenobu Sumi (Chief Financial Officer)
- Institute for Global Environmental Strategies, Kitakyushu Urban Center: Kohei Hibino (Programme Manager)
- ATGREEN Co., Ltd.: Seiya Tominaga (Senior Manager), Sho Koizumi (Consultant)

Figure5-2：Final meeting (Briefing session on outcomes) (online)

【Summary of discussions】

1. Opening remarks

    - (Kitakyushu) This is the final meeting of the city-to-city collaboration project. It is unfortunate that we were unable to travel to the site because of COVID-19, but thanks to your cooperation, we have been able to conduct the study remotely and obtained results that can be reported to the Ministry of the Environment. We will need to submit a final report, including the results of today's meeting, so that the project will continue to be adopted next year. We are looking forward to your active discussions today.

2. Report on project outcomes (EV proposal)

    - (ATGREEN) Used slides (Reference 3) to provide an overview of the outcomes of the study on the EV proposal.

3. Report on project outcomes (Other candidate projects)

    - (IGES) Used slides (Reference 3) to provide an overview of the outcomes of the study on other candidate projects.

4. Q&A
    - (Kitakyushu) I would like provide an additional explanation about the Oneworld Japan project, which was mentioned as one of the other candidate projects. Oneworld Japan is in the process of installing a demonstration plant on an island in Thailand with the aim of realizing the resource recycling of waste in the limited space available on the island. Since the treatment of tires is an issue for Koror State, we would like to introduce Oneworld Japan's technology in this regard.
    - (Koror) At the suggestion of Ingerosec (French development consultant), we have exchanged information with Oneworld Japan at a Zoom meeting and are now discussing the possibility of using a JICA project study or dissemination and demonstration project for the treatment of scrap tires. We are also discussing the possibility of linking the PPP project (resource-separation trans-shipment and storage facility) at M-DOCK, which we are carrying out in collaboration with Amita Corporation, with Oneworld Japan's technology. Is our understanding correct that Oneworld Japan's scrap tire treatment project and the EV project are all related to the larger framework of the PPP project?
    - (Kitakyushu) That understanding is correct.
    - (Kitakyushu) We think that next year's study will also need to be conducted remotely,

since it is unlikely that we will be able to travel immediately because of COVID-19. We are thinking about using a system called SynQRemote as a tool to facilitate this type of remote survey. This tool is a system that can connect Japan and the local area via a PC/smartphone and allow detailed instructions and checks to be carried out remotely on-site. I would like to introduce Quando Inc., the company that provides the system, and conduct a connection test at a later date.

- (Koror) We note your comments about the connection test.
- (EVM) We have no additional comments.
- (ATGREEN) As we prepare the final report for the Ministry of the Environment, we would like to know if there are any areas in particular that Koror State would like to have support on in the study for the next fiscal year.
- (Koror) If it is in relation to the Ministry of the Environment, we are interested in the JCM Model Project scheme. We would also like to know how feasible the EV project is and what the subsidy rate would be for the equipment. We think that we need to look at different financing schemes (especially those subsidized by the Japanese government) as well, as it would be difficult to develop a project only using the JCM. Specifically, sovereign loans between ADB and Koror State government (which require a debt guarantee from the central government) and grant aid for projects and management rights from JICA are possibilities. We hold direct discussions with ADB and the Private Sector Department on the PPP project that we are working on with Amita Corporation (with regular meetings held every Saturday). We are also examining the project on a resource-separation trans-shipment and storage facility at M-DOCK at the same time as an expanded project called the “comprehensive resource recycling system” that is being planned by Koror State. This is a comprehensive approach that includes a separate PET bottle crushing (pelletizing) project and the introduction of EV vehicles, which is being studied in this project, in conjunction with the PPP project. ODA from the Japanese government (JICA) is being used to develop a project scheme of at least JPY 1 billion in consultation with ADB (partial sovereign loans are also being considered). ADB is in a position to provide consultation to Koror State.
- (ATGREEN) Since the initial investment of an EV project is around JPY 70 to 80 million and storage batteries account for one-third of the cost, we think that a bundling application, where multiple JCM projects are bundled together, will be needed. In addition, the EV sightseeing bus operation program and maintenance system are also issues that need to be addressed, so we think that it will be necessary to provide support on soft aspects as well. Since there is a possibility that financing from the JCM Model Project alone will not be enough to cover the cost of the project, we are aware that collaboration

with other financing sources, such as ADB, needs to be considered, as per the comment from Koror State.

- (ATGREEN) Would you like to comment on the type of implementation system you feel would be best for the introduction of EV vehicles in the tourism sector?
- (Koror) Since there is no real public transportation system in Palau, tourists use buses operated by local private tour agents. Adjustments will need to be made while also confirming the intentions of Mr. Obichang, Minister of Public Infrastructure, Industries and Commerce, and the Palau International Airport (PIAC/operated together with Sojitz Corporation and others). In either case, it is important for business to grow on a business basis. PIAC is also considering the construction of a local hotel, which could also be implemented as part of a package. Joint investment by several private tour agents may also be a possibility.
- (ATGREEN) During interviews, locals pointed out that the system was an issue. It may be more realistic to imagine when multiple projects are coordinated/combined. PIAC is also quite interested in the introduction of EV sightseeing buses from the perspective of adding value to the airport and tourism sectors, so we think that there is potential for collaboration.
- (Koror) The beverage container deposit and collection system under the CDL project also includes the collection of PET bottles. However, the low market price of plastic bottles makes it difficult for them to be removed from the island. This is a problem not only for Palau, but for all of the Pacific island countries; it is also related to the issue of marine plastics. A system to convert waste plastic into oil is already in operation in Koror State to treat waste plastic, and it may be possible to use Oneworld Japan's system to treat scrap tires. In this respect, it is only PET bottles that have no outlet. JICA is considering the introduction of equipment to pelletize PET bottles in response to this, and it may be possible to use JICA's grant aid for projects and management rights. The budget scale for a project like this is expected to be JPY 1 to 1.5 billion yen. Together with this, Palau is being considered as a central hub for recycling in Micronesia as part of the Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries (J-PRISM). The concept is to bring in waste from other countries in Micronesia for collection in Palau and add value to resources. Just recently, a glass center for the reuse of waste glass collected through the CDL project was completed and has started operating. The electricity used to melt the waste glass is generated from the oil produced through the process of converting waste plastic to oil. The gas used is expected to be biogas, so it is envisioned to be like a recycling expo. These are a few representative examples of what Koror State is thinking will become reality and is

attracting attention from other sectors. We also have a video, which we will share later. Normally, PPP projects are conducted by the private sector, but a unique feature of Koror State is that the government is involving the private sector in the process.

- (ATGREEN) We will share the draft report that will be submitted to the Ministry of the Environment. Thank you for checking it.

5.3 Applying to participate in Our Ocean 2020

5.3.1 About Our Ocean

Representatives, including heads of state from around the world, as well as those from international organizations, research institutions and non-profit organizations, gather together to discuss issues related to oceans and present their commitments at the Our Ocean Conference, an international meeting that has been held annually since its inaugural meeting in 2014 (in the U.S.). In its commitment to the meeting as the representative of the island nations, the Government of Palau announced that it would host the 7th conference in Palau on August 17 and 18, 2020.[12]

The past six meetings have been held in the following locations: the first meeting in 2014 (U.S.), second meeting in 2015 (Chile), third meeting in 2016 (U.S.), fourth meeting in 2017 (U.S.), fifth meeting in 2018 (Indonesia), and sixth meeting in 2019 (Norway).

At the Our Ocean Conference, each participating country and organization submits a commitment on specific policies along with budgetary measures on six running themes: (1) marine protected areas, (2) sustainable fisheries, (3) climate change, (4) marine pollution, (5) blue economies, and (6) maritime security. It is customary for the host country to compile and release the results. For example, Table 5-1 shows the measures submitted by the Government of Japan as its commitments at the sixth session in 2019.

Table5-1：Specific measures submitted by the Japanese government as commitments (Source: Cabinet Office documents[13])

Category	Details	Budget, other
Climate change	International cooperation through the Geostationary Meteorological Satellite "Himawari" (GMS)	27.98 million USD
	Marine observations using ocean meteorological observation vessels, etc.	6.66 million USD
Sustainable fisheries	Project on strengthening capacity for joint wide-area management of fishery resources	3 million USD
	Project on improving the management of fisheries for the sustainable use of marine life resources	0.384 million USD
	Study on fisheries by foreign countries in the vicinity of Japan's EEZ	0.3 million USD
	Contributions to the International Commission for the Conservation of Atlantic Tunas (ICCAT) through support for capacity building	0.109 million USD
	Support for projects by the North Pacific Marine Science Organization (PICES) to improve the monitoring capacity of small-scale fisheries in coastal countries	0.073 million USD

[12] 7th Our Ocean Conference: https://www.ourocean2020.pw/

[13] Cabinet Office (2019). 6th Our Ocean Conference: Summary of outcomes: https://www8.cao.go.jp/ocean/policies/international/pdf/2019_ourocean.pdf

	Support for projects by the Southeast Asian Fisheries Development Center (SEAFDEC) to promote sustainable fisheries in Southeast Asia	1.83 million USD
	Support for projects by the Western and Central Pacific Fisheries Commission (WCPFC) to improve fisheries statistics, regulations and enforcement capacity of small island states	0.23 million USD
Marine pollution	Conservation of coral reef ecosystems	0.28 million USD
	Promotion of regional measures for coastal debris	32 million USD
	Comprehensive study on measures to reduce marine litter	2.5 million USD
	Measures for decarbonization and recycling of plastic resources	62.1 million USD
	MARINE Initiative to realize the Osaka Blue Ocean Vision	Human resources development of 10,000 people, etc.
	Support for the promotion of measures to counter marine plastic litter in Southeast Asia and India	1.1 million USD
	Formation of a hub for research on marine plastic litter in Southeast Asian waters	3 million USD
	Research and development on ocean acidification, marine biodiversity and microplastics	1 million USD
Sustainable blue economies	Training for mariner educators in developing countries	0.17 million USD
	Formation of LNG bunkering bases	14.54 million USD
	Plan for strengthening livelihoods, food security and maritime security by improving the resilience of fishery communities that are dependent on coral reef fisheries in African countries in the Indian Ocean	4.4 million USD
Marine protected areas	Strengthening the capacity of maritime law enforcement through cooperation with the United Nations Office on Drugs and Crime (UNODC)	25 million USD※
	Disaster prevention awareness activities on World Tsunami Day	12 million USD
	Navigational safety and environmental conservation in the Straits of Malacca and Singapore	0.3 million USD
	Support for capacity building of foreign coast guard agencies by dedicated Japan Coast Guard divisions	2 million USD
	Promoting mutual understanding and exchange among coast guard agencies in Asian countries through the Maritime Safety and Security Policy Program	0.73 million USD
	Promoting cooperation with coast guard agencies overseas and onboard training for personnel from Asian coast guard agencies using the training ship, Kojima, of the Maritime Safety Academy	0.45 million USD
	Operation of the MDA Situational Indication Linkages	1 million USD
	Project for capacity development of the Djibouti Coast Guard Phase 3	4.7 million USD
	Project on strengthening the capacity for maritime law enforcement in the operations and maintenance plan of the Philippine Coast Guard vessels	1.3 million USD
	Rescue and environmental disaster prevention training	1.6 million USD

* Note: Contributions for these projects will not be exclusively used for the marine sector.

5.3.2 Plan and proposal for side event

The survey team planned and applied to organize a side event at the Our Ocean Conference in cooperation with Koror State and other related organizations, as it would be a good opportunity to disseminate information and publicize the project. Since side events must be related to existing or new commitments in Our Ocean, the application was submitted in conjunction with a new

commitment.

The concept of the side event was to provide an opportunity to introduce the outcomes of activities and future prospects in waste management that Koror State has been engaged in over the years with Amita Corporation and others from the perspective of its relevance to the six themes and commitments of Our Ocean. The purpose of the event was to emphasize how the establishment of an island circulation model can contribute to controlling marine pollution and to discuss how the introduction of carbon-free and low-carbon technologies, which will be commercialized based on the city-to-city collaboration project, can contribute to the world's blue recovery in the post-COVID-19 years.

The contents of the proposal for the side event conducted online are as follows. Refer to Appendix 1 for the concept note uploaded at the time of submission.

Table5-2 : Content of proposal for the side event

Content of proposal for the side event
■ Name of proposing organization Department of Public Works, State of Koror ■ Name of representative from proposing organization Selby P. Ettie ■ Title of side event Development of Island Resource Circulation Model in Koror State: Achievements and Future Perspectives ■ Co-organizers of side event Koror State Solid Waste Management Office, Amita Corporation, City of Kitakyushu, EV Motors Japan, ATGREEN Co., Ltd., Institute for Global Environmental Strategies ■ Relevance to commitments This side event is related to a new commitment jointly proposed by Koror State, Amita Corporation and the City of Kitakyushu on the "Development of Transportation Station at the former landfill site (M-Dock) in Koror State: As an important base for building a resource circulation society. Preferred date and time (rank preferences from first to fifth)

	2020/12/07 7.30AM	2020/12/07 12.15PM	2020/12/08 7.30AM	2020/12/08 12.45PM	2020/12/08 4.30PM
Choice 1				X	
Choice 2					X
Choice 3		X			
Choice 4			X		
Choice 5	X				

- Preferred venue

  Indoors

  Outdoors

- Action category

  Climate change

  Marine pollution

  Sustainable blue economies

  Marine protected areas

  Sustainable fisheries

  Maritime security

- Scheduled presenters

  1. Koror State Government
  2. City of Kitakyushu
  3. Koror State Department of Public Works
  4. Amita Corporation
  5. ATGREEN Co., Ltd.

- Level of participation

  Heads of state

  Ministerial level

  Other participants

- Upload concept note

  Refer to Appendix 1

5.3.3 Submission of commitment

The new commitment submitted together with the side event was a joint proposal by Koror State, Amita Corporation and the City of Kitakyushu entitled the “Development of Transportation Station at the former landfill site (M-Dock) in Koror State: As an important base for building a resource circulation society”. Based on the waste management initiatives that Koror State has been implementing together with Amita Corporation and others for many years, this plan calls for the construction of a waste separation, collection and storage facility at the former landfill site (M-DOCK) in Koror State that will become an important foundation for further strengthening and developing the project in the future. This commitment was submitted together with the proposal for the side event and can be found in Appendix 1.

5.3.4 Postponement of the event and future developments

Due to the COVID-19 pandemic, Our Ocean was postponed to December 7 and 8, four months after the original dates. However, as it appeared that there was no end in sight for the pandemic even beyond those dates, the organizers decided to leave off holding the event in 2020 and instead postpone it to 2021 (to be held around September).

The side event and commitment submitted will not be withdrawn but instead will be proposed again with updated information as part of the tasks for this project in FY 2021 (the second year of a three-year period) as dawn breaks for Our Ocean in 2021.

5.2 Seminar on City-to-City Collaboration for Creating a Zero-carbon Society

The “Seminar on City-to-City Collaboration for Creating a Zero-carbon Society” (closed) hosted by the Ministry of the Environment, Japan (and co-hosted by the Institute for Global Environmental Strategies) was held on Monday, February 1, 2021 for stakeholders from Japan and overseas involved in projects adopted under the FY 2020 City to City Collaboration Project for the Realization of a Carbon-free Society.

As in previous years, the organizers planned to invite officials from partner cities overseas (Koror State, in the case of this project) to participate in the seminar in Japan and give them an opportunity to visit their partner city in Japan (Kitakyushu City, in the case of this project) to inspect related facilities. However, this year, travel was not possible due to the COVID-19 pandemic, so the event was held completely online, including the participation of attendees from Japan.

Although there were no opportunities for the project members from Kitakyushu City and Koror State to present at the seminar, the team provided support by introducing contact persons, preparing invitation letters, and sending invitations to make online participation as smooth as possible, as well as by preparing materials to introduce the project and creating an explanatory video. The video was released from Wednesday, January 27 to Wednesday, February 3, 2021.

5.3 Webinar on the Joint Crediting Mechanism (JCM) Implementation in Republic of Palau

A webinar was organized on Friday, February 26, 2021 by the Ministry of the Environment, Japan, Ministry of Public Infrastructure, Industries and Commerce, Palau, the Global Environment Centre Foundation, and Pacific Consultants Co., Ltd. (and sponsored by Pacific Islands Centre) for government officials and private companies in Palau and Japan to share the outline and outcomes of JCM Model Projects and further develop and scale up the development of projects.

At the webinar, ATGREEN provided an overview of the city-to-city collaboration project and introduced the technologies of EV Motors Japan. ATGREEN also took part in a panel discussion that was held in conjunction with the webinar, offering up comments on topics such as the potential for banded applications for small-scale projects in island areas, perspectives on co-benefits, collaboration through funds with ADB and other donors, and recovery in the post-COVID age.

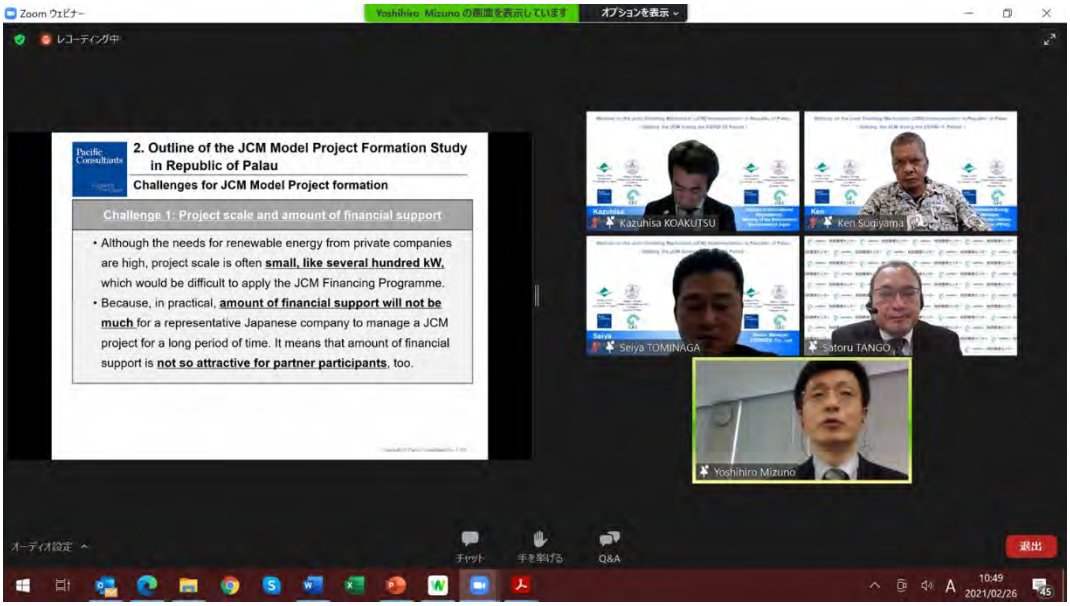


Figure5-3：Webinar on the Joint Crediting Mechanism (JCM) Implementation in Republic of Palau (Online)

Appendix

- Appendix1：Concept note of Our Ocean Side event and Submission of commitment
- Appendix2：Presentation material of City to City collaboration project (Koror State in Palau and Kitakyushu city) Kick-off meeting
- Appendix3：Presentation material of Seminar on City-to-City Collaboration for Creating a Zero-carbon Society
- Appendix4：Presentation material of Webinar on the Joint Crediting Mechanism (JCM) Implementation in Republic of Palau- Utilizing the JCM during the COVID-19 Period (The material of project overview is also used as Appendix 3)
- Appendix5：Local survey summary report (Tourism sector)
- Appendix6：Local survey summary report (Waste treatment sector)
- Appendix7：Presentation material of final meeting with Koror State
- Appendix8：Presentation material of achievement briefing session for Ministry of Environment Government of Japan
- Appendix9：Pamphlet about Introduction consideration EV vehicle
- Appendix10：Survey results of Commercial EV vehicle introduction cases

Appendix 1

Concept Note, Side Event at the Our Ocean 2020

Development of Island Resource Circulation Model in the State of Koror: Progress and Future Perspectives

Department of Public Works, Koror State
AMITA CORPORATION
City of Kitakyushu
EV Motors Japan Co., Ltd.
ATGREEN Co., Ltd.
Institute for Global Environmental Strategies

Background and Objectives

As a small island state, the Republic of Palau is highly vulnerable due to its heavy reliance on trade with foreign countries from energy, food, to waste disposal due to geographical restrictions. Besides, since the tourism sector accounts for more than 50% of its GDP, it is important to preserve the environment of the terrestrial areas as well as the marine ecosystems as the tourism resources. Therefore, the State of Koror, where 70% of the population is concentrated in Palau, has been working on the 3Rs (reduce, reuse and recycle) of waste for resource recycling and environmental protection. In 2004, the state established a recycling center and started composting of organic waste and selling of compost. In 2009, the Beverage Container Recycling Regulation came into effect, and the state started recycling of beverage containers in 2011 and has now achieved more than 90% of its recycling. In 2015, the state also introduced a waste plastic oil processing facility to promote not only recycling of waste plastics but also to curb the number of pet bottles and plastics that spill into the ocean. Despite these concerted efforts, however, the volume of waste continues to increase, and with the consolidation of the country's final waste disposal (landfill) sites to a new site in the remote State of Aimelik, starting in November 2020, there is a need to further reduce and recycle waste. Reduction of waste is also expected to reduce transportation costs and extend the life of the landfill site.

To address this issue, the State of Koror, in collaboration with AMITA CORPORATION and the City of Kitakyushu, will establish waste segregation, accumulation and storage facility at the former landfill site (M-Dock) in Koror State to significantly increase the recycling rate of waste and reduce waste disposal costs based on synergies with the existing recycling center. Also, other interconnected initiatives, such as the bio-gasification facility for treating organic waste, a glass workshop that makes effective use of the biogas energy, and organic farms that utilizes the compost and liquid fertilizers, are included in its scope. Through these efforts, it is aimed to build a model that integrates resource circulation and tourism that could be replicated to other small island states.

This side event aims to introduce the achievements and prospects of the 3Rs initiatives by the State of Koror and its partners and to discuss how the establishment of the island circulation model can contribute to the reduction of marine pollution, climate change, and post-COVID-19 blue recovery.

Relevance to the six Areas of Action and Commitments

The side event is directly related to the new commitment '*Development of Transportation Station at the former landfill site (M-Dock) in Koror State: As an important base for building a resource circulation society*' jointly proposed by the State of Koror, AMITA CORPORATION and the City of Kitakyushu. While this commitment mainly contributes to the theme of 'A Clean Ocean', the side event will also introduce the 'Climate Change' related program in conjunction with the commitment. Specifically, the Ministry of the Environment of Japan's program 'City-to-City Collaboration for the Realization of a Decarbonized Society in FY2020' will be utilized to study the feasibility of introducing EV vehicles in the areas of waste collection and tourism to contribute to the promotion of decarbonization efforts in Koror State. These initiatives are based on city-to-city cooperation between the State of Koror and the City of Kitakyushu.

COVID-19 and its Relevance to Blue Recovery

The realization of the proposed project is expected to create various co-benefits. It is expected to not only solve the waste issues, promote ecotourism, and reduce GHG emissions, but also contribute to post COVID-

Appendix 1

19 economic recovery and alleviation of the vulnerability of island countries through increased local production and consumption of energy and food and creating job opportunities.

Provisional Agenda

1. Introduction (Moderator: TBD)
   A brief framing presentation of the side event and introduction of the panelists. Raising the question of how the realization of an island resource circulation model could contribute to the theme of Our Ocean 2020.

Presentations

2. TBD, Koror State (5 min)
   Greetings on behalf of the organizers and brief introduction of the side event and the commitments; outlines of the status and challenges of waste management in the Koror State.

3. TBD, City of Kitakyushu (10 min)
   Introduction of Kitakyushu City's policy and achievements on the environmental technical cooperation in the Asia-Pacific region; the history and the prospects of cooperation with the Koror State.

4. TBD, Department of Public Works, Koror State (15 min)
   The history, achievements and overall concept of the 3Rs initiative in the Koror State.

5. TBD, AMITA CORPORATION (10 min)
   Introduction of the waste segregation and storage facility planned at the M-Dock in collaboration with the Koror State.

6. TBD, ATGREEN Co.,Ltd. (10 min)
   Introduction of the city-to-city collaboration project, which aims to reduce CO_2 emissions through the conversion of tourist vehicles and waste hauling vehicles to EVs in Koror.

Panel discussions (10 min)

7. Q&As
   Participants will be invited to ask questions to the panellists, and a question and answer session will follow.

[NOTE] If it would be difficult to travel to Palau and/or to physically organize the side event at the local venue due to COVID-19 situation, we can flexibly organize the event through online.

Appendix 1

Commitment

Proponent	State of Koror, AMITA CORPORATION, City of Kitakyushu
Areas of Action	Marine Pollution, Climate Change
Theme	Development of Transportation Station at the former landfill site (M-Dock) in Koror State: As an important base for building a resource circulation society
Amount (USD)	4 million USD
Abstract	The State of Koror, AMITA CORPORATION, and the City of Kitakyushu are planning to develop a 'Transportation Station' facility which aims to provide one-stop service including waste segregation, accumulation and storage functions at the former landfill site (M-Dock) in Koror State. This station is expected to play a key role in facilitating the achievement of 'Resource Circulation Society' which the Koror State has been aiming for.
Impact	The Transportation Station is positioned as the supply depot to provide stable feedstock to the existing Recycling Center, which is managed by the Koror State, including the waste plastics (for electricity generation), organic waste (for composting), and beverage containers (for Container Deposit Legislation and glass workshop). This is expected to significantly contribute to the development of self-sustaining industry toward achieving the 'Resource Circulation Society' which is the ultimate goal of the Koror State. It is also expected to provide various co-benefits including achieving of the '3R + Return' policy; raising of the recycling rate; reduction of pet bottle and plastic leakages into the ocean; and reduction of GHG emissions and hence contributing to the climate change mitigation. These concerted efforts toward achieving the 'Resource Circulation Society' in Koror State has not been possible only by the resources of Koror State, but through various financial and technical support provided from external supporting agencies. The accumulated number of relevant projects so far has reached up to 2.5 million USD (as of December 2020).
Monitoring parameters	• Amount of municipal solid waste recycled （tonne/year） • Amount of plastic waste recycled （tonne/year）

Appendix 2

City to City collaboration project (Koror State in Palau and Kitakyushu city)

Kick-off meeting Agenda

Date: November 25, 2020
Time: 10:00 a.m.-11:30 a.m.
Location: Zoom Meeting
Participants:
<Koror State side>
Selby P. Etibek(Department of Public Works, Koror State Government)
Katsuo Fuji(Adviser of Koror Waste Recycle Center)
<Japan side>
Yuichi Arita (Kitakyushu City /Asian Center for Low Carbon Society)
Hiroshi Yasutake(Kitakyushu City /Asian Center for Low Carbon Society)
Naoko Mori(Kitakyushu City /Asian Center for Low Carbon Society)
Kazumasa Miura(Kitakyushu City /Asian Center for Low Carbon Society)
Takashi Hasegawa(AMITA CORPORATION)
Hiroyuki Sato(EV Motors Japan Co., Ltd)
Hidenobu Sumi(EV Motors Japan Co., Ltd)
Kohei Hibino(Institute for Global Environmental Strategies)
Sho Koizumi(ATGREEN Co., Ltd)
Seiya Tominaga(ATGREEN Co., Ltd)
Program:

Time	Contents	Presenter
10:00	Opening remarks Background explanation	Kitakyushu City
10:05	Self-introduction(Participant)	Participant
10:15	Introduction of project overview	ATGREEN
10:35	Supplementary explanation (EV and waste project)	Participant (Japan side)
10:45	Comment from Koror state side Current status of Palau	Koror State
10:55	Discussion Question-and-answer session	Participant
11:15	Closing remarks	Kitakyushu City

Appendix 2

Project Overview

FY2020 City to City collaboration project for the realization of a carbon-free society

Feasibility Survey of promoting of carbon-free society and co-benefits through the implementation of EV vehicles in the state of Koror, Republic of Palau
(City to City collaboration between Koror state and Kitakyushu city)

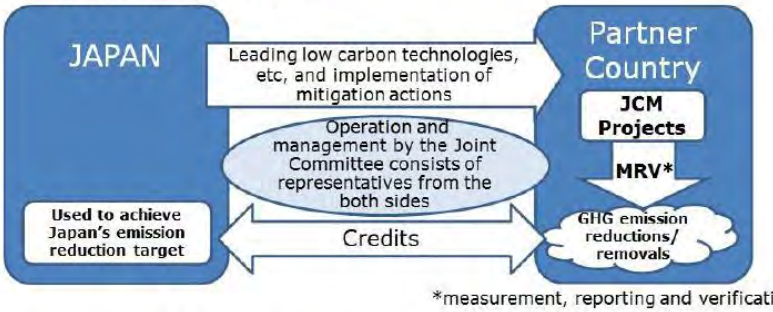
November 2020

Kitakyushu City (Asian Center for Low Carbon Society)
AMITA CORPORATION
EV Motors Japan Co., Ltd
Institute for Global Environmental Strategies
ATGREEN Co., Ltd

Overview of JCM(Joint Crediting Mechanism)

The Joint Crediting Mechanism(JCM) promotes diffusion of leading carbon-free technology, product, system, service, and infrastructure as well as implementation of mitigation actions. JCM also contributes to sustainable development of partnership countries. It appropriately evaluates contributions to GHG emission reductions from Japan by applying MRV(measuring, reporting and verification) methodologies, and uses them to achieve Japan's emission reduction target.

Concept image of JCM



*measurement, reporting and verification

History of JCM project in Japan and Palau

時期	内容
Jan 2014	Signed bilateral documents
May 2014	1st Joint Committee held
Feb 2015	Credit Methodologies approved
Apr 2015	First project approval (Credit issuance approval in 2016)

Source：Joint Committee between Palau and Japan https://www.jcm.go.jp/pw-jp

Appendix 2

City to city collaboration history between Koror and Kitakyushu

City to city collaboration between Koror and Kitakyushu has been ongoing since 2015 with the main theme is construction of resource recycling systems. This feasibility survey project will be carrying out and based on this collaboration and JCM scheme.

Koror State

Challenges of Koror (Our Assumption)

- Expansion of using renewable energy
- Improvement of environmental pollution in tourism sector
- Improvement of waste resource circulation
- Reduction of exhaust gas in transportation sector
- Lack of experience to construction the environmental plans and system
- Promoting SDGs Know-how

Kitakyushu City

Experience and know-how from Kitakyushu

- Experience of overcoming pollution
- Experience of establishment of recycling system
- Experience of EV-bus transportation in public transportation
- Experience to construction the environmental plans and system
- Experience and know-how of promotion of SDGs

•Past cooperation projects between Koror and Kitakyushu

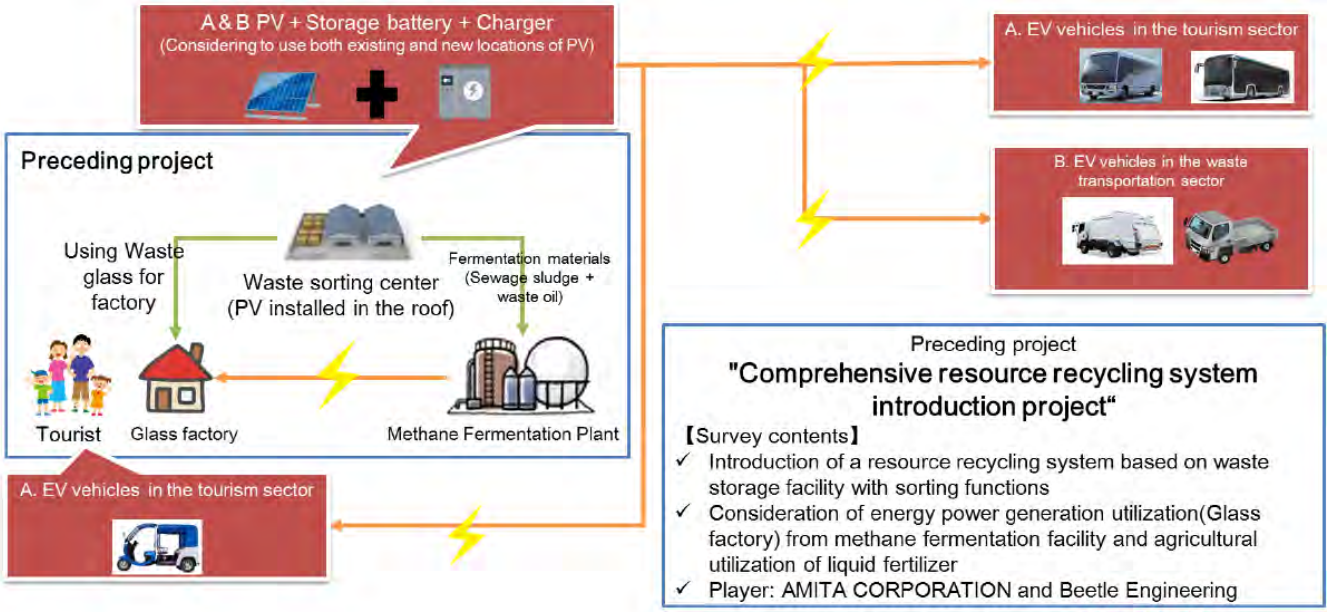
Project name	Member(s)	Year	Project Activities
Survey of waste treatment in islands (Ministry of the Environment Japan Project)	AMITA Institute for Sustainable Economies Co.,Ltd. Kitakyushu City	FY2015 ~ FY2017	· Survey for landfill site (current waste treatment volume and processable volume) · Survey for recycling facility specifications and costs · Survey for waste treatment system design, estimation, preparation items for construction · Signing of partnership agreement (between AMITA Institute for Sustainable Economies Co.,Ltd. and Koror State)
Feasibility Survey of introduction of small size methane fermentation plant in islands (JICA PJ)	VIOCE Co., Ltd Kitakyushu City	FY2017 ~ FY2018	· Survey for raw biomass materials (garbage, resource crops, etc.) · Survey for methods of waste separation and collection scheme · Promotion for using liquid fertilizer · Survey for methane fermentation facility specifications and operational design
Feasibility Survey on introduction of resource sorting and storage facilities in Koror State (Ministry of the Environment Japan Project)	AMITA CORPORATION BEETLE Engineering Co., Ltd Kitakyushu City	FY2019 ~ FY2020	· Survey for introduction of resource sorting and storage facilities in Koror State · Survey for international recycling

for Confidential 3

Overview of proposal project

We will start feasibility survey of the introduction EV vehicle technologies as a means of decarbonization and co-benefits, based on the cooperate relationship between Kitakyushu City and Koror State.

[Proposal model and survey issues] * In the red frame
A. Introduction of EV vehicles (buses, etc.) in the tourism sector
B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector
C. Consideration of other technology solutions to contribute to carbon-free society and local issue



Preceding project

"Comprehensive resource recycling system introduction project"

【Survey contents】

- ✓ Introduction of a resource recycling system based on waste storage facility with sorting functions
- ✓ Consideration of energy power generation utilization(Glass factory) from methane fermentation facility and agricultural utilization of liquid fertilizer
- ✓ Player: AMITA CORPORATION and Beetle Engineering

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Appendix 2

Local issues related to this project (Assumed)

Palau is visited by many tourists. So, we assume there are many issues(energy, tourism and transportation, waste treatment) related to the tourism sector.

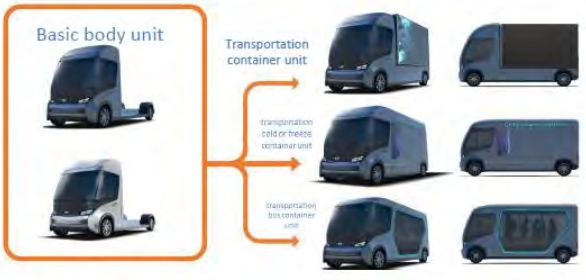
Sector	Issues	Detail
Energy	High dependence rate for Fossil fuel	· Impact of GHG emissions · Increased exhaust gas · The risk of changes in energy procurement costs
	Increasing load on the electricity grid due to the introduction of renewable energy	· Increasing load on grid due to acceleration of large-scale PV introduction · Response to surplus power and sudden output fluctuations · Risk of both short-period fluctuations and long-period fluctuations
	Consideration for renewal for existing diesel power generation equipment due to aging	· Power outage · Expanding for renewable energy according to national energy plan
Sightseeing & Transportation	Seriously environmental impact due to increasing tourists	· Increased waste, especially progress of marine pollution · Improving the landscape and environmental image of tourist destinations
	Impact on the environment due to traffic jam	· There are many means of transportation, but it is dispersed (e.g. Taxi, Shuttle Bus, Hotel pick-up service) · Increased exhaust gas and noise
Waste Treatment	Increasing costs of waste transportation and treatment	· Increased waste by tourists · Increased transportation costs to landfill site in Aimeliik State · Increased fossil fuel consumption due to transporting for landfill site · Energy recovery from waste

Overview of the EV vehicle technology

EV Motors Japan Co., Ltd (EVM) has the following strengths in electric vehicles.

EV Motors Japan Co., Ltd
【Strength】
(1)Extensive commercial vehicle lineup and customizability
(2)EVM has high market value with the technology of parts selection and manufacturing processes
(3)EVM has superior CO2 reduction technology, such as battery load and vehicle weight reduction
(4)EVM has an experience of overseas expansion about EV vehicle
(They have experience of verification project about EV bus in Cat Ba Island, Hai Phong, Vietnam)

Basic body unit that connects to the container F8 series8-M



F８ series2-City Bus Urban city e-BUS Specification
8.5m / 10.5m / 12m Urban road Urban city bus specifications (Pure e-BUS)

F8series7-Driverless car Specification
LEVEL-4 Small autonomous driving mobility EV
F8 series7 (custom made model)

Appendix 2

Co-Benefit effects (expected)

If this project is advanced, there are expected many co-benefit effects .

Co-Benefit effects(expected)	
Emission mitigation	Zero exhaust gas from EV vehicles
Traffic jam mitigation	Traffic jam mitigation by reducing the number of vehicles
Energy cost reduction / local production for local consumption	Cost reduction by avoiding fossil fuel procurement and promoting for using local production energy
Maintenance cost reduction	EV vehicle is a simple structure without an internal combustion engine. It is expected to reduce maintenance costs.
Used as an emergency power source in the disaster	EV vehicle can be used as a mobile emergency power source in the disaster
Image up	【For tourism sector】 Improving the image of tourists and promoting green tourism 【For waste treatment sector】 Renewable energy can be used throughout the waste recycling flow
Contribution for SDGs	・ Contribution to achieving for the SDGs in Koror 

Project members and role in this project

Organization	Activity	role in this project
Kitakyushu City (Asian Center for Low Carbon Society)	● OECD selection "World model city for promoting SDGs" ● Promote advanced initiatives in resource recycling, carbon-free, renewable energy utilization, social welfare, SDGs, etc.	• Overall coordination of city to city collaboration • Sharing experience and knowledge regarding the environment and SDGs
AMITA CORPORATION	● Solution provider for sustainability ● Waste recycling business	• Consideration of adding value to existing resource recycling project
EV Motors Japan Co., Ltd	● Manufacture, sales and maintenance of EV vehicles (commercial vehicles such as buses and trucks) and charging stations	• Consideration of locally adapted technology and equipment • Business model examination
Institute for Global Environmental Strategies	● An international research institute that conducts strategic policy research related to the environment and SDGs	• Consideration of other technology solutions to contribute to carbon-free society and local issue • Support for holding local workshops
ATGREEN Co., Ltd	● Consulting service business for the environment, energy, waste sector	• Summary of the survey • Business model examination • MRV methodology creation

Appendix 2

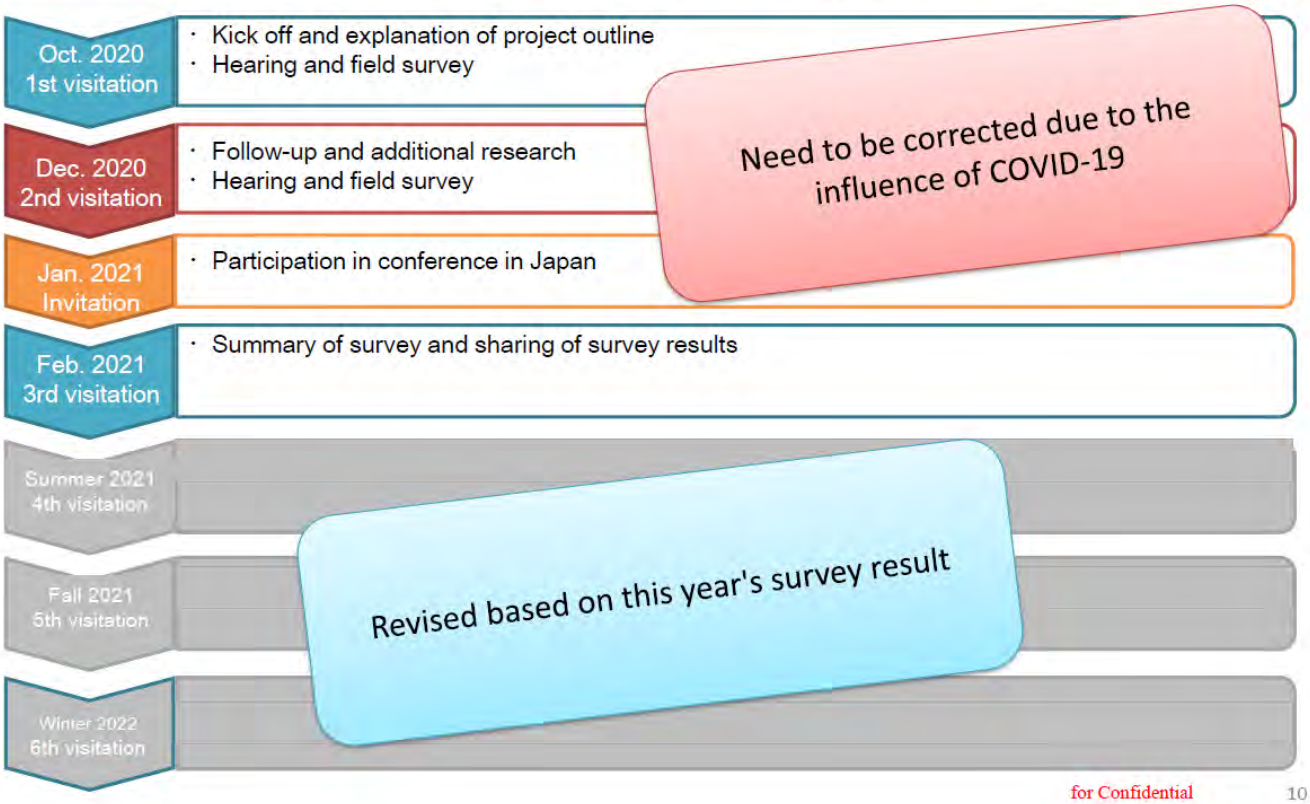
Survey details・ Hearing partner

In this project, we will mainly carry out three surveys. After that, we will consider introducing equipment by utilizing the JCM support project and so on.

ID	Outline of survey	Survey contents / Activity contents	Hearing partner
A. Introduction of EV vehicles (buses, etc.) in the tourism sector			
A-1	Consideration of location candidates for PV / charging base	Needs survey Consideration of the location, the arrangement of vehicles, and operation routes.	Koror State Hotels and tourism company Sightseeing bus owner
A-2	Consideration of availability of existing power plants	Survey on the possibility of providing electric power	Existing power plant owner
A-3	Consideration of business model related to EV vehicle introduction	Consideration of technical requirements, location, other needs	Koror State Hotels and tourism company Sightseeing bus owner
A-4	Consideration for application for JCM support program with local partner	Discussion and consideration of introduction issues, promotion schemes, financial resources, etc.	Koror State EV vehicle user(candidate)
B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector			
B-1	Consideration of business model related to EV vehicle introduction	Consideration of technical requirements, location, other needs	Koror State EV vehicle user(candidate)
B-2	Consideration for application for JCM support program with local partner	Discussion and consideration of introduction issues, promotion schemes, financial resources, etc	Koror State EV vehicle user(candidate)
C. Consideration of other technology solutions to contribute to carbon-free society and local issue			
C-1	Consideration of other technology solutions to contribute to carbon-free society and local issue	Survey of environmental issues and needs to solve them	Koror State Hotels and tourism company
C-2	Dissemination of information at local WS and international conferences	Dissemination of necessary information locally Sharing of Kitakyushu's international cooperation efforts and experiences	Koror State
C-5	Consideration for further survey with local partner	Consideration of future investigation items Preparation for consideration for feasibility survey	Koror State Local partner(candidate)

Survey schedule(Original plan)

Scheduled to visit Palau 6 times (need to change plan due to pandemic of COVID-19 virus)



Appendix 3

Seminar on City-to-City Collaboration for Creating a Zero-carbon Society
Program for the section closed seminar

Date & Time: February 1st (Mon.) 14:00-16:00 (Japan Standard Time *see below for your time zone)
Place: Zoom (https://zoom.us/meeting/register/tJ0qd-6pqD0qHN1QY8oczW1X1pSVvEDYKjYk)
Language: Japanese & English (Simultaneous translation available)
Participants: Project members involved in the FY2020 C2C Collaboration Programme

Time	Contents
14:00	**Opening remarks** Ryuzo Sugimoto Director, International Cooperation and Sustainable Infrastructure office, Global Environmental Bureau, Ministry of the Environment, Japan (MOEJ)
14:05	**Outline of the support menu for building a decarbonized society** ・ Japan's Measures to Build a Zero-carbon Society Ryuzo Sugimoto Director, International Cooperation and Sustainable Infrastructure office, MOEJ ・ Recent Development of the Joint Crediting Mechanism (JCM) Kazuhisa Koakutsu Director of International Negotiations, Market Mechanisms Office, Climate Change Policy Division, MOEJ ・ Introduction of Japan Fund for the Joint Crediting Mechanism (JFJCM) Shintaro Fujii Environment and Climate Change Specialist, Climate Change and Disaster Risk Management Division, Sustainable Development and Climate Change Department, Asian Development Bank (ADB) Q & A
14:55	**[Panel discussion] How can we proceed projects in the corona era?** Panelists: - Ryuzo Sugimoto Director, International Cooperation and Sustainable Infrastructure office, MOEJ - Yuichi Arita Director, Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu - Masaru Ishikawa Acting General Manager, International Environment Dept., Nippon Koei Co., Ltd. - Masanori Fujii Project Manager, International Projects Division, Oriental Consultants Co., Ltd. - Yuka Shinohara Manager, Corporate Sales Division, Business Development Support Team, H.I.S. Co., Ltd. - Kensuke Ezoe Corporate Sales Division, Business Development Support Team, H.I.S. Co., Ltd. Facilitator: - Shiko Hayashi Programme Director, Kitakyushu Urban Centre, IGES Q & A End of the program (16:00)

Note: "14:00 Japan Standard Time" is 14:00 for Palau; 13:00 Malaysia, Mongolia and Philippines; 12:00 for Indonesia, Thailand and Viet Nam; 11:30 for Myanmar; 10:00 for Maldives; and 2:00 for Chile.

✧ Please allow plenty of time for access.
✧ We set a networking lounge (Remo) before and after the seminar. Please refer to the " Instruction for Remo" and feel free to join us. (Voluntary participation)

Appendix 3

Project Overview

FY2020 City-to-City Collaboration for Creating a Zero-carbon Society

Feasibility Survey of promoting of carbon-free society and co-benefits through the implementation of EV vehicles in the state of Koror, Republic of Palau
(City to City collaboration between Koror state and Kitakyushu city)

February 2021

Kitakyushu City (Asian Center for Low Carbon Society)
AMITA CORPORATION
EV Motors Japan Co., Ltd
Institute for Global Environmental Strategies
ATGREEN Co., Ltd

City-to-city collaboration history between Koror State and Kitakyushu City

City-to-city collaboration between Koror State and Kitakyushu City has been ongoing since 2015 with the main theme is construction of resource recycling systems. This feasibility survey project will be carrying out and based on this collaboration and JCM scheme.

Koror State

Challenges of Koror (Our Assumption)
- Expansion of using renewable energy
- Improvement of environmental pollution in tourism sector
- Improvement of waste resource circulation
- Reduction of exhaust gas in transportation sector
- Lack of experience to construction the environmental plans and system
- Promoting SDGs Know-how

Kitakyushu City

Experience and know-how from Kitakyushu
- Experience of overcoming pollution
- Experience of establishment of recycling system
- Experience of EV-bus transportation in public transportation
- Experience to construction the environmental plans and system
- Experience and know-how of promotion of SDGs

•Past cooperation projects between Koror and Kitakyushu

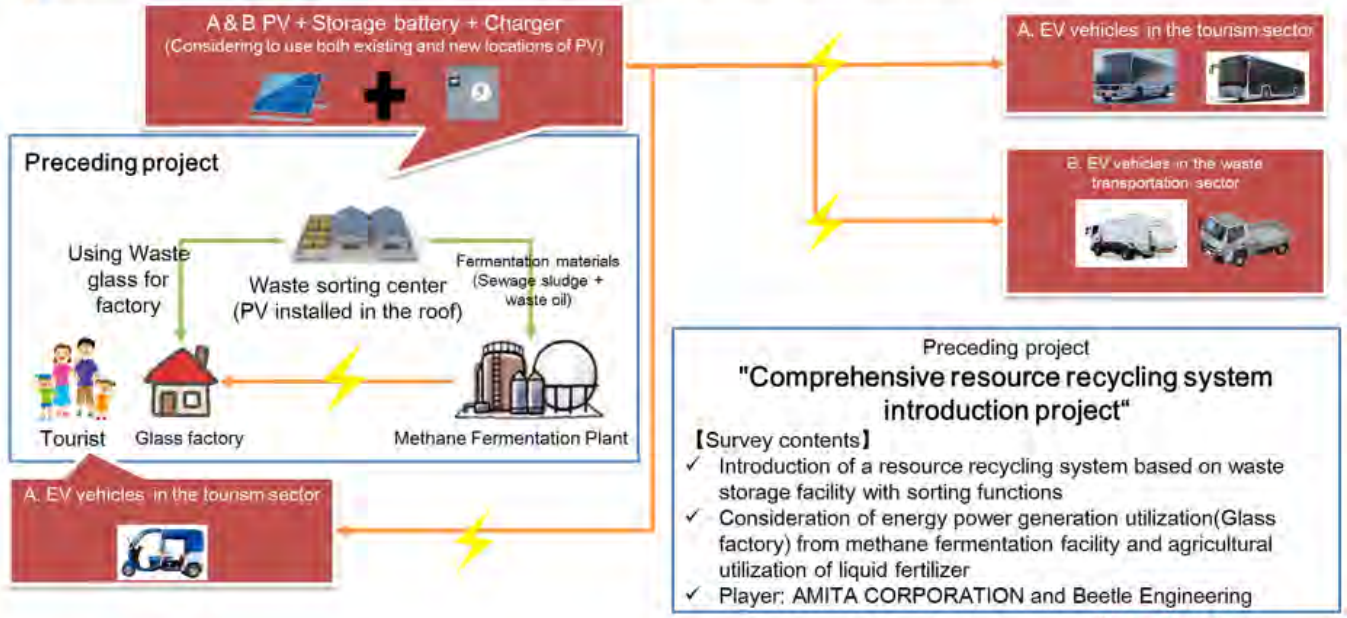
Project name	Member(s)	Year	Project Activities
Survey of waste treatment in islands (Ministry of the Environment Japan Project)	AMITA Institute for Sustainable Economies Co.,Ltd. Kitakyushu City	FY2015 ～ FY2017	・Survey for landfill site (current waste treatment volume and processable volume) ・Survey for recycling facility specifications and costs ・Survey for waste treatment system design, estimation, preparation items for construction ・Signing of partnership agreement (between AMITA Institute for Sustainable Economies Co.,Ltd. and Koror State)
Feasibility Survey of introduction of small size methane fermentation plant in islands (JICA PJ)	VIOCE Co., Ltd Kitakyushu City	FY2017 ～ FY2018	・Survey for raw biomass materials (garbage, resource crops, etc.) ・Survey for methods of waste separation and collection scheme ・Promotion for using liquid fertilizer ・Survey for methane fermentation facility specifications and operational design
Feasibility Survey on introduction of resource sorting and storage facilities in Koror State (Ministry of the Environment Japan Project)	AMITA CORPORATION BEETLE Engineering Co., Ltd Kitakyushu City	FY2019 ～ FY2020	・Survey for introduction of resource sorting and storage facilities in Koror State ・Survey for international recycling

Appendix 3

Overview of proposal project

We started feasibility survey of the introduction EV vehicle technologies as a means of decarbonization and co-benefits, based on the cooperate relationship between Kitakyushu City and Koror State.

[Proposal model and survey issues] * In the red frame
A. Introduction of EV vehicles (buses, etc.) in the tourism sector
B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector
C. Consideration of other technology solutions to contribute to carbon-free society and local issue



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Local issues related to this project (Assumed)

Palau is visited by many tourists. So, we assume that there are many local issues in Palau such as energy, tourism and waste sector.

Sector	Issues	Detail
Energy	High dependence rate for Fossil fuel	・Impact of GHG emissions ・Increased exhaust gas ・The risk of changes in energy procurement costs
	Increasing load on the electricity grid due to the introduction of renewable energy	・Increasing load on grid due to acceleration of large-scale PV introduction ・Response to surplus power and sudden output fluctuations ・Risk of both short-period fluctuations and long-period fluctuations
	Consideration for renewal for existing diesel power generation equipment due to aging	・Power outage ・Expanding for renewable energy according to national energy plan
Sightseeing & Transportation	Seriously environmental impact due to increasing tourists	・Increased waste, especially progress of marine pollution ・Improving the landscape and environmental image of tourist destinations
	Impact on the environment due to traffic jam	・There are many means of transportation, but it is dispersed (e.g. Taxi, Shuttle Bus, Hotel pick-up service) ・Increased exhaust gas and noise
Waste Treatment	Increasing costs of waste transportation and treatment	・Increased waste by tourists ・Increased transportation costs to landfill site in Aimeliik State ・Increased fossil fuel consumption due to transporting for landfill site ・Energy recovery from waste

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Appendix 3

Overview of the EV vehicle technology

EV Motors Japan Co., Ltd (EVM) has the following strengths in electric vehicles.

EV Motors Japan Co., Ltd

【Selling point】

(1)Extensive commercial vehicle lineup and customizability
(2)EVM has high market value with the technology of parts selection and manufacturing processes
(3)EVM has superior CO2 reduction technology, such as battery load and vehicle weight reduction
(4)EVM has an experience of overseas expansion about EV vehicle
(They have experience of verification project about EV bus in Cat Ba Island, Hai Phong, Vietnam)

Basic body unit that connects to the container F8 series8-M

F８ series2-City Bus Urban city e-BUS Specification
8.5m / 10.5m / 12m Urban road Urban city bus specifications (Pure e-BUS)

F8series7-Driverless car Specification
LEVEL-4 Small autonomous driving mobility EV
F8 series7 (custom made model)

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Co-Benefit effects (expected)

If this project is advanced, there are expected many co-benefit effects .

Co-Benefit effects(expected)	
Emission mitigation	Zero exhaust gas from EV vehicles
Traffic jam mitigation	Traffic jam mitigation by reducing the number of vehicles
Energy cost reduction / local production for local consumption	Cost reduction by avoiding fossil fuel procurement and promoting for using local production energy
Maintenance cost reduction	EV vehicle is a simple structure without an internal combustion engine. It is expected to reduce maintenance costs.
Used as an emergency power source in the disaster	EV vehicle can be used as a mobile emergency power source in the disaster
Image up	【For tourism sector】 Improving the image of tourists and promoting green tourism 【For waste treatment sector】 Renewable energy can be used throughout the waste recycling flow
Contribution for SDGs	・Contribution to achieving for the SDGs in Koror

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Appendix 3

Project members and role in this project

Organization	Activity	role in this project
Kitakyushu City (Asian Center for Low Carbon Society)	● OECD selection "World model city for promoting SDGs" ● Promote advanced initiatives in resource recycling, carbon-free, renewable energy utilization, social welfare, SDGs, etc.	• Overall coordination of city to city collaboration • Sharing experience and knowledge regarding the environment and SDGs
AMITA CORPORATION AMITA	● Solution provider for sustainability ● Waste recycling business	• Consideration of adding value to existing resource recycling project
EV Motors Japan Co., Ltd EVM	● Manufacture, sales and maintenance of EV vehicles (commercial vehicles such as buses and trucks) and charging stations	• Consideration of locally adapted technology and equipment • Business model examination
Institute for Global Environmental Strategies IGES	● An international research institute that conducts strategic policy research related to the environment and SDGs	• Consideration of other technology solutions to contribute to carbon-free society and local issue • Support for holding local workshops
ATGREEN Co., Ltd ATGREEN	● Consulting service business for the environment, energy, waste sector	• Summary of the survey • Business model examination • MRV methodology creation

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Survey details ・ Hearing partner

In this project, we will mainly carry out three surveys. After that, we will consider introducing equipment by utilizing the JCM support project and so on.

ID	Outline of survey	Survey contents / Activity contents	Hearing partner
A. Introduction of EV vehicles (buses, etc.) in the tourism sector			
A-1	Consideration of location candidates for PV / charging base	Needs survey Consideration of the location, the arrangement of vehicles, and operation routes.	Koror State Hotels and tourism company Sightseeing bus owner
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B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector			
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C-2	Dissemination of information at local WS and international conferences	Dissemination of necessary information locally Sharing of Kitakyushu's international cooperation efforts and experiences	Koror State
C-5	Consideration for further survey with local partner	Consideration of future investigation items Preparation for consideration for feasibility survey	Koror State Local partner(candidate)

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Appendix 3

Survey progress and issues

At first, we planned to visit Palau 3 times in FY2020. Although, we were forced to change plan due to pandemic of COVID-19 virus. Currently, we are conducting the survey for the introduction of EV vehicles in the tourism and waste sectors with local corporations.

A. Introduction of EV vehicles (buses, etc.) in the tourism sector

- We consider the possibility of introduction of a shuttle bus.(from the airport to the hotel)
- A Japanese company operates Palau International Airport.
- This EV project in tourism sector may be a partnership with the airport company.
- Currently, we are estimating the cost of vehicles , charge equipment, renewable power energy generation.

B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector

- We are considering the possibility of introducing garbage trucks and loading trucks.
- We plan to use these mobilities for waste collection and transporting to the landfill site.
- This EV project in waste transportation sector may be a partnership with the Koror States.
- Currently, we are estimating the cost of vehicles, charge equipment, renewable power energy generation.

Introduction issues of EV vehicles

- ✓ Reduction for initial costs
- ✓ Maintenance system
- ✓ Promotion organization

Appendix 4

Webinar on the Joint Crediting Mechanism (JCM) Implementation in Republic of Palau
- Utilizing the JCM during the COVID-19 Period -

Date and Time : Friday 26 February 2021, 9:00 a.m. - 12:00 p.m.
Venue : Online (Zoom)
Organizers : Ministry of Public Infrastructure, Industries and Commerce, Republic of Palau, Ministry of the Environment, Government of Japan, Global Environment Centre Foundation, Pacific Consultants Co., Ltd.
Language : English
Moderator : Pacific Consultants Co., Ltd.

Tentative Agenda

Session 1. Opening Remarks	
9:00-9:05	Opening Remarks Mr. Hajime Sugimura, Second Secretary, Embassy of Japan in the Republic of Palau
Session 2. Information Sharing on the JCM Progress	
9:05-9:20	Recent Development of The Joint Crediting Mechanism (JCM) Mr. Hironori Aoki, Ministry of the Environment, Government of Japan
9:20-9:30	Status of JCM Implementation in Republic of Palau Mr. Tutii Chilton / Mr. Gerald Tulop, Ministry of Public Infrastructure, Industries and Commerce, Republic of Palau
9:30-09:50	Financing Programme for JCM Model Projects and JCM Global Match Mr. Satoru Tango, Global Environment Centre Foundation (GEC)
Session 3. JCM Implementation in Republic of Palau	
09:50-10:10	JCM Model Project Formation Study in Republic of Palau Mr. Yoshihiro Mizuno, Pacific Consultants Co., Ltd. (PCKK)
10:10-10:20	Business Opportunities with Low-carbon or Decarbonizing Technologies in Palau Mr. Myers Techitong, Palau National Communications Corporation
10:20-10:30	Business Opportunities with Low-carbon or Decarbonizing Technologies in Palau Mr. Clement K. Gbewonyo, Western Caroline Trading Company
10:30-10:40	Low-carbon or Decarbonizing Businesses and Technologies Applicable in Island Countries Mr. Seiya Tominaga, ATGREEN Co., Ltd.
Session 4. Panel Discussion	
10:40-11:05	- Efforts toward Low Carbon Emission and Decarbonization in Palau and Role of JCM Moderator: Mr. Yoshihiro Mizuno, Pacific Consultants Co., Ltd. Panelists: Mr. Kazuhisa Koakutsu, Ministry of the Environment, Government of Japan Mr. Ken Sugiyama, Palau Public Utilities Corporation Mr. Satoru Tango, Global Environment Centre Foundation Mr. Seiya Tominaga, ATGREEN Co., Ltd.

Appendix 4

Session 5. Closing Address	
11:05-11:10	Closing Address Ministry of Public Infrastructure, Industries and Commerce, Republic of Palau
Individual Meeting among Participants and Asian Development Bank (ADB)/GEC/PCKK Consultation (via Zoom Meeting)	
11:10-12:00	- Individual meetings between Session 3. speakers and participants - Consultation to ADB including Japan Fund for JCM (JFJCM) - Consultation to GEC or PCKK about JCM and JCM Financing Programme

*Program may be changed.

Appendix 4

Company Overview

EV Motors Japan

Company Name: EV Motors Japan Co., Ltd.
Headoffice location(With exhibition hall): Kitakyushu City, Fukuoka Prefecture
Sales office: Fukuoka City, Fukuoka Prefecture
Chiyoda-ku, Tokyo
Capital: 10 million yen
Representative director: Yuji Sato
Established date:April,2019
Main business:

- Sales and maintenance of commercial electric vehicles and charging stations
- Commercial electric vehicle leasing, rental, ESCO business

Handling EV vehicle models

- ✓ EV bus (minibus, route bus, high-decker type)
- ✓ EV light truck
- ✓ EV heavy truck
- ✓ Specific vehicles such as EV garbage trucks, etc.

Appendix 4

Technology Strength

EV Motors Japan

Development for high efficiency battery utilization system

EVM has been developing charge / discharge application systems for lithium-ion batteries more than 30 years. EVM has experience and achievements in battery life extension, deterioration prevention, deterioration diagnosis, charge / discharge capacity inspection, life inspection, and safety test system.
EVM has technology to support the safety of lithium-ion batteries around the world.
EVM has released various type of EV vehicles to achieve the highest class low power consumption rate and battery deterioration prevention function using these technology.

Development of high performance inverter for EV vehicles of commercial use

EV vehicle for commercial use made by EVM is equipped with a water-cooled, IP67 waterproof, and high-efficiency inverter with a proprietary multi-CPU, achieving the highest level of low power consumption, long battery life, and safety.
As a result, our mass-production models have a long cruising distance (more than 200km in WLTC mode) and the same price range as the fuel cell vehicle.

Developing automatic driving technology of level 4

EVM plans to build a final assembly plant for mass-production model of EV vehicles in Fukushima Prefecture with a test driving course including automatic driving.
And , we are trying to developing Level-4 class automatic driving system for EV commercial vehicles.
We are challenging to realize safe and fully automatic driving system for EV commercial vehicles with the latest various high-performance sensors technologies(DGPS, laser radar, 3D camera, etc.).

Vehicle Introduction ～EV Trike～

EV Motors Japan

The FUNC series is an EV trike for small delivery, and has a good balance between the mobility of a motorcycle and the transportation capacity of a truck.
This series is used for express services and retail delivery.
The car body weight is made lighter by devising materials and construction methods.
It can load various container sizes.

FUNC CARGO COOL is a model equipped with refrigeration function.
The refrigerating function can control the temperature from -18 ℃ to 10 ℃.
It can efficiently deliver beverages, perishables, flowers and other refrigerated products for cold chain delivery.
It is only 980mm width, so it's easy to drive and to park in tight spaces.
It can run about 70km on a single charge.

We can prepare various lineups according to the purpose such as delivery, sightseeing, advertising etc.

Appendix 4

Vehicle Introduction ～EV Bus～

EV Motors Japan

It is a compact 30-seater minibus that can travel up to 230 km.
In the disaster, it can be as a mobile power supply vehicle equipped with a large capacity battery.

It is a large route bus that can travel up to 250 km.
In the disaster, it can be as a mobile power supply vehicle equipped with a large capacity battery.

-Functions-
1. Low floor flat structure
2. Uses composite materials of latest long-life and lightweight for EV chassis and frame (20-years long-life assuarance)
3. Realization of long-distance driving with the highest class low power consumption system(in WLTC mode 250km)
4. Battery control system that suppresses deterioration
5. Battery can be selected according to the purpose
(Long life type, cold region type, non-combustible specification, ultra-quick charging type, low cost type)
6. Flexible solar panels can be mounted on the side and ceiling of the car body

We can prepare various lineups according to the purpose of sightseeing, transportation, etc.

Appendix 5

パラオ国際空港における観光客輸送 EV バス及び充電設備導入に際する導入条件・課題

1. 概況：

パラオ共和国政府（ROP）が掲げる環境政策目標として、公共インフラ通商省（MPII; Ministry of Public Infrastructure, Industries and Commerce）オビアン大臣より、以下の情報があり。

1）2025 年までに CO2 排出量を 22%削減（2005 年との比較において）

2）45%の電源を再生可能エネルギーとする

3）2005 年比 35%のエネルギー削減

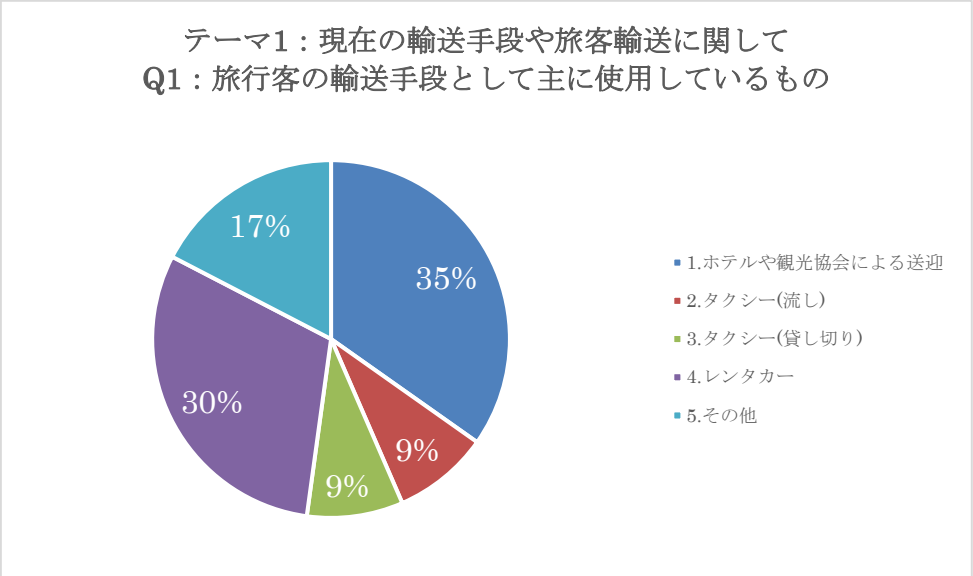
今回、株式会社 ATGREEN（AG）が調査対象とする観光者輸送用 EV バスおよびその電源に PV を使用することは、上記政策に将に合致するとのコメントが大臣のみならず、Belau Chamber of Commerce（BCC）[注1]会長、Palau Visitors Authority(PVA)[注2] MD、ホテル数社よりもあり、総じてコンセプトとしては、受け入れらやすいプロジェクトと感じられた。

注１： 観光関連会社である旅行代理店・ホテル・ダイブショップなどで組織されていた Palau Travel Association(PTA)は、現在 BCC に吸収されている。

注２： PVA は、独立した組織でパラオの観光促進活動を行っている。大統領府直轄の組織で、国の予算で運営されている。

2. ヒアリング結果-1（共通の質問）：

以下に、ヒアリング結果を報告する。最初に共通の質問について。



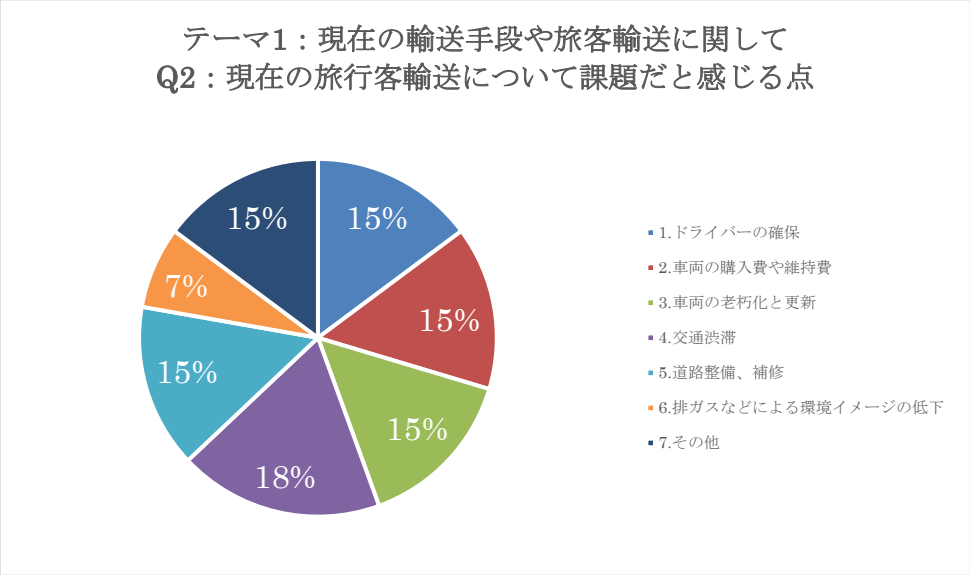
ホテルや観光協会による送迎が 35%との回答となったが、観光協会（民間観光関係者が集まって組織化された協会は、今は PTA を吸収した BCC であるが、BCC としては旅客輸送を行っていない。回答者の中には観光協会＝旅行代理店と解釈した方もおられ、また、その他（17%）は全て旅行代理店による送迎と回答されており、実質過半数は、ホテルないし旅行代理店の送迎となっている。

タクシーとの回答もあったが、パラオ内でタクシー会社は現在存在しておらず、10 台程度の所謂白タクが走っている状況であり（ヒアリング時に回答者に確認）、実質は左程使用されていないのではないかと思われる。

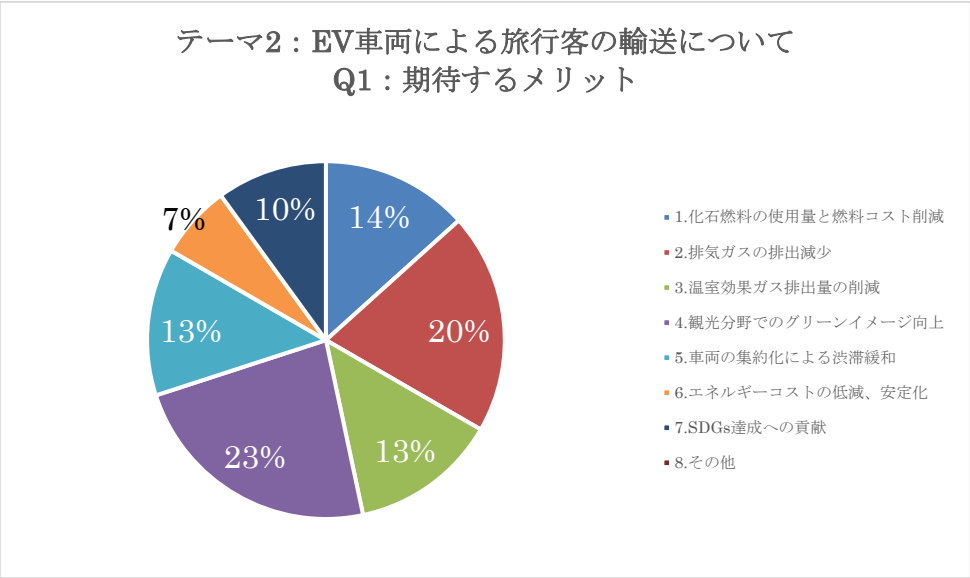
Appendix 5

基本的には、パラオへのアジアよりの旅行者（日本・台湾・韓国）はまだパッケージツアーによるものが多く（全体の 60～80%）、旅行代理店・ホテルが手配した運送手段を利用。欧米豪よりの旅行者およびリピーターは FIT [注3] の率が多く、レンタカーを借りるケースが多い様子。

注３： FIT Foreign Independent Tour 個人で行く旅行のこと。コロナ前の状況であるが、パラオへの到着便は深夜が多く、タクシーも自由に拾えず、かつ公共交通機関もないこと、加えてホテルより観光地・ツアーに行くにも交通手段がないことより、未だパラオへはパッケージツアーの比率が高いとのこと。



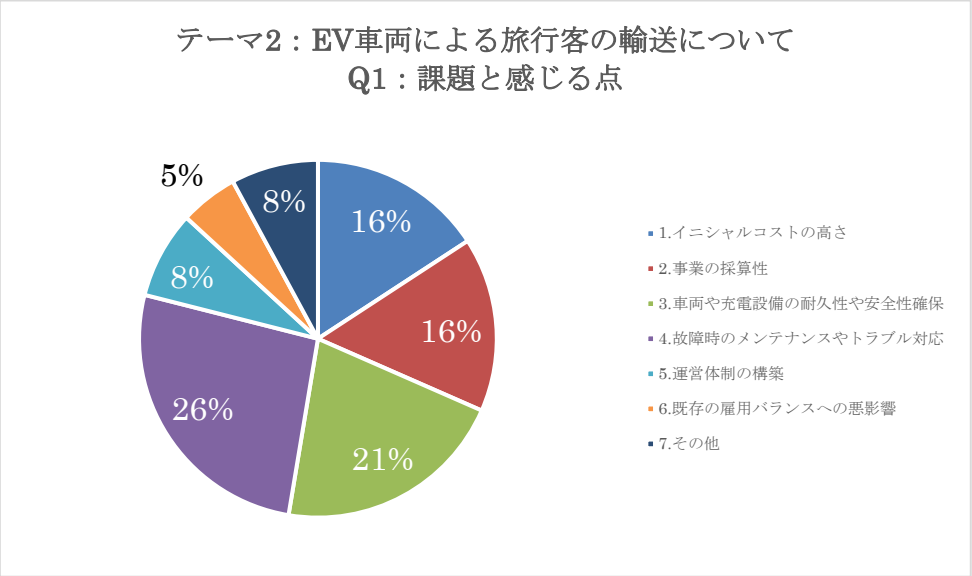
課題については、まんべんなく全項目に回答があったが、環境イメージの低下につながるとの回答は少なかった。空港－ホテル間の送迎だけを考えると、パラオ就航便は深夜便が多く、その時間帯は交通渋滞のない時間帯である。その他の回答で、“公共交通機関がない”という課題が示されていた。また、BCC よりは、自動車学校・運転手養成所の設立も提起された。



EV 車両導入について、期待するメリットとしては、観光分野でのグリーンイメージ向上および温室効果ガス排

Appendix 5

出量の削減が上位に挙げられた。MPII、PVA、BCC および Palau Pacific Resort(PPR)よりは、将にパラオ政府の目指す方向性に合致しているとのコメントあり。
また、かかる公共交通機関を設けることで、パラオへの FIT を増加させ、ひいてはパラオへの観光客増につながるとの意見もあった。　すなわち、公共機関がなく、移動手段がレンタカーしかない（タクシーは限られる）状況下で、パッケージツアーに抵抗がある観光客の取り込みにつながるという考えであり、貴重な意見である。



一方、課題であるが、故障時のメンテナンスやトラブル対応、車両や充電設備の耐久性や安全確保の回答が上位に挙げられた。また、その他の回答で EV のエキスパートがパラオにはいないこと、保守をどうするのかという回答もあり。これら回答に共通するのは、導入実績がない EV に対する技術・バックアップ体制への不安と思われる。過去、パラオにおいてプリウスの中古車が輸入されたことがあったが、誰も整備できずに、早々に廃車になった事例があるとの情報もヒアリング時にあった。（Cove Resort）
また、技術のエキスパートのみならず、運営のエキスパートも不可欠との意見が BCC よりあった。この件の詳細は、個別質問の項目で報告する。

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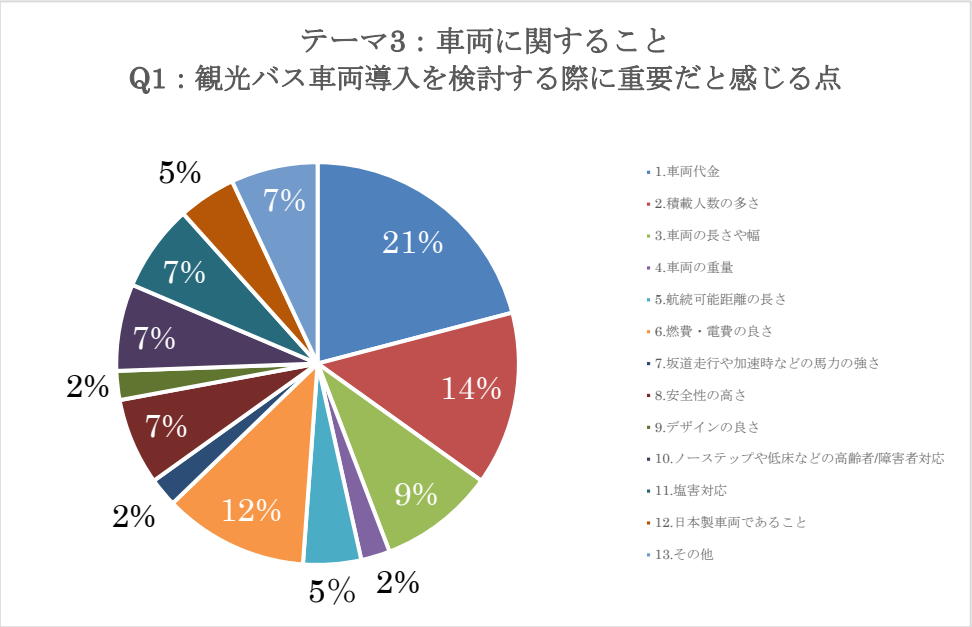
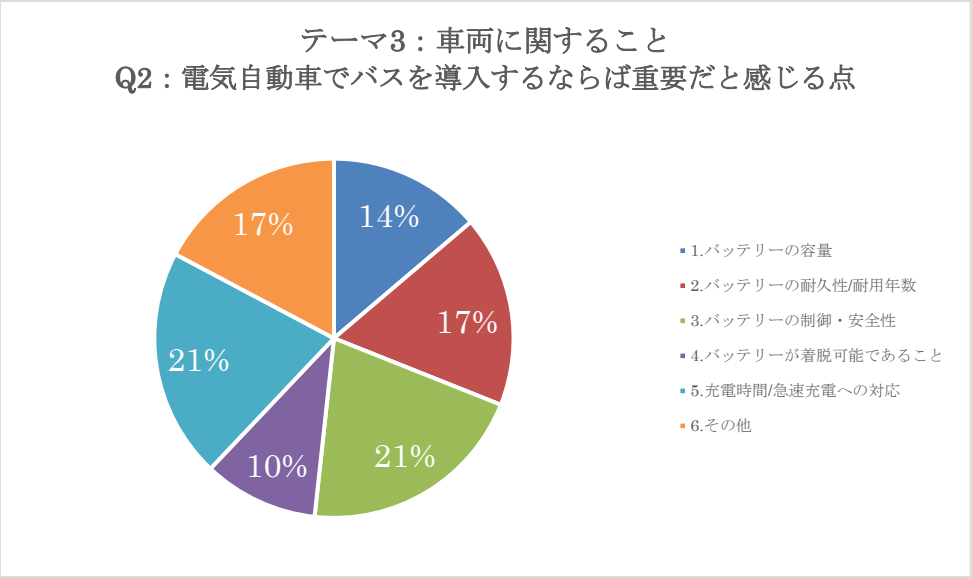


観光バス車両導入時を検討する際の重要項目としては、車両代金、積載人数の多さ、燃費・電費の良さが上位に挙げられた。導入コストおよびランニングコスト、多くの乗客を乗せられることによる収益という採算を考えた回答か？

一方、デザインの良さ、車両の重量、坂道走行や加速時の馬力についての重要度はあまり示されなかったが、空港⇔コロール市街地入口、Route A　PPR 近辺は、傾斜のきつい道が続くので、EV の場合は馬力の検討は必要かもしれない。（動画による道路情報参照ください。）

また、その他で、荷物スペースがあること、乗降口が右側にあることという回答があった。

観光客（特にダイバー）は荷物が多く、小型バスでは座席が荷物スペースで取られてしまうことより荷物を収めるスペースがあった方が良いという指摘。また、後者はパラオにては右側通行にて、右側に乗降口があるべきという指摘。当たり前のことながら、日本で使用されていた中古バスがパラオに輸入されて走っている（乗降口が左）ケースが多々あることよりの指摘。



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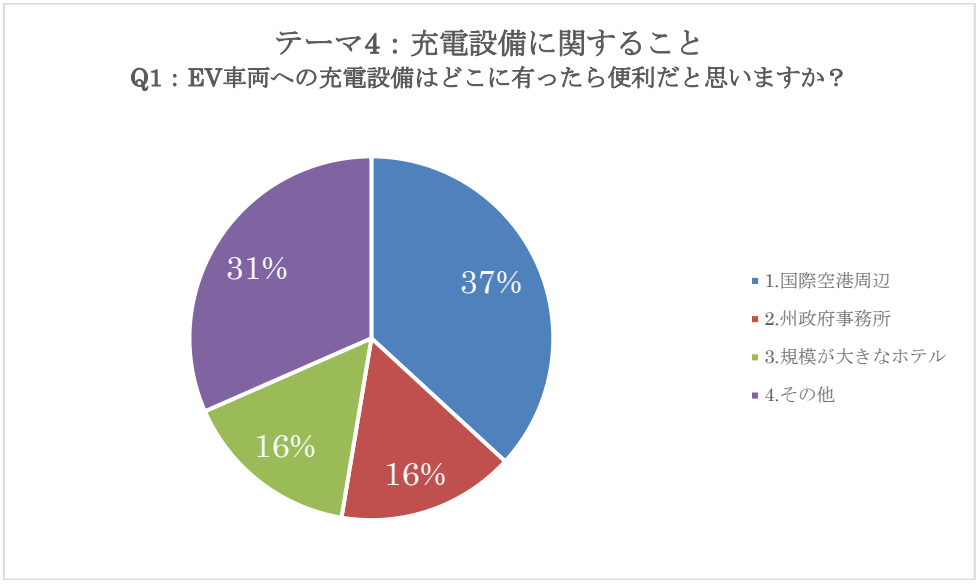
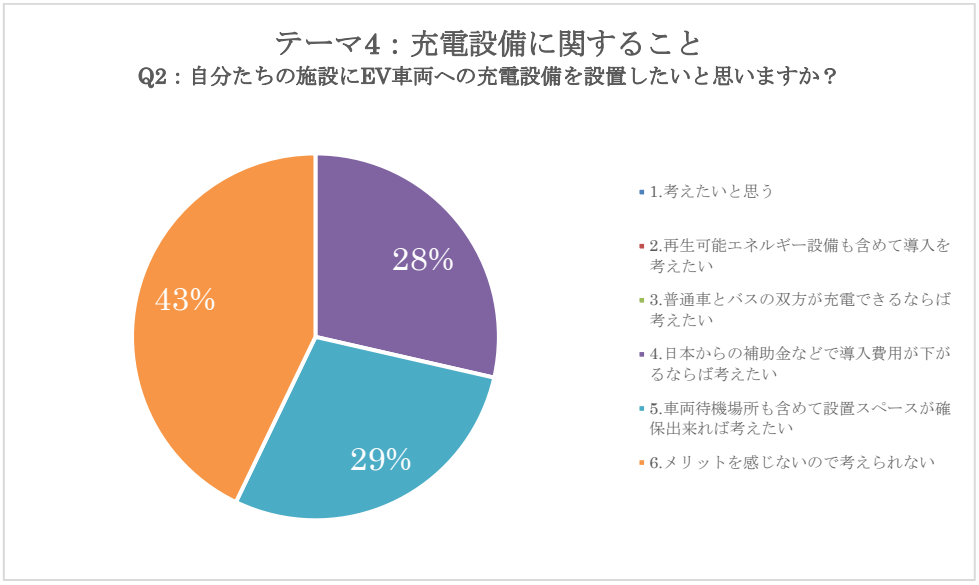
電気自動車でバスを導入する場合の重要点については、各項目に回答が散らばっているが、バッテリーの脱着についての回答は比較的少なかった。その他にて、メンテナンスが重要とする回答もあり。（Garden Palace）これは、テーマ 2　Q3 の EV 車両の課題にても指摘されている。



充電設備の設置場所については、起点となる国際空港周辺とその他の回答が多かった。その他はすべてコロール市街地中心部で、バス駐車可能スペースがあるところ、ガソリンスタンド（スペースがあるので）という補足もあった。



自分たちに施設に充電設備を設置したいか？という設問に関しては、設置の意向を示す回答はなく、メリットを感じないので考えられないという回答が筆頭であった。未だ、どの様に運営がなされるか明確な案がない中での議論にて、致し方ない回答と思われる。その表れとして、日本からの補助金が出るならば、設置スペースが確保できればという回答が次に来ている

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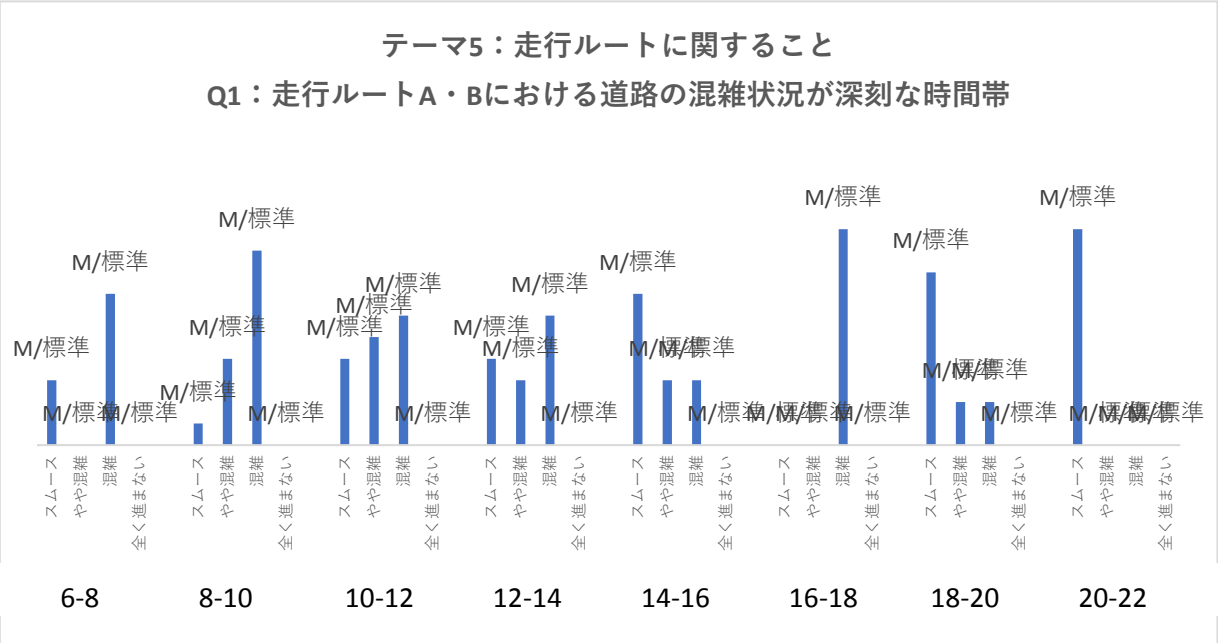
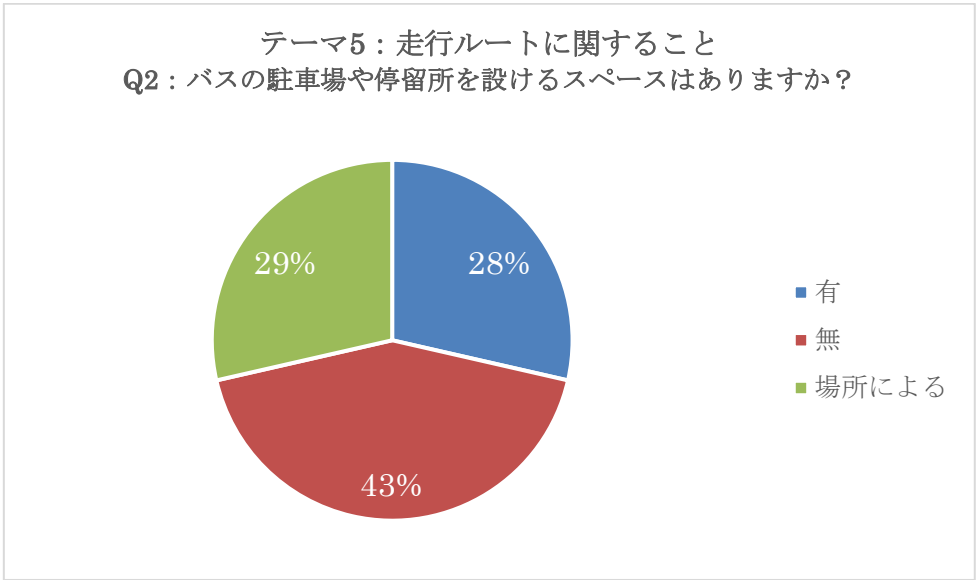


走行ルート A・B における道路の混雑状況については、ヒアリング対象者にて若干のばらつきはあったが、通勤・通学時の 6-10 時（8 時前後がピーク）と帰宅時の 16-18 時が混雑、18 時以降は、スムーズに流れるという回答であった。全く進まないという渋滞はどの時間帯もないという結果であった。



バスの駐車場や停留所を設けるスペースについては、回答が分かれたが、道路沿いでそのまま駐車場・停留場に使えそうなスペースは限られる。実際に旅行代理店として顧客移動用にバスを運行している Belau Tour よりは、特にコロール市街地での駐車スペースには困っているとの回答があり。土地確保して新たに建設する必要がある（Garden Palace）との回答もあった。市街地では、政府機関（Culture Center や National Gym）の駐車場の活用はできないかとのコメントもあった。（PPR）

3. ヒアリング結果-2 （個別の質問事項）：

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1）観光部局・空港　テーマ 1　Q3　旅行客運送につき、公共事業・官民連携事業として検討した経緯はあるか？また、その可能性は？

BCC 回答：　民間企業が独自でバスの運営を検討したことがあるが、技術・運営の専門　　知識がなく断念した。

PIAC 回答：　検討は未だ行ったことがない。国が公共事業として単独で行うことは考えにくく、やるとすれば官民連携事業となると思う。ビジネスとして成り立つのか最大の課題になる。

Belau Tour よりの情報：　コロナ前にツアー客の輸送の為に市内循環バス（ホテル―レストラン―スーパーマーケット等を循環）を行なっていた経緯がある。自社の送迎バスの空き時間を利用したものであるが、バス事業としての採算は全く取れず、ツアー客を引き付ける手段としての効果を狙ったもの。バスの停車場所でバスが時間待ちをしている際、停車地点の店と揉めたり（邪魔になる）、渋滞による遅延などの問題も常時発生していた由。
コロナ収束後に再度サービスを提供するかは未定。

2）観光部局　テーマ 1　Q4　　今後　民間連携含めて政府で事業として実施・民間に協力する可能性はあるか？

BCC 回答：　PPEF や国家予算を使った支援は得られる可能性はあると思う。

MPII 回答：　ビジネスモデル次第であるが、民間連携の可能性は否定しない。

3）観光部局　テーマ 4　Q1　電気自動車が公道を走行する上においての規則

MPII 回答：　事例がなく問題点がまだ分からず、規則はない。将来的には規則設定が必要。

4）観光部局　テーマ 4　Q2　公道を走行する際の車長・重量に関する法規制

MPII 回答：　上記の通り電気自動車にはないし、通常車における明確な法規制もない。

5）観光部局　テーマ 4　Q3　車両のメンテナンスに関する点検義務

MPII 回答：　年に 1 回　点検が必要。EV に対しては、今後決定することになる。

ヒアリングした方々：　年一回　車両登録を更新する際に、5 分程度で終わる簡単な点検を行う（ライトが付く、ストップランプがつく等）

6）観光部局　テーマ 4　Q4　EV 車両の関税および HS コード

Custom 回答：　関税　5%＋250 ドル（手数料）
HS コード　8303．80．10　新車
20　中古車

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7）観光部局　テーマ 5　Q2　政府施設に充電設備を整備することは検討できるか？
　空港　テーマ 4　Q1　　空港周辺に充電設備を設置する検討はできるか？

MPII 回答：　検討は可能と思う。
PIAC 回答：　検討は可能。
8）観光部局　テーマ 6　Q2　EV 充電設備設置の規制

MPII 回答：　車両同様に導入事例なく、今後の策定となる。

9）観光部局　テーマ 6　Q3　EV 充電設備の関税・HS コード

Custom 回答：　EV 車両用充電設備というカテゴリーはないと思うが、タリフ表を提供するので、内容をチェックしてほしい。（添付）基本的に適用の判断が難しい場合には、個別に仕様書と共に申請書を提出してもらい、Custom が判断することになる。

10）観光部局　テーマ 6　Q4 他社に電気を販売・供給する場合の規制

PPUC：　売電については、ケース毎に協議することとなる。

11）観光部局　テーマ 7　Q2　走行ルート路面状況がわかる資料はあるか？共有可能か？

MPII 回答：　測量等のデータは保有していない。
＊ ここ 2 年間にて、今回対象になっている走行ルート（幹線道路）の舗装改良がおこなわれており、過去に比べて状態は良くなっている。
全ての走行ルートの往復の動画を送付するので、道路状況とおおよその状況はそれでご判断いただきたい。

12）観光部局　テーマ 8　Q1/Q 2/Q3　JCM で支援を行った太陽光発電設備で政府が保有/運用に関与しているものがあるか？　またある場合はどのプロジェクトか？また、その該当プロジェクトで発電された電力を活用できるか？

PPUC 回答：　政府が関与しているプロジェクトはない。（すべて民間）

13）空港　テーマ 6　Q1 空港の太陽光発電設備にて発電された電力を活用できるか？

PIAC 回答：　空港の太陽光発電設備は JICA による無償資金協力によるもので、JCM 制度に基づいたものではない。PPUC が所有・運用権を持っているが、一部空港にも還元してもらっている電力もあるので、条件次第で検討は可能。

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４．まとめ：

✧ 今回のヒアリング項目には含まれていなかったが、そもそも公共交通機関がパラオで存在しない理由は、自家用車が普及している（一家に複数台）ことにあるとの意見が多かった。また逆に公共交通機関がないことより車の普及がすすんでしまったのかもしれない。

✧ EV のコンセプトは、受け入れられる土壌はある様に見受けられたので、環境問題と絡めた EV 車両による公共交通機関の推進コンセプトをまずはパラオ政府との間で協議することが必要ではないかと感じた。チャレンジングではあるが、幹線道路へのガソリン車乗り入れ規制、車検・登録の強化、排ガス規制を法規制化するなど規制面から取り組みが不可欠と感じる。BCC 会長よりも同様の示唆があり、ビジネスモデルがしっかりできたら、EV 化推進の政府へのロビー活動への協力は行うとのコメントはあった。

✧ 今回のヒアリングにて、浮き彫りになった課題として、導入実績がない EV 車両ゆえに
保守・メンテ体制の構築および関連法整備の必要性を感じた。
また、導入の際に重要と感じる点にコストに関する関心が寄せられたが、基本的には
パラオ政府よりの資金はほぼ期待できないゆえ、JCM 制度や無償資金援助などを上手
く活用できるスキーム構築が必要となる。

✧ パラオ関係者とのヒアリングで特に感じたのは、パラオ政府ないしパラオ民間企業では EV バスの保守など技術面のみならず、バス運行のオペレーションもできないということ。EV バス導入にあたっては、オペレーションを主体的に行っていく組織が必要。

以上

Appendix 6

The following is a "Summary Report" for the above mentioned project and includes pictures and specifications of waste collection vehicles among others. It sums up the answers to inquiries made through the provided hearing questionnaire.

Hearing Conductor: **KE+ Environmental Consulting Services** on behalf of **ATGREEN Co., Ltd.**

Respondents:
-Mr. Selby Etibek, Manager, Solid Waste Management, Department of Public Works, Koror State Government
-Mr. Katsuo Fuji, Consultant, Solid Waste Management, Department of Public Works, Koror State Government
-Mr. Calvin Ikesiil, Chief, Solid Waste Management, Bureau of Public Works, Ministry of Public Infrastructures, Industries and Commerce
-Mr. Darl Ellis, Supervisor, Division of Utilities, Department of Public Works, Koror State Government

"Summary Report"

Primarily, a total of four (4) individuals were interviewed face to face during the survey. Others were contacted by telephone for inquiries.
In the case of the Survey for introduction of EV vehicles in waste collection and transportation sector (Themes 1 to 7 on the Hearing Questionnaire), Mr. Selby Etibek and Mr. Katsuo Fuji from Koror State Solid Waste Management were the primary respondents. In addition, officers from Customs & Border Control were contacted through telephone for questions pertaining to tariff codes and tariff rates.
Hearing was conducted on February 05 & 08, 2021 at the Koror State Recycling Center at M-Dock.

Theme 1: Current Waste Transportation Method(s)
Currently, waste collection and transportation in Koror State is carried out using 2 Ton loading capacity Garbage Trucks (4 units) for general residential household wastes, Public Park wastes, Schools & Government Offices. They usually travel a **maximum distance of 40 km/day and at times a minimum of 25 km/day** depending on waste volume. All four (4) Garbage trucks are equipped with **Press Type** loading mechanism and **Extruded Type** discharge mechanism.

**Please refer to attachments for detail specifications on garbage trucks.*

Appendix 6

2 Ton “Recycling Dump Trucks” (4 units) are utilized for small quantity bulky wastes, yard waste & kitchen waste for composting, plastics for pyrolysis recycling, and beverage containers for CDL program. In addition, (2 units) 5 Ton multi-purpose Dump Trucks are utilized for large quantity bulky wastes such as construction waste, large volume yard waste, and disaster waste among others. The 2 Ton Recycling Trucks usually travel a **maximum distance of 15 km/day as opposed to minimum distance of 10 km/day** on lighter days. The 5 Ton dump trucks don’t have precise mileage data for waste collection as they are not specifically assigned for waste collection and transportation.

(Mileage data are based on daily mileage records and average daily fuel consumption)

**Please refer to attachments for detail specifications on Recycling Dump Trucks & Dump Trucks.*

There are no major problems or issues with waste collection and transportation trucks pertaining to operations and functions of the vehicles. Most mechanical issues are easily fixed and parts are readily available locally or ordered overseas. Rather, a glaring issue is caused by a major external factor, more specifically, the close proximity to the ocean (salt water) which causes rapid rusting and breakdown of the vehicles’ main bodies and external components. This situation places a burden (both operational and financial) on users/ operators in order to keep vehicles in safe operational conditions.

In the case of introducing EV Garbage Trucks and/ or EV transportation trucks for Koror State, the Solid Waste Management Division and the Heavy Equipment Division (both under the Department of Public Works) are the primary focal points for such matter. Otherwise, the Department head- Director of Public Works or his assignee may assume charge role.

Theme 2: Project concept of transporting waste by EV vehicles

Expected Benefits and Challenges:

It is expected that the introduction of Electric Vehicles for waste collection and transportation will provide compounding benefits. The most principal of these benefits include 1) Reducing dependence on fossil fuels which in turn reduces fuel cost in the case where renewable energy is the source of charge, 2) Improving the image of environmental consideration for the waste management sector and promoting activities aimed at creating a zero-carbon society, and 3) Provide much needed contributions to achieving the Sustainable Development Goals within the waste management system. These benefits will definitely lead to a much cleaner and safer environment. However, there are expected challenges associated with the introduction of Electric Vehicles in the waste management sector. Chief of all the concerns include 1) The high initial cost needed to acquire and set up equipment’s to sustain operations of Electric Vehicles, 2) Concerns of maintaining durability and safety of vehicles and charging station, and 3) Concerns of establishing maintenance system in case of failure.

Appendix 6

Theme 3: Electric Vehicles specifications

In the case of desired specifications when acquiring waste transportation and collection vehicles, it is highly considerable that the vehicle system allows for 1) Economical or low fuel/ electricity consumption, 2) Loading capacity is an important aspect of operational efficiency, and 3) The vehicle is manufactured with consideration for protection against salt damage. The most important things to consider when introducing EV waste collection and transportation vehicles are 1) Battery capacity, 2) Battery durability/ service life, 3) Battery control and safety (control against overheating), 4) Availability for quick charging, and 5) Vehicle's loading capacity and measures against salt damage.

Theme 4: Charging Equipment

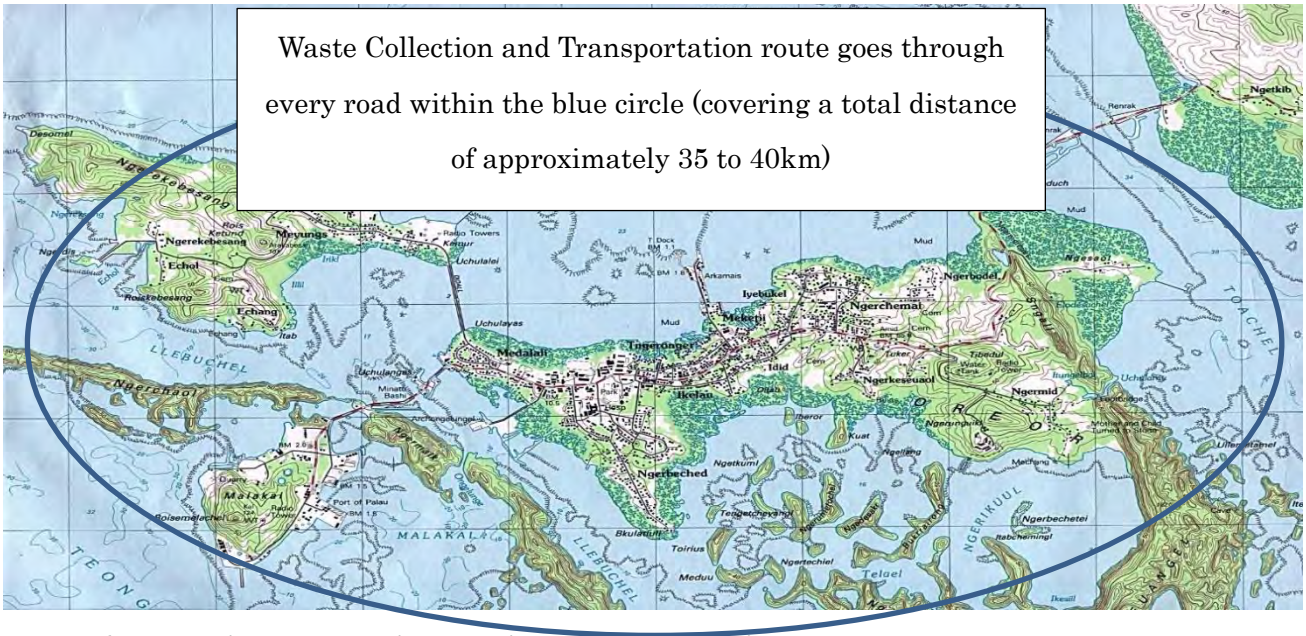
Presently, the most available and accessible site for waste management vehicles for parking is the M-Dock Recycling Center, which is the base for all waste collection and transportation vehicles for Koror State Government. It is also anticipated that the Koror State Solid Waste Management will occupy and operate the M-Dock Landfill soon. Therefore, two (2) locations, the M-Dock Recycling Center and M-Dock Landfill, are the most suitable places to locate an EV charging facility if conditions allow for the introduction of Electric Vehicles in the waste management sector of Koror State. In such case where EV vehicles are introduced, there are a few capacities or specifications which are highly desired. 1) Charging connection methods (example: charging facility can charge different sizes and types of cars, trucks and buses), 2) Economically friendly initial cost, 3) Durability and extended service life of charging equipment.

Theme 5: Waste collection and transportation routes and transportation distances

Waste transportation route from Koror State to the new National Landfill in Aimeliik State is depicted in the map shown below. The anticipated route or collection plan is as follows: **Collection trucks depart from the M-Dock Recycling Center ---> various Collection Points until reaching loading capacity, then ---> Aimeliik Landfill site for final disposal ---> M-Dock Recycling Center**. This route is estimated to gross an estimated 45 to 50 KM per waste collection truck on a daily basis. However, Koror State Solid Waste Management is currently in the process of taking over operations of the M-Dock landfill. It is estimated that Koror State can continue using the M-Dock landfill for approximately 5 to 7 years before it is filled to capacity. In addition, a plan is in place to establish a "Transportation Station", which is designed for purposes of waste sorting & transferring. It is planned to be constructed within the confines of the M-Dock landfill. This will allow for all waste in Koror State (including business waste) to be deposited into M-Dock for retrieval of recyclable material before actual waste materials are finally disposed in the M-Dock landfill or transferred to Aimeliik landfill site.

Appendix 6

Currently, the waste collection and transportation route covers every household, Public Parks, Schools, and Government Offices & Facilities. This requires trucks to travel the full distance of the main road and all the secondary roads in Koror State. The total road distance covers approximately 35 to 40Km. This means that one complete cycle of waste collection throughout the State of Koror will gross a collective distance of approximately 3 times the total road distance or 120Km at most. This is taking into account the 2Ton loading capacity of garbage trucks which will require frequent discharge.



Theme 6: Regulation about vehicle running and import duties

Currently, regulations on vehicles are limited to Vehicle Road Use Tax which categorizes registration fees for vehicles based on their weight. There are no specific regulations on Electric Vehicles, therefore, they are treated the same as fuel vehicles. Other vehicle requirements that are for the purpose of ensuring road safety are that vehicles must have functioning lights (head lights, parking lights, brake lights, signal lights) and horn in order to be registered and allowed to operate in public roads.

Appendix 6

The tariff handling for EV vehicles is the same as regular fuel vehicles. The tariff rates are fixed and Garbage trucks and Dump trucks for waste collection and transportation purposes are considered “Special Purpose Vehicles”. They are listed under Tariff Code 8705.90.00 and have a tariff rate of 5% + $250.00.

Theme 7: Regulations about import duties for charging facility

Regulations pertaining to charging facilities for EV vehicles are treated the same as regular electrical facilities as there are limited cases in Palau for EV charging stations. Tariff handling is also treated the same. The Tariff code is 8543.70.00 and is considered among “Other machines and apparatus” with a tariff rate of 3%.

At present, there are no particular regulations pertaining to the sales and supply of energy using a charging facility.

In the case of Local issues in the waste field sector and other projects that contribute to zero-carbon society, Mr. Calvin Ikesiil, Chief of the National Solid Waste Management Division and Mr. Darl Ellis, Supervisor of the Divison of Utilities in Koror State Government were the primary respondents. Hearing was conducted on February 10 - 12, 2021 at the National Bureau of Public Works Conference room located in Medalii, Koror and then on February 15 - 18, 2021 at the Koror State Department of Public Works compound located in Malakal, Koror.

Theme 1: Carbonization waste treatment of used tired and used fishing nets.

Waste tires had been a long standing pollutant around the island nation as well as in the marine environment and coastal waters, bringing on a burden of harboring vector-borne disease carriers which in turn caused almost regular and constant outbreaks of vector-borne diseases such as dengue fever and other health problems. This prompted the National Government to seek aid in acquiring a tire shredder to tackle the overwhelmingly increasing issue of waste tires. Hence, the tire shredding treatment commenced in 2017.

During a time in which the local economy saw rapid growth due to increased tourism activities and infrastructure development, waste tires were estimated to reach 100,000 on an annual basis. This number was brought about solely by the number of existing vehicles on island as well as the anticipated imports of cars and tires based on Customs & Border Control’s previous data on importation.

Before the tire shredding treatment option was available, waste tires which were dumped in the landfill were freely given away to individuals and/ or entities for repurposing. However, there are no records showing the number of waste tires given away for reuse or repurpose. Waste tires are usually repurposed as flower pots in gardens, swing sets for children in playgrounds, car stoppers in parking lots, boat cushions in docking areas, and also used to build retaining walls among other things.

Appendix 6



The implementation scheme of the tire shredding treatment is to encourage end users or tire shops to bring waste tires to the M-Dock Landfill, where the tire shredding facility is located. From there, tires will be shredded and given away to construction companies or individuals to be used as backfill materials. Another option which has been an ongoing discussion is to include tires with the Deposit system (CDL) upon import. This gives further incentives to end users and tire shops to redeem waste tires for recycling purposes and provides a funding mechanism which can hopefully fund the exportation of shredded tires for off-island recycling.

Capital Source: National Recycling Fund which is derived from the Container Deposit Legislation.

The Capital Expense as reported by the National Bureau of Public Works was $335,000.00 US. This expense includes housing facility, shredder and belt conveyors, electrical control panels, and additional parts. The average annual operating expense covers the following: Labor Cost (4 Staff) - $35,000.00, Utility Cost (includes electric and water bill): estimated at $5,000.00, Spare parts and work supplies: $10,000.00, Fuel Cost for moving/ transporting waste/ shredded tires: $2,000.00. **ESTIMATED AVERAGE ANNUAL OPERATING EXPENSE: $52,000.00**.

As for Fishing Nets and other fishing waste, there is very limited data. There are no specific, categorized data on marine debris/ litter. The only data available is from a daily waste measurement survey in 2015 conducted by Koror State Government and AMITA which reveals 508 kg/day of mixed marine debris from rock islands and coastal waters. Currently, most fishery waste are brought directly to the M-Dock landfill for final disposal. However, the plan is to eventually treat fishery waste through the Pyrolysis System (Plastic to Oil) at the Koror State Recycling Center in M-Dock.

Theme 2: Possibility of LED Lighting introduction

The current situation for LED streetlights in Palau is controlled by the Palau Public Utilities Corporation as they are the main recipients for Taiwan government support program and/ or other donors.

It was originally planned that Koror State, the most populous state, be the target where all public roads and public

areas receive LED streetlights. Total number of installations was estimated at 600 LED lights of mostly grid system connected. Only a few numbers were independent types (estimated at around 100 units). A large portion of Koror State have installed streetlights. However, a few areas where grid lines aren't available have yet to be installed. These areas are considered for stand-alone, independently powered streetlights. These areas include docking areas, coastal areas, public parks and a few streets where grid lines are not accessible. An estimated number of approximately 250 units of independently powered streetlights will be able to cover these areas.

Koror State faces an issue of ownership concerning streetlights. There is a need for state owned streetlights where states are able to control and maintain the lights while they are connected to the public grid system which is controlled by the Public Utilities Corporation.

***Additional information pertaining to project funding:**

As per Mr. Katsuo Fuji, Consultant with Koror State Solid Waste Management, discussions are ongoing with the Asian Development Bank and arrangements are being made for funding from JICA Headquarter (ODA) for "Koror State Transportation Station Project" including "Public Private Partnership Project", "PET flake & pelletizing project" and could potentially include "Introduction of EV vehicles for waste collection and transportation".

End of Summary Report

Appendix 7

Achievement report meeting

FY2020 City-to-City Collaboration for Creating a Zero-carbon Society

Feasibility Survey of promoting of carbon-free society and co-benefits through the implementation of EV vehicles in the state of Koror, Republic of Palau

(City to City collaboration between Koror state and Kitakyushu city)

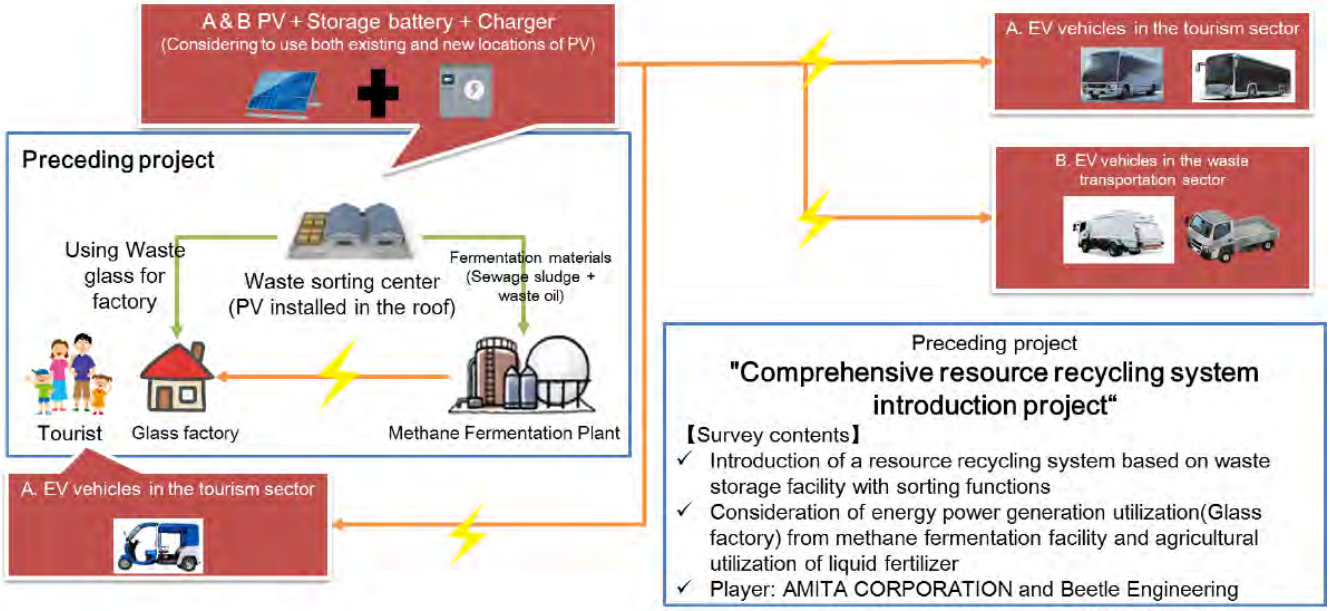
March 2021

Kitakyushu City (Asian Center for Low Carbon Society)
AMITA CORPORATION
EV Motors Japan Co., Ltd
Institute for Global Environmental Strategies
ATGREEN Co., Ltd

【Remind】 Overview of proposal project

We are going on feasibility survey of the introduction EV vehicle technologies as a means of decarbonization and co-benefits, based on the cooperate relationship between Kitakyushu City and Koror State.

[Proposal model and survey issues] * In the red frame
A. Introduction of EV vehicles (buses, etc.) in the tourism sector
B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector
C. Consideration of other technology solutions to contribute to carbon-free society and local issue



Preceding project

"Comprehensive resource recycling system introduction project"

【Survey contents】

- ✓ Introduction of a resource recycling system based on waste storage facility with sorting functions
- ✓ Consideration of energy power generation utilization(Glass factory) from methane fermentation facility and agricultural utilization of liquid fertilizer
- ✓ Player: AMITA CORPORATION and Beetle Engineering

Appendix 7

【Remind】 Local issues related to this project (Assumed)

Palau is visited by many tourists. So, we assume that there are many local issues in Palau such as energy, tourism and waste sector.

Sector	Issues	Detail
Energy	High dependence rate for Fossil fuel	· Impact of GHG emissions · Increased exhaust gas · The risk of changes in energy procurement costs
	Increasing load on the electricity grid due to the introduction of renewable energy	· Increasing load on grid due to acceleration of large-scale PV introduction · Response to surplus power and sudden output fluctuations · Risk of both short-period fluctuations and long-period fluctuations
	Consideration for renewal for existing diesel power generation equipment due to aging	· Power outage · Expanding for renewable energy according to national energy plan
Sightseeing & Transportation	Seriously environmental impact due to increasing tourists	· Increased waste, especially progress of marine pollution · Improving the landscape and environmental image of tourist destinations
	Impact on the environment due to traffic jam	· There are many means of transportation, but it is dispersed (e.g. Taxi, Shuttle Bus, Hotel pick-up service) · Increased exhaust gas and noise
Waste Treatment	Increasing costs of waste transportation and treatment	· Increased waste by tourists · Increased transportation costs to landfill site in Aimeliik State · Increased fossil fuel consumption due to transporting for landfill site · Energy recovery from waste

for Confidential 3

【Reporting Tourism side】 Assumed model of tourism EV vehicle introduction

We are considering to operate a shuttle bus to move between the airport and hotels. So, we would like to set up a charging station near the airport. In addition, we would like to use renewable energy from solar power at charging stations.

<Passenger sheet capacity> 30 seats(Including driver)
<Battery Power>114kWh
<Range on a single charge> 230km
<Provisional Route>
Route A (Airport ~ Palau Pacific Resort / 14.6km)
Route B (Airport ~ Icebox Park / 13.1km)
<Charging Station> Near the airport
<Charging Method> CHAdeMO (EV vehicles made in Japan use CHAdeMO.)

for Confidential 4

Appendix 7

【Reporting Tourism side】Acceptance of the concept

We interviewed the stakeholder about this concept with the cooperation of PIAC(Palau International Airport Corporation). Mr.Charles I. Obichang, the Minister of MPIIC, says this project matches with national policy. BCC, PVA and some hotel also say similar idea.

Target Field	Name
Hotel	Palau Royal Resort(PPR)
Hotel	Palau Organic Farms/Nishi Corporation(Garden Palace Downtown Koror)
Hotel	Palau Pacific Resort(PRR)
Hotel	Palasia Hotel
Hotel	COVE Resort Palau
Travel agency	U.B.D.I.BELAU TOUR
Travel agency	IMPAC Tours
Chamber of Commerce	Belau Chamber of Commerce
Public organization	Palau Visitors Authority
Ministries	Ministry of Public Infrastructure, Industries and Commerce (MPII)
Ministries	Custom
Airport	Palau International Airport Corporation
Utilities company	Palau Public Utilities Corporation

Feedback from stakeholder

▾Expected Merit of introduction EV
- GHG and exhaust gas reduction
- Image up of tourism sector

▾ Current issues of tourism transportation
- Securing vehicle purchase and maintenance costs
- Aging vehicle
- Construction of public transportation system

※BCC proposes to establish a car driving school

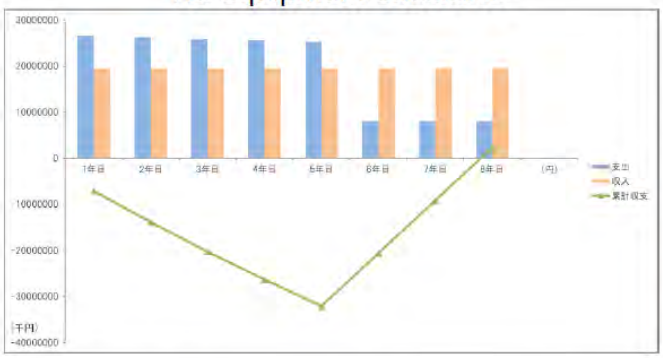
【Reporting Tourism side】Cost Simulation

We tried an approximate simulation of introduction costs. It is important to promote the use of buses to secure income from tourists. In addition, it is necessary to actively consider the use of subsidies in order to quickly recover the cost.

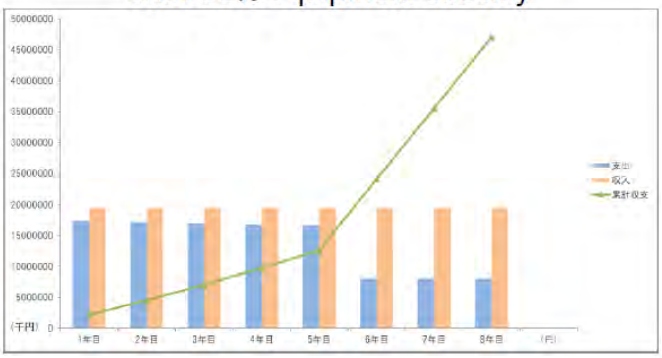
<Common conditions>

- Equipment costs(Over 750 thousands Dollar)
- Income from tourist(Over 150 thousands Dollar per year)
- Borrowing period(5 years)

No equipment subsidies



With 50% equipment subsidy

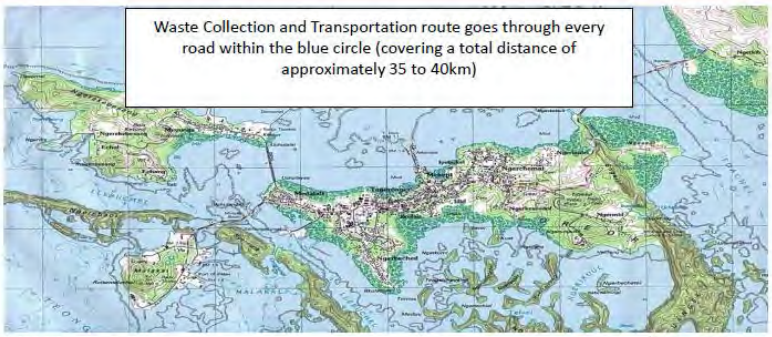


It is seen that it is difficult to recover the investment without equipment subsidies from this simulation.

Appendix 7

【Reporting Waste transportation side】Assumed model of waste transportation EV vehicle introduction

We are considering to operate EV garbage truck for waste collection and transportation. We would like to set up a charging station near the M-dock. In addition, we would like to use renewable energy from solar power at charging stations.



The main parameters	
Length (mm)	6795
Width (mm)	2100
Height (mm)	2400
Wheelbase (mm)	3360
Curb Weight (kg)	6090
The rated load quality (kg)	1995
GVW (kg)	8280
The dog house feeder volume (m³)	1.1
The dog house feeder size (wido) (mm)	990
Compression way	双方向压缩
The cycle time of loading	<165
Waste discharge time	<205
The garbage box effective volume (m³)	6
The sewage tank (L)	200
Compression ratio	1:3
Hydraulic system pressure (MPa)	16.2
Power Train	
Type	Pure EV
Motor Type	TZ365XS-YBM303
Rated power (kw)	60

<Charging Station> M-Dock
<Charging Method> CHAdeMO (EV vehicles made in Japan use CHAdeMO.)

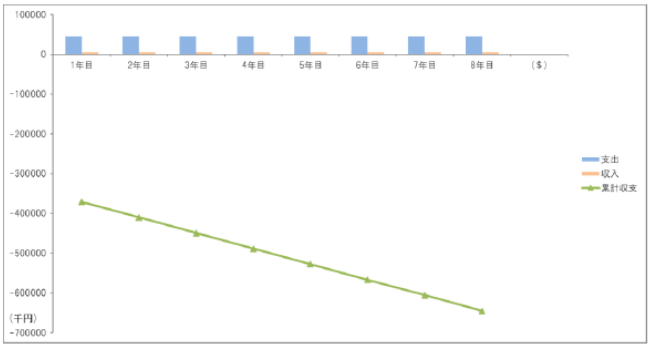
【Reporting Waste transportation side】Cost Simulation

We tried an approximate simulation of introduction costs. It is important to promote the use of buses to secure income from tourists. In addition, it is necessary to actively consider the use of subsidies in order to quickly recover the cost.

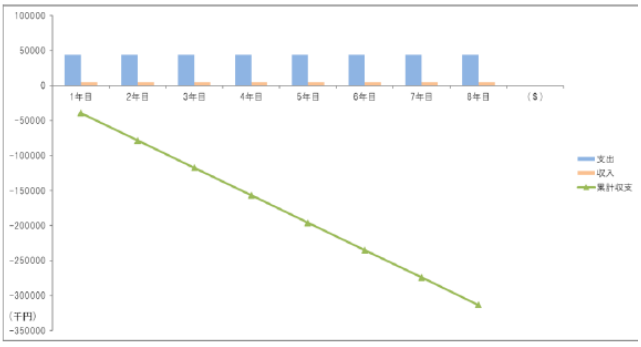
<Common conditions>

- Equipment costs(Over 650 thousands Dollar)
- Cost reduction benefit (About 5 thousands Dollar per year)
- Not borrowing

With 50% equipment subsidy



With 100% equipment subsidy



It is seen that it is difficult to proceed the project without higher rate equipment subsidies from this simulation. At the same time, it is necessary to reduce maintenance costs and equipment renewal costs.

Appendix 7

Survey progress and issues

At first, we planned to visit Palau 3 times in FY2020. Although, we were unable to visit due to pandemic of COVID-19 virus. Fortunately, we were able to conduct the survey for the introduction of EV vehicles in the tourism and waste sectors with local corporations. Thank you for cooperation.

A. Introduction of EV vehicles (buses, etc.) in the tourism sector

- We consider the possibility of introduction of a shuttle bus.(from the airport to the hotel)
- Stakeholders in Palau understand the significance of this project.
- This EV project in tourism sector may be a partnership with the airport company.
- It is important to reduce the initial cost, build a bus operation system and build a maintenance system.

B. Introduction of EV vehicles(packer vehicles, truck, etc.) in the waste transportation sector

- We consider the possibility of introducing garbage trucks and loading trucks.
- We plan to use these mobilities for waste collection and transporting to the landfill site.
- This EV project in waste transportation sector may be a partnership with the Koror States.
- It is important to reduce the initial cost and build a maintenance system.

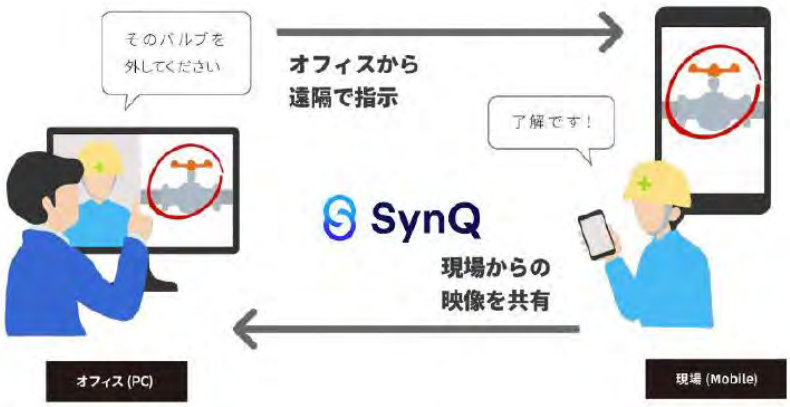
Issues of EV vehicles Introduction

✓ Reduction for initial costs ⇒It is necessary to get various budget to reduce spending.
✓ Maintenance system ⇒It is necessary to build a remote maintenance system, etc.
✓ Promotion organization ⇒Tourism sector is especially necessary

【supplemental information 】Remote maintenance tool developer in Kitakyushu-city

At first, we planned to visit Palau 3 times in FY2020. Although, we were unable to visit due to pandemic of COVID-19 virus. Fortunately, we were able to conduct the survey for the introduction of EV vehicles in the tourism and waste sectors with local corporations. Thank you for cooperation.

SynQ Remote はオフィスや自宅など、離れた場所にいても
まるでその場にいるかのように現場とコミュニケーションがとれる
現場に最適なリモートワークツールです



Corporation name: QUANDO Inc.
Business content: IT tool developer / consulting

Their product, SynQ remote, is support tool of remote maintenance system with smart phone application.

We are considering building a remote maintenance system for EV vehicles with this tool.

Appendix 7

Activity Report 3

Possibility of forming other projects that contributes to a carbon-free society

Institute for Global Environmental Strategies (IGES)

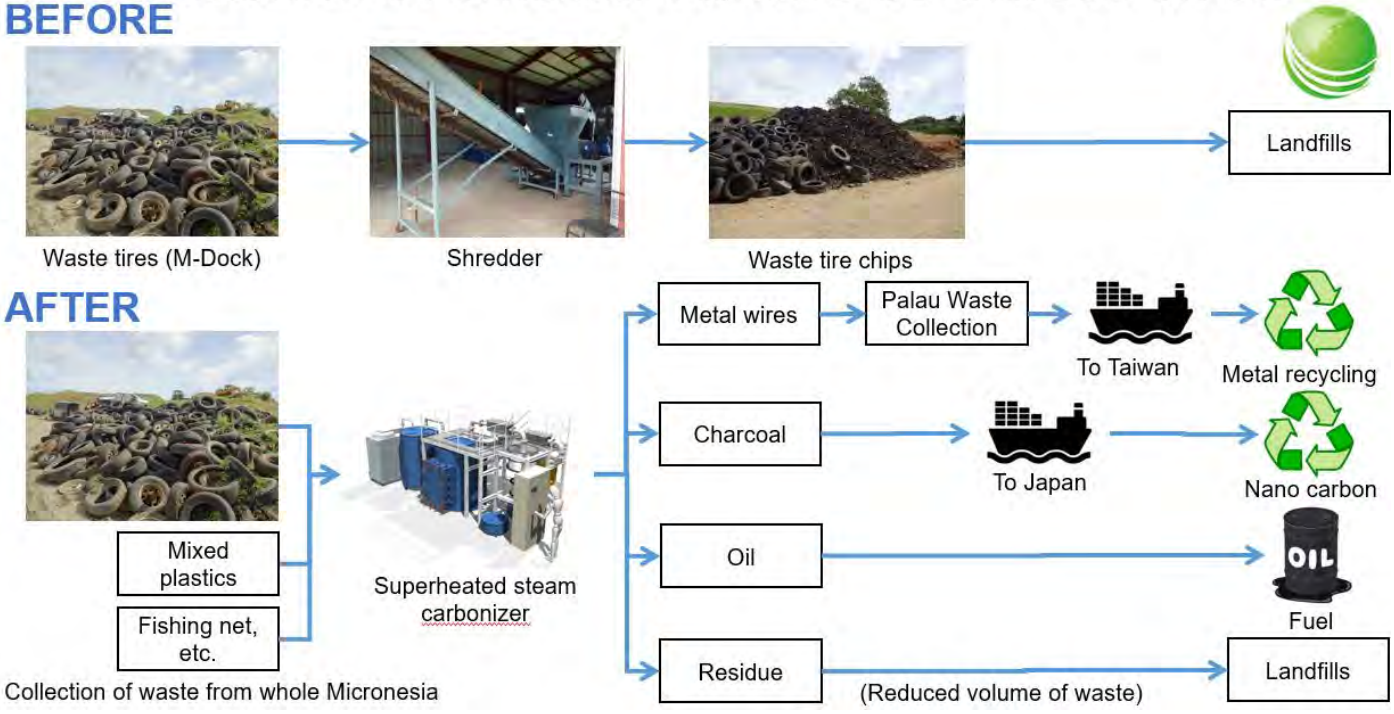
JCM application in large resort hotels

Future plans to install low carbon equipment

	PV system 	Diesel engine generator (co-generation) 	Central chiller system 
PPR 	Already installed (26.1 KW)	YES	YES
PRR 	NO	NO	NO

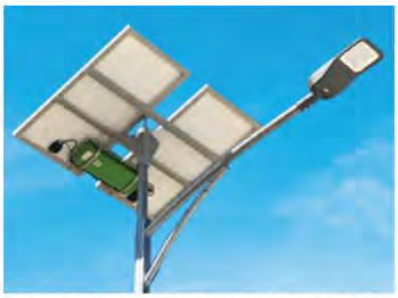
Appendix 7

Creation of added values to waste tires



LED street lighting

DHOWA TECHNOS



LED Solar Light (JOIN PLANNING)

210W, 110W, 80W, 60W

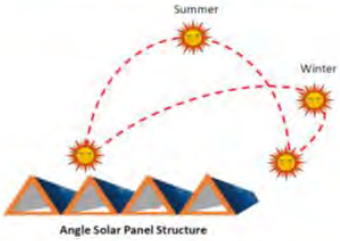
Customization to local needs (LED samples provided to Davao City)

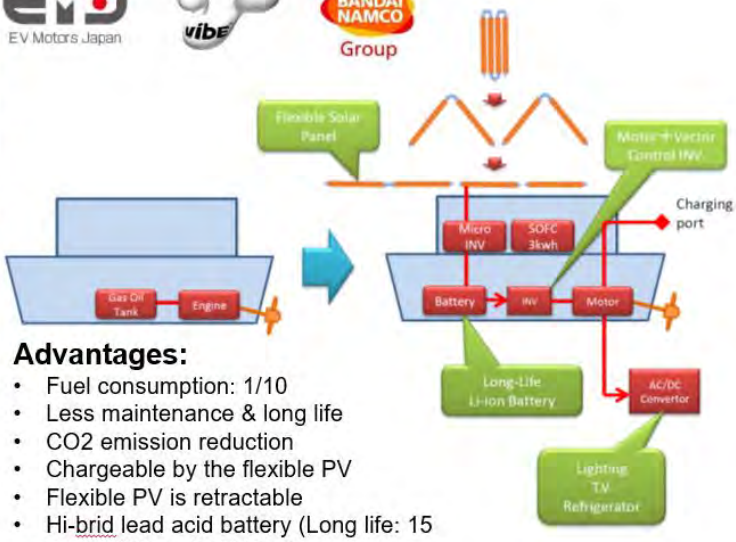
	Grid LED lightings	PV/LED lightings (off-grid/independent)
Koror State	Approx. 500 units	Approx. 100 units (Potential needs: 250 units)
Other States	?	?

Appendix 7

Transforming engine-ship to e-ship

EV Motors Japan





Advantages:

- Fuel consumption: 1/10
- Less maintenance & long life
- CO2 emission reduction
- Chargeable by the flexible PV
- Flexible PV is retractable
- Hi-brid lead acid battery (Long life: 15 years; 1/2 cost of Li-Ion)
- Safety and free-from-maintenance
- GPS spotting system
- Backup fuel by Solid Oxide Fuel Cell

Appendix 8

成果報告会資料

令和2年度 脱炭素社会実現のための都市間連携事業委託業務

パラオ共和国コロール州におけるEV車両導入を通じた
脱炭素化促進およびコ・ベネフィット創出事業
(コロール州・北九州市都市間連携事業)

2021年3月

北九州市 (環境局環境国際戦略課 アジア低炭素化センター)
アミタ株式会社
株式会社EVモーターズジャパン
公益財団法人地球環境戦略研究機関 (IGES)
株式会社ATGREEN

1. EV車両導入に向けた検討

Appendix 8

【観光分野】　想定EV車両導入モデル

ホテルと空港を結ぶシャトルバスの導入モデルについて検討を進めています。充電器については空港近隣への設置を想定。併せて、PVパネル(+パワコン)・蓄電池を整備し、PV発電分を蓄電し、再エネで走行する観光EVモデル構築を想定しています。

<乗客数>　30(運転席含)　　<バスバッテリー容量>114kWh　　<航続可能距離> 230km
<充電方式> CHAdeMO (日本式EV車両の充電方式)
→EVバスの主要生産国である中国BYD社のバスは独自規格の充電器。今回のプロジェクトを通じて、CHAdeMO式充電器の導入が進めば、日本国のEV車両の充電に使用される為、将来的な日本車EVの拡大・展開戦略にも有利になる可能性有

パラオ観光の拠点となる国際空港に充電拠点を整備することで、主要なホテルや景勝地へのアクセスを確保(台数が増えてくれば、中央部での充電拠点整備の検討も必要)

<計画走行ルート>
Route A (パラオ国際空港～Palau Pacific Resortホテル/14.6km)
Route B (パラオ国際空港～アイスボックス公園/13.1km)

【観光分野】旅客輸送の現状と本事業コンセプトへの利害関係者コメント

現状、パラオ国には商用EV車両は1台も無い状況です。そこで主要な利害関係者へ本コンセプトについての印象・意欲を尋ねるとともにパラオ国の現状の旅客輸送の現状や課題、EVバス車両による観光輸送に期待する点をヒアリングしました。調査に際しては、パラオ国際空港の運営会社であるPalau International Airport Corporation(PIAC(※))の協力を得て実施しました。以下、利害関係者のコメントを記載します。

●パラオ政府公共インフラ通商産業省(MPIIC)　オビアン大臣コメント

パラオ国の直近の環境政策目標として以下の3つがある。

1）2025年までにCO2排出量を22%削減(2005年比)
2）電源の45%を再生可能エネルギーとする
3）2005年比35%のエネルギー削減

出所)国土交通省HP(H30年3月14日)
牧野副大臣(当時)表敬訪問時の様子より

本プロジェクト(観光用EVバス+電源へのPV活用)は上記政策に正に合致するとのコメントを頂き、ビジネスモデル次第で官民連携の可能性も検討されるとの趣旨のコメントも有りました。同様の趣旨のコメントはBelau Chamber of Commerce(BCC/ベラウ商工会)やPalau Visitors Authority(政府系観光促進団体/PVA)、複数のホテルからも寄せられています。

●PIACとの本プロジェクトにおける連携の可能性について

PIACには日本国側の中間持株会社(Japan Airport Management Partners Co., Ltd.)が51%、パラオ共和国政府も49%出資しており、滑走路の拡張やホテルの建設(計画)など、パラオ国の観光地としての魅力向上による収益力強化がミッションになっています。本EVプロジェクトについてもその側面から関心が寄せられています。

※日本の総合商社である双日株式会社が中心となって国際空港(ロマン・トメトゥチェル国際空港)の運営権をコンセッション方式で取得。
日本側中間持ち株会社は双日株式会社48%、日本空港ビル31.9%、株式会社海外交通・都市開発事業支援機構(JOIN)20.1%で構成。

Appendix 8

【観光分野】旅客輸送の現状と本事業コンセプトへの利害関係者コメント

ここでは各所にて行ったヒアリングについて、要旨を採り上げます。ヒアリング先は以下の通りです。

ヒアリング先	組織名
ホテル	Palau Royal Resort(PPR) / Palau Pacific Resort(PRR) / Palasia Hotel / COVE Resort Palau Palau Organic Farms/Nishi Corporation(Garden Palace Downtown Koror)
旅行代理店	U.B.D.I.BELAU TOUR / IMPAC Tours
商工会	Belau Chamber of Commerce
公的機関	Palau Visitors Authority
政府機関・公共機関	公共インフラ通商産業省(Ministry of Public Infrastructure, Industries and Commerce (MPIIC)) 税関
Airport	パラオ国際空港会社(Palau International Airport Corporation)
Utilities company	Palau Public Utilities Corporation

●現状の主要な旅客輸送手段は?
・ホテルや旅行代理店による送迎
→アジア圏顧客はほぼパックツアーでこれを利用
・レンタカー
→欧米客は個人旅行が多く、レンタカー利用が大
・白タク(国内に10台程度)

●現状の旅客輸送の課題は?
・車両購入費用や維持費確保
・ドライバー確保
・車両の老朽化と更新
・交通渋滞

●EV車両導入により期待されるメリット
・観光分野のグリーンイメージ向上
・温室効果ガスの排出削減

※MPIIC／PVA／BCC及びPPR(東急不動産系列の高級ホテル)からはパラオ政府方針との合致とのコメント。パラオの個人旅行増加による観光客増への期待も寄せられる

●EV車両導入時の課題は?
・故障時対応や**メンテナンス対応**(技術者不足)
・耐久性や安全性
・(公的機関の立場では)規制等が無い点があり、整備が必要
・公共交通の運用ノウハウ欠如
※中古プリウスが輸入された際に誰も整備できずに廃車になった事例があり、メンテナンスは重要課題

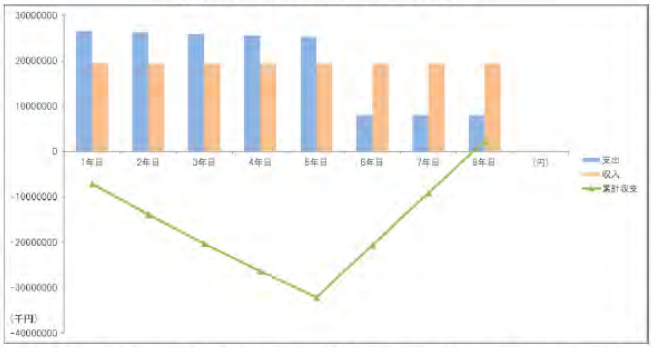
関係者限り 9

【観光分野】コスト試算

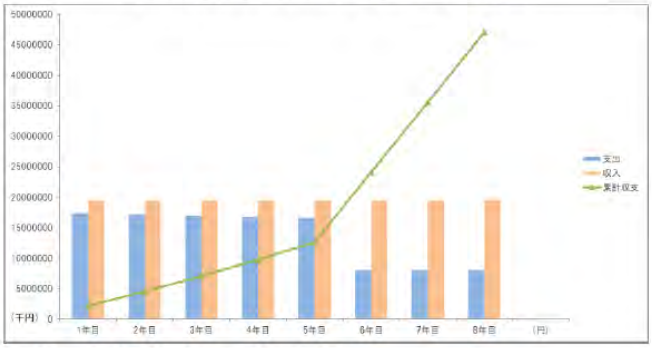
現地での調査が出来ていない点も有り、現時点で判明している範囲の概算でコスト試算を実施しました。観光客の一定利用があれば、設備更新の積み立てをしながら採算性を確保することが期待出来る結果となりました。但し、EV車両＋PV(パワコン含)＋蓄電池＋充電器全体のイニシャルコストの負担は8千万円近くと大きく、イニシャルコストを低減するファンドの確保を行うことが望ましい結果となりました。

<試算条件>
・設備費(参考価格：車両2,800万円/充電器300万円/蓄電池2,600万円/PV+パワコン600万円)
・エンジニアリング費用・トレーニング費用等は計上
・観光客からの収入 (年間2,000万円近くの売上を想定)
・5年借入
・関税は考慮(現地確認済)、設備運搬費は非計上
・メンテナンス費(設備費5%/年)、ドライバー費用は計上、ホテル等からの輸送業務委託費は未計上

設備費補助無しの場合



50%設備費補助を受けた場合



設備補助無しだと回収は単年度黒字は返済後の6年目以降。累損解消は8年目以降。
50%の設備補助があれば単年度から黒字化の可能性有。現状は観光客(コロナ前2万5千人程度)の2割が往復800円で利用した場合で試算を実施しています。

関係者限り 10

Appendix 8

【廃棄物収集運搬部門】 想定EV車両導入モデル

コロール州にある廃棄物処分場M-Dockは、埋立処分場として延命措置が取られてきましたが最終処分場は北部のアイメリーク州に移ることとなっています。そこでM-Dockでは、廃棄物資源化を通じた循環型社会形成を進め、埋立最終処分量の縮減に繋げるとともにガラス工房による観光客誘因や農業プロジェクト等に繋げる計画を立てています。このプロジェクトはアミタ株式会社がコロール州と連携してPPPとして進めているプロジェクトです。今回はこのM-Dockにおける廃棄物回収・収集運搬車両のEV化を図り、廃棄物処理分野における温室効果ガスの排出削減を目指すものです。

<バッテリー容量>110kWh
<航続可能距離>180km未満
<積載量> 1,995kg
<車両総重量> 8,280kg

<充電設備想定設置箇所> M-Dock
<充電方式> CHAdeMO方式

The main parameters	
Length (mm)	6795
Width (mm)	2100
Height (mm)	2400
Wheelbase (mm)	3360
Curb Weight (kg)	6090
The rated load quality (kg)	1995
GVW (kg)	8280
The dog house feeder volume (m)	1.1
The dog house feeder size (wide) (mm)	990
Compression way	双方向压缩
The cycle time of loading	<16s
Waste discharge time	<20s
The garbage box effective volume (m)	6
The sewage tank (L)	200
Compression ratio	13
Hydraulic system pressure (MPa)	16.2
Power Train	
Type	Pure EV
Motor Type	TZ365XS-YBM303
Rated power (kw)	90

当初アイメリーク⇔M-Dockの運搬をベースにモデルを想定していましたが現地ヒアリングを経て州内の回収・収集運搬を主に据えております。(おおよそ35~40km程度)

関係者限り 11

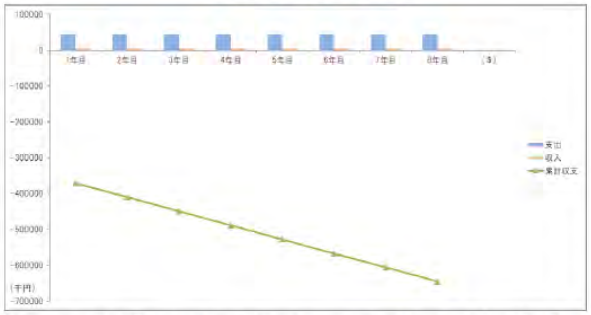
【廃棄物収集運搬部門】 コスト試算

観光分野と同様に現地実地調査が出来ておりませんので現時点で判明している範囲の概算でコスト試算を実施しました。観光バスと異なり、EVパッカー車を導入することによる収益確保要素が化石燃料コストの低減しか無く、50%あるいは100%の設備助成を受けたとしても採算性の確保は厳しい結果となりました。但し、本試算においては車両や充電器等の更新に備えて毎年300万円程度の積み立てを行っていること、初回導入時に必要となる充電器や蓄電池などの費用がそのまま計上されていることで不利な試算となっていることには留意が必要です。

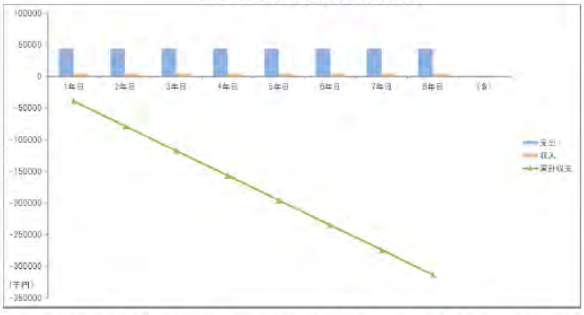
<試算条件>

- 設備費(参考価格：車両1,800万円/充電器300万円/蓄電池2,600万円/PV+パワコン600万円)
- エンジニアリング費用・トレーニング費用等は計上
- 燃料費用削減貢献は計上
- 5年借入
- 関税は考慮(現地確認済)、設備運搬費は非計上
- メンテナンス費(設備費5%/年)は計上、ドライバー費用は非EV車両と同一と考え非計上

50% 設備補助



100% 設備補助



なお、いずれにしてもイニシャルコスト低減は重要テーマとなりますので、輸送距離に合わせたバッテリー容量のリサイズ、蓄電池の容量見直し等に拠ってイニシャルコストの見直しの余地はまだあるものと考えられます。

関係者限り 12

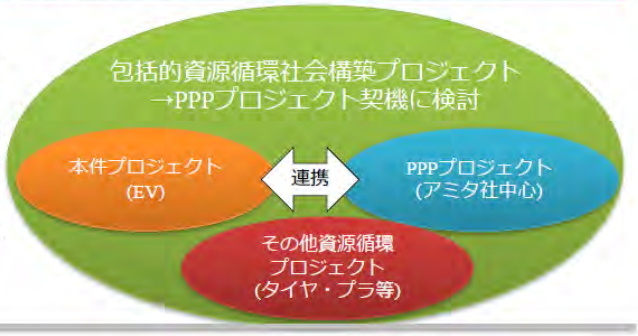
Appendix 8

【廃棄物収集運搬分野】廃棄物輸送の現状と本事業コンセプトへの利害関係者コメント

本事業と密接な利害関係者であるコロール州廃棄物管理事務所のマネージャーSelby氏、コンサルタントの藤勝雄氏らとは、本コンセプトを共有し、廃棄物処理部門での温室効果ガスの排出削減施策としてEV化の推進を前向きに考えていきたいとのコメントを得ており、ローカルコンサルタントの協力も受けながら調査を進めています。

●コロール州廃棄物管理事務所コメント

コロール州としては、アミタ社と連携して進めているPPPプロジェクトをきっかけに包括的な資源循環社会構築プロジェクトを推進しており、様々な種類の廃棄物に対して資源循環を進めて、最終処分量を圧縮していきたいと考えている。
併せて、一連の運搬処理フローにおける脱炭素化も重要と考えており、このEV導入プロジェクトは前向きに検討していきたい。



●廃棄物回収・収集運搬の現状

・コロール州は4台のパッカー車を保有。週5日収集運搬に出ている。
一日の走行距離は最低25km～最大40km
・その他に2tダンプ(4台)、5tダンプ(2台)を保有。
一日の走行距離は最低10km～最大15km
・アイメリークへの運搬を複数回繰り返す場合は、一日で120km程度となることも。
(1往復で35～40km)但し、最終処分量を抑制する取り組みを推進している為、利用は限定的と計画。

●EV化についてのコメント

・現状なら充電拠点はM-Dockが最適だと考えられる。
・期待メリットは**化石燃料依存度や燃料費用削減・廃棄物管理分野のイメージ向上・脱炭素社会への貢献**
・想定される課題は、**初期コスト・メンテナンス・安全性**

関係者限り13

EV導入における調査まとめ・成果と課題　次年度以降の対応策

観光・廃棄物EVともに期待されるメリットと課題と感じている点について、概ね共通している点が特徴として挙げられました。また、現地の利害関係者の多くから温室効果ガスの排出削減に向けた施策としての期待が寄せられている点も特徴と考えられ、本プロジェクトの現地での親和性は期待できるものと考えられます。

A. 観光分野のEV車両導入検討

- 空港からホテルへのシャトルバスを検討
- パラオ国の利害関係者からは本プロジェクトへの期待の声が寄せられた
- 観光客の起点となる国際空港との連携は重要と考えられる
- イニシャルコストの低減と共にメンテナンス体制の構築が課題
- 公共交通のノウハウが乏しいので運行システムに対するキャパビルや知見に明るい体制構築が必要

B. 廃棄物回収・収集運搬分野におけるEV車両導入検討

- 廃棄物回収・収集運搬時のパッカー車の導入検討(トラックは走行距離が短い点が課題)
- 新規の埋め立て地への運搬をベースで想定していたが、現地からは回収時の運行に対する期待が寄せられた。
- コロール州からは州の進める包括的な資源循環社会構築プロジェクトとの連携への期待が寄せられた。
- イニシャルコストの低減とメンテナンス体制の構築は廃棄物分野においても課題

課題と次年度以降の検討・対応策(案)

✓ イニシャルコスト低減･･･ADBやJICAなど多様な支援・財源の確保と車両仕様の精査
✓ メンテナンス体制･･･リモートメンテナンスなど島嶼部に適したシステムの検討
✓ 実施体制・推進体制･･･観光分野では運行システム含めた検討・対策が必要

関係者限り　14

Appendix 8

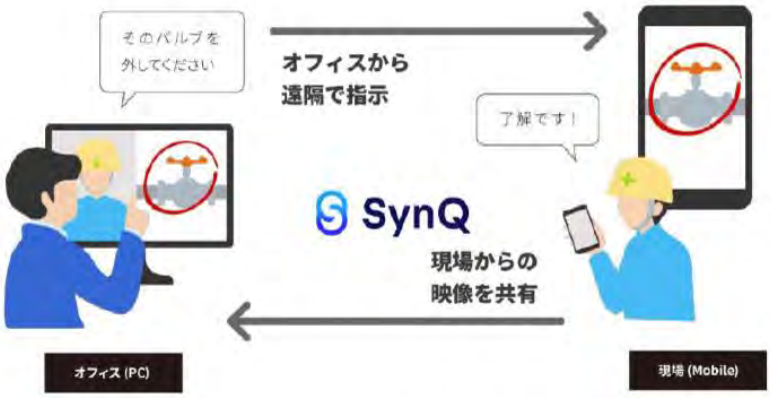
【補足情報 】リモートメンテナンスツール “SynQ”の活用

次年度以降の調査に北九州市のスタートアップ企業「クアンド社」が開発しているメンテナンス業務に活用しやすい遠隔コミュニケーションツール ”SynQ” の活用を考えています。

SynQ Remote はオフィスや自宅など、離れた場所にいても

まるでその場にいるかのように現場とコミュニケーションがとれる

現場に最適なリモートワークツールです



PCとスマホで動画会話をしながら、強調やテキスト指示、図面表示をしながら効果的な遠隔メンテナンスの実施をサポートするツールです。

現地に技術者が不足していること、他の島への展開なども見越して、EV車両のオンラインメンテナンス活用の可能性を検討したいと考えています。

関係者限り 15

2. その他案件組成に向けた調査

関係者限り 16

Appendix 8

【その他案件組成に向けた調査】提供可能なノウハウとシーズの整理

パラオ国は人口が1万5千人強と少なく、産業も観光分野に特化していることから一般的にJCMで提案される工場等での省エネ案件の形成・提案が難しい点があります。その中でまず、ノウハウとシーズの整理を行いました。

	提供可能ノウハウ	提供可能シーズ
廃棄物・農業	• 廃棄物組成分析 • 廃棄物分別回収 • 高倉コンポスト • 農業での肥料活用・施設園芸 • メタン発酵+液肥活用 • 再エネ+農業	• 堆肥製造機 • 廃プラ油化 • セメント原燃料化 • 廃タイヤの炭化処理（※） • 高濃度有機系排水処理システム • 家電系樹脂再生 • 廃プラ混合木材 • 太陽光PVパネルリサイクル • 廃小型家電基板リサイクル • 蛍光管リサイクル • 自動車部品リユース
再生可能エネルギー		• 街灯LED化（※）
エネルギーマネジメント 省エネ		• インバーター • 節水型水回り
交通		• 電動船舶（eシップ）（※）

※は別途検討を行ったシーズを指しています。

関係者限り 17

【その他案件組成に向けた調査】検討を行った技術等

検討を行った技術やニーズのヒアリングについてここでは概要を述べます。

(1)大規模ホテルへの設備導入可能性

現在、多くのホテルが休業状態にある中、PPR(Palau Pacific Resort/日系)とPRR(Palau Royal Resort/台湾系)の担当者へヒアリングを実施しました。PPRについては設備更新の予定があることから、今後の案件組成に繋がる可能性をヒアリングすることが出来ました。
反面、PRRは設備が新しく更新予定が無いこと、また台湾系ホテルである為、意思決定プロセスが複雑であることから提案が難しい点があります。

(2)街灯のLED化

パラオ共和国内の街灯整備は電力供給を行うパラオ公共事業公社(PPUC)が実施しています。現地調査によると250基程度の独立式のLED街灯の導入ニーズがあることが分かりました。

現在、フィリピン国ダバオでの都市間連携事業でLED導入に向けた入札に参加した市内企業へ情報提供を行い、意見交換を進めているところです。

コロール州にある独立式のLED街灯

関係者限り 18

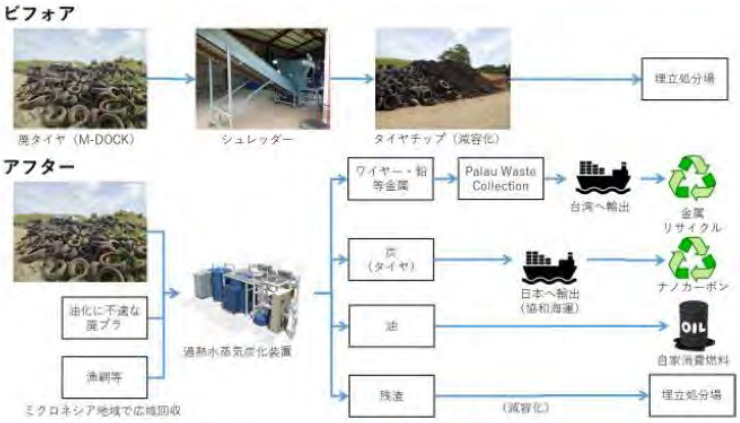
Appendix 8

【その他案件組成に向けた調査】検討を行った技術等

検討を行った技術やニーズのヒアリングについてここでは概要を述べます。

(3)廃タイヤの処理

パラオ国内では廃タイヤの処理が進まず、堆積しているとのことでコロール州から情報提供がありました。タイヤについてはM-Dockでの処理を前提に持ち込みを推奨しているものの、タイヤ中のワイヤーの分別が困難であり、破砕処理の実施が難しい点も有り、処理が進んでいない状況です。そこで過熱水蒸気炭化装置を保有する市内企業の技術を活用し、ナノカーボンの抽出や金属のリサイクル、再生油の精製に活用する機器導入に期待が有ることが分かりました。これは漁網などの処理への展開も期待されます。



(4)EV船舶の導入可能性

EV車両導入の検討で本調査事業へ参画していますEVモーターズ・ジャパン社では電動船舶も開発しています。リチウムイオン電池ではなく、鉛蓄電池を活用し、コストを低減させている点が特徴です。併せて既存船舶の改造モデルである為、比較的低コストでの導入が期待される点もメリットです。次年度以降、EV車両導入検討プロジェクトと連携して検討することで相乗効果が期待されるものです。

関係者との協議や本PJの取り組みの情報発信について

現地関係者とのMTGや本PJの取り組みの情報発信について以下に纏めます。

●現地政府関係者との協議

✓ 現地正式キックオフMTG(11月25日)
→プロジェクト概要や調査における論点等を改めて共有するとともに、これまでのインターナルなミーティングでの議論における進捗の確認などを実施

✓ 現地成果報告会(3月3日)
→調査を通じた成果や事実を報告するとともに今後の検討事項や次年度以降の案件化に向けた協議を実施

●各種ワークショップ等でのプロジェクトの報告

✓ 脱炭素都市の構築に向けた都市間連携セミナーにおけるプロジェクト紹介動画(1月27日～2月3日)
→プロジェクト概要や現時点での課題等について紹介。

✓ パラオにおける二国間クレジット制度の実施に関するウェビナー ～コロナ時代におけるJCMの活用～ (2月26日)
→プロジェクト概要や調査を通じて得られた内容を基に島嶼部のJCM案件化や設備補助に関する意見交換のパネルディスカッションへ参加。小規模な案件のバンドリング申請の可能性やコ・ベネフィットに関する評価、COVID-19後のグリーンリカバリーなどをテーマに議論がなされた

●現地政府関係者や利害関係者とのインターナルMTG

✓ インターナルMTG (6月以降1.5～2か月に一度程度のペースで実施)
→コロール州廃棄物管理事務所やパラオ国際空港の運営会社(Palau International Airport Corporation)との打ち合わせを実施し、現地課題の把握、プロジェクト推進に際する課題や予算確保の可能性に向けた協議や後述するOur Ocean国際会議での発表やコミットメントの内容協議などを実施。

●Our Ocean開催時のサイドイベントでの報告

✓ Our Oceanで再度イベントを開催するべく、イベント開催申請やコミットメント文章の提出を実施
✓ Our Oceanは一度12月に延期されたうえで、最終的には2021年秋へ延期

Appendix 8

全体のまとめ

今年度の結果を踏まえた次年度以降の調査における論点等は以下の通りです。

- 今年度調査を通じて得られた課題の検証と解決策の検討
  - ✓ より利用実態に即した車両や設備モデルの検討
    →最適なバッテリー容量等を再検討する
  - ✓ 設備補助など資金の獲得に向けた検討
    →JCM設備補助は勿論、ADBやJICA等の資金獲得に向けた検討
    コロール州の進める包括的資源循環社会構築プログラムの推進への協力
  - ✓ メンテナンス体制の構築に向けた検討
    →既述のリモートメンテナンスツール活用や人財育成等の体制検討
  - ✓ バス運行等のノウハウの確保
    →ノウハウを保有する組織との連携やプログラム化の検討
- その他新規案件候補について具体的案件化に向けた検討・国内企業との協議・調査等の実施スキーム検討
- 訪問できなかった現地調査を実施し、路面状況・勾配などの調査の実施
- 細かい製品仕様ニーズ把握(バスのドアの向きや床の高さ・段差・荷物積載等)

Appendix 9

EV Motors Japan　Wisdom (Fujian) Motor

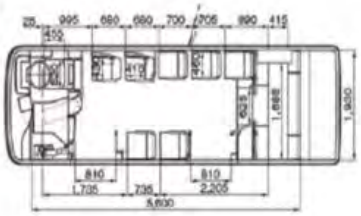
Full electric　Hydrogen

F8 series4-mini BUS　7m マイクロ e-BUS Specification

特長

1. 低床・フルフラット構造の都市バス仕様　全長：7m
2. 軽量化　：最新の長寿命・軽量コンポジット素材による EV 専用シャーシ、フレーム採用
3. 長寿命　：最新のシャーシ、フレーム材料の採用により 20 年の長寿命保証
4. 航続距離　最大 230km　：世界最高クラスの低消費電力システムによる長距離走行の実現
5. 長寿命バッテリー　：世界最高クラスのバッテリー制御システムによりバッテリー劣化を防止
6. 災害時には、大容量バッテリーを搭載した移動電源車として機能
7. 世界最高パーツ、ユニットの採用　：日本、EUを始めとして世界で最高のパーツ、ユニットにて構築
8. 最新デザイン　：一目で EV と分かる最新のデザインにて環境配慮へのイメージアップ
9. 用途に応じて、各種のバッテリーを選択可能
   長寿命タイプ、寒冷地タイプ、不燃仕様、超急速充電タイプ、ローコストタイプ
10. オプションにて天井、側面にフレキシブルソーラーパネルを搭載可能
11. 内装は座席仕様、座席レイアウト共に、カスタムメイド可能
    標準仕様の他に、豪華ファブリックシート、VIP 対応本革仕様

シートレイアウト



Appendix 9

Wisdom (Fujian) Motor　EV Motors Japan

外形





内装




座席オプション




送迎用豪華ファブリックシート　　VIP 席仕様皮革シート

Appendix 9

F8 series4-mini BUS (WSD6690BLS1EV) Specification

タイプ Type	コミュニティユース・マイクロ e-BUS Urban use Micro e-BUS
型式 Model	F8 series4-mini BUS (WSD6690BLS1EV)
全長 (mm) Overall length	6,990
全幅 (mm) Overall width	2,100
全高 (mm) Overall height	3,050
ホイールベース Wheel base	4,800
座位数 seat Capacity	13+1 / 30 名

No.	項目 Item	標準配置 Standard SHC	備考 Remark
1	モーター Motor	East lake	
2	バッテリー Battery System	CATL battery	
3	バッテリー容量 Battery power (kwh)	114kwh	
4	航続距離 Range	230km	
5	ブラストポンプ Blast pump	3kw Ingersoll rand	
6	フロントアクスル Front axle	DANA Axle 2700kg	
7	リアアクスル Rear axle	Electric drive integrated rear 3,500kg	
8	フロントサスペンション Front suspension	複合材料サスペンション composite material suspension	<Option> Air bag E-CAS
9	リアサスペンション Rear suspension	複合材料サスペンション composite material suspension	<Option> Air bag E-CAS
10	ブレーキシステム Brake system	空気圧ブレーキ、ABS 付ディスクタイプ pneumatic brake, disk type with ABS	
11	ステアリングシステム Steering system	Electro-hydraulic power steering system	
12	タイヤ Tire	Goodyear 215/75 R17.5	
13	ホイール Rims	JWL-T 付 6.0 * 17.5 Alcoa アルミニウム合金ホイール 6.0*17.5 Alcoa Aluminums rim with JWL-T	<Option>
14	エアコン A/C	DENSO AC Cool & Heat dual mode type	
15	デフローザー Defroster	DENSO デフロスター Denso AC defrost	
16	中央ドア middle passenger door	シングルスライドドア single sliding door	
17	後方ドア Rear Passenger door	シングルスライドドア single sliding door	<Option>
18	運転座席 driver seat	ISRI NTS 6860 布製 3 点シートベルト ISRI NTS 6860 Fabric type with 3 point safe belt	
19	乗客座席 Passenger seat	クッション布製 sponge fabric chair	
20	床 Floor	アルミ+PVC+アルミラミネートフロア Aluminum + PVC + Aluminum laminated floor	
21	フロア カバー Floor cover	レザーフロア Gerford import floor leather	
22	手すり Hand rails	アルミニウム製(黄色)手すり Yellow aluminum hand rails	
23	停止ボタン Stop button	ワイヤレス停止ボタン Wireless stop button on the stanchions	<Option>
24	前方ウィンドスクリーン Front windscreen	ラミネート前方ウィンドウ 1piece laminated front windscreen	
25	後方ウィンドスクリーン Rear windscreen	ラミネート後方ウィンドウ 1piece laminated rear windscreen	
26	サイドグラス Side glass	4mm 固定強化ガラス 4mm fixed tempered glass	
27	ブラインド Blinds	運転席側ブラインド + 電動フロントウインドブラインド driver side blind + electric front windscreen blind	<Option>
28	チェアランプ chair ramp	車椅子用スロープ wheel chair ramp	
29	ワイパー Wipers	Feipeng wiper	
30	Audio/PA システム Audio/PA system	ラジオ/CD/DVD プレーヤー,ドライバーマイク radio/CD/DVD player & driver's microphone on flexible arm	<Option>
31	カメラ Cameras	内部カメラ×2、中央ドア用×1、背面ドア用×1 Two cameras to be fitted internally; One for middle door & one rear door	<Option>
32	行先標 Destination sign	Tongda	<Option>
33	エクステリアライト Exterior Lights	Hella	
34	インテリアライト Interior lights	Tongda	
35	バックミラー Rear view mirror	電動ミラー Shanghai shengshi top mounted Electric mirror	<Option>
36	リバーシングカメラ Reversing camera	後方確認カメラ rear view camera	<Option>
37	自動消火器 Auto fire extinguisher battery cabin	付属	
38	バッテリーキャビンの煙検知	煙検知とアラーム Smoke detection and alarm	
39	車体構造 Body structure	モノコックボディ Monocoque body	
40	ボディスチール Body steel	ステンレススチール stainless steel	
41	ボディパネル Body panel	複合材料 composite material	

Remarks

1. If the specification is not specified, it shall be implemented according to the design standard of EVM-Japan.
2. If there is no special requirement, it shall be executed according to the standard process requirements of EVM-Japan.
3. The technical data involved in this document are owned by EVM-Japan, In case of infringement, the company reserves the right to retroactively.
4. Warranty: 1 Year (or) 100,000Km, Whichever occurs first after product arrived at destination port.

Appendix 9

EV Motors Japan

Full electric

Hydrogen

pure electric compression type garbage truck

The main parameters	
Length (mm)	6795
Width (mm)	2100
Height (mm)	2400
Wheelbase (mm)	3360
Curb Weight (kg)	6090
The rated load quality (kg)	1995
GVW (kg)	8280
The dog house feeder volume (m³)	1.1
The dog house feeder size (wide) (mm)	990
Compression way	双方向压缩
The cycle time of loading	<16s
Waste discharge time	<20s
The garbage box effective volume (m³)	6
The sewage tank (L)	200
Compression ratio	1:3
Hydraulic system pressure (MPa)	16.2
Power Train	
Type	Pure EV
Motor Type	TZ365XS-YBM303
Rated power (kw)	60

Remarks
1. If the specification is not specified, it shall be implemented according to the design standard of EVM-Japan.
2. If there is no special requirement, it shall be executed according to the standard process requirements of EVM-Japan.
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4. Warranty : 1 Year (or) 100,000Km, Whichever occurs first after product arrived at destination port.

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取り扱い代理店

Appendix 9

新・CHAdeMO Ⅱ 急速充電設備　外観と仕様　120kwh

EV Motors Japan

750VCHAdeMO Ⅱ充電設備

主な仕様

1．CHAdeMO、CCS1、CCS2、BGT規格に対応
2．IP65防水仕様
3．OCPP1.6J対応
4．最大出力120kw　出力電圧　750V
5．FUSE、EPO、SPD、RCD、漏れ電流検出
6．７”TFT液晶モニターサポート

Technical parameters	
Input parameters	
AC Frequency	45~65Hz
AC Voltage	3~phases+N+PE, 280Vac~530Vac
Power Factor	>0.99
Total harmonic current	<5% (Rated input)
Output parameters	
DC Voltage accuracy	<±0.5%
Output DC voltage range	DC 150V~750V / DC 150V~550V / DC 150V~500V
Max DC output current	200A (750V120KW) / 280A (550V120kW) / 320A (500V128kW) Each charging cable's max output current is 200A/CCS, 250A/GBT, 125A/CHAdeMO
Max DC output power	120kW / 120kW / 128kW
Max system efficiency	>94.5% (Rated input and output)
AC output	AC type2 22kW/32A
Working environment	
Ambient temperature	-20 ~ +70°C, full power output below 45°C, Power derating 5% /°C above 45°C
Storage temperature	-40 ~ +75°C
Working humidity	0 ~ 95%
Working altitude	2000 m
Standard	
CCS PLC communication	DIN70121 and ISO15118
CHAdeMO	CHAdeMO V1.2
GBT	GB/T 18487.1-2015, GB/T 27930-2015, GB/T 20234.1~3-2015
EMC/Safety	CE, EN61000-6-3/EN61000-6-1 Class A ; EN 61851-1-2001/EN 61851-21-2001/EN 61851-22-2001
Protection Class	IP65/K10
Function and Interface	
HMI	7" TFT Touch Screen LCD, RFID, Power(G) /Alarm(R) /3-Charging(Y), panel LED
Metering	1 AC energy meter and 2 DC energy meter ; GB/T 30063-2008 and GB/T 5137-2008 standard
Monitor interface	OCPP 1.6J , LAN 10M/100M and optional inner LTE wireless modem support
Charging Mode	Auto basis, Time basis, Amount basis, Energy basis, SOC basis
Power Distribution Mode	Stand alone, Current switch, Plug switch, Full hold, Master slave
Mechanical	
Dimention (W * H * D mm)	700 * 1750 * 760 mm
Weight (Kg)	150 +11 * N (N is the charger module configuration number)
Charging Protection	
	Overcurrent protection, Short circuit protection, Overvoltage protection, Undervoltage protection Insulation monitoring, Protect Earth connect monitoring Reverse polarity protection, Overtemperature protection RCD-A main protection and RCD-B for AC connector protection
Configuration	
Charger module configuration	8 charger power module slots, 750V15kW / 550V15kW / 500V16kW Charger power modules selection
Charging connector configuration	2 CCS /2GBT /1 CCS+1 CHAdemo / 1 CCS+1 GBT, AC type2 cable or AC type2 socket
Charging connector capacity	200A/1000V for CCS, 125A/500V for CHAdeMO, 250A/750V for GBT, 32A for AC Type2

商用EV車の導入事例調査(国内)　①

ＩＤ	国内外	地域	車名・型式	仕様	価格	メーカー（改造の場合、改造実施者）	導入主体・体制	導入台数	導入年月	メンテナンス メンテナンス体制	バッテリー容量	充電設備数	充電規格	充電時間	想定走行距離	導入の経緯	導入・稼働におけるメリット	導入・稼働における課題	備考	写真・イメージ等
1	国内	東京都 羽村市	(改造/ベース)日野ポンチョ	墨田区と同じ車両 ・6,990×2,080×3,100mm ・車両総重量：7,790kg ・乗車定員：36人 ・最大出力：200kW ・蓄電池種別：ＩＨＩ社製リチウムイオン電池 ・モーター：米国ＵＱＭ製モーター ・航続可能距離：30km	事業費86,687千円のうち、国から40,249千円、都から44,869 千円補助	日野自動車	西東京バス㈱	1台	2011年	記載無	30kWh	2基(急速1台、普通充電)	CHAdeMO 準拠 JFE エンジニアリング㈱	110分/日(①10 分、②20分、③20分、④20分、⑤20 分、⑥20 分 整備充電として週に 1回100%まで充電)	14km/周(6便/日、実績：76km/日)	・AZEMS(エイゼムス)：All Zero Emission Mobile System(オールゼロエミッションモービルシステム)プロジェクト ・平成26年度二酸化炭素排出抑制対策事業費補助金(先導的「低炭素・循環・自然共生」地域創出事業のうちグリーンプラン・パートナーシップ事業)	・企業と地域のイメージアップや観光振興など、地域の活性化が図られる。 ・乗務員からブレーキの利き具合、車内の騒音・振動が少ないといった評価を得ている。 ・排出ガス、エンジン音がないため沿道環境の向上が図られる。 ・供給電力の選択によりカーボンフリー化も可能。	・ 蓄電池容量の制限から、長い距離を走らせることができない。 ・ 充電に時間を要することから、短距離走行、多頻度充電等の解決策が必要でありインフラ整備も必要。 ・ 電気バスや充電設備が故障した場合、自社の整備部門では対処できなく、全て外部の業者に修理を依頼するため復旧するまでに時間が掛かる。	・年間電気使用量：約24,300kWh ・年間走行距離：約16,200km ・平均電費：0.67kWh/km ・導入後の運行状況：運行後は特に大きな故障もなく運行を続けることができていたため、平成２６年７月のルート・ダイヤ改正で1行程7.3km から14km に延伸し、運行時間を34分間から63分間に延長した。運行時刻は、午前9時50分が始発、終発は午後6時41分で、1日6便運行で、その間6回(10分1回、20分5回)充電をしている。	
2	国内	岩手県 宮古市	(改造/ベース)日野レインボー	・8,990×2,300×2,890mm ・車両総重量：11,720kg ・乗車定員：54人 ・最大出力：200kW ・蓄電池種別：東芝製リチウムイオン電池(SCiB) ・モーター：米国UQM製モーター ・航続可能距離：40km	事業費52,300千円のうち1/2(26,150 千円が補助)	㈱フラットフィールド	岩手県北自動車㈱	1台	2012年	記載無	43kwh	1基(急速充電)	CHAdeMO 準拠 ㈱ハセテック	1 時間(夜間30分、途中30分)	往復11.1km(4便/日　実績：52.8km/日)	・自然保護を目的としたマイカー侵入規制区域への観光客の負担軽減 ・東日本大震災復興のシンボル	・ランニングコストの削減(電気基本料金を除けばディーゼル車に対して４割の削減) ・整備コストの削減(修繕費がディーゼル車の約半分、オイル交換不要、交換部品が少ない＝点検項目が少ないことから整備要員の時間コスト削減効果もある。	・ 基本料金が電気量料金の半分強を占めている。 ・ ディーゼルバスに比べて車両費用が高い。 ・ 増車するには補助金の利用が必須である。 ・ 車両、電池のリースがあれば初期の資金需要が軽減されるので、事業化して欲しい。	・地域交通グリーン化事業活用 ・CO2排出量約31%削減 ・電気代、燃料代約37%削減 ・整備費用約53%削減 ・導入後の運行状況：導入後、車両には大きな故障もなく運行を継続。エアコンは蓄電池への影響を加味して搭載蓄電池容量を決定したので、電欠には至っていない。満充電で出発し、1運行後と帰車後に40分程充電する。冬季は車内に少量搭載した軽油を暖房に用いているため、蓄電池への影響はない。充電設備の不具合が2件ほど発生したが、改造会社の迅速な対応により、運行への重大な支障は発生していない。事前に改造会社が運行経路を調査し、その結果に合わせた調整がなされ、乗務員の習熟運転を何回も行ったことにより、乗務員からの苦情もなく、これまで安定して運行している。	
3	国内	石川県 小松市	(改造/ベース)日野ポンチョ	・6,990×2,080×3,100mm ・車両総重量：7,790kg ・乗車定員：36人 ・最大出力：200kW ・蓄電池種別 IHI社製リチウムイオン電池 ・モーター：米国UQM製モーター ・航続可能距離：30km	記載無 墨田区や羽村市を参照	日野自動車	小松バス㈱	1台	2012年	記載無	30kWh	3基(急速充電)	CHAdeMO 準拠 富士電機㈱		11km				・地域交通グリーン化事業活用	
4	国内	東京都 墨田区	(改造/ベース)日野ポンチョ	・6,990×2,080×3,100mm ・車両総重量：7,790kg ・乗車定員：36人 ・最大出力200kW ・蓄電池種別 IHI社製リチウムイオン電池 ・米国UQM製モーター ・航続可能距離：30kW	7,000万円(国と都の補助金有)	日野自動車	京成バス	1台	2012年	記載無	30kWh	2基(急速充電)	CHAdeMO 準拠 富士電機㈱	記載無 羽村市も参照	8.9km	区の「すみだ環境区宣言」の趣旨に基づき、主要目標である温室効果ガス排出量のさらなる削減を目指す	記載無	記載無	・世界初の路線循環電気バスとされている	
5	国内	宮城県 気仙沼市	(改造/ベース)いすゞエルガミオ	・形状：中型ノンステップ ・電動機形式：IPM motor ・最大出力：150kW ・最大トルク：650N・m ・駆動方式：6M/T 後輪駆動 ・8,990×2,295×3,005mm ・車両総重量：11,855kg ・蓄電池種別：三菱重工製リチウムイオン電池 ・モーター：IPM モーター(永久磁石同期方式) ・航続可能距離：30km ・乗車定員：49人	事業費103,824千円のうち1/2(51,912千円が補助)	株式会社ピューズ (関連会社：㈱東京アールアンドデー)	東日本旅客鉄道(株)	電気BRT車両 気仙沼線 1台	2013年	記載無	65.12kWh	3基(急速充電：2基、普通充電：1基)	CHAdeMO 準拠 ㈱東光高岳	7時間(夜間普通充電300分〔AC200V〕、途中急速充電40分3回)	片道21.3km(1日2往復/気仙沼～本吉/実績94km/日)	東日本大震災からの復興のため、早期に輸送サービスを提供することができるBRTを採用。BRTでは、環境に配慮したハイブリッドノンステップバスを中心に運行しているが、さらに環境負荷を抑えて、被災地の観光需要を創出しようと電気バスの導入を検討。検討当時、電気バスとして運行されているのは小型バスに限定されており、かつ運行距離が短いケースが大半であることから、利用の多い区間である気仙沼線BRTの本吉～気仙沼間(21.3km)を対象として、小型バスより大きな中型バスの導入を決定。20kmを超える距離を１充電で通年運行する事例は当時、国内ではほとんどなかったが、車両購入費用と充電設備導入費用に国土交通省の地域交通グリーン化事業の補助を平成25年度に受けて平成26年4月から運行を開始。	従来車と比べて加速が良く、走行中の音が静かであるとの評価を得ており、副次的効果として企業のイメージアップも図られた。	発進や停止時の従来車との違和感 航続距離が30kmのため運行ルートの選定がしづらい 故障したときの電気自動車関連部品の入手が難しい。	屋根上に太陽光パネルを設置し、車内照明やUSB充電用に使用(車内にはモバイル充電用USB端子あり) 災害時には100V電源の供給が可能なコンセントを装備 ・CO2排出量約24%削減 ・電気代、燃料代約51%削減 ・整備費用約36%削減	

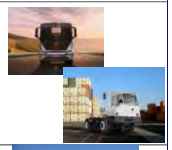
商用EV車の導入事例調査(国内) ②

ＩＤ	国内外	地域	車名・型式	仕様	価格	メーカー（改造の場合、改造実施者）	導入主体・体制	導入台数	導入年月	メンテナンス メンテナンス体制	バッテリー容量	充電設備数	充電規格	充電時間	想定走行距離	導入の経緯	導入・稼働におけるメリット	導入・稼働における課題	備考	写真・イメージ等
6	国内	福岡県 北九州市	（改造/ベース）韓国ファイバーHFG	・11,065×2,495×3,475mm ・車両総重量：11,250kg ・乗車定員：67人 ・最大出力：240kW ・蓄電池種別：三菱重工製リチウムイオン電池） ・モーター：非同期誘導三相交流モーター ・航続可能距離：80km	事業費187,700千円のうち1/2(93,850千円が補助)	三菱重工業㈱	北九州市交通局	2台	2013年	記載無	93kWh	2基(高電圧充電：1基、(急速充電：1基)	CHAdeMO 準拠 ㈱東光高岳/三菱重工業㈱		往復20km(1日2便　実績：52km/日)	・太陽光発電と電気バスを組み合わせた「ゼロエミッション交通システム」を構築し、電気バスのゼロエミッション化を実現	・乗客からの声 「走行音が静か」 「ショックが少ない」 「排気ガスの臭いがない」 「他の路線でも活用して欲しい」といった評価 ・乗務員からの声 「馬力が強く、加速が良い」 「勾配の急な道路も余裕で走行できる」 「発車時、加速時に黒鉛が排出されない」 「加速性、安定性があり、走行音も静かなため、運転していて疲れを感じない」	・乗客からの声 「騒音(モーター音(インバーターの音と思われる)が想定より大きい」 ・乗務員からの声 「車体の重心が高く、カーブ走行の際車体の傾きが大きい」 「車内温度が一定にならず、設定が難しい」などの課題 ・電気バスはDUCユニット(DC/DCコンバーター)等の定期点検(3年毎)が必要で、部品に不具合がある場合は、韓国(現在は企業買収により中国)にあるメーカーでの修理が必要になる。また費用が最大で170万円程度になる可能性がある。 ・蓄電池の充電容量が次第に少なくなる劣化が生じるため、ディーゼルバスの通常耐用年数(14年)使うには途中で蓄電池交換が必要になり、費用が1千万程度必要。	・地域交通グリーン化事業 ・導入後の運行状況：導入した2台を週交代で使用。停車中のバスは見学に使用している。	
7	国内	鹿児島県 薩摩川内市	（改造/ベース）韓国ファイバーHFG	・11,065×2,495×3,475mm ・車両総重量：15,245kg ・乗車定員：72人 ・最大出力：240kW ・蓄電池種別：三菱重工製リチウムイオン電池） ・モーター：非同期誘導三相交流モーター ・航続可能距離：80km	記載無	三菱重工業㈱	南国交通㈱	1台	2013年	記載無	93kWh	1基(高電圧充電)	CHAdeMO 準拠 ㈱東光高岳/三菱重工業㈱		28km	・薩摩川内市の次世代エネルギービジョンとその行動計画に基づく取り組みとして実施			・地域交通グリーン化事業活用	
8	国内	三重県 伊勢市	（改造/ベース）いすゞERGA QPG-LV234N3	・車両寸法：10,925×2,490×2,965 mm ・乗車定員(運転席を除く)74名 ・座席数(運転席を除く)32席 ・駆動用バッテリー株式会社東芝製　SOB ・駆動用モーター(最高出力)：米国製UQM社製　Power Phase200 (200kw) 航続可能距離(SOC90%使用)：※設計数値 53km ・最高速度(定員乗車時)70km/h	事業費102,300千円のうち1/2(51,150 千円が補助)※電気バス改造費に対し、別途三重県と伊勢市より各1/8の補助有	(株)フラットフィールド	三重交通㈱	1台	2014年	記載無	66kWh	1基 (伊勢営業所に設置)	CHAdeMO 準拠 ㈱ハセテック	3時間(夜間60分、途中60分2回)	29.5km(外宮内宮線(51・55系統)　6往復　実績：99km/日)	・アイドリングストップバス、CNGバスや排ガス規制適合車を積極導入 ・平成25年秋ハイブリッドバス導入 ・三重県が始めた低炭素なまちづくりを目的としたモデル事業として、平成24年8月に伊勢市・地元団体・業界団体・民間事業者・大学等で構成する「電気自動車等を活用した伊勢市低炭素社会創造協議会」が設立され、協議会行動計画「おかげさまAction！～住むひとも、来たひとも～」を平成25年3月に策定。その中で電気バスの導入も活動に位置付けられた ・二酸化炭素(CO2)、窒素酸化物(NOx)、粒子状物質(PM)の排出量削減 ・観光者への環境対策広報 ・非常時電源供給(AC100Vコンセント)	・ラッピング(ポケモン)の効果もあり、子供の乗客などに喜ばれている。インバーターの音を聞いて「電車のようだ」という感想も。 ・市外、県外から電気バスに乗車するために伊勢を訪れたという人がいた。	・車両導入費等経費負担が多額なため、導入には公費の投入が必須となるので、環境面以外の効果(観光や防災)があることもアピールする必要がある。	・導入には国土交通省の「地域交通グリーン化事業」、および「電気自動車等を活用した伊勢市低炭素社会創造協議会」に取り組んでいる三重県及び伊勢市の補助を受けている ・導入後の運行状況：平成26年3月に運行を開始し、3か月弱で乗車 1 万人を達成。約1年が経過した平成27年4月1日からは電気バス専用ダイヤから、一般ダイヤへの組み込みを行い1日当たり4往復から６往復とし、運行回数を1.5倍に増加した。夏季の電池温度上昇による充電不良が発生したが、電池に排熱ファンを設置し解消した。 ・CO2排出量約39%削減 ・電気代、燃料代約8%削減	
9	国内	神奈川県 川崎市	（改造/ベース）いすゞエルガミオ	・8,990×2,300×3,200mm ・車両総重量：12,070kg ・乗車定員：56人 ・最大出力：220kW ・蓄電池種別：東芝製リチウムイオン電池(SCｉB) ・モーター：永久磁石埋込型同期電動機(IPMM) ・航続可能距離：40km	記載無	(株)東芝	川崎鶴見臨港バス(株)	1台	2014年	記載無	57.4km	1基(急速充電)	CHAdeMO 準拠 (株)ハセテック	1日3回、30分から1時間弱充電	1周2.4km。15周/日		・車内にコンセントを備えており、災害時などにバス自体を非常電源として利用可能		・地域交通グリーン化事業活用 ・東芝初の商用電気バス ・ITを2つ導入。1つ目は乗降数と乗降時間を自動的に測定する機能。乗車口の上に設置したカメラを利用。2つ目は乗客の年齢層を推定し、適切な広告を車内のサイネージ画面に表示するシステム	
10	国内	東京都 港区	（改造/ベース）日野ポンチョ	・6,990×2,080×3,100mm ・車両総重量：7,790kg ・乗車定員：36人 ・最大出力：200kW ・蓄電池種別 IHI社製リチウムイオン電池 ・モーター：米国UQM製モーター ・航続可能距離：30km	事業費166,182千円のうち1/2(83,091千円が補助)	(株)フラットフィールド (株)フジエクスプレス		2台	2017年	記載無	39.7kWh	2基(超高速充電：1基、急速充電：1期)	CHAdeMO プロトコル準拠 (株)ハセテック	・超高速充電：10分で容量の80%以上・30分(夜間10分、途中10分2回)	往復17km(5便/日　実績：89.6km/日)	港区は、コミュニティバス「ちいばす」の芝ルートにおいて、(株)フジエクスプレス、(株)東芝などの事業者と平成25年7月から平成27年3月の期間、超急速充電器を使用した電気バスの実証実験を実施した。実証実験の結果、都心部でもディーゼルバスから環境配慮型の電気バスに置き換えることが可能なことが分かったため、低炭素まちづくり計画の施策の柱として、「ちいばす」の運行を委託されている(株)フジエクスプレスが、走行条件が合う芝ルートに電気バス４台導入した(補助対象車両２台を含む)。	・乗客から「静かで乗り心地が良い。」「あまり運行していない電気バスに乗れて良かった。」といった評価を得ている。 ・乗務員からは、「車内の騒音と振動が少なく、発進時や追い越し時の加速性が良い。」「日常の点検・整備がディーゼルバスに比べて容易である。」といった評価を得ている。 ・これまで大きな故障もなく順調に運行しており、整備面では、ディーゼルバスに比べて容易で整備費用も安い。	・充電設備は営業所内に設置してある１箇所しかないので、充電の都度、営業所に戻らなければならない。 ・冷暖房は、蓄電池残量に注意しながら使用することが必要。 ・超急速充電器の充電コネクターは３～４年で交換することになり、予備コネクターの在庫が1個しかないうえに常時生産してないので高価である。	・地域交通グリーン化事業 ・CO2排出量30%削減 ・電気代、燃料代60%削減 ・整備費用約65%削減 ・導入後の運行状況：4台の電気バスは、導入以降、故障なく順調に運行している。1回の運行で残量20%になり、営業所に戻って超急速充電器で約15分で電池容量90%以上まで充電して、運行に戻っている。	

商用EV車の導入事例調査(国内)　③

ＩＤ	国内外	地域	車名・型式	仕様	価格	メーカー (改造の場合、改造実施者)	導入主体・体制	導入台数	導入年月	メンテナンス メンテナンス体制	バッテリー容量	充電設備数	充電規格	充電時間	想定走行距離	導入の経緯	導入・稼働におけるメリット	導入・稼働における課題	備考	写真・イメージ等
11	国内	京都府 京都市	BYD K9	BYD K9(12m)　仕様は1と同じ (米)ニューヨークメトロポリタン交通局のテスト報告 テスト期間の合計走行距離は2,383km フル充電下での航続距離は225km、30時間。 1.6kmあたりの運転コストは0.2～0.3ドル(LNG、ディーゼルの場合1.3ドル)。	8,000万円(税別)程度	中国・比亜迪(BYD)	プリンセスライン株式会社(京都急行バス)	5台 (2018年に大型2台追加)	2015年	記載無	324kWh	7基	独自規格 BYD	記載無 1日あたり走行距離と航続距離からほぼ毎日充電?	120km/日	特に記載無	特に記載無	特に記載無	・BYD日本初進出案件 ・車重を国土交通省が緩和認定したことにより導入が進められた	
12	国内	沖縄県 那覇市	BYD K9	BYD K9(12m) 主要諸元 全長×全幅×全高:12050×2550×3360mm 出力(モーター)90/150k W×2 動力用主電池：リン酸鉄リチウムイオン電池(BYD製) 走行可能距離／1充電：250km以上(エアコン使用時) 乗車定員　69名	6,500万円(税別)程度	中国・比亜迪(BYD)	有限会社沖縄シップスエージェンシー	10台 (2020年に更に80台計画)	2018年　春	ヤマトオートワークス沖縄株式会社 (ヤマトホールディング株式会社傘下)	324kWh	6基	独自規格 BYD	記載無(4日に1回のペース)	約1km(岸壁からクルーズターミナルまでの間) 14～15km/日	暑い沖縄では、待機中にエアコンをかけるため、ディーゼルエンジンのバスでアイドリングをしていると排ガスが臭く、お客様に不快感を与えるという理由からクリーンな電気バスを探していた	・振動はまったくなく、音もない(導入法人 会長談)	特に記載無	・ノンステップ化を図る為、床下と屋根の双方にバッテリーを配置	
13	国内	福島県 会津若松市	BYD K7 (中型路線バス)	BYD K7(9m) 航続距離:180km(フル充電時) 乗車定員　27名	5,000万円 充電器 250万円 2019年度標準価格	中国・比亜迪(BYD)	みちのりホールディングス会津バス	3台	2018年	記載無	217kwh	2基 32A(約12.8kW)×2 16A(約6.4kW)×2	独自規格 BYD 2つの充電口から同時充電	76%～100%まで充電するのに2時間15分(実績値) 65.7%～100%まで3時間12分(実績値)	160km/日 (1日8往復)	クリーンで先進的な尾瀬のイメージ形成に活用 観光シーズンの尾瀬国立公園へのシャトルバス(シーズンオフは路線バスとして運行)	国土交通省「平成30年度地域交通グリーン化事業」に認定され、低公害車普及促進対策費補助金が交付 アクセルレスポンス良好 静音性	運送能力(座席数)が少ない為、ディーゼルバスも併用している 電気バスへの切り替えについては福島県や桧枝岐村との協議	・2020年春頃により小型のJ6モデル発表(105kWh/定員25～31名/価格税抜1,950万円)	
14	国内	沖縄県 国頭郡	BYD C9	車長×車幅×車高：12,000×2,500×3,520mm 航続距離：250km以上 バッテリー容量：311kWh 乗車定員：49 人	記載無 K9よりバッテリー容量が少ないが高さが少し高いので価格はそう変わらないと推察される	中国・比亜迪(BYD)	伊江島観光バス	2台	2019年2月	記載無	311kWh	記載無	独自規格 BYD	記載無	沖縄本島一円を想定	・沖縄県においても「やんばるの貴重な森林を守るため」世界遺産登録を目標に環境保護を推進 ・沖縄県、観光をリーディング産業と位置付け、観光客輸送の柱となる二次交通のバス・タクシー・レンタカー事業が毎年のように立ち上がるものの、寄港するクルーズ船の大型化に伴い、輸送需要のさらなる強化が求められている	記載無	記載無	・沖縄振興開発金融公庫の融資を受けている ・災害時のUSB端子からの充電利用も想定	
15	国内	岩手県 盛岡市	BYD K9	仕様は1と同じ 乗車定員は56名としている	6,500万円	中国・比亜迪(BYD)	岩手交通	1台	2019年	記載無	324kWh	台数からも1基と推察される	独自規格 BYD	記載無 1日あたり走行距離と航続距離からほぼ毎日～2日に1階は充電か	約60km/日 (盛岡駅東口～イオンモール盛岡南までの片道3.2kmキロで1日9往復)	排出ガス抑制と静音性。環境にも優しいことやコストの削減、車両故障のリスクが少なくなる 若い利用者が多いことから新しい技術に触れてほしいという思い	ギアチェンジの必要がないため、車体の揺れが非常に少なく、走行がスムーズで高齢者も安心して利用できる	記載無	・イオンモール盛岡南線 ・東北発の電気バス ・国交省「地域交通グリーン化事業」	
16	国内	山梨県 南都留郡	BYD K9	・車長×車幅×車高 12,000×2,500×3,400mm ・航続距離：250km以上 ・バッテリー容量：324kWh ・乗車定員：56 人(運転手含む)	記載無 但し、他の地域で6,500～8,000万円程度	中国・比亜迪(BYD)	富士急バス	3台	2020年3月	記載無	324kWh	3台 (380/400V×63A＝約25kW×2)	独自規格 BYD	約6.5時間(理論値)	記載無	もともと富士急バスでは、富士山が世界遺産に登録(2013年6月)される以前から、CNG(圧縮天然ガス)バスや、ハイブリッドバスなどの低公害車をいち早く導入して環境保全に取り組んできた。今回、電気バスの導入を決めたのも、そうした環境保全への取組のひとつ BYD社導入は世界的な納入実績(5万台以上)があることから選定	記載無	記載無	・BYD日本仕様は道路運送車両法による道路運送車両の保安基準第26条の規定に従い、中国本国を含む他国には存在しない非常口を後部右側に設置した。 ・災害時の非常用電源活用も想定	

商用EV車の導入事例調査(海外)

ID	国内外	地域	車名・型式	仕様	価格	メーカー (改造の場合、改造実施者)	導入主体・体制	導入台数	導入年月	メンテナンス メンテナンス体制	バッテリー容量	充電設備数	充電規格	充電時間	想定走行距離	導入の経緯	導入・稼働における メリット	導入・稼働における課題	備考	写真・イメージ等
17	国外	中国 深圳市	記載無	250km程度走行可能	リースをしている	記載無	記載無	16,359台	2017年	不明	記載無	記載無	記載無	5時間		市をあげてグリーンライフの実現を推し進め、2017年12月までに市内の公共バスを全て電気バスに転換。市内バスの1日の平均走行距離は 285 万kmに上っていると同時に不足気味の充電ステーションの整備も急速に進めている。これにより深圳市は全国最大規模の電気バス普及都市となり、2005年から足掛け12年間に及んだ計画を達成。	記載無	記載無	・市内バス全てをEV化 ・2017年には深圳市は「新エネルギー普及応用財政支持政策」を発表し、市内の次世代自動車及び充電設備の購入、設置に対し、蓄電池回収に補助金を付与。現時点での市からの補助金額は、1車両あたり年間最大40万元(約640 万円)。	
18	国外	中国 北京市	記載無	トータルで4,500台を導入 初期型は全長18m 最大航続距離130km		記載無	北京公共交通控股(公交集団)	4,500台	2017年	不明	記載無	100か所へ拡大予定 (5,000台対象)	記載無	急速充電15分(フル)	最大130km		記載無	記載無		
19	国外	イギリス・ロンドン ルート98(Willesden⇔Holborn)	二階建ての電気バス	・座席数54人/定員81人 ・航続可能距離300km以上	記載無	BYD	メトロライン(Metroline)	記載無	2018年	記載無	340kWh	記載無	独自規格 BYD	急速充電4時間	300km以上	ロンドン交通局(TfL)仕様の二階建て電気バスを新たに設計・開発	記載無	記載無	記載無	
20	国外	アメリカ・ワシントン州	BYD 9KS	電気バスに200kW最大で非接触充電させる	記載無	モメンタム・ダイナミクス社 (MomentumDynamics)		記載無	2018年	記載無	266kWh	記載無	超高速非接触充電 モメンタム・ダイナミクス社 (Momentum Dynamics)	5分で次の運行に必要な充電が可能		記載無	・充電スポットにバスを停めると自動で充電が始まる。プラグをコンセントに繋ぐ手間はなく、乗務員は降車する必要がない。	記載無	記載無	
21	国外	ノルウェー	・パネルバン ・7.5t/19tの輸送用EVトラック ・EVヤードトラクター	今後の展開の為記載無	記載無	BYD Europe	記載無	記載無	2020年後半以降	記載無	記載無	記載無	記載無	記載無	記載無	BYD Europeは国として整備が進んだEVバスの供給網を活用したトラック販売を行う	記載無	記載無	記載無	
22	国外	アメリカ・シアトル市近郊	記載無	バスの長さ12m 航続可能距離40km	75万ドル/台程度	プロテラ社 Proterra	King County Metro	120台	2020年までに	不明		記載無 1か所 550万~660万ドル程度	記載無	10分で40km走行	記載無	記載無	記載無	記載無	・導入主体は連邦公共交通局(Federal Transit Administration:FTA)の低排出・無排出自動車導入計画(Low-or NoEmission Vehicle Deployment Program)を通じ、330 万ドルの補助金を受けている。	
23	国外	オランダ・アムステルダム スキポール国際空港及び周辺地域	全長18mのバス	・乗車定員:117~120人 ・想定電費:2kWh/km ・航続可能距離:80km	記載無	VDL	スキポール航空とアムステルダム運輸局	100台	今後の計画2021年とされている	記載無	170kWh	記載無	不明 但し、450kWhの充電とあるので新しい規格の可能性高	・急速充電は15~25分充電容量450kWhまで ・普通充電は30kWhの充電容量があり、充電時間は4~5時間		2018年3月に既に100台導入済 2040年までに空港及び空港周辺地域への移動に使うバスのゼロエミ化を図っている 入札条件が電動バスになっている	記載無	記載無	・スキポール国際空港は、2040年までに空港及び周辺地域の移動に利用するバスのゼロエミッション化を目指しており、電気バスは2021 年までに258台以上に増やす計画がある。	

Appendix10

廃棄物収集運搬EV車の導入事例調査(国内)

ＩＤ	国内外	地域	公共/民間	車名・型式	仕様	価格	最大積載量	メーカー（改造の場合、改造実施者）	導入主体・体制	導入台数	導入年月	メンテナンス メンテナンス体制	バッテリー容量	充電設備数	充電規格	充電時間	想定走行距離	導入の経緯	導入・稼働における メリット	導入・稼働における課題	備考	写真・イメージ等
1	国内	神奈川県川崎市	公共	1.5t車	・5000×1900×2000mm ・荷箱容積：3.7m^3 ・ホッパー容積：0.18m^3 ・電池重量：340kg／個 ・電池交換所要時間：約3分 ・電池交換方法：リモコンによる操作	車体：約2,000万 ステーション：約3,500万 電池：350万/1個	約1.4t	ＪＦＥエンジ	川崎市（ＪＦＥエンジと共同）	1台	2019年2月	記載無	40kW	最大電池保管数：7個	（電池交換型）	約8時間（フル充電まで）	60km／個	記載無	・CO2やNOxの排出がゼロ ・電池交換が約3分間で自動交換 ・災害時の非常電源としての活用	・電池重量の分だけ、収集できるごみの重さが少なくなってしまうために運用上の制約がある	・平成30年度廃棄物発電電力を有効活用した収集運搬低炭素化モデル事業 ・ごみ焼却施設における廃棄物発電で得られる電気を敷地内の電池ステーションへ送電して電池を充電	 
2	国内	埼玉県所沢市	公共	1.5t車	記載無	記載無	記載無	ＪＦＥエンジ	所沢市	記載無	2019年3月	記載無	記載無	記載無	（電池交換型）	記載無	記載無	記載無	記載無	記載無	・平成30年度廃棄物発電電力を有効活用した収集運搬低炭素化モデル事業 ・R2年8月に電気自動車（EV）に係る事業の周知、普及啓発、環境教育活動、EVによる避難所等への電力供給に取り組む「電気自動車に係る連携協定」を締結(日産自動車、埼玉県所沢市、埼玉日産自動車、日産サティオ埼玉、日産プリンス埼玉販売の5者)	 
3	国内	神奈川県横浜市	民間	記載無	記載無	記載無	記載無	ＪＦＥエンジ	J&T環境株式会社	記載無	2019年8月	記載無	記載無	記載無	（電池交換型）	記載無	記載無	・J&T環境株式会社およびJFEエンジニアリンググループの協力のもと、2010年より廃棄物リサイクル率約90%（産業廃棄物リサイクル率はほぼ100%）を実現 ・2011年より横浜市の3R活動優良事業所として認定 ・2017年4月、汚れたプラスチック等の産業廃棄物を燃料として発電し、その電力を臨港パークに供給するアーバンエナジー株式会社の『創電割®』を導入。その電力を臨港パークに供給。 ・リサイクル率100%を目指すなかで、食品廃棄物のリサイクルを目指し、調整を推進	・食品廃棄物のリサイクルを導入することで、年間リサイクル率は約１%上がる見込み	記載無	記載無	
4	国内	大阪府大阪市	公共	2t車	記載無	EVゴミ収集・運搬車3台、交換電池など通常のシステム一式の価格は1億円強	記載無	ＪＦＥエンジ	(排出事業者) 株式会社横浜国際平和会議場(パシフィコ横浜) (実施者) J&T環境株式会社	記載無	2019年2月	記載無	記載無	記載無	（電池交換型）	記載無	記載無	記載無	記載無	記載無	・ゴミ焼却場での廃棄物発電で作る電力を収集・運搬車の動力源とし、環境に優しいゴミ収集・運搬システムを構築する。 ・試験期間は6日～6月30日で走行距離、コストなどのデータを集めるほか、避難所などでの非常用電源として活用する際の課題を探る。 ・市の発表ページが削除されており、それ以上の情報がない	記載無

廃棄物収集運搬EV車の導入事例調査(海外)

ＩＤ	国内外	地域	公共/民間	車名・型式	仕様	価格	最大積載量	メーカー（改造の場合、改造実施者）	導入主体・体制	導入台数	導入年月	メンテナンスメンテナンス体制	バッテリー容量	充電設備数	充電規格	充電時間	想定走行距離	導入の経緯	導入・稼働におけるメリット	導入・稼働における課題	備考	写真・イメージ等
5	国外	アメリカ イリノイ州 シカゴ	公共	記載無	記載無	120万ドル（約1億2000万）	9t	Loadmasterと Motivが提携	シカゴの衛生部門 (the Chicago's sanitation department)	記載無	2014年	記載無	記載無	記載無	記載無	8時間	60マイル（約97km）	記載無	・ディーゼル仕様のゴミ収集車をEVに切り替えることで、年間2,688ガロン（約1万175L）もの軽油の節約。年間23トンの二酸化炭素を相殺	記載無	・毎日60マイル（約97km）のルートを9トンのゴミを回収しながら走り切ることができる ・テスト車両が成功を証明した場合、総コスト約1,340万ドルで、さらに19台の電気トラックを取得する予定 ・電気とガス価格を考慮すると1マイルあたりのガストラックのコストの8分の1	
6	国外	アメリカ ニューヨーク州	公共	Mack LR BEV	・NMCリチウムイオン電池 ・496のピーク馬力と4,051 lb.-ftを組み合わせた2つの130 kWモーターを搭載	記載無	記載無	Mack （ボルボグループ）	ニューヨーク市衛生局 (DSNY)	記載無	2021年	記載無	記載無	記載無	150kW200A	記載無	20～25マイルの交通量の多い通りを通る典型的な12時間のルート	・2050年までにカーボンニュートラルにするという目標に向けて市が取り組む ・2040年までに収集車全般を電化する構想 ・2035年までにGHG排出量を80%削減する	・ニューヨーク市は都市部の騒音が課題であり、静かな全電動トラックはソリューションとなり得る。夜を通して動作することが可能 になることを期待している。	・パイロットが成功しても、パンデミックによる予算の打撃を受けているため、ニューヨーク市はすぐにより多くのトラックを注文することができない可能性がある。(衛生省今年1億6000万ドルの削減に直面)。電気トラックの採用が遅延する。先行コストが高いため、都市も一般的にいくつかのサポートを必要とする。	・実証導入	
7	国外	アメリカ カルフォルニア州 サクラメント	公共	class 8 rear-loader	記載無	記載無	記載無	Motiv Power Systems ボディは Loadmaster	記載無	記載無	2017年	記載無	記載無	記載無	記載無	記載無	記載無	・サクラメントは、2013年に北米の政府グリーンフリートに選ばれたことで、非常に積極的な持続可能性政策を展開。サクラメント地域の有害な車両排出量を削減することは、持続可能性政策の主な焦点である	・年間6,000ガロンの燃料を節約	記載無	・10個のバッテリーパックを装備しており、将来のルート拡張に必要な場合は12パックに拡張可能	
8	国外	アメリカ カルフォルニア州 ロサンゼルス	公共	automated side-loader	記載無	記載無	記載無	Motiv Power Systems ボディは Amrep, Inc	Los Angeles Board of Sanitation (ロサンゼルス衛生委員会 (LASAN))	2台	2018年	記載無	212kWh	記載無	記載無	記載無	160km	・市が2022年にガス駆動のゴミ収集車の購入を停止するだけでなく、2035年までに完全な電化を目指す ・2045年までに100%再生可能電力を供給するという目標を掲げている	・騒音問題の解決 ・年間6000 galもの燃料を節約する見込み	記載無	・4ヶ月間のパイロットプロジェクトを実行 ・10個のバッテリーパックが装備 ・バッテリーは一晩充電	
9	国外	アメリカ ワシントン州 シアトル	民間	class 8 rear-loader	・パワートレイン：320kW(430hp) ・モーター：1101Nm(812フィートポンド)	記載無	記載無	BYD	Recology (西海岸の廃棄物管理会社)	記載無	2019年	記載無	295kW	記載無	急速充電 (120kWまたは240kW DC)	1.5～2.5時間	～90km	記載無	・騒音問題の解決 ・パワートレインについてディーゼル車よりも振動が少ないため、耐用年数が優れる ・機械的なブレーキではなく電気モーターを使用する電気システムは、ブレーキ摩耗を削減できる	・車体重量が21,605ポンド(9,800kg)のトラックでなければならない ・総車体重量は57,500ポンド(26,082kg)または66,000ポンド(29,937kg)になる ・車体重量のため、65mph（104km / h）の最高速度と56マイル（90km）の範囲と600のピックアップに制限されている		
10	国外	アメリカ フロリダ州 オカラ	公共	class 8		ディーゼル車より52万5000ドル(20～30%)程度高価		BYD		5台	2021年～2022年						120km		・動部品が少ないため、メンテナンスが少ない ・騒音が非常に少ない(騒音70%削減) ・テールパイプの排出もない ・ルートをカバーする燃料費で比較すると、ディーゼル車では100ドル。電力では20ドル	120km+S14:W14		
11	国外	オランダ ロッテルダム市	公共	Collect 26E model																		
12	国外	スイス バーゼル市	公共			1700万ユーロ(20億円)（12台＋ステーション分）		Futuricum （スイスの商用車メーカー、パートナーにボルボ）		20台	2020年～2021年		170kW×2