Feasibility Studies on Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia

Feasibility Study on low carbon community development project promoting and commoditizing electric motorbikes in Vietnam

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Summary

In Vietnam, where more than one out of three people owns a motorcycle, there is a call for prompt action as the increasing use of motorcycles has become a source of serious social issues, including air pollution and exhaust fumes that are harmful to human health, and traffic accidents and congestion. The precipitous pace of its economic growth has also contributed to tight demand for energy resources. Among them, the greatest rise in consumption is found in petroleum products, which made up approximately 45% of the final energy consumption in 2010. This imposes a huge fiscal burden on Vietnam, a country that relies on imports for 70 percent of its oil. Prices of gasoline - a petroleum product - have been rising constantly, nearly doubling over the period from 2007 to 2012.

Given those circumstances, the Vietnamese government endorses a policy for reducing energy consumption by making its traffic sector more energy-efficient and low-carbon, and for reducing emissions of greenhouse gases (hereinafter "GHG") generated as a result of fossil fuel consumption. Its law on energy efficiency, which was introduced in 2010, requires organizations that manufacture or import means of transportation and associated products to "promote development of vehicles featuring advanced technology which are energy-efficient, utilize clean energy or use other fuels alternative to fossil fuels." Also, in the area of combating global warming, the Vietnamese government has presented its action policy in the National Target Programme to Respond to Climate Change (NTP-RCC), which it announced in 2008, to address the situation where emissions in the transport sector amount to 23% of Vietnam's aggregate GHG emissions, coming next to the manufacturing and construction sectors. The "Green Growth Strategy," introduced in 2012 with the aim of enhancing the NTP-RCC, lists 17 measures in this area, with greater energy efficiency and fuel shifts in the traffic sector positioned as an important step as well. In Danang City, the target of this study, measures like achieving increased energy efficiency in traffic projects and promoting clean and green urban transportation founded on GHG reduction technology have been adopted in its "Vision 2020" and climate change action plan.

As introducing electric motorcycles - the target technology under this study - in Vietnam as an alternative means to gasoline-fuelled motorcycles would make it possible to reduce GHG emissions from gasoline and also to contribute to improving air quality, it is an action amply in line with Vietnam's, and Danang's, own measures. The introduction of electric motorcycles has already begun and is now underway. However, the maintenance structure remains inadequate, leaving issues with durability. Partly because the substantial numbers of inexpensive low-quality products have been introduced, electric motorcycles are considered as something that breaks down easily, which poses a hindrance to their more widespread use. Terra Motors Corporation (hereinafter "Terra Motors"), the top seller of electric motorcycles in Japan, has secured an electric motorcycle production plant in the province of Long An to the south of Ho Chi Minh City, Vietnam and is planning to begin production by the spring of 2014.

The purpose of this study is to encourage the introduction of electric motorcycles by promoting the recognition of Terra Motors' superior technology and after-sales service in Danang, a major city in the fast-growing central part of Vietnam. Myriads of benefits can be expected by bringing this project to realization, including not only its contribution to reducing GHG emissions from gasoline combustion, but also improvement on air pollution and better images for the city as a leader in the introduction of the latest low-carbon technology.

The topics covered by this study and an overview of the findings are presented below.

(1) Study on the electric motorcycle utilization potential in Danang City

To start with, a basic study by means of questionnaires and interviews was conducted mainly in resort establishments in Danang City, for which large-scale construction work is in progress, to check the extent of potential popularization.

The questionnaire survey was conducted with 16 resort establishments to collect information on, among other matters, development projects, the current state of affairs in the area of mobility and the need for electric mobility. In addition, the interview survey was conducted with seven resort establishments and major complexes to perform a similar study. These studies have led to a finding that each establishment carries demand for one to 100 units.

(2) Development of a scenario for an electric motorcycle popularization project in Danang City

Based on the study on the electric motorcycle utilization potential described above and on Terra Motors Corporation's sales plan, a popularization project scenario has been examined as follows. As shown in following table, it is estimated that 1,575 three-wheel electric motorcycles in total for

the resort hotels and major complexes and 3,700 two-wheel electric motorcycles - by 2016 in stages - could potentially be introduced.

Table: Number of three-wheel electric motorcycles expected to be introduced

Resort hotels	410 units (100 units in the first year)
Major complexes	1,165 units
Total	1,575 units

(3) Development of a demonstration project - Selection of a prospective site and project development aimed at implementing the demonstration project next year

Next, a plan was developed on the basis of the questionnaire survey, etc. with the aim of implementing a demonstration project at a particular site.

A plan to introduce 100 units of three-wheel electric motorcycles at a resort establishment was developed. To serve as a financial incentive, support through leasing scheme has been considered. As for the actual scheme, a program similar to Japan's Eco-Lease Promotion Program where a certain percentage of lease fee is supported by government funding can be introduced. Alternatively, a program to support the reduction of lease fees through directly extending subsidy or loans to lease companies can be implemented. There is a variety of funding sources provided by the Japanese government for the purpose of promoting low-carbon technology that may potentially be used for such purpose.

While the study findings show that two-wheel motorcycles have larger potential of popularization and longer distance of travel, their GHG emission reduction potential is also higher. Therefore, a project to introduce three-wheel electric motorcycle would achieve improved costs and GHG emission reduction, *i.e.*, lower reduction costs if it is implemented in conjunction with two-wheel motorcycles under a community-wide scheme through the use of community cycle system, which is explained in the following sections.

(4) MRV methodology refinement and GHG reduction potential estimation

In order to grasp the project's potential as a JCM project, the GHG reduction potential delivered by the project was estimated. First, applicability of the MRV methodology that we had developed for the FY2012 Global Warming Mitigation Technology Promotion Project (bilateral FS), entitled "Project Development Study on the Promotion of Electric Motorbikes," was confirmed. We then proceeded to update the CO_2 emission factor for grid electricity to the latest figures and, when applying it to three-wheel motorcycles, also changed the travel distance to the average travel

distance at resort hotels to arrive at the following GHG reduction potential calculation:

(a) Under the scenario of the three-wheel electric motorcycle introduction at resort hotels, etc.

	First project year	After large-scale application
No. of units introduced (units)	100	1,575
Reference emissions (tCO2)	29	453
Project emissions (tCO2)	13	207
Emission reduction (tCO2/year)	16	245
Emission reduction (tCO2/2014-2020)	112	1,718

(b) Under the two-wheel electric motorcycle popularization scenario

For reference the amount of emission reduction for 5,500 units of two-wheel motorcycle, which is Terra Motors' sales target for the first year has been estimated as follows. When taking into account the sales target up to 2020, the emission reduction potential reaches 13,824 tCO2 on annual average and 96,771 in total.

	2014	2015	2016	2017	2018	2019	2020
Emission Reduction(tCO2)	1,341	1,317	1,292	1,268	1,244	1,221	1,198
Total (2014~2020)	8,881tCO2						
Annual (2014~2020)	1,269 tCO2						

(5) Promotion of recognition of superiority of the electric motorcycle technology to be introduced and examination of a method of introduction

(a) Promotion of recognition of superiority of the electric motorcycle technology to be introduced

Since, in Vietnam, as explained above, electric motorcycles carry an entrenched image that they break easily, it is imperative to work on promoting recognition of superior Japanese technology when promoting their popularization. In this study, a workshop was held as an opportunity to present and explain the superiority of the technology offered by Terra Motors Corporation, which was done in addition to providing explanations, etc. in the course of interviews. A total of 26

participants from the government, university and industry circles gathered and engaged in a vibrant discussion.

The Japan side tried to solve local people's concerns, including those regarding battery life and prices, and also gave an explanation of the Bilateral Offset Credit Mechanism and other support systems of the Japanese government.

The participants provided comments, including ones about linkage with public transportation. In general, we were able to confirm once again our shared recognition that electric motorcycles do represent technology effective for the sustainable development of Danang.

(b) Promotion of recognition of eco-city development through popularization of electric motorcycles

The "community cycle system," which is based on IT-operated management technology that has been adopted by IHI Scube Co., Ltd. in Japan as part of city development, was presented as a method of introducing electric motorcycles. This system, which has been adopted as a bicycle-sharing system in Japan, could also be applied to electric motorcycles. It has been confirmed that it carries a potential for linkage with a BRT service scheduled in Danang in the future. At the same time, combining the project with two-wheel motorcycle will lead to greater possibility of linking with pubic transportation and implementation of “community cycle system”; thereby maximizing the potential of GHG emission reduction and increasing the scale of the JCM project.

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1. Background

In Vietnam, where more than one out of three people owns a motorcycle, there is a call for prompt action as the increasing use of motorcycles has become a source of serious social issues, including air pollution and exhaust fumes that are harmful to human health, and traffic accidents and congestion. The precipitous pace of its economic growth has also contributed to tight demand for energy resources. Among them, the greatest rise in consumption is found in petroleum products, which made up approximately 45% of the final energy consumption in 2010. This imposes a huge fiscal burden on Vietnam, a country that relies on imports for 70 percent of its oil. Prices of gasoline - a petroleum product - have been rising constantly, nearly doubling over the period from 2007 to 2012.

Given those circumstances, the Vietnamese government endorses a policy for reducing energy consumption by making its traffic sector more energy-efficient and low-carbon, and for reducing emissions of greenhouse gases (hereinafter "GHG") generated as a result of fossil fuel consumption. The Law on Energy Efficiency and Conservation, which was introduced in 2010, requires organizations that manufacture or import means of transportation and associated products to "promote development of vehicles featuring advanced technology which are energy-efficient, utilize clean energy or use other fuels alternative to fossil fuels." Also, in the area of combating global warming, the Vietnamese government has presented its action policy in the National Target Programme to Respond to Climate Change (NTP-RCC), which it announced in 2008, to address the situation where emissions in the traffic sector amount to 23% of Vietnam's aggregate GHG emissions, coming next to the manufacturing and construction sectors. The "Green Growth Strategy," introduced in 2012 with the aim of enhancing the NTP-RCC, lists 17 measures in this area, with greater energy efficiency and fuel switching in the transport sector positioned as an important step as well. In Danang City, the target of this study, measures like achieving increased energy efficiency in traffic projects and promoting clean and green urban transportation founded on GHG reduction technology have been adopted in its "Vision 2020" and climate change action plan.

In terms of the current state of motorcycle use in Vietnam, privately-owned motorcycles make up approximately 90 percent of traffic in Danang City and, also, approximately 80 percent of traffic in Ho Chi Minh City, which has a relatively developed public transportation system, an indication of a high degree of reliance on motorcycles. As those figures have been rising from year to year, the number of motorcycle registrations by 2020 as predicted by the master plan that the government has developed, *i.e.*, 3,600, has reportedly already been surpassed as of March 2013. Although the Vietnamese government has laid out a policy that limits the number of motorbikes, no specific

measures have been set due to, among other reasons, low rates of switching to cars on account of high tax rates and the underdeveloped car infrastructure, including parking spaces and roads, and the slow pace of public transportation development – therefore, it is expected that the number of motorbike registrations will continue to follow an upward curve in the coming years as well.

As introducing electric motorcycles - the target technology under this study - in Vietnam as an alternative means to gasoline-fuelled motorcycles would make it possible to reduce GHG emissions from gasoline and also to contribute to improving air quality, the proposed project is an action amply in line with Vietnam's, and Danang's, own measures. The introduction of electric motorcycles has already begun and is now underway. However, the maintenance structure remains inadequate, leaving issues with durability. Partly because the substantial number of inexpensive made-in-China products have been introduced, electric motorcycles are considered as something that breaks down easily, which poses a hindrance to their more widespread use. Terra Motors Corporation (hereinafter "Terra Motors"), the top seller of electric motorcycles in Japan, has secured an electric motorcycle production plant in the province of Long An to the south of Ho Chi Minh City, Vietnam, and is planning to begin production by the spring of 2014.

The purpose of this study is to encourage the introduction of electric motorcycles by promoting the recognition of Terra Motors' superior technology and after-sales service in Danang, a major city in the fast-growing central part of Vietnam. Myriads of benefits can be expected by bringing this project to realization, including not only its contribution to reducing GHG emissions from gasoline combustion, but also improvement on air pollution and better images for the city as a leader in the introduction of the latest low-carbon technology.

2. Overview of the Study

The content of this study is primarily as follows:

(1) Study on the electric motorcycle utilization potential in Danang City
- Conducting a basic study by means of questionnaires and interviews mainly in resort establishments in Danang City, for which large-scale construction work is in progress, to comprehend the extent of potential popularization

(2) Development of a scenario for an electric motorcycle introduction project in Danang City
- Formulating a popularization project scenario on the basis of the utilization potential study

(3) Development of a demonstration project - Selection of a prospective site and project development aimed at implementing the demonstration project next year

- Through the utilization potential study, selecting a prospective demonstration project site and develop a demonstration project plan

(4) MRV methodology refinement and GHG reduction potential estimation

- Estimating GHG reduction on the basis of the applicable MRV methodology in order to clarify the proposed project's potential as a JCM project

(5) Promotion of recognition of superiority of the electric motorcycle technology to be introduced and examination of a method of introduction

- Promoting recognition of superiority of the electric motorbike technology to be introduced and making an effort to disseminate an understanding of it.
- Examining a method of introduction that would contribute to low-carbon city development based on the "community motor concept."

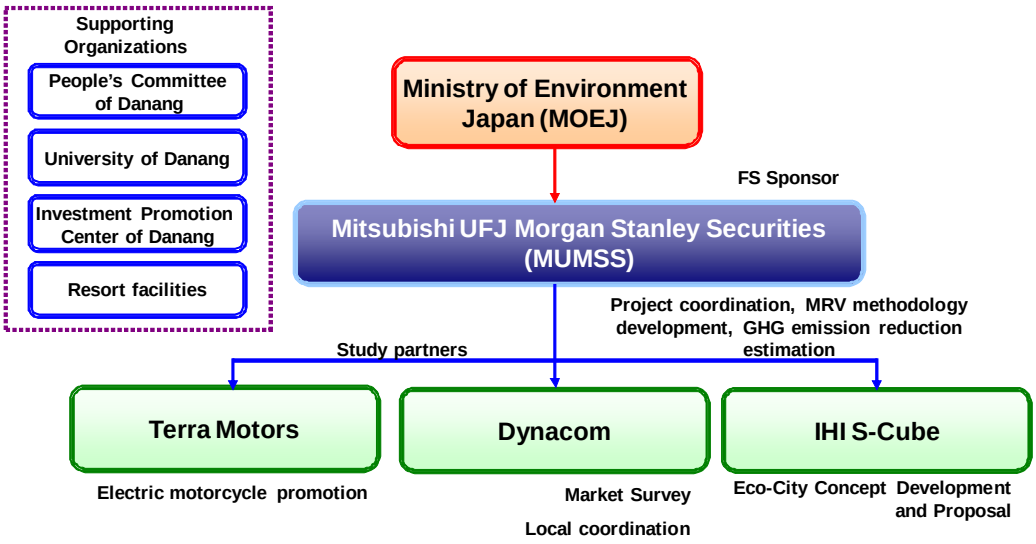


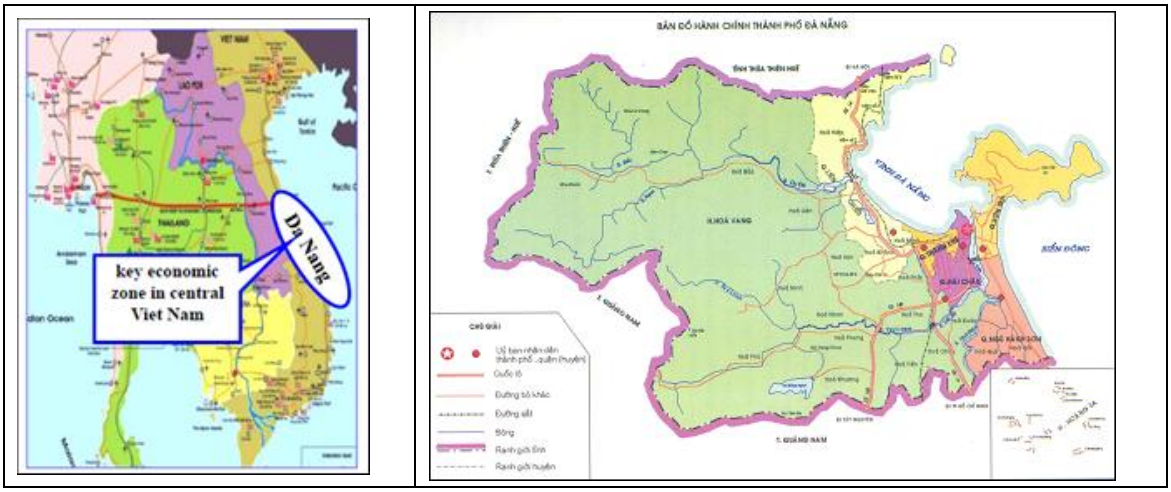
Figure 1: Study implementation framework

3. Study Findings

(1) Study on the electric motorcycle utilization potential in Danang City

Located in the central part of Vietnam, Danang is the largest city in the region. It has long served as a trading city where activities center around its port and it occupies a strategically important position as the gateway to the eastern side of the East-West Economic Corridor that connects four Indochina countries. Its population stands at approximately 960,000 as of 2012 and is expected to

reach 1.4 million by 2020.



Source: Danang People's Committee documents

Figure 2: Location and Map of Danang

Driving forward its policy as an environmentally-friendly city, Danang is advancing a series of projects, such as the APEC Low-Carbon Model Town Project that include one for electric motorcycles in addition to, for example, energy efficiency in buildings, water treatment and public transportation development through BRT introduction; therefore, it offers a good groundwork for this study.

In this study, focus was placed on Danang's tourism sector, which is marking remarkable growth. Located along a beautiful marine coastline and also close to world heritage site Hoi An, Danang City is in the thick of a construction rush for building tourism infrastructure in response to the rising number of tourists and, as resort hotels thus constructed one after another there are built on vast areas, mobility of tourists as well as employees has loomed to be a significant issue. Currently, there are 30 resort hotel and villa projects underway alongside the marine coastline that have an area of 5ha or greater, 11 of which are in operation. In this study, a basic study by means of questionnaires and interviews was conducted mainly in resort establishments in Danang City, for which large-scale construction work is in progress, to check the extent of potential popularization of three-wheel electric motorcycles.

The questionnaire survey was conducted with 16 resort establishments to collect information on, among other matters, development projects, the current state of affairs in the area of mobility and the need for electric mobility. As a result of the study, it came to light that every establishment is either planning to take, or interested in taking, some action associated with introducing electric mobility.

The average number of units expected to be introduced per establishment is five in terms of an equivalent to the number of three-wheel electric motorcycles of Terra Motors Corporation. On the basis of the study findings that there are 30 resort establishments in Danang with a site area of 5ha or greater, the number of units that could potentially be introduced in typical resort establishments is calculated as 150. Furthermore, we also believe that by adding the numbers of expected introduction at similar establishments which we interviewed on an individual basis, a total of 410 units could be introduced in the resort establishments.

Danang City is also experiencing a boom in the construction of large complexes that consist of office buildings, housing, schools, commercial establishments, entertainment establishments, etc. On the assumption that those establishments should also carry a high potential for electric motorcycle introduction, we examined their popularization potential, which has led to our estimate that a total of 1,165 units could be introduced in five establishments in and around Danang City.

(2) Development of a scenario for an electric motorcycle popularization project in Danang City

Based on the study on the electric motorcycle utilization potential described above and on Terra Motors Corporation's sales plan, a popularization project scenario has been examined as follows. As shown in Table 1, it is estimated that 1,575 three-wheel electric motorcycles in total for the resort hotels and major complexes and approximately 117 thousand two-wheel electric motorcycles - by 2020 in stages - could potentially be introduced.

Table 1: Number of three-wheel electric motorcycles expected to be introduced

Typical resort establishments	410 units (100 units in the first year)
Major community development complexes	1,165 units
Total	1,575 units

(3) Development of a demonstration project - Selection of a prospective site and project development aimed at implementing the demonstration project next year

Next, a plan was developed on the basis of the utilization potential study, etc. with the aim of implementing a demonstration project at a particular site.

A plan to introduce 100 units of three-wheel electric motorcycles at a resort establishment was developed. To serve as a financial incentive, support through leasing scheme has been considered. As for the actual scheme, a program similar to Japan's Eco-Lease Promotion Program where a certain percentage of lease fee is supported by government funding can be introduced. Alternatively, a program to support the reduction of lease fees through directly extending subsidy or loans to lease companies can be implemented. The funding sources of the Japanese government provided for the purpose of promoting low-carbon technology may potentially be used for such purpose.

Table 2: Demonstration Project Plan

<table>
<tr><td>Number of units introduced</td><td colspan="2">100 units</td></tr>
<tr><td>Project site</td><td colspan="2">A resort establishment</td></tr>
<tr><td>Estimated cost</td><td colspan="2"><table>
<tr><th></th><th>Item</th><th>Value</th><th>Unit</th><th>Note</th></tr>
<tr><td>(a)</td><td>Unit introduced</td><td>100</td><td>Unit</td><td></td></tr>
<tr><td>(b)</td><td>Unit price</td><td>5,000</td><td>US$/unit</td><td>Price in the Philippines</td></tr>
<tr><td>(c)</td><td>Total equipment cost</td><td>500,000</td><td>US$</td><td>(a) x (b)</td></tr>
</table></td></tr>
<tr><td>Financial incentives (Concept)</td><td>Support schemes of the Japanese government
(1) Climate change Action Plan Support Programme (JICA)
(2) Low-carbon technology fund (Ministry of Enviroenmtn
(3) ADB Trust Fund (Ministry of Environment)</td><td>Vietnamese version of “Eco-Lease”
・ Subsidize certain percentage of lease fee
・ Or, directly support lease company through subsidy or loan and promote the lowering of loan fee</td></tr>
<tr><td></td><td>Other (non-government) incentives</td><td>“Transport Eco-Point”</td></tr>
</table>

(4) MRV methodology scrutiny and GHG reduction potential estimation

In order to grasp the project's potential as a JCM project, and to formulate a demonstration project plan, the GHG reduction potential that would be delivered by the project was estimated. First,

applicability of the MRV methodology that we had developed for the FY2012 Global Warming Mitigation Technology Promotion Project (bilateral FS), entitled "Project Development Study on the Promotion of Electric Motorbikes," was confirmed. We then proceeded to update the CO_2 emission factor for grid electricity to the latest figures and, when applying it to three-wheel motorcycles, also changed the travel distance to the average travel distance at resort hotels to arrive at the following GHG reduction potential calculation:

(a) Eligibility criteria

Criterion 1	New electric motorbikes (with an engine size up to 150cc) have been introduced in Vietnam
Criterion 2	The amount of electricity consumed by, and the mileage traveled by, the electric motorbikes is measureable after the implementation of the project
Criterion 3	Electricity to be used for the electric motorbikes should be sourced from the Vietnamese power grid

(b) Reference emissions calculation

Reference emissions are calculated in the following manner.

$$RE_y = EF_{df,km} \times DD_y \times N_y \times 10^{-6} \quad (1)$$

Parameter	Explanation	Value
RE_y	Reference emissions in year y (t-CO2/year)	29.04
$EF_{df,km}$	Emission factor for reference motorbikes (g-CO2/km)	48.9
DD_y	Average distance travelled by the project motorbikes in year y (km) To be monitored	5,939
N_y	Number of operational project motorbikes in year y (number of bikes) To be monitored.	100

*Values are ex-ante estimates for introduction of 100 units of three-wheel motorcycles. In case of two-wheel motorcycles, DD_y is established at 9,125km.

$$EF_{df,km} = SFC_{df} \times NCV_{RE} \times EF_{RE} \times IR^{t}_{RE} \quad (2)$$

Parameter	Explanation	Value
SFC_{df}	Default value for Specific fuel consumption per km per reference motorbikes (g/km)	17.22
NCV_{RE}	Net calorific value of the fossil fuel consumed by reference motorbikes (J/g) Default value at the lower average based on IPCC 2006 is to be applied.	42.5
EF_{RE}	Emission factor of fossil fuel consumed by reference motorbikes (g-CO2/J) Default value at the lower average based on IPCC 2006 is to be applied.	0.0675
IR^{t}_{RE}	Technology improve factor for reference motorbikes in year t Improvement rate should be applied each year in accordance with AMS-III.C, a small-scale CDM methodology, and improvement rate per year should be 0.99.	0.99
t	Year counter for the annual improvement. Monitored.	1

(c) Project emissions calculation

Project emissions are calculated in the following manner.

$$PE_y = EF_{pj,km,y} \times DD_y \times N_y \quad (3)$$

Parameter	Explanation	Value
PE_y	Project emissions in year y (t-CO_2/year)	13.17
$EF_{pj,km,y}$	Emission factor for electric motorbikes introduced under project in year y (t-CO2/km)	0.022×10^{-3}
DD_y	Average distance travelled by the project motorbikes in year y (km) To be monitored.	5,939
N_y	Number of operational project motorbikes in year y (number of bikes) To be monitored.	100

* In case of two-wheel motorcycles, DD_y is established at 9,125km.

$$EF_{pj,km,y} = SEC_{pj,km,y} \times EF_{elect,y}/(1 - TDL) \times 10^{-3} \quad (4)$$

Parameter	Explanation	Value
$SEC_{pj,km,y}$	Specific electricity consumption by project motorbikes in year y (kWh/km) To be monitored.	0.369
$EF_{elect,y}$	CO2 emission factor of electricity consumed by project motorbikes (kg-CO2/kWh) The latest official value is to be applied.	0.5408
TDL	Average technical transmission and distribution losses for providing electricity in the year y The latest value from official literature is to be applied.	0.1

(d) Under the scenario of the three-wheel electric motorcycle introduction at resort hotels, etc.

(e)

Table 3: Emission Reduction Estimation for three-wheel motorcycles

	First project year	After large-scale application
No. of units introduced (units)	100	1,575
Reference emissions (tCO2)	29.04	453
Project emissions (tCO2)	13.17	207
Emission reduction (tCO2/year)	15	250
Emission reduction (tCO2/2014-2020)	102	1,653

(f) Under the two-wheel electric motorcycle popularization scenario

For reference the amount of emission reduction for 5,500 units of two-wheel motorcycle, which is Terra Motors' sales target for the first year has been estimated as follows at the annual average of 1,269 tCO2. When taking into account the sales target up to 2020, the emission reduction potential reaches 13,824 tCO2 on annual average and 96,771 in total, signifying upward trend of emission reduction as sales grows.

Table 4: Emission Reduction Estimation for two-wheel motorcycles

	2014	2015	2016	2017	2018	2019	2020
Emission Reduction(tCO2)	1,341	1,317	1,292	1,268	1,244	1,221	1,198
Total (2014~2020)	8,881tCO2						
Annual average (2014~2020)	1,269 tCO2						

(5) Promotion of recognition of superiority of Japan's electric motorcycle technology to be introduced and assessment of the method of introduction

(a) Promotion of recognition of superiority of the electric motorcycle technology to be introduced

Since, in Vietnam, electric motorcycles carry an entrenched image that they break easily, it is imperative to work on promoting recognition of superior Japanese technology when promoting their popularization. In this study, a workshop was held as an opportunity to present and explain the superiority of the technology offered by Terra Motors Corporation, which was done in addition to providing explanations, etc. in the course of interviews. A total of 26 participants from the government, university and industrial sector gathered and engaged in a vibrant discussion.

The Japan side tried to solve local people's concerns, including those regarding battery life and prices, and also gave an explanation of the Bilateral Offset Credit Mechanism and other support systems of the Japanese government.

The participants provided comments, including ones about linkage with public transportation. In general, we were able to confirm once again our shared recognition that electric motorcycles do represent technology effective for the sustainable development of Danang.

Figure 3: A scene from the workshop

Figure 4: Presentation of battery operation performance

(b) Encouragement and promotion of recognition of eco-city development through popularization of electric motorcycles

The "community cycle system," which is based on IT-operated management technology that has been adopted by IHI Scube Co., Ltd. in Japan as part of city development, was examined as a method of introducing electric motorcycles. Adopted as a bicycle-sharing system in Japan, being a framework for centralized management of multiple bicycle rental establishments (ports) whereby "who" rented/returned "which bicycle" "when" and "where" can be recorded and the bicycle can be returned at an establishment different from the one where it was rented out, this system could also be applied to electric motorcycles.

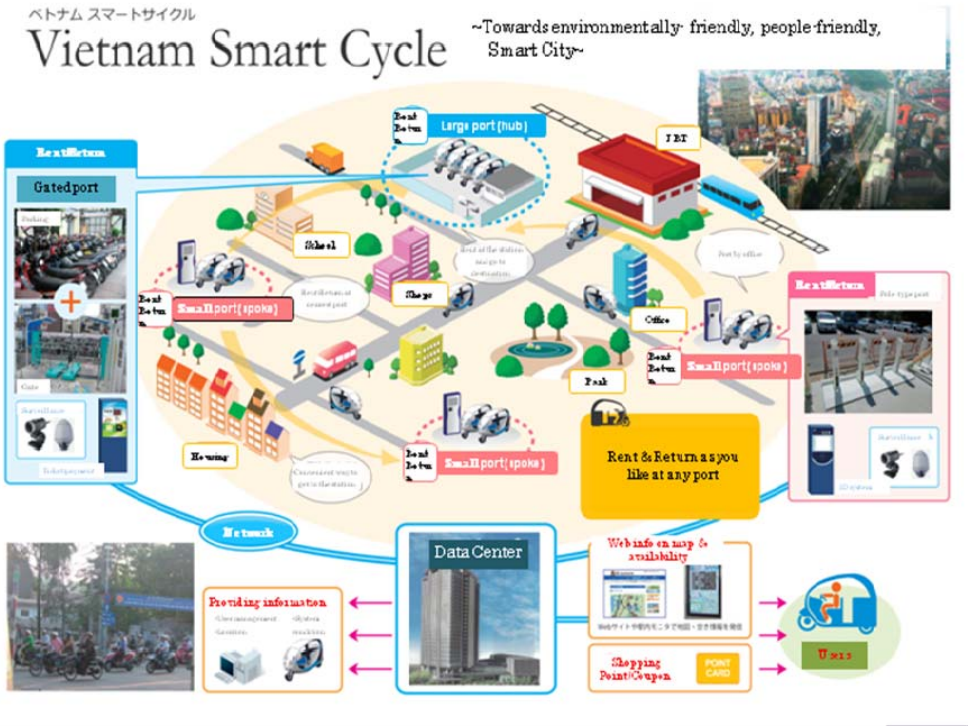


Figure 5: Conceptual image of "community cycle system" in Vietnam

4. Conclusion

The findings of this study have clearly shown that there is undoubtedly a need for electric motorcycles in resort establishments in Danang. Overwhelming majority of the resort establishments surveyed emphasizes quality of such vehicles as key factor in their purchase decision and have shown interest in the high quality Japanese product. With respect to three-wheel electric motorcycles, however, due to the limited number of three-wheel motorcycles required per establishment as well as limited distance travelled, its potential as a large-scale JCM project can face limitations. Therefore, in order to achieve large scale introduction, it would be more effective to introduce three-wheel electric motorcycles together with two-wheel motorcycles which have greater GHG reduction potential under the community wide scheme with linkages to public transport. Through such implementation method, the potential as a JCM project may be augmented.

In Danang and many other regions of Vietnam alike, urban development is in progress, including development of major complexes that consist of office buildings, housing, commercial establishments, etc. Although a good majority of them are aiming to create an environmentally-conscious, sustainable community, no specific low-carbon measures are in place. It is believed that in those new communities, a highly cost-effective JCM project could be realized on a great scale by introducing a community cycle system that links major establishments and housing, coupled with linkage with public transportation.