MOE

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

Final Report

Project for Developing Environmentally and Culturally Sustainable Cities through Joint Crediting Mechanism (JCM) in Siem Reap, the Kingdom of Cambodia

March 2015

Overseas Environmental Cooperation Center, Japan (OECC)

Executive Summary

The purpose of the "Project on Developing Environmentally and Culturally Sustainable Cities through the Joint Crediting Mechanism in Siem Reap" (hereinafter referred to as "this Project") is to determine to find and to formulate potential projects of the Joint Crediting Mechanism (JCM) in a multilateral manner in Siem Reap City and the Angkor Park. This Project is expected to contribute to the transfer of advanced Japanese low-carbon technologies through the JCM and introduce relevant environmental policies of the Kamakura city and Kamakura Prefecture to the stakeholders of the APSARA Authority and the Siem Reap provincial government, thereby supporting the development of an Asia's leading city in environmental and cultural sustainability in Cambodia.
The list of potential JCM projects identified in this Project is shown as Table A and Table B.

Table A. The list of potential JCM projects identified in this project
(EcoMobility project)

Title	Introduction of electric Reumork Moto in Cambodia
Content of the JCM project	In 2016 and 2017, a total of 250 electric Reumork Moto vehicles will be introduced in Siem Reap City and the Angkor Park in Cambodia.
Technology	Electric Reumork Moto
Approximate project cost	About ¥125 million *The Project Team presumes that the vehicle price will be USD 5,000/vehicle (exempt from import tax).
MRV Methodologies	Introduction of electric Reumork Moto in Cambodia (Appendix 1)
GHG emission reduction (FS)	About 110 tCO2e/year
GHG emission reduction (Scaling-up)	About 11,880 tCO2e/year
Co-benefits	Increase of drivers' income due to fuel cost reduction, and improvement in air pollution in Siem Reap City and the Angkor Park

*Reumork moto is a unique passenger vehicle which consists of a gasoline-driven motorbike and a passenger cart in Cambodia. This project defined a passenger vehicle which consists of an electric motorbike and a passenger cart as an "electric Reumork Moto".

Table B. The list of potential JCM projects identified in this project
(Mekong Heritage Park project)

Title	Introduction of highly efficient air conditioners in Cambodia	Introduction of highly efficient chillers, inverters and the BEMS in Cambodia
Content of the JCM project	Popularizing highly efficient air conditioners in hotels in Siem Reap City and the Angkor Park	Introduction of highly efficient chillers, inverters and the BEMS in hotels in Siem Reap City and the Angkor Park
Technology	Highly efficient inverter-driven air conditioners	Highly efficient chiller and controlling chiller pumps with the use of inverters and the BEMS
Approximate project cost	N/A	N/A
MRV Methodologies	N/A *Created based on the draft methodologies in Thailand and Vietnam	N/A * Created based on the draft methodologies in Thailand
GHG emission reduction (FS)	50 to 250 tCO2e/year *Per hotel	100 to 300 tCO2e/year * Per hotel
GHG emission reduction (Scaling-up)	About 5,400 tCO2e/year *When this case is applied to 29 four-star hotels and seven three-star hotels in Siem Reap City	About 3,200 tCO2e/year *When this case is applied to 16 five-star hotels in Siem Reap City
Co-benefits	Management improvement due to fuel cost reduction	Management improvement due to fuel cost reduction

For the introduction of electric Reumork Moto, in the first half or second half of the FY 2015, Japan Developing Institute Inc. and Forval Corporation will establish the SPC, build the business processes of the companies, and maintain the system for monitoring the electric Reumork Moto. In the first half of the FY 2016, the SPC will start the JCM project by using the JCM model project scheme. Furthermore, after carrying out the project in Siem Reap City and the Angkor Park in Cambodia, the SPC will try to popularize the electric Reumork Moto in other cities of Cambodia and in neighboring countries

For the introduction of highly efficient equipment, in the first half or second half of

the FY 2015, the Project Team will cooperate with the representative companies and the companies with the required technologies to prepare the JCM project and conduct detailed researches. The Project Team is planning to start the JCM project in the first half of the FY 2016 by using the JCM Model project scheme. After making the existing hotels in Siem Reap City implement the project, the Project Team will try to popularize the project in the MHP and other cities in Cambodia.

Table C shows the needs from Siem Reap City and the environment-related knowledge Kanagawa Prefecture or the City of Kamakura has obtained, both of which are identified through this Project.

Table C. Needs from Siem Reap City

Issue	Needs from Siem Reap City	Knowledge that Kanagawa Prefecture or the City of Kamakura has obtained
City master plan	Strengthening the institutional capcity for plan, do, check, act (PDCA) of the city master plan	Managing the Exploratory Committee for drawing up the city master plan
	Strengthening ties with the institutions concerned such as the APSARA National Authority	Cooperating with public organizations, research institutions, and citizens for the establishment of the city master plan
	Revising the city master plan	Drawing up and revising the city master plan
Traffic (transport demand management and EV popularization)	Easing traffic jams and reducing air pollution	Taking measures such as traffic regulations, park and ride, community buses, a traffic pollution reduction system, preferential treatment for purchasing or using an EV, and the Kanagawa EV taxi project
Environment (solid waste)	Increasing citizens' awareness of reducing and recycling solid waste	Taking measures such as training local leaders, keeping the residents informed about trash separation, and providing environment education

The Siem Reap Provincial Government has made the following requests to the Kanagawa Prefecture: (a) Establishing inter-city cooperation, (b) supporting Siem Reap City in drawing up the master plan, and (c) supporting Siem Reap City in reducing the carbon emitted from the vehicles used for touring the city.

In the future, under the framework of inter-city cooperation, the issues of Siem Reap City can be solved and the establishment of the Environmentally and Culturally Sustainable Cities can be promoted by (a) the utilization of funding schemes including JCM of the Japanese Government, (b) technical support from the Japanese municipalities, and (c) the introduction of technologies from Japanese private companies.

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Chapter 1 Outline of the Project

1.1 Purposes of the project

The Angkor Park is located near Siem Reap City (with a population of about 245,000 people in 2014) in the northwest of Cambodia. In the Angkor Park, there are buildings and art objects of the capital of the Khmer Empire which was prosperous from the 9th to 14th centuries. In 1992, the Angkor Park is registered on the World Heritage List of the United Nations Educational, Scientific and Cultural Organization (UNESCO). Annually, about 5,020,000 tourists (in 2014) visit the site. Of the tourists, about 2,350,000 are foreign tourists. As just described, the Angkor Park is the leading tourist site in Cambodia and has become a leading force in the Cambodian economy in which the tourist industry takes up about 10% of GDP.

On the other hand, due to a rapid increase in the number of population and tourists, Siem Reap City and the Angkor Park are faced with delays in developing infrastructure such as water supply, electricity, as well as roads and in taking environmental measures such as air pollution prevention and waste disposal. In the above areas, the percentage of water supply coverage is about 25% which is the lowest level in main cities in Cambodia. In addition, serious problems are that vehicles with inadequate exhaust emission controls and maintenance emit pollutants, and that serious air pollution is caused by large-sized diesel generators used in hotels, by open burning of collected wastes, and by other factors. In the above areas, polycyclic aromatic hydrocarbon (PAHs) pollution is severe, and the concentration of PAHs is as high as that in the center of Bangkok, the capital of Thailand.

In order to solve these problems in the Angkor Park, in the FY 2010 a Japanese business entity, led by Japan Development Institute Ltd., planned the ”Project for Developing a Smart Community in Angkor Park, Cambodia” to develop an eco-friendly, cultural, and tourism city in the Angkor Park. For the above plan, the establishment of a project was discussed in and after the FY 2012 through the Project run by the Japanese Ministry of Economy, Trade and Industry (METI). Then, in the FY 2013, based on the discussion results, funds were raised for the first time. In 2015, it is planned that Japan Development Institute Ltd. will establish special purpose companies (SPC) in Tokyo and Cambodia, that the details of the project will be designed after the establishment of the SPC, and that funds will be raised for the second time. The “Project for Developing a Smart Community in Angkor Park, Cambodia” is comprised of the EcoMobility project and the Mekong

Heritage Park project (hereinafter the “MHP project”) that includes smart energy, water as well as sewage, water recycle, and waste control. It is presumed that any of the above projects will utilize the Joint Crediting Mechanism (JCM), a credit system between two countries, to contribute to the reduction of CO2 emissions from fuel combustion.

Under these backgrounds, the “Project on Developing Environmentally and Culturally Sustainable Cities through the Joint Crediting Mechanism in Siem Reap” (hereinafter referred to as “this Project”) works together with the “Project for Developing a Smart Community in Angkor Park, Cambodia” so that in the Angkor Park, JCM cases will be determined and possibilities of JCM will be investigated in a multilateral manner. Through this Project, discussions will be made for promoting the introduction of excellent low-carbon and low-emission technologies. While making the discussion, Overseas Environmental Cooperation Center, Japan, Japan Development Institute Ltd., Terra Motors Corporation, MILAI Corporation, and JTB Business World Travel & Solutions Inc. (hereinafter referred to as “the Project Team”) will investigate the current status as well as problems of the environmental measures taken in the Angkor Park and introduce the information and knowledge about the environmental policies of Japanese municipalities to Siem Reap City, private companies in the City, and the APSARA National Authority which manages the Angkor Park, thereby supporting the development of an Asia's leading city in environmental and cultural sustainability in Cambodia.

1.2 Selected Technologies

In this Project, by considering the technologies shown in Table 1, the Project Team investigated the possibility of the determination of JCM cases.

Table 1: List of the investigated technologies

Selected technologies	Summary
Electric motorbike and three-wheelers	Motorbikes and three-wheelers which are run by using an electric motor as the power source
Inverter-driven packaged air conditioners	Packaged air conditioners with inverters which allow the partially loaded operation of the compressor and which are highly energy-efficient
Inverters (for chiller pumps)	Equipment that converts DC power into AC power
Building energy management system (BEMS)	System which is composed of equipment for measurement, control, monitoring, data saving, analysis, and diagnosis, and which reduces energy consumption by controlling the operation of the equipment in accordance with the indoor condition

1.3 Target areas

In this Project, Siem Reap City and the Angkor Park in Cambodia were investigated.

Chapter 2 Methods of Investigation

2.1 Project Activities

This Project is composed of three activities: (1) Study on the potential of an EcoMobility project as JCM projects, (2) Study on the potential of a MHP project as JCM projects, and (3) Study on appropriate environmental policies needed to developing environmentally and culturally sustainable cities. The content of each activity is described below.

(1) Study on the potential of an EcoMobility project as JCM projects

In Siem Reap City and the Angkor Park, while working together with the Drivers' Associations in the area, the Project Team conducted interviews and investigated vehicle fuel economy, carried out test runs with project vehicles, and investigated the electricity ecomony of the project vehicles. Then, the Project Team created the Results of driver interview survey, Results of vehicle monitoring survey, Results of electric vehicle test drive, and the Maintenance manual. By referring to these documents and manuals, the Project Team created draft MRV Methodologies, a draft Monitoring plan, and a draft JCM Project Design Document (PDD).

(2) Study on the potential of a MHP project as JCM projects

For the solar power system, hotel, commercial facility, water as well as sewage facilities, and waste disposal facility that are planned to be built in the Mekong Heritage Park, the Project Team investigated whether the low-carbon technologise can be used and whether they can be JCM projects. Then, the Project Team specified the projects the feasibility of which is high and considered draft MRV Methodologies.

(3) Study on appropriate environmental policies for developing environmentally and culturally sustainable cities

The Project Team investigated the current status and problems of the environmental measures taken in Siem Reap City as well as the Angkor Park and finalized improvement proposals.

2.2 Implementation Arrangement

The agencies that implemented this Project are specified below. Fig. **1** shows the implementation arrangement chart.

(1) Agencies in Cambodia

Implementing agencies:	Siem Reap Provincial Government, Siem Reap City Government, APSARA National Authority, and Drivers' Associations (CCDA and IDEA)
Institutions concerned:	Ministry of Environment, Ministry of Tourism, Ministry of Public Works and Transport, Cambodia Hotel Association, Cambodia Association of Travel Agents, and Cambodia Chamber of Commerce

(2) Agencies in Japan

Implementing agencies:	Overseas Environmental Cooperation Center, Japan, Japan Development Institute Ltd., Terra Motors Corporation, MILAI Corporation, and JTB Business World Travel & Solutions Inc.
Supporting municipalities:	Kanagawa Prefecture, and the City of Kamakura

(3) Donors

Japan International Cooperation Agency (JICA) and United Nations Educational, Scientific and Cultural Organization (UNESCO)

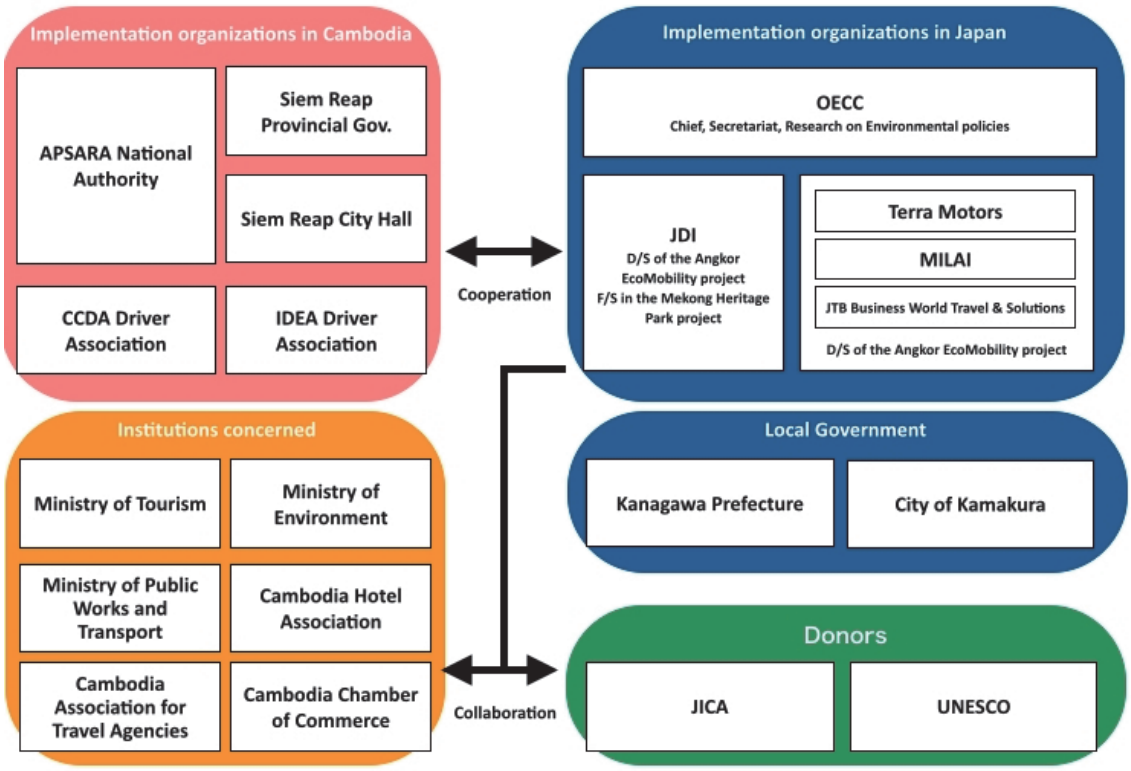


Fig. 1 Implementation arrangement chart

Chapter 3 Results of Investigation

3.1 Achievements

Table 2 shows the achievements of each activity of this Project. Each activity proceeded according to the original plan. During the activity period, the Project Team went to Cambodia seven times to investigate the site, discuss with the institutions concerned, and give seminars. Besides, relevant parties in Cambodia traveled to Kanagawa Prefecture to conduct a courtecy call, discussion and ste visit.

Table 2 Achievements

<table>
<tr><td rowspan="2">Month and year</td><td colspan="3">Activities</td></tr>
<tr><td>(1) Study on the potential of an EcoMobility project as JCM projects</td><td>(2) Study on the potential of a MHP project as JCM projects</td><td>(3) Study on appropriate environmental policies for developing environmentally and culturally sustainable cities</td></tr>
<tr><td>June 2014 (first mission)</td><td colspan="3">Discussions as to study targets, content, schedule, and implementation arrangement</td></tr>
<tr><td>July 2014 (second mission)</td><td>1-1 Interviewing with drivers
1-2 Investigating vehicle fuel economy</td><td rowspan="6">2-1 Discussing with the APSARA National Authority as to the Mekong Heritage Park project

2-2 Hearing from the existing hotels in Siem Reap City and survey of needs for low-carbon technology</td><td rowspan="2">3-1 Collecting information on environmental policies and measures</td></tr>
<tr><td>August 2014 (third mission)</td><td>1-3 Conducting an interim report session</td></tr>
<tr><td>September (fourth mission)</td><td>1-4 Conducting a test drive of project vehicles and investigating electricity efficiency of the vehicles</td></tr>
<tr><td>October (fitth mission)</td><td>1-5 Conducting a traffic survey</td></tr>
<tr><td>November (sixth mission)</td><td>-</td><td>3-2 Conducting a study tour to Japan</td></tr>
<tr><td>December (seventh mission)</td><td>1-6 Investigating vehicle fuel economy
1-7 Conducting a traffic survey</td><td>3-3 Identifying key issues related to environmental protection</td></tr>
<tr><td>January 2015 (eighth mission)</td><td>1-8 Conducting a test drive of project vehicles and the investigating electricity efficiency of the vehicles
1-9 Conducting a final report session</td><td>3-4 Organizing a seminar</td></tr>
<tr><td>February</td><td>1-10 Drafting MRV Methodologies
1-11 Drafting a Monitoring plan
1-12 Drafting a PDD</td><td>2-3 Determining JCM potential projects in the existing hotels
2-4 Creating a low-carbon technology list</td><td>3-5 Considering the environmental policy develiopment in Siem Reap</td></tr>
</table>

3.2 Summary of activity achievements

Table 3 shows the summary of each activity achievement of this Project

Table 3 Activity achievements

Activity		Achievements
(1)	Study on the potential of an EcoMobility project as JCM projects	Results of driver interview survey, Results of vehicle monitoring survey, Results of electric vehicle test drive, Maintenance manual, Business plan for tourist transportation service in which the operation of Reumork Moto is managed, draft MRV Methodologies, draft Monitoring plan, and draft PDD
(2)	Study on the potential of a MHP project as JCM projects	Draft MOU with the APSARA National Authority, and a list of low-carbon technologies applicable to the Mekong Heritage Park and existing hotels
(3)	Study on appropriate environmental policies for developing environmentally and culturally sustainable citis	Information on urban issues of Siem Reap City, and a formal request from the Siem Reap Province Governor regarding the establishment of inter-city cooperation with Kanagawa Prefecture

3.3 Results of the study on the potential of an EcoMobility project as JCM projects

(1) Summary of the EcoMobility project

The EcoMobility project is the tourist transportation service business for which the operation of Reumork Moto (tuk-tuk in Cambodia) is managed. Fig. 2 shows the draft schedule of the implementation plan. In 2015, it is planned that a SPC will be established, and that processes for managing the operation of the existing Reumork Moto will be established. In and after 2016, it is planned that JCM will be utilized to introduce about 250 electric vehicles. Appendix 4 shows the Outline of EcoMobility project.

Implementation plan	2015	2016	2017	2018
Employment and organization creation	● →	→	→	→
Diffusion of the vision and corporate identity	● →	→	→	→
Building relationships with strategic partners	● →	→	→	→
Establishing a system and bases for attracting tourists	● →	→		
Establishing a system for assigning drivers	● →	→		
Establishing a system for managing the work of drivers	● →	→		
Establishing a system for managing the operation of Reumork Moto	● →	→	ICT development	
Establishing a system for managing electric vehicles		●		
Co-development with electric vehicle manufacturers	● →	→	→	Cost reduction
Strategic procurement of electric vehicles		● →	→	→

△Registerd as a JCM project

Fig. 2 Draft Schedule of the implementation plan of the EcoMobility project

(2) Results of considering MRV Methodologies

Throughout this Project, the Project Team considered the draft MRV Methodologies for the EcoMobility project. The table below shows the results derived from the consideration of the draft MRV Methodologies. Furthermore, Appendix 1 shows the JCM proposed methodology that is created.

1) MRV Methodologies used as references

When considering the draft MRV Methodologies, the Project Team referred to the existing Clean Development Mechanism (CDM) methodologies shown in

Table 4. Furthermore, the Project Team referred to the proposed JCM methodologies, which had been discussed in the FY 2013 MOE (Ministry of Environment) demonstration study for JCM methodologies in Laos, and the proposed JCM methodologies, which had been discussed in the FY 2012 Global

Warming Mitigation Technology Promotion Project by NEDO in Vietnam.

Table 4 Referenced MRV Methodologies (existing CDM methodologies)

Methodologies	Description
AMS-III.C Emission reduction by utilizing electric and hybrid vehicles	The targets are the projects in which GHG emissions are reduced by changing the existing transportation means that use fossil fuel to the transportation means that use electricity and hybrid.
AMS-III.S. Introducing low-carbon technologies to commercial vehicles and using low-carbon vehicles	The targets are the projects in which GHG emissions are reduced by using low-carbon technologies and vehicles for the commercial vehicles such as public buses that routinely run on certain routes or modifying such commercial vehicles for the purpose of low-carbon emissions.

2) GHG emission reduction measures

The methodologies described here applies to the project in which the Cambodian electricity-driven transportation means (electric Reumork Moto) replace the existing fossil-fuel-driven transportation means (Reumork Moto) to reduce fossil fuel consumption and greenhouse gas (GHG) emissions.

3) Methods for evaluating GHG emission reduction

Methods for evaluating the GHG emitted from the transportation sector are classified, according to active mass and CO2 emission coefficients, into the four options shown in Table 5. In this investigation, since the Project Team needed to evaluate the effect of introducing electric Reumork Moto, the Project Team adopted the notion of option (2), the fuel-consumption-based method, to evaluate GHG emissions.

Table 5 Methods for evaluating GHG reduction

Option	Calculation formula	Summary	Typical applications
(1) Fuel-based method	Fuel consumption (l) × CO2 emission coefficient (kgCO2/l)	Calculate the CO2 emission based on the fuel consumption.	When accuracy is the priority.
(2) Fuel-consumption-based method	Driving distance (km) ÷ fuel economy (km/l) × 1/1,000 × CO2 emission coefficient (kgCO2/l)	Calculate the CO2 emission based on the fuel economy and driving distance.	When it is difficult to directly grasp the fuel consumption but when accuracy needs to be focused on. When the effect of a low fuel consumption vehicle is evaluated.
(3) Passenger-kilometer method	Passengers carried × driving distance (km) × CO2 emission coefficient (kgCO2/person km)	Calculate the CO2 emission based on the mode- and route-specific passenger-km carried.	When it is difficult to apply the fuel-based method or the fuel-consumption-based method. When the effect of modal shift, etc. is evaluated.
(4) Ton-kilometer method	Weight carried (t) × driving distance (km) × CO2 emission coefficient (kgCO2/ton km)	Calculate the CO2 emission based on the vehicle-type- and mode-specific ton-km carried.	When it is difficult to apply the fuel-based method or the fuel-consumption-based method. When the effect of improved loading ratio, etc. is evaluated.

(Source) These methods are based on the"Guidelines for Calculating CO2 Emissions in the Logistics Sector" created by the Ministry of Economy, Trade and Industry and by the Ministry of Land, Infrastructure, Transport and Tourism. These methods are finally created by OECC.

4) Eligibility criteria

Table 6 shows the eligibility criteria for the draft methodologies described here and the reasons for selecting the criteria. The Project Team considered the cases relating to the proposed draft JCM methodologies, which had been discussed in the FY 2013 MOE demonstration study for JCM methodologies in Laos, and the cases relating to the proposed draft JCM methodologies, which had been discussed in the FY 2012 Global Warming Mitigation Technology Promotion Project by NEDO in Vietnam. After considering the above, the Project Team set the eligibility criteria that suit the conditions in Cambodia.

Table 6 Eligibility Cliteria

Cliteria	Content	Reason for selection
Cliterion 1	The project replaces a gasoline bike of a reumork moto with a new electric bike	The cliterion is the positive list of the technologies that are the targets of the JCM project.
Cliterion 2	The project determines an electricity economy and a driving distance of the introduced electric reumork moto	The cliterion is the availability of the data required for evaluating the amount of GHG reduced by the JCM project.
Cliterion 3	The project uses electricity only supplied from the national grid in Cambodia	The cliterion is the use of grid eletricity to simplify the monitoring of the amount of GHG reduced by the JCM project.

Table 7 Eligibility criteria used as references

Cliteria	Laos	Vietnam
Cliterion 1	The methodologies described here can be applied to the project in which electric vehicles to be introduced will replace fossil-fuel-driven vehicles.	New electric motorcycles (displacement: up to about 150 cc) need to be introduced to Vietnam
Cliterion 2	The methodologies described here can be applied to two-, three-, as well as four-wheeled electric vehicles and electric vehicles with at least five wheels. The methodologies cannot be applied to electric assist bicycles, hybrid vehicles, and plug-in hybrid vehicles. By applying the methods specified below, prove that the project vehicle is equivalent to the reference vehicle. Then, describe the proven results in the Project Specification a) Same type of vehicle. (e.g. motorcycle, bus, taxi, freight vehicle, and three-wheeled vehicle) b) They are equivalent in the number of seats including the driver's seat or in the maximum load.	After the project is carried out, the electricity consumption and driving distances of the electric motorcycles can be measured.
Cliterion 3	Make sure that the target electric vehicles (a) have passed relevant standards in Laos, (b) can be subject to vehicle registration, and (c) are likely to go through the vehicle disposal procedure. The Project Specification describes how to identify the vehicles that satisfy this requirement.	The electricity used by the electric motorcycles shall be grid electricity in Vietnam.
Cliterion 4	The EV uses only grid electricity in Laos.	

5) GHG type

Table 8 shows the GHG emission sources and the type of GHG which are the targets of the methodologies described here.

Table 8 Emission sources and GHG types

Emission sources	GHG Type	Description
Fossil fuel consumption	CO2	CO2 generated from the gasoline which the existing Reumork Moto consumes
Grid electricity consumption	CO2	CO2 generated from the electricity derived from the grid electricity which the electric Reumork Moto consumes

6) Method for calculating emission reduction

The JCM defines the emission reduction, for which credit will be issued, as the difference between reference emission and project emission. The reference emission is calculated lower than the BaU (business-as-usual) emissions. This approach will ensure a net decrease and/or avoidance of GHG emissions (according to the Latest Trend of the Joint Crediting Mechanism issued by the Ministry of Environment in October 2014). By following the above policies, in this Project the Project Team considered the procedures specified below to calculate emission reduction.

Procedures for considering methods for calculating emission reduction in the EcoMobility project

(1) Setting the BaU scenario
  (a) Setting the boundaries of the JCM project
  (b) Creating results of driver interview survey
  (c) Predicting the trend of emissions from the existing Reumork Moto
(2) Considering methods for calculating emissions from reference vehicles
  (a) Calculation formula for reference emission
  (b) Sampling
  (c) Creating results of vehicle monitoring survey
  (d) Setting the default value
(3) Considering methods for calculating emissions from project vehicles
  (a) Calculation formula for project emission
  (b) Organizing data on project vehicles
  (c) Considering charge modes
(4) Considering leakage emission
(5) Considering methods for calculating emission reduction

(1) Setting the BaU scenario

(a) Setting the boundaries of the JCM project

The boundaries of the JCM project in the EcoMobility project are the Reumork Moto which runs in and around Siem Reap City and the Angkor Park. The Reumork Moto mainly carries the overseas tourists visiting the Angkor Park. The Reumork Moto is used only in the area (within about a 20-km radius) around the monuments such as Angkor Wat and Angkor Thom. Fig. 3 is the map showing Siem Reap City and the Angkor Park.

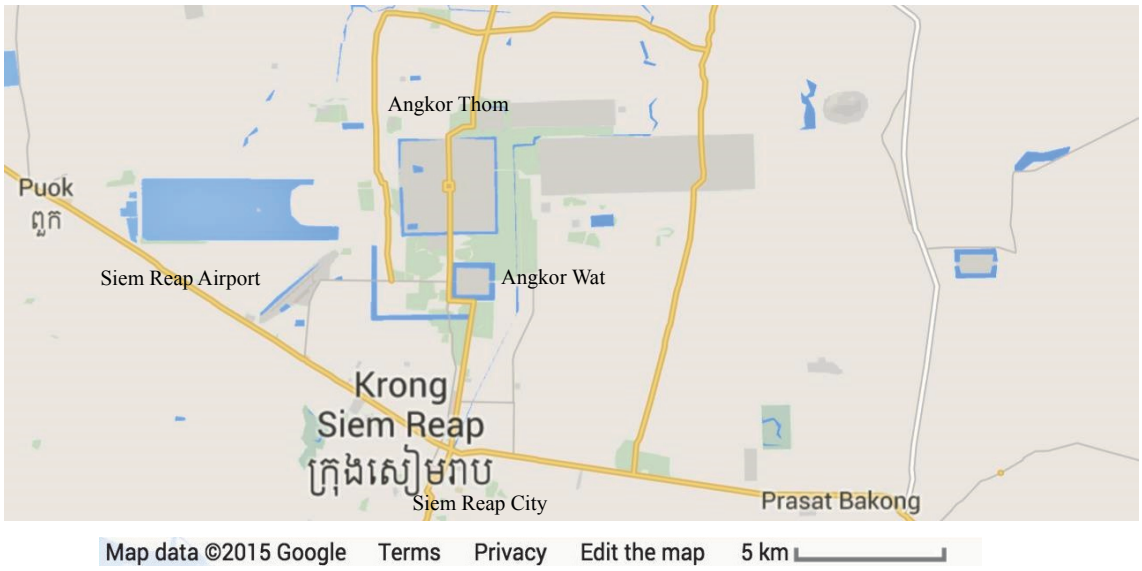


Fig. 3 Map showing Siem Reap City and the Angkor Park

(b) Creating results of driver interview survey

One-hundred forty-seven Reumork Moto drivers in Siem Reap City were asked to complete a questionnaire, and 142 of them made valid responses. By using the responses, the Project Team organized the driver-related data such as their profiles, income, necessary costs, and work styles. Fig. 4 through Fig. 9 show key findings. In addition, Appendix 2 shows the survey sheet for drivers, and the results of driver interview survey.

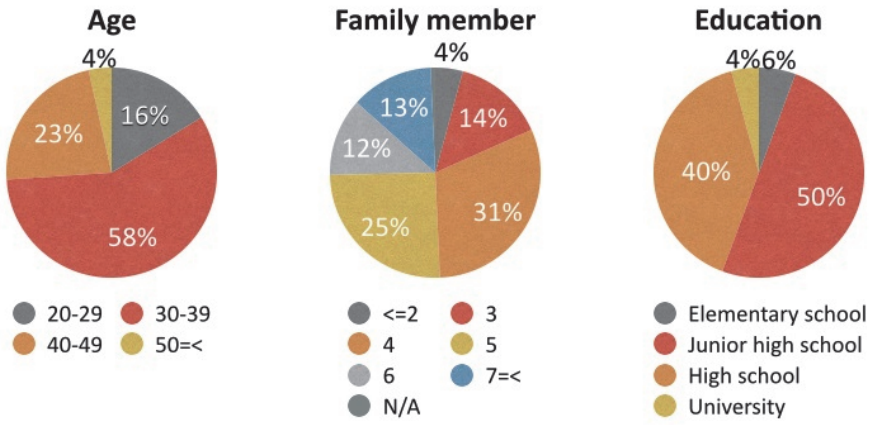


Fig. 4 Age, family members, and educational backgrounds of the drivers

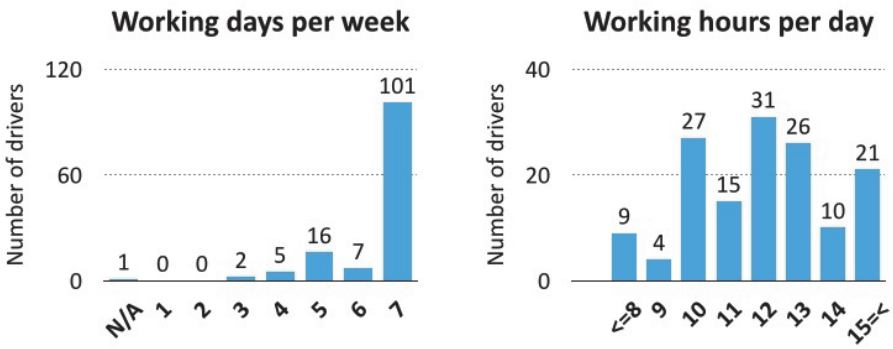


Fig. 5 Average working days and hours of the drivers

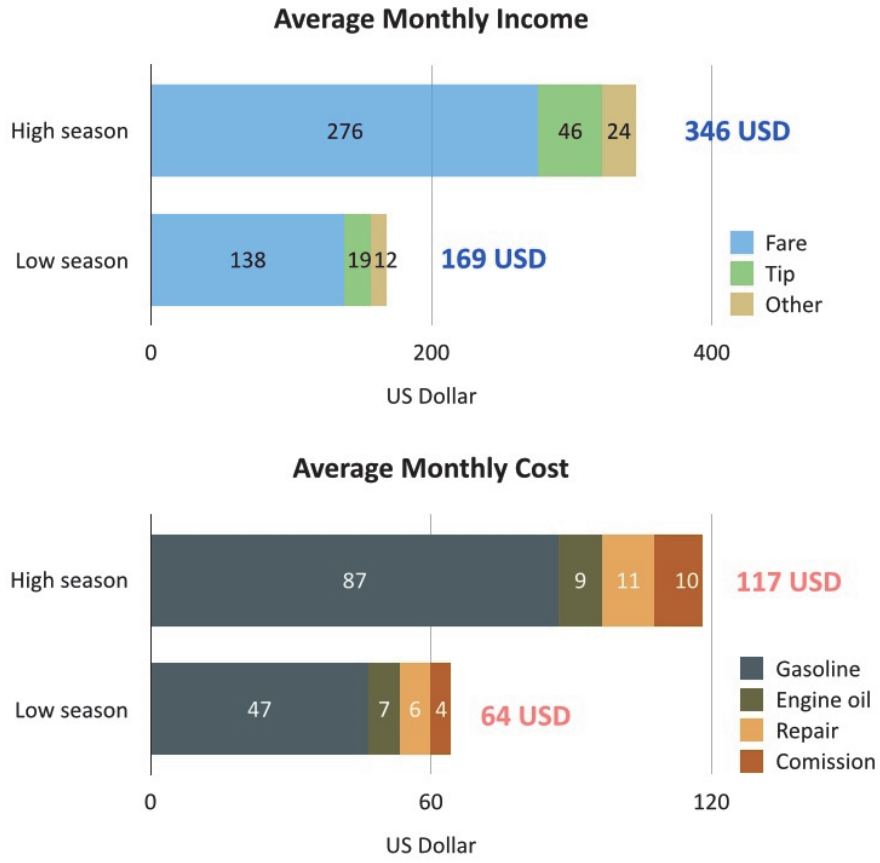


Fig .6 Average monthly income of the drivers and average monthly cost (High season: October through March, low season: April through September)

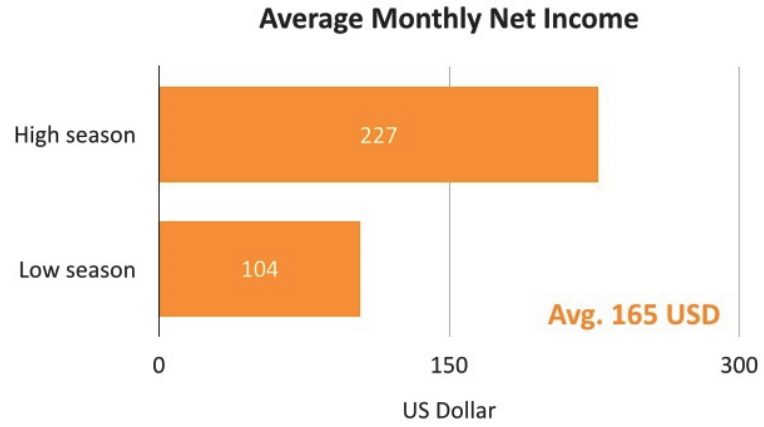


Fig. 7 Average monthly income, cost, and net income of the drivers
(High season: October through March, low season: April through September)

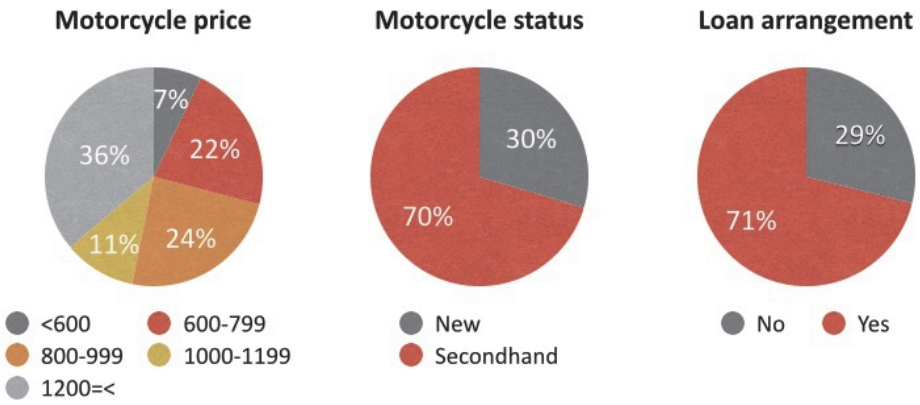


Fig. 8 Prices, statuses, and loan conditions of the gasoline-driven vehicles

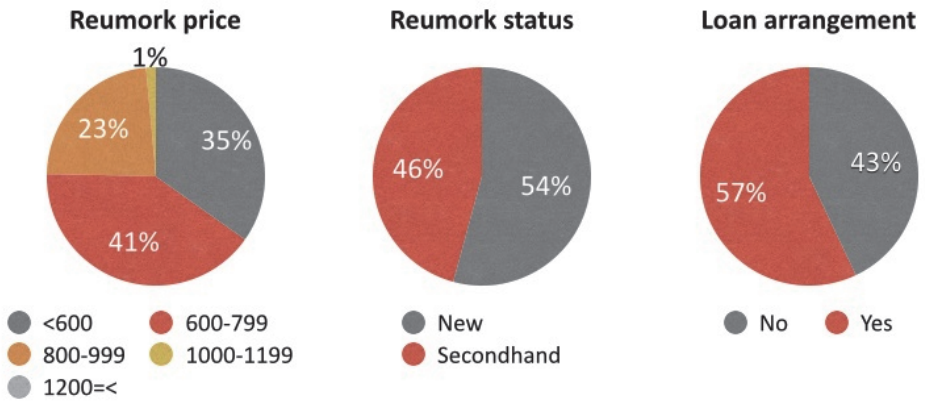


Fig. 9 Prices, statuses, and loan conditions of the Reumork (passenger car)

(c) Predicting the trend of emissions from the existing Reumork Moto

Driving distance and fuel economy affect emissions from the existing Reumork Moto. Table 9 shows the prediction of the future trend of the driving distance and fuel economy, and the reason for the prediction. Since it is not predicted that the driving distance of the Reumork Moto will sharply increase, and that the fuel efficiency of the Reumork Moto will suddenly be improved, the BaU scenario predicts that the amount of GHG annually emitted by the Reumork Moto will remain nearly the same in the coming several years.

Table 9 Prediction of the future trend of emissions from the existing Reumork Moto

Factor affecting emissions from the existing Reumork Moto	Prediction of the future trend	Reason for the prediction
Driving distance	The driving distance (area of service) of the Reumork Moto is not predicted to increase sharply.	As shown in Fig. 3, the Reumork Moto carries the overseas tourists visiting the Angkor Park. Therefore, its area of service is only around the monuments such as Angkor Wat and Angkor Thom.
Fuel economy	The fuel efficiency of the Reumork Moto is not predicted to suddenly be improved by means of a measure such as switching to gasoline-driven motorcycles with lower fuel consumption or to electric motorcycles.	So far, Cambodia has not established laws and regulations for the fuel economy, which vehicles must achieve, such as the Energy Saving Act, and does not have a plan to establish such laws and regulations. As Fig. 4 through Fig. 9 show, many drivers have to support at least three family members; however their average monthly net income is low, $165. The average price of their gasoline-driven motorcycles is $1,024; therefore 70% of the drivers get a loan to buy used motorcycles.

(2) Setting reference emission

(a) Calculation formula for reference emission

Below is the calculation formula for the emission of a reference vehicle. Divide the average driving distance of the electric Reumork Moto to be introduced in the project in "y" year by the fuel economy of the reference vehicle. Then, multiply the sought value by the fuel economy improvement factor, gasoline's net caloric value, and CO2 emission factor.

$$RE_y = \sum_i ((DD_y / SFC_{RE}) \times IR_y \times NCV_{gasoline} \times EF_{gasoline} \times N_y)$$

The elements of the above formula are described below.

RE_y	Reference emission	tCO2e/y
DD_y	Annual average driving distance by project vehicle in year y	km
SFC_{RE}	Specific fuel consumption of reference vehicle	km/l
IR_y	Technology improvement factor for referene vehicle in year y	-
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	MJ/l
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	tCO2e/MJ
N_y	Number of operational project vehicles in year y	Unit

Table 10 shows the parameters required for the calculation of the reference emission. So far, Cambodia has not conducted a statistical survey or existing survey for vehicle fuel economy; therefore Cambodia does not nave data applicable to the fuel economy of the reference vehicle. In this Project, existing Reumork Moto vehicles were sampled. After measuring the fuel economy of the vehicles, the Project Team set the default value of the fuel economy (km/l) of the reference vehicle.

As described in the previous section, sudden improvement of fuel efficiency is not predicted. Therefore, for the fuel economy improvement factor of the reference vehicle, the Project Team adopts the default value (0.99) of CDM small-scale methodologies AMS-III.C. Furthermore, since Cambodia does not have the characteristic values of gasoline's net caloric and CO2 emission factors, the Project Team adopt the default values specified in the IPCC2006 guideline.

Table 10 Parameters required for the calculation of reference emission

Parameter	Content	Source
DD_y	Annual average driving distance by project vehicle in year y	Project participants
SFC_{RE}	Specific fuel consumption of reference vehicle	This Project sets the default value.
IR_y	Technology improvement factor for reference vehicle in year y	CDM small-scale methodologies AMS-III.C
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	IPCC 2006 guideline
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	IPCC 2006 guideline
N_y	Number of operational project vehicles in year y	Project participants

Table 11 How to set the default value of the fuel economy of the reference vehicle

Option	Evaluation	Comment
Statistical survey	×	No available data.
Existing survey	×	No available data.
Manufacturer's catalogue value	×	Since tuku-tuku in Cambodia is a vehicle comprised of a motorcycle towing a cabin, the motorcycle manufacturer's catalogue value does not reflect the actual fuel economy.
Fuel economy measurement: All vehicles	△	This method is troublesome.
Fuel economy measurement: Sampled vehicles	○	This method is not troublesome. It is necessary to select the sampling method which can guarantee "reliability" and "representativeness."

○ (High), △ (Middle), and × (Low)

(b) Sampling

According to hearing from the Drivers' Association, in 2014, about 7,000 Reumork Moto vehicles were presumed to engage in service in Siem Reap City and the Angkor Park. Of them, about 1,200 Reumork Moto vehicles (N=1,200) were registered in the Drivers' Association. The EcoMobility project assumes that the

drivers registered in the Association will use electric vehicles. Therefore, the drivers registered in the Association were the parent population. The Project Team randomly selected the vehicles, the fuel consumption of which would be measured, from the parent population. By referring to a CDM guideline, "Sampling and surveys for CDM project activities and programs of activities," the Project Team set the confidence level at 90% (λ=1.645). In addition, regarding the accuracy of the survey results, the Project Team tolerated an error of up to 10%. The Project Team assumed that the average fuel economy is 20km/l (mean = 20), and that the standard deviation is 10km/l (SD = 10), and sought the number of samples by considering the fuel economy and standard deviation. In other words, the calculation formula below made us determine that the number of samples would be at least 65.

$$n \geq \frac{1.645^2 \times N \times V}{(N-1) \times 0.1^2 + 1.645^2 \times V} = \frac{1.645^2 \times 1{,}200 \times 0.25}{(1{,}200-1) \times 0.1^2 + 1.645^2 \times 0.25} = 64.091$$

$$V = \left(\frac{SD}{mean}\right)^2 = \left(\frac{10}{20}\right)^2 = 0.25$$

(c) Creating results of vehicle monitoring survey

A fuel economy survey was conducted on 67 Reumork Moto vehicles registered in the Drivers' Association, and effective results were obtained from 66 of them. By utilizing the survey results, the Project Team created the results of vehicle monitoring survey. Table 12 shows the summary of the survey, Fig. 10 shows the procedures of the survey, and Fig.11 through Fig.13 show important results. In addition, Appendix 3 shows the survey sheet for vehicles, and the results of vehicle monitoring survey.

Table 12 Summary of the fuel economy survey

Target vehicles	66 Reumork Moto vehicles (Of them, 10 were 100 cc motorcycles, 21 were 110 cc motorcycles, 34 were 125 cc motorcycles, and the remaining one was a 150 cc motorcycle.)
Measurement period	One day
Measurement date	July 4, 2014 (11 motorcycles), July 5, 2014 (one motorcycle) July 9, 201 (14 motorcycles), July 10, 2014 (14 motorcycles) July 11, 2014 (16 motorcycles), and December 9, 2014 (10 motorcycles)
Measurement area	Siem Reap City and the Angkor Park
Measurement method	Full tank of gas (Read the distance indicated by the odometer, or read it with a GPS logger. Fill up the tank to check how much gasoline can be poured into the tank. Then, calculate the fuel economy of the motorcycle.)

Fig. 10 Procedures for the fuel economy survey

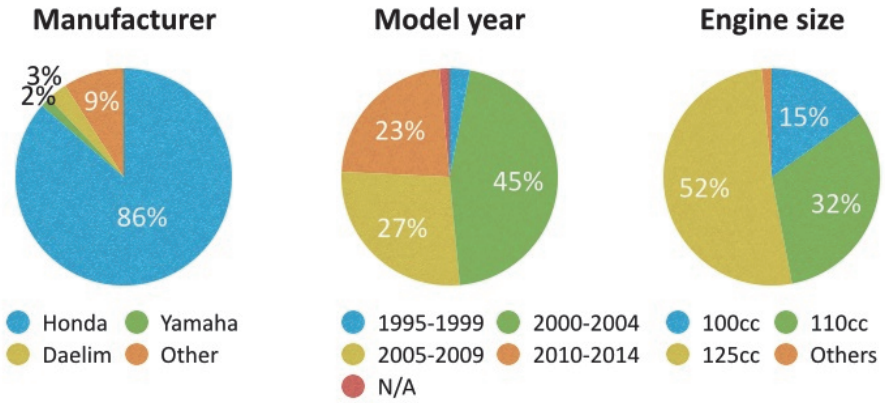


Fig.11 Manufacturers, model years, and displacement of the surveyed motorcycles

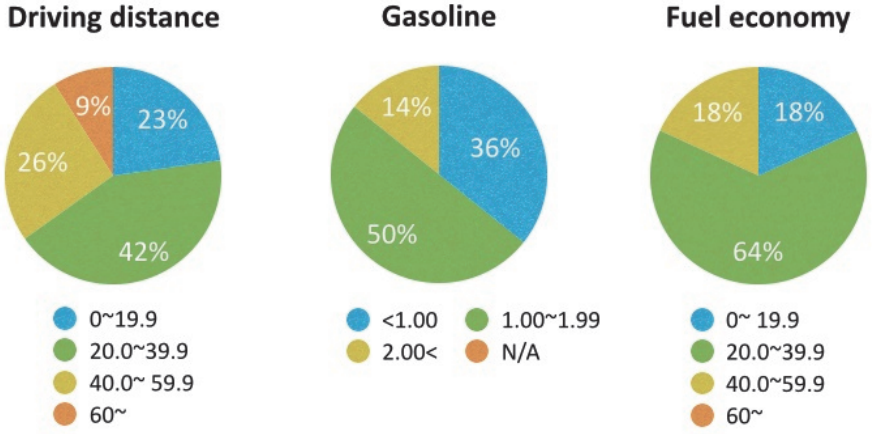


Fig.12 Driving distance, gasoline consumption, and fuel economy

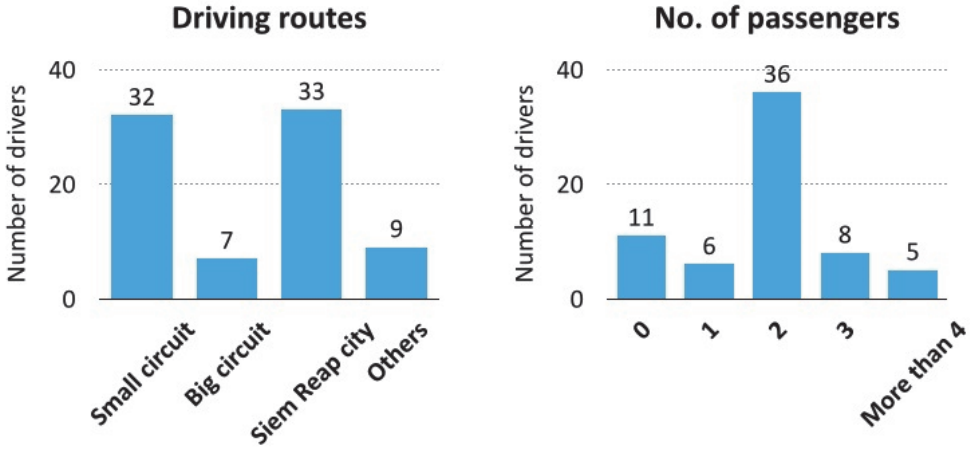


Fig.13 Driving routes, and average No. of passengers on each drive

(d) Setting the default value

By analyzing the data obtained from the fuel economy survey, the Project Team set the fuel economy of the reference vehicle. Table 13 shows the results of the fuel economy survey. Regarding the setting of the default value, the Project Team have to make sure that reference emission is calculated lower than the emission in the BaU scenario. Therefore, the Project Team thinks it is adequate to apply the upper limit of the 90% confidence interval. Based on this idea, the default value of the fuel economy of the reference vehicle is 31.6 km/l.

Table 13　Results of the fuel economy survey

Vehicle type	No. of vehicles	Average fuel economy (km/l)	Standard deviation	90% confidence interval	
				Lower limit	Upper limit
Reumork Moto	66	29.5	10.7	27.3	31.6

(3) Considering methods for calculating emissions from project vehicles

(a) Calculation formula for project emission

Below is the calculation formula for the emission of a project vehicle. Divide the average driving distance of the project vehicle to be introduced in the project in “y year by the electricity efficiency of the project vehicle. Then, multiply the sought value by the grid power’s CO2 emission factor for which the rate of energy transmission and distribution losses is considered.

$$PE_y = \sum_i ((DD_y / SEC_{PJ,y}) \times EF_{grid} / (100\% - TDL_y) \times N_y)$$

The elements of the above formula are described below.

PE_y	Project emission	tCO2e/y
DD_y	Annual average driving distance by project vehicle in year y	km
$SEC_{PJ,y}$	Specific electricity consumption of project vehicles in year y	km/kWh
TDL_y	Average technical transmission and distribution losses providing electricity in year y	%
EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	tCO2e/MJ
N_y	Number of operational project vehicles in year y	Unit

Table 14 shows the parameters required for the calculation of the project emission. When carrying out a JCM project, the project participants measure the driving distances and specific electricity consumption of all or sampled project vehicles (which will be introduced), and then continuously measure, record, and totalize the data. Besides, for average technical transmission and distribution losses, adopt data from the Electricity Authority of Cambodia, and for the CO2 emission factor of the grid electricity, adopt the data published by Ministry of Environment, Cambodia.

Table 14 Parameters required for the calculation of the project emission

Parameter	Content	Source
DD_y	Annual average driving distance by project vehicle in year y	Project participants
$SEC_{PJ,y}$	Specific electricity consumption of project vehicles in year y	Project participants
TDL_y	Average technical transmission and distribution losses providing electricity in year y	Electricity Authority of Cambodia
EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	Ministry of Environment, Cambodia
N_y	Number of operational project vehicles in year y	Project participants

(b) Organizing data on project vehicles

a) Summaries of project vehicles and test runs

In order to collect data on the electricity efficiency (driving distance per 1 kWh) of the electric vehicle which will be introduced in the JCM project, the Project Team conducted test runs of vehicles to measure their driving distances and electricity consumption. The vehicles that were subject to the test runs are (1) "ES11" which is developed by MILAI Corporation and manufactured by Eclimo, an electric motorcycle manufacturer in Malaysia, and (2) "R6" which is developed and manufactured by Terra Motors Corporation. Table 12 shows the summaries of the project vehicles and test drive. Fig.14 shows procedures for the test drive.

Table 15 Summaries of the project vehicles and test runs

Target vehicle	ES11(electric two-wheeled vehicle)	R6 (electric three-wheeler)
Photo		
Manufacturer	MILAI Corporation (development), and Eclimo (manufacture)	Terra Motors Corporation (development and manufacture)
Specifications	[Size] Length x width x height: 1945 mm x 1140 mm x 720 mm [Lithium-ion battery] 54 v/57 Ah ｜ 1000 lifecycles Driving distance after each electric charge: About 60 km [Electric motor] 6000 W 110 Nm torque direct drive	[Size] Length x width x height: 2950 mm x 1090 mm x 1800 mm [Lead-acid battery] 60v/120Ah ｜ 300 lifecycles Driving distance after each electric charge: About 100 km [Electric motor] 3000 W ｜ shaft drive
Measurement date	October 6 and 7, December 3, and December 10 through 12, 2014 (6 days in total)	From January 28 to February 3, 2015 (7 days in total)
Measurement area	Siem Reap City and the Angkor Park, Siem Reap Province, Cambodia	Rajkot city, Gujarat, India
Measurement method	Full battery charge (The Project Team read the charged electricity and driving distance with a GPS logger and then calculated the electricity efficiency.)	Full battery charge (the Project Team read the charged electricity and driving distance with a GPS logger and then calculated the electricity efficiency.)

Fig.14 Procedures for the test drive

b) Methods for the test drive of ES11

The Project Team made a Reumork Moto driver in Siem Reap City drive fully charged electric Reumork (which is a vehicle comprised of ES11 connected with an existing passenger car) and carry tourists as usual. Then, the Project Team recorded his driving distance (km) on the day and how much electricity was charged (which means electricity consumption) (kWh). The Project Team used a GPS logger to measure the daily driving distance, and used a wattmeter to measure the electricity consumption. In order to ensure data quality, the Project Team selected the measuring devices that fully work in the communication and electricity environments in Cambodia, and the measuring devices were managed by the survey team. In addition, for the electric vehicle to be properly maintained and managed, MILAI Corporation prepared the "Maintenance Manual." The Manual was used to instruct the driver. Fig.15 shows the summaries of the GPS logger and wattmeter used for the test. Note that the on-board charger that can be attached to the vehicle was charged with electricity from power sources in places such as the driver's house, hotels, and restaurants.

GPS logger
GARMMIN eTrex 10

Wattmeter (190 to 270 V)
Made by an unknown manufacturer
TUV-GS certified.

Fig.15 Summaries of the GPS logger and wattmeter used for the tste

c) Results of test drive of ES11

Table 22 shows the results of the test drive of ES11. The average electricity efficiency of the electric vehicle was 20.46 km/kWh.

Table 16 Results of the test drive of ES11

Survey date	Driving distance (km)	Electricity consumption (kWh)	Electricity efficiency (Km/kWh)	Main driving route
October 6, 2014 (Mon.)	50.8	1.99	25.53	Small circuit in Siem Reap City
October 7, 2014 (Tue.)	46.8	2.00	23.40	Small circuit in Siem Reap City
December 3, 2014 (Wed.)	72.1	4.34	16.61	Small circuit in Siem Reap City
December 10, 2014 (Wed.)	33.1	1.14	29.03	In Siem Reap City
December 11, 2014 (Thu.)	55.2	2.00	27.60	Small circuit in Siem Reap City
December 12, 2014 (Fri.)	22.4	2.23	10.04	In Siem Reap City
Total average	-	-	20.46	-

d) Methods for the test drive of R6

The Project Team made an R6 driver drive a fully charged electric vehicle and carry passengers as usual. Then, the Project Team recorded his driving distance (km) on

the day and how much electricity was charged (which means electricity consumption) (kWh). The Project Team used a driving distance measuring device to measure the daily driving distance (km), and used a wattmeter to measure the electricity consumption. Note that the charger that can be attached to the vehicle was charged with electricity from power sources in places such as the driver's house, hotels, and restaurants.

GPS logger
Made by an unknown manufacturer

Wattmeter (190 to 270 V)
Made by an unknown manufacturer

Fig.16 Summaries of the GPS logger and wattmeter used for the tste

e) Results of the test drive of R6

Table 17 shows the results of test drive of R6. The average electricity efficiency of the electric vehicle was 18.67 km/kWh.

Table 17 Results of the test drive of R6

Survey date	Driving distance (km)	Electricity consumption (kWh)	Electricity efficiency (Km/kWh)	Main driving route
January 28, 2015 (Wed.)	55.2	2.74	20.15	In Rajkot City
January 29, 2015 (Thu.)	59.3	3.31	17.92	In Rajkot City
January 30, 2015 (Fri.)	45.0	2.31	19.48	In Rajkot City
January 31, 2015 (Sat.)	50.5	2.62	19.27	In Rajkot City
February 1, 2015 (Sun.)	50	2.49	20.08	In Rajkot City
February 2, 2015 (Mon.)	74.2	4.52	16.42	In Rajkot City
February 3, 2015 (Tue.)	60.7	3.50	17.34	In Rajkot City
Total average	-	-	18.67	-

(c) Considering charge modes

a) Short-term solution

The above-mentioned vehicle fuel economy survey showed that the daily average driving distance of the Reumork Moto is 35.5 km. The driving distance of ES11 after each electric charge is about 60 km, and the driving distance of R6 after each electric charge is about 100 km. Therefore, in a short term, electricity will be charged to the accompanying on-board charger from grid power in places such as the driver's house, hotels, and restaurants.

b) Medium-term solution

The EcoMobility project is planning to increase the number of electric vehicles which are used for carrying passengers to 440 by 2020. Therefore, over a medium term, the dedicated battery charging stations which are not burdensome to grid power will be required. In addition, the APSARA National Authority has told us that the electricity derived from renewable energy should be used to protect the environment.

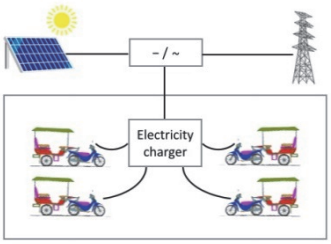
While considering these, the Project Team will keep cooperating with the relevant government organizations. With this cooperation, the Project Team will continuously consider the development of electric-vehicle-charging infrastructure in Siem Reap City and the Angkor Park. Shown below are the low-carbon technologies and systems that may be used for the infrastructure. Introducing these low-carbon technologies and systems can streamline the JCM project and simplify the monitoring methods.

・Solar charging station

Solar charging stations are the battery charging stations which use solar power. The solar charging stations are classified into the ”hybrid battery charging stations” that use solar power as well as grid power and the ”independent battery charging stations” that use solar power as well as a rechargeable battery. Table 18 shows the images and features of both types of stations.

The utilization of the solar charging stations will further reduce the CO2 emissions which are at first reduced by the use of electric vehicles and allow electricity to be charged in places (such as parking areas in the Angkor Park) where grid power is not available.

Table 18 Images and features of battery charging stations

Classification	Hybrid battery charging station	Independent battery charging station
Image		
Features	• The combination of grid power and solar light allows electricity to be charged to electric motorcycles day and night. • In one station, electricity can be charged to up to about 50 electric motorcycles. • The monitoring system allows staff in a remote place to check the conditions of the electric motorcycles.	• This station can be established in places in the Angkor Park in which grid power is not available. • In one station, electricity can be charged to up to about five electric motorcycles. • LED light lights up at night. • In case of an emergency, electricity can be supplied from the rechargeable battery to devices such as cell-phones.

・Ubiden

Ubiden is a charging and certification system which SoftBank Mobile Corp. is now developing. The use of the system allows the certification of the electric vehicle as well as battery charging station and the management of information such as the amount of charge, the time and date of charge, and the location of the battery charging station through the server. Furthermore, the use of the dedicated application allows the monitoring of the electricity charged to the motorcycle and of the battery charging station in which electricity was charged.

The use of Ubiden can simplify the monitoring of the JCM project.

Figure 17 Ubiden tested in Aska village, Nara Prefecture, Japan
(Source: http://news.mynavi.jp/photo/articles/2014/10/11/michimo/images/005l.jpg)

・Battery sharing system

The battery sharing system is a system for charging and replacing batteries of electric motorcycles. Through the "demonstration research for the commercialization of battery replacement stations contributing to the popularization of electric motorcycles, global warming countermeasure technology development and demonstration research project of the Ministry of the Environment (2012)," JTB Business World Travel & Solutions Inc., Kanematsu Communications Ltd., Suzuki Motor Corporation, Panasonic System Solutions Japan Co., Ltd., and Recycle One, Inc. are conducting demonstration experiments (so-called "Kamakura electricity motorcycle project") in the City of Kamakura to verify the effectiveness of the system. Fig.18 shows an example of the business model of the battery sharing service.

The utilization of the battery sharing system will reduce the time required for charging electricity to electric Reumork Moto during operating hours and allow the person in charge to monitor conditions such as battery management, trace, and deterioration conditions.

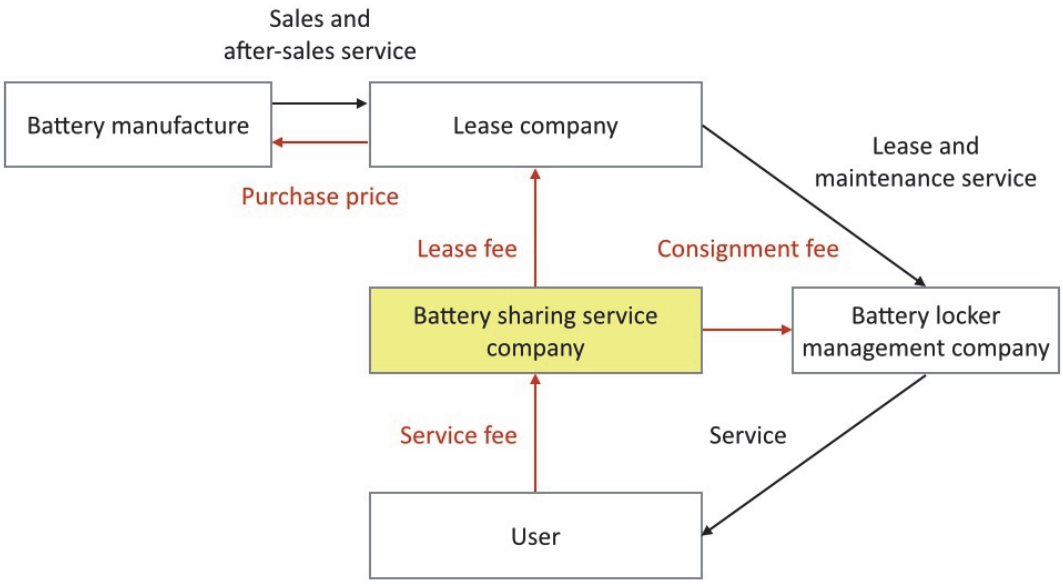


Fig.18 Example of the business model of battery sharing service

(4) Considering leakage emission

When the electric vehicle to be introduced is the one that has been transferred from another project, consider leakage emission. In the methodologies described here (draft), a qualification requirement is the introduction of "new" electric vehicles, and the possibility of transferring electric vehicles used in another project is eliminated. By doing so, the Project Team avoid the generation of the leakage emission.

(5) Considering methods for calculating emission reduction

Use the formula below to calculate emission reduction.

$$ER_y = RE_y - PE_y$$

The elements of the above formula are described below.

ER_y	Emission reduction	tCO2e/y
RE_y	Reference emission	tCO2e/y
PE_y	Project emission	tCO2e/y

7) Monitoring parameters and monitoring methods

Table 19 shows the monitoring parameters and monitoring methods required for the methodologies described here.

Table 19 Monitoring parameters and monitoring methods

Parameter	Content	Monitoring method
DD_y	Annual average driving distance by project vehicle in year y	By reading the odometer or taking another means, continuously measure, record, and totalize the average driving distance of all or sampled vehicles.
N_y	Number of operational project vehicles in year y	By using purchase slips, etc., continuously record the No.
SFC_{RE}	Specific fuel consumption of reference vehicle	Apply the default value (31.6km) that has been set in this Project.
$SEC_{PJ,y}$	Specific electricity consumption of project vehicles in year y	By using a voltmeter, etc., continuously measure, record, and totalize the electricity efficiency of all or sampled vehicles.
IR_y	Technology improvement factor for reference vehicle in year y	Check the default value of CDM small-scale methodologies AMS-III.C. When the characteristic value is published by the nation, use the characteristic value.
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	Check the default value of the IPCC 2006 Guideline. When the characteristic value is published by the nation, use the characteristic value.
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	Check the default value of the IPCC 2006 Guideline. When the characteristic value is published by the nation, use the characteristic value.
TDL_y	Average technical transmission and distribution losses providing electricity in year y	Check the rate published by the Electricity Authority of Cambodia.
EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	Check the CO2 emission factor published by the Ministry of Environment, Cambodia.

(3) Trial calculation of emission reduction

Based on the above methodologies, the Project Team calculated the emission reduction that would be derived from the purchase of one electric Reumork Moto vehicle as a project vehicle. The emission reduction is estimated to be 0.44 tCO2e for each electric Reumork Moto vehicle. The calculation formula and parameters used for the trial calculation are given below.

1) Reference emission

$$RE_y = 238.1/31.6 \times 0.99 \times 32.8 \times 69{,}300 \times 10^{-9} = 0.85\ tCO_2e$$

Table 20 Values used for the trial calculation of reference emission

Parameter	Content	Value	Source
DD_y	Annual average driving distance by project vehicle in year y	11,999 km	Calculated from the daily average driving distance of the existing Reumork drivers (35.5 km) and from the weekly average working days (6.5 days which are calculated based on the annual working days, 338 days)
SFC_{RE}	Specific fuel consumption of reference vehicle	31.6 km/l	Default value that has been set in this Project
IR_y	Technology improvement factor for reference vehicle in year y	0.99	Default value of CDM small-scale methodologies AMS-III.C
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	32.8 MJ/l	Calculated from the default value of the IPCC 2006 Guideline (44.3 TJ/Gg) and from the default value of IEA (0.741 kg/l)
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	69,300 kgCO2e/TJ	Default value of the IPCC 2006 Guideline
N_y	Number of operational project vehicles in year y	One vehicle	

2) Project emission

$$PE_y = 11{,}999/20.5 \times 0.6257/(100\% - 12.3\%) \times 10^{-3} = 0.41\ tCO_2e$$

Table 21 Values used for the trial calculation of project emission

Parameter	Content	Value	Source
DD_y	Annual average driving distance by project vehicle in year y	11,999 km	Calculated from the daily average driving distance of the existing Reumork drivers (35.5 km) and from the weekly average working days (6.5 days which are calculated based on the annual working days, 338 days)
$SEC_{PJ,y}$	Specific electricity consumption of project vehicles in year y	20.5 km/kWh	Result of the test runs of ES11 in this Project
TDL_y	Average technical transmission and distribution losses providing electricity in year y	12.3 %	Electricity Authority of Cambodia (2013)
EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	0.6257 kgCO2e/kWh	Ministry of Environment, Cambodia (2011) (operating margin)
N_y	Number of operational project vehicles in year y	One vehicle	

3) Emission reduction

$ER_y = 0.85 - 0.41 = 0.44\ tCO_2e$

(4) Trial calculation of the emission reduction which will be derived from the implementation of the EcoMobility project

Table 22 shows the electric Reumork Moto introduction plan and CO2 emission reduction in the EcoMobility project. Under this scenario, 440 electric Reumork Moto vehicles will have been introduced by the end of 2020, which will reduce CO2 emissions--a total of 640.8 tCO2e.

Table 22 No. of vehicles to be introduced, and emission reduction

Year	2015	2016	2017	2018	2019	2020	Total
Total No. of electric vehicles to be introduced	20	120	270	340	390	440	440 vehicles
CO2 emission reduction	8.8	51.6	113.4	139.4	156	171.6	640.8 tCO2e

(5) Trial calculation of the emission reduction which will be derived from introducing electric Reumork Moto on a large scale

According to hearing from the Drivers' Association, in 2014, about 7,000 Reumork Moto vehicles were presumed to engage in service in Siem Reap City and the Angkor Park. On the other hand, about 20,000 Reumork Moto vehicles are presumed to engage in service in Phnom Penh. If the EcoMobility project is implemented on a large scale and all of these Reumork Moto vehicles are replaced by electric Reumork Moto, the emission reduction is estimated to be 11,880 tCO2e/year.

3.4 Implementation of the JCM projects in the EcoMobility project

(1) Summary JCM potential project

Table 23 shows the summary of the JCM potential project in the EcoMobility project.

Table 23 Summary of JCM potential project in the EcoMobility project

Title	Introduction of electric Reumork Moto in Cambodia
Content of the JCM project	In 2016 and 2017, a total of 250 electric Reumork Moto vehicles will be introduced in Siem Reap City and the Angkor Park in Cambodia.
Technology	Electric Reumork Moto
Approximate project cost	About ¥125 million *The Project Team presumes that the vehicle price will be USD 5,000/vehicle (exempt from import tax).
MRV Methodologies	Introduction of electric Reumork Moto in Cambodia (Appendix 1)
GHG emission reduction (FS)	About 110 tCO2e/year
GHG emission reduction (Scaling-up)	About 11,880 tCO2e/year
Co-benefits	Increase of drivers' income due to fuel cost reduction, and improvement in air pollution in Siem Reap City and the Angkor Park

(2) Issues to consider for installation of technologies

For the specified potential JCM project, the Project Team needs to consider the items given below. In the near future, the Project Team has to establish the SPC that will be the implementing agencies of the JCM project, build the business processes of the companies, and maintain a system for monitoring the electric Reumork Moto.

Furthermore, considering the introduction of the electric Reumork Moto on a large scale, the Project Team should reduce the cost of each vehicle and obtain tax incentive for the vehicles. This Project is highly public and social, and reducing the cost of the electric Reumork Moto will increase the drivers' income. Therefore, although electric vehicles are at present not exempt from import tax, the Siem Reap Province Governor has expressed support for tax exemption for the vehicles. From now on, with help from the Province Government, etc., the Project Team will approach the Ministry of Economy and Finance and other relevant organizations.

< Issues to consider for the technologies >

- Establishing the special purpose companies which will be the implementing agencies of the JCM project
- Building the business processes of the companies and maintaining the system for monitoring the electric Reumork Moto
- Negotiating with the manufacturer about the cost reduction of the electric

vehicles

- Negotiating with government organizations about approval for import tax exemption for the electric vehicles

(3) Schedule for the completion of the project

Table 24 shows a schedule for the completion of the project. In the first half or second half of the FY 2015, the Japan Development Instutute Inc. and Forval Corporation will establish the SPC, build the business processes of the companies, and maintain the system for monitoring the electric Reumork Moto. In the first half of the FY 2016, the Project Team will start the JCM project by using the JCM model project scheme. Furthermore, after carrying out the project in Siem Reap City and the Angkor Park in Cambodia, the Project Team will try to popularize the electric Reumork Moto in other cities of Cambodia and in neighboring countries.

Table 24 Schedule for the completion of the project

Item	FY 2015		FY 2016	
	First half	Second half	First half	Second half
1) Preparation of the project • Establishing the SPC • Building the business processes • Maintaining the monitoring system • Negotiating with the electric vehicle manufacturer • Negotiating with government organizations	◆→	◆→		
2) Implementation of the JCM project • Transporting the vehicles • Driving the vehicles and verifying their effects			◆→	◆→
3) Popularization of the vehicles in other cities and countries				◆→

3.5 Results of the study on the potential of a MHP project as JCM projects

(1) Summary of the MHP project

The MHP project is a project for developing an area of culture and tourism. The area, which is about 5 km away from the center of Siem Reap City, will contain and manage the newly developed hotels, commercial facilities, aquarium, markets, bazaar sites, etc. Fig.19 shows the project site. Appendix 5 shows the Outline of MHP project.

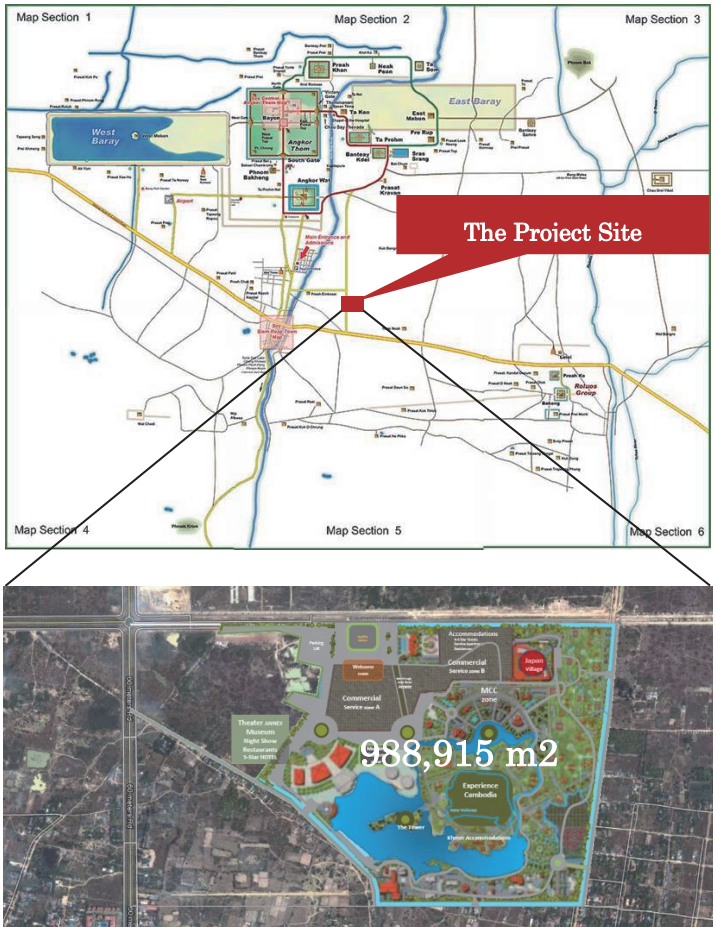


Fig.19 Site of the MHP project

(2) Results of the study on the potential of a MHP project as JCM projects

In the FY 2014, the Japanese business entity mainly composed of Japan Development Institute Ltd. negotiated with the APSARA National Authority about the conclusion of the MoU that defines the TOR which is related to the concession agreement of the land that will be developed in the Angkor Park. However, in November 2014, the Cambodia National Rescue Party pointed out that the income from the entry fees for the Angkor Park had lacked transparency. Then, the problem led to arguments between the ruling and opposition parties. Under these circumstances, the Project Team cannot have an appointment with the Director-General of the APSARA National Authority, and negotiations for MoU are suspended.

Accordingly, in this Project, the Project Team conducted a survey of the existing hotels in Siem Reap City to understand their current conditions and needs for low-carbon technologies. The final aim of the survey was to consider the possibility

of implementing a JCM project in the hotels that are planned to be built in the MHP. The survey results are described below.

1) Current conditions of the existing hotels in Siem Reap City

Table 25 shows changes in the number of overseas tourists visiting Siem Reap City, in the number of hotels as well as guesthouses, and in the number of the rooms of the hotels as well as guesthouses. From 2008 to 2013, the number of overseas tourists increased at an average annual rate of 16%. In association with the increase of overseas tourists, the number of hotels as well as guesthouses and the number of the rooms of the hotels as well as guesthouses increased.

Table 25 Changes in the number of overseas tourists visiting Siem Reap City, in the number of hotels as well as guesthouses, and in the number of the rooms of the hotels as well as guesthouses

Year	2008	2009	2010	2011	2012	2013
No. of overseas tourists	1,059,870	998,084	1,322,971	1,610,076	1,907,226	2,237,286
No. of hotel	113	120	125	138	155	163
No. of guesthouses	221	227	210	230	219	229
No. of hotel rooms	8,405	8,723	9,468	10,407	10,969	11,281
No. of guesthouses	2,854	3,060	2,766	3,207	3,251	3,497

(Source: Ministry of Tourism and the Siem Reap Province's tourism department)

2) Results of hearing from the existing hotels in Siem Reap City

As of June 2014, Siem Reap City has 16 five-star hotels, 29 four-star hotels, and seven three-star hotels. In this Project, the Project Team conducted hearings from representative five- and four-star hotels. Table 26 shows the hotels from which the Project Team conducted the hearings.

The hearing results show that each hotel pays 20.0 to 17.5 US cents to purchase 1 kWh of grid power, which a large portion of the cost the hotel has to bear is electricity expense, which all the hotels are actively taking energy-saving measures, and which many of the hotels have a great need for energy-saving diagnosis and energy-saving equipment.

Many of the hotels have opened for more than 10 years, are considering the renewal of their air-conditioning equipment, and thus especially have a great need for a highly efficient air-conditioning system. On the other hand, many of the hotels have independently introduced LED and a solar water heater that are used for their lighting systems and hot-water supply equipment. Therefore, the Project Team investigated air-conditioning-equipment-related technologies of Japanese companies.

Table 26 List of the hotels from which the Project Team conducted the hearings

Hotel	No. of rooms	Established in	Remarks
Borei Angkor Spa and Resort	138	2003	Five-star hotel owned by a Cambodia company (Innotality)
Le Meridien Angkor	213	2004	Five-star hotel owned by an American company (Starwood)
Raffles Grand Hotel d'Angkor	199	1997	Five-star hotel owned by a Canadian company (FRHI)
Sofitel Angkor Phokeethra Golf and Spa Resort	236	2000	Five-star hotel owned by a French company (Accor)
Sokha Angkor Resort	276	2004	Five-star hotel owned by a Cambodia company (Sokimex)
Somadevi Angkor Resort and Spa	164	2004	Four-star hotel owned by a Cambodia company (Khek Leang)

3) Results of investigating air-conditioning-equipment-related technologies of Japanese companies

The types of air-conditioning equipment used in the hotels in Siem Reap City are classified into a chiller, cooling tower, air-handling unit, and packaged air conditioner. For the reduction of the electricity consumed by (and the CO2 emitted from) the above equipment, effective measures are to streamline the equipment and introduce technology for controlling the equipment.

Table 27 is the list of the low-carbon technologies related to air conditioning equipment and of the representative Japanese companies that have the technologies.

Table 27 List of the low-carbon technologies

Classification	Low-carbon technology	Representative companies that have the technology
Streamlining air-conditioning equipment	Highly efficient chillers	DAIKIN INDUSTRIES, LTD., EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO., LTD., Hitachi, Ltd., and TOSHIBA CORPORATION
	Solar natural chillers	Kawasaki Thermal Engineering Co., Ltd.
	Highly efficient air-handling units	DAIKIN INDUSTRIES, LTD., SINKO INDUSTRIES LTD. and TOSHIBA CORPORATION
	Inverter-driven packaged air conditioners	DAIKIN INDUSTRIES, LTD., Mitsubishi Electric Corporation and TOSHIBA CORPORATION
Controlling air-conditioning equipment	Inverters (for chiller pumps)	Azbil Corporation, and Hitachi, Ltd.
	Building energy management system (BEMS)	Azbil Corporation, and Hitachi, Ltd.

4) Considering MRV Methodologies

For the streamlining and control of air-conditioning equipment, Table 28 shows the proposed JCM methodologies (draft) that were considered in the past. The inverter-driven packaged air conditioners and the BEMS were investigated in the countries surrounding Cambodia. Based on the existing and proposed JCM methodologies, the Project Team can consider qualification requirements and reference emission.

Table 28 draft MRV Methodologies for air-conditioning equipment

Proposed JCM methodology	Description	Investigation project
Program for popularizing highly efficient air conditioners in Thailand	This methodology is applied to a program for popularizing highly efficient inverter-driven air conditioners.	FY 2013 JCM Methodology Demonstration Research by the MOE
Reducing GHG by the introduction of highly efficient inverter-driven air conditioners in Vietnam	This methodology is applied to the project in which highly efficient inverter-driven air conditioners replace the conventional non-inverter air conditioners or are newly introduced to buildings to reduce electricity consumption and which will finally reduce GHG emissions.	FY2012 Global Warming Mitigation Technology Promotion Project by the METI
Saving energy with the use of the building energy management system (BEMS) in Thailand	Introducing the BEMS to the existing buildings (such as office buildings) improves the efficiency of the electricity or fossil fuel used. This methodology is applied to the project in which the BEMS is utilized to reduce more CO2 emissions than in the case where the reference scenario is applied.	FY 2012 JCM Methodology Demonstration Study by the MOE

3.6 Implementation of the JCM projects in the MHP project

(1) Summary JCM potential project

Table 29 shows the summary of the JCM potential project in the MHP project.

Table 29 Summary of JCM potential project in the MHP project

Title	Introduction of highly efficient air conditioners in Cambodia	Introduction of highly efficient chillers, inverters and the BEMS in Cambodia
Content of the JCM project	Popularizing highly efficient air conditioners in hotels in Siem Reap City and the Angkor Park	Introduction of highly efficient chillers, inverters and the BEMS in hotels in Siem Reap City and the Angkor Park
Technology	Highly efficient inverter-driven air conditioners	Highly efficient chiller and controlling chiller pumps with the use of inverters and the BEMS
Approximate project cost	N/A	N/A
MRV Methodologies	N/A *Created based on the draft methodologies in Thailand and Vietnam	N/A * Created based on the draft methodologies in Thailand
GHG emission reduction (FS)	50 to 250 tCO2e/year *Per hotel	100 to 300 tCO2e/year * Per hotel
GHG emission reduction (Scaling-up)	About 5,400 tCO2e/year *When this case is applied to 29 four-star hotels and seven three-star hotels in Siem Reap City	About 3,200 tCO2e/year *When this case is applied to 16 five-star hotels in Siem Reap City
Co-benefits	Management improvement due to fuel cost reduction	Management improvement due to fuel cost reduction

(2) Issues to consider for installation of technologies

For the specified potential JCM project, the Project Team needs to consider the items below. From now on, the Project Team needs to specify the representative companies and the companies with required technologies, both of which will be the implementing agencies of the JCM project. In addition, the Project Team needs to conduct an energy audit in each hotel and to take necessary measures such as calculating the cost of introducing the equipment, evaluating the effect of the equipment, drawing up the basic design of the equipment, building the MRV Methodologies, making a financial plan, and negotiating with the hotel owner about equipment investment.

< Issues to consider for the technologies >

- Specifying the representative companies and the companies with required technologies, both of which will be the implementing agencies of the JCM project
- Calculating the cost of introducing the equipment and evaluating the effect of the equipment
- Drawing up the basic design of the equipment
- Building the MRV Methodologies
- Making a financial plan
- Negotiating with the hotel owner about equipment investment

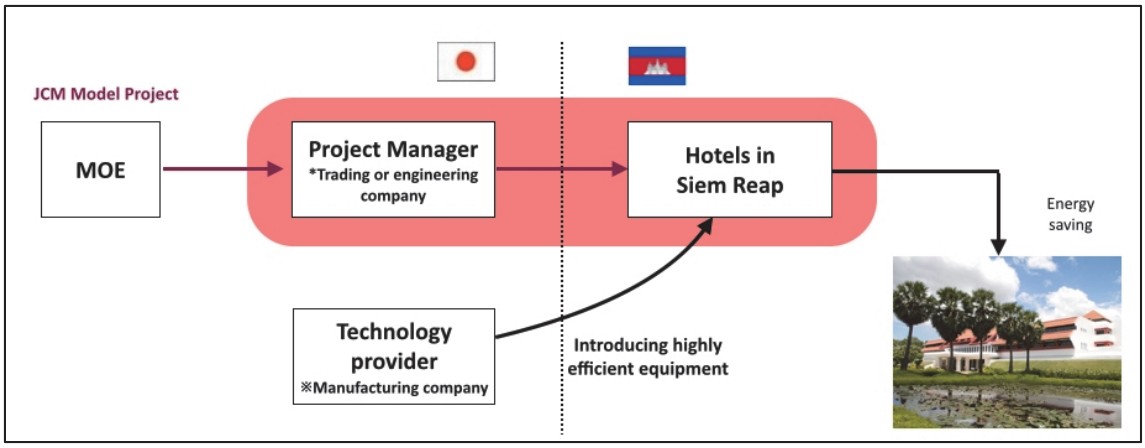


Fig. 20 Proposed institutional arrangement of JCM Project

(3) Schedule for the completion of the project

Table 30 shows a schedule for the completion of the project. In the first half or second half of the FY 2015, the Project Team will cooperate with the representative companies and the companies with the required technologies to prepare the JCM project and conduct detailed researches. The Project Team is planning to start the JCM project in the first half of the FY 2016 by using the JCM Model project scheme. After making the existing hotels in Siem Reap City implement the project, the Project Team will try to popularize the project in the MHP and other cities in Cambodia.

Table 30 Schedule for the completion of the project

Item	FY 2015		FY 2016	
	First half	Second half	First half	Second half
1) Preparing the project • Specifying the representative companies and the companies with required technologies • Conducting simplified energy-saving diagnoses • Calculating the cost of introducing the equipment and evaluating the effect of the equipment	◆⟶			
	◆⟶			
	◆⟶			
2) Conducting detailed surveys • Conducting detailed energy-saving diagnoses • Drawing up • the basic design of the equipment to be introduced • Building the MRV Methodologies • Making a financial plan • Negotiating with the hotel owner		◆⟶		
		◆⟶		
		◆⟶		
		◆⟶		
2) Implementing the JCM project • Drawing up the detailed design of the equipment to be introduced • Transporting and installing the equipment • Operating the equipment and verifying its effect			◆⟶	
			◆⟶	
				◆⟶
(3) Popularizing the equipment in the Mekong Heritage Park and other cities in Cambodia				◆⟶

3.7 Results of the study on appropriate environmental policies

(1) Results of collecting basic information on the environmental policies in Siem Reap City

Basic information was collected in this Project to identify the environmental policies in Siem Reap City and to organize improvement proposals.

1) History of drawing up a city plan for Siem Reap City

From 2004 to 2006, JICA implemented the "Master Plan Study for the Sustainable Development of Siem Reap/Angkor Town" to create the city master plan which is targeted at 2020. The Master Plan has set a vision, "the tourist city in which Khmer history harmonizes with Khmer art and nature." Six strategies are provided for achieving the vision. One of the strategies is "building a city with high environmental persistence." For this strategy, the four approaches specified below are proposed.

(a) Establishing a system for environment management

(b) Increasing environmental awareness of people

(c) Securing revenue for environment protection

(d) Carrying out an eco-friendly development plan

- Encouraging hotels, etc. to be more eco-friendly
- Controlling the pumping of groundwater by establishing water supply pipe networks.
- Reducing water pollution by creating a drainage system
- Cleaning up the towns by establishing systems for controlling, collecting, and disposing of waste
- Controlling private diesel electric generation by developing power and establishing an electricity grid
- Promoting the use of eco-friendly vehicles in the Angkor Park

In 2010, JICA implemented "Follow-up Comprehensive Planning Cooperation for Promotion of Regional Sustainable Development in Siem Reap, Cambodia." This cooperation activity focused on the urban development sector (developing and improving city centers) as well as the transportation sector and reviewed the content of the project proposed in the Siem Reap City Master Plan. Based on the reviewed results, a road maintenance basic plan and a city center maintenance plan were drawn up, and preferred project plans were proposed.

2) Problems of the city plan for Siem Reap City

The city master plan which was drawn up with the help of JICA has not so far been formulated in Siem Reap Province as well as Siem Reap City and is treated as a reference material.

JICA pointed out that the master plan has not been formulated due to the lack of ownership in Siem Reap Province, Siem Reap City, and the APSARA National Authority. On the other hand, the Mayor of Siem Reap recognizes the following problems: (a) The existing city master plan is too wide and does not clearly specify execution staff as well as execution plans; (b) when the master plan was drawn up, the competence and functions of the municipalities in Cambodia were weak; and (c) since Siem Reap City has grown very rapidly, there is a gap between the master plan and the current conditions. Accordingly, the Mayor stresses the necessity of the following measures: (a) Strengthening the institutional capacity for plan, do, check and act (PDCA) of the city master plan; (b) strengthening cooperation with the institutions concerned such as the APSARA National Authority; and (c) revising the city master plan. Furthermore, the Mayor of Siem Reap thinks that the current priority issues are the "environment," "traffic," and "resettlement of the poor." The Mayor indicates a willingness to intensively address these issues, revise the city master plan, and draw up individual plans.

3) Improvement strategy for the city plan for Siem Reap City

Based on the ministerial meeting order (Sub-Decree), the authority for drawing up the city master plan was given to Siem Reap City in 2012, and a Mayor-led committee on the master plan is established in the City Government. Table 31 is the list of the members of the City Master Plan Committee. At present, with support from the Ministry of Urban Planning and Construction, the above Committee is drawing up a land-use plan. In the future, the Committee will manage the city master plan and the individual plans of each department.

For revising the city master plan and drawing up the individual plans of each department, the Siem Reap Province Governor and the Mayor of Siem Reap hope to share information and knowledge with Japanese municipalities.

In Kanagawa Prefecture, a municipality which supports this Project, the basic idea for revitalizing the Miura area is " the 'attractive' and 'vigorous' Miura Peninsula which is like a park surrounded by 'trees' and 'sea'." For the revitalization, Kanagawa Prefecture arranges systems for policies as well as activities, regards the highly appealing nine businesses that are directly related to the realization of

future visions as the leading projects, and presents a 5-year business program. Besides, in the City of Kamakura, the basic idea for revitalizing the city is "Kamakura, an ancient capital, in which the residents can feel nature, history, and culture in their daily lives." Under the basic idea, the City of Kamakura draws up the Kamakura City master plan, and draws up as well as executes basic environmental plans and department-specific individual plans (a basic greenery plan, urban landscape formation basic plan, traffic master plan, housing master plan, tourism basic plan, industrial development plan, general waste disposal basic plan, health and welfare plan, and sport facility maintenance plan). The characteristics of Siem Reap City and the basic ideas for revitalizing the City resemble to those in the Miura Peninsula and the City of Kamakura. It seems to be beneficial for Siem Reap City to know the experiences of drawing up and executing the "Miura Peninsula Park" initiative and the city master plan, basic environmental plan, as well as department-specific individual plans of the City of Kamakura.

Table 31 List of the members of the City Master Plan Committee

Name	Title	Role
Mr. So Platong	Mayor of Siem Reap	Chairman
Ms. Kov Visal	Deputy Mayor of Siem Reap	Vice Chairman
Mr. Sor Chanphallin	Head of the City Plan Agency, Siem Reap City	Committee member
Mr. Vean Samol	Siem Reap City Council Member	Committee member
Mr. Keng Lis	Siem Reap City Council Member	Committee member
Mr. Soum Sambath	Deputy Head of the General Affairs Bureau, Siem Reap City	Committee member
Mr. Hun Sambath	Staff of the General Affairs Bureau, Siem Reap City	Committee member
Ms. Eung Saran	Staff of the General Affairs Bureau, Siem Reap City	Committee member
Mr. Em Kimsaroeun	Country Administration Bureau, Siem Reap City	Committee member
Mr. Sean Kimthan	Head of the Development Bureau, Siem Reap City	Committee member
Mr. Tan Cheavutha	Head of the Agriculture Bureau, Siem Reap City	Committee member
Mr. Mao Davy	Head of Culture and Literacy Bureau, Siem Reap City	Committee member
Mr. Chan Sokun	Head of Statistics Bureau, Siem Reap City	Committee member
Mr. Khiev Soth	Mayor of Slorkram Village	Committee member
Mr. Horng Hoeum	Mayor of Svaydorngkum Village	Committee member
Mr. Huy Huon	Mayor of Kokchork Village	Committee member
Mr. Sam Lorn	Mayor of Salakomroeuk Village	Committee member
Mr. Chhloeun La	Mayor of Sambo Village	Committee member
Mr. Ngar Chong	Mayor of Nokorthom Village	Committee member
Mr. Em Man	Mayor of Chongkhnies Village	Committee member
Mr. Ngiv Thong	Mayor of Srorgne Village	Committee member
Mr. Oum Chat	Mayor of Siemreap Village	Committee member
Mr. Kooub Rorn	Mayor of Chreav Village	Committee member
Mr. Chhoum Chhoeut	Mayor of Tekveul Village	Committee member
Mr. Chiem Thai	Mayor of Krorbeiriel Village	Committee member
Mr. Heang Sari	Mayor of Ampeaul Village	Committee member

(Source: Tentative translation by Siem Reap City and OECC)

4) Problems in the environmental policies of Siem Reap City

Table 32 shows the content of the “environment,” “traffic,” and “resettlement of the poor,” which are the important issues of Siem Reap City, and the activities that Siem Reap City is currently engaging in.

Table 32 Important issues of Siem Reap City

Categoty	Issues	Activities
Environment	The sewerage and drainage systems are not set up well.	• Establishing a sewerage system with support from donors (the French Agency for Development, the Asian Development Bank, and the Korean Government) • Tightening regulations on solid waste control • Educating stakeholders in solid waste control and urging them to take necessary measures • Drawing up the solid waste master plan which includes the 3R concept made up by the City Government and GAEA (solid waste disposal companies) • Burning and burying waste • Securing a sufficient budget
	Solid waste is piled up high in the final disposal site.	
	The system for solid waste collection is not established well.	
	There are not enough hygienic disposal sites and compost.	
	The citizens lack the awareness of the environment.	
Traffic	Traffic jams and air pollution are getting worse.	• Paving the roads and creating as well as maintaining intersections • Promoting the use of eco-friendly vehicles
	There are not enough sidewalks, road traffic signs, and traffic lights.	• Providing and maintaining sidewalks
	There are not enough parking areas and parking-area-related regulations.	－
Resettlement of the poor	There are not enough proper solutions for providing houses for the poor.	• Developing areas for the poor to live (The Government has obtained land and had illegal residents along the Siem Reap River move to the land. The Government is planning to develop a town which can contain a total of 1,300 families; so far, 700 families have moved to the town. The Government digs wells and builds toilets, and the residents build their own houses.)
	Some illegal residents make noise, pollute water, and cause safety-related problems.	
	The environment in the area in which illegal residents are living is unhygienic.	

5) Strategies for improving the environmental policies of Siem Reap City

The Cambodia Government hosts the “Clean City Contest” to improve citizens’ awareness of creating an environmentally friendly city, change their attitudes toward waste reduction as well as recycling, beautify the local environment, protect the environment for the next generation, earn the trust of tourists, and encourage the tourists to stay longer in Cambodia. The State Commission on evaluating clean cities evaluates activities of each city by using a total of 77 indexes that are determined for seven categories: (1) Environment management, (2) civil hygiene, (3) waste control, (4) awareness improvement, (5) wooded areas, (6) health as well as safety, and (7) tourism infrastructure as well as facilities. The cities in top ranks are awarded. Siem Reap City is aiming at attaining first place in the “Clean City Contest” and accordingly has expressed a policy that the City will focus on environmental measures.

In order to reduce traffic jams, Kanagawa Prefecture, a municipality supporting this Project, is improving road networks, intersections, as well as traffic control systems and focusing on transport demand management policies. In addition, in order to popularize environmentally friendly vehicles, Kanagawa Prefecture is implementing advanced policies for the popularization of electric vehicles (EV). Siem Reap City may possibly adopt the measures taken in Kanagawa Prefecture such as traffic regulations, park and ride, community buses, a traffic pollution reduction system, preferential treatment for purchasing or using an EV, and the Kanagawa EV taxi project.

Furthermore, in order to achieve ”Zero Waste Kamakura” that is a project for minimizing the waste which is finally burnt or buried, the City of Kamakura is actively taking measures such as training local leaders, keeping the residents informed about trash separation, and providing environment education. The experience gained from these activities seems to be beneficial to Siem Reap City.

6) Promoting inter-city cooperation between Siem Reap Province and Kanagawa Prefecture, and that between Siem Reap City and the City of Kamakura

Through the above-mentioned collection and investigation of basic information, the Project Team reached a conclusion that an effective measure is to provide Siem Reap Province and Siem Reap City with information and knowledge about the ”city master plan,” “traffic (transport demand management and EV popularization),” and “environment (solid waste)” of Kanagawa Prefecture and the City of Kamakura.

Based on the conclusion, the Project Team created a program for inviting relevant

parties to Japan and for giving training to them to promote the following inter-city cooperation: Cooperation between Siem Reap Province and Kanagawa Prefecture and that between Siem Reap City and the City of Kamakura.

(2) Results of the Study tour to the City of Kamakura, Kanagawa Prefecture, Japan

1) Background

The agencies implementing this Project, which are (a) (General Incorporated Association) Overseas Environmental Cooperation Center, Japan, (b) Japan Development Institute Ltd., (c) Terra Motors Corporation, (d) MILAI Corporation, and (e) JTB Business World Travel & Solutions Inc. (hereinafter referred to as "the survey team"), invited the Governor, Administrative Manager, as well as Deputy Governor of Siem Reap Province, and the Vice President of the APSARA National Authority, to Japan in the period from November 17 (Mon.) to 23 (Sun.) to provide training for the Cambodians in the City of Kamakura, Kanagawa Prefecture. The main purpose of the training was to promote the inter-city cooperation.

2) Purposes

The purposes of visiting relevant municipalities, companies, etc. are specified below.

(a) Discussing the policies of and activities in the environment and traffic sectors in Kanagawa Prefecture and the City of Kamakura
(b) Exchanging opinions with the survey team

3) Invited persons

Table 33 shows the names and titles of the persons invited to Japan.

Table 33 List of the invited persons

No.	Name	Title
1	Mr. Khim Bunsong	Siem Reap Province Governor
2	Mr. Ly Samreth	Administrative Manager of Siem Reap Province
3	Mr. Hout Sothy	Deputy Governor of Siem Reap Province
4	Mr. Chhor Thanath	Vice President of the Forest, Culture, Scenery, and Environment Administration Bureau, the PSARA National Authority

4) Results of the invitation

(a) Discussing the policies of and activities in the environment and traffic sectors in Kanagawa Prefecture and the City of Kamakura

The invited Cambodians paid their respects to (a) the Vice-Minister for Global Environmental Affairs, Ministry of the Environment (MOE), (b) the Parliamentary Vice-Minister for Foreign Affairs of Japan (MOFA), (c) the Vice-Governor of Kanagawa Prefecture, and (d) the Mayor of Kamakura City. They also exchanged opinions with (a) Depertment of Industrial and Labor Affairs, Kanagawa Prefecture and (b) Depertment of Environment, City of Kamakura, and then engaged in activities such as observing the cases in which municipalities cooperate with private companies to take environmental measures.

At the coutecy visit to the Vice-Governor of Kanagawa Prefecture, the Governor of Siem Reap Province requested to establish intercity cooperation between Kanagawa Prefecture and Siem Reap Province, and then in December the Siem Reap Provincial Government issued the letter to promote this idea. The Kanagawa Prefecture has considered the proposal, and the Governor of Kanagawa Prefecture preceded the intercity cooperation by using the Japanese Governmental programs, including the JCM in line with the policy to support Kanagawa-based private companies who expand a business into overseas market.

Table 34 Destinations and content No.1

Field	Destination	Content
Inter-city cooperation	MOE	The Cambodians paid their respects to the Vice-Minister for Global Environmental Affairs, Ministry of the Environment. In addition, the Cambodians were informed of activities for promoting inter-city cooperation in Asia by the International Cooperation Office, the Ministry of the Environment.
	MOFA	The Cambodians paid their respects to the Parliamentary Vice-Minister for Foreign Affairs of Japan.
	Kanagawa Prefecture	The Cambodians paid their respects to the Vice-Governor of Kanagawa Prefecture. Kanagawa Prefecture explained to the Cambodians about policies for popularizing electric vehicles in Kanagawa Prefecture and some cases in which Kanagawa Prefecture cooperates with private companies for the above popularization.
	City of Kamakura	The Cambodians paid their respects to the Mayor of the City of Kamakura. The City of Kamakura provided the Cambodians with the summaries and implementation mechanisms of the "Environmental Policy of Kamakura" and the "Kamakura Environmental White Paper." Also, the Environment Part explained measures (waste control, traffic planning, and environment education) described in the "Environmental Policy of Kamakura."

Table 35 Destinations and content No.2

Field	Destination	Content
Environment	Fujisawa Sustainable Smart Town	Panasonic Corporation provided the Cambodians with information on technology for managing energy as well as mobility in the entire town and on the unique support activities provided by the town management company.
	Koajiro Forest	Tokyo University of Agriculture and the Koajiro Outdoor Activity Coordination Council provided the Cambodians with information on nature conservation activities in Koajiro Forest and on environment education activities.

Traffic	Riviera Zushi Marina	Riviera Resort Co., Ltd. and JTB Business World Travel & Solutions Inc. provided the Cambodians with information on electric vehicle sharing service and the energy management for which renewable energy as well as rechargeable batteries are used.
Other	Toppan Printing Co., Ltd.	The Cambodians leaned about the activity, in which a card system is used for promoting tourism, and the virtual reality system with which cultural heritages can be saved in stereoscopic digital images.

(b) Exchanging opinions with the survey team

The survey team provided the Cambodians with information on cases of inter-city cooperation among Japanese municipalities and on cases of low-carbon technology transfer by private companies, and then the Cambodians exchanged opinions concerning future activities with the Japanese participants. The Siem Reap Province Governor expressed his hope for establishing cooperation between Siem Reap Province and Kanagawa Prefecture. The Governor also expressed his hope for continuous cooperation in the drawing up of the Siem Reap City master plan and in the reduction of carbon from the vehicles used for the sightseeing tour of Siem Reap City.

5) Schedule of the invited Cambodians

Table 39 shows the schedule of the invited Cambodians.

Table 36 Schedule of the invited Cambodians

No.	Date	Activities	Stay
1	November 18 (Tue.)	Zhengzhou → Beijing → Narita (the Siem Reap Province Governor, Administrative Manager, and Deputy Governor) *Before coming to Japan, they participated in an international conference held in Zhengzhou Siem Reap City → Inchon → Narita (the Vice President of the APSARA National Authority)	Tokyo
2	November 19 (Wed.)	Participated in a briefing session Paid their respects to the MOE Paid their respects to the MOFA	Kamakura
3	November 20 (Thu.)	Paid their respects to the Kamakura City Government Learned about the environmental policies of the City of Kamakura and had a discussion about the policies Visited Riviera Zushi Marina Visited Koajiro Forest	Kamakura
4	November 21 (Fri.)	Visited the Fujisawa Sustainable Smart Town. Visited the Kanagawa Prefecture Government Office Learned about the policies of Kanagawa Prefecture and had a discussion about the policies Visited Toppan Printing Co., Ltd.	Tokyo
5	November 22 (Sat.)	Had a meeting with the survey team Narita → Inchon → Siem Reap City (the Vice President of the APSARA National Authority)	Tokyo
6	November 23 (Sun.)	Narita → Inchon → Siem Reap City (the Siem Reap Province Governor, Administrative Manager, and Deputy Governor)	—

(3) Results of the invitation relating to ISAP2014

1) Background

The MOE and the Institute for Global Environmental Strategies (IGES, a public interest incorporated foundation) invited the Siem Reap City Government to ISAP2014 (the Sixth International Forum for Sustainable Asia and the Pacific) and relevant events. The purposes of the invitation were to share information on activities among (a) the Japanese municipalities investigating the formation of

large-scale JCM cases, (b) the Japanese companies related to the investigation, and (c) the Asian municipalities considering the introduction of JCM projects, and to promote JCM-related projects in the future.
In relation to this, the Mayor of Siem Reap City stayed in Yokohama from July 21 (Mon.) to 24 (Thu.). The survey team arranged his visits to the relevant municipalities, companies, etc.

2) Purposes of the Mayor's visits
The purposes of the Mayor's visits to the relevant municipalities, companies, etc. are specified below.
(a) Learning about the policies and activities in the environment as well as traffic sectors which Siem Reap City has to deal with
(b) Exchanging opinions with the survey team

3) Invited person
Table 37 shows the name and title of the invited person.

Table 37 List of the invited person

No.	Name	Title
1	Mr. So Platong	Acting Mayor of Siem Reap City *In December 2014, he was promoted to the Mayor.

4) Results of the invitation
(a) Learning about the policies and activities in the environment as well as traffic sectors which Siem Reap City has to deal with
The Mayor visited the Fueta Recycle Center of the City of Kamakura, NISSAN MOTOR CO., LTD. and learned about the policies and activities in the environment and traffic sectors of Japan. He also visited the JICA Headquarters and exchanged opinions with JICA staff about the possibility of future cooperation between JICA and Siem Reap City.
As a result, the Major deepened the understanding on low-carbon technologies, policies and the JCM, and he extended his cooperation in the EcoMobility project. The Major also expressed his expectation to promote an intercity cooperation with Japanese cities.

Table 38 Destinations and content

Field	Destination	Content
Environment	Fueta Recycle Center of the City of Kamakura	The Mayor learned about activities, taken in the City of Kamakura, for recycling glass bottles and steel as well as aluminum cans and for making compost from organic waste.
Traffic	NISSAN MOTOR CO., LTD.	The Mayor learned about the activities, taken in the Minato Mirai 21 area, for reducing carbon emission, improving mobility quality, and promoting tourism. ”Choi-mobi--Nissan's concept electric car sharing in Yokohama” is used for the activities.
Other	JICA Headquarters	The Mayor exchanged opinions with JICA staff about JICA's policies for aiding Cambodia and about the possibility of future cooperation between JICA and Siem Reap City.

(b) Exchanging opinions with the survey team

The survey team provided the Mayor with information on cases of EcoMobility promotion in Japan and on cases of infrastructure development in Japan such as the establishment of battery replacement stations. Then, the Mayor exchanged opinions with the team members about future activities. The Mayor expressed his opinion that he could learn a lot from the experience the Japanese municipalities and companies had had, and that he expected continuous support from Japan. Also, he made a remark that it would take a long time, 20 to 30 years, for Cambodian cities to become ”clean cities” like those in Japan. For the direction of future Siem Reap City, the Mayor gave the comments below.

- In Cambodia, the decentralization of power from central government to local governments (provinces and cities) is promoted. In Siem Reap City and Battambang City that are model cities, advanced efforts have been made. One of the efforts is “dialogue with citizens.” In Siem Reap City, the Mayor has time to listen to requests from citizens on every Monday. (Requests are always received. However, in certain minutes on every Monday, it seems that the Mayor surely appears in front of citizens.) Furthermore, the Mayor has a meeting with a commune once a month to exchange opinions with the commune members.
- The Cambodian Government draws up the National Strategic Development

Plan (NSDP). In addition, each province and city draws up a similar development plan. At present, Siem Reap City is drawing up the NSDP 2014-2018. The NSDP should contain the content related to "the environment."

- The Mayor thinks that Siem Reap City will drastically change in the coming five years. "Culture" and "the environment" will be the keys for building new Siem Reap City. The Mayor expects support from the Japanese Government and cities. By the way, the Cities of Yokohama, Kawasaki, and Kita Kyushu, the representatives of which participated in an ISAP seminar, are heavily-populated industrial cities. Since Siem Reap City is a "tourist and agriculture city" with a population of 200,000 people, it should desirably cooperate with a city that resembles it in population size and social environment. From this point of view, the City of Kamakura seems to be suitable.
- Owing to the decentralization of power from central government to local governments, now, each city is allowed to have a sister city relationship with a foreign city. In such a case, the city must obtain approval from the province and/or the Cambodian Government. (At present, Siem Reap City is negotiating with a city in China and with a city in Korea about a sister city relationship. The Project Team can sign with the city in Korea after receiving approval from the Cambodian Government.)

5) Schedule of the invited Mayor

Table 39 shows the schedule of the invited Mayor.

Table 39　Schedule of the invited Mayor

No.	Date	Activities	Stay
1	July 21 (Mon.)	Siem Reap City → Inchon → Narita Participated in a briefing session	Yokohama
2	July 22 (Tue.)	Participated in an event related to ISAP2014 (a workshop in which JCM-related municipalities participated)	Yokohama
3	July 23 (Wed.)	Visited NISSAN MOTOR CO., LTD. Had a discussion with the survey team Visited the JICA Headquarters	Yokohama
4	July 24 (Thu.)	Visited the Fueta Recycle Center of the City of Kamakura Participated in a work session of ISAP2014 Had a wrap-up meeting with the survey team	Yokohama
5	July 25 (Fri.)	Narita → Inchon → Siem Reap City	―

(4) Results of the invitation relating to the Asia Smart City Week

1) Background

The MOE and IGES invited representatives of JCM target cities, Japanese municipalities, and relevant companies to the municipality seminar hosted by the Ministry and IGES. The seminar was held around the Smart City Week 2014 which was held in PACIFICO Yokohama from October 29 (Wed.) to October 31 (Fri.). The purposes of the seminar were to share information on activities among (a) the Japanese municipalities investigating the formation of large-scale JCM cases, (b) the Japanese companies related to the investigation, and (c) the Asian municipalities considering the introduction of JCM projects, and to promote JCM-related projects in the future.

In relation to this, the Head of Tourism Management Plan, APSARA National Authority, stayed in Yokohama from October 27 (Mon.) to 31 (Fri.). The survey team arranged his visits to the relevant municipalities, companies, etc.

2) Purposes of the Head's visits

The purposes of the Head's visits to the relevant municipalities, companies, etc. are specified below.

(a) Learning about the policies and activities in the environment as well as traffic sectors which the Angkor Park has to deal with

(b) Exchanging opinions with the survey team

3) List of the invited person

Table 37 shows the name and title of the invited person.

Table 40　List of the invited person

No.	Name	Title
1	Mr. Sok Sangvar	Head of Tourism Management Plan, APSARA National Authority

4) Results of the invitation

(a) Learning about the policies and activities in the environment as well as traffic sectors which the Angkor Park has to deal with

The Head visited Tokyo SKYTREE TOWN, Hakone Geopark, Yokohama Minato Mirai 21, Traffic Control Center--Kanagawa Prefectural Police Department, as well as Toppan Printing Co., Ltd., and learned about the policies of and activities in the environment and traffic sectors of Japan. He also visited the JICA Headquarters and exchanged opinions with JICA staff about the possibility of future cooperation between JICA and the APSARA National Authority.

As a result, the Head deepened the understanding on low-carbon technologies, policies and the JCM, and he extended his cooperation to promote the low-carbon technology transfer by using the JCM specifically in the fields of transport and solid waste management around the Angkor Park.

Table 41 Destinations and content

Field	Destination	Content
Environment	Tokyo SKYTREE TOWN	The Head learned about (a) efforts for the management of tourist flow in the tourist facility which has about 5 million visitors every year, and (b) the environmental-load-reducing technology used for the local air-conditioning equipment which conditions the air in the entire commercial building.
	Hakone Geopark	The Head learned about the "Hakone Geopark Project" (activities for preserving not only geologic resources of the Hakone Volcano and the surrounding areas, but also historic, cultural, and ecological resources, and for using the resources for purposes such as regional development) and visited Geopark sites.
Traffic	Traffic Control Center--Kanagawa Prefectural Police Department	The Head learned about efforts for the traffic management, for which a real-time traffic monitoring system is used, in Kanagawa Prefecture.
	Yokohama Minato Mirai 21	In the Yokohama Minato Mirai 21 area, the Head observed traffic service such as the sharing of electric assist bicycles and the buses traveling around tourist spots.
Other	Toppan Printing Co., Ltd.	The Head learned about the utilization of the virtual reality system that can save cultural heritages in stereoscopic digital images.
	The Sophia University Institute of Asian Cultures	The Head learned about activities for researching the Angkor Monuments and the restoration of traditional culture.
	JICA Headquarters	The Head exchanged opinions with the JICA staff about the possibility of future cooperation in the Angkor Park between JICA and the APSARA National Authority.

(b) Exchanging opinions with the survey team

The Head exchanged opinions with the survey team members about methods for managing tourist flow as well as hygiene, preserving monuments, and improving tourist satisfaction in the Angkor Park.

The Head of Tourism Management Plan, APSARA National Authority, expressed his hope for the comprehensive and continuous cooperation that is based on ties with Japanese municipalities. He also expressed that he especially would like to use the JCM system to introduce low-carbon technologies to the traffic and solid waste control sectors. In relation to these sectors, he also said that he recognizes the importance of cooperation among Siem Reap Province, Siem Reap City, and the APSARA National Authority.

5) Schedule of the invited Head

Table 39 shows the schedule of the invited Head.

Table 42 Schedule of the invited Head

No.	Date	Activities	Stay
1	October 27 (Mon.)	Siem Reap City → Singapore → Narita Participated in a briefing session.	Yokohama
2	October 28 (Tue.)	Visited Traffic Control Center Participated in a JCM workshop	Yokohama
3	October 29 (Wed.)	Participated in a company seminar for the promotion of low-carbon emission in Asia Participated in a seminar for the formation of low-carbon cities in Asia	Yokohama
4	October 30 (Thu.)	Visited the JICA Headquarters Participated in the Asia Smart City Conference	Yokohama
5	October 31 (Fri.)	Visited Toppan Printing Co., Ltd Visited Tokyo SKYTREE TOWN Had a discussion with the survey team	Yokohama
6	November 1 (Sat.)	Visited Hakone Geopark	Yokohama
7	November 2 (Sun.)	Visited Yokohama Minato Mirai 21	Yokohama
8	November 3 (Mon.)	Visited the Sophia University Institute of Asian Cultures Narita → Singapore → Siem Reap City	－

(5) Results of a seminar held in Siem Reap City

As a part of this Project, on January 24, 2014 (Sat.), the Project Team hosted a seminar in Siem Reap City which was targeted at the government organizations and industry groups of the City. In the seminar, survey results were reported, business models of the EcoMobility project were announced, Japanese low-carbon technology and service were introduced, and a discussion for future cooperation was held.

For the solution of the important issues (the environment, traffic, and resettlement of the poor) in Siem Reap City and for the preservation of as well as tourism promotion in the Angkor Park, the Siem Reap City Government and the APSARA National Authority expressed that the following are important: (a) Having the citizens participate in the planning, (b) having them understand the importance of the preservation as well as tourism promotion, and (c) having the stakeholders

gather as well as express their ideas. Then, the Siem Reap City Government and the APSARA National Authority expressed support for the future achievement of the EcoMobility project. For making Siem Reap City environmentally and culturally friendly, the Siem Reap City Government and the APSARA National Authority expressed strong expectations for sharing information and knowledge with Japanese municipalities and private companies.

Table 43 shows the summary of the seminar, and Table 44 shows the agenda of the seminar. Table 45 shows the details of exchanged opinions. Furthermore, Appendix 6 shows the presentation materials of the semnar.

Table 43 Summary of the seminar

Time and date:	9: 00-13: 00, January 24, 2014 (Sat.)
Place:	Sokha Angkor Resort, Siem Reap
Attendants:	[From Cambodia] Siem Reap Provincial Government, Siem Reap Province Police, Siem Reap City Government, APSARA National Authority, Government - Private Sector Forum (G-PSF), UNESCO, IDEA (Drivers' Association), CCDA (Drivers' Association), Bollore Blue Solutions, Ly Brothers Motors, Phum Meas Aphiwat, and AEON MALL (Cambodia) [From Japan] Japan Development Institute Ltd., JTB Business World Travel & Solutions Inc., MILAI Corporation, Terra Motors Corporation, FORVAL Corporation, and Overseas Environmental Cooperation Center, Japan (which is a General Incorporated Association)
Purposes:	➢ To present a business model of "Angkor Mobility Service" which is developed based on results of surveys conducted in 2014 ➢ To discuss collaboration among relevant organizations on promotion of integrated EcoMobility services for tourists and citizens in Siem Reap City and the Angkor Park

Table 44 Agenda of the seminar

Time	Topic	Speaker
Registration and Opening Session:		
09:00-09:20	Opening remarks	H.E Sang Riha, Vice Governor of Siem Reap Province
Session 1: Survey results and a business model of Angkor Mobility Service		
09:20-09:30	Results of surveys on EcoMobility project	Mr. Yushin Nakao, Researcher, OECC and Mr. Phuong Veasna, IDEA
09:30-09:45	Angkor Mobility Service	Mr. Tomonori Kimura, Partner, JDI
09:45-09:55	Q & A	
09:55-10:05	Concept of e-Reumork	Mr. Ichiro Hatayama, CEO, MILAI
10:05-10:15	Expectation for Angkor Mobility Service in driver association's context	Mr. Phieng Samedh, Branch coordinator, IDEA and Mr. E. Sophors, President, CCDA
10:15-10:25	Q & A	
10:25-10:40	Coffee break	
Session 2: Toward building integrated low-carbon mobility services in Siem Reap City and Angkor Park		
10:40-10:55 (15 min.)	Tourism Management in Angkor	Ms. Oum Marady, Deputy Director, Tourism Management Plan, APSARA Authority
11:55-11:15	Q&A	
11:15-11:30 (15 min.)	Development of the Siem Reap City Master Plan to address traffic and environmental issues	H.E So Platong, Governor, Siem Reap City
11:30-11:40 (10 min.)	Best practices on promoting tourism and mobility in Japan and Asia	Mr. Takayuki Kuroiwa, Producer, JTB Business World Travel & Solutions
11:40-12:10	Discussion	
12:10-12:15	Closing remarks	Dr. Soichi Kobayashi, CEO and Chairman, JDI
12:15-13:00	Test drive on "e-reumork" by MILAI and showcase of A4000i by Terra Motors	

Table 45 Details of exchanged opinions with stakeholders

No.	Speaker	Summary of his/her opinion
1.	IDEA	Through the surveys in this fiscal year, the Project Team could obtain important data items such as drivers' income and the use of Reumork Moto by tourists. I am interested in the improvement of service quality. By cooperating with concerned parties in various ways, IDEA would like to provide tourists with better service.
2.	CCDA	CCDA is cooperating with the Phnom Penh City Government and considering cooperation with the Phnom Penh Metropolitan Traffic Master Plan which is supported by JICA. At present, the Reumork Moto service is classified as a non-official sector. However, CCDA thinks that Reumork Moto drivers need to cooperate with the institutions concerned to establish traffic safety and security standards to make the Reumork Moto service become an official sector. From now on, the Project Team will negotiate with the APSARA National Authority and the Siem Reap Provincial Government about the establishment of standards in Siem Reap City. In Siem Reap City, culturally and environmentally friendly activities are important.
3.	UNESCO	I support an idea of using electric motorcycles for reducing CO2 emissions and increasing drivers' income.
4.	G-PSF	I would like to continuously support this Project as an advisor. The ASEAN integration in 2015 is expected to increase tourists and allow travel agencies from neighboring countries such as Thailand to enter into the Cambodian tourism market. These seem to complicate management. In relation to this possibility, I would like the Cambodian Government, Siem Reap Province, Siem Reap City, and the APSARA National Authority to take the measures below. • Consolidating the legal system for supporting drivers • Controlling the number of vehicles entering into the Angkor Park, and reducing traffic jams by applying regulations such as one-way traffic • Distributing information to tour guides • Providing chances for private companies and government organizations to periodically exchange their opinions

Table 46 Details of exchanged opinions with Governmental agencies

No.	Speaker	Summary of his/her opinion
1.	Siem Reap City	In anticipation of the ASEAN integration in 2015, the Project Team are consolidating the legal system, enriching social and welfare services, settling conflicts, drawing up the city master plan, and engaging in other necessary activities. Besides, in order to handle the increase of tourists, the Project Team need to focus on activities in the traffic sector. I am interested in the promotion of one-way traffic. It is important to establish the traffic system that allows the cars to go smoothly without running into a dead end. On the other hand, Siem Reap City regulates the construction of roads and highways to preserve the Angkor Park and the landscape of the city. Therefore, when a policy is implemented, there is a high risk of a conflict between concerned parties. Mutual understanding and compromise need to be propagated.
2.	APSARA National Authority	I believe that the EcoMobility project has lower risk and fewer burdens on the monuments, environment, and residents. On the other hand, for likely risks, the Project Team needs to have discussions with the concerned parties beforehand and take necessary measures. I agree to the necessity of consolidating the legal system and establishing standards.

3.8 Policies for establishing Environmentally and Culturally Sustainable Cities

Table 47 shows the needs from Siem Reap City and the environment-related knowledge Kanagawa Prefecture or the City of Kamakura has obtained, both of which are identified through this Project. The Siem Reap Provincial Government has formally made the following requests to the Japanese Government and Kanagawa Prefecture: (a) Establishing inter-city cooperation with Kanagawa Prefecture, (b) supporting Siem Reap City in drawing up the master plan, and (c) supporting Siem Reap City in reducing the carbon emitted from the vehicles used for touring the city.

In the future, under the framework of inter-city cooperation, the issues of Siem Reap City can be solved and the establishment of the Environmentally and Culturally Sustainable Cities can be promoted by (a) the utilization of funding schemes including JCM of the Japanese Government, (b) technical support from the Japanese municipalities, and (c) the introduction of technologies from Japanese private companies.

Table 47 Needs from Siem Reap City

Issue	Needs from Siem Reap City	Knowledge that Kanagawa Prefecture or the City of Kamakura has obtained
City master plan	Strengthening the institutional capcity for plan, do, check, act (PDCA) of the city master plan	Managing the Exploratory Committee for drawing up the city master plan
	Strengthening ties with the institutions concerned such as the APSARA National Authority	Cooperating with public organizations, research institutions, and citizens for the establishment of the city master plan
	Revising the city master plan	Drawing up and revising the city master plan
Traffic (transport demand management and EV popularization)	Easing traffic jams and reducing air pollution	Taking measures such as traffic regulations, park and ride, community buses, a traffic pollution reduction system, preferential treatment for purchasing or using an EV, and the Kanagawa EV taxi project
Environment (solid waste)	Increasing citizens' awareness of reducing and recycling solid waste	Taking measures such as training local leaders, keeping the residents informed about trash separation, and providing environment education

Appendix 1

JCM proposed methodology,

Draft Project Design Document (PDD),

Draft MonitoringPlan

20 February, 2015
OECC

Joint Crediting Mechanism Proposed Methodology Form

A. Title of the methodology

Introduction of electric reumork moto in Cambodia

B. Terms and definition

Terms	Definition
Electric motorbike	Motorbikes run by using an electric motor as the power source
Reumork moto	Passenger vehicles consist of a gasoline-driven motorbike and a passenger cart
Electric reumork moto	Passenger vehicles consist of a electric motorbike and a passenger cart

C. Summary of the methodology

Items	Summary
GHG emissions reduction measures	The methodology is applicable to the project which reduces GHG emissions in the Kingdom of Cambodia by replacing a gasoline-driven reumork moto with an electric reumork moto.
Calculation of reference emissions	Reference emissions are calculated from specific fuel consumption of the reference vehicle.
Calculation of project emissions	Project emissions are calculated from specific electricity consumption of the project vehicle.
Monitoring parameters	Specific electricity consumption from the project vehicle, annual average driving distance, number of operational project vehicles, average technical transmission and distribution losses and CO2 emission factor of electricity are monitored.

D. Eligibility criteria

This methodology is applicable to projects that satisfy all of the following criteria.

Criterion 1	The project replaces a gasoline bike of a reumork moto with a new electric bike.
Criterion 2	The project determines an electricity economy and a driving distance of the introduced electric reumork moto.
Criterion 3	The project uses electricity only supplied from the national grid in Cambodia.

E. Emission sources and GHG types

Reference emissions	
Emission sources	GHG types
Fossil fuel consumption	CO2
Project emissions	
Emission sources	GHG types
Grid electricity consumption	CO2

F. Establishment and calculation of reference emissions

F.1 Establishment of reference emissions

Reference emissions are calculated from specific fuel consumption from the reference vehicle, which is set based on results of fuel economy measurement for existing gasoline-driven reumork moto.

F.2 Calculation of reference emissions

The reference emissions are calculated as follows.

$$RE_y = \sum_i ((DD_y / SFC_{RE}) \times IR_y \times NCV_{gasoline} \times EF_{gasoline} \times N_y)$$

Where:

RE_y	Reference emissions	tCO2e/y
DD_y	Annual average driving distance by project vehicle in year y	km
SFC_{RE}	Specific fuel consumption of reference vehicle	km/l
IR_y	Technology improvement factor for reference vehicle in year y	-
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	MJ/l
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	tCO2e/MJ
N_y	Number of operational project vehicles in year y	Unit

G. Calculation of project emissions

Project emissions from electricity used in the project vehicle, determined as follows.

$$PE_y = \sum_i ((DD_y / SEC_{PJ,y}) \times EF_{grid} / (100\% - TDL_y) \times N_y)$$

Where:

PE_y	Project emissions	tCO2e/y
DD_y	Annual average driving distance by project vehicle in year y	km
$SEC_{PJ,y}$	Specific electricity consumption of project vehicles in year y	km/kWh
TDL_y	Average technical transmission and distribution losses providing electricity in year y	%
EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	tCO2e/MJ
N_y	Number of operational project vehicles in year y	Unit

H. Calculation of emission reductions

The emission reductions achieved by the project activity shall be determined as the difference between the reference emissions and the project emissions.

$$ER_y = RE_y - PE_y$$

Where:

ER_y	Emission reductions	tCO2e/y
RE_y	Reference emissions	tCO2e/y
PE_y	Project emissions	tCO2e/y

I. Data and parameters fixed *ex ante*

The source of each data and parameter fixed *ex ante* is listed as below:

Parameter	Description of data	Source
DD_y	Annual average driving distance by project vehicle in year y	By reading the odometer or taking another means, continuously measure, record, and totalize the average driving distance of all or sampled vehicles.
N_y	Number of operational project vehicles in year y	By using purchase slips, etc., continuously record the No.
SFC_{RE}	Specific fuel consumption of reference vehicle	Apply the default value (31.6km) that has been set in this Project.
$SEC_{PJ,y}$	Specific electricity consumption of project vehicles in year y	By using a voltmeter, etc., continuously measure, record, and totalize the electricity efficiency of all or sampled vehicles.
IR_y	Technology improvement factor for reference vehicle in year y	Check the default value of CDM small-scale methodologies AMS-III.C. When the characteristic value is published by the nation, use the characteristic value.
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	Check the default value of the IPCC 2006 Guideline. When the characteristic value is published by the nation, use the characteristic value.
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	Check the default value of the IPCC 2006 Guideline. When the characteristic value is published by the nation, use the characteristic value.
TDL_y	Average technical transmission and distribution losses providing electricity in year y	Check the rate published by the Electricity Authority of Cambodia.
EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	Check the CO2 emission factor published by the Ministry of Environment, Cambodia.

Joint Crediting Mechanism Proposed Methodology Spreadsheet Form (input sheet) [Attachment to Proposed Methodology Form]

Table 1: Parameters to be monitored *ex post*

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Monitoring point No.	Parameters	Description of data	Estimated Values	Units	Monitoring option	Source of data	Measurement methods and procedures	Monitoring frequency	Other comments
(1)	EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	0.0000000	tCO2/kWh	Option A	Ministry of Environment, Cambodia	Calculating by using the data of the most updated MOE report	once a year	N/A
(2)	TDL_y	Average technical transmission and distribution losses providing electricity in year y	0.0	%	Option A	Energy Authority Cambodia	Calculating by using the data of the most updated EAC report	once a year	N/A
(3)	N_y	Number of operational project vehicles in year y	0	Unit	Option B	Project participants	Collecting puchase amount from retailer invoices and inputing to an spread sheet manually	once a year	N/A
(4)	DD_y	Annual average driving distance by project vehicle in year y	0	km/year	Option C	Project participants	Based on an odometer or a GPS logger	once a year	N/A
(5)	$SEC_{PJ,y}$	Sepecific electricity consumption of project vehicles in year y	0.0	km/kWh	Option C	Project participants	Collecting elctricity consumption data with validated/calibrated electricity monitoring devices and inputting to a spread sheet manually	continuous	N/A

Table 2: Project-specific parameters to be fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	0	tCO2/MJ	IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	N/A
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	0	MJ/l	IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	N/A
SFC_{RE}	Specific fuel consumption of reference vehicle	0	km/l	Default values based on field measurement	N/A
IR_y	Technology improvement factor for reference vehicle in year y	0	-	Default values as provided in CDM methodology AMS III.C. Emission reductions by electric and hybrid vehicles	N/A

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
#DIV/0!	tCO_2/y

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

Joint Crediting Mechanism Proposed Methodology Spreadsheet Form (Calculation Process Sheet)

[Attachment to Proposed Methodology Form]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period of year y		#DIV/0!	tCO_2/y	ER_y
2. Selected default values, etc.				
Specific fuel consumption of reference vehicle		0	km/l	SFC_{RE}
3. Calculations for reference emissions				
Reference emissions during the period of year y		#DIV/0!	tCO_2/y	RE_y
CO2 emission factor of gasoline consumed by reference vehicle	Gasoline	0	tCO2/MJ	$EF_{gasoline}$
Net Calorific value of gasoline consumed by reference vehicle	Gasoline	0	MJ/l	$NCV_{gasoline}$
Technology improvement factor for reference vehicle in year y	N/A	0	-	IR_y
4. Calculations of the project emissions				
Project emissions during the period of year y		#DIV/0!	tCO_2/y	PE_y
CO2 emission factor of electricity consumed by project vehicle in year y	Electricity	0	tCO2/kWh	EF_{grid}
Average technical transmission and distribution losses providing electricity in year y	N/A	0.0	%	TDL_y
Number of operational project vehicles in year y	N/A	0	Unit	N_y
Annual average driving distance by project vehicle in year y	N/A	0	km/year	DD_y
Sepecific electricity consumption of project vehicles in year y	Electricity	0	km/kWh	$SEC_{PJ,y}$

[List of Default Values]

Specific fuel consumption of reference vehicle	31.6	km/l

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Project for introduction of electric reumork motos in Cambodia

A.2. General description of project and applied technologies and/or measures

This proposed project aims to reduce CO2 emissions from gasoline-based reumork motos by introducing electric reumork motos in Cambodia. The project contributes to abating 110 tCO2e of greenhouse gas (GHG) emissions annually through the operation of 250 units of electric reumork motos in Siem Reap City, Siem Reap Province, Cambodia.

A.3. Location of project, including coordinates

Country	Kingdom of Cambodia
Region/State/Province etc.	Siem Reap Province
City/Town/Community etc.	Siem Reap City
Latitude, longitude	13.3622° N, 103.8597° E

A.4. Name of project participants

Kingdom of Cambodia	Asian Gateway (Cambodia) Corporation
Japan	Asian Gateway Corporation

A.5. Duration

Starting date of project operation	01 January 2017
Expected operation lifetime of project	6 years

A.6. Contribution from developing countries

This proposed project will contribute to reducing air pollution around the Angkor World Heritage sites, while increasing local driver's income by introduction of an electric reumork moto, which is 5 times more cost-effective than gasoline-based reumork moto. Asian Gateway Corporation and Asian Gateway (Cambodia) Corporation will also provide drivers with training opportunities in the hospitality and technology fields.

B. Application of an approved methodology

B.1. Selection of methodology

Selected approved methodology No.	JCM_KH_Draft
Version number	1.0

B.2. Explanation of how the project meets eligibility criteria of approved methodology

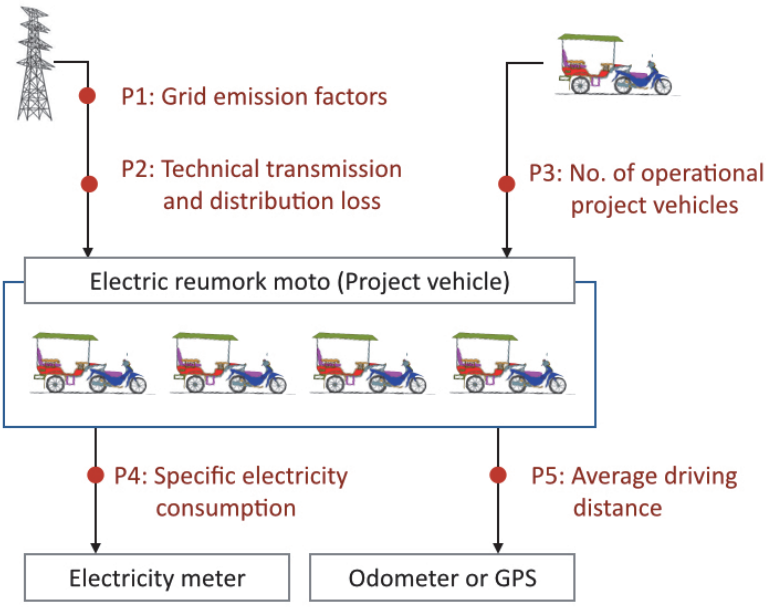
Eligibility criteria	Descriptions specified in the methodology	Project information
Criteria 1	The project replaces a gasoline bike of a reumork moto with a new electric bike	The project introduces a new electric bike to replace a gasoline bike of a reumork moto
Criteria 2	The project determines an electricity economy and a driving distance of the introduced electric reumork moto	The project monitors an electricity economy and a driving distance of the introduced electric reumork moto
Criteria 3	The project uses electricity only supplied from the national grid in Cambodia	The project uses electricity only supplied from the national grid in Cambodia

C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Gasoline consumption by the reference vehicle	CO2
Project emissions	
Emission sources	GHG type
Electricity consumption by the project vehicle	CO2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



C.3. Estimated emissions reductions in each year

Year	Estimated reference emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated emission reductions (tCO2e)
2017	212.5	102.5	110.0
2018	210.0	102.5	107.5
2019	207.5	102.5	105.0
2020	205.0	102.5	102.5
2021	202.5	102.5	100.0
2022	200.0	102.5	97.5
Total	1237.5	615.0	622.5

D. Environmental impact assessment

Legal requirement of environmental impact assessment for the proposed project	No

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The project participants identified local stakeholders as the APSARA National Authority, Siem Reap Provincial Government, Siem Reap City Hall, UNESCO, the

reumork moto driver's association and the association of travel agents since the project activities are closely linked with the conservation and tourism in Angkor World Heritage sites. The project participants conducted a local stakeholder meeting described as below:

[1] Time and Date
9:00-13:00, 24 January 2015

[2] Venue
Sokha Angkor Resort, Siem Reap

[3] Participated agencies
APSARA National Authority, Siem Reap Provincial Government, Siem Reap Provincial Police, Siem Reap City Hall, Government-Private Sector Forum Tourism Working Group, UNESCO, Reumork moto driver association (IDEA and CCDA)

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Mr. Phieng Samedh, IDEA	IDEA has an interest in increasing the quality of reumork moto driving services. We would like to collaborate with stakeholders to offer better services to tourists.	No action is required.
Mr. Mey Kosal, UNESCO	UNESCO endorses the project that aims to reducing CO2 emissions while increasing local driver's income.	No action is required.
Mr. Ho Vandy, Government-Private Sector Forum	G-PSF will participate in the project as an advisor. After the 2015 ASEAN community building, Siem Reap will face management issues due to increasing number of tourists and travel agents from neighboring countries. G-PSF requests the APSARA National Authority, Siem Reap Provincial Government and Siem Reap	The project participants will actively collaborate with stakeholders.

	City Hall to address the issues by the following measures: - To establish law and regulations which assure driver's safety, - To mitigate traffic congestion by limiting vehicles entering into the Angkor Park, - To hold regular meetings between the Government and private sector	
H.E Mr. So Platong, Siem Reap City	The project participants have to promote a mutual understanding with stakeholders to avoid any conflicts.	The project participants will actively collaborate with stakeholders.
H.E Mr. Mey Marady, APSARA National Authority	APSARA National Authority considers the project as relatively low risk and low social and environmental impact. However, the project participants should minimize any risks in collaboration with stakeholders.	The project participants will actively collaborate with stakeholders.

F. Reference

N/A

Reference lists to support descriptions in the PDD, if any.

Annex

N/A

Revision history of PDD

Version	Date	Contents revised
1.0	20 February 2015	First edition

Monitoring Spreadsheet: JCM_KH_Draft_ver01.0

Monitoring Plan Sheet (Calculation Process Sheet)

[Attachment to Project Design Dosument]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period of year y		110.00	tCO_2/y	ER_y
2. Selected default values, etc.				
Specific fuel consumption of reference vehicle		31.6	km/l	SFC_{RE}
3. Calculations for reference emissions				
Reference emissions during the period of year y		212.5	tCO_2/y	RE_y
CO2 emission factor of gasoline consumed by reference vehicle	Gasoline	0.0000693	tCO2/MJ	$EF_{gasoline}$
Net Calorific value of gasoline consumed by reference vehicle	Gasoline	32.8	MJ/l	$NCV_{gasoline}$
Technology improvement factor for reference vehicle in year y	N/A	0.99	-	IR_y
4. Calculations of the project emissions				
Project emissions during the period of year y		102.5	tCO_2/y	PE_y
CO2 emission factor of electricity consumed by project vehicle in year y	Electricity	0.0006257	tCO2/kWh	EF_{grid}
Average technical transmission and distribution losses providing electricity in year y	N/A	12.3	%	TDL_y
Number of operational project vehicles in year y	N/A	250	Unit	N_y
Annual average driving distance by project vehicle in year y	N/A	11,999	km/year	DD_y
Sepecific electricity consumption of project vehicles in year y	Electricity	20.5	km/kWh	$SEC_{PJ,y}$

[List of Default Values]

Specific fuel consumption of reference vehicle	31.6	km/l

Monitoring Plan Sheet (input sheet) [Attachment to Project Design Dosument]

Table 1: Parameters to be monitored *ex post*

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Monitoring point No.	Parameters	Description of data	Estimated Values	Units	Monitoring option	Source of data	Measurement methods and procedures	Monitoring frequency	Other comments
(1)	EF_{grid}	CO2 emission factor of electricity consumed by project vehicle in year y	0.0006257	tCO2/kWh	Option A	Ministry of Environment, Cambodia	Calculating by using the data of the most updated MOE report	once a year	N/A
(2)	TDL_y	Average technical transmission and distribution losses providing electricity in year y	12.3	%	Option A	Energy Authority of Cambodia	Calculating by using the data of the most updated EAC report	once a year	N/A
(3)	N_y	Number of operational project vehicles in year y	250	Unit	Option B	Moniterd data	Collecting puchase amount from retailer invoices and inputing to an spread sheet manually	once a year	N/A
(4)	DD_y	Annual average driving distance by project vehicle in year y	11,999	km/year	Option C	Monitored data	Based on an odometer or a GPS logger	once a year	N/A
(5)	$SEC_{PJ,y}$	Sepecific electricity consumption of project vehicles in year y	21	km/kWh	Option C	Monitored data	Collecting elctricity consumption data with validated/calibrated electricity monitoring devices and inputting to a spread sheet manually	continuous	N/A

Table 2: Project-specific parameters to be fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments
$EF_{gasoline}$	CO2 emission factor of gasoline consumed by reference vehicle	0.0000693	tCO2/MJ	IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	N/A
$NCV_{gasoline}$	Net Calorific value of gasoline consumed by reference vehicle	32.8	MJ/l	IPCC default values as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	N/A
SFC_{RE}	Specific fuel consumption of reference vehicle	31.6	km/l	Default values based on field measurement	N/A
IR_y	Technology improvement factor for reference vehicle in year y	0.99	-	Default values as provided in CDM methodology AMS III.C. Emission reductions by electric and hybrid vehicles	N/A

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
110	tCO_2/y

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

Monitoring Structure Sheet [Attachment to Project Design Document]

Responsible personnel	Role
Project Manager	Responsible for planning and implementing the project as well as monitoring and reporting results.
Supervisor	Appointed to be in charge of checking the archived data for irregularity and lack.
Operators	Appointed to be in charge of collecting and archiving the data.

Appendix 2

Driver interview survey sheet,

Results of driver interview survey

Date of Survey 14-June, 2014

REUMORK MOTO Driver Interview Survey Sheet

1. Driver's Profile

(1) Drivers Name

(2) Gender ☐Male ☐Female ☐Other

(3) Age

(4) Education ☐Junior high school ☐High school ☐University ☐Others ( )

(5) Marital Status ☐Single ☐Married

(6) No. of family members (including you)

(7) How many years working as remourk moto driver?

(8) Do you have a reumork moto lisence? ☐No ☐Yes

(9) Name of associated driver's association ☐None ☐IDEA ☐CCDA ☐Others ( )

(10) Business type ☐Hotel ☐Travel agency ☐Tour guide ☐Airport ☐Bus station
☐Museum ☐Others ( )

(11) Are you a leader of a driver group? ☐No ☐Yes (If Yes) No. of drivers of a group

(12) Health Status ☐None ☐Smoking ☐Asthma ☐Difficulty in breathing
☐Hypertention ☐Alcoholic ☐Others ( )

(13) Language skill 1) English ☐None ☐Beginner level ☐Business level
2) Others( ) ☐None ☐Beginner level ☐Business level

(14) Other job ☐No ☐Yes (If Yes) What kind of job?

2. Income and cost

(1) Average income (USD)

Category		High season (Oct-Mar)		Low Season (Apr-Sep)	
		Daily	Monthly	Daily	Monthly
1) Fare	Average				
	Maxmum				
	Minimum				
2) Tip	Average				
	Maxmum				
	Minimum				
3) Other job	Average				
	Maxmum				
	Minimum				

(2) Average cost (USD)

Category		High season (Oct-Mar)		Low Season (Apr-Sep)	
		Daily	Monthly	Daily	Monthly
1) Gasoline	Average				
2) Engine oil	Average				
3) Repair	Average				
4) Comission fee for agent	Average				

(3) Member fee for association (USD per year)
(4) Licence registration fee (USD per year)
(5) Purchase price of a motorcycle (USD)
(6) Is a motorbike new or secondhand? ☐New ☐Second-hand
(7) Do you get a loan to purchace a motorcycle? ☐No ☐Yes
(8) Purchase price of a reumork (USD)
(9) Is a reumork new or secondhand? ☐New ☐Second-hand
(10) Do you get a loan to purchace a reumork? ☐No ☐Yes

3. Reumork moto driving

(1) No. of days of operation of reumork moto per week
(2) Average working hour per day
1) Start time
2) End time
(3) Average time spent daily (hour)

Category	Hour
1) Moving with passangers	
2) Waiting for passengers	
3) Seeking passengers (Stand-by)	
4) Seeking passengers (Moving)	
5) Break (breakfast, lunch, dinner)	

(4) Obstacles frequently encountered ☐Potholes ☐Humps ☐Narrow roads ☐Pedestrians ☐Canals/manholes
☐Traffic congestion ☐Flood ☐Rain ☐Heat ☐Dust
☐Pollution/emission ☐Slope ☐Others ( )
(5) Have you ever faced any trafic accidents? ☐No ☐Yes (If Yes) What kind of accidents?
(6) Have you ever faced any troubles in your business? ☐No ☐Yes (If Yes) What kind of toubles?

4. Others

(1) Minimum necessary income (USD per month)
(2) Ideal income for reumork moto driving (USD per month)
(3) Any requests or messages for the Government?
1) For the Siem Reap Provincial Government

2) For the Royal Government of Cambodia

Thank you for your cooperation !

This survey is conducted as part of cooperation programmes from the Ministry of the Environment, Japan with its partners in the Kingdom of Cambodia.
To protect your privacy, your responce will be anonymous and will never be linked to you personally.
Overseas Environmental Cooperation Center, Japan (OECC) / Japan Development Institute (JDI)

Results of reumork moto driver interview survey in Siem Reap

Study Team on the EcoMobiliy project

1

Survey methods

1st: Study session

2nd: Questionnaire

3rd: Quality check

4th: Completion!

3

Results of the survey (142 drivers)

1. Driver's profile
2. Income and cost
3. Reumork moto driving
4. Comparison among 3 different groups

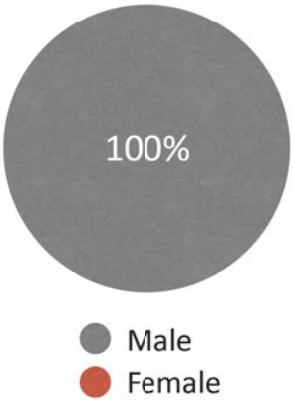
4

1. Driver's profile

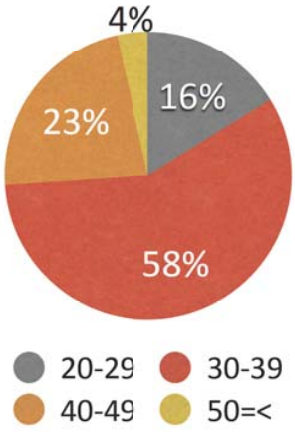
5

1. Driver's profile

Gender



Age



Key findings

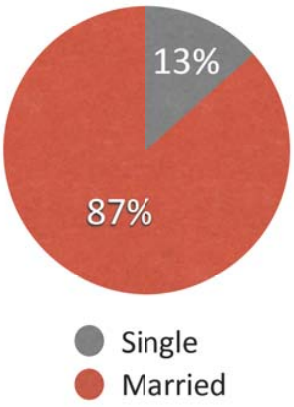
Male drivers occupy **100%**

81% of drivers are in their thirties and forties

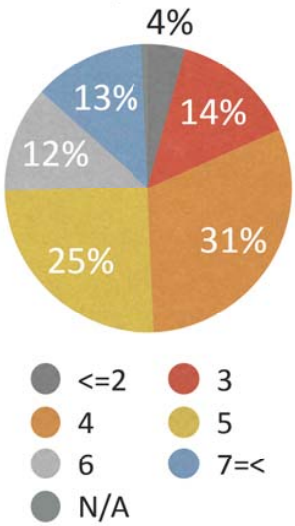
6

1. Driver's profile

Marital status



Family member



Key findings

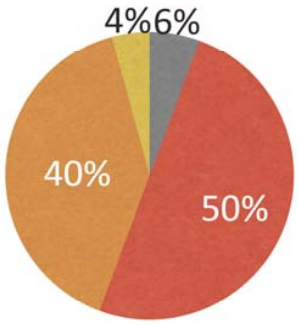
87% of drivers get married

96% of drivers have more than 3 family members to support

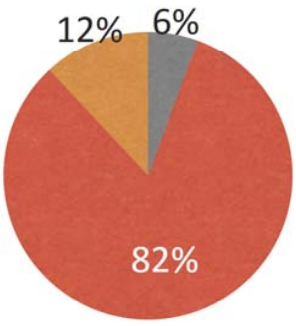
7

1. Driver's profile

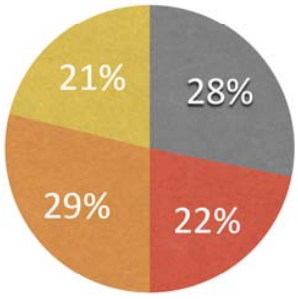
Education



Language



Years working



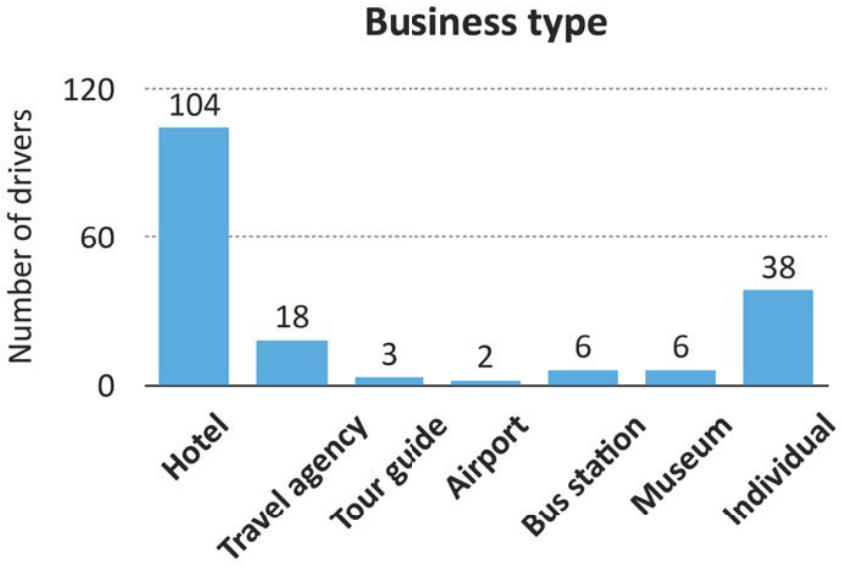
Key findings

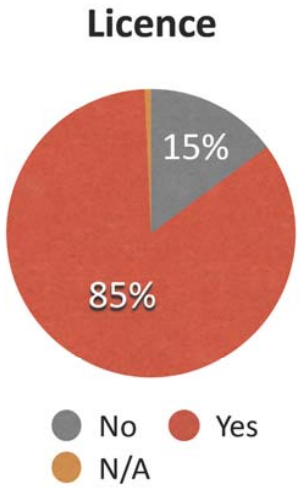
56% of drivers do not get higher education

Only 12% of drivers speak business-level English

Years working as a remark moto driver are **diverse**

1. Driver's profile





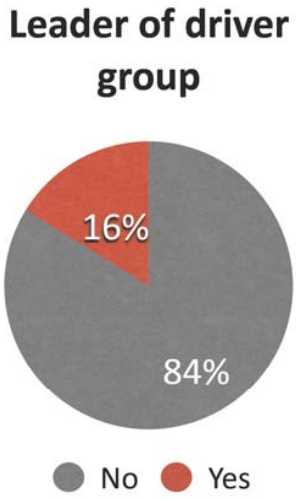
Key findings

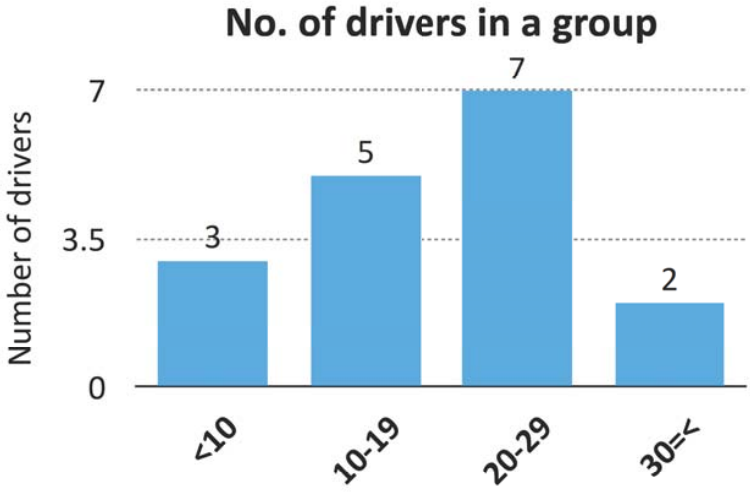
Most drivers work **individually** or work with a **hotel**

15% of drivers do not have a reumork moto license

9

1. Driver's profile



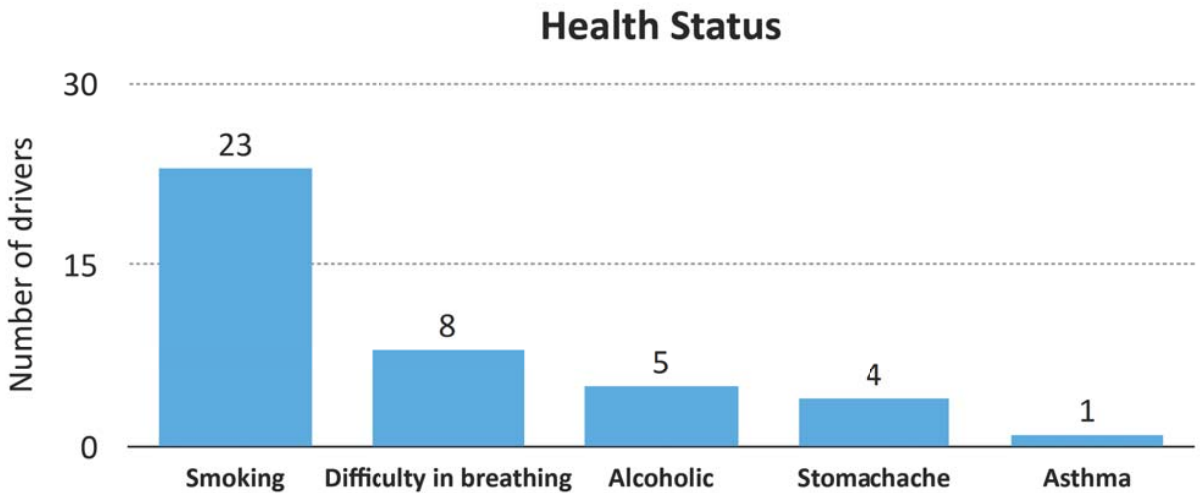


Key findings

16% of drivers is a leader of a driver group

10

1. Driver's profile



Key findings

Some drivers are in bad health.

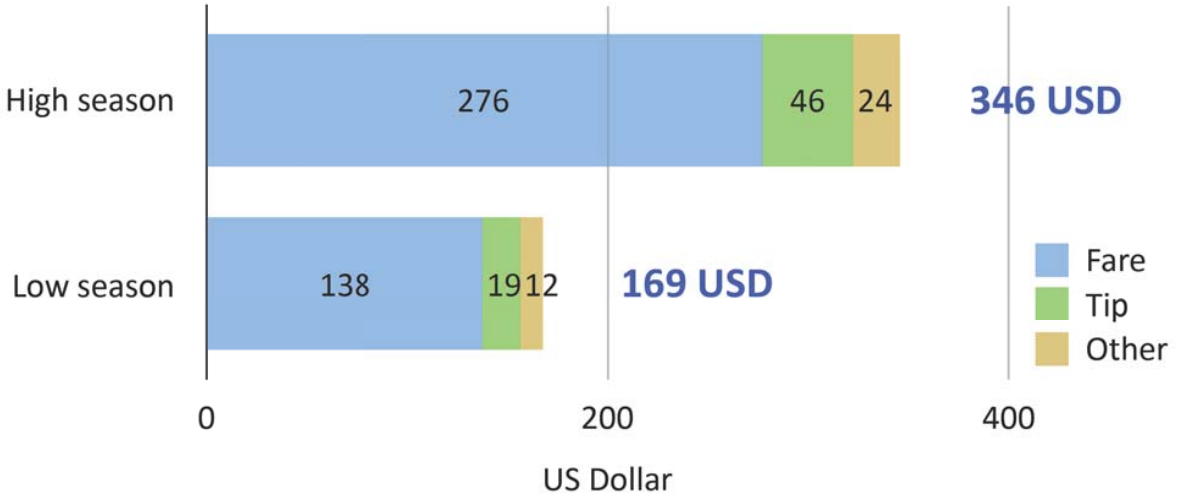
11

2. Income and cost

12

2. Income and cost

Average Monthly Income



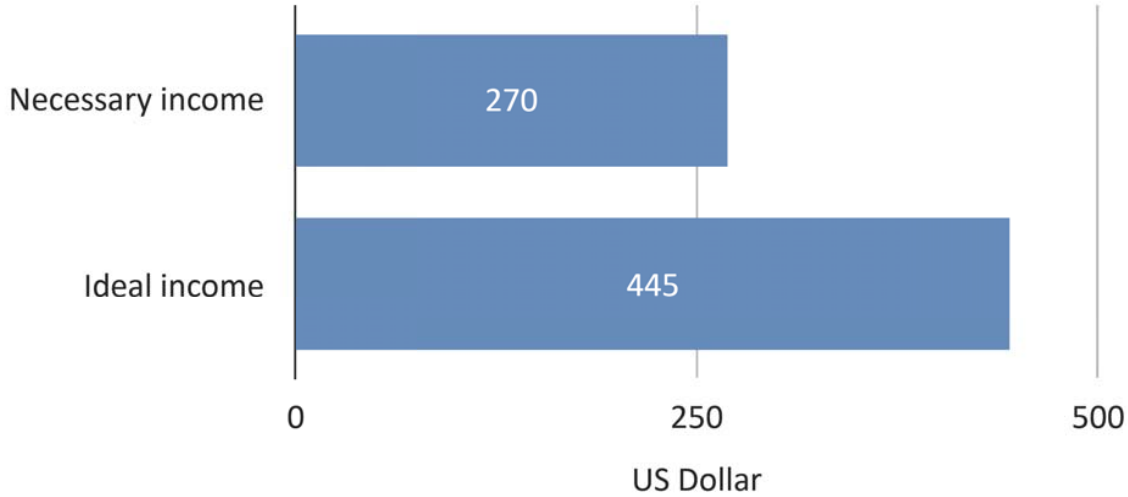
Key findings

Driver's income is unstable;
average monthly income in the low season is
177 USD lower than the high season

13

2. Income and cost

Necessary income and ideal income



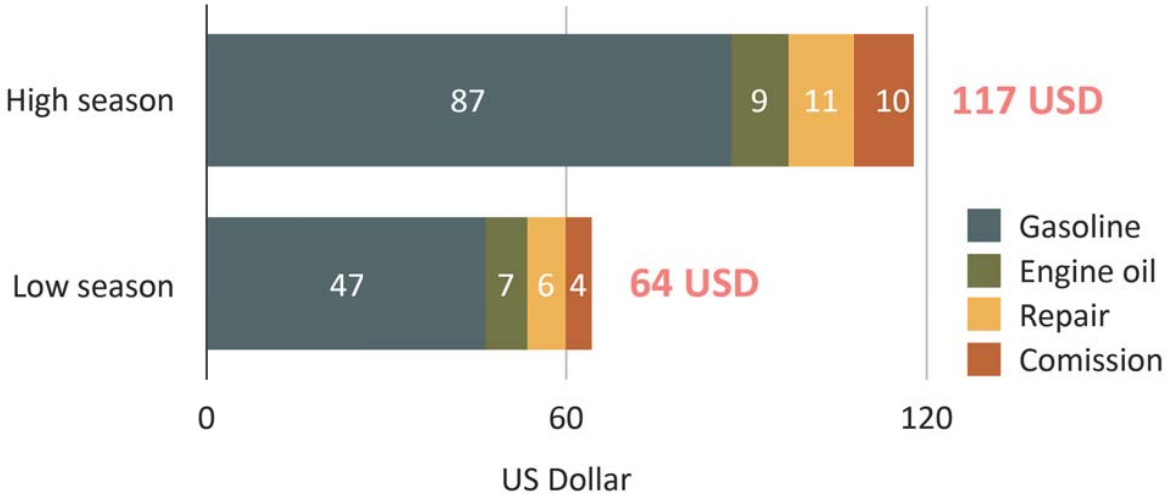
Key findings

Minimum necessary monthly income is **270 USD**.
Ideal monthly income is **445 USD**.

14

2. Income and cost

Average Monthly Cost



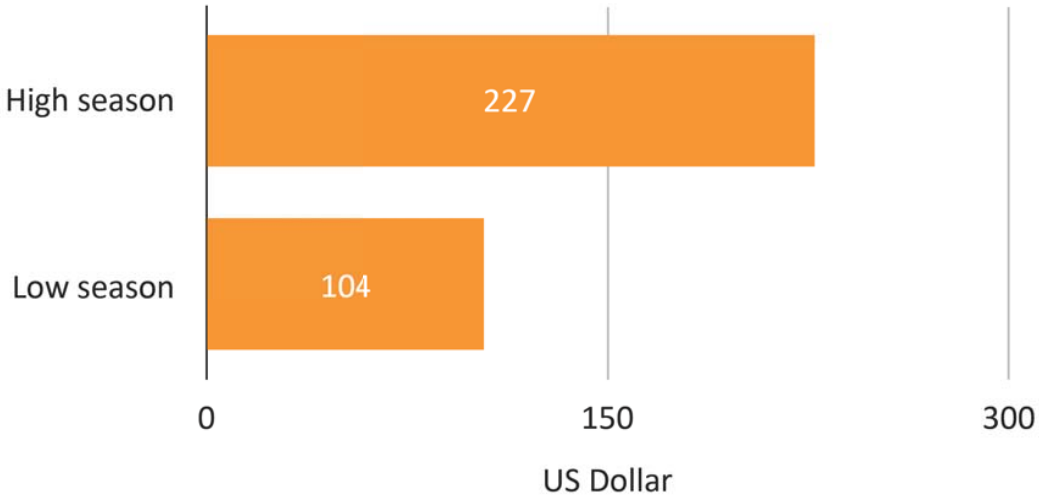
Key findings

Fuel cost reaches over **70%** of average monthly cost both in the high season and in the low season

15

2. Income and cost

Average Monthly Net Income



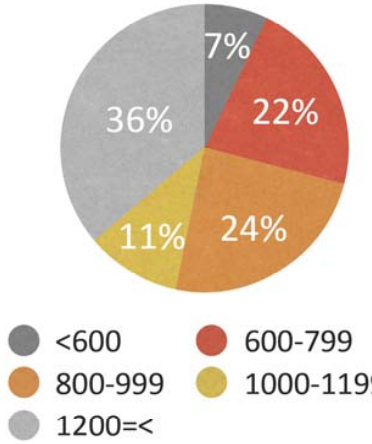
Key findings

Average monthly net income is;
227 USD in the high season
104 USD in the low season

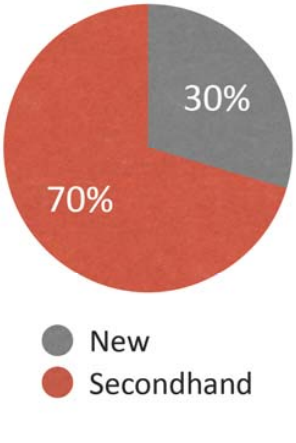
16

2. Income and cost

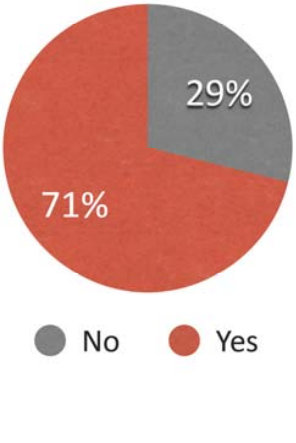
Motorcycle price



Motorcycle status



Loan arrangement



Key findings

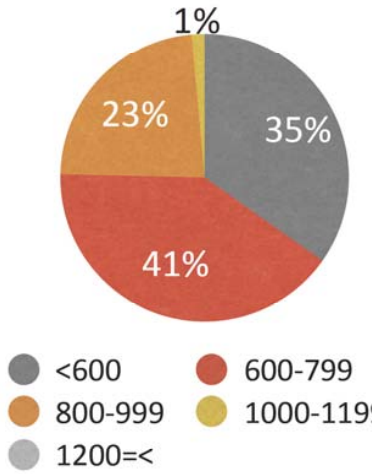
Average purchase price of a motorcycle is **1,024 USD**

70% of motorcycles are secondhand

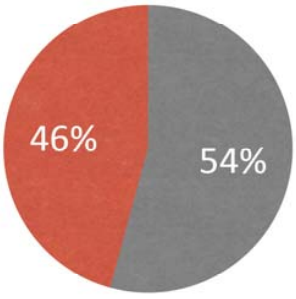
71% of drivers arranged a loan to purchase a motorcycle

2. Income and cost

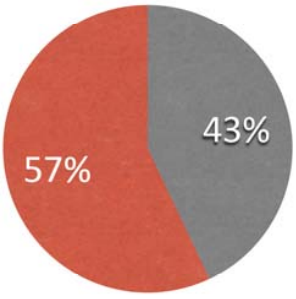
Reumork price



Reumork status



Loan arrangement



Key findings

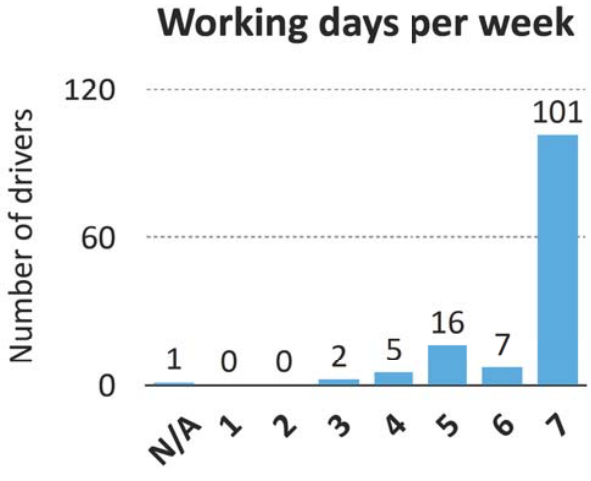
Average purchase price of a reumork is **649 USD**

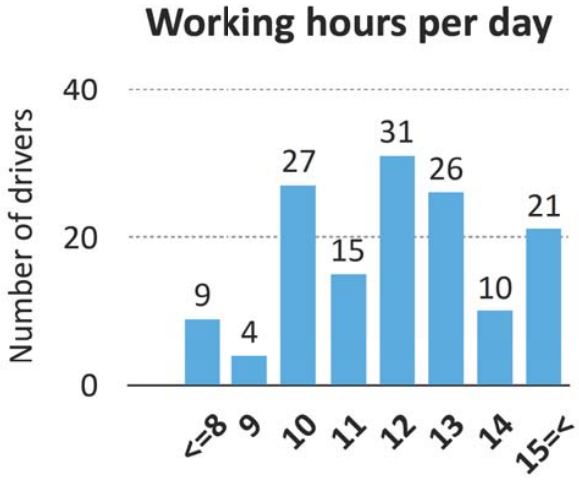
46% of reumorks are secondhand

57% of drivers arranged a loan to purchase a reumork

3. Reumork moto driving

3. Reumork moto driving





Key findings

Average working days per week is **6.5 days**

Average working hours per day is **12 hours**

How drivers spend their working hours?

Move with passengers

Wait for passengers

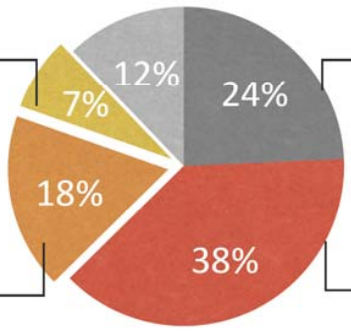
Stand by

Move and seek passengers

21

How drivers spend their working hours?



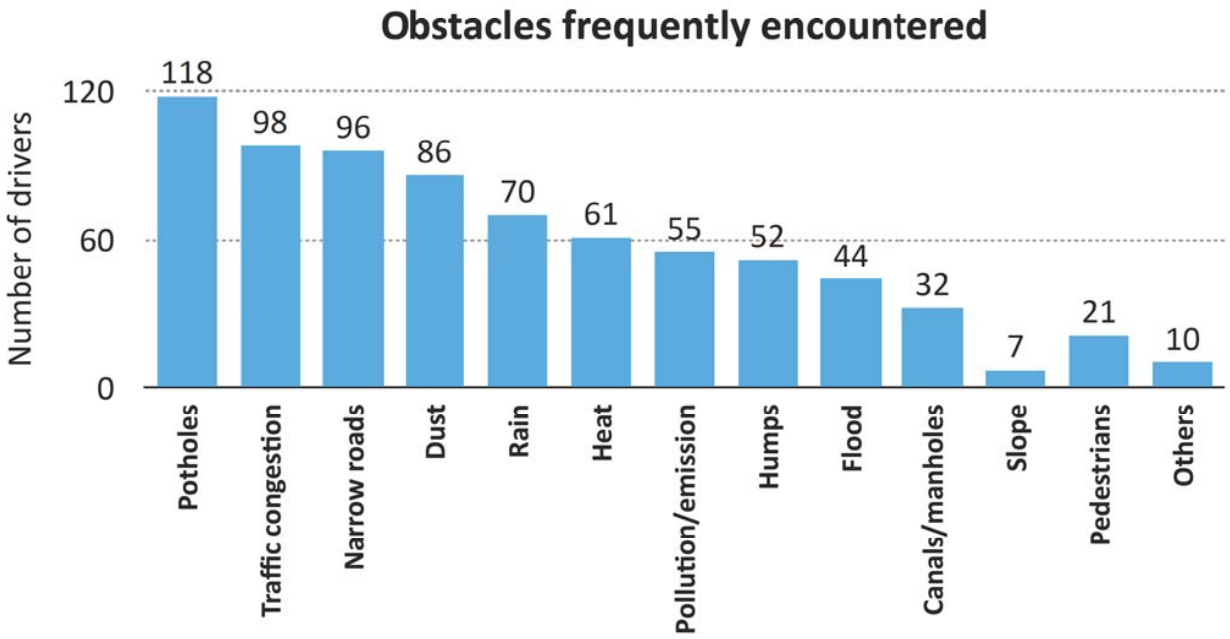
Move with passengers
Wait for passengers
Stand by
Move and seek passengers
Break

Key findings

25% of the working hours are spent for standing by, moving and seeking passengers (non billable)

22

3. Reumork moto driving

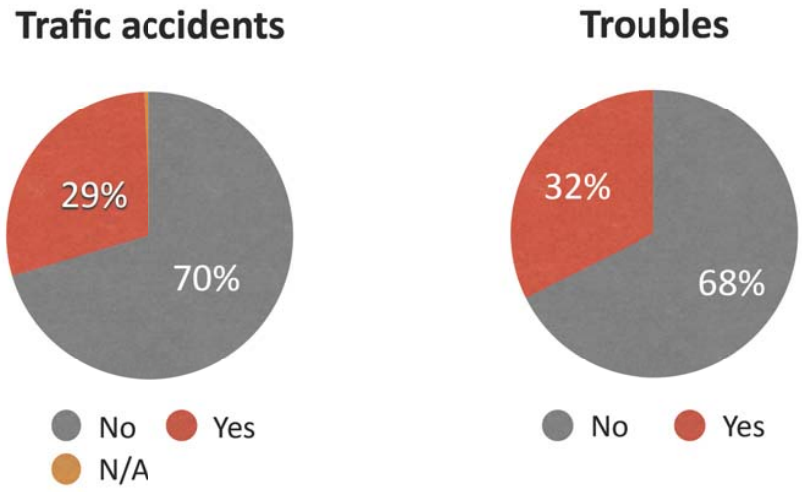


Key findings

Path holes, Congestion and Narrow roads are top 3 obstacles

23

3. Reumork moto driving



Key findings

29% of drivers have ever faced traffic accidents

32% of drivers have ever faced business-related troubles

24

4. Comparison among 3 different groups

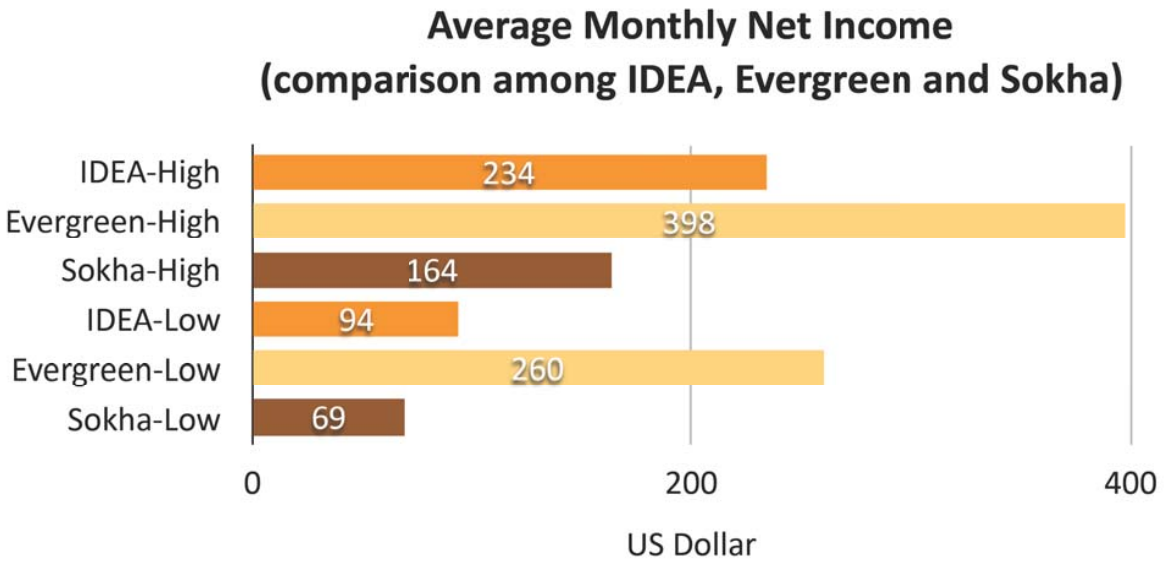
25

IDEA, Evergreen and Sokha: 3 different groups of drivers

IDEA	Evergreen Hotel	Sokha Angkor Resort
		
93 drivers	20 drivers	26 drivers
Belong to the Association	Managed by the Evergreen Hotel	Belong to the Sokha Angkor Resort
Operating in a individual manner	Operating as an employee under fleet management	Operating in a individual manner

26

Average monthly net income



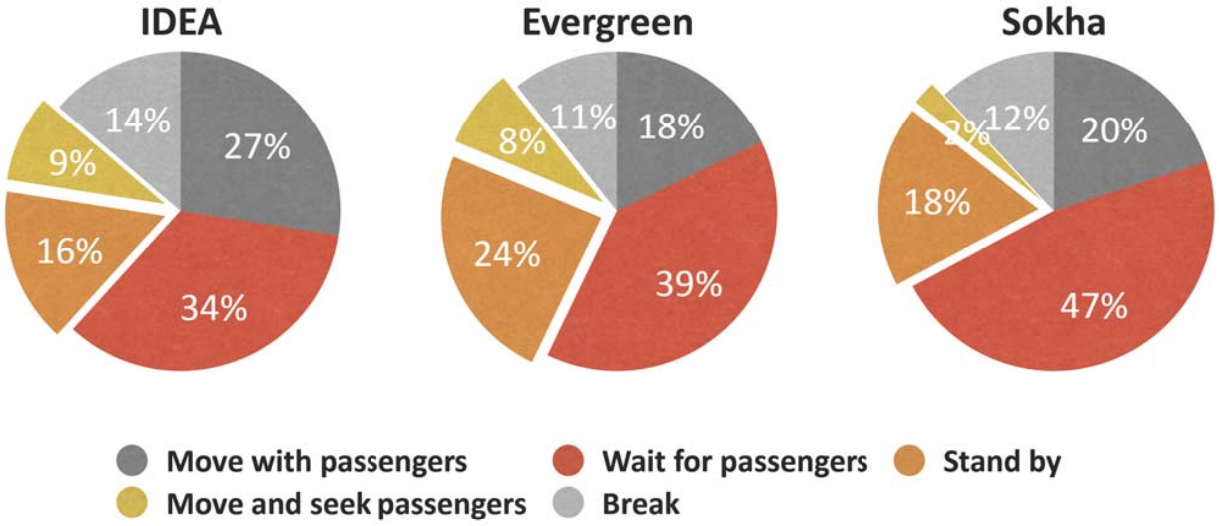
Key findings

Evergreen drivers get **higher net income** than IDEA drivers

* Evergreen: all cost covered by the Evergreen Hotel

27

How drivers spend their working hours?



Key findings

IDEA and Sokha drivers spend more billable time
(moving and waiting with passengers) than Evergreen drivers

28

Thank you!

Appendix 3

Vehicle monitoring survey sheet,

Results of vehicle monitoring survey

Survey date:

Vehicle Monitoring Survey Sheet

1. Vehicle profile

(1) Driver's name					
(2) Motorcycle manufacturer	☐Honda	☐ Yamaha	☐ Daelim	☐Other(	)
(3) Motorcycle model					
(4) Motorcycle model year					
(5) Engine type	☐2 Stroke	☐ 3 Strokes	☐ 4 Strokes	☐Other(	)
(6) Engine size	☐100cc	☐110cc	☐125cc	☐Other(	)
(7) Nominal Tank size (Liter)					
(8) Oddmeter	☐Broken	☐ Working			
(9) Average driving distance per working day (km)					
(10) Average amount of gasoline consumed per working day (Liter)					

2. Result of driving test

(1) Amount of gasoline put in the vehicle at the end of the survey					
(2) Driving route	☐Small circuit	☐Big circuit	☐Siem Reap City	☐Other(	)
(3) Average number of passengers	☐0	☐1	☐2	☐3	☐More than 4
(4) GPS logger ID					
(5) Driving distance (km) before the survey (reading an oddmeter)					
(6) Driving distance (km) after the survey (reading an oddmeter)					

*Following information is filled in by the Study Team

(7) Driving distance (km)	
(8) Vehicle fuel economy (km/Liter)	

Results of mobility monitoring survey in Siem Reap

Study Team on the EcoMobiliy project

Results of the survey

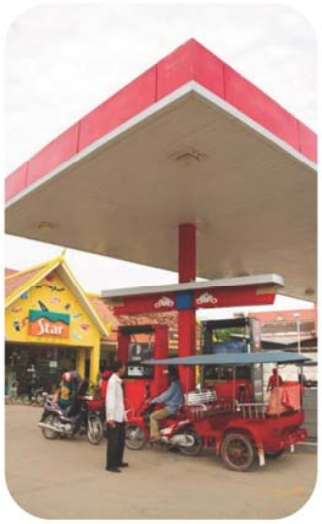
1. Results of gasoline reumork moto driving test
2. Results of Electric vehicle driving test
3. Comparison between EV and gasoline reumork moto

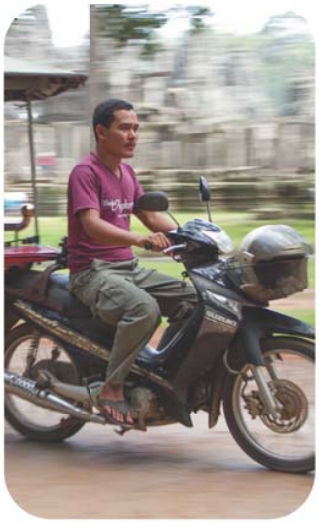
2. Results of gasoline reumork driving test

3

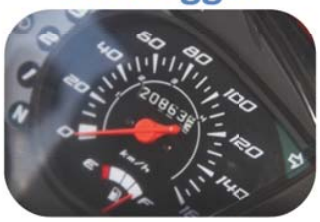
Survey methods

1st: Fill up the tank ▶ 2nd: Drive in a day ▶ 3rd: Record the driving distance ▶ 4th: Fill up the tank again





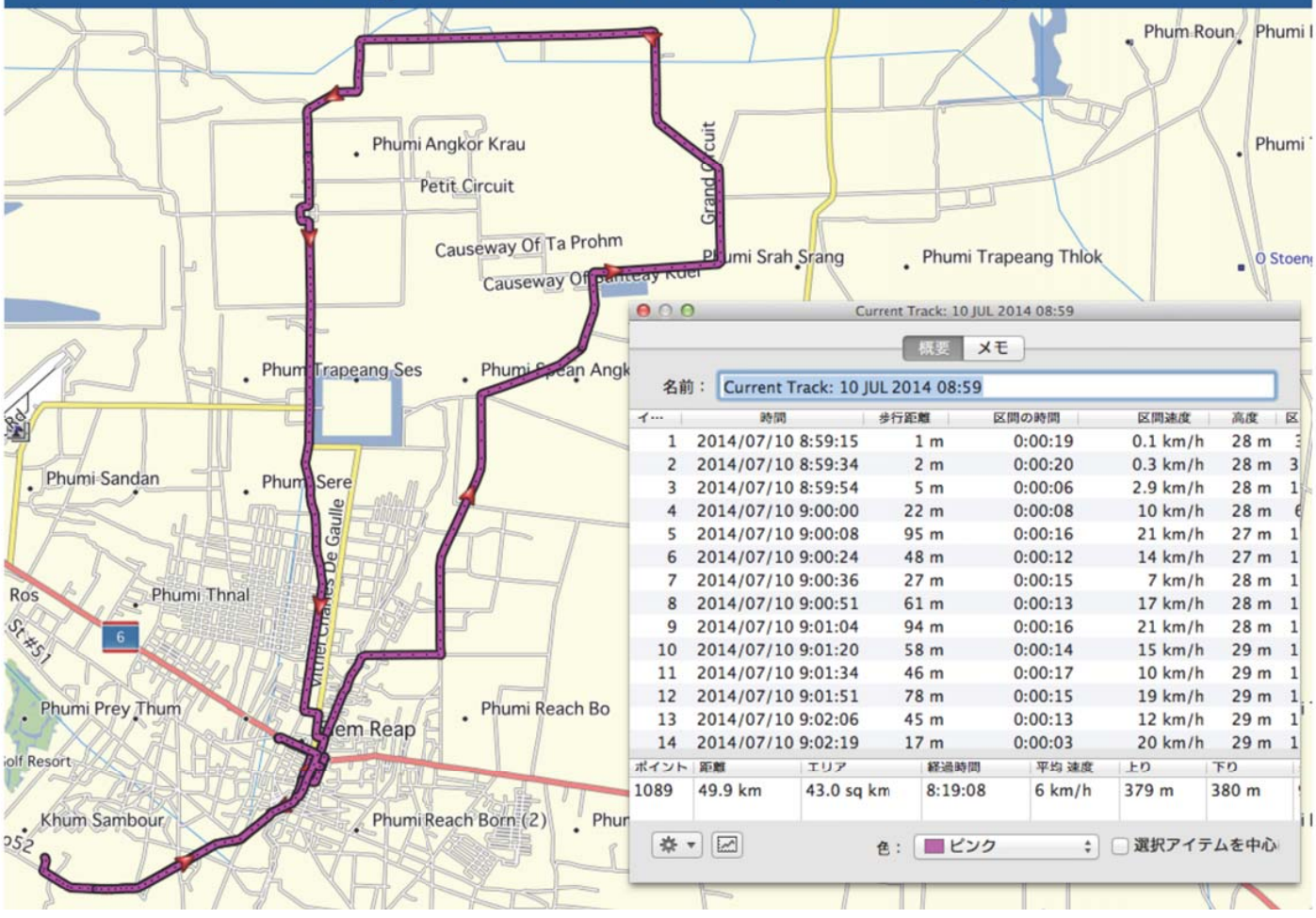
GPS loggar



Odometer

5

Driving routes recorded by a GPS logger

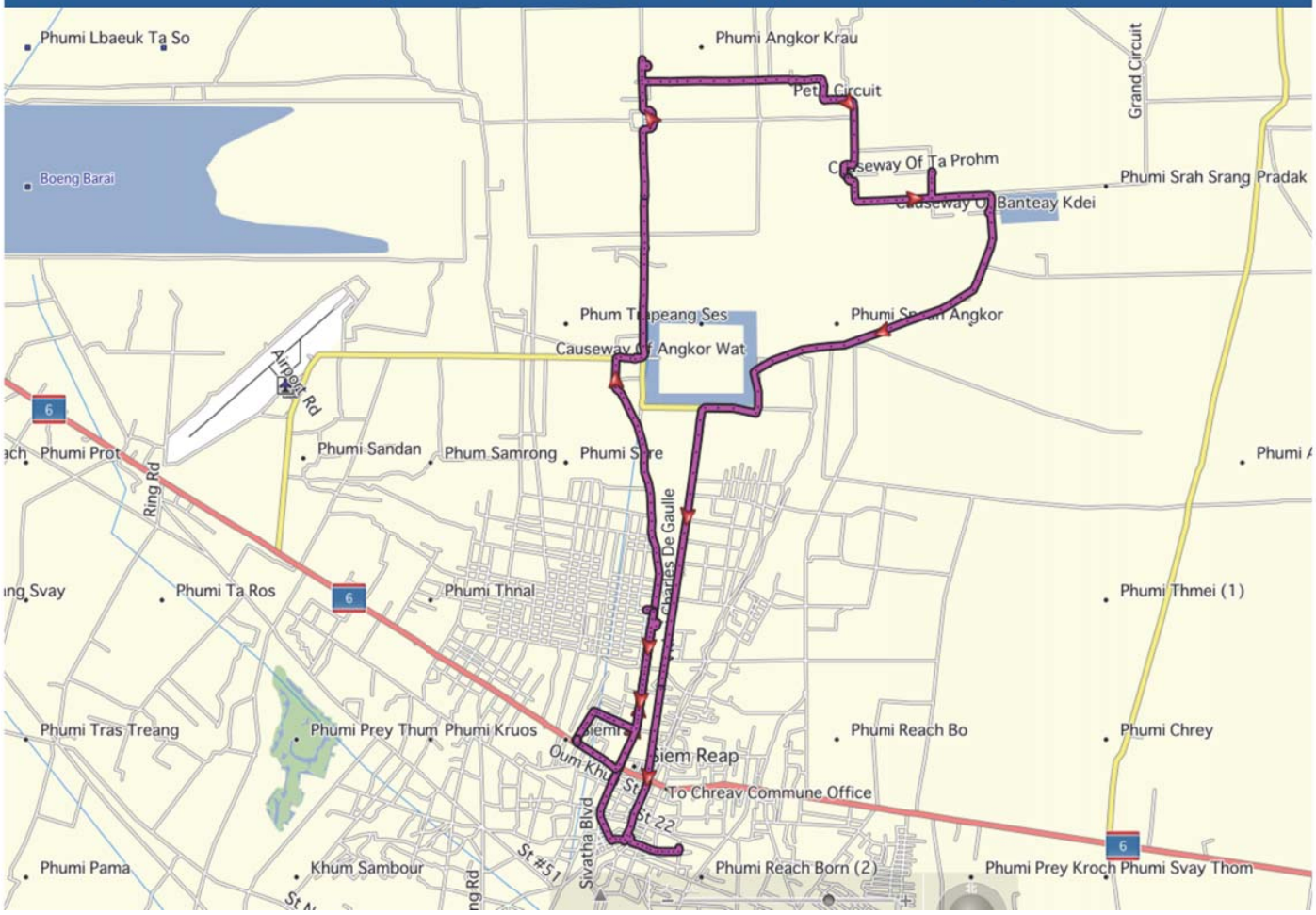


イ…	時間	歩行距離	区間の時間	区間速度	高度	区
1	2014/07/10 8:59:15	1 m	0:00:19	0.1 km/h	28 m	
2	2014/07/10 8:59:34	2 m	0:00:20	0.3 km/h	28 m	3
3	2014/07/10 8:59:54	5 m	0:00:06	2.9 km/h	28 m	1
4	2014/07/10 9:00:00	22 m	0:00:08	10 km/h	28 m	6
5	2014/07/10 9:00:08	95 m	0:00:16	21 km/h	27 m	1
6	2014/07/10 9:00:24	48 m	0:00:12	14 km/h	27 m	1
7	2014/07/10 9:00:36	27 m	0:00:15	7 km/h	28 m	1
8	2014/07/10 9:00:51	61 m	0:00:13	17 km/h	28 m	1
9	2014/07/10 9:01:04	94 m	0:00:16	21 km/h	28 m	1
10	2014/07/10 9:01:20	58 m	0:00:14	15 km/h	29 m	1
11	2014/07/10 9:01:34	46 m	0:00:17	10 km/h	29 m	1
12	2014/07/10 9:01:51	78 m	0:00:15	19 km/h	29 m	1
13	2014/07/10 9:02:06	45 m	0:00:13	12 km/h	29 m	1
14	2014/07/10 9:02:19	17 m	0:00:03	20 km/h	29 m	1

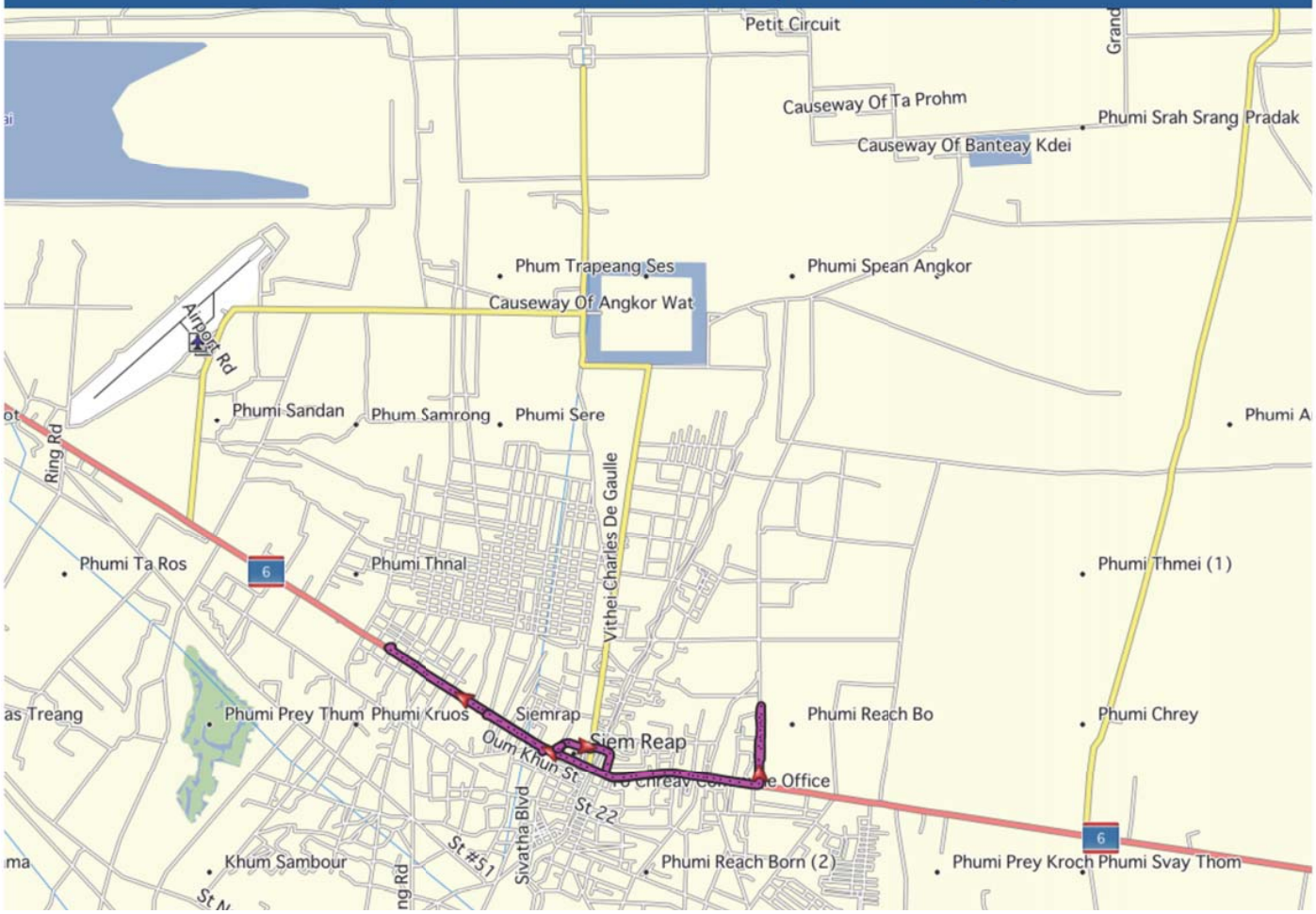
ポイント	距離	エリア	経過時間	平均速度	上り	下り
1089	49.9 km	43.0 sq km	8:19:08	6 km/h	379 m	380 m

色： ピンク　選択アイテムを中心

Driving routes recorded by a GPS logger

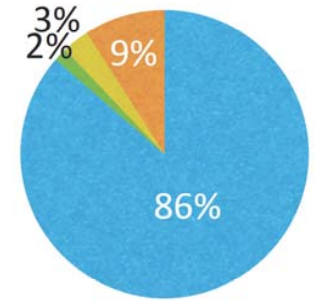


Driving routes recorded by a GPS logger

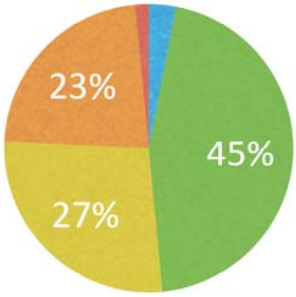


Results of gasoline reumork moto driving test

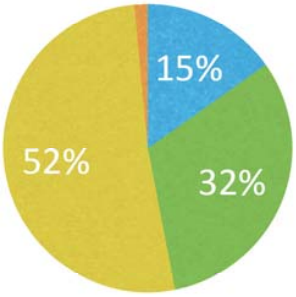
Manufacturer



Model year



Engine size

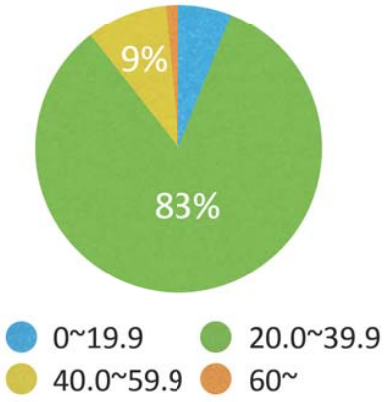


Key findings

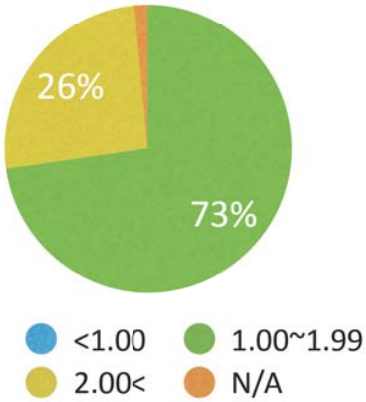
86% of motorcycles are made by HONDA
45% of motorcycles are 2000-2004 year's model
52% of motorcycles have a 125cc engine

Results of gasoline reumork moto driving test

Driving distance



Gasoline

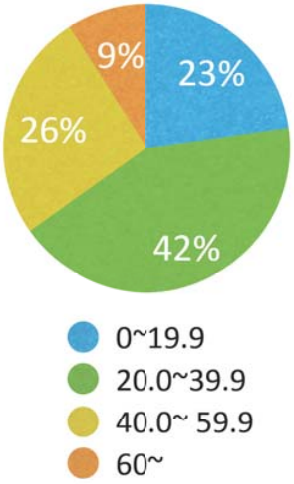


Key findings

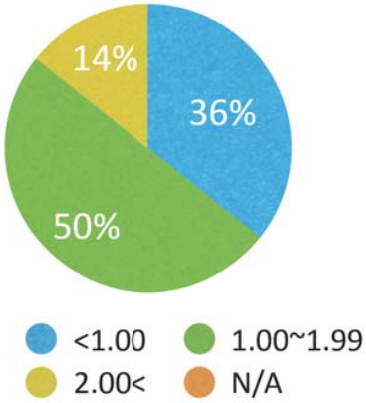
[Based on an interview]
Average driving distance per working day is **28.9 km**
Average amount of gasoline consumed per working day is **1.37 L**

Results of gasoline reumork moto driving test

Driving distance



Gasoline



Key findings

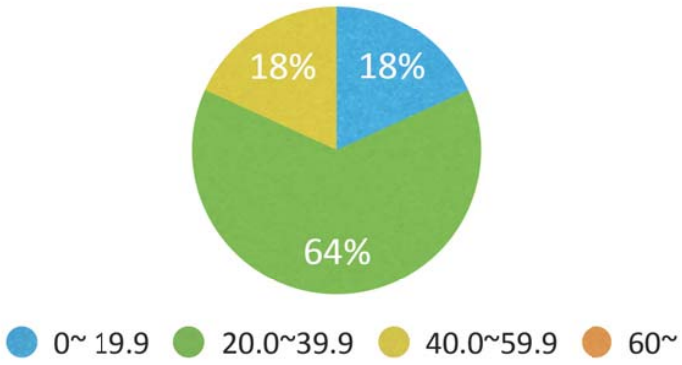
[Based on a driving test]

Average driving distance per working day is **35.5 km**

Average amount of gasoline consumed per working day is **1.26 L**

Results of gasoline reumork moto driving test

Fuel economy



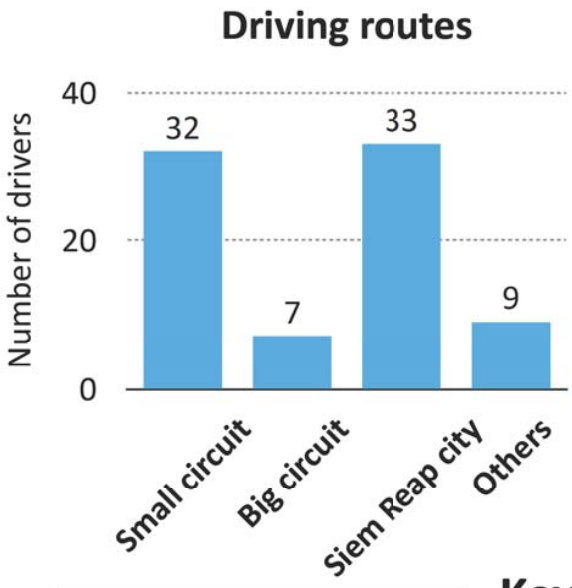
Key findings

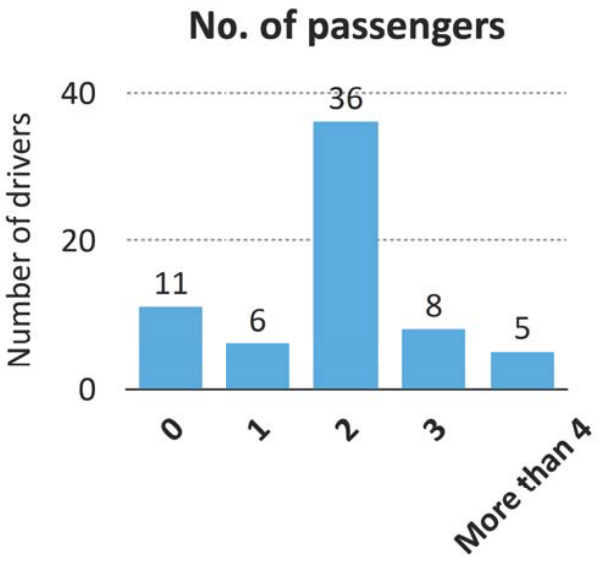
[Based on a driving test]

Average vehicle fuel economy is **29.5 km/L (22.7 km/USD)**

12

Results of gasoline reumork moto driving test





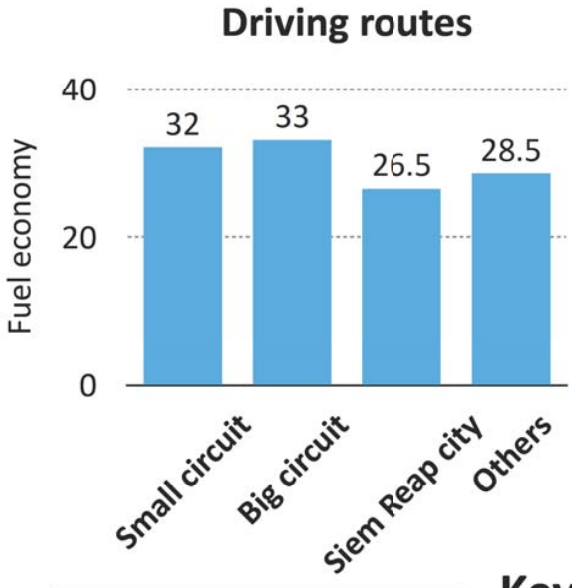
Key findings

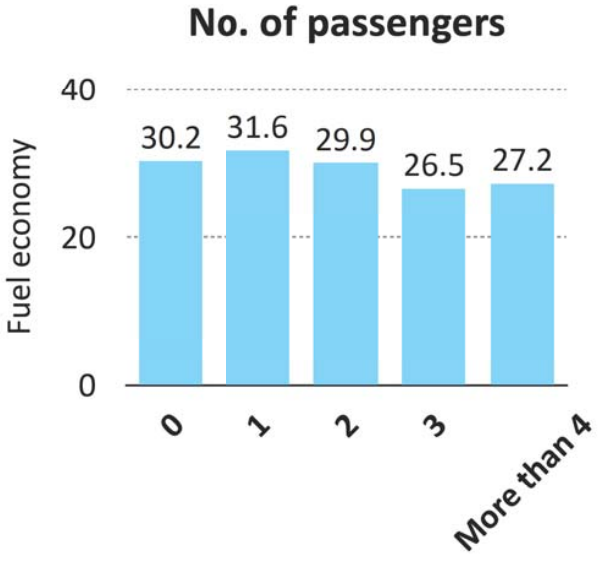
Small circuit and **Siem Reap city** are frequent destination

Average number of passengers per occasion is **1.85**

13

Results of gasoline reumork moto driving test





Key findings

Vehicles drove in **Siem Reap City** have low fuel economy

No. of passenger did not affect fuel economy much

14

2. Results of electric vehicle driving test

15

Survey methods

1st: Fully charge battery ▶ 2nd: Drive in a day ▶ 3rd: Record the driving distance ▶ 4th: Charge again & record

GPS loggar

Odometer

Targeted vehicles

	Photo	
ecomo（Design） eclimo（Manufacture）	Manufacture	Terra Motors
ES11	Model name	R6
Malaysia	Factory	India
60 km/h	Max. speed	30 km/h
60 km	Driving distance per charge	100 km

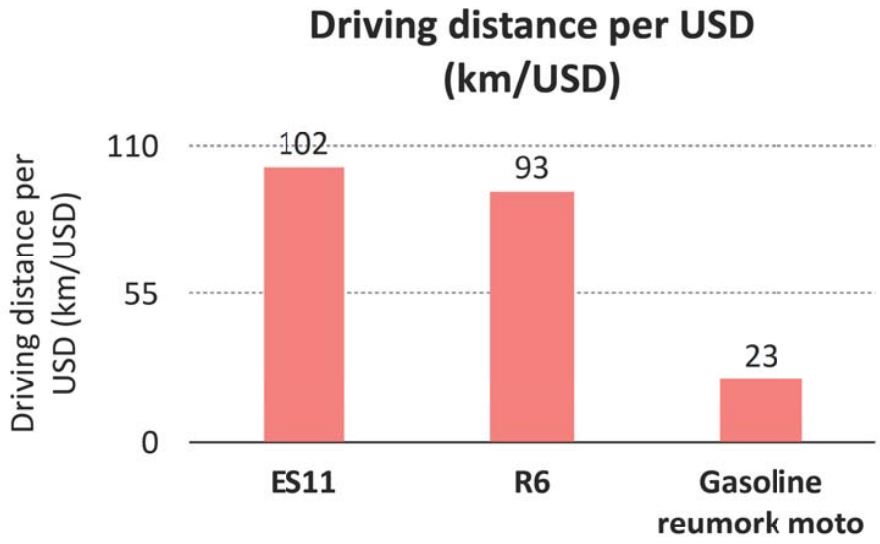
17

Results of EV driving test

Results of EV driving test

3. Comparison between EV and gasoline-based reumork moto

Comparison: EV and gasoline-based reumork moto



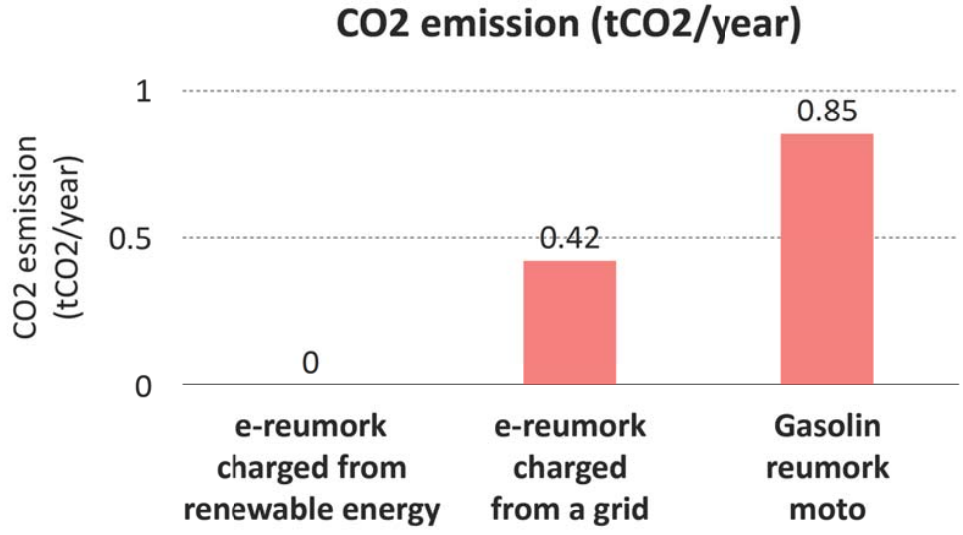
Key findings

Electric vehicles are **more cost effective** than a gasoline-based vehicle

Source:
- Electricity price in Siem Reap: 0.20 USD/kWh (EDC)
- Gasoline price in Siem Reap: 1.3 USD/l (IDEA)

21

Comparison: e-reumork and gasoline-based reumork moto



Key findings

e-cocoon will reduce **0.85 tons** of CO2 emissions when charged from renewable energy

22

Thank you!

Appendix 4

Outline of EcoMobility project

Bayon
in Angkor World Heritage Park of Cambodia

ECO MOBILITY

REDUCE IMPACTS ON ANGKOR WHILE PRODUCING A POSITIVE VISITOR EXPERIENCE

Pure Electric Reumork

The e-Reumork (Electric Tuk-Tuk) was first introduced into Siem Reap and Angkor Park in 2014. It uses one electric in-wheel motor for propulsion and has no gasoline engine.

The driving distance of e-Reumork is over 60km on a fully charged lithium-ion battery. The driving cost of the e-Reumork is approximately 1/5 that of a gasoline based Reumork.

The e-Reumork will introduce a new value to Angkor Tourism improving passenger comfort and increasing accessibility inside Angkor Park and Siem Reap City.

Partnership for Survey

JDI Japan Development Institute

OECC

APSARA

IDEA

CCDA Cambodia for Confederation Development Association

Asian Town Mobility Council

TERRA MOTORS

ecomo

eclimo™

Contact
kimura@jditokyo.com
nakao@oecc.or.jp

A modern approach

To keep a suitable number of Reumorks operating in Angkor Park, the fleet operation control shall be set up as the public transport service to reduce air pollution, traffic congestion, and provide a more convenient mobility environment to international tourists.

The fleet operation service using e-Reumork will be developed and operated by a Japanese JCM Team using advanced IT related technologies. Furthermore, an NGO controlled by the Royal Government of Cambodia will be organized to provide this fleet operation service in Siem Reap for the foreseeable future.

Five times more for driving cost saving

Current operation

The Reumork (Tuk-Tuk) is a very unique and popular Para-Transit vehicle in the world - having a motorcycle to pull a Khmer designed cabin. All travelers want to ride on this Reumork to enjoy the Angkor experience in the rarified air of Angkor Park.

Many Reumorks (Tuk-Tuks) run day and night by freelance drivers in Angkor Park and Siem Reap City today. The Reumork is the main public transport service in the country for tourists and visitor arrivals, so that the number of Reumorks consists of over 5,000 units in this region alone.

IDEA (Independent Democracy of Informal Economy Association) supports about 1,000 Reumork drivers with advocacy service, safety driving training, and hospitality improvement activities in Siem Reap Province. CCDA (Cambodia for Confederation Development Association) also organizes many Reumork drivers.

Key points

Target-generated objectives for “Eco Mobility” as following key points are examining and making solutions by Japanese JCM (Joint Crediting Mechanism) Team in 2014;

- **Reduce negative impacts on Angkor Heritage Park.**
- **Improve the Angkor tourism experience with better mobility and less congestion.**
- **Social contributions for current Reumork drivers are lower fuel costs and higher income.**

A carefully conducted and fruitful survey for “Eco Mobility” has been executed by a Japanese JCM Team in cooperation with IDEA, CCDA, APSARA Authority, and the Siem Reap Provincial Government in 2014.

Today the Angkor sites are facing serious continuing damage from transportation exhaust and acid rain. In the Angkor region, many tourist vehicles using diesel/gasoline as their fuel have been traveling the site area and polluting the environment.

Strictly Private and Confidential

New Angkor Mobility and Transport

AngkorMOBILITY

Japan Development Institute
September 2014

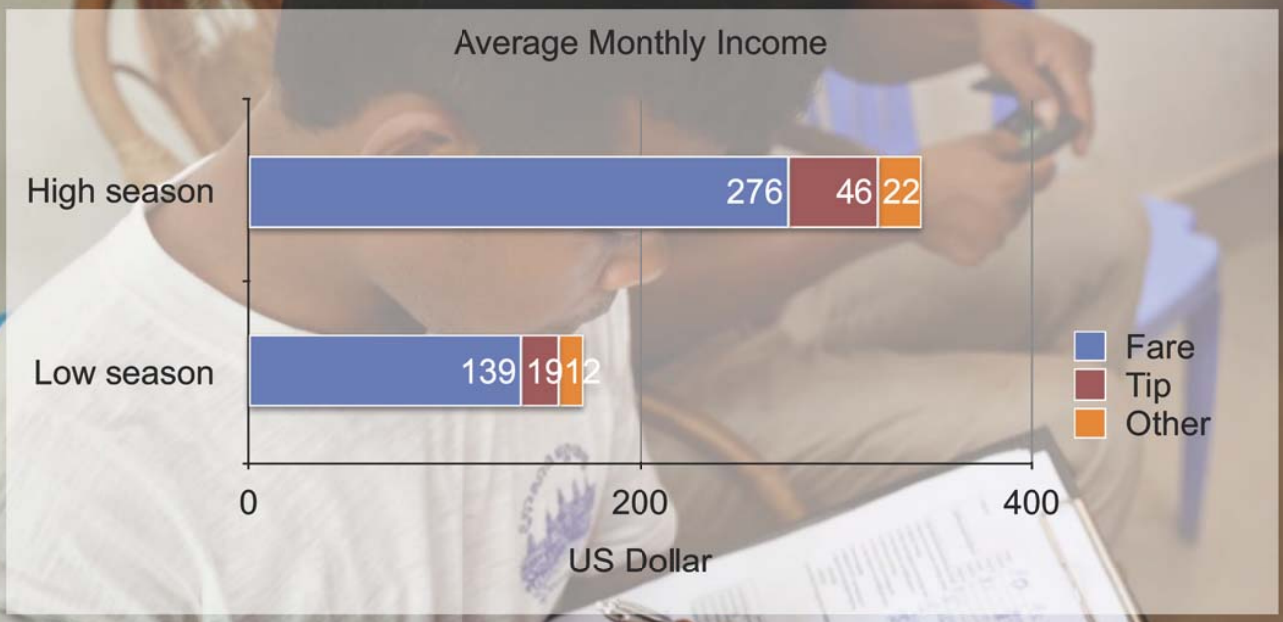
Our Vision for AngkorMOBILITY

Improving tourism mobility using zero emissions vehicles will reinvigorate local economies, increase the value of touristic destinations, and develop a sustainable "touris-centric" city.


Reumork Motos in Siem Reap Province
4,200± Licensed
7,000 units??
© 2014 Japan Development Institute
September 2014 | 3

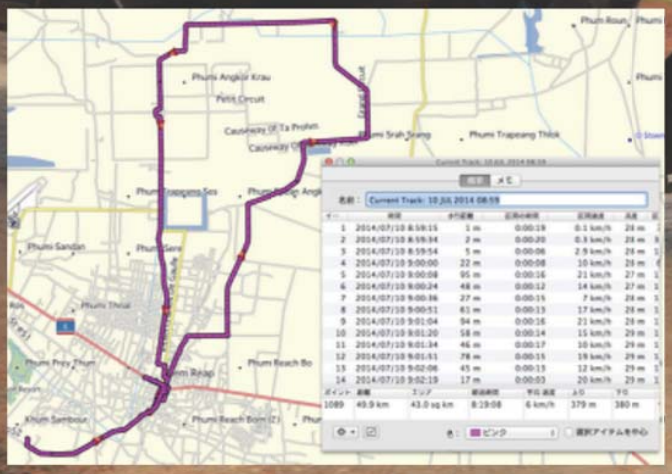

Whisky or Tea?
Pure Gasoline?
1.3$/Liter
…Gasoline price, no lower
© 2014 Japan Development Institute
September 2014 | 4

Reumork Moto Drivers' Interview Survey

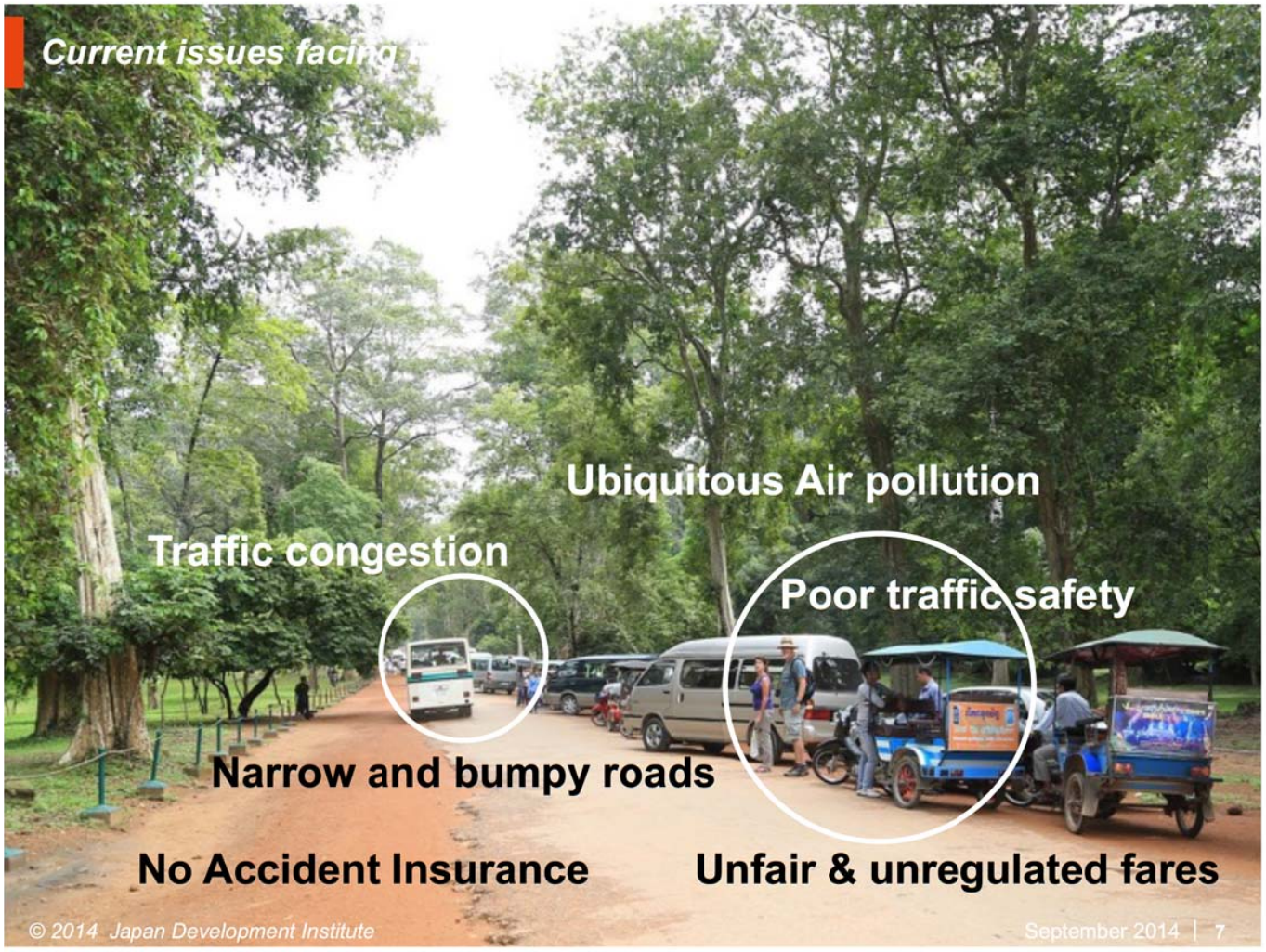


Driver's income is unstable; average monthly income in the low season is **173 USD lower** than the high season

Reumork Moto Monitoring Survey



- Average driving distance per working day is **35.8 km**
- Average amount of gasoline consumed per working day is **1.26 L**


Current issues facing
Ubiquitous Air pollution
Traffic congestion
Poor traffic safety
Narrow and bumpy roads
No Accident Insurance
Unfair & unregulated fares
© 2014 Japan Development Institute
September 2014 | 7


No parking control in Angkor Park
No public tourism transport mobility service
No traffic control
No strict regulations
Difficulty looking for one's driver
No parking line and numbers
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September 2014 | 8


Current issues facing travelers getting around town and temples
Angkor Tourists
Many journey choices for tourists.
However, transportation to and around the temples is usually hired by the day.
No transfer way
Forced to negotiate the details of the driver's services carefully
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Value proposition; Angkor Mobility and Tra
Do the favorite mix;
Enjoy the great Angkor experience…
Travel more easily and efficiently…
Save money…
…as well as the planet
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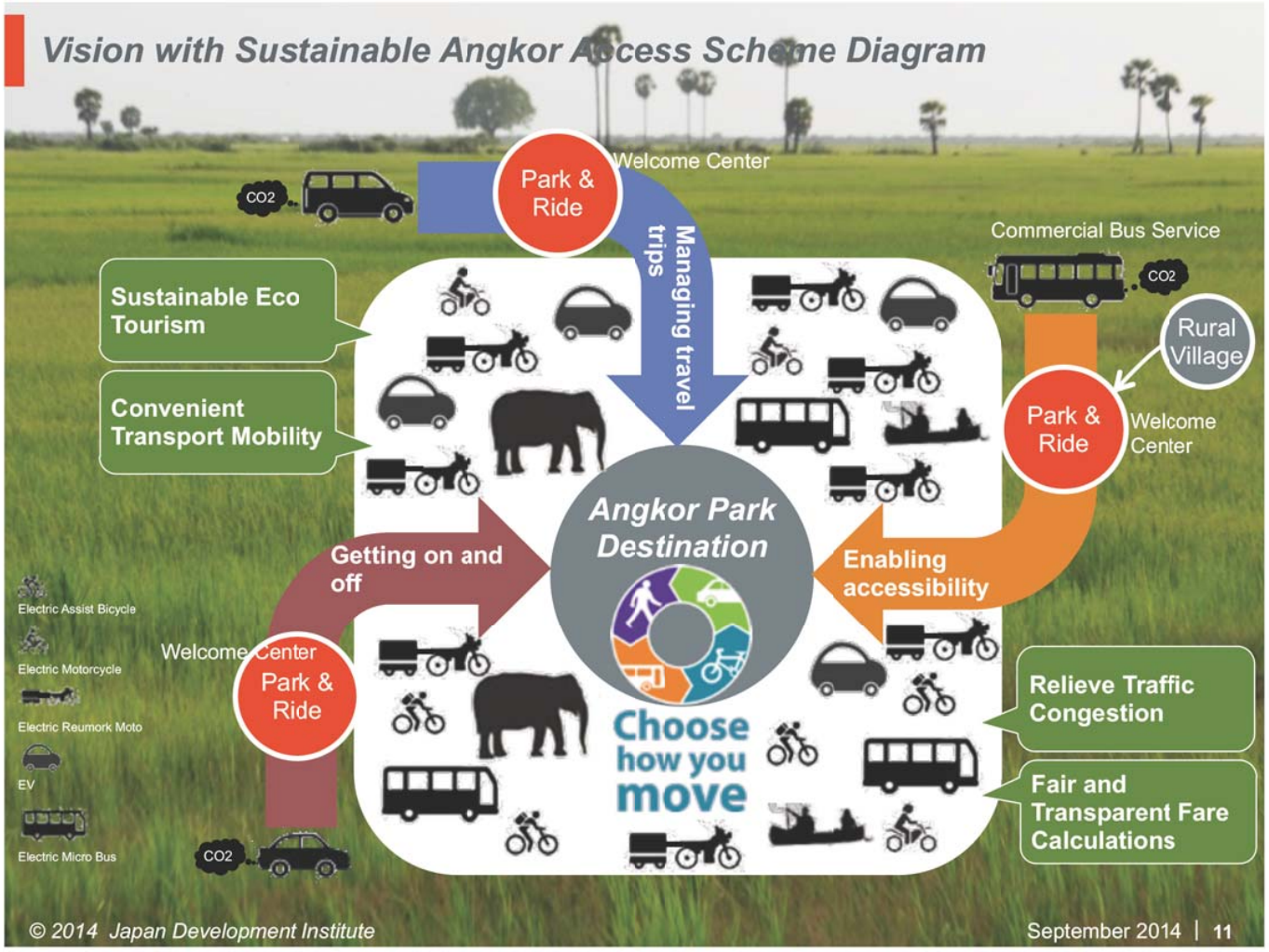
September 2014 | 10


Vision with Sustainable Angkor Access Scheme Diagram
CO2
Park & Ride
Welcome Center
Managing travel trips
Commercial Bus Service
CO2
Rural Village
Sustainable Eco Tourism
Convenient Transport Mobility
Park & Ride
Welcome Center
Angkor Park Destination
Getting on and off
Enabling accessibility
Electric Assist Bicycle
Electric Motorcycle
Electric Reumork Moto
EV
Electric Micro Bus
Welcome Center
Park & Ride
CO2
Choose how you move
Relieve Traffic Congestion
Fair and Transparent Fare Calculations
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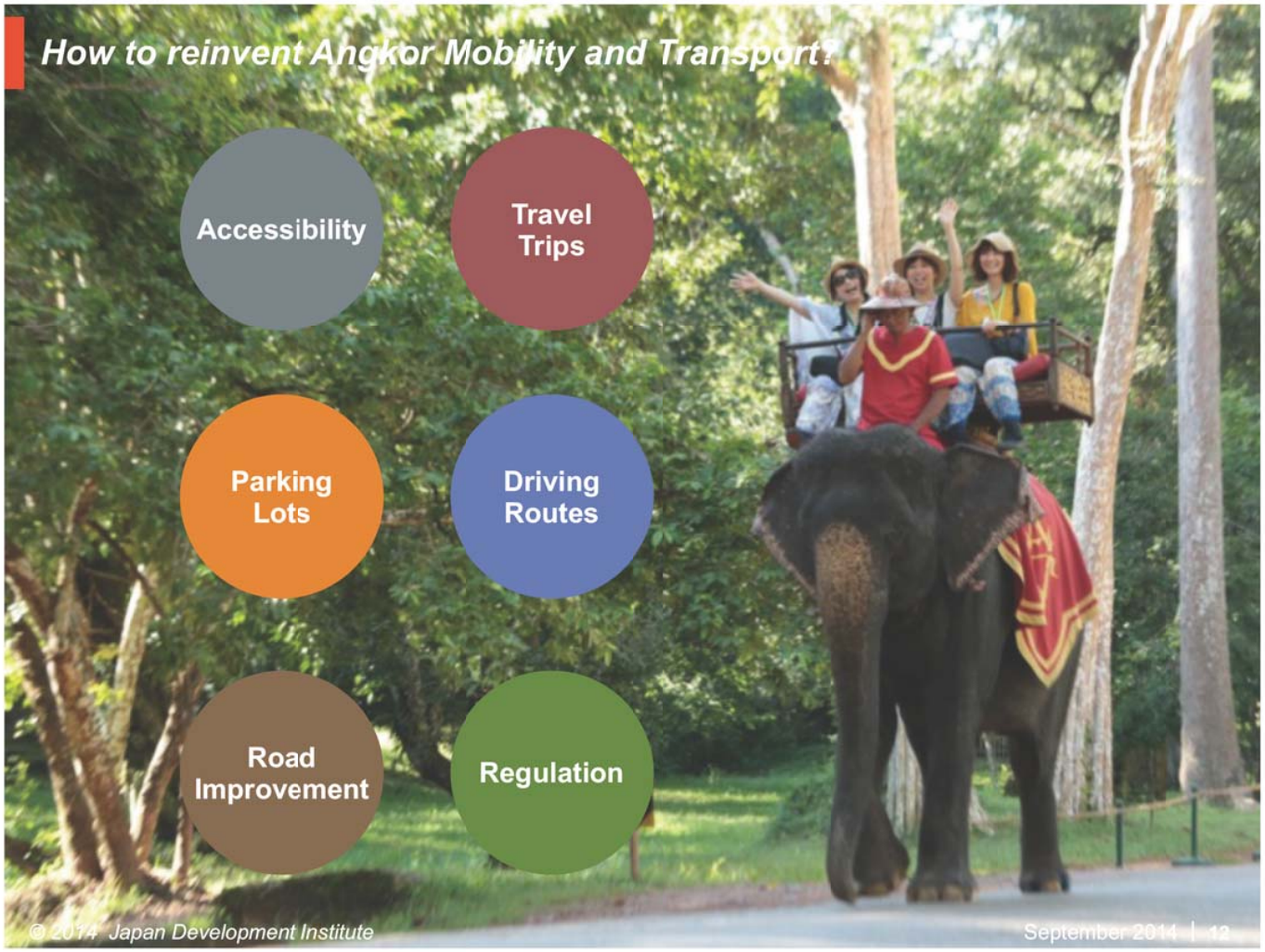
September 2014 | 11


How to reinvent Angkor Mobility and Transport?
Accessibility
Travel Trips
Parking Lots
Driving Routes
Road Improvement
Regulation
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September 2014 | 12

Business Model for AngkorMOBILITY

AngkorMOBILITY

TOD
Transit-Oriented Development

JCM
Joint Credit Mechanism

Easily accessible and safe transportation with zero emissions for international tourists

Park and ride terminal to transfer onto zero emission's vehicles to traverse the resort development, cool down, and feel peace and tranquility.

EcoMobility's Objectives

- Increase drivers' income
- Positive Visitor Experience
- Reduced Angkor Impacts

Specification of ES11 by Team Japan (ecomo) and Malaysia (Eclimo)

BATTERY	
Battery Chemistry	Lithium
Battery Nominal Voltage	<60V
Battery Weight	45Kg
Charging Time	3 hours
Life Cycle	1000 Cycle
Charge Input Voltage	110V / 220V

MOTOR	
Motor (Max. Power)	5000W 13' high torque maintenance free motor
Motor Type	Radial Hub
Torque	100Nm
Continuous Power	5kW
Transmission	100% direct drive

PERFORMANCE	
Maximum Speed	80Km/hr
Distance Range	100Km (50Km/hr)
Climbing Capacity	11°
Max Range Per Full Charge	100Kmh

BASIC INFO	
Weight	119Kg
Tyres	130/60-13"
Brakes	Hydraulic Disc Brake
Rim	Aluminium
Front/Rear Shock Absorber	Oil / Gas Pressure
Dimension (mm)	1905 x 720 x 1140
Wheelbase	1410mm
Ground Clearance	150mm
Payload	212Kg

http://www.eclimo.com.my/products/ES11.html

Five Times for driving cost saving

5.5 Times

Driving Costs Saving

Gasoline

22km
per one USD

Electric

120km
per one USD

Electric Vehicles at the temple of Angkor

7makara

Coming soon

Terra Motors

Star8

Advanced AngkorMOBILITY Solution for operation service

Dispatching Control

- call center integrated system
- manage vehicles
- manage returning customers
- manage call center employee
- manage dispatchers
- event history overview
- call center statistics
- statistics by shifts
- integrated map
- database support

Fleet Control

- support any digital map
- support for vector and raster layers
- display of position for vehicles
- display of status for vehicles
- display of customer position
- display vehicle movement history
- unlimited number of users
- individual communication

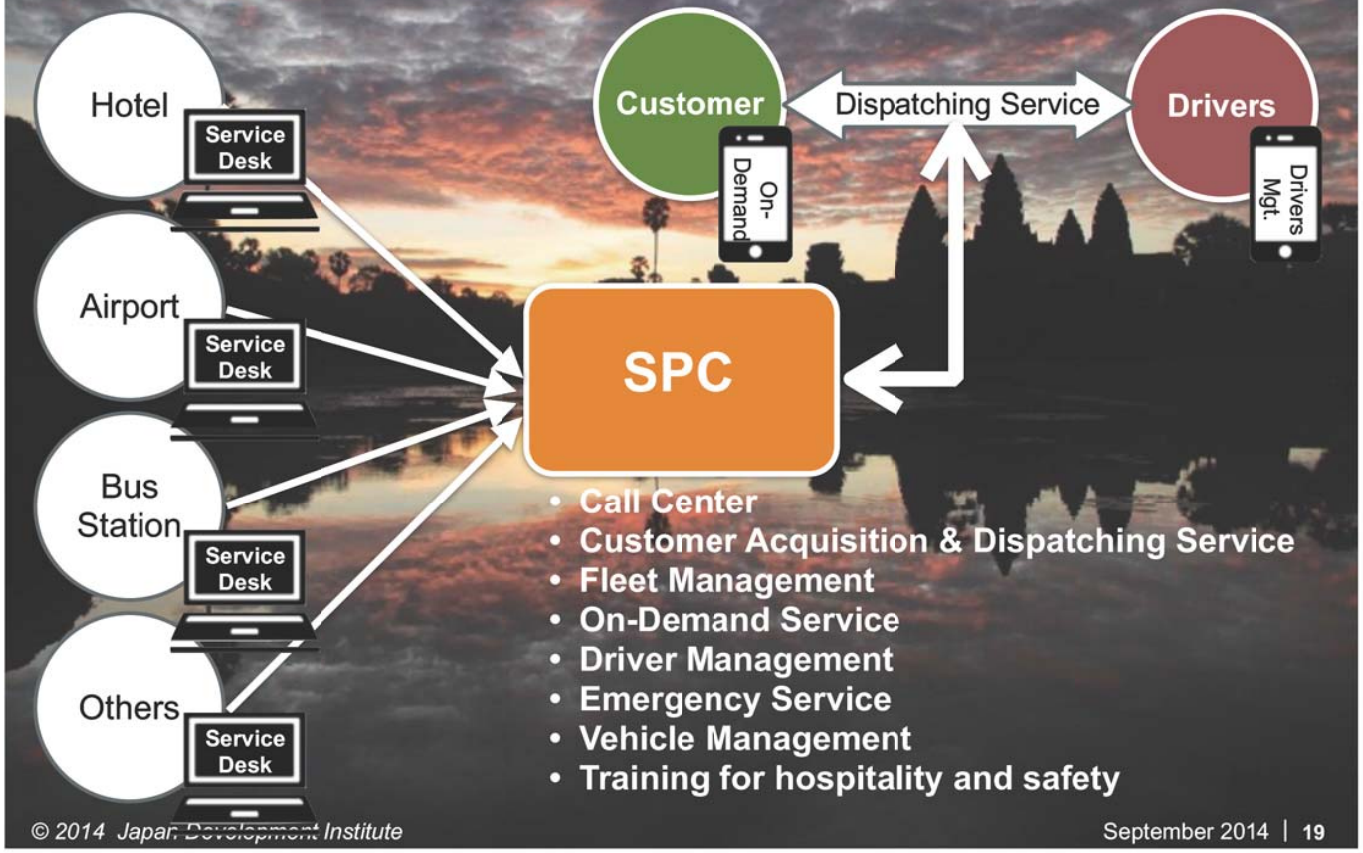
On-demand Service

- attractive and intuitive UI
- three steps to order a vehicle
- calculate the price in beforehand
- choose the vehicle type
- evaluate the provided service

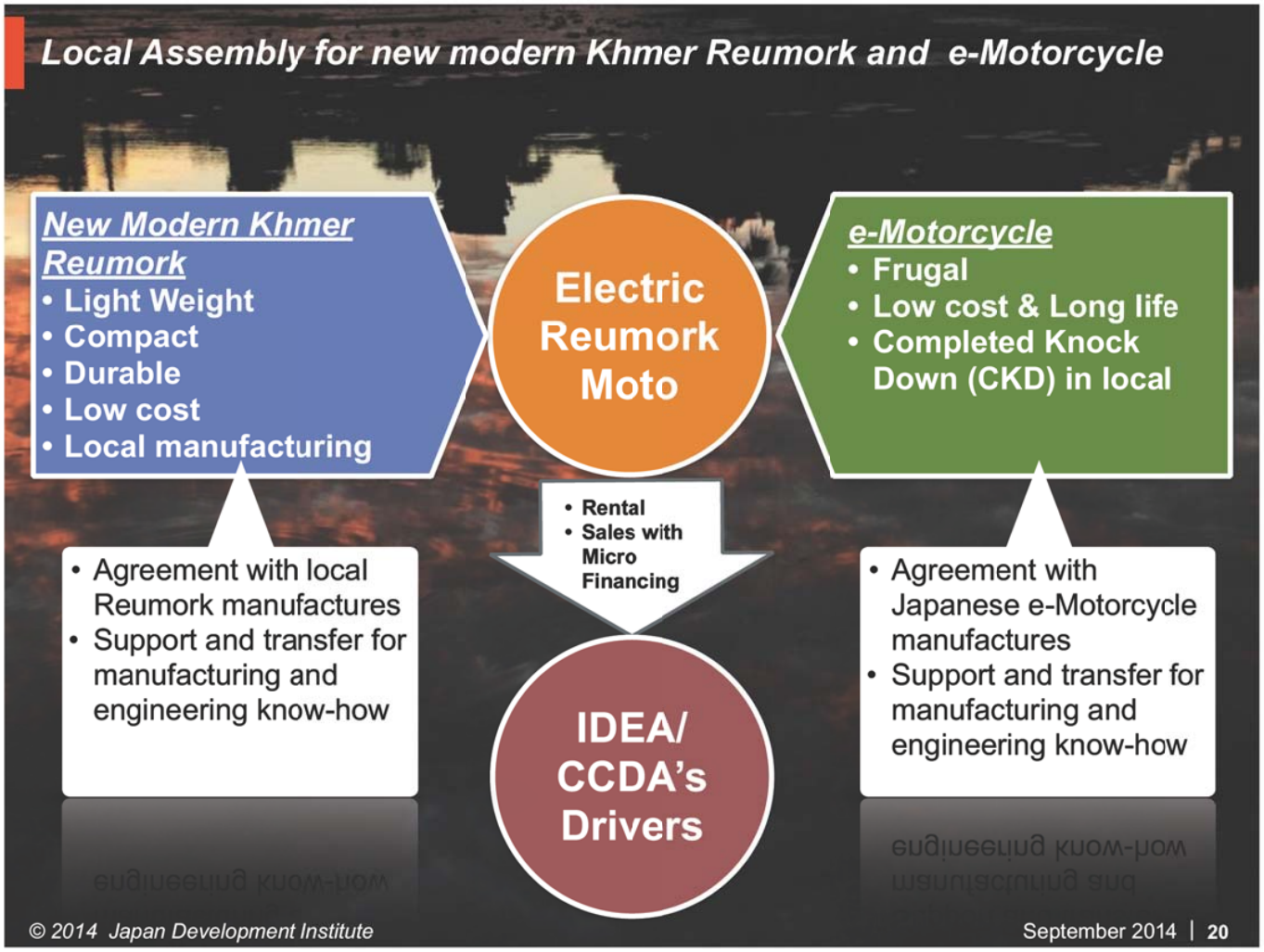
Driver Management

- rental affordable smartphone
- display of position for drivers
- driver login
- driver sign in and sigh out
- accepting customer pickup
- denying customer pickup
- navigation support
- messaging over IP
- day and night mode

AngkorMOBILITY Operation Service managed by SPC



Local Assembly for new modern Khmer Reumork and e-Motorcycle



Fleet Operation of Main Three Routes

In response to an APSARA Authority directive, and due to the narrow roads and vibration detection, the plan seeks to avoid large vehicle use such as e-Shuttle buses inside Angkor Thom.

1
- 18.5km
- 7 stations

2
- 25km
- 11 stations

3
- 38.6km
- 12 stations

AngkorSTATION (9 ha)

Park & Ride Terminal (2 ha)

- Large-sized Bus(>25): 10 unitis
- Middle-sized Bus(<24): 20 units
- Mini-VAN: 20 units
- Reumork Moto; 30 units
- Shuttle Buses between Hotel and here

Shops/Fine Foods/ IMAX Theater (4 ha)

- Japanese Shops(Cosmetics, General Store, Works of Pottery, etc.)
- Japanese, Khmer, Italian, French, Chinese, etc.
- IMAX Theater

Big Pond (3 ha) & Boats Rowing

- Big pond (3 ha) with lotus flowers and water purifying
- 10 boats to be rowed by customers

Shopping Street

Gallery and Shopping Avenue

Restaurants & Food Court

IMAX Theater using Virtual Reality

Using Digital Archiving and Virtual Reality Technology, Toppan created whole interactive 3D model of the Bayon of Angkor Park.

Park-and-Ride Facilities, and Mobility Center

AngkorMOBILITY Operation Centre

Managed by NGO

Park-and-Ride facilities are car parks with connections to authorized public transport that allow circle line transport service headed to Angkor Park and downtown of Siem Reap City to leave their vehicles and transfer to low emission vehicles.

We would like to hear from you and answer any questions that you might have.
kimura@jditokyo.com

JDI Japan Development Institute

Appendix 5

Outline of Mekong Heritage Park project

Strictly Private and Confidential

Public-Private Partnership for

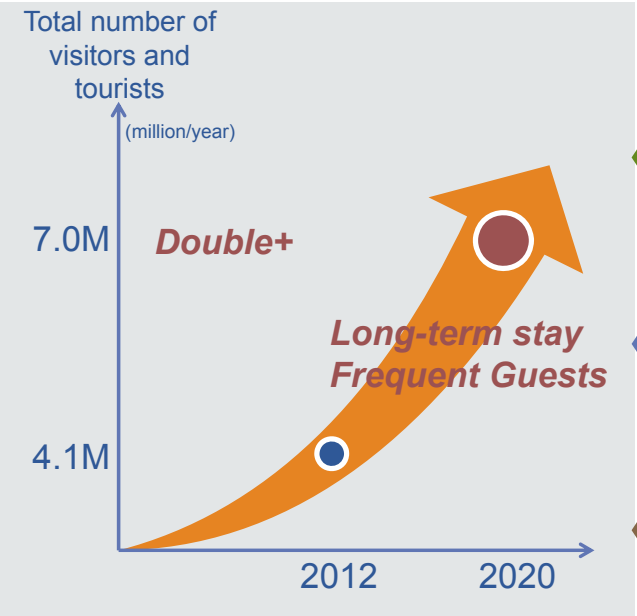
Angkor Gate City and Eco Mobility

Dr. Shoichi KOBAYSHI
Chairman and CEO of
Asian Gateway Corporation
and
Japan Development Institute Ltd.

June 5, 2014

Background to this project

The number of visitors to these sites is expected to double along with an increase of long term visitor-stays by 2020 as a direct result of the improvement of connecting roads, new modern tourist attractions, and the advent of a new international airport.

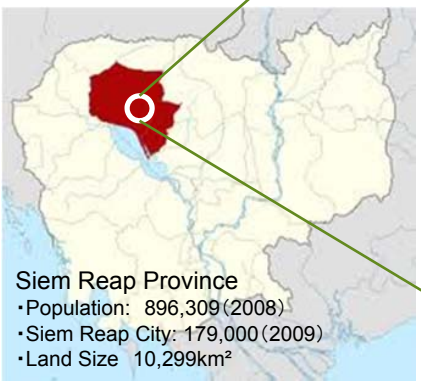


Urgent Countermeasures

- Hospitality and Urban Infrastructure to be improved
- Mobility Improvement for international visitors in Siem Reap and Angkor Park
- Air Pollution to be decreased to halt the damage to Angkor Park

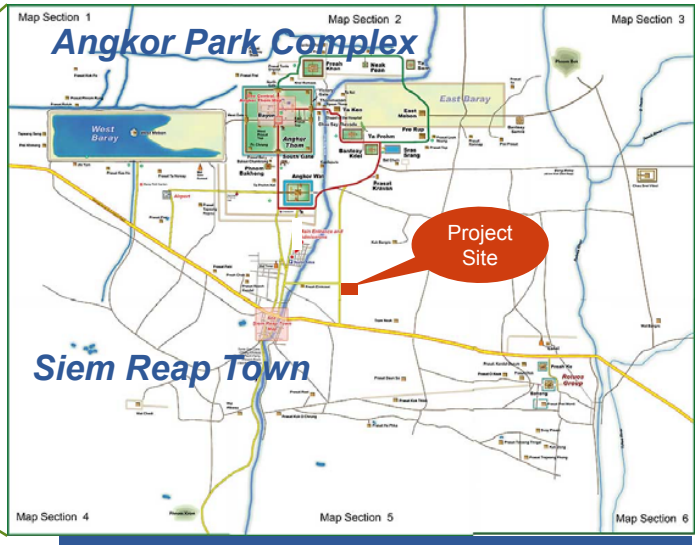
Project Site as a PPP

The Angkor Park, Siem Reap Province, Kingdom of Cambodia



Siem Reap Province
・Population: 896,309（2008）
・Siem Reap City: 179,000（2009）
・Land Size 10,299km²

The Tourism Industry accounts for 22.1% of GDP in the Cambodian economy. Most of the tourism income comes from the revenues of Angkor Park in Siem Reap Province.



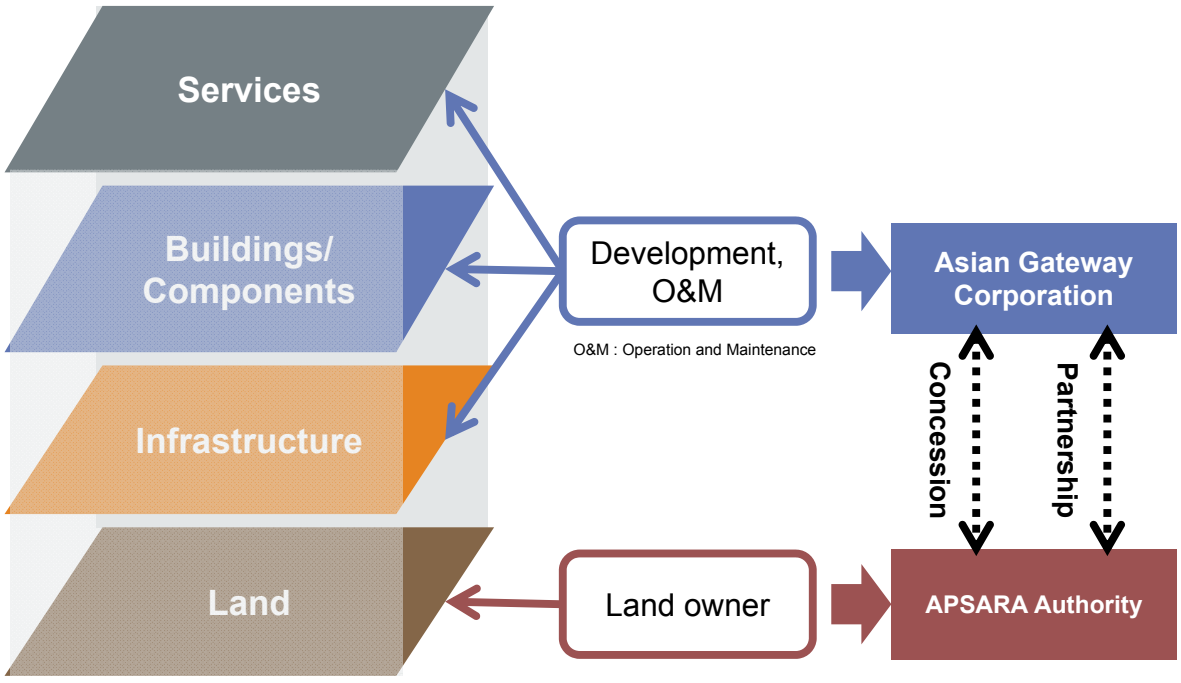
Public Private Partnership

A Memorandum of Understanding was signed between the APSARA Authority and the Japanese companies (JDI, MAEDA Corporation and JGC) in August 2012 at the ASEAN Economic Ministers' Meeting for promoting the proposed Smart Community Project in Angkor Park

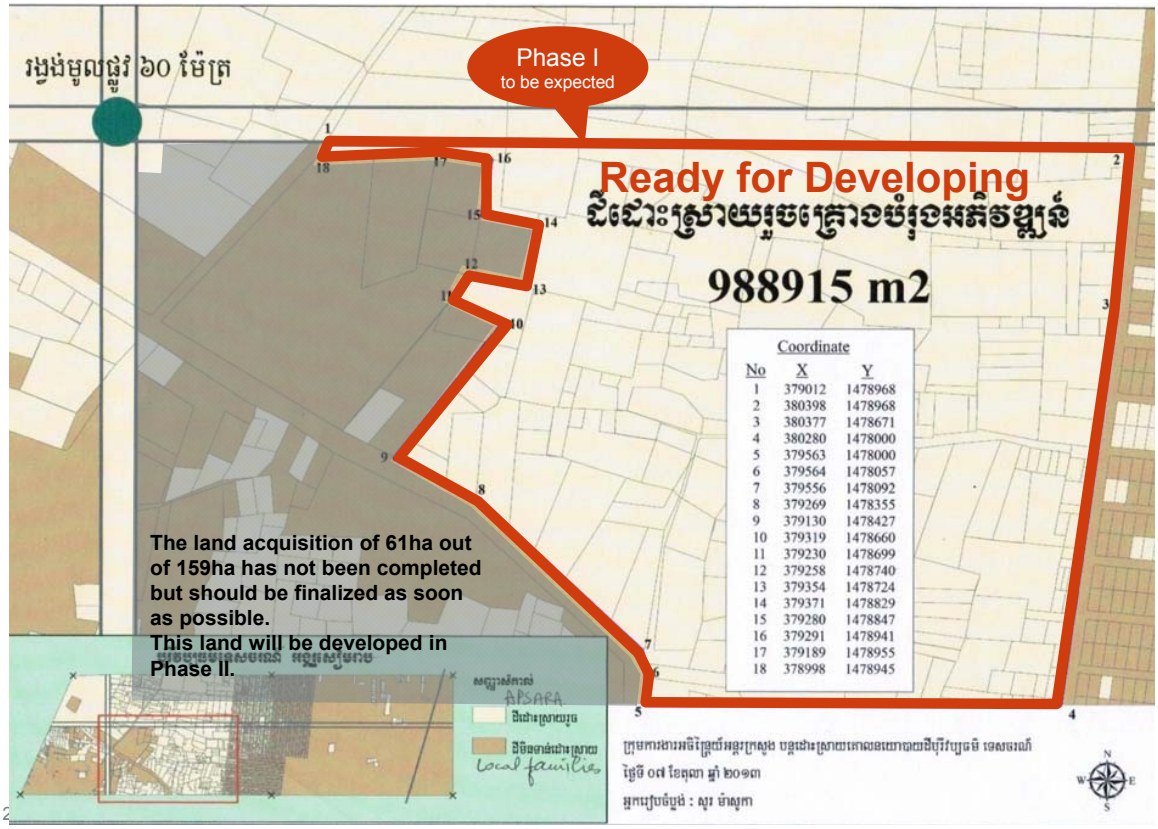
- To conduct the Feasibility Study in aiming to solve various environmental problems through introducing state-of-the-art technology;
- To examine the implementation of the Japanese cutting-edge yet eco-friendly technology including an EV transportation system and mega solar power delivery system;
- APSARA Authority shall support Japanese companies' activities for the Study.

A Proposed PPP Mechanism for Angkor Gate City Development

Based on a PPP Mechanism, a "win-win" relationship between APSARA Authority/RGC and Asian Gateway Corporation should be agreed and achieved.



GPS Map for Assembling Land of Phase I



5

Phase I Zoning Plan (illustrative)

The site lies directly opposite to the new APSARA Welcome Center and ticket offices for visitors to the Angkor park complex which is now under construction.

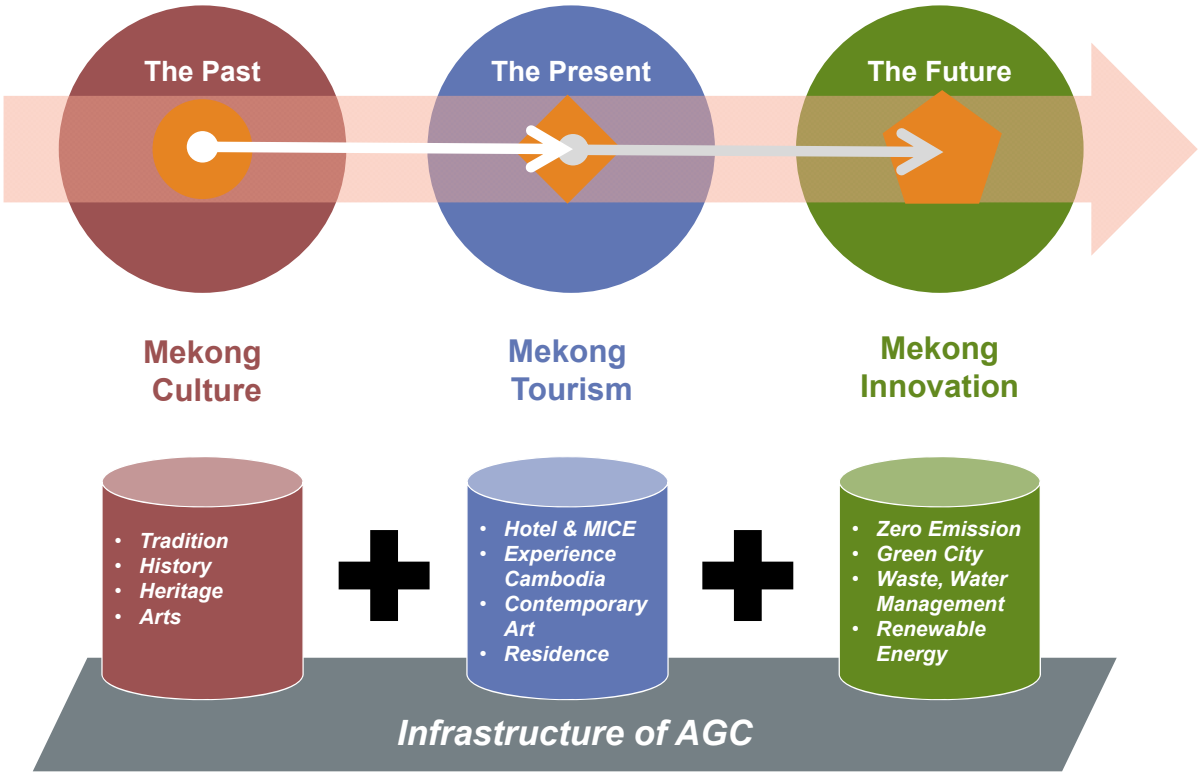
Our Vision and Approach is to celebrate the dynamism of the Mekong Spiritual Value

Vision :

To be the Mekong Gateway of "Cultural and Economic Community" in cooperation with the Mekong neighbour countries.

Approach :

Development Concept for Angkor Gate City (AGC)

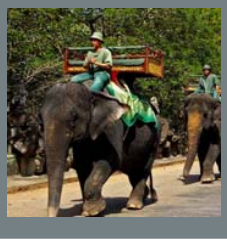


Mekong Heritage Park Zone

Discovery and experience mysterious Cambodian lifestyles and Mekong cultures

Experience Cambodia

- The best of traditional Khmer architecture and modern Cambodian architecture
- Angkor History and Experience
- Tonle Sap Lake
- Animals and Birds
- Jungle

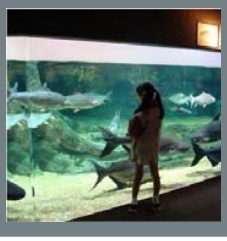


Mekong Culture Center

- Thailand
- LAO. PR
- Vietnam
- Myanmar
- China
- Agriculture
- Handcrafting
- Silk based relationship with Japan

Mekong Aquarium

- Aquatic life experts
- Fish & fisheries conservation
- Plants
- Water Chemistry
- Riverbanks and Shorelines



IMAX Theater and Conference

- VR Museum Theater
- Digital Archives

Accommodation Zone

This zone includes 1) The World's Best Luxury Hotel (International Five Star Hotel), 2) Local Five Star Hotel, 3) Local Four Star Hotel, and 4) Bungalow such as flouting village in Tonle Sap Lake.

The World's Best Luxury Hotel

The Local Five Star Hotel

- MICE Tourism
- Wellness Tourism

The Local Four Star Hotel

Bungalows

- River Floating Lodges
- Tented Villas in a stunning position in the Cambodian jungle

Commercial Zone

A Commercial Zone in a city can take up about 5% of a city's land. It is used for commercial activities. These activities include the buying and selling of goods and services in retail businesses, wholesale buying and selling, financial establishments, and a wide variety of services that are broadly classified as "business."

Gallery Arcade and Souvenir shops

- Gallery Shops
- Contemporary Cambodian Art
- Cambodian Silk
- Wood Carvings
- Statues & castings
- Handicrafts, etc.

Shopping Mall & Service Station

- Selected Shops
- Fashion
- Appliances
- General Stores
- Jewel
- Furniture
- Fine Arts
- Pharmacy
- Sports arena
- Grocery Store, etc.

Restaurants & Café Terrace

- Japanese
- French
- Khmer
- Thai
- Chinese
- Indian
- Italian
- Korean, etc.

Office Complex

- Rental Office Service for Ventures
- City Banks
- IT related SEZ
- Real Estate Agency
- Travel & Tour Guide Agency
- Local headquarters of Asian Gateway

SEZ : Special Economic Zone

General Park, Marketplace & Food Court Zone

This zone includes the general park, with a water complex and arboretum, beside the Accommodation Zone, and the marketplace with food court offering inexpensive everyday food that most people enjoy.

General Central Park

- Arboretum
- Botanical Garden (Orchid, Jasmine, Ethno botany, Herbarium, etc.)
- Urban Agriculture Garden
- Bench Terrace
- Tap Posts

Complex water garden

- Big pond
- River
- Pools
- Flood control measure
- Cleaning water

Marketplace

- Floating Market
- Local Products
- Vegetables
- Fruits
- Spices
- Herbs

Food Court

- Local foods (Blue Pumpkins, etc.)
- Casual restaurants
- Events

Health Tourism Service

"Health tourism" is a collective term, labeling various sub-categories of health & wellness-related tourism & travel. Health tourism as a system comprises several subsystems, as illustrated in the following chart.

Medical Tourism

Travel reactively to receive treatment for a diagnosed disease or condition.

Wellness Tourism

Travel for the purpose of promoting health and well-being through physical, psychological, and spiritual activities.

Adventure Tourism

Travel with perceived (and possibly actual) risk, and potentially requiring specialized skills and physical exertion.

Education Tourism Service for Phase II

Focused towards individuals gaining necessary knowledge and skills to improve ability to create value and a livelihood for themselves.

Leadership Education

There are scholars among you who aspire to achieve something even greater than a college degree. They aspire to be leaders.

Education Professions

Selective program that provides a variety of resources for students such as in the hospitality industry - hotel staff, tourism specialists, artists, photographers, etc.

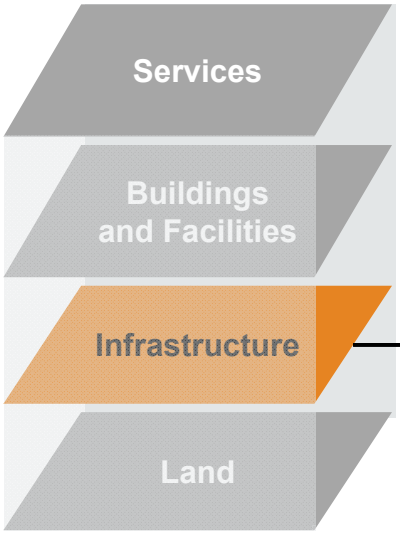
Public Digital Library

Focused collection of digital objects that can include text, visual material, audio material, video material, stored in electronic media formats.

ODA : Official Development Assistance

Infrastructure Facilities

The Master Developer employs contractors to manage the construction of primary park infrastructure including below;



- Water supply and sanitation
- Water treatment
- Storm drainage system
- Retention pond and dredging
- Sewerage system

- Base solar power plant including intra-park electricity supply system and external connectivity network to existing Siem Reap electricity grid
- Telecommunication and information technology infrastructure including 4G network and Wi-Fi spots

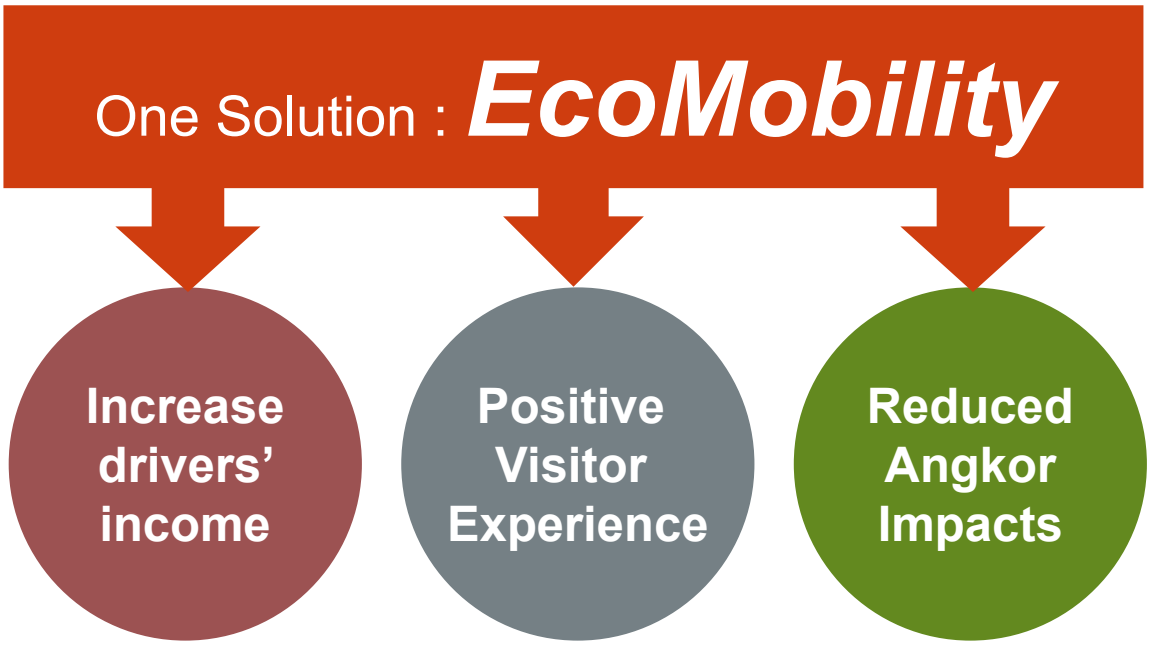
- An appropriate, effective, and responsible solid waste disposal system that should become a model system for the region
- Waste management and treatment

- Internal circulation network (roads)
- EV electrical charging stations park-wide
- Periphery wall & circumferential moat

Eco Mobility for Reumork Moto

Benefits for Cambodia

The Special Purpose Company, as a subsidiary of the Japan Development Institute Ltd. in Tokyo, is poised to provide many social benefits to Cambodia as well as Siem Reap Province.



Japan and Cambodia Signed a Low Carbon Growth Partnership

On April 11, 2014, a document concerning the Joint Crediting Mechanism (JCM) was signed in the Kingdom of Cambodia by H.E. Mr. Yuji Kumamaru, Ambassador Extraordinary and Plenipotentiary of Japan to Cambodia, and H.E. Dr. Say Samal, Minister of Environment, Cambodia.

- To promote the Low Carbon Growth Partnership between Japan and Cambodia, both sides will establish the **JCM(Joint Crediting Mechanism)** and also establish a joint committee to operate it.
- Both sides mutually recognize that verified emission reductions or removals by the mitigation projects under the JCM can be used as a part of Japan's internationally pledged greenhouse gas mitigation efforts and Cambodia's nationally appropriate mitigation actions (NAMA).
- Both sides ensure transparency and the environmental integrity of the JCM and that neither side will use any mitigation projects registered under the JCM for the purpose of any other international climate mitigation mechanisms.

http://www.meti.go.jp/english/press/2014/0411_01.html

Survey Detail for JCM on Eco Mobility

There are three types of surveys:

Driver Interview Survey

Personal interviews will serve three purposes: 1) create drivers' profiles, 2) compile motorcycle attributes, and 3) record net income with cost structure.

Person Trip Survey

Discovery of travel patterns of international tourists in the Angkor park complex and Siem Reap Town.

Mobility Monitoring Survey

Collection of fuel consumption data and diurnal driving range information using a data logger device.

Cambodian Benefits for socio-economic development

Development of Angkor Gate City (AGC) and Eco Mobility will promote long-term sustainable socio-economic development

Growth

- Bring rural economic growth by strengthening the tourism industry;
- Increasing the number of in-bound tourists and contributing to GDP growth and reducing poverty in Siem Reap;

Employment

- Creating many jobs in the Tourism Industry of Siem Reap Province;
- In education, ensuring strength for the quality and responsiveness to the tourism market demand;

Rectangular Strategy Phase III

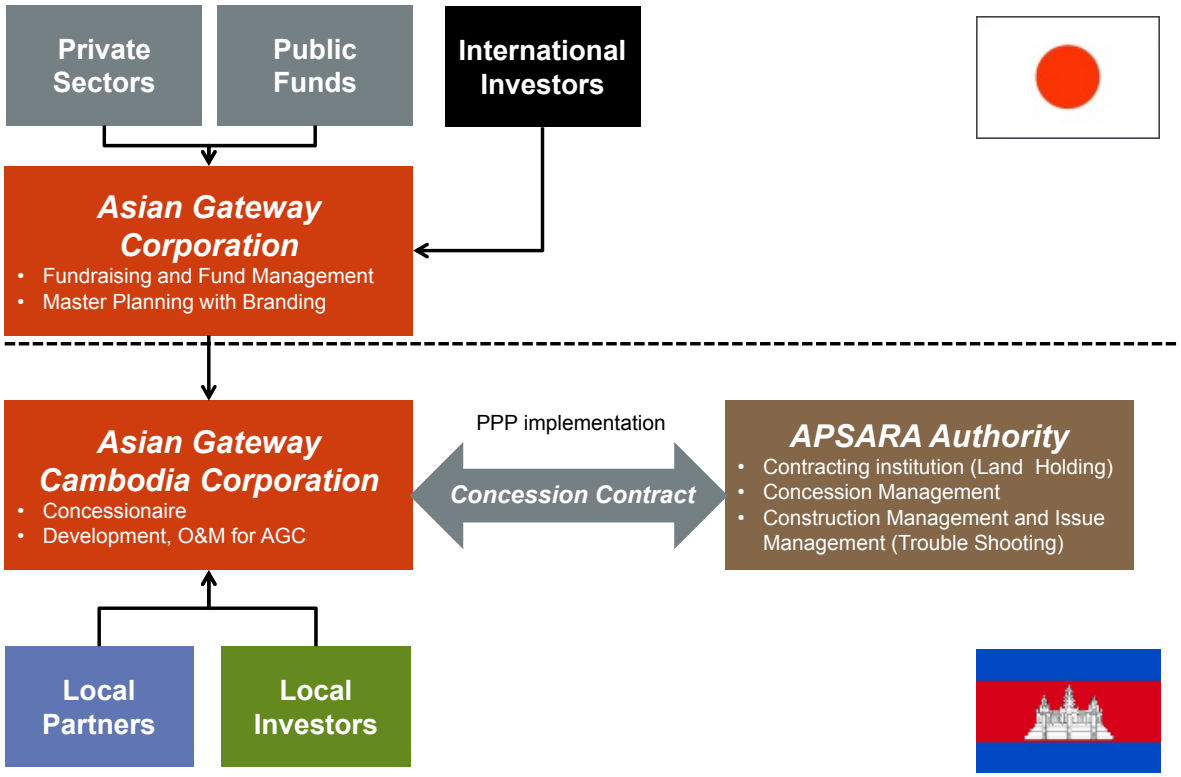
Efficiency

- To ensure sustainable development, and, improve Siem Reap's urban infrastructure thereby reducing negative ecological impacts and enhancing land and water resource management;

Equity

- Through implementing AGC and Eco Mobility operations, knowledge of greater efficiency and effectiveness in managing the provincial administration will be transferred to the Siem Reap Provincial Government;

Organizational Model and Concession Contract



AG
Asian Gateway

Appendix 6

Presentation materials of seminar

Strictly Private and Confidential

Results of Survey on EcoMobility Project

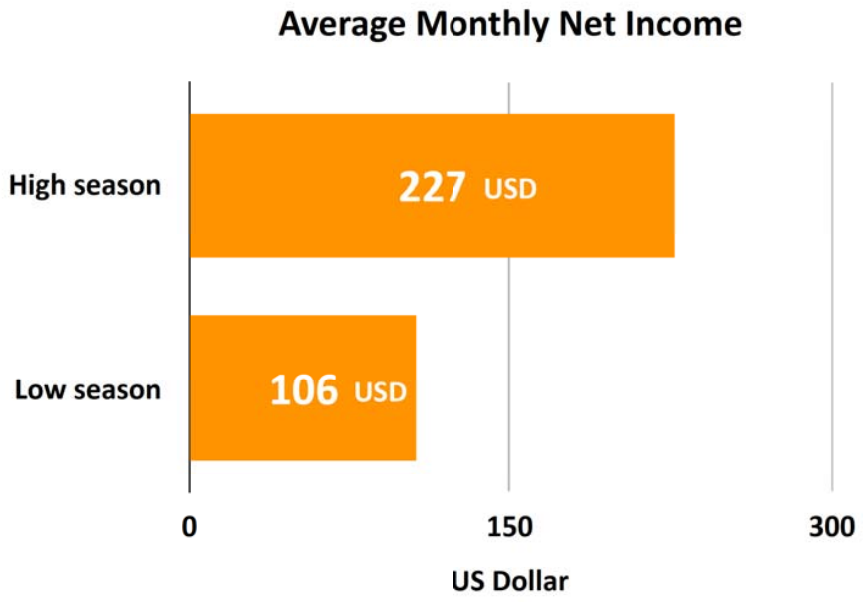
January 2015

Survey on EcoMobility Project

- Social contribution for current drivers
- Improve tourism experience
- Reduce impact on Angkor

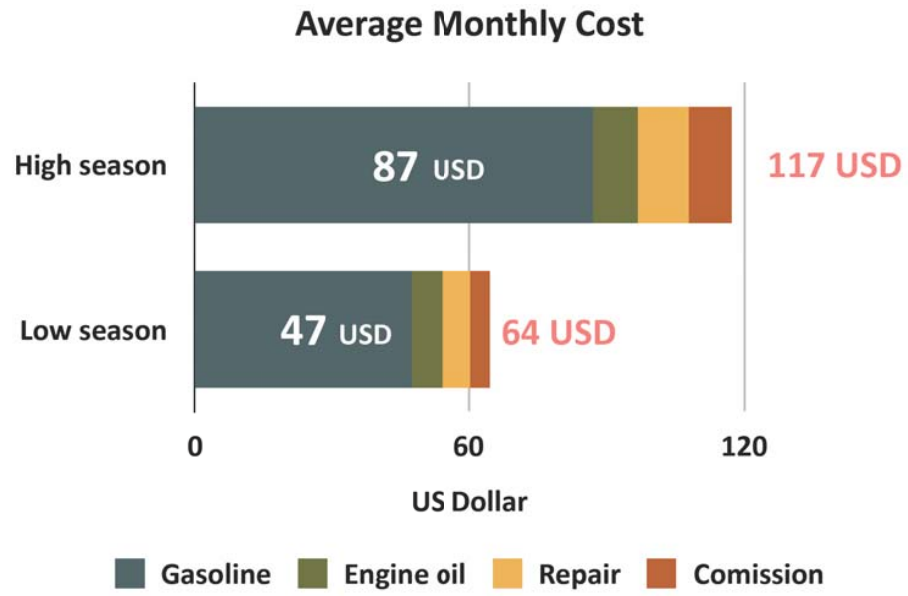
Survey on EcoMobility Project

Survey on EcoMobility Project



Driver's income is unstable and inadequate

Survey on EcoMobility Project



Fuel cost reaches over **70%** of average monthly cost

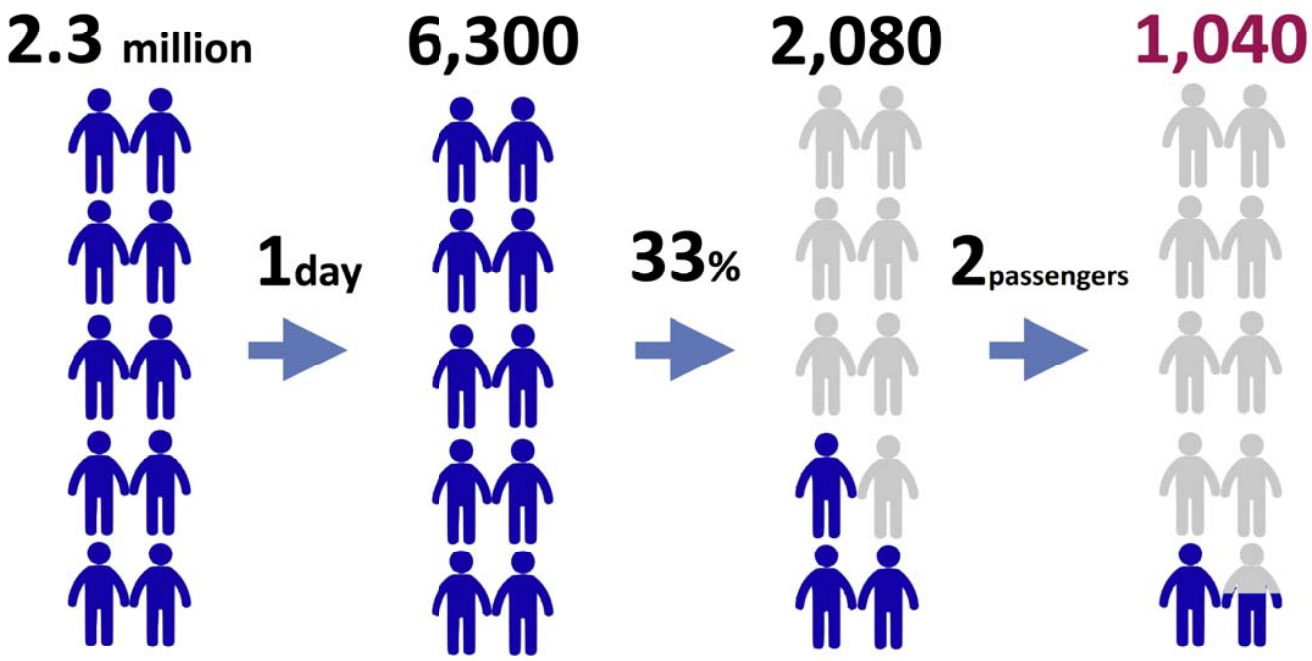
Reumork moto and Angkor Tourism

2.3 million

33 %

2 passengers

Reumork moto and Angkor Tourism



Reumork moto and Angkor Tourism

1,040 vs 7,000

Key solutions

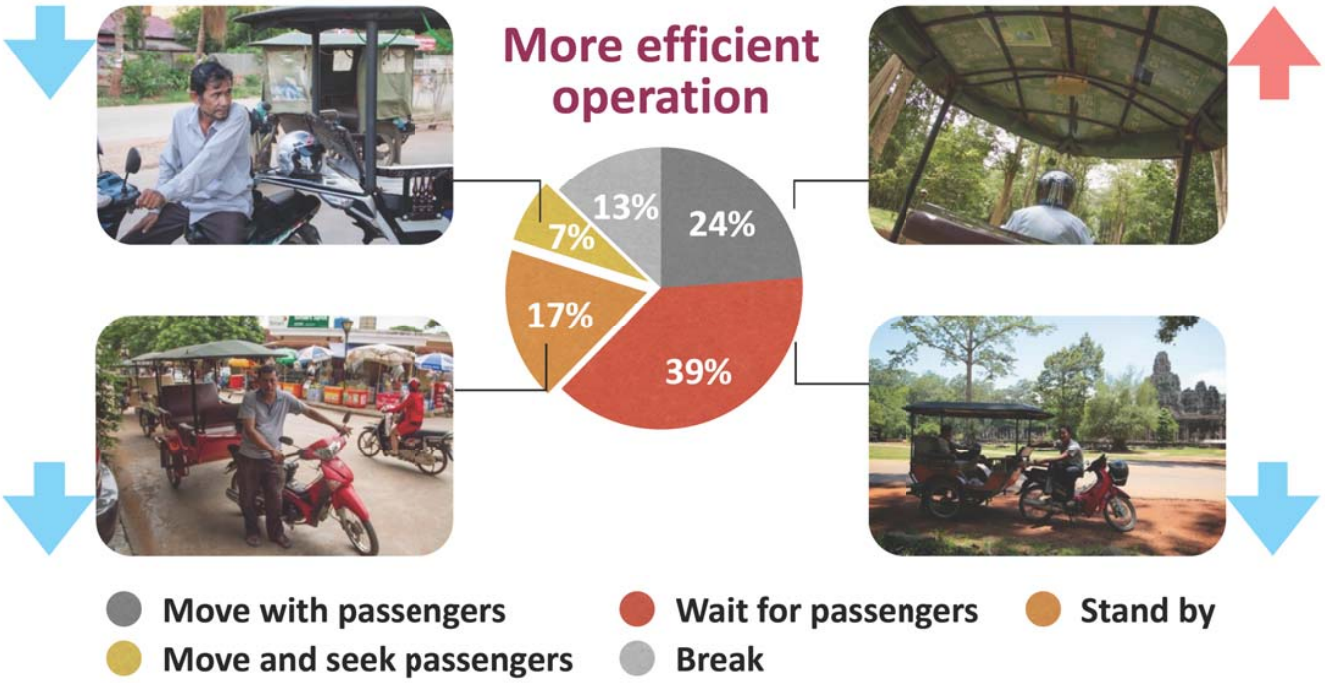
Increase number of customers

Increase spending per customer

Making rules for fair competition

Save fuel costs

Key Solutions



Key Solutions

Terra Motors

7makara

Blue Solutions

Next steps

Solutions
- High quality service
- More efficient operation
- Electric reumork moto

Study → Organization → Actions → Goal (EcoMobility)

- Social contribution for current drivers
- Improve tourism experience
- Reduce impact on Angkor


Thank you!

Beyond the Eco Mobility

Key points of Eco Mobility

- Reduce negative impacts on Angkor Heritage Park.
- Improve the Angkor tourism experience with better mobility and less congestion.

- ***Social contributions for current Reumork drivers are lower fuel costs and higher income.***

Angkor Mobility Servise (AMS)?

On-demand dispatching

Fair pricing

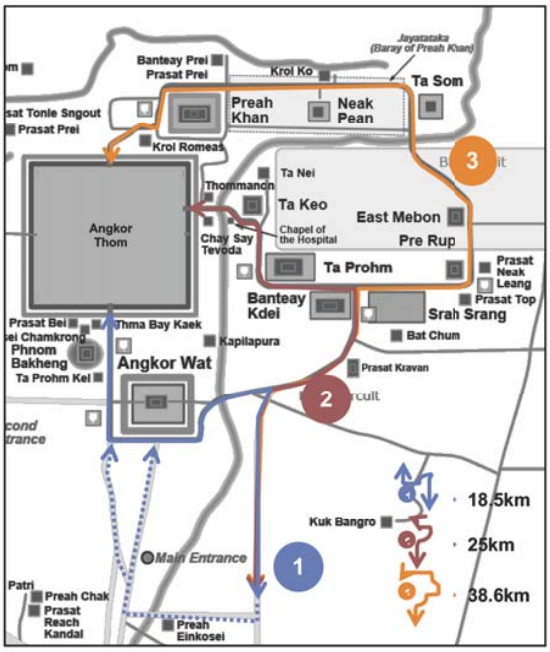
Do the favorite mix

To develop an integrated, continuous passage for sustainable tourism mobility, which improves the possibilities for environmentally friendly travel to, between, and in the Angkor Experience.

On-Demand Dispatching

The fastest & Safetest Mobility Service Booking by Smartphone

Fair Pricing



One-Driver ⇨ Any-Drivers

	Tickets	Time
Standard Service	One-day Pass	4:30am - 8:30pm
	Half-day Pass (AM)	4:30am - 0:30pm
	Half-day Pass (PM)	0:30pm - 8:30pm
	Charter	4:30am - 8:30pm
Option Service	Some destinations	4:30am - 8:30pm

Strategic Pricing

Do the favorite mix

Leadership and Teamwork

Leaders

Dr. Shoichi KOBAYASHI
Mr. Tomonori KIMURA
Mr. Yushin NAKAO
Mr. Phieng Samedh
Mr. Kethya Ly
Mr. Koun Rith
Mr. Dy Kulen
Mr. Vonn Vouch
Mr. Phoung Veasna

Advisors

H.E. So Platon
Mr. Ho Vandy
H.E. Sok Sangvar
Mr. Hout Sothy
Mr. E Sophors
Mr. Bunhut

Tourism Management in Angkor

OUM Marady
Deputy Director of the Department of Angkor Tourism Development,
APSARA National Authority
24 January 2015

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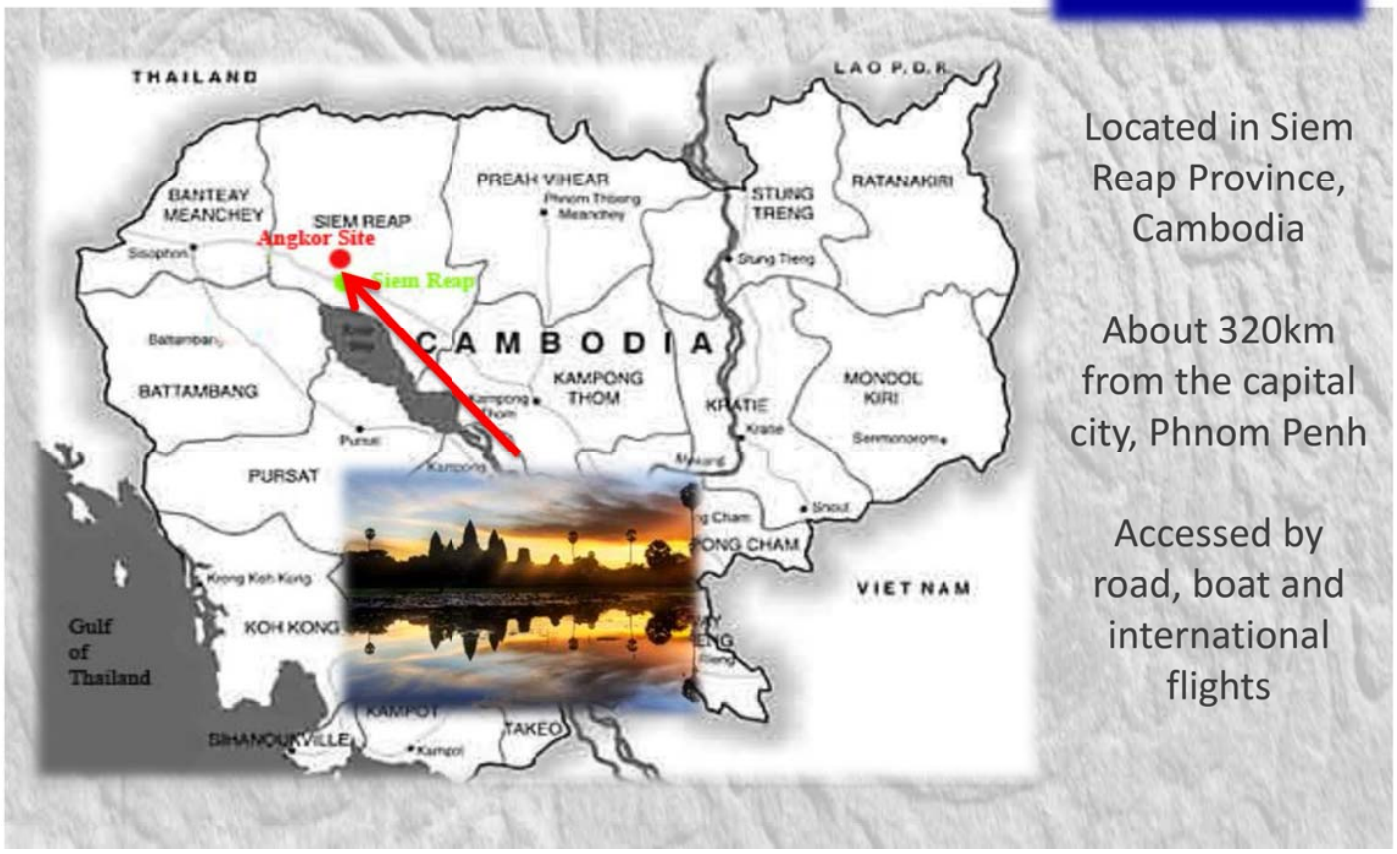
I. Introduction



Located in Siem Reap Province, Cambodia

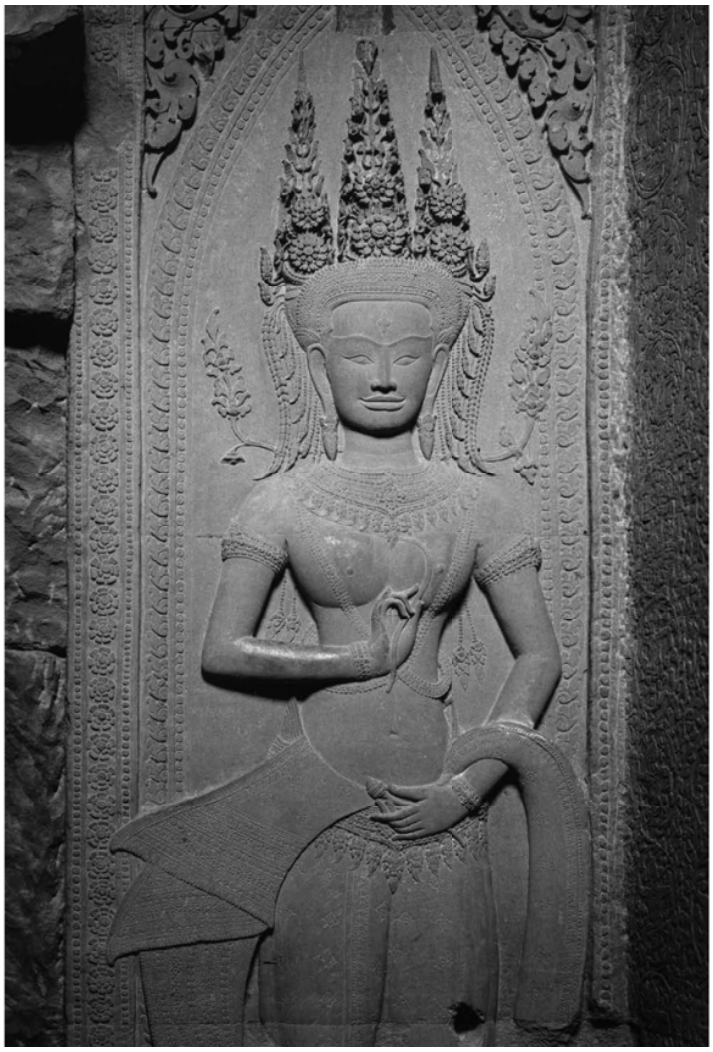
About 320km from the capital city, Phnom Penh

Accessed by road, boat and international flights

Capital of the Khmer empire from the 9th to the 14th century

- An unique cultural heritage of the Cambodian people
- A dynamic cultural complex
- A remarkable model for coherent territorial management
- The Angkor Park is inhabited (about 125,000 inhabitants)

Angkor Wat



II. Angkor and its legal Framework

The management of the World Heritage Site is based on following legal framework

On the national level:

- *The Law on the protection of the national cultural heritage promulgated in 1996, and sub-decree of application come into force in 2002;*
- *The Royal decree on the zoning of the region of Siem Reap/Angkor in 1994;*
- *The Royal decrees of the creation and the modification of the status as well as the restructuring of the APSARA National Authority (1995, 1999, 2004 and 2008);*
- *Many laws and ministerial circulars.*

On the international level:

- *The Hague Convention for the protection of cultural property in the event of armed conflicts (1954);*
- *The Convention concerning the measures to be taken to forbid and prevent the illicit import, export and ownership transfer of cultural property (1970);*
- *The Convention concerning the protection of the cultural and natural world heritage (1972);*
- *The Convention on the protection of the intangible cultural heritage (2003);*
- *The Convention on the protection and the promotion of the Diversity of cultural expressions (2005);*
- *The ICOMS Charter on cultural tourism;*
- *The Charter of the sustainable tourism of Lanzarote (the Canary Islands, Spain 1995),*

The ICC meeting

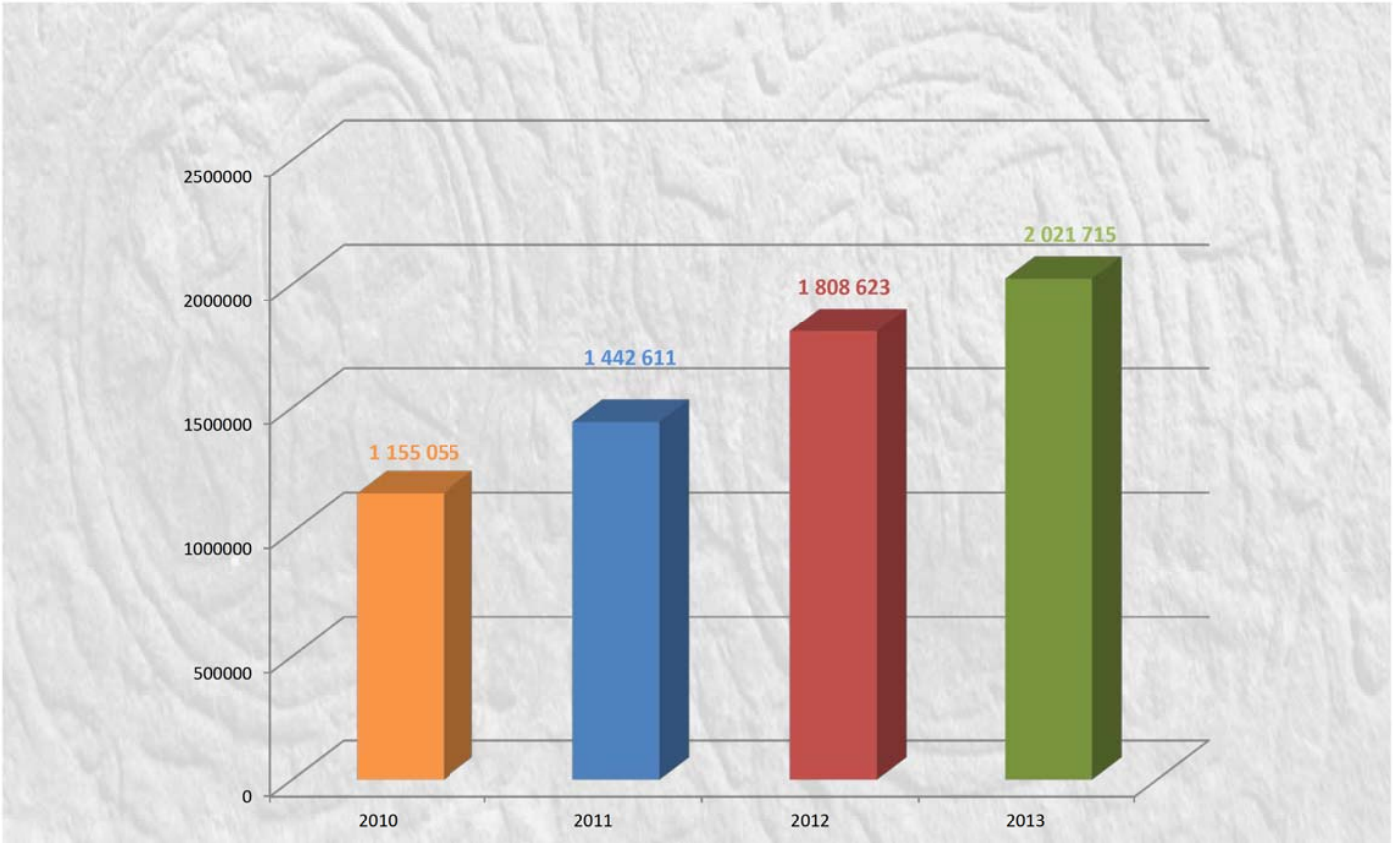
The Plenary Session of the ICC

The permanent scientific secretariat

III. Tourism Management Plan

- Increasing number of national and international tourists
- Nature of Tourism: *Benefits and Impacts*

Number of visitors per year in Angkor



Year	2011			2012			2013		
Temple	Angkor Wat	Bayon	Ta Prohm	Angkor Wat	Bayon	Ta Prohm	Angkor Wat	Bayon	Ta Prohm
Count Day	7	7	6	7	7	7	7	7	7
khmer Visitors	7997	2055	1923	7487	6084	2194	6199	2368	1625
Japan Visitors	3192	4769	2942	2772	4350	4027	4464	4922	4828
China Visitors	4815	5720	3843	3952	15699	4706	6198	5435	8109
Korea Visitors	9468	5848	5992	10367	9967	8782	12175	7354	9740
Asia Visitors	2771	2209	3043	3484	14698	3751	3167	4639	5337
Europe Visitors	14281	13837	13004	12389	14540	16358	15847	24718	15765
Total Visitors	42524	34438	30747	40451	65338	39818	48050	49436	45404
Average per day	**6075**	**4920**	**5125**	**5779**	**9334**	**5688**	**6864**	**7062**	**6486**

- How to Management those number of visitors

  and

- How to preserve the values of Angkor?

Elaboration of the TMP

- **In 2010:** The **ICC-Angkor** requested tools to support APSARA to sustainably manage the Angkor World Heritage Site.

- Collaborative partnership between UNESCO, the Royal Cambodian Government and the Australian Government.

- The Heritage Management Framework (HMF) project for the Angkor.

United Nations Educational, Scientific and Cultural Organization

KINGDOM OF CAMBODIA

Australian Government

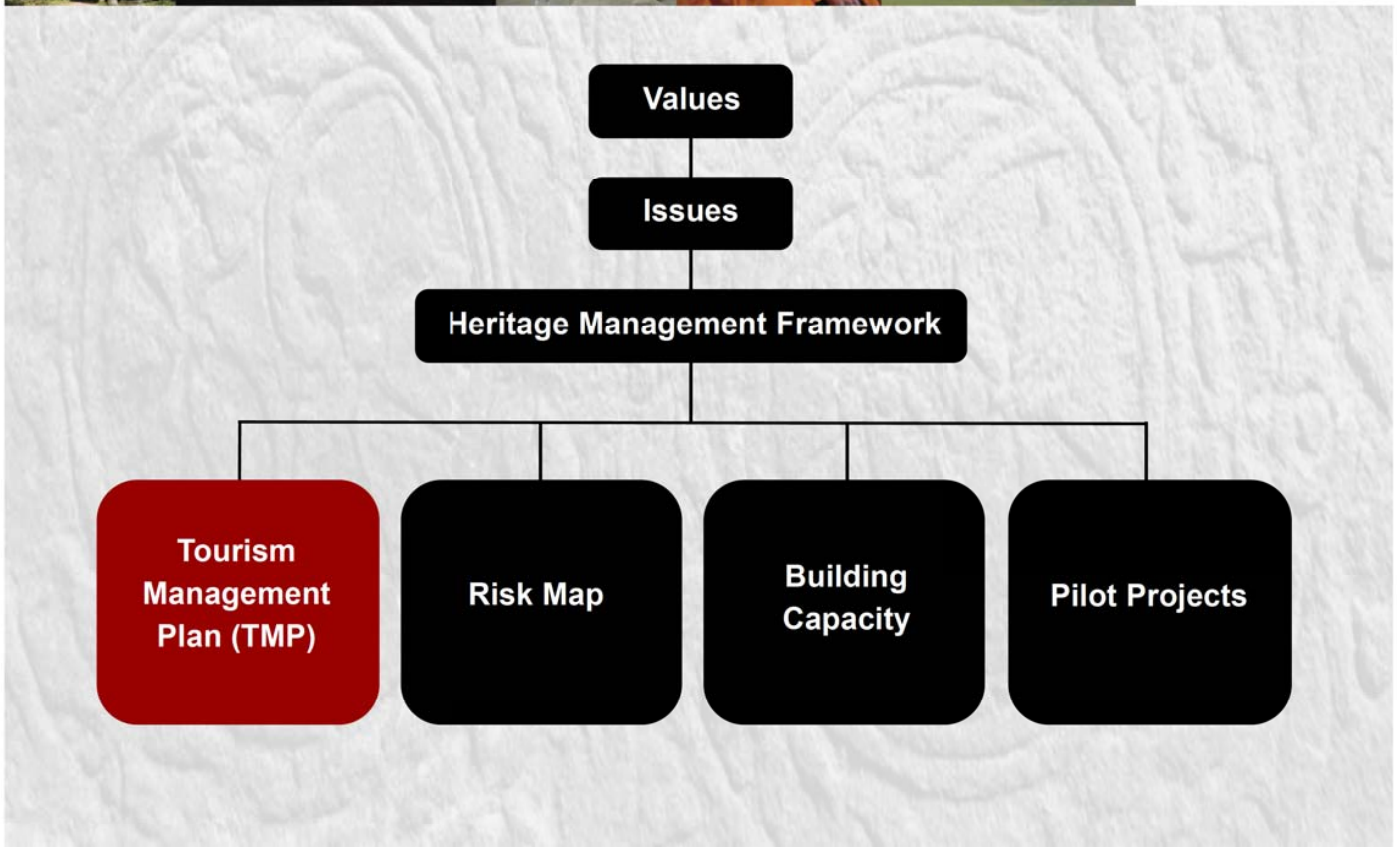
GML HERITAGE

APSARA

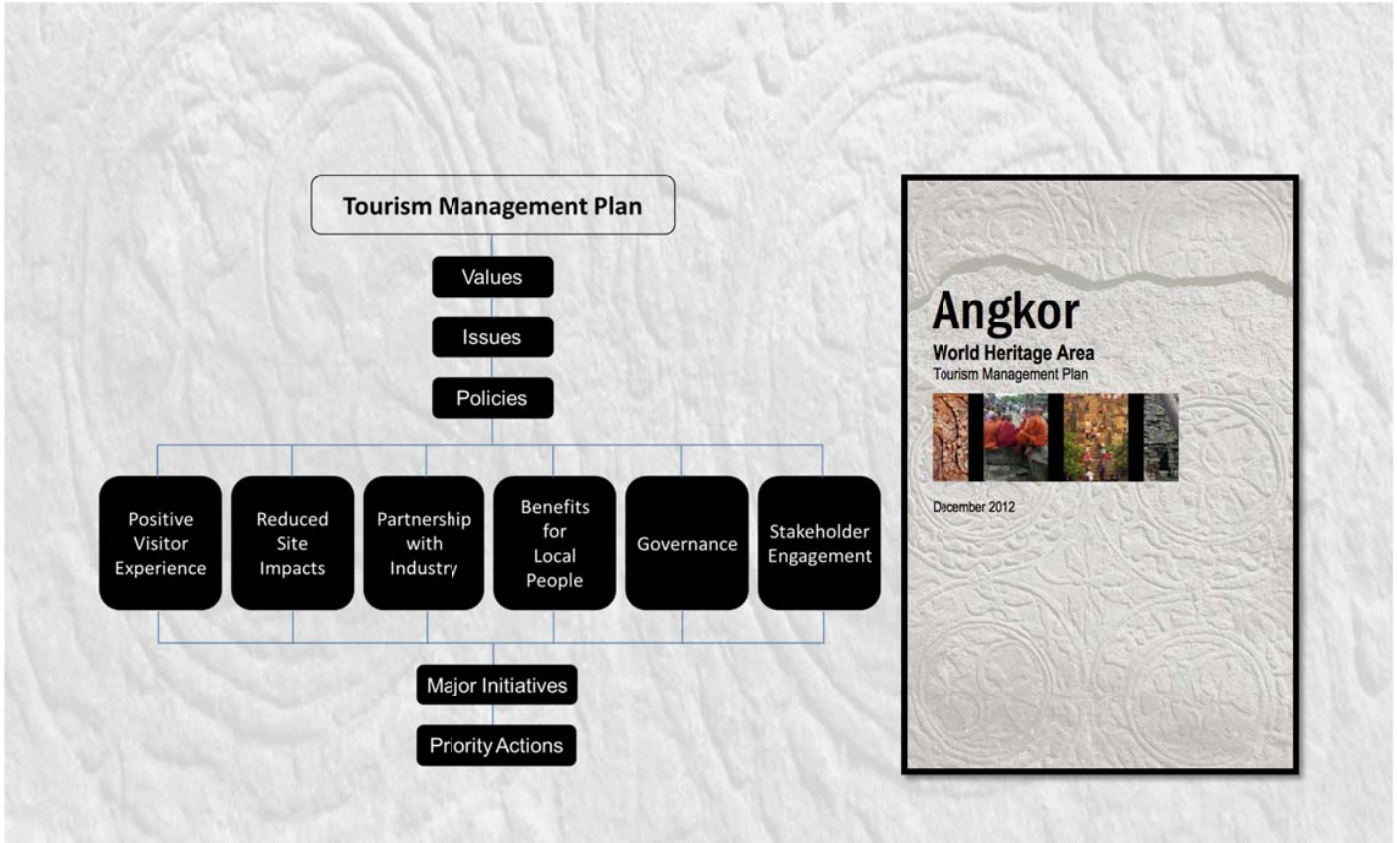
Private sector and Local community

United Nations Educational, Scientific and Cultural Organization

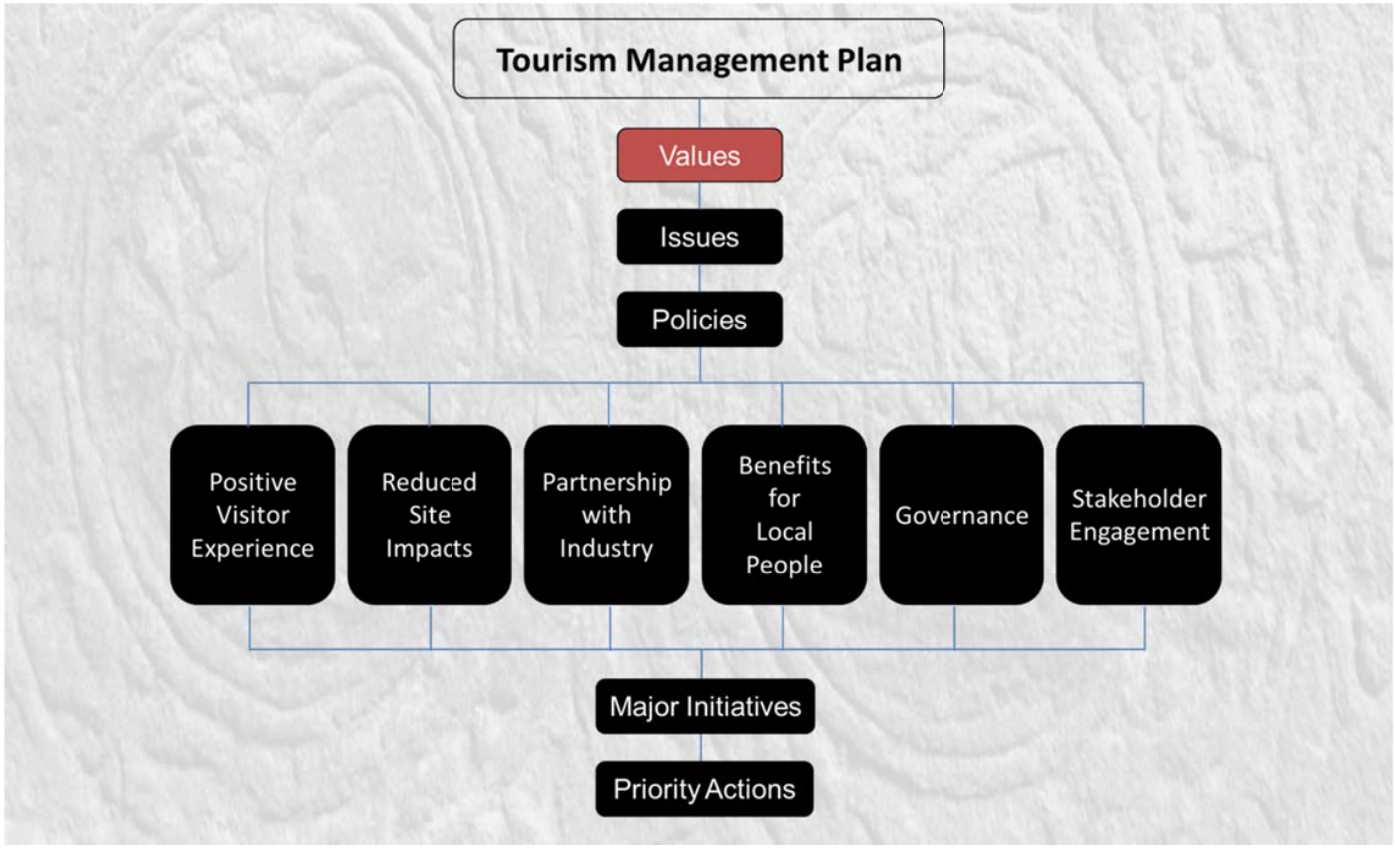
APSARA



Contents of the TMP

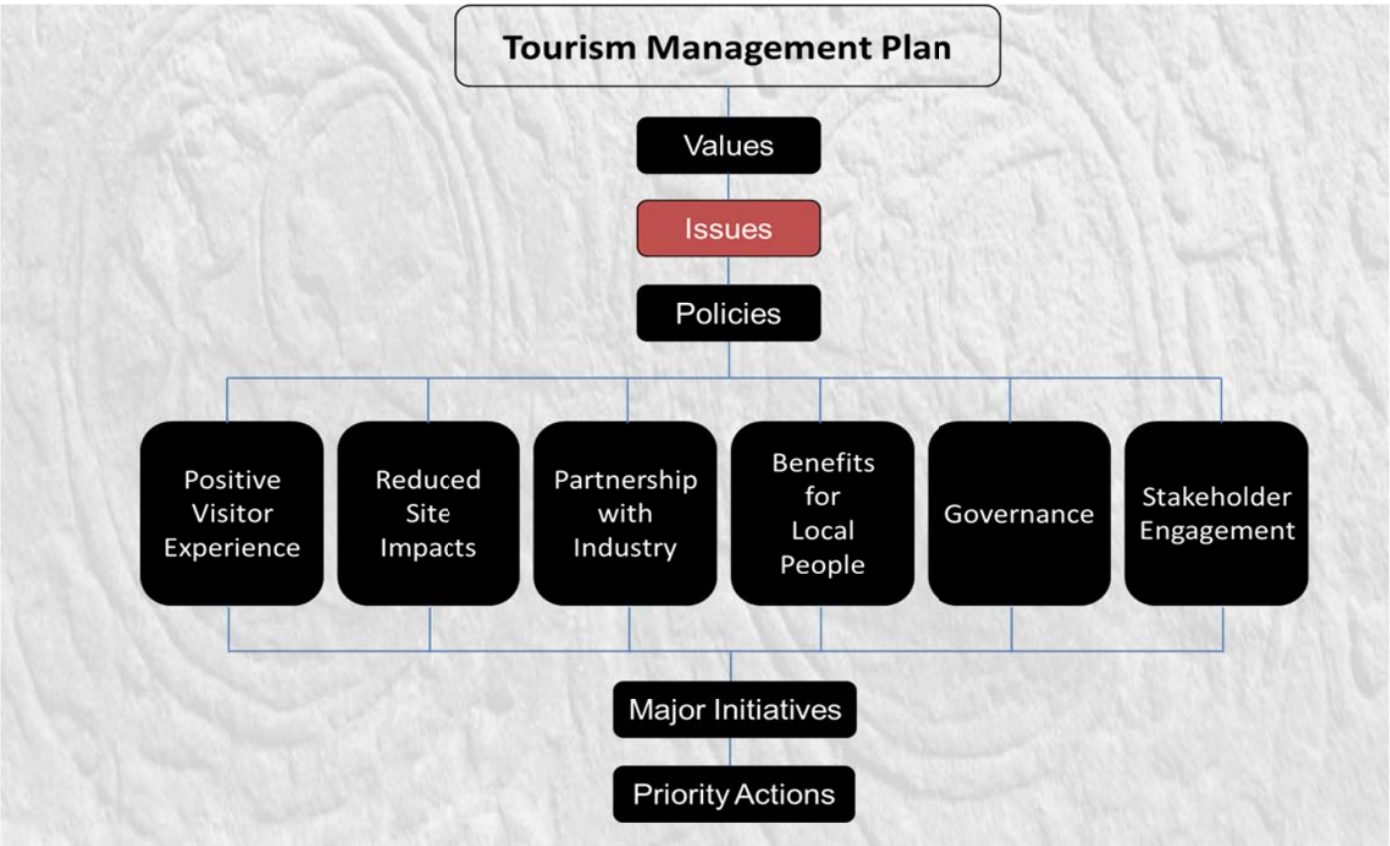


Values



- National Heritage Value
- Outstanding Universal Value by ICOMOS and UNESCO (i,ii,iii,iv criteria)
- UNESCO World Heritage Listing in 1992

Issues



United Nations Educational, Scientific and Cultural Organization

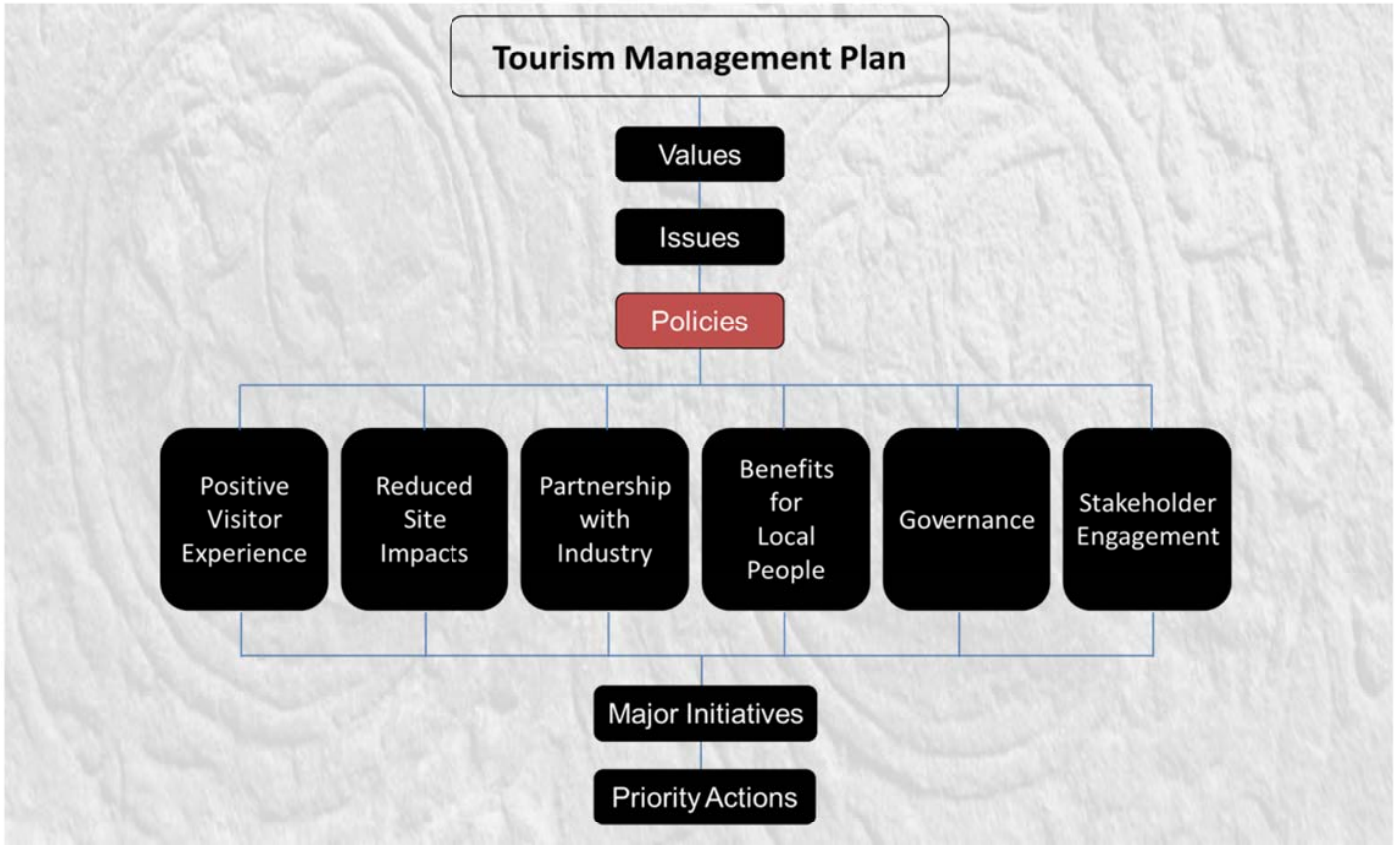
APSARA

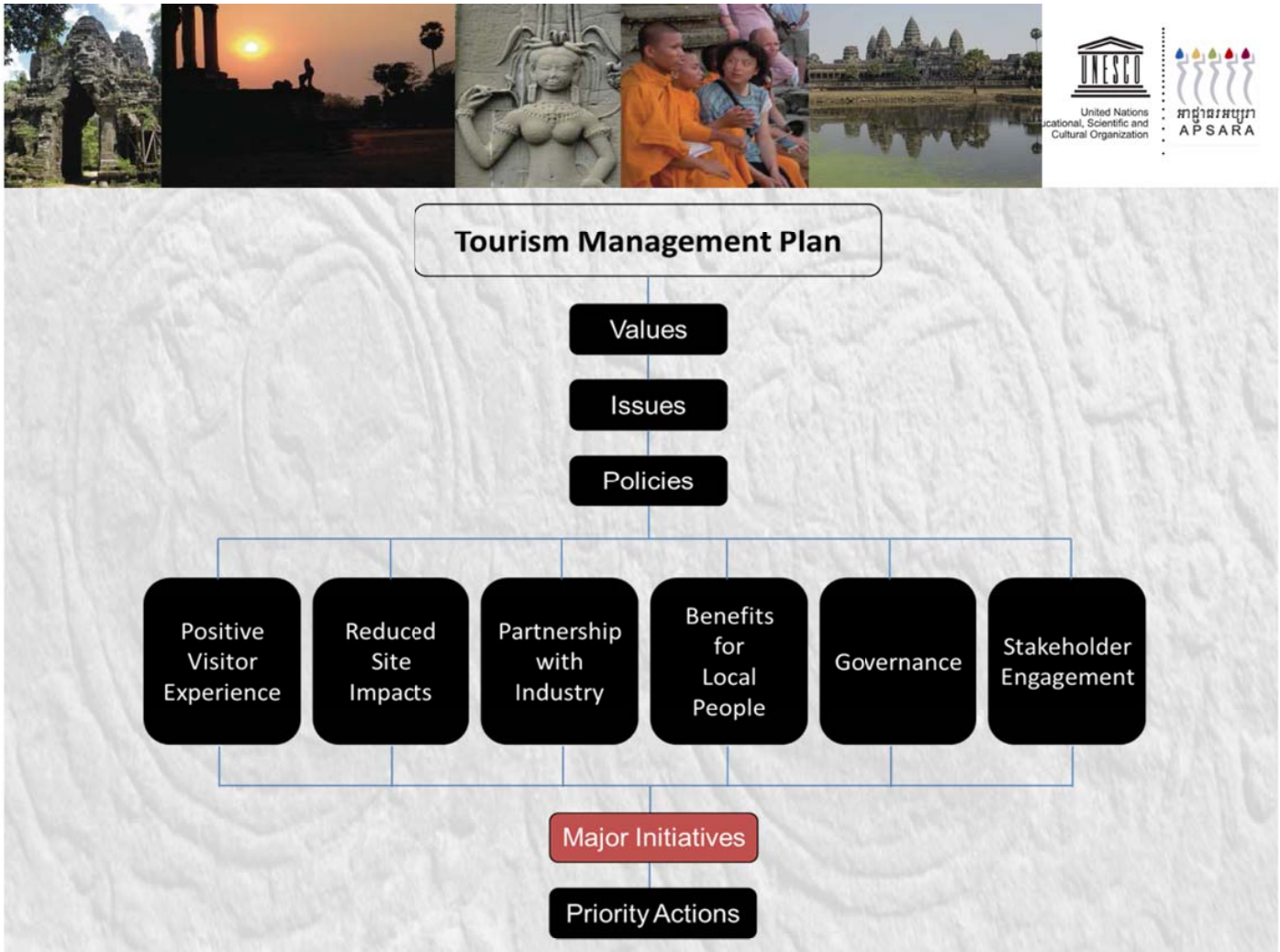
- **Managing Visitors at Angkor as Visitor Numbers Increase :**
  - *Around 6000 visitors per day at Angkor Wat*
- **Understanding and Communicating Heritage Values:**
  - *Tourists are not well informed; they do not received enough information from travel agent either well communicated in the park.*

- **Site Impacts:**
  - *Touching carvings, graffiti, littering, guides pointing, umbrella usage,*
- **Visitor Experience, Behavior and Safety**
  - *Crowded, noisy, pushing make bad visiting experience*

- **Infrastructure and Transport**
  - *Traffic jam, air pollution*
- **Local People**
  - *Benefit sharing from tourism and impact on traditional costumes*
- **Stakeholder Engagement**
  - *Lack of relationship with private*
- **Governance**

Policies


Tourism Management Plan
Values
Issues
Policies
Positive Visitor Experience
Reduced Site Impacts
Partnership with Industry
Benefits for Local People
Governance
Stakeholder Engagement
Major Initiatives
Priority Actions


United Nations
Cultural Organization
APSARA
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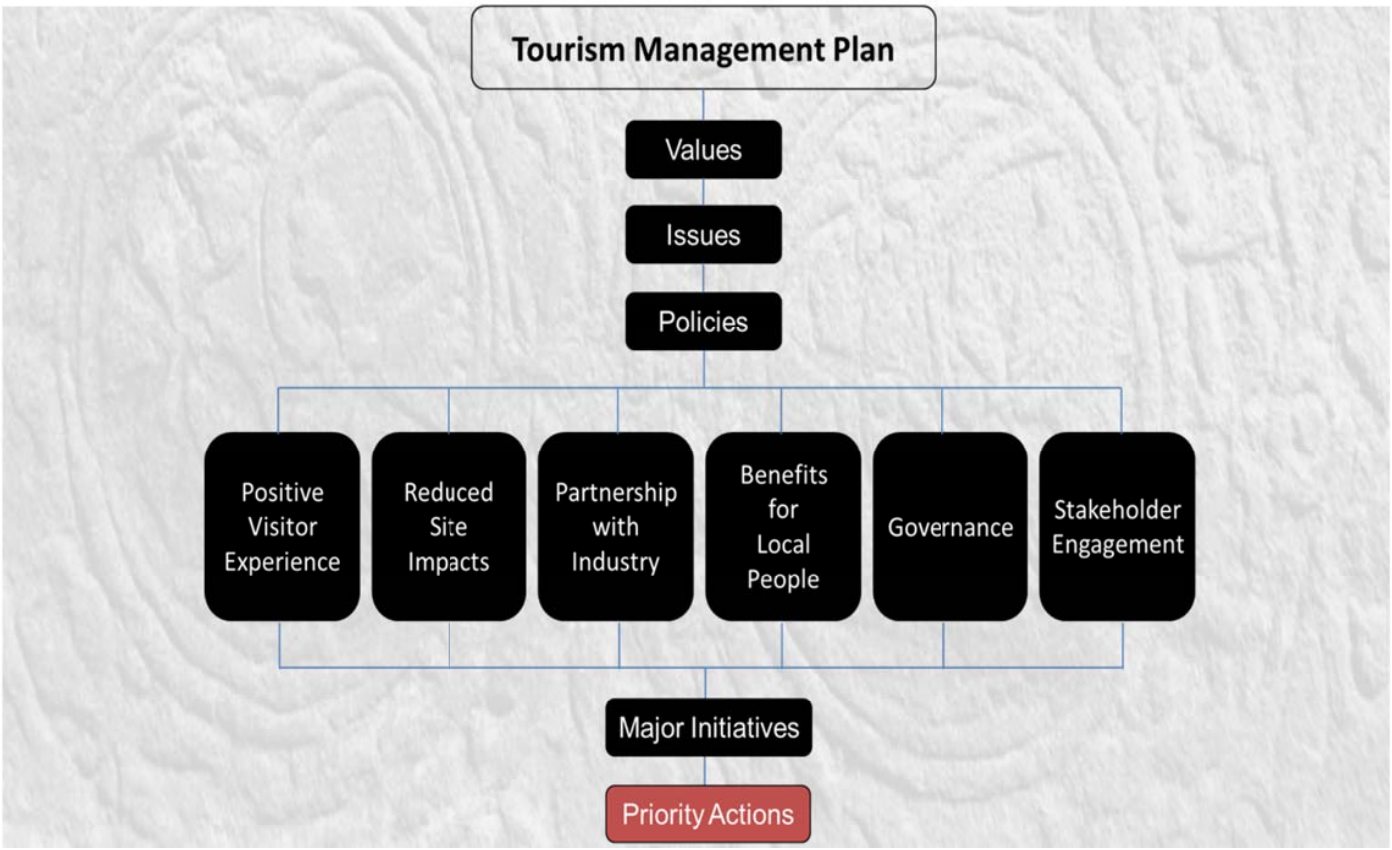
Stakeholder Engagement
Major Initiatives
Priority Actions

- Integrated Management at Individual Temples
- **Visitor Flow Management**
- Transport System
- **Visitor Orientation**
- Visitor Services and Experience

- **Tourist Guide Training**
- Local Craft
- Ticketing

- **Industry Relationship and Communication**
- **Siem Reap, the Tonle Sap and the Kulen Hills**
- Monitoring of Progress by the ICC

Priority Actions



IV. Implementation of the TMP

RECOMMANDATIONS POUR LE DÉVELOPPEMENT DURABLE

Le CIC recommande :

1. **Parvis des temples sur le site d'Angkor**

2. **Cadre de gestion du patrimoine (HMF)**
   a) Que l'ensemble du Cadre de gestion du patrimoine (HMF) soit mis en œuvre très rapidement et que les opérations soient suivies attentivement ;
   b) Afin de pérenniser la qualité et la fiabilité de la carte des risques du patrimoine mondial angkorien, il est de la plus haute importance que ses données soient actualisées. Qui plus est, il appartient à tous les services concernés de valider la fiabilité des données saisies dans la carte des risques (SIG).
   c) Que le CIC-Angkor accepte les résolutions du Comité de pilotage du projet "**Cadre de gestion du**

RECOMMENDATIONS FOR SUSTAINABLE DEVELOPMENT

The ICC recommends:

1. **Angkor site temple visitor intake areas**

2. **Heritage Management Framework (HMF)**
   a) That all aspects of the Heritage Management Framework (HMF) be implemented very quickly and operations be monitored closely;
   b) In order to make long-term use of the high quality, reliable Angkor World Heritage risk map, a regular update of its data is of utmost importance. Furthermore, the reliability of all data entered into the GIS risk map must be checked by the responsible departments.
   c) That the ICC-Angkor accepts the resolutions of the "**Angkor Heritage Management Framework**" Steering Committee dated 2 December 2013.

ICC Angkor Recommendation, December 2013

3e Conférence intergouvernementale sur Angkor Siem Reap, 5 décembre 2013

RECOMMANDATIONS

opérateurs pour mettre en œuvre les projets ;

d) Accroître le transfert de technologies et de savoir-faire aux équipes cambodgiennes dans tous les secteurs liés à la sauvegarde, la restauration, la mise en valeur et la gestion du site d'Angkor ;

e) Mettre en œuvre le "**Plan de gestion du tourisme**" élaboré pour promouvoir le tourisme durable et préserver l'esprit du site.

3rd Intergovernmental Conference on Angkor Siem Reap, 5 December, 2013

RECOMMENDATIONS

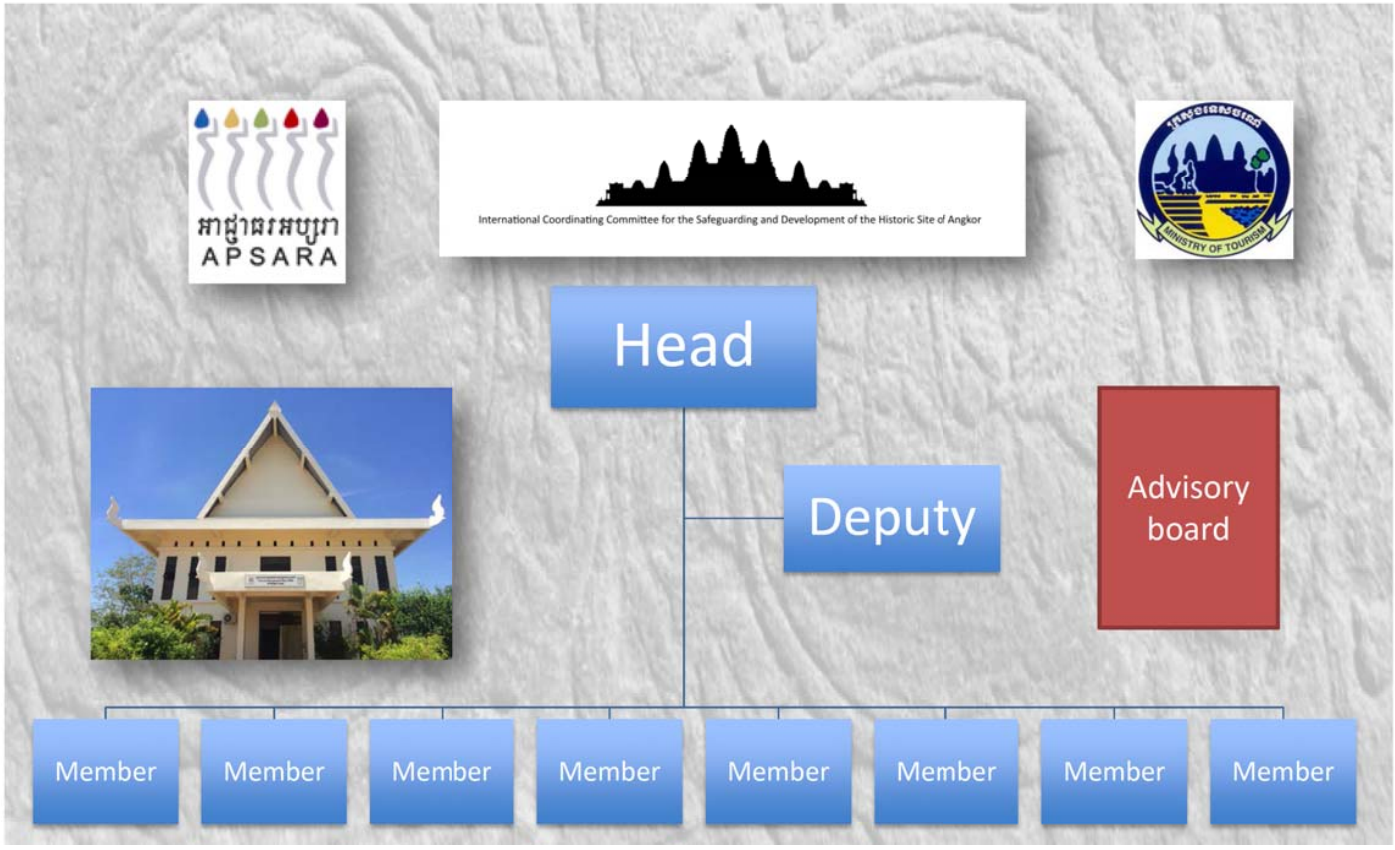
operators to implement the projects;

d) Increase technology and knowledge transfer to the Cambodian teams in all sectors, including safeguarding, restoration, showcasing and managing the Angkor site;

e) Implement the "**Tourism Management Plan**" designed to promote sustainable tourism and preserve the significance of the site.

3rd Intergovernmental Conference Recommendation, December 2013

TMP Working group



Goals

- Protect and preserve values of Angkor
- Ensure the 6 policies
- Strong collaboration with Stakeholders

United Nations
Educational, Scientific and
Cultural Organization

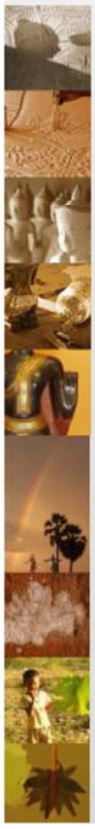
APSARA

Siem Reap City Urban Development

Sokha Angkor Resort, January 24th , 2015

By So Platong, Mayor of Siem Reap Municipality
E-mail: soplatong168@gmail.com

Contain



CAMBODIA

I-Introduction

II-Current Development

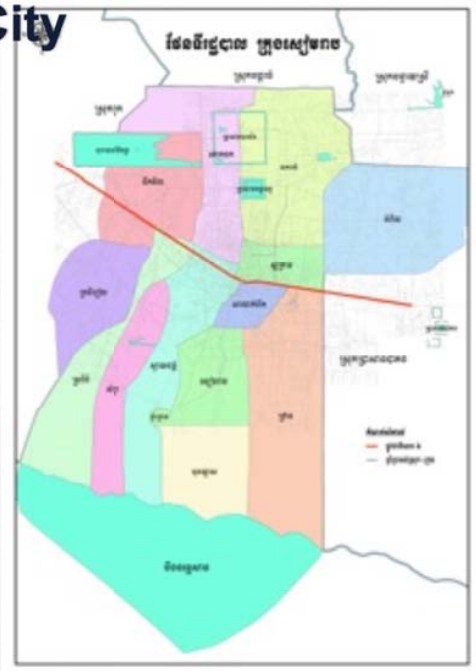
III-Development Problems and Constraints

IV-Clean City Contest

V-Project EcoMobility

I-Introduction of Siem Reap City

- Location: 314 Km from capital Phnom Penh
- Land area: 472.73 Km^2
- Sangkats: 13,
- Villages:108
- Population: 245,229 Households: 50,266
- Family size: 5
- Tourists: 5,023,887 (2014) (International: 2,350,937)



II-Current Development

1. Increased Population and Tourist Arrivals
2. Main Area of Action
3. Densification and Slightly Expanded Urbanized and Urbanizing Area
4. Large Scale Development
5. Land Use Plan and Urban Growth Management

III-Development Problems and Constraints

1-Problems related to roads and transportation

- Traffic congestion
- Lack of sidewalks, traffic signs, traffic lights, street signs, and signposts
- Lack of parking lots and parking regulations

III-Development Problems and Constraints

2-Problems related to Water, Wastewater, and solid waste disposal

- Insufficient sewerage and storm drainage systems (some systems are blocked at certain places)

III-Development Problems and Constraints

3-Problems related to Solid Waste Management

- Litter piles up
- Insufficient solid waste collection system
- Lack of sanitary waste disposal sites, municipal landfill sites, and composting sites
- Public lack of environmental awareness

III-Development Problems and Constraints

4-Problems related to Squatter Settlements

- Lack of appropriate solutions for housing the urban poor
- Squatter settlements partly cause disturbances such as noise pollution, water pollution, and security problems
- Living and environmental conditions in squatter settlements are squalid.

IV-Clean City Contest

Clean City Standard

7 basic indicators, divided into **33 more detailed indicators**, and being defined as the **77 criteria-based assessment** :

1. Environmental arrangement and management
2. Civic hygeine
3. Waste management
4. Raising Awareness
5. Green areas
6. Health safety, security, and urban arrangement
7. Tourism infrastructure and facilities:




IV-Clean City Contest

1-Solid Waste

- Enforcement of regulation on SWM
- Education and Participation with stakeholders
- Master Plan on SWM by Local Authority and GAEA (3R concept)
- Incineration and Landfill
- Budget



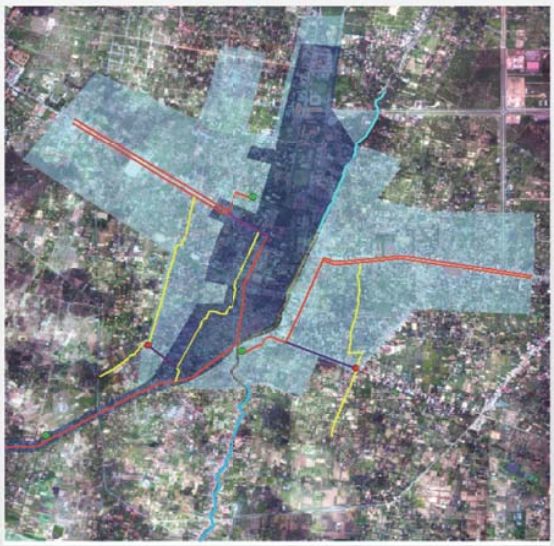

IV-Clean City Contest

1-Solid Waste

IV-Clean City Contest

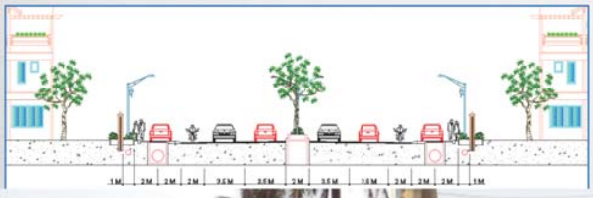
2-Sewerage

- AFD ៖ 362 Ha
- ADB ៖ 3,000m3
- KOREA-1 ៖5,000m3
- KOREA 2 ៖ House Connection
- Today 17,000 m3 (9,000m3)



IV-Clean City Contest

ប្លង់សំរាប់ផែនការអភិវឌ្ឍន៍ផ្លូវក្នុងពេលអនាគត
ផ្លូវវេមកក (ចាប់ពីកែងផ្លូវលោកតា ខៀវណើយ ដល់ផ្លូវវែងក្រុង)ទទឹងផ្លូវសរុប:៣០ម



3-Road Network

Road improvement
To improve road conditions and create attractive cityscape

- **Road pavement**
- **Improvement of Intersections**

IV-Clean City Contest

4-Quality of Tourism and Public Services

- Side Walks
- Public Toilets
- Garden for Children
- Tourism Information
- Security and Safety for Tourists
- E-co Transportation

V-Project EcoMobility

1-Current issues facing travelers getting around town and temples

Ubiquitous Air pollution

Unfair fares

No Accident Insurance

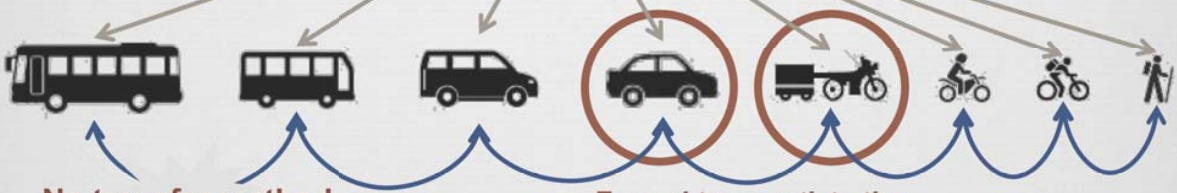
Traffic congestion

No by-pass or alternative routes

Narrow and bumpy roads

Poor traffic safety

Many journey choices for tourists



No transfer method

Forced to negotiate the details of the driver's services carefully

However, transportation to and around the temples is usually hired by the day.

V-Project EcoMobility

2-Benefits by EcoMobility

- Increase driver incomes
- Positive visitor experience
- Reduced Angkor Impacts

Thank You For Your Attention !

Seminar on Promotion of Integrated Eco Mobirity Services in Siem Reap,Kingdom of Cambodeia

JTB Corporate Sales Inc
Sales Promotion Department
2015.1.24

Ver0. : 20140926

About JTB・・・

◎Origin
Founded by national policy 102 years ago, to promote foreign tourists coming to Japan.

◎Transformation to Exchanging Cultural Business
Sublimation from sales agent, by inbound-outbound combination.

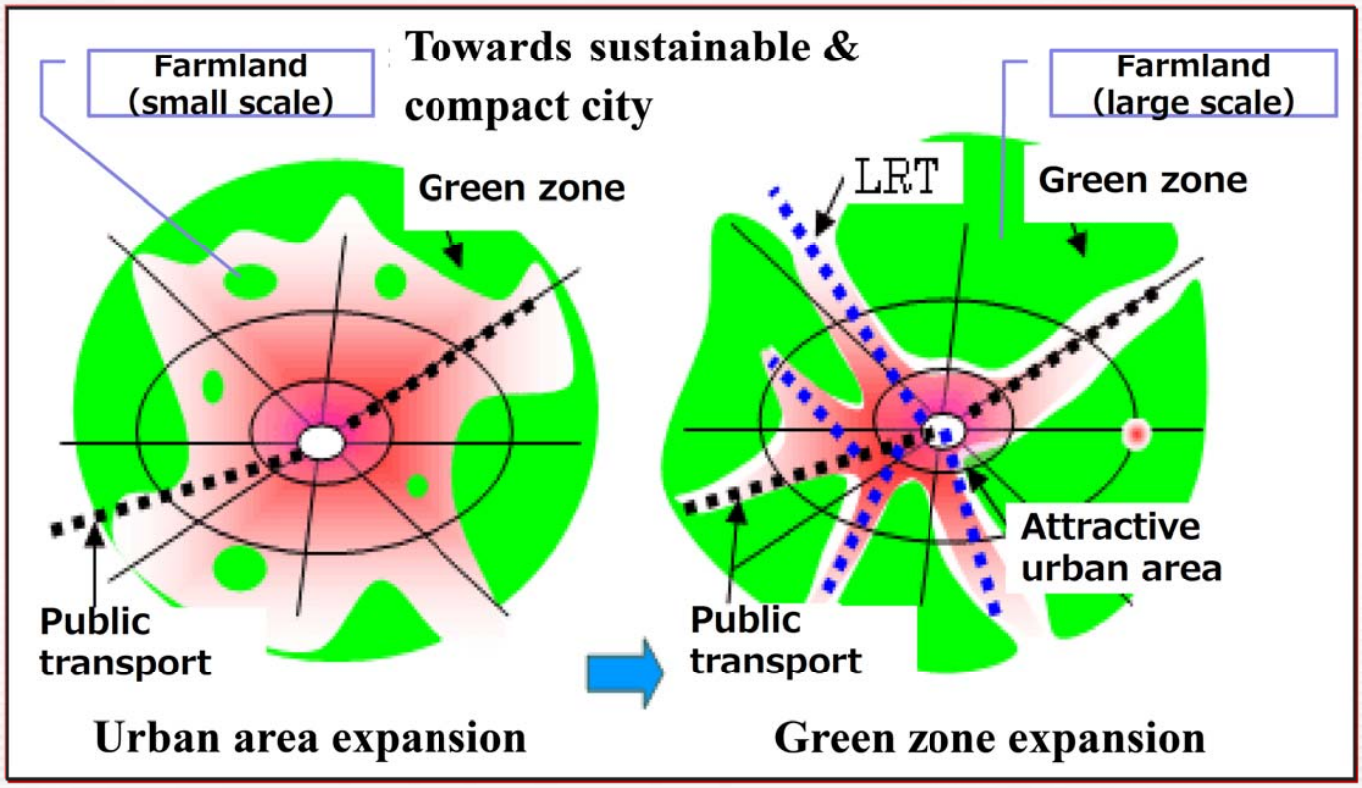
◎Purpose
To complement population decrease with population exchange (exchange of peoples)

◎Keywords
Information transmission and mobility via ICT.

120 thousand people ⇒ 10 thousand people（in 20 years）

3

Regional rebirth plan in Japan (urban areas)



4

JTB's Tourism DMC (Hawaii)

◎Mobility

Arrival at Airport ⇒ Briefing at Aloha Tower ⇒ Shuttlebus ⇒ Check-in (luggage is separately delivered to rooms), during stay, bookings for optional tours and restaurants accepted via smartphones and tour desks, 24h emergency support available in Japanese

http://www.jtb.co.jp/lookjtb/miryoku/shuttlebus/hawaii.asp

◎Information during stay, optional tours sales

Developing income generating models via cooperation with local tour agents, shops and hotels (support in Japanese, reassuring support in case of trouble, one-stop service, etc.))

http://www.oliolihawaii.com/

DMC: Destination Management Company

Mobility in Asia

◎Rolling-out Hawaiian model in Asia

http://www.jtb.co.jp/lookjtb/miryoku/shuttlebus/asia.asp

Roll-out opportunities in Angkor area;

①EV Mobility

②Heritage & environment conservation

③Regional life infrastructural development via ①&②

Energy platform based on renewable energy & reserve cell, developing an exchanging cultural, environmental tourism city, via cooperation with Japanese Gov, Japanese enterprises, Siem Reap Province, Cambodia Gov & local enterprises

http://www.rescgroup.com/eplatform/