# Introduction of ITS Business and Smart Community System - Demonstration Project of EV

三菱重工メカトロシステムズ株式会社



MHI MITSUBISHI HEAVY INDUSTRIES / GROUP

# Contents

# Outline of MHI's ITS Business

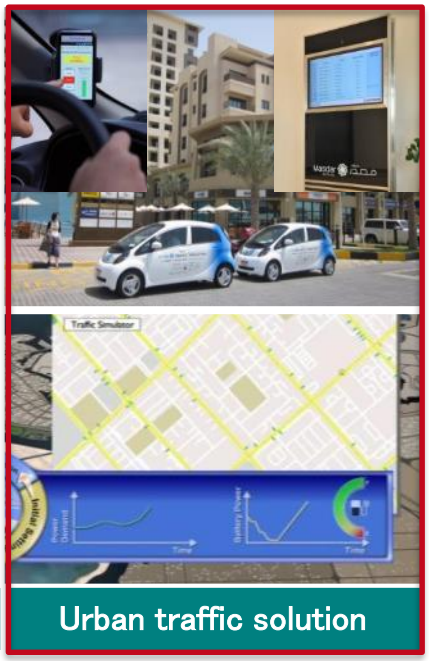
**Solutions by ICT to challenge social issues**
**brought about by development of motorization and urbanization**

| Relief of Traffic Congestion | Increase of Safety | Versatile Mobility |
|---|---|---|
| ⇒ Slashes time loss | ⇒ Slashes Property / Human loss | ⇒ Availability of effective usage |

- ITS is a typical business of MHI which applies common ICT platform of MHI.
- MHI has 50 years or longer experience and track records

Toll collection system


Traffic control system



Urban traffic solution

**The World's No.1 "ITS Total Solution Provider"**
**who solves global concerns in road transport sector by means of Technological capabilities and engineering available to utilize in global market.**

# MHI's Solutions and Technology for ITS

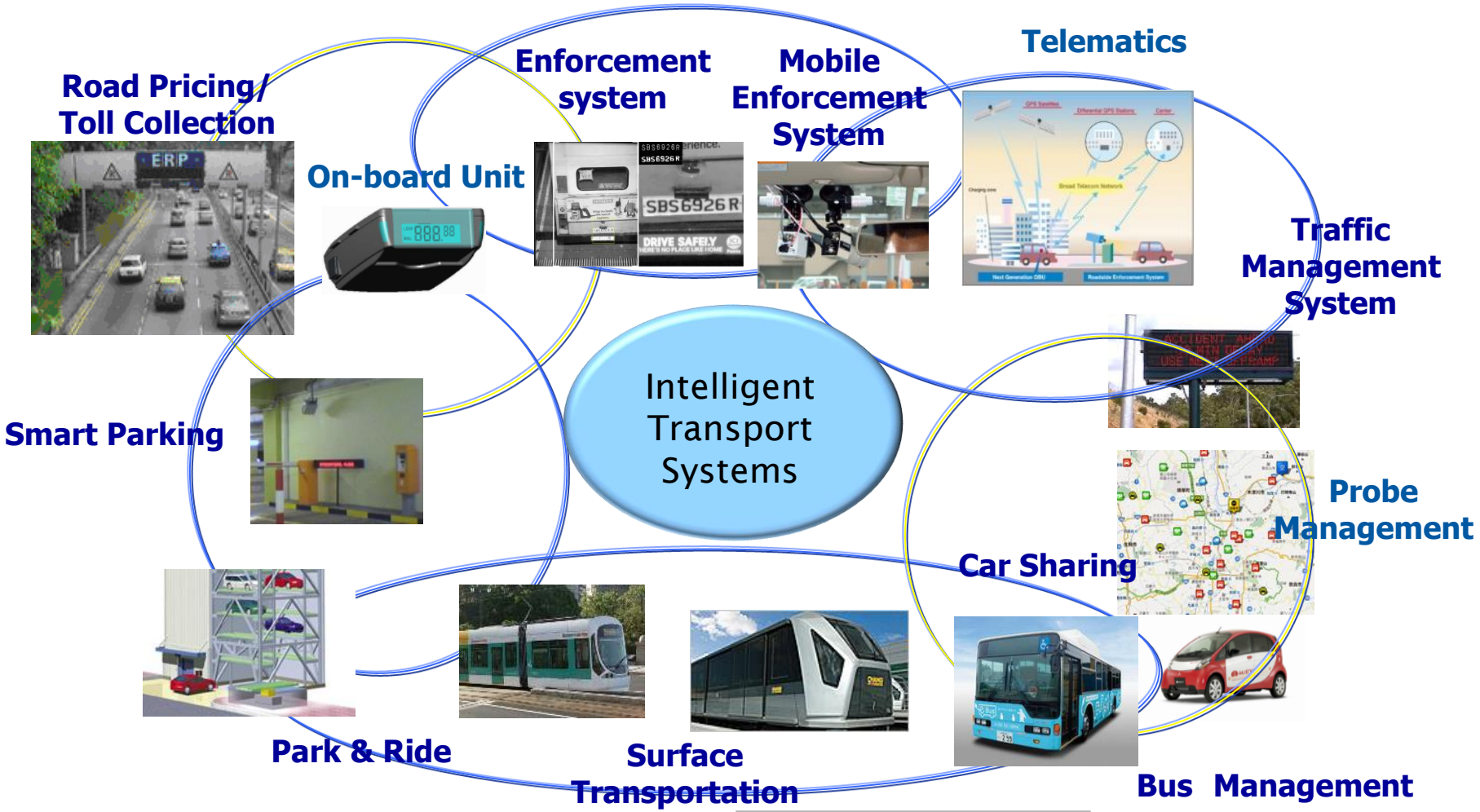



Image Processing | Map Matching | Remote Maintenance | Data Analysis

RF Communication | Real Time System | Security | Modeling & Simulation

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# Our Experience in the Global Market

≪Spain≫2011~
Smart City

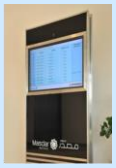
≪India≫2014~
Tolling System

≪China≫1995~
Tolling System
Traffic Information System

≪USA≫1984~
Tolling System

≪Korea≫1991~
Tolling System

≪UAE≫2011~
Smart City



≪Thailand≫2000~
Tolling System

≪Vietnam≫2015~
Tolling System

≪Malaysia≫1985~
Tolling System

≪Indonesia≫1979~
Tolling System

≪Sri Lanka≫2014~
Traffic Management
System

≪Singapore≫1998~
Electronic Road Pricing System
Electronic Parking System

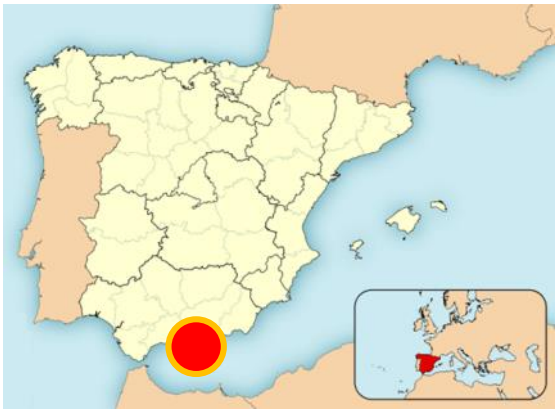

≪Japan≫1967~
Tolling System
Parking System
Traffic Information System
Smart city

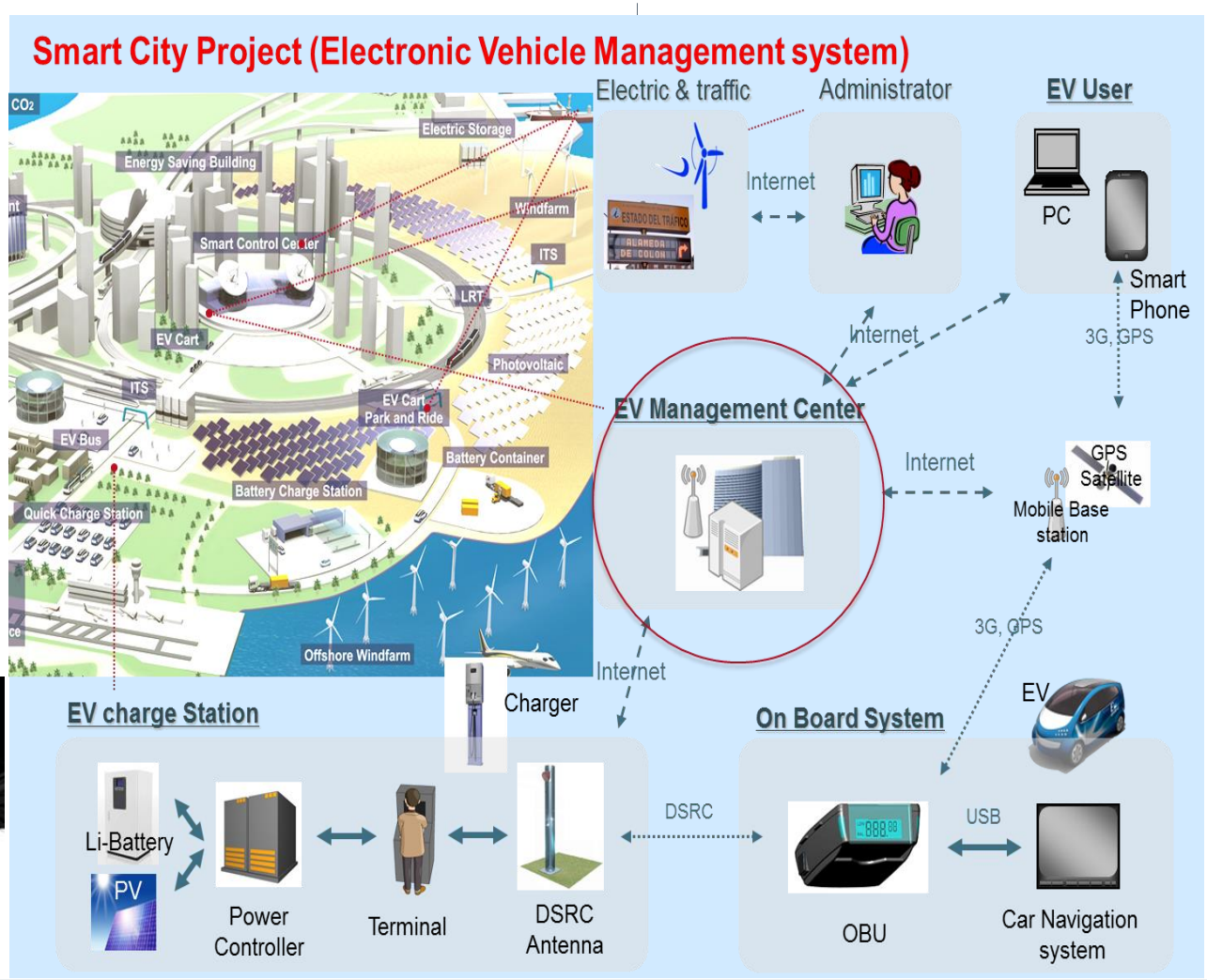
# MHI's Smart City Project

【Telematics for Electric Vehicles】

Pilot Projects of EV operation management and grid power demand management are in operation by utilizing RF communication technology, equipment control technology, on-board unit technology and data analysis technology etc.

## Spain, Malaga City



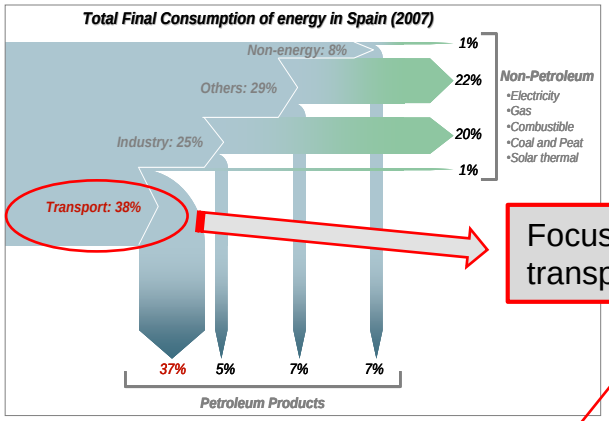



# Oveview of Malaga Project 'ZEM2ALL'

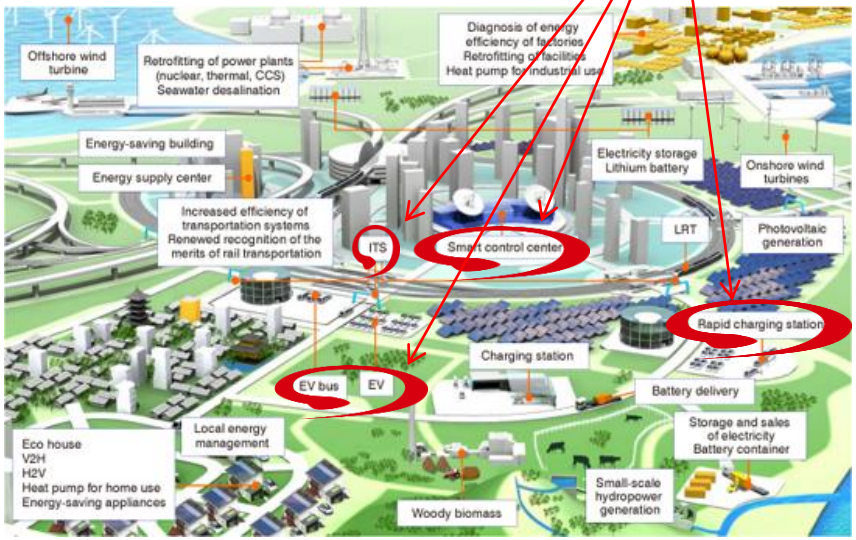
## 【Concept of Smart City】

**"Smart community"**:

- Smart **Supply**（e.g. Renewable energy, Efficiency distribution）
- Smart **Consume**（e.g. High-efficiency appliances, Smart meter）
- Supply & Consume **Balance**（e.g. Power demand response）



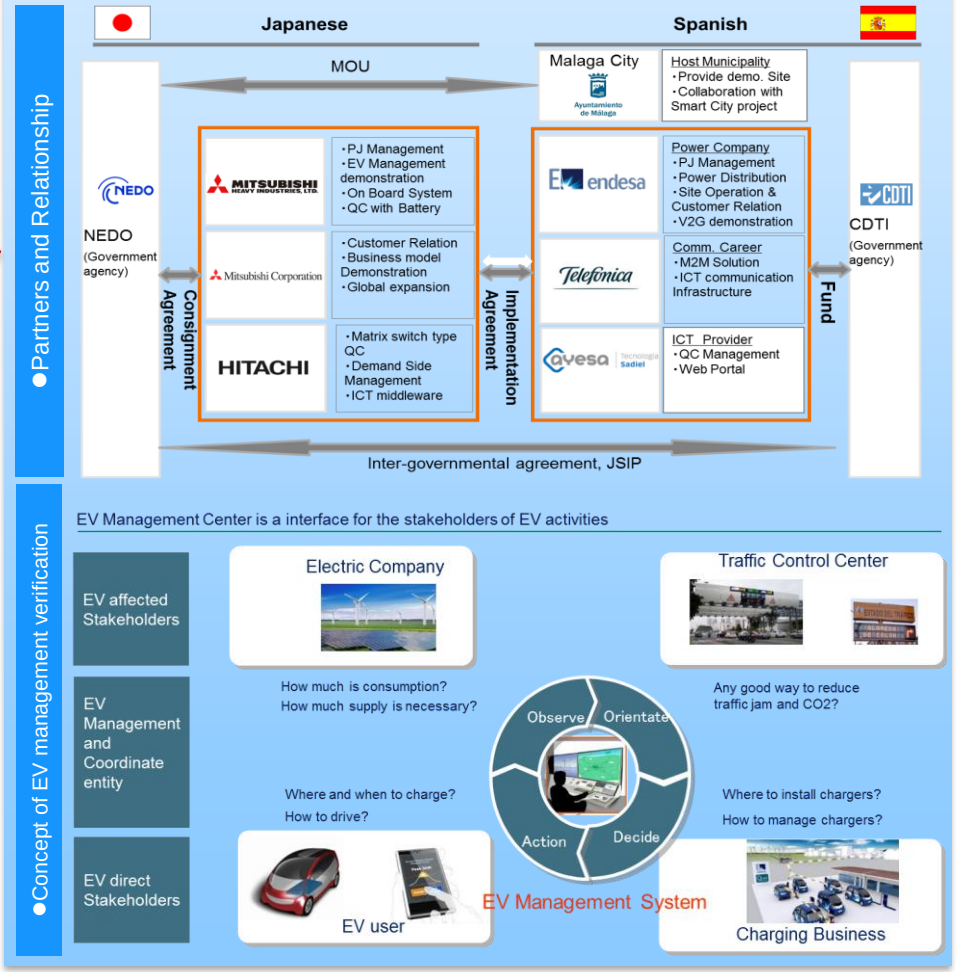

Focus on road transportation sector




## 【ZEM2ALL Project】

**"Smart mobility**

- Smart **Supply** (e.g. EV charging station)
- Smart **Consume** (e.g. EV/PHEV)
- Supply & Consume **Balance**（e.g. EV charge demand control)



# Verification packages of Malaga Project 'ZEM2ALL'

| | Verification packages | |
|---|---|---|
| Common Platform | ① Traffic data Management | Probe Collection and Processing |
| | | Bigdata Mining and Analysis |
| | | Telematics OBU sysytem |
| EV related | ② Demand response for EV | EV charging demand Monitoring |
| | | EV charging demand Estimation |
| | | EV charging demand Control |
| | ③ Support for EV drivers | Information for EV users (public portal, personal web site, e-mail, smartphone application) |
| | ④ Support for EV infra. Operator | Charging station Monitoring |
| | | Charging station Control |
| Common Sollutions | ⑤ Value added services | Driving analysis service |
| | | Car shareing management |

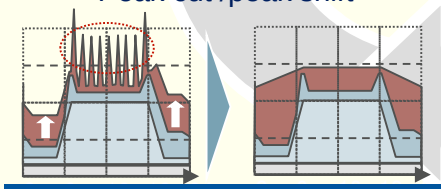
**Step1 : Monitoring**

- Monitor power consumption in real time by probes from EVs and charging stations

**Step3 : Control**

- We give users valuable points as inventive to change their charging behaviors. (ex. place, time, reservation)

Peak cut /peak shift



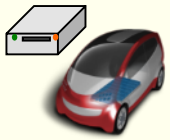
**Step2: Estimation**

- Estimate power consumption in future by big data(current status, historical data, whether, etc.)

**Demand response for EV**

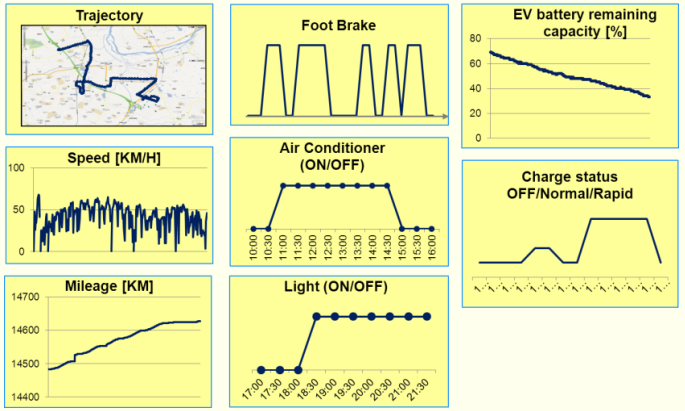
## Traffic data Management

DB and DWH in servers

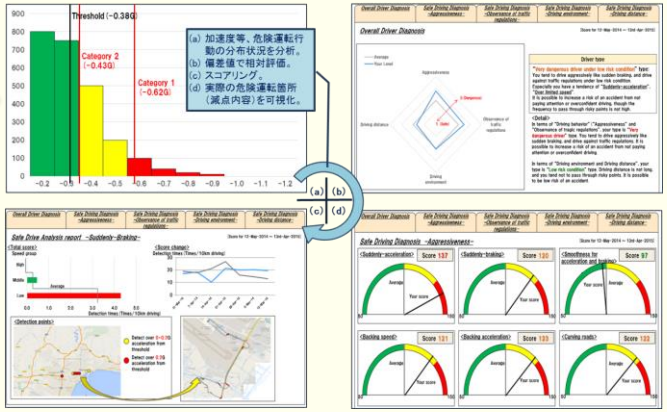


- How drive?
- What are they doing?
- Where will they go?

Participants'EVs




Analysis

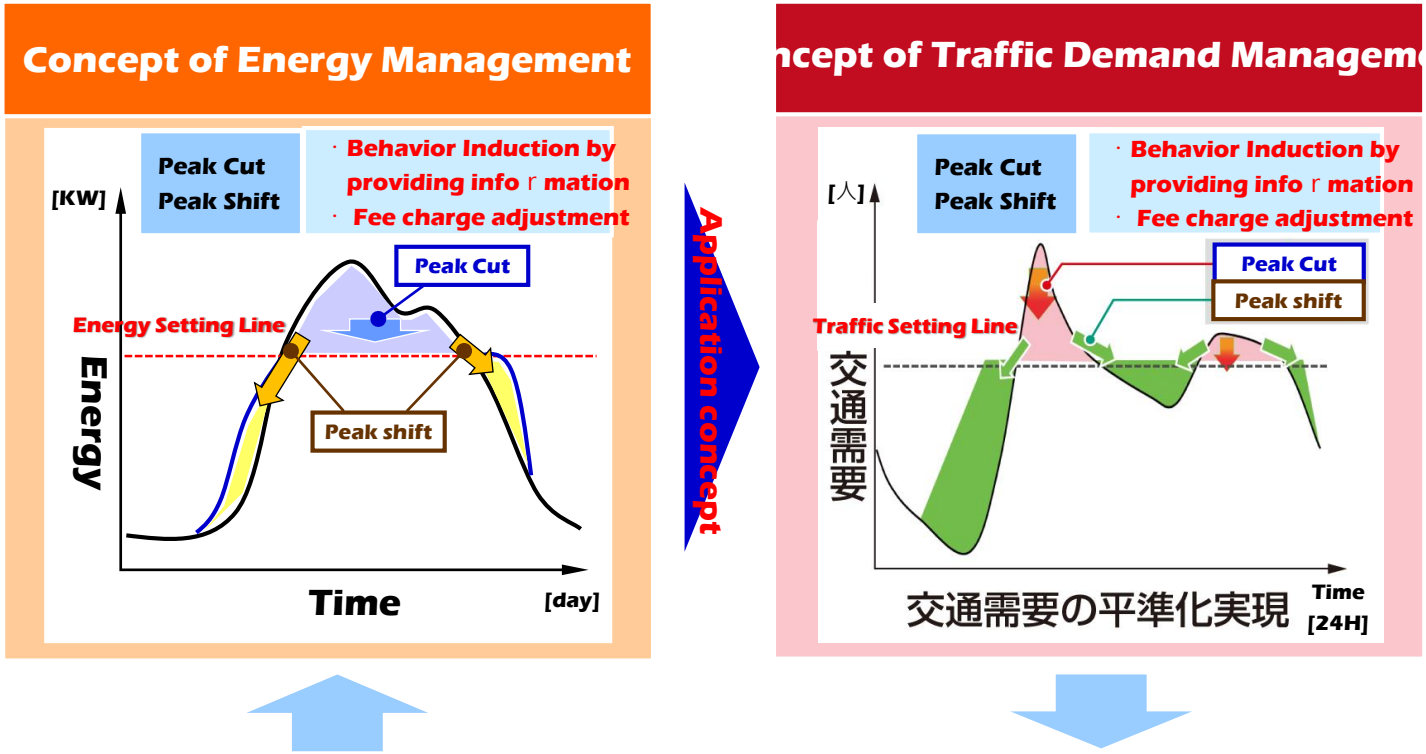


Recommend EV Driver

# Application to Mobility Sharing of EV management

【Application to the demonstration of Traffic Demand Management】

It is expected that such a management system for changing behavior can be applied in the future, not only to EV power management but also to the entire transportation field. MHIG plans to establish and verify a mechanism that generally motivates drivers who are the main movable constituents of transportation as well as the main consuming constituents.




EV Demo（Malaga・Keihanna）

Application to Mobility Sharing

# MobilitySharing Solution Proposed by MHI

## 1.1 Effective in solving the problems of users and business users of usage behavior prediction

**Problems**


**Solution**

Solve the business user problem by usage behavior prediction

・from where to where / when / how much :demand prediction

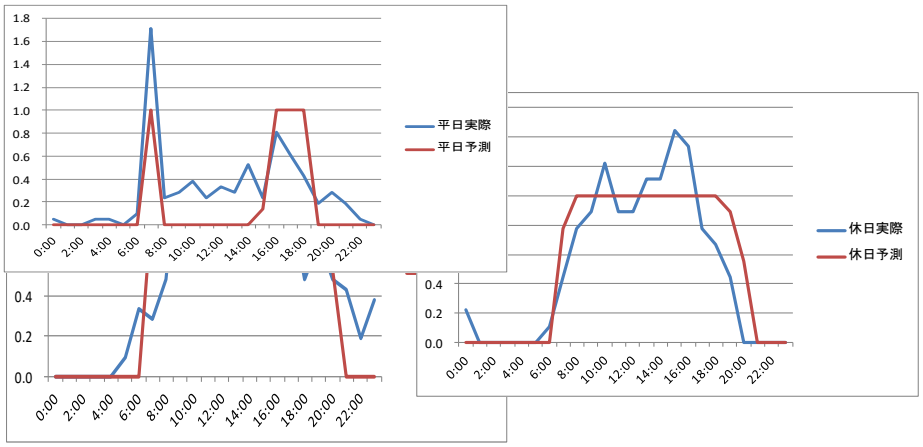
→(1)possible to predict the effective service area and time

→(2)OW(one way type=drop off type)parking of car share possible to minimize the parking spaces and reduce the cost of forwarding cars

## 1.2 Achieve the optimization of car share by usage behavior prediction (Expectation Example)

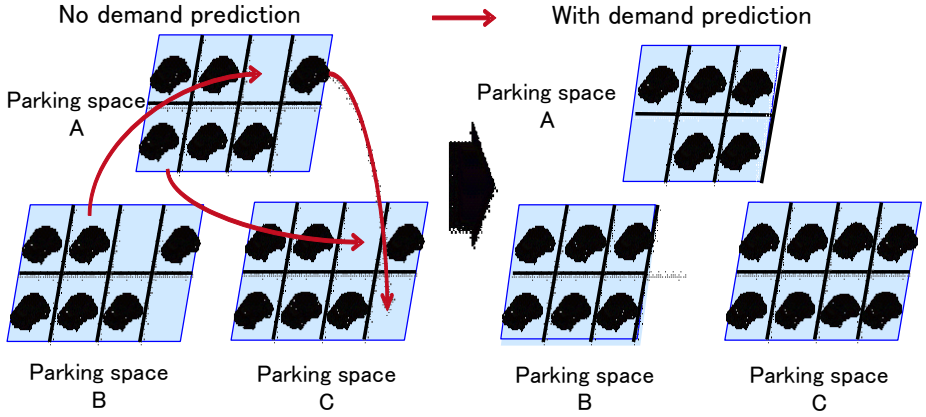
### (1) Choice of effective service area/time

By predicting the net working rate after introduction, it will be possible to select the area and time with business feasibility.



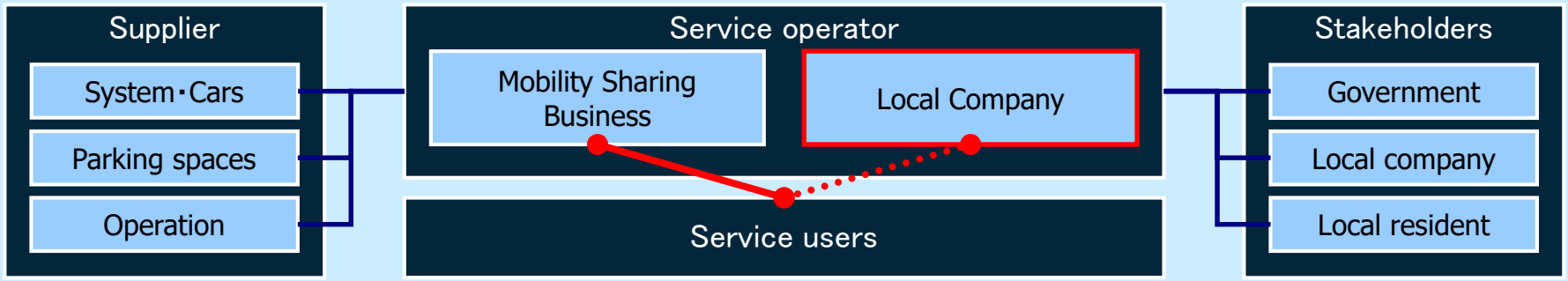

### (2)Planning the parking spaces effictivity

By doing the parking usage prediction, it becomes possible to minimize parking space and reduce forward costs of the cars, which is a concern for OW type car share.

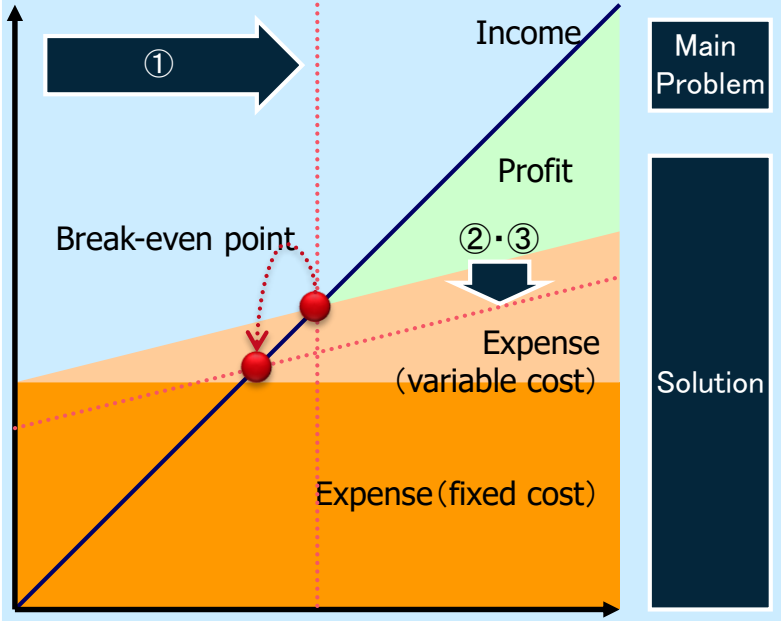


# Business Model of Mobility Sharing

## 1) The basic business model of Mobility Sharing : Revenue from service user




## 2) The point to realize the business model of Mobility Sharing : important to cooperate with local company




Main Problem

Business structure of huge fixed costs

Ensure possible large customer base to recover fixed costs(①)(Ideal is horizontal deployment from the existing businesses of the community-based)

Collaboration with local companies

Improvement of ARPU*

Solution

Solution provided by MHI

Services that fit into the existing customer base of benefits(one way type rather than round-trip)

Optimize the car forwarding → Reduce the operating cost (②) → Utilization of local senior human resources

Optimize the parking space → Reduce the land rent cost (③) → Cooperation with the government and local businesses

*ARPU : Average Revenue Per User (monthly revenue per user)

# Purpose of ‘SEA:MO’ Project and Role of MHI

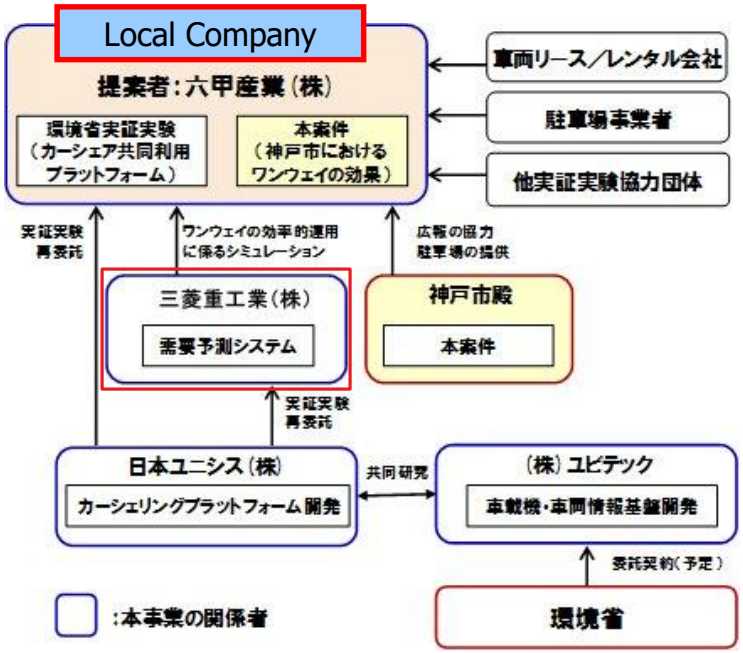
## Purpose

“Kobe-City comprehensive transportation planning” aims to achieve the well balance of pedestrian, bike, car etc. in the center of the public transportation to form a comfortable traffic environment measures. Therefore involve public and private sectors to consider the possibility of introducing one-way type (drop-off possible) car-sharing to supplement the current public transportation.

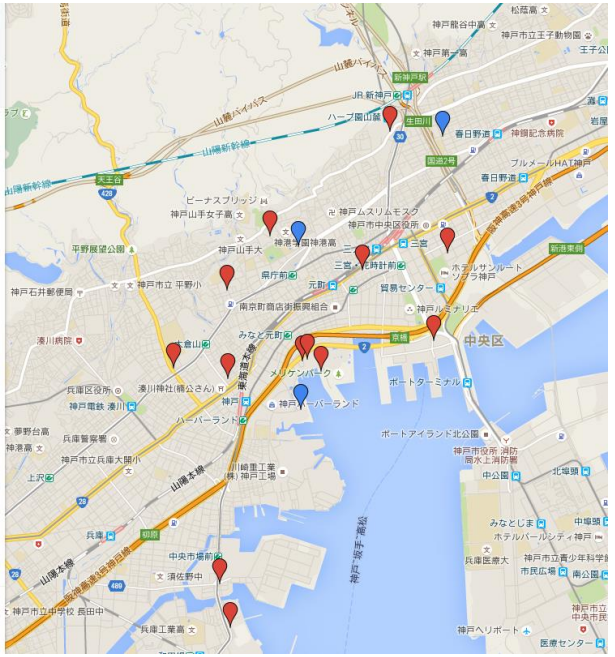

## Demonstration Field

- Verify the convenience / business of one-way type car-sharing on the assumption of the public transport
- Verify the development and CO2 reduction effect of EV car-sharing platform that can contribute to the reduction of environmental pollution

## Scheme







# Verification results of ‘SEA:MO’

- Gradually increase in the number of member（756 member on 2/29）、Mainly 30～40 generations,  wide range of age groups use this service . About 20% of all members regularly  use this service( Fig. 1, 2)
- 70% of the member are resident of Kobe city, and 31%live in Chu-o District（Fig. 4）

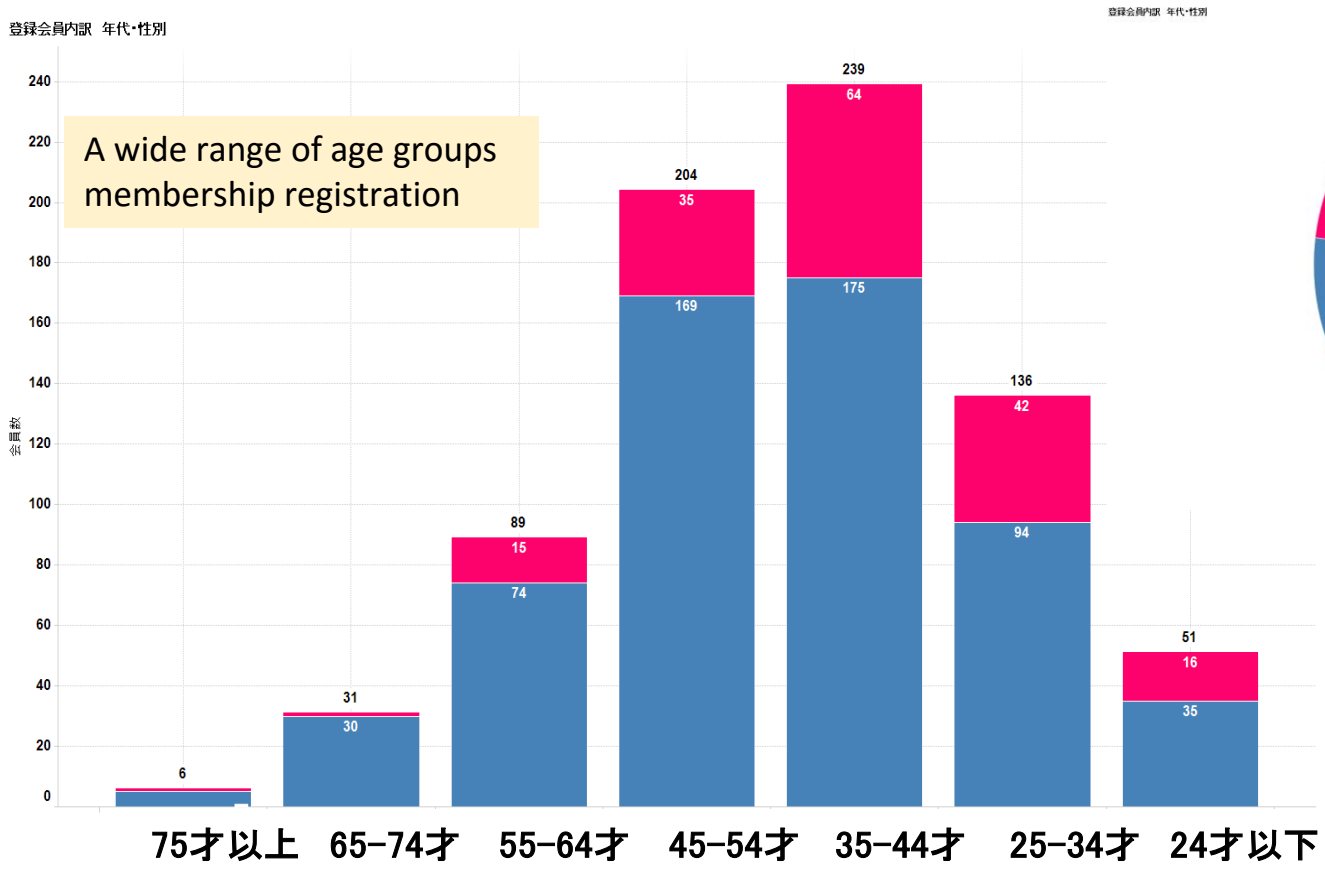



Fig.1　Age structure of the member

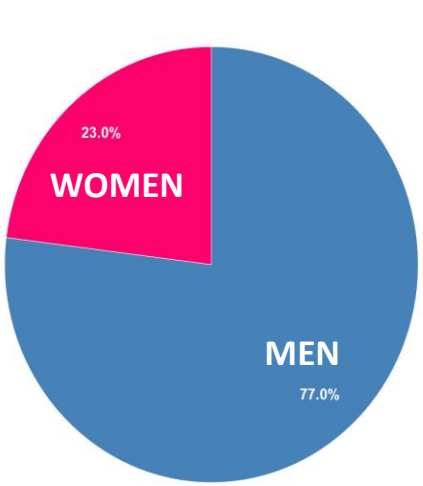



Fig. 3　Men and women configuration

Men  and Women  ratio is around 3 : 1

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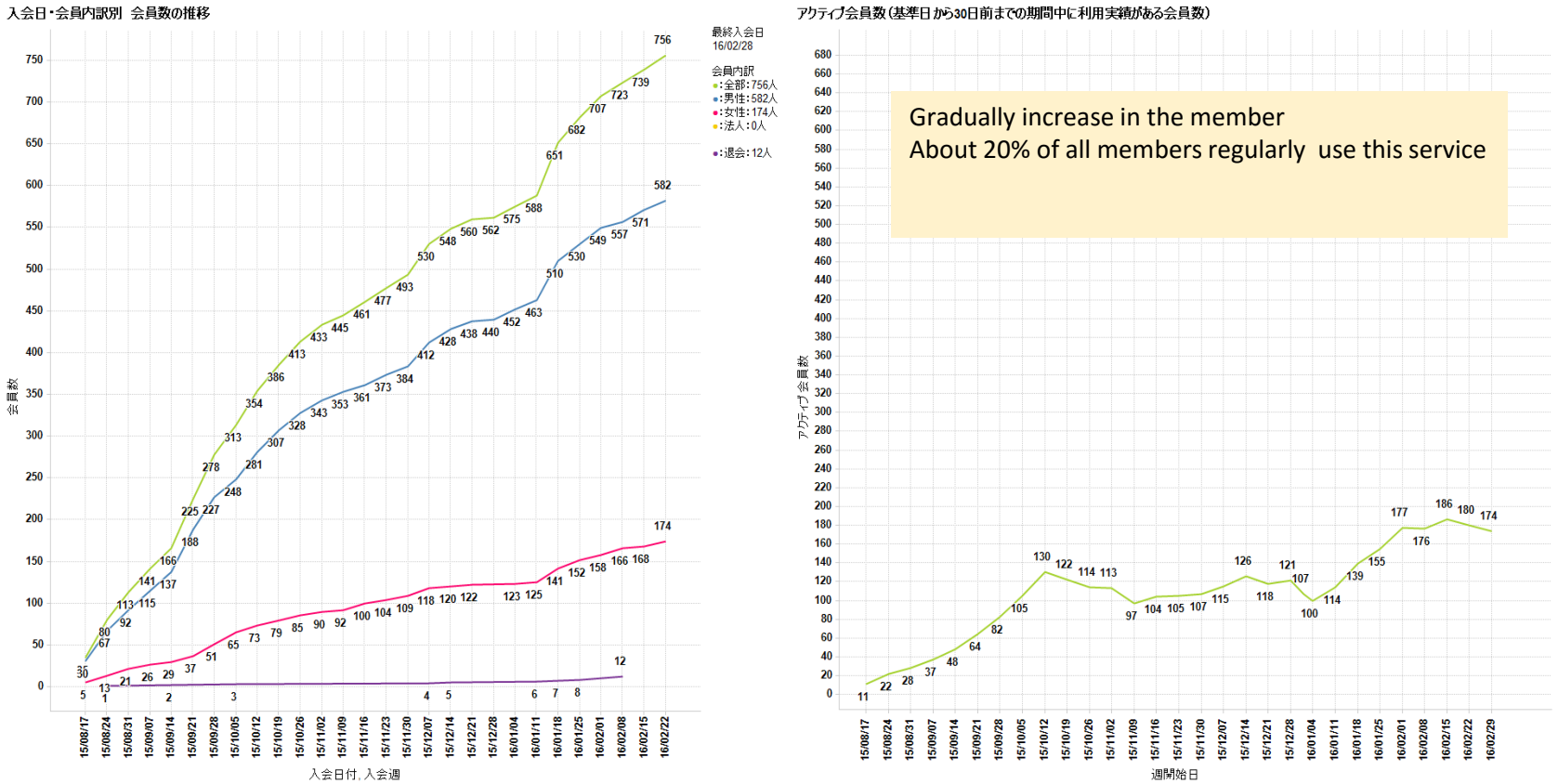


Fig. 2　registration change of the member

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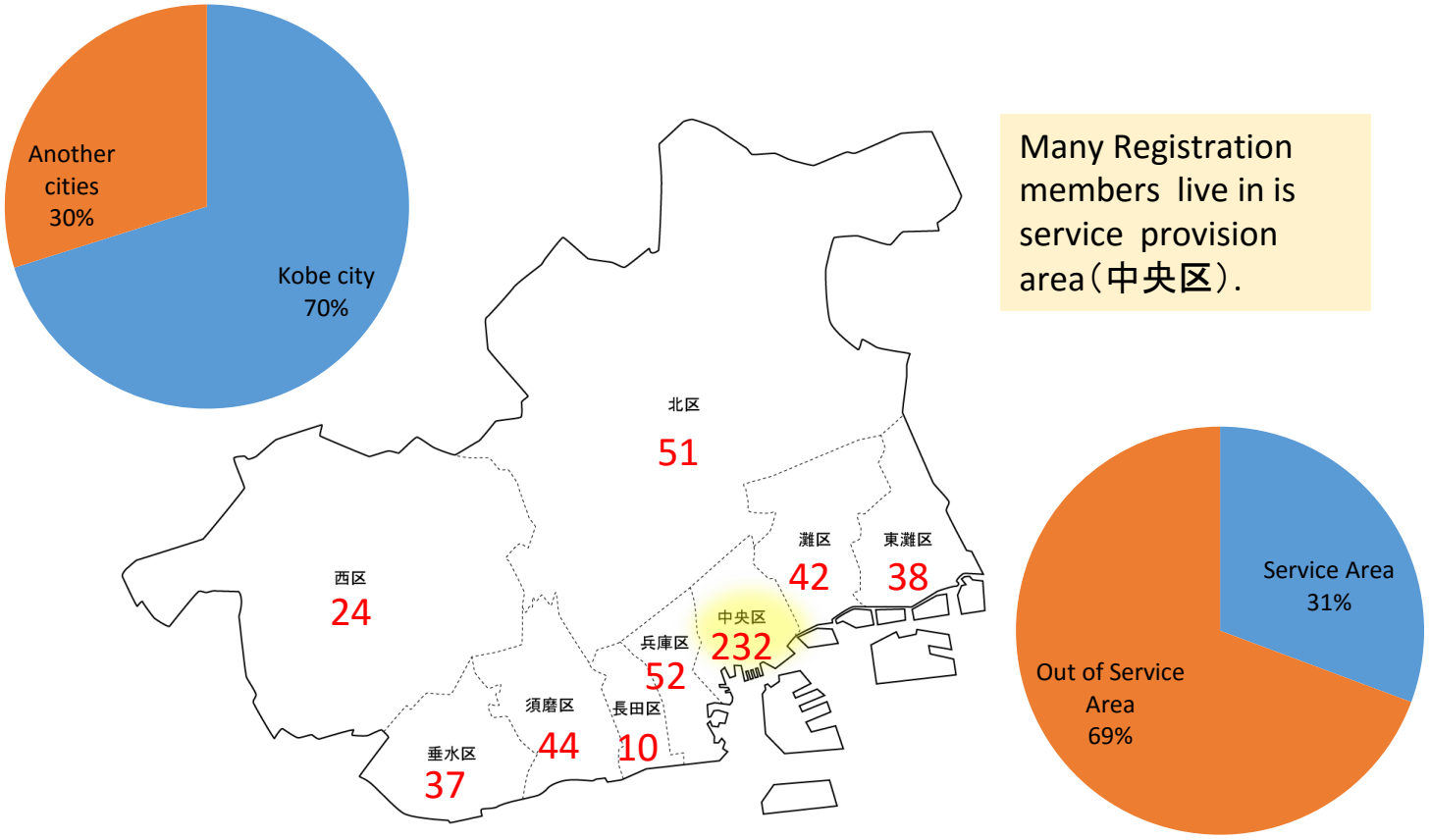



Fig.4　Member location

# Verification results of ‘SEA:MO’

Separated kobe city by a 100m mesh, and record the number of data in one mesh by the latitude and longitude of the travel history of the vehicle (traveling tracked by every 30 seconds). Only the mesh with more than 20 points are displayed.

・The size of the circle is greater as the number of data in one mesh is larger (means heavy traffic).

・Color in the circle represents the ratio of holiday : weekday within a mesh.

・②③⑥⑦⑧ in the figure shows the location of the port of Figure 2 with red frame.

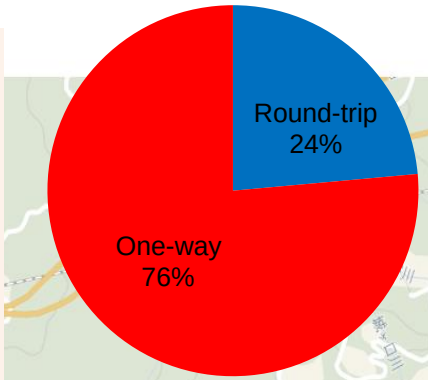



Fig.3 Oneway／Round-trip Usage

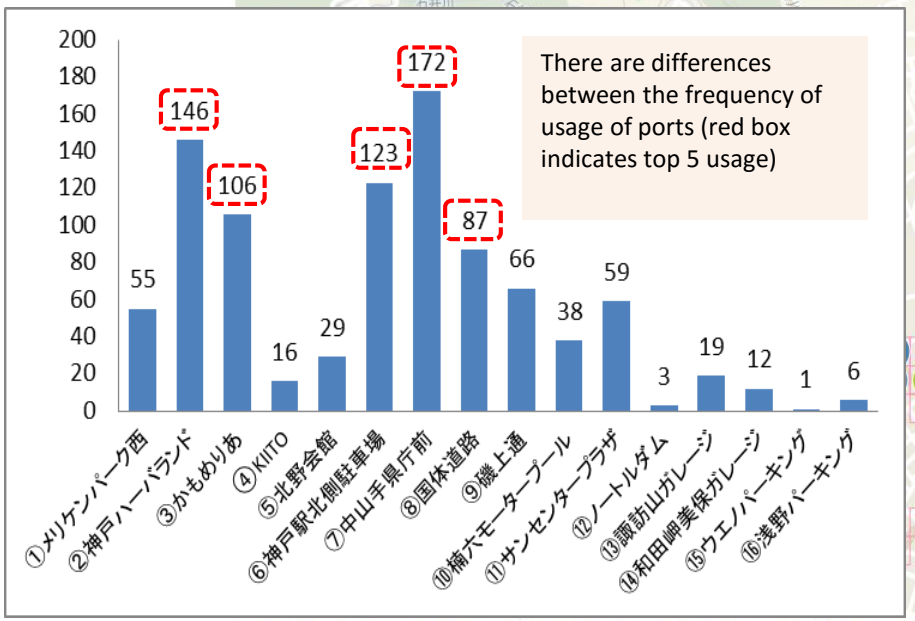



Fig.2 Frequency of usage by ports（Lending）



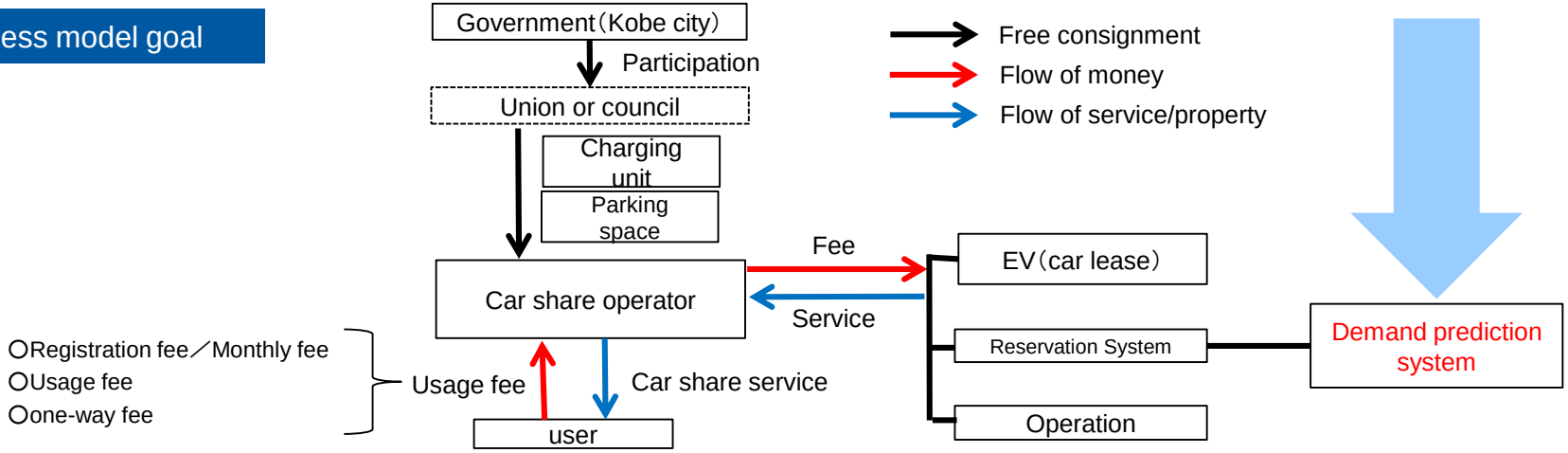

Fig.1 Usage pattern（shows the top 5 of lending spot）

# Verification results of ‘SEA:MO’

## Demonstration result and Future steps

| KPI | Current status | Solution | Government and public responsibility | |
|---|---|---|---|---|
| | | | Kobe city | Public |
| ①The average occupancy rate: keeping more than 20% | ・About 6% for i_Miev （free of charge） （About 20 % for Active member ） | ①increase user (strengthen the public relations/ simplify the registration process etc.) | ○ （Appeal to the target user） | ○ （Partnership with hotels and commercial facilities） |
| | | | ○ （e.g. Reception counter in city hall） | ○ （Partnership with hotels and commercial facilities） |
| | | ② increase users’ rate of utilization | – | ○ （Use evocation based on the demand forecast） |
| | | | – | ○ （Selection of ports with expected demand） |
| ② provide free service port (if EV, battery charger also required) | ・Port is not free of charge （difficult to keep the space） ・no charging unit in the port | ③provision of service port | ○ | – |
| | | ④Maintenance of charger (regular charger) | ○ | – |
| ③Half the personnel expenses due to management efficiency | Large burden of EV charging / forwarded process by EV use and one-way. | ⑤optimize operations | – | ○ （Efficiency of forwarding） |

## Business model goal



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