Intelligent Transport Systems development In Japan

ITS Japan

November 6, 2012

Takaaki Segi

Achievements of Automobiles

Greater mobility
Freedom and convenience
Mobile private space

Development of mobility supports economic growth, as well as social and cultural expansion.

Challenges for Sustainable Mobility

Environmental Protection

Traffic Safety

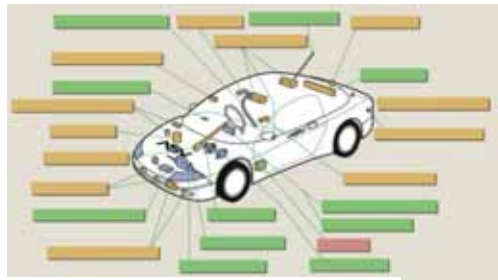
Efficiency

Infrastructure: Roads and Railways
Technologies: Intelligent Transport Systems
People: Changes in Behaviors

9 Areas of ITS Development in Japan

1. Car Navigation

2. ETC



3. Driving Safety

4. Traffic Management

5. Road Management

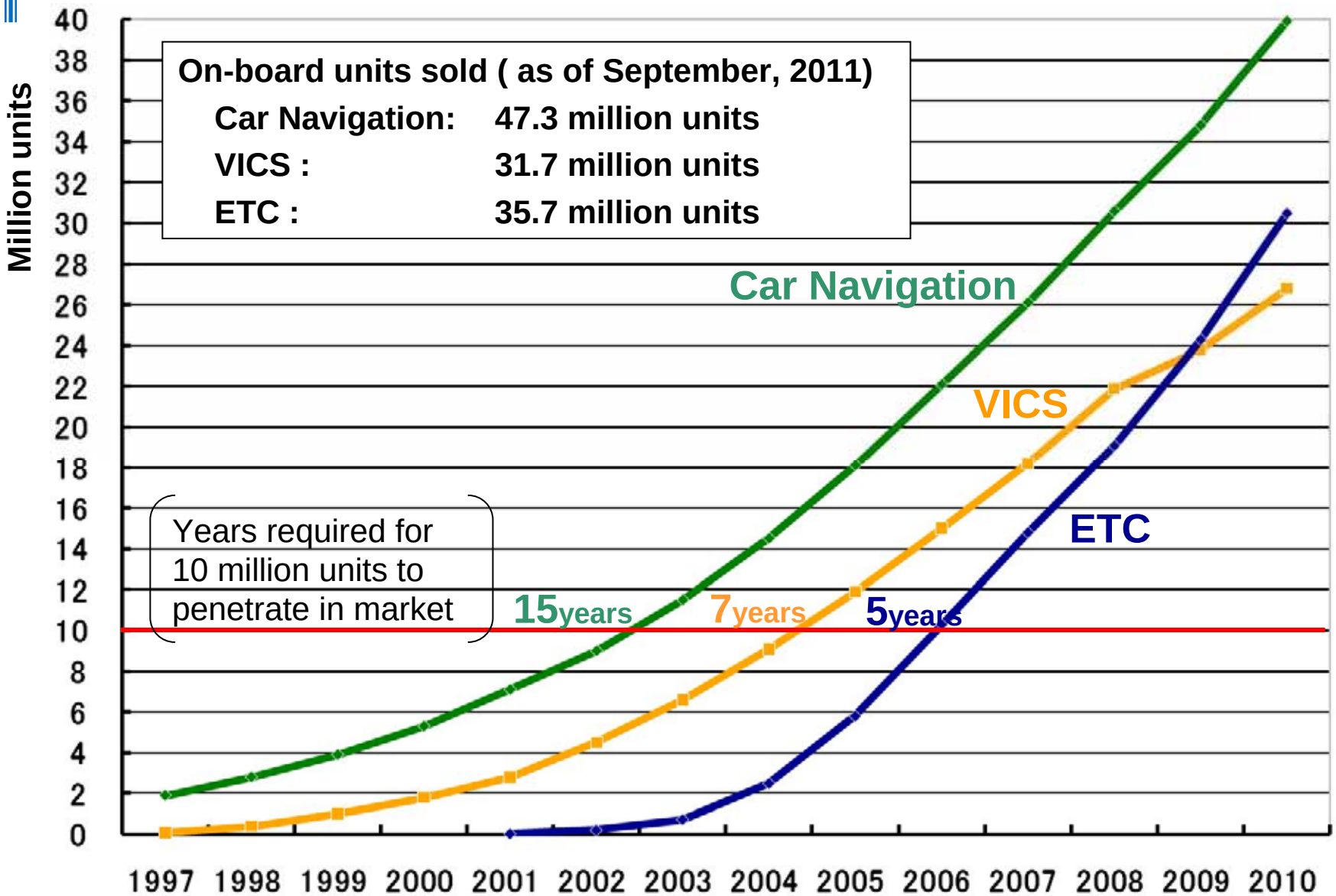
6. Public Transportation

7. Commercial Vehicle Operation

8. Pedestrian Support

9. Emergency Vehicle Operation

Market Penetration of On-board Units



Source: Ministry of Land, Infrastructure, Transport and Tourism

VICS

Vehicle Information and Communication System

Police Department

Traffic Information Center

Road Operator

VICS Center

FM Multiplex

Regional traffic information is broadcast through FM radio station.

Radio Beacon

Highway traffic information up to 200km ahead is sent through DSRC beacons.

Infrared Beacon

Local traffic information up to 30km ahead is sent at major intersections.

VICS Display

: Congestion

: Heavy traffic

: Accident

: Vehicle breakdown

: Obstacle

: Road work

: Construction

: Road closure

: No entry

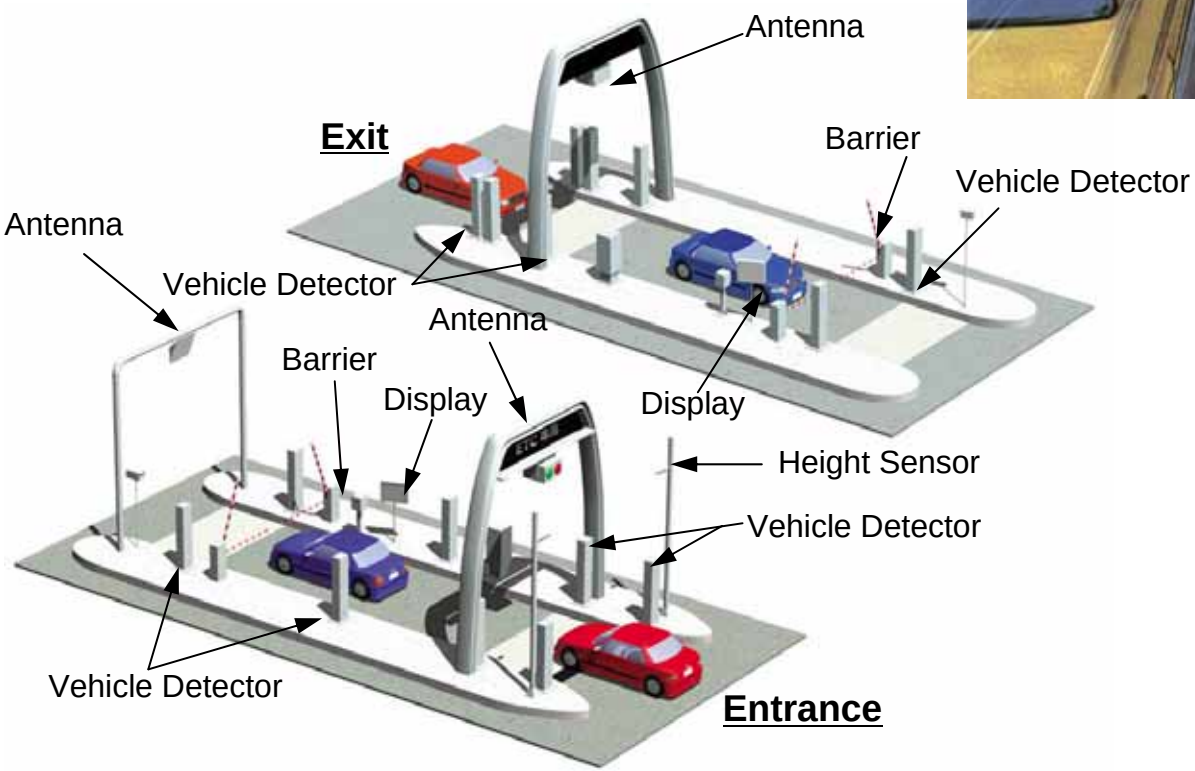
: Limited access

: Road narrows

: Alternative control

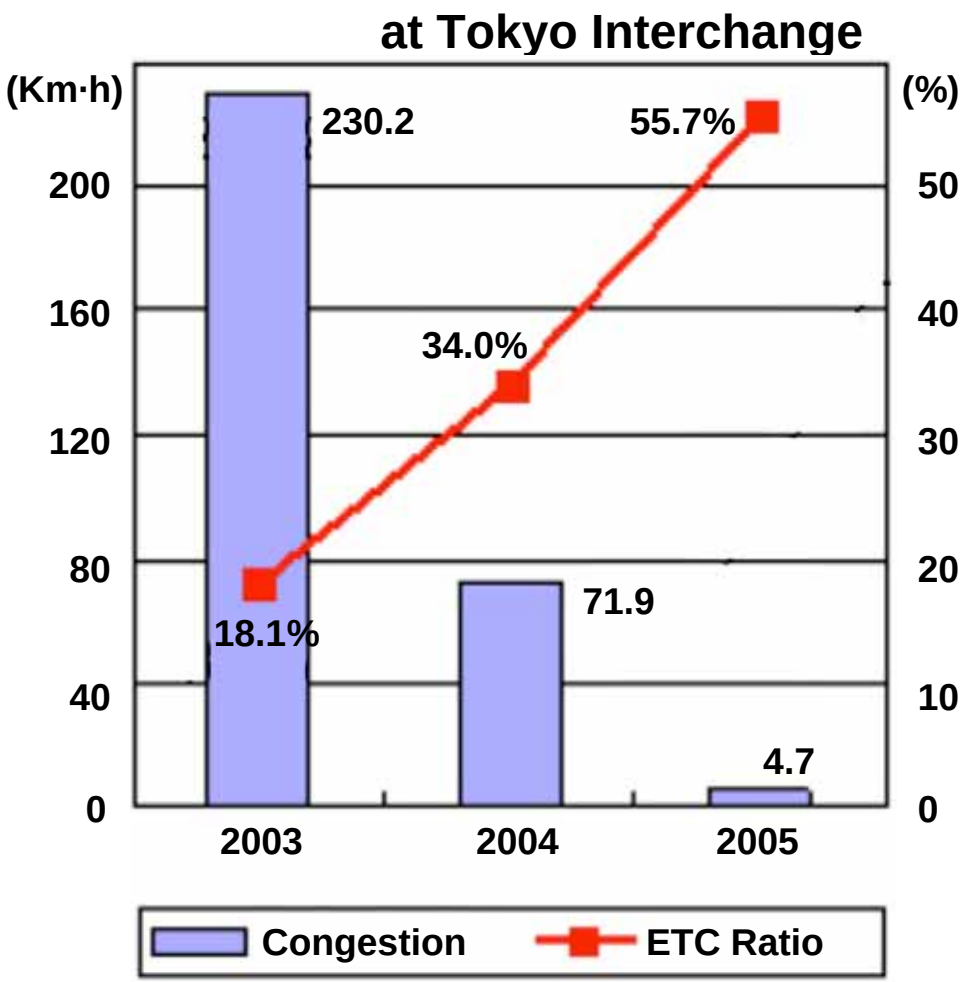
Electronic Toll Collection

Highway tolls are electronically collected through radio communication without stopping at toll gates.

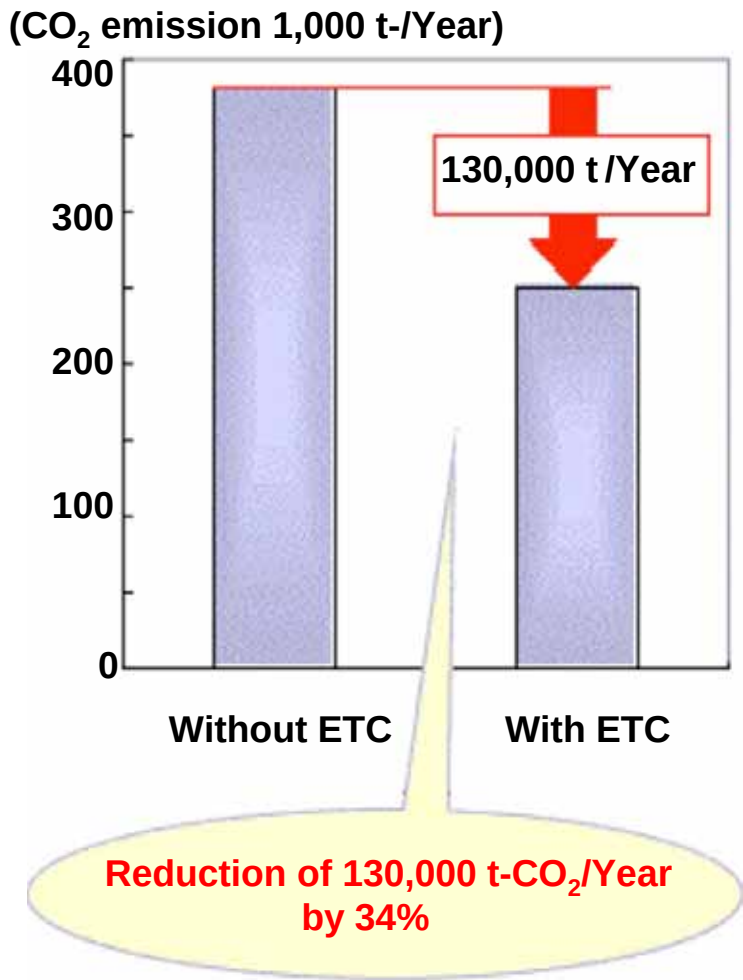


Social Benefit from Widespread Use of ETC

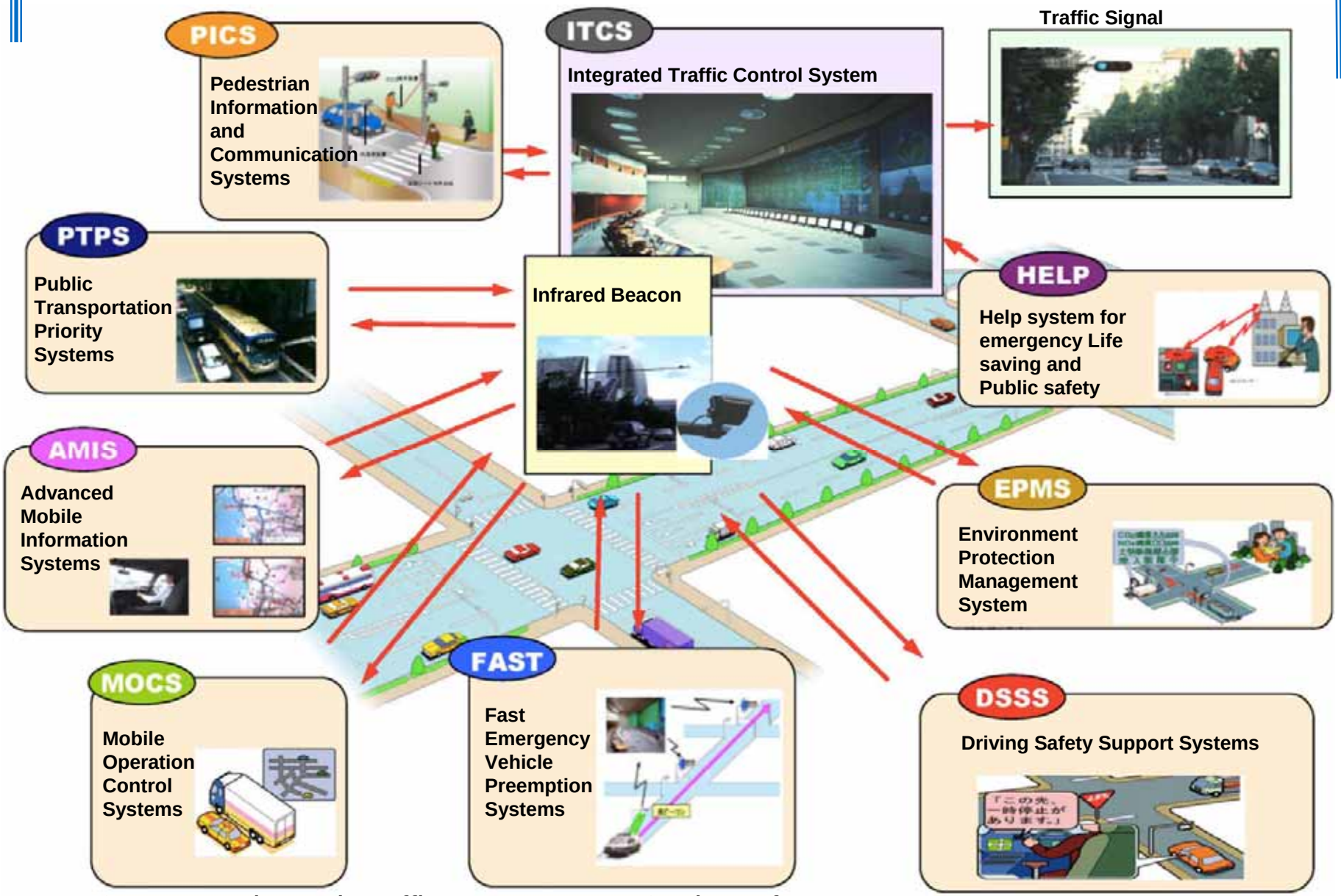
Reduction of congestion



Reduction of CO_2



Universal Traffic Management System



Source: Universal Traffic Management Society of Japan

Traffic Management

For safety and smooth flow, traffic signals are systematically controlled by measuring and predicting traffic flow.

Vehicle Detectors

Traffic Control Center

Traffic Signals

Variable Message Signs

Infrastructure light implementation

Conventional Traffic Information System

Fixed sensor data

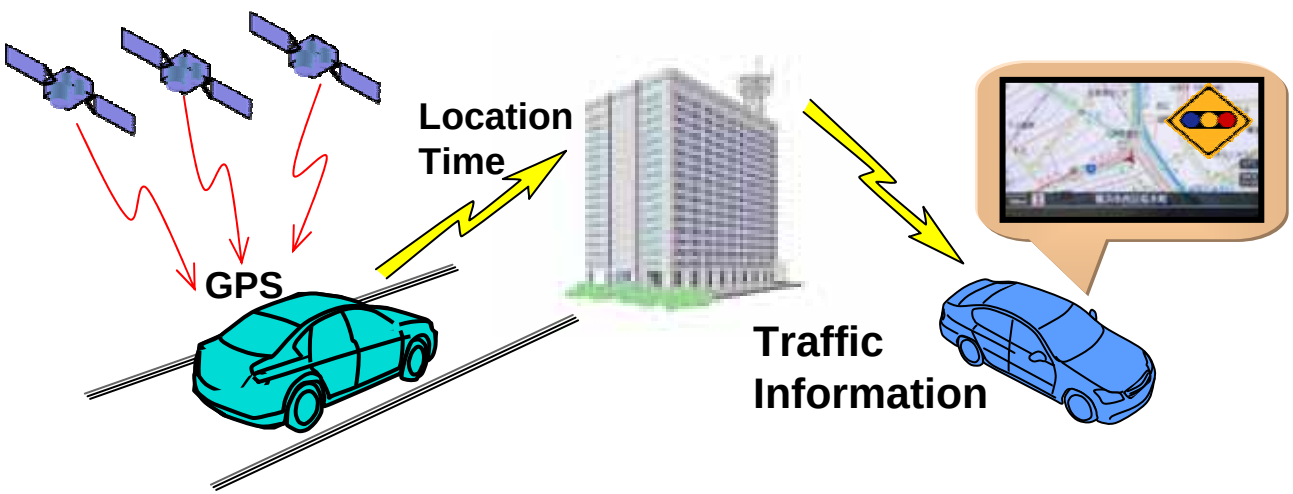
Central Tokyo

Traffic Control Center

Mobile Device based System

Probe Data

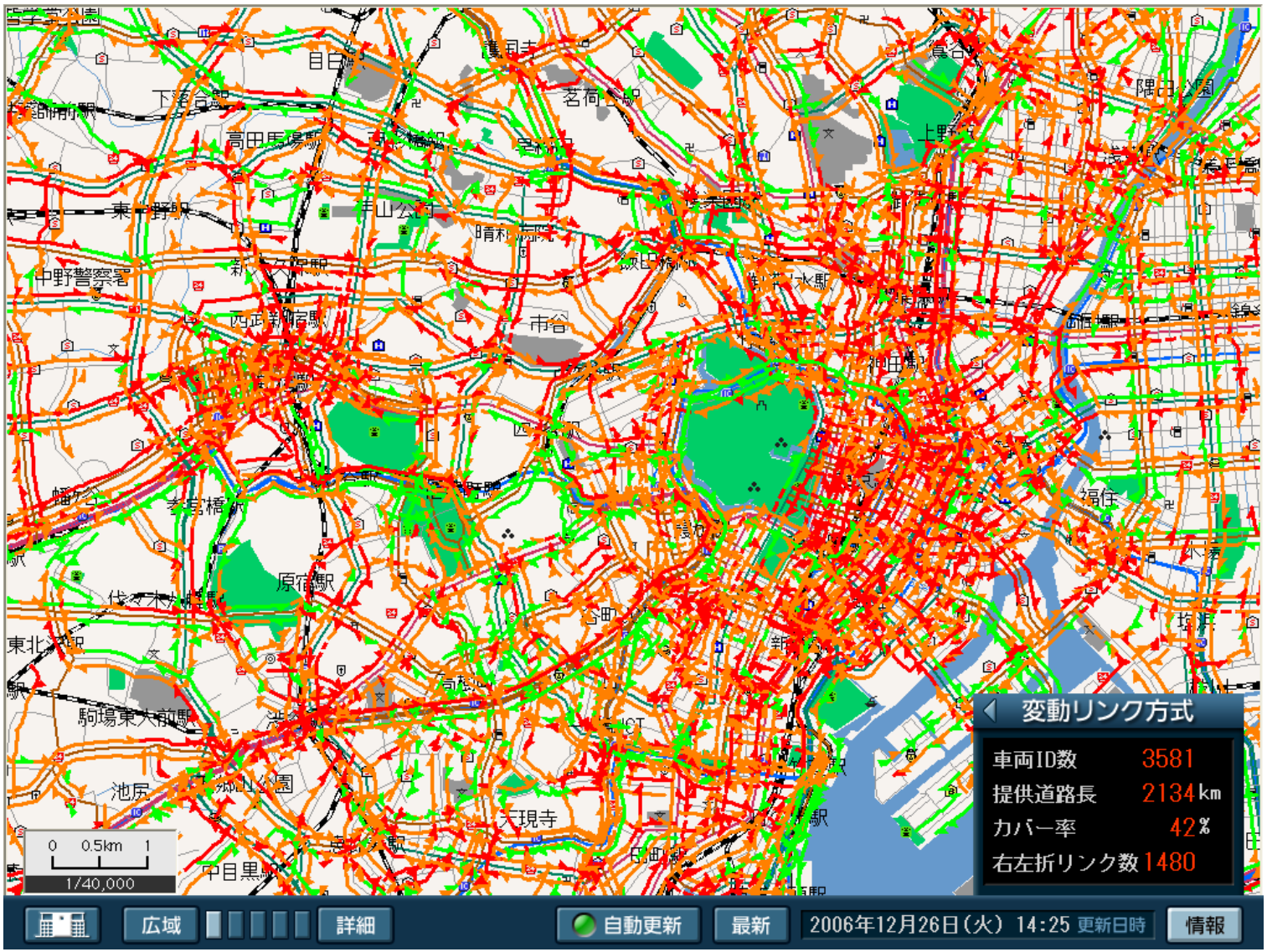
Central Tokyo



Source: Pioneer Corporation

Urban Transport System

Traffic Management System with Probe Data Collection

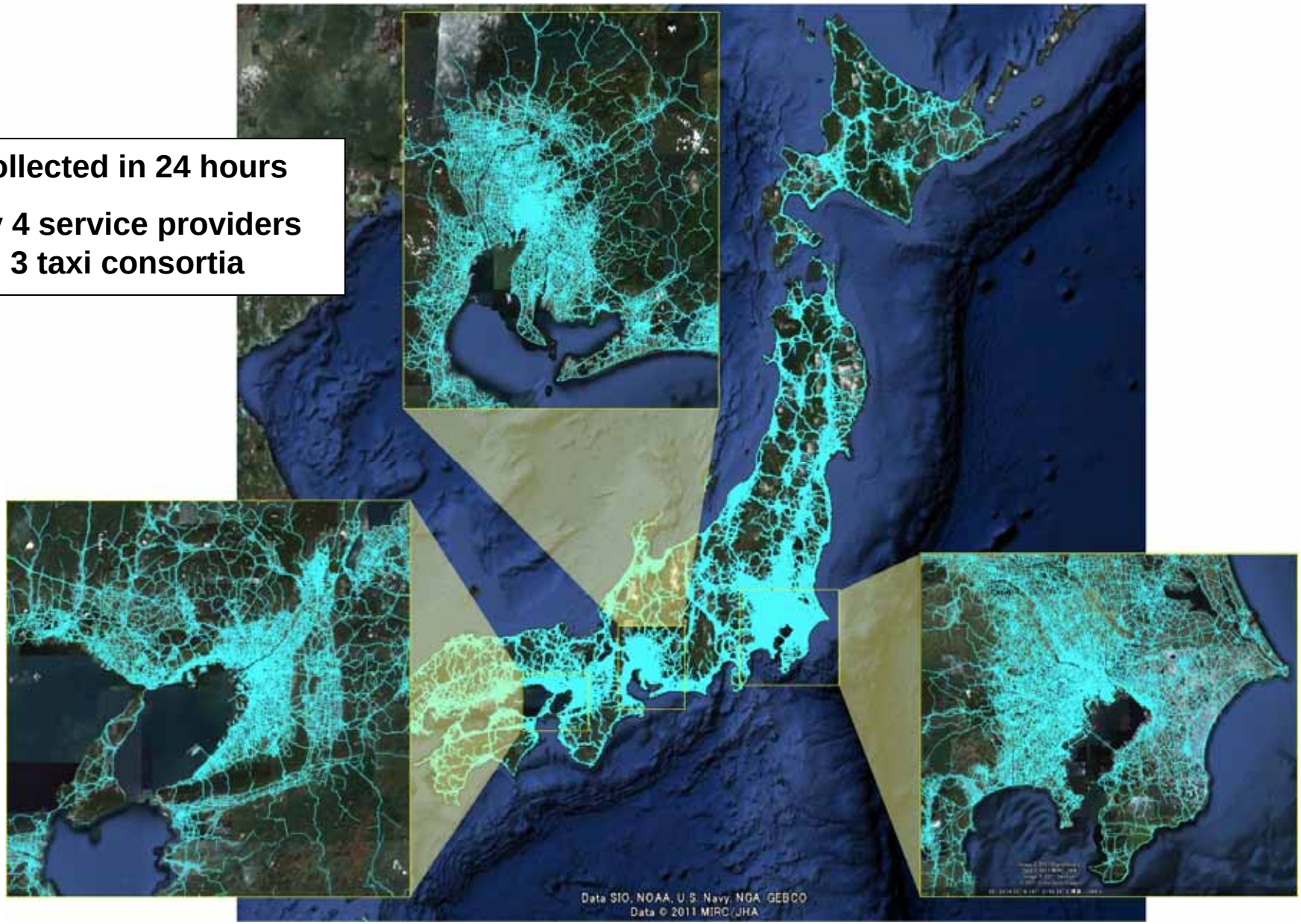


Source: COSE

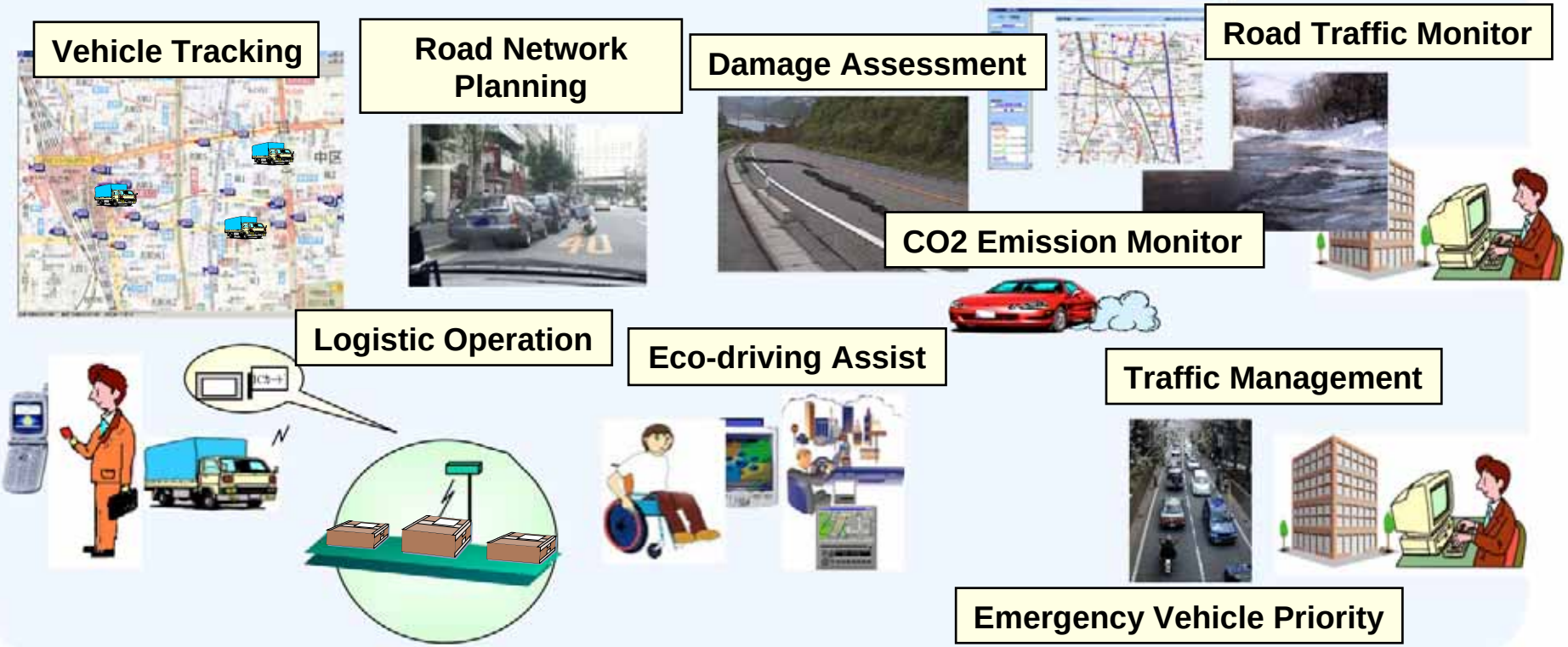
Probe Data Collected by Private Sector

Collected in 24 hours

by 4 service providers
3 taxi consortia



Anticipated Services



Concept: - Shared database and interface

- Ubiquitous and high speed network connection
- Vehicles as network terminals with physical mobility

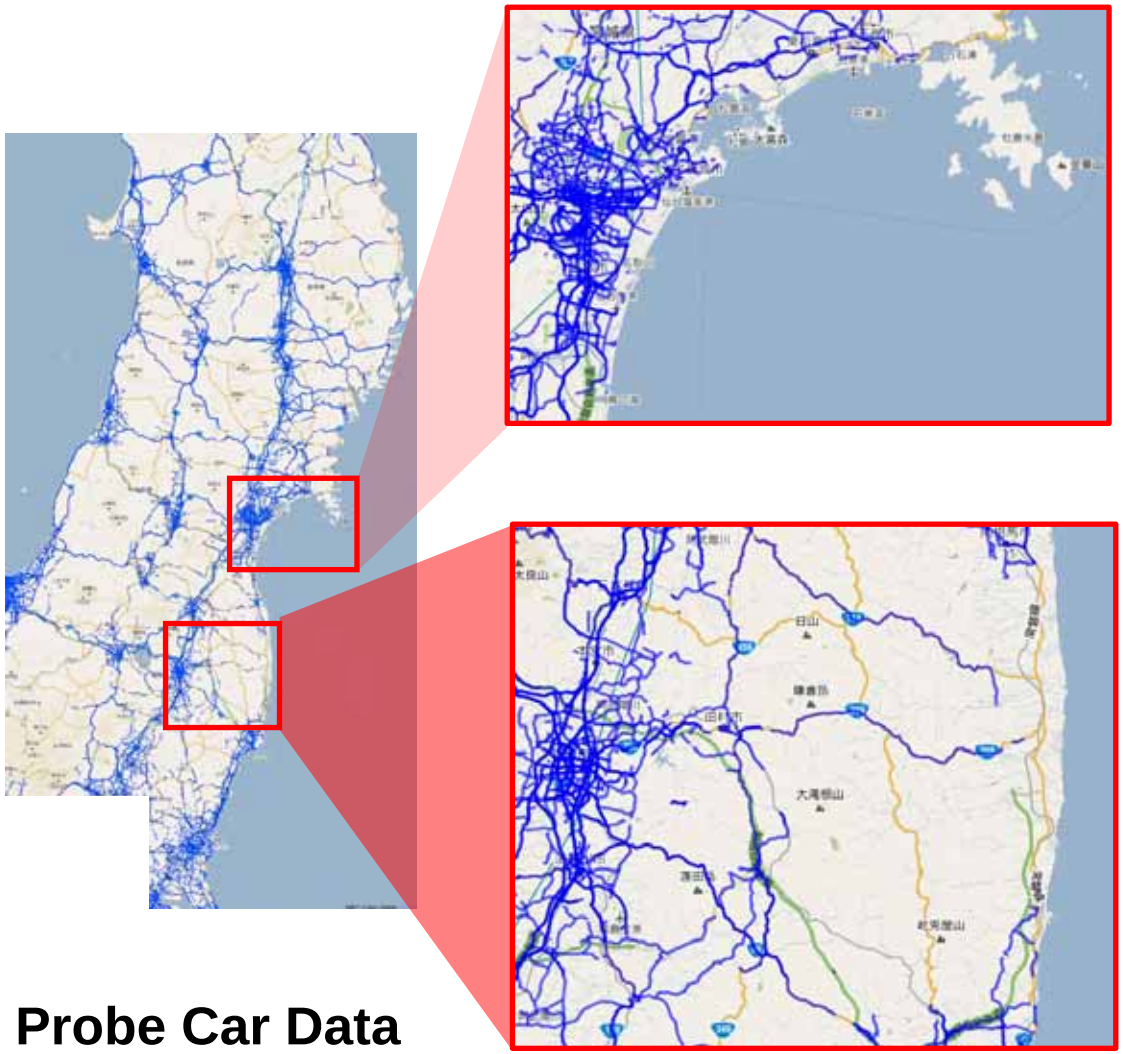
Lessons learned from the disaster

Source: Haruo HAYASHI, SS65, ITS World Congress 2011, Orlando

Probe Data for Rescue and Recovery

Road Closure Information

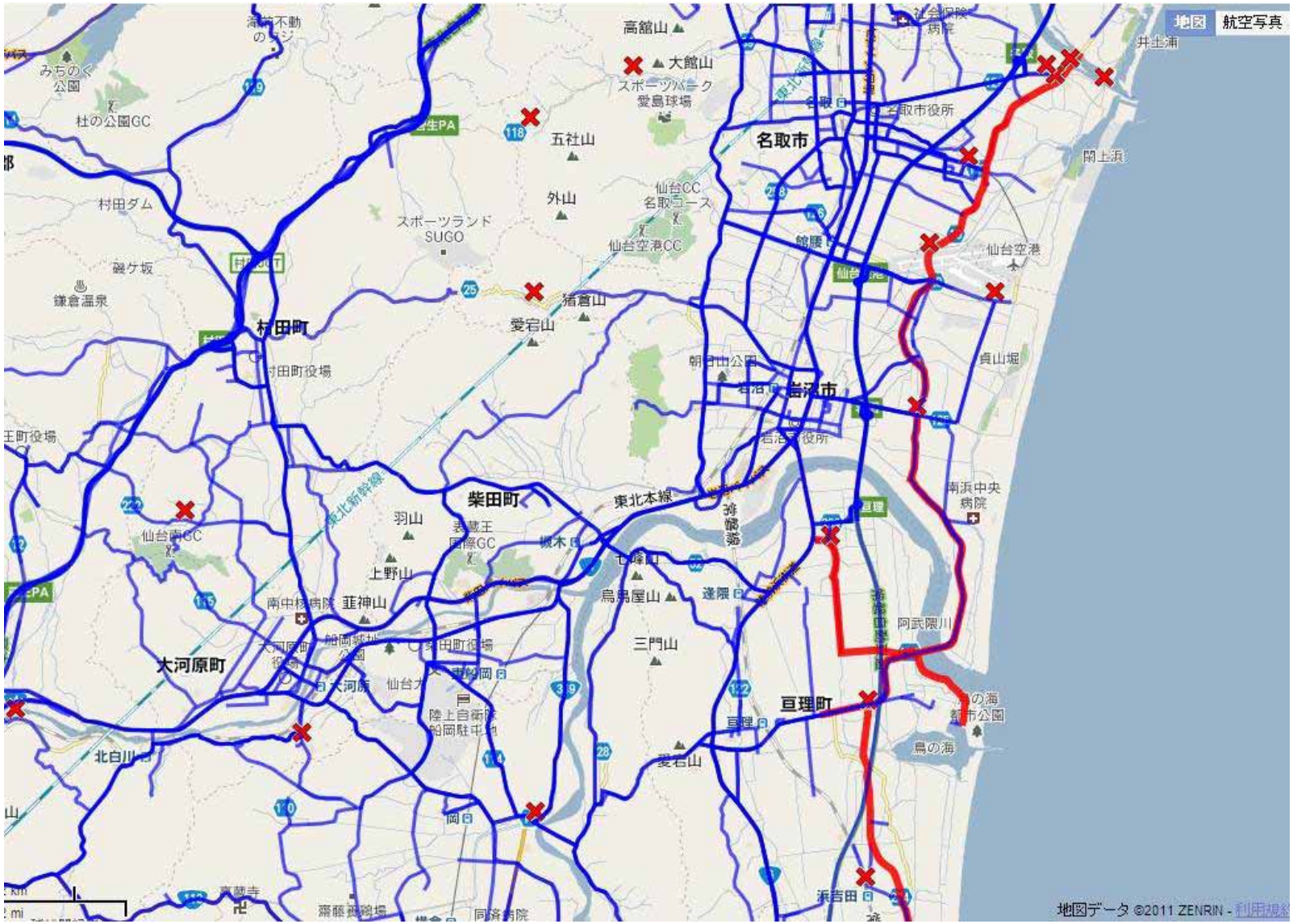
Source:
Ministry of Land, Infrastructure, Transport and Tourism



Probe Car Data

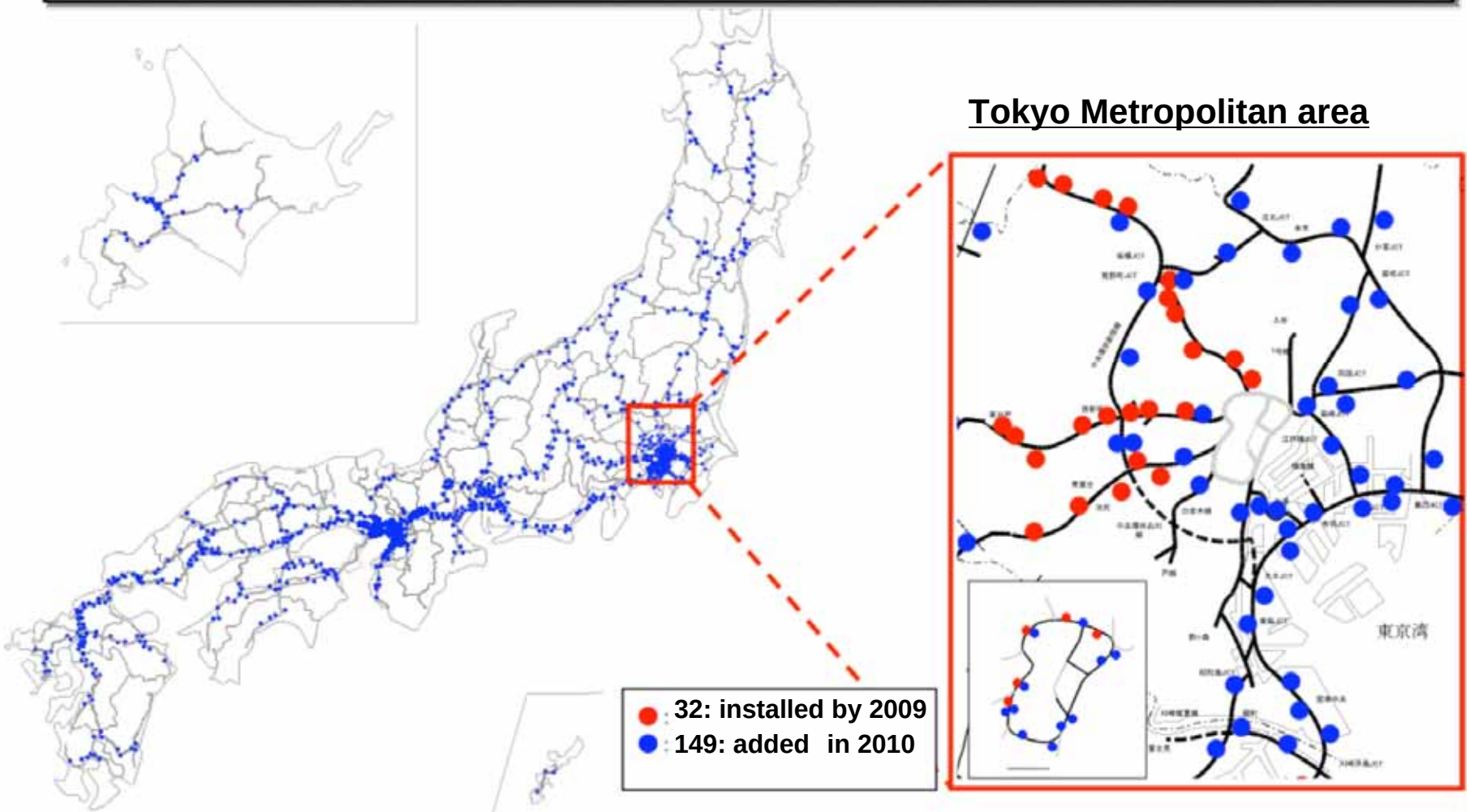
Source: Honda, Pioneer, Toyota, Nissan

Probe Data with Road Closure Information



Smart-Way Services (ITS Spot)

Nationwide installation of roadside equipment (1,630 in 2010)



Source: Ministry of Land, Infrastructure, Transport and Tourism

On-board Equipment already available

Nissan
Fuga（2009.11）

Toyota
Lexus LS600h(2009.10)

Pioneer
ND-DSRC1(2009.10)

Mitsubishi Electric
EP-409DSB(2009.10)

Panasonic
CY-DSRC1000D (2010.3)

Mitsubishi Heavy Industries
MOBE－1000 (2009.10)

Vehicle to Infrastructure

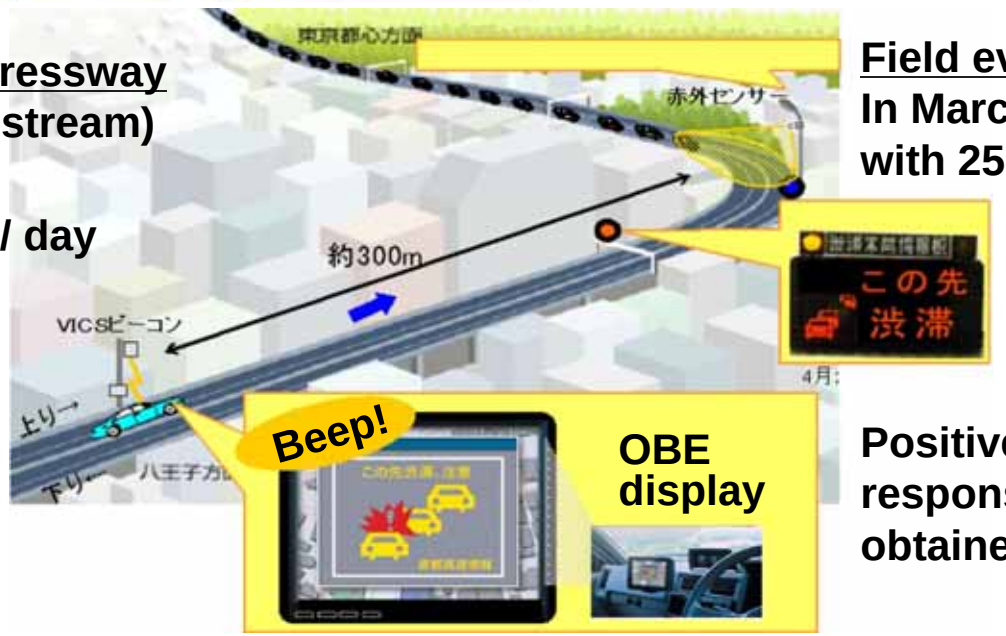
Communication in Tokyo

Number of accidents at San-gu-bashi

Year	Accidents
2002	75
2003	135
2004	141

Tokyo Metropolitan Expressway
San-gu-bashi curve (up stream)

- **Radius: 88m**
- **Traffic volume: 46,000 / day**



Field evaluation test
In March to May, 2005 with 259 participants

Positive data and responses by drivers obtained

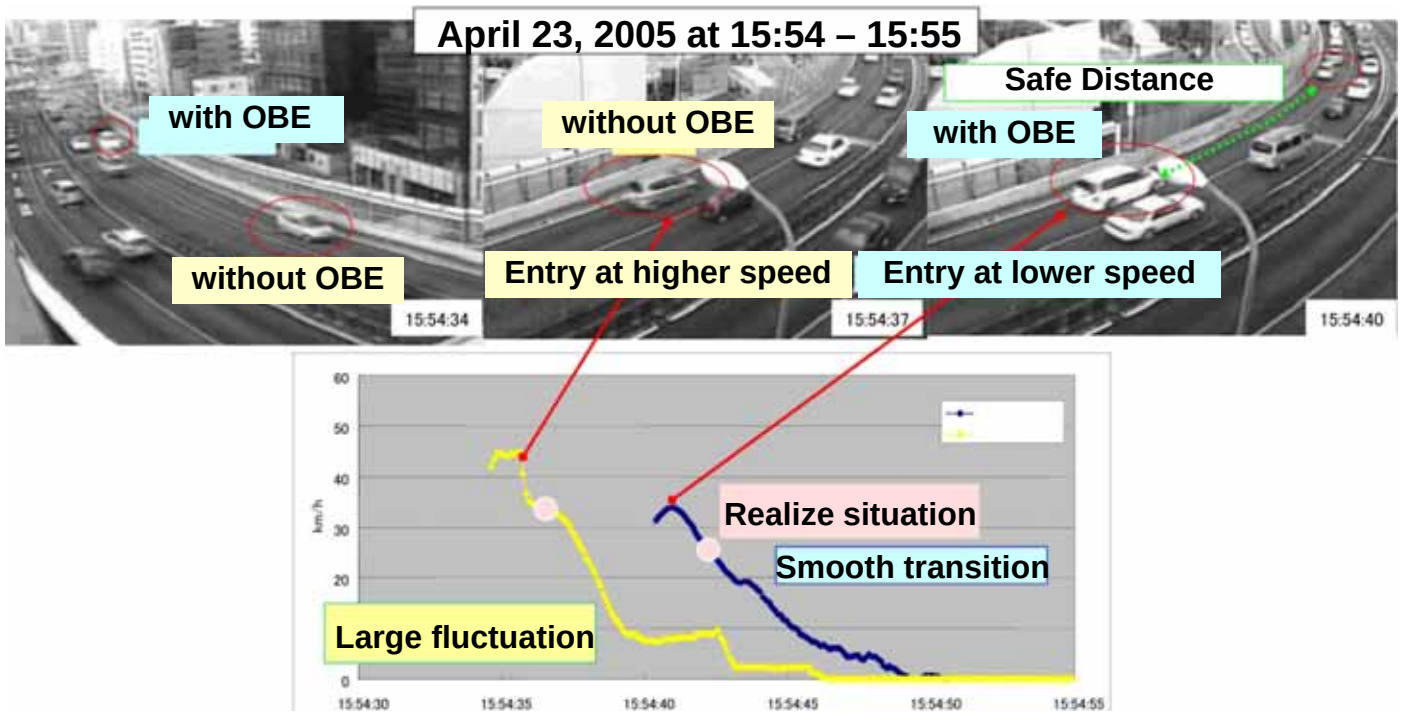
Source: AHSRA

Vehicle to Infrastructure

Communication in Tokyo

Reduction of accidents by 70%

Period	Total	Fatality / Injury	Property damage
Before installation	44	3	41
After installation	12	2	10



Source: AHSRA

Vehicle to Infrastructure Communication

Information on Dangers Ahead

Live Image Feed

Merging Assistance

Dynamic Route Guidance with Real-time Information

Highway Network Surrounding Tokyo

Dynamic Route Guidance
- Real-time information & analysis
- Vehicle - Infrastructure communication

Source: Ministry of Land Infrastructure, Transport, and Tourism

Vehicle to Infrastructure Communication

Stop Sign Recognition Enhancement

DSRC

IR Beacon

Vehicle Detector

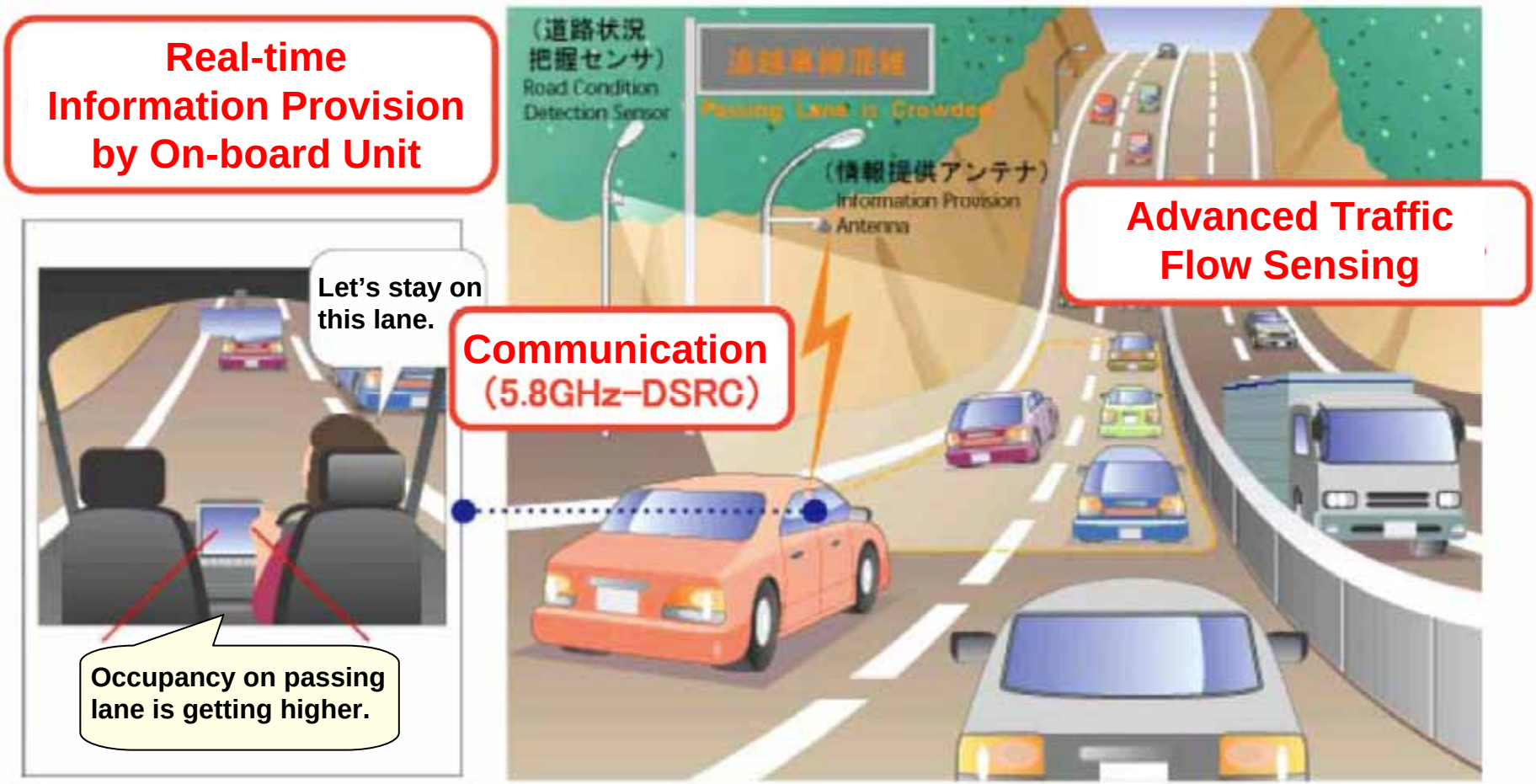
Traffic Signal

Stop Sign

Crossing Collision Avoidance

Signal Recognition Enhancement

Reduction of Traffic Congestion



Source: Ministry of Land Infrastructure, Transport, and Tourism

Vehicle to Vehicle Communication

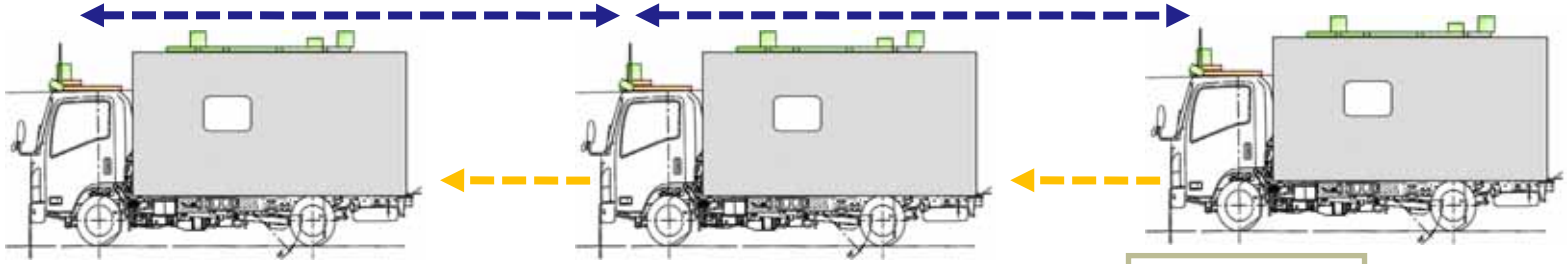
Emergency Vehicle Approaching Alert

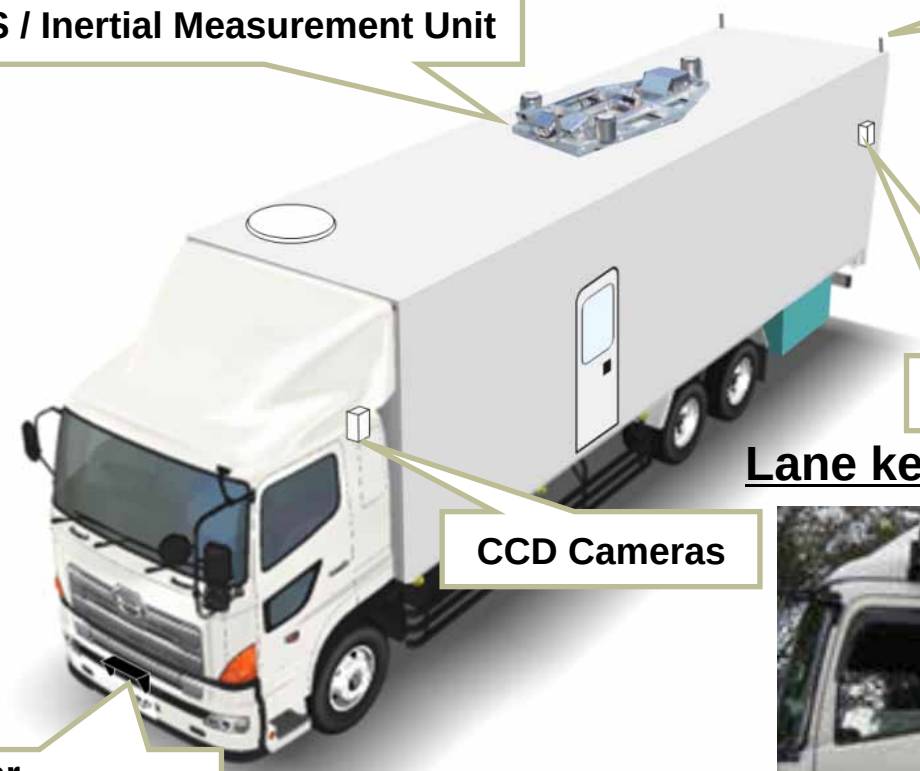
Intersection Collision Prevention

Rear-end Collision Prevention

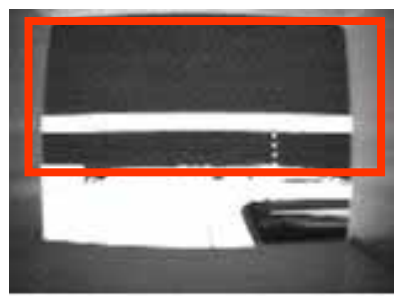
Automated Platoon

Headway control with radar and vehicle to vehicle communication





Lane keeping by painting recognition



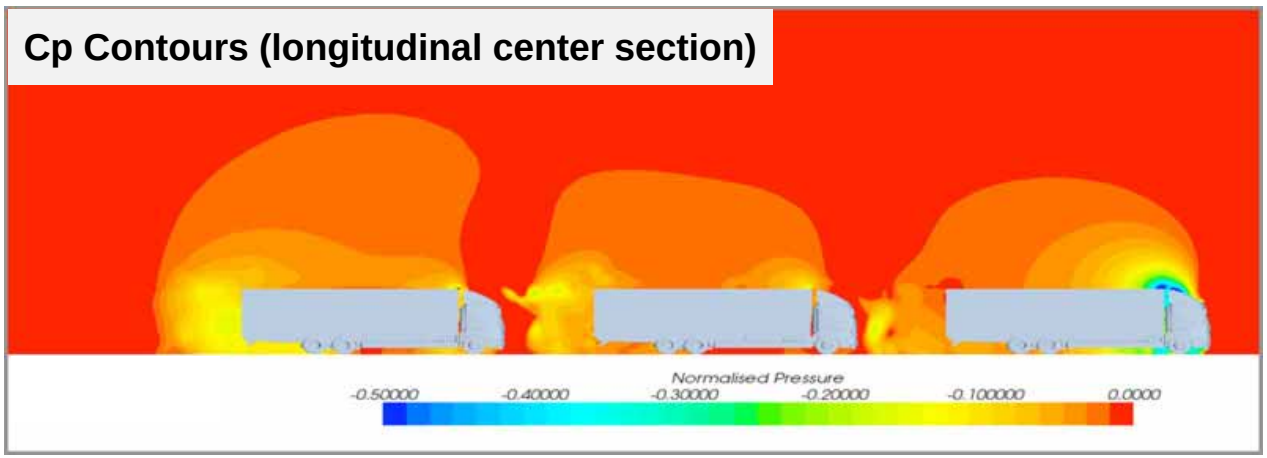
Source: Japan Automobile Research Institute

Estimation of CO_2 Reduction by Platoon

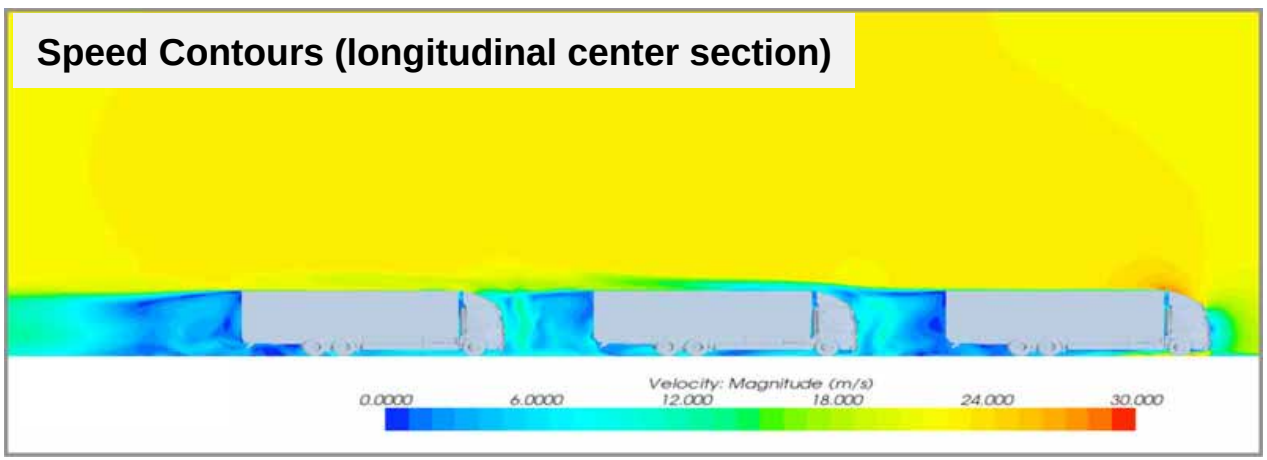
Aerodynamics Simulation of the platoon

Vehicle speed:80km/h , Gapdistance:4m

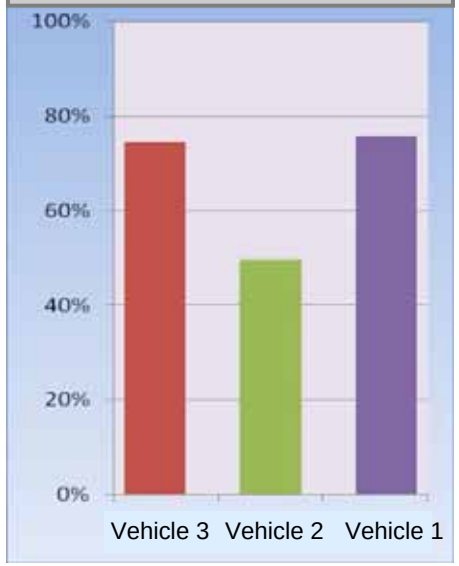
Cp Contours (longitudinal center section)



Speed Contours (longitudinal center section)



Relative Cd value rate
(100% for Single vehicle)



15% CO_2 Reduction by 3 vehicles

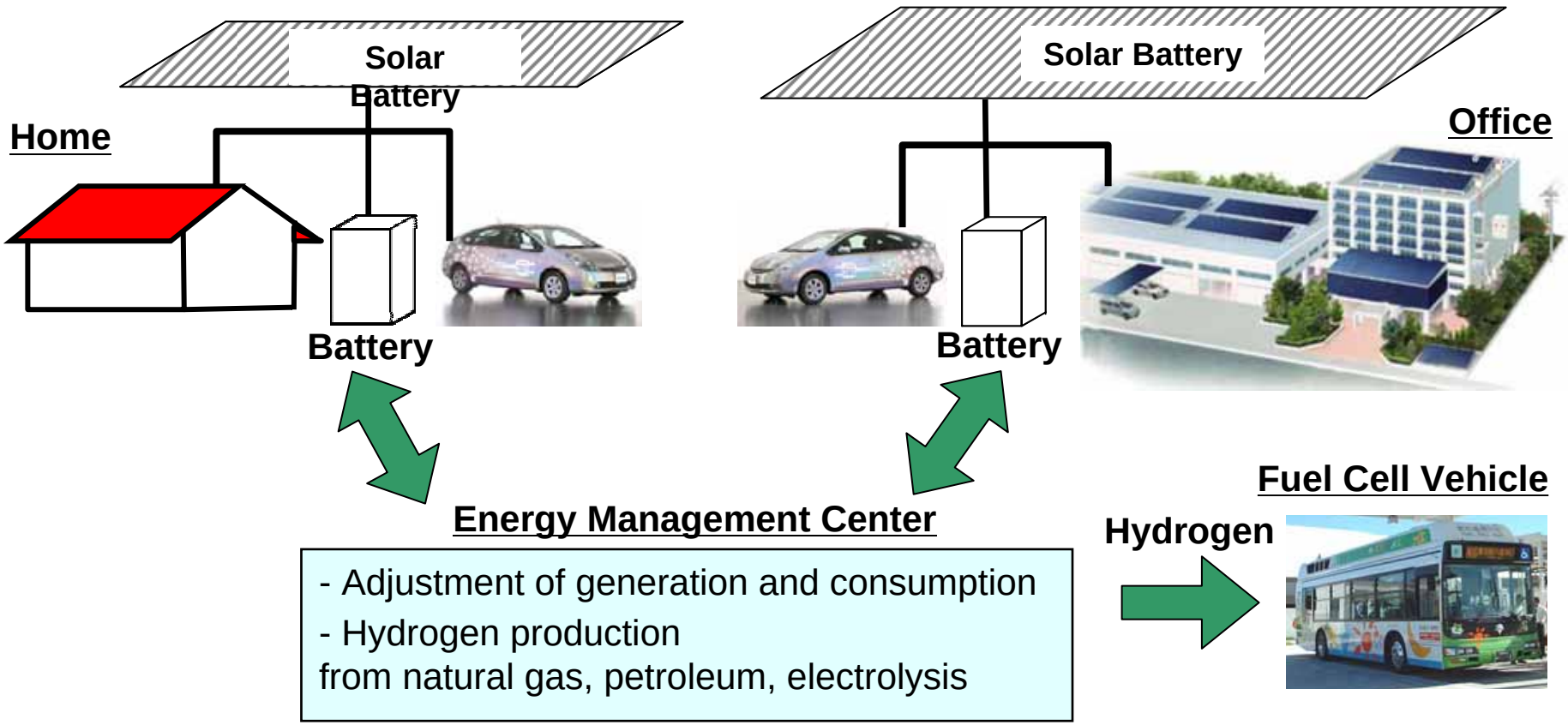
Automated Platoon of Heavy Vehicles

Conducted by **Japan Automobile Research Institute (JARI)**
at National Institute of Advanced Industrial Science and Technology (AIST)

Source: Japan Automobile Research Institute

Community Energy Management

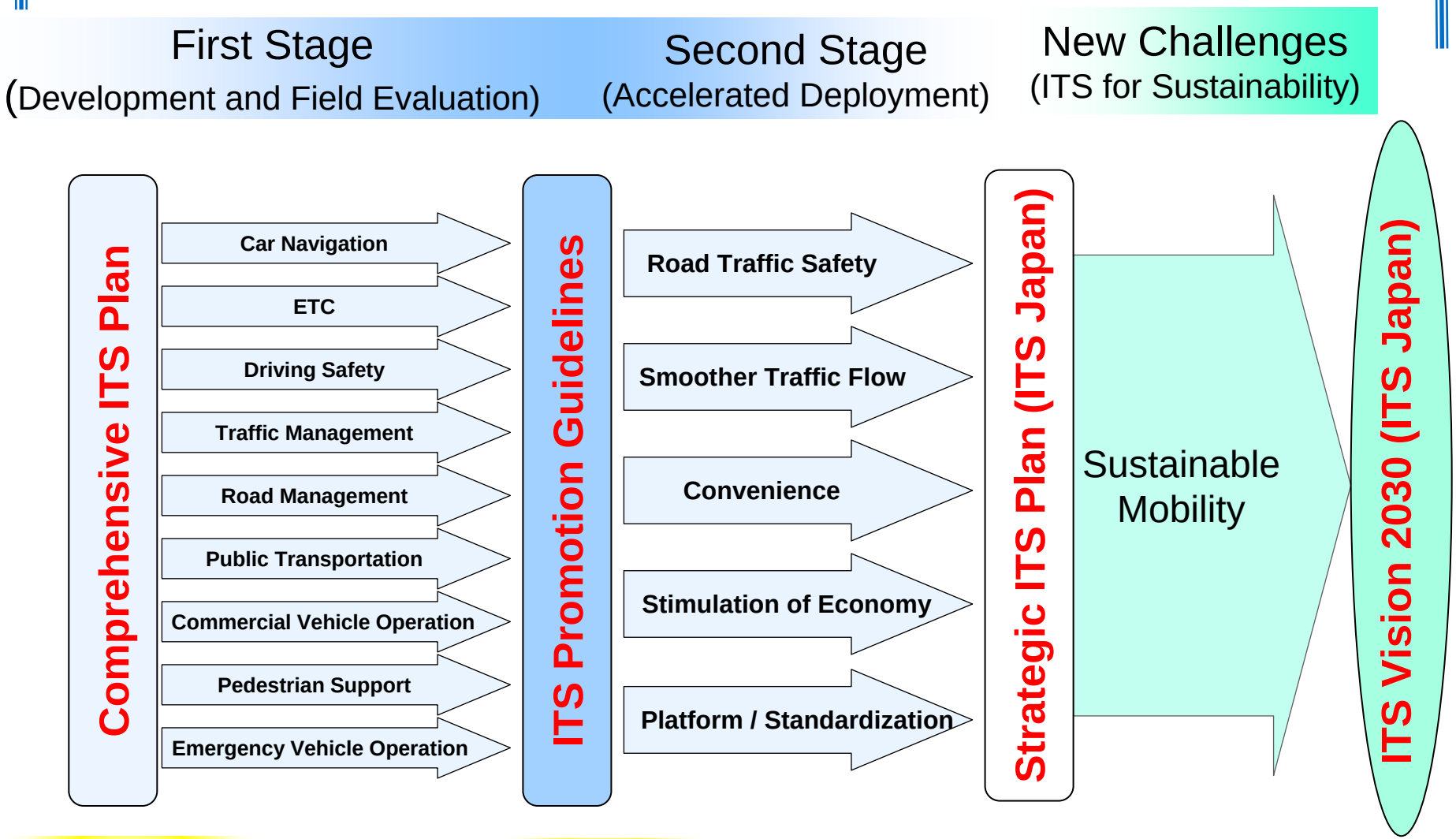
- Dependence on electricity for lower emission
- Increase of locally generated electricity
- Energy management within a community
- Large scale field tests involving citizens' daily life



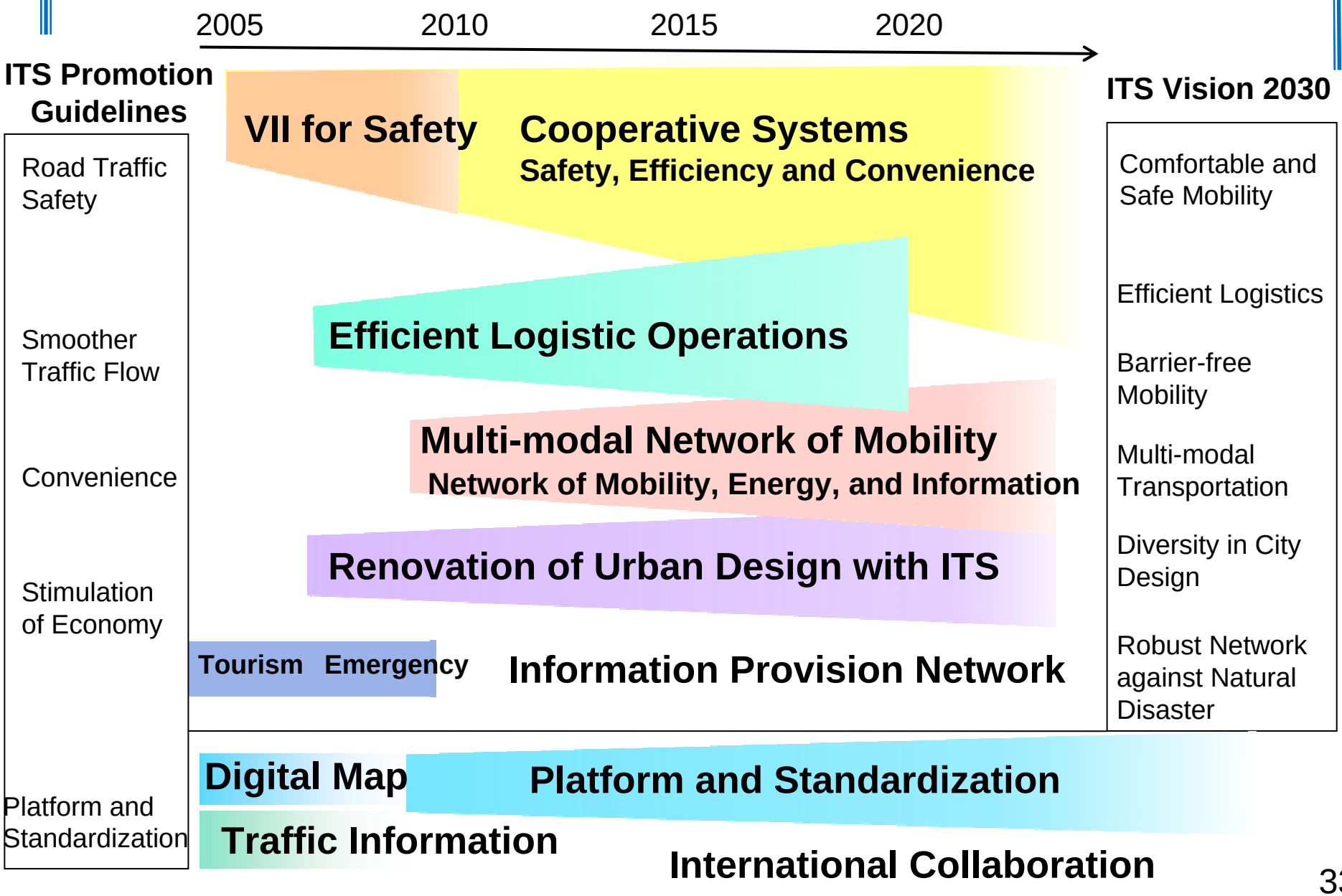
Smart Community Initiative in Japan

Source: Ministry of Economy, Trade, and Industries

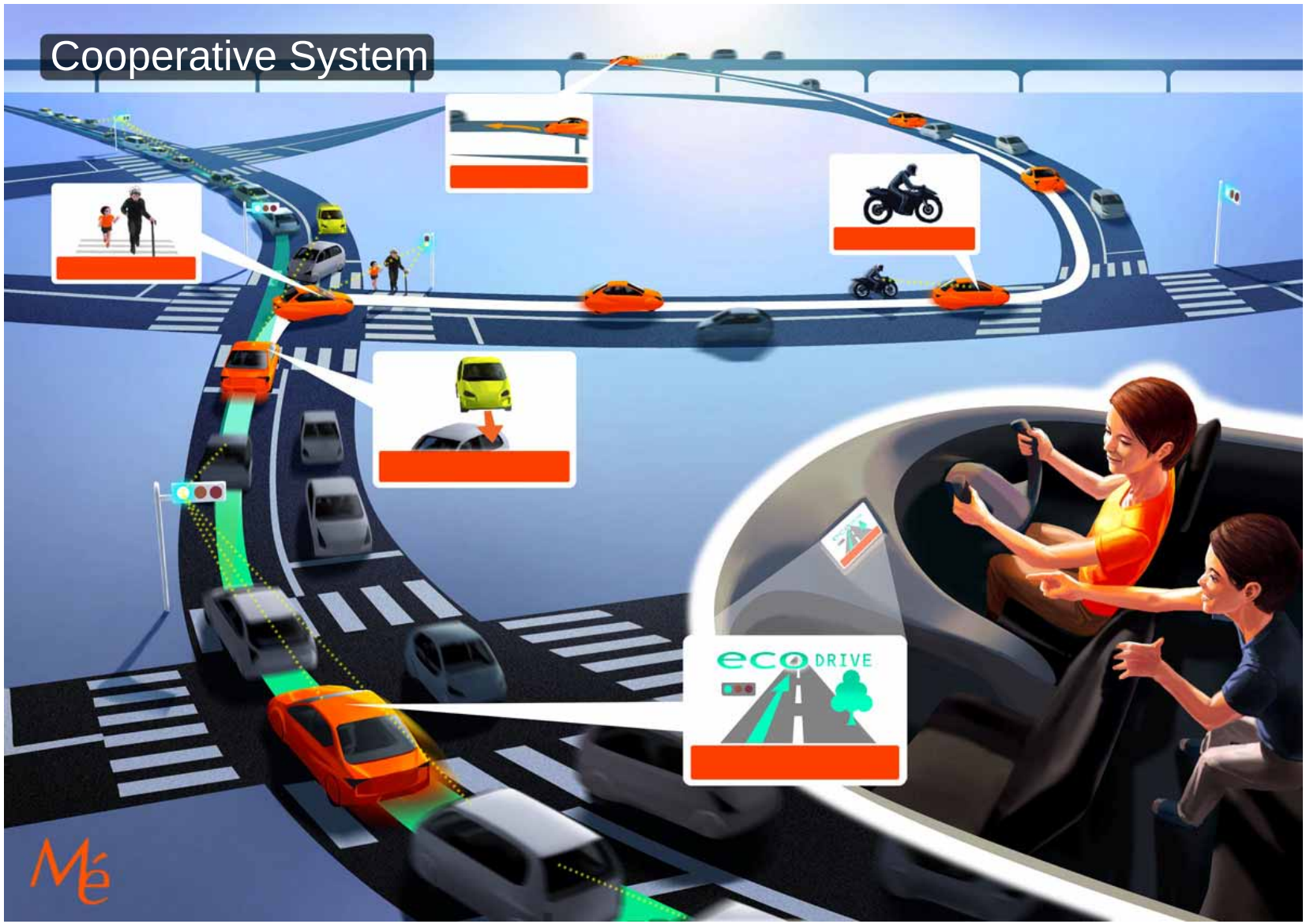
R&D, Deployment, and New Challenges



New Challenges for Sustainability



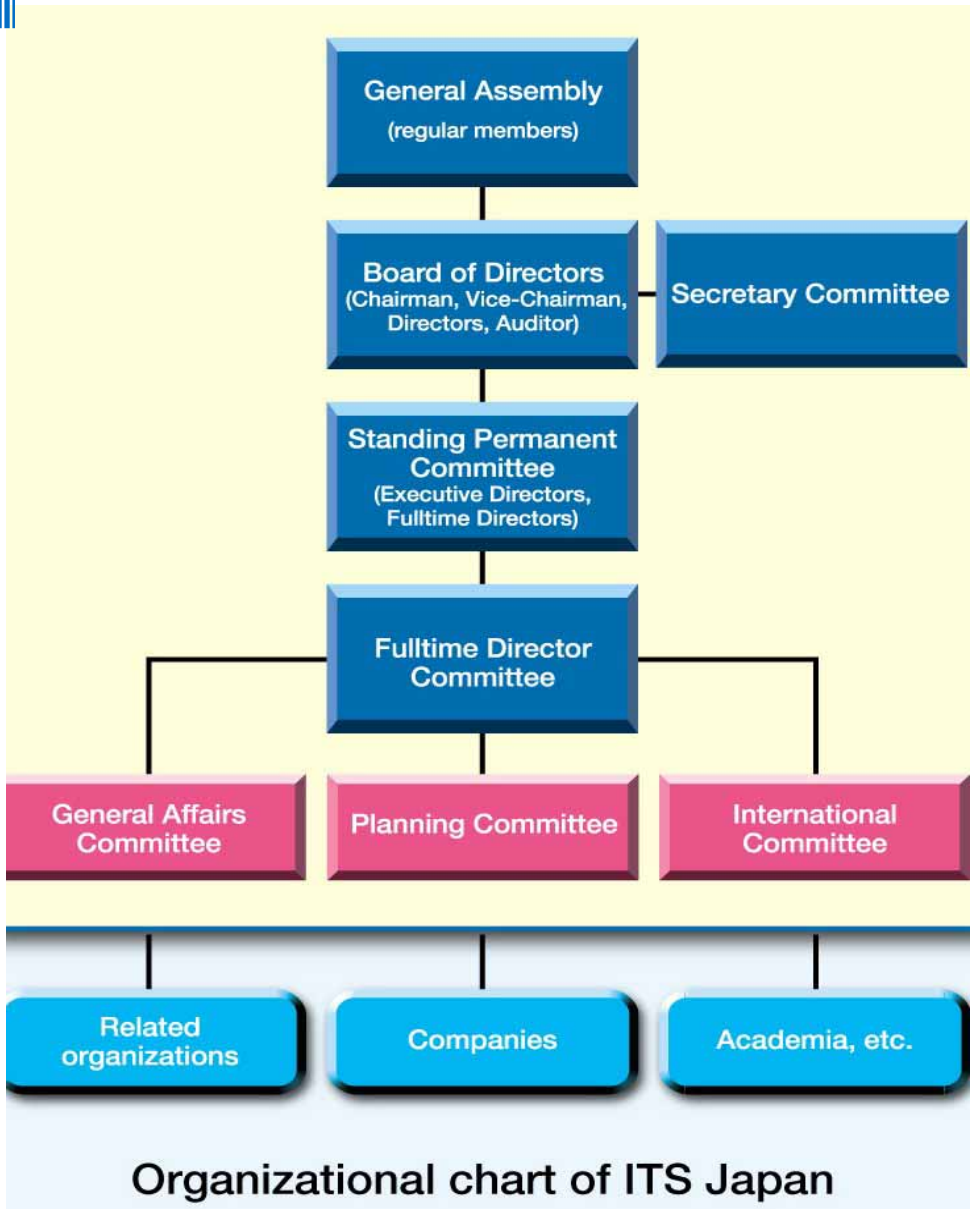
Cooperative Systems



Networked Vehicles and Infrastructure

Open Platform for Integrated Services

ITS Japan: Organization



Organizational chart of ITS Japan

1994 Founded
2005 Registered as Legal Entity

(NPO: Nonprofit Organization)

Honorary Chairman
Dr. Shoichiro Toyoda

Chairman
Dr. Hiroyuki Watanabe

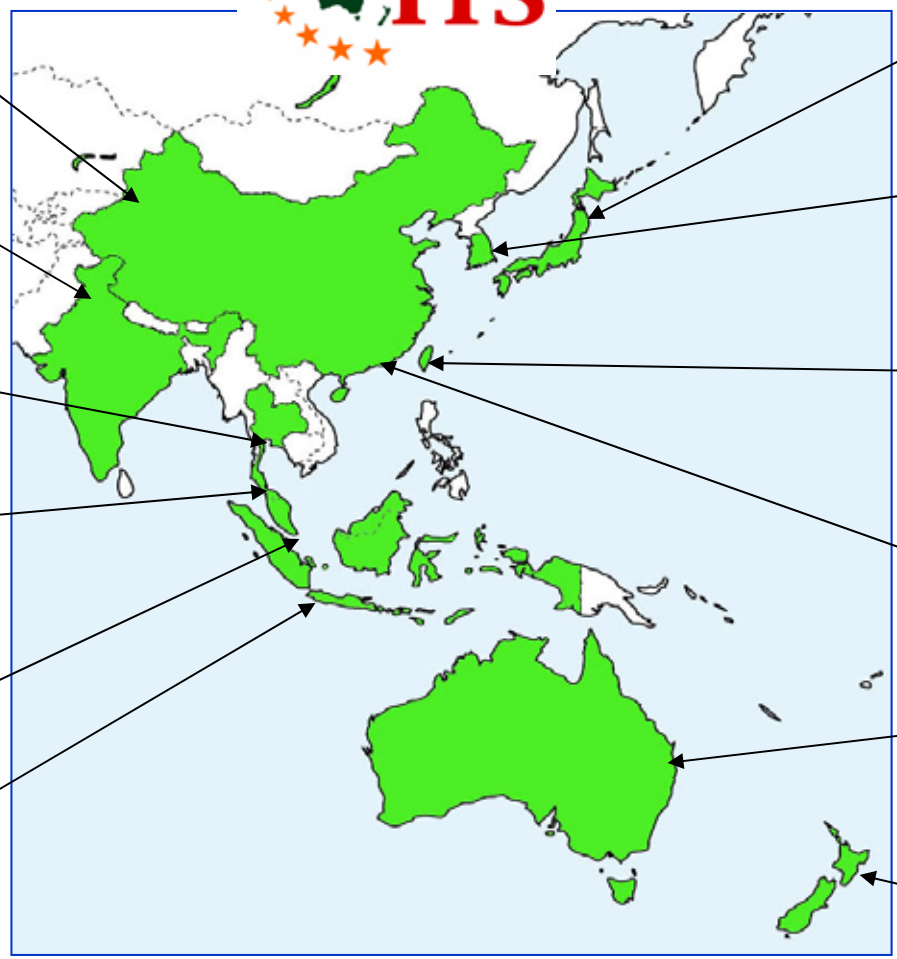
Vice Chairmen
Professor Masao Sakauchi
Mr. Kazumasa Fujie

Membership (268)
- **Industries (167)**
- **Academia (40)**
- **ITS Related Organizations (26)**
- **Others (35)**

ITS Organizations in Asia-Pacific

Memorandum of Understanding signers

Partners



China

India

Thailand

Malaysia

Singapore

Indonesia

Japan

Korea

Chinese Taipei

Hong Kong SAR

Australia

New Zealand

Vietnam

Philippines

The 11th ITS AP Forum: Kaohsiung 2011

ITS Japan

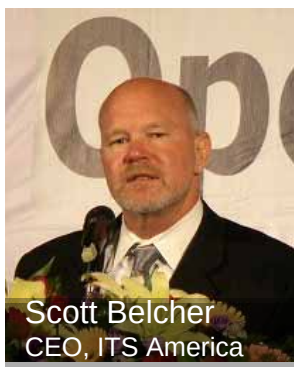
AP 2011 ITS KAOHSIUNG TAIWAN

John Lee
Chairman, ITS Taiwan

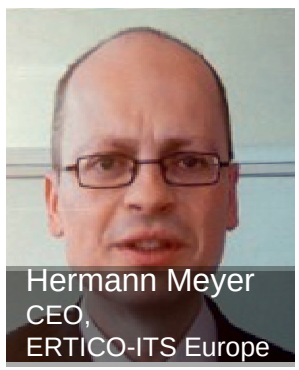
Chu Chen
Mayor, Kaohsiung

Chi-Kuo Mao
Minister, MOT,

Ko Yang Wang
CTO, Institute for Information Industry


Scott Belcher
CEO, ITS America

Hiroyuki Watanabe
Chairman, ITS Japan


Hermann Meyer
CEO,
ERTICO-ITS Europe

Chullho Lieu
President, Korean Expressway Corporation

ITS World Congress 2013, Tokyo

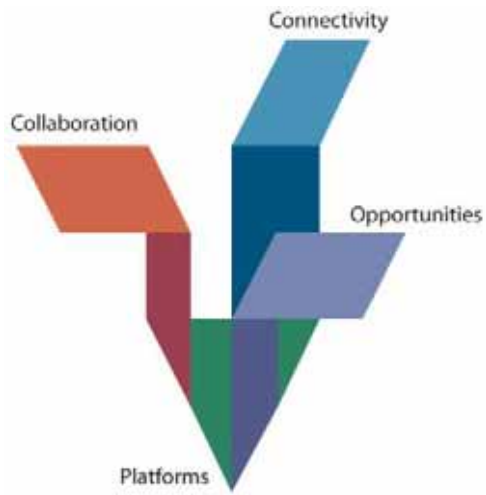
Theme: Open ITS to the Next

Date： October 14th – 18th, 2013

Venue： Tokyo International Forum (Opening Ceremony)

Tokyo Big Sight (Session & Exhibition)

20TH ITS WORLD CONGRESS TOKYO 2013



Thank you !

November 6, 2012

Takaaki Segi