CO2 reduction with traffic signal control, toward JCM

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What is JCM?

JCM: ‘Joint Crediting Mechanism’ is an initiative aimed at facilitating the diffusion of advanced low carbon technologies, products, systems, services and infrastructure, which was developed by the Japanese government in August 2013.

12 partner countries: Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao People's Democratic Republic, Indonesia, Costa Rica, Palau, Cambodia and Mexico.

Financing Program for JCM Model Projects by MOE: Ministry of Environment

The budget for FY 2014
1.2 billion JPY (approx. **USD12 million**) per year by FY2016
(total 3.6 billion JPY)

Government of Japan

Finance part of an investment cost (up to the half)

International consortiums (which include Japanese entities)

Conduct MRV and expected to deliver at least half of JCM credits issued

- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO\textsubscript{2} from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects: starting installation after the adoption of the financing and finishing installation within three years.

Source: New Mechanisms Information Platform HP
http://www.mmechanisms.org/e/index.html
CO2 emission volume from the transportation sector

- **in 2006, 6.4 billion tons**
- **in 2030, 8.9 billion tons**

- Developed countries: Stable in coming 15 years
- Developing countries: Double in coming 15 years

Source: Ministry of Land, Infrastructure, Transport and Tourism in Japan
3 keywords of traffic management

Source: Sumitomo Electric Industries, Ltd.

Operation and Maintenance
- Training
- Operation
- Hardware, Software

Design of Intersections
- Lane Marking
- Phase Plan
- Signal Parameters

System Construction
- Supply of Equipment
- Installation
- Adjustment
Improvements of signalized intersections - 1/2

Before

After

Traffic signals introduction

Right-turn lane addition

From one lane to right-turn & left-turn lanes

Source: Sumitomo Electric Industries, Ltd.
Improvements of signalized intersections - 2/2

Detector -> Green light time adjustment -> Controller

Source: Sumitomo Electric Industries, Ltd.
Candidate cities for signal control introduction

These cities have a big opportunity to reduce traffic jams with signal control introduction.

<Ranking of cities with heavy traffic jams>

1: **Bangkok, Thailand**  
   Around 600 signals (1,000 signals in the future)
2: **Jakarta, Indonesia**
3: **Nairobi, Kenya**
4. **Manila, Philippines**
5. **Mumbai, India**
6. **Kampala, Uganda**
7. **Lexington, Kentucky, USA**
8. **Austin, Texas, USA**
9. **Seoul, Korea**
10. **Dhaka, Bangladesh**  
    Around 400 signals

*Source: Ordering by BBC of England in 2012, No. of signals by team estimation*
Concept of CO2 emission volume evaluation tool

Traffic Simulation: TS

Driving data

Express driving pattern by SSF
(Stepwise Speed Function)

Emission Model: EM

CO2 emission of target area

Estimate by Multiple regression from SSF data

\[
E = C_{dist} \cdot D_n + C_{V_n}^2 \cdot V_n^2 + C_{V_n} \cdot V_n + \cdots
\]

ITS Measures

Comprehensive evaluation of various scales
(integrated approach)

\[\downarrow\]

Hybrid simulation

Evaluation of the ITS in a large area

\[\downarrow\]

Mesoscopic Harmonization

Driving dynamics is considered statistically

\[\downarrow\]

Mesoscopic EM

Source: Energy-ITS Project, 2008-2013

3rd AAI Summit, 2-4 Dec. 2014, Bangkok
CO2 Evaluation, Kashiwa City in Japan

Traffic Situation (traffic volume)

Roads: more than **5.5m width** in Kashiwa City and surrounding area.
(total road length: **2,399 km**)
Period: **24 hours** of working day

Source: Energy-ITS Project, 2008-2013
### CO2 Evaluation Results, Kashiwa City in Japan

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<td>Ratio</td>
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<td><strong>Eco-routing</strong></td>
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<td><strong>Idling Stop</strong></td>
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<tr>
<th>CO₂ Emission</th>
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<th>-2.2%</th>
<th>-2.7%</th>
<th>-6.6%</th>
<th>-7.3%</th>
<th>-8.8%</th>
</tr>
</thead>
</table>

### Measures for Evaluation

**Eco-driving:**
- Moderate start
- Constant speed cruising
- Early deceleration

**Eco-routing:**
- Route of the shortest time

**Idling Stop**

### Source:
Energy-ITS Project, 2008-2013
Collaboration points with you

**MRV: Measure Report and Validation process creation**

We'd like to **research and develop the MRV points** together with you for the scoped area with signal intersections:
- **✓ Monitoring processes with reasonable cost**
- **✓ Reporting method with reasonable human resources**
- **✓ Validation method with variability over time against an unspecified number of vehicles in the scoped area**

**Relationship building with supervisory authorities**

We'd like to **build relationships** with supervisory authorities for intersections and signals together with you, because their understanding and cooperation is crucial.
Thank you for your attention.

If you have any comments and questions, please feel free to contact Mr. Mitsuo Yonezawa.

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Scheme of the JCM

Japan

Government
- Issuance of credits
- Notifies registration of projects
- Reports issuance of credits
- Request issuance of credits
- Request registration of projects

Project Participants
- Implementation & monitoring of projects
- Submit PDD/monitoring report
- Inform results of validation/verification

Third party entities
- Validation of projects
- Verification of amount of GHG emission reductions or removals

Host Country

Government
- Issuance of credits
- Notifies registration of projects
- Reports issuance of credits
- Request issuance of credits
- Request registration of projects

Project Participants
- Implementation & monitoring of projects
- Submit PDD/monitoring report
- Inform results of validation/verification

Joint Committee (Secretariat)
- Development/revision of the rules, guidelines and methodologies
- Registration of projects
- Discusses the implementation of JCM

Conduct policy consultations


3rd AAI Summit, 2-4 Dec. 2014, Bangkok
JCM Model Projects in 2014 by MOEJ

Viet Nam:
- Anaerobic Digestion of Organic Waste for Biogas Utilization at Market
  Organic waste discharged from a market is used to generate biogas in a methane fermentation system. The biogas is then supplied to a seafood processing factory.
- Eco-driving by Utilizing Digital Tachograph System
  Trucks are fitted with eco-drive improving system using digital tachographs, realizing CO2 emission reduction and safe-driving.

Indonesia:
- Power Generation by Waste Heat Recovery in Cement Industry
  Waste heat recovery system with suspension preheater boiler and air quenching cooler boiler is installed in cement production process and generates electricity (28 MW) to be used in the cement plant.
- Palm Waste Biomass Power Generation Project
  Fluidized bed furnace is installed in a biomass power generation plant (6.2 MW) utilizing EFB (Empty Fruit Bunch) as a fuel.
- Solar Power Hybrid System Installation to Existing Base Transceiver Stations in Off-grid Area
  Solar power (900 kW) and lithium ion batteries are installed to replace inefficient diesel generators at mobile base stations.
- Energy Saving through Introduction of Regenerative Burners to the Aluminum Holding Furnace of the Automotive Components Manufacturer
  Regenerative burners which recover heat from exhaust gas efficiently are installed in a casting process.
- Energy Saving for Textile Factory Facility Cooling by High Efficiency Centrifugal Chiller
  Chiller with a high efficiency compressor and economizer cycle are installed.

Source: New Mechanisms Information Platform HP
http://www.mmechanisms.org/e/index.html

3rd AAI Summit, 2-4 Dec. 2014, Bangkok
Large Scale JCM Feasibility Study in 2014 by MOEJ

1. The feasibility study to promote Low Carbon Technology application in India (Gujarat, Maharashtra, Punjab).
2. Feasibility study on financing scheme development project for promoting energy efficiency equipment installation in Indonesia (Jakarta, Bali, etc.).
3. Low Carbon City Planning Project in Surabaya, Indonesia (Surabaya City).
6. Study for Developing Environmentally and Culturally Sustainable Cities through the Joint Crediting Mechanism in Siem Reap (Angkor Park and Siem Reap City).
7. Study on the Accelerating Implementation of Bangkok Master Plan on Climate Change through the JCM (Bangkok).
8. Introduction of a recycling system for cars and parts in Thailand (Bangkok).
9. Strategic Promotion of Recovery and Destruction of Fluorocarbons (Bangkok/Johor Bahru).
10. Demonstration Project on Installing an Evacuation Shelter with Renewable Energy as a "Low-Carbon/Resilient Model for Small Island Countries" (Palau, etc.).
12. The feasibility study towards eco-island in cooperation between Kien Giang Province and Kobe City (Kien Giang Province).
14. Ho Chi Minh City – Osaka City Cooperation Project for Developing Low Carbon City (Ho Chi Minh City).
15. Feasibility study on a Large-Scale GHG Emissions-Reduction Project Development in the Iskandar Development Region, Malaysia (Iskandar Development Region).
17. Study for the development of JCM projects for comprehensive improvements in the power generation, transmission and distribution systems in Ulaanbaatar City and on the possibility of nationwide horizontal application of the same improvement model in Mongolia (Ulaanbaatar).
18. Feasibility study on a programme-type finance scheme for the JCM in Mongolia (Ulaanbaatar).
19. JCM Feasibility Studies of GHG Mitigation Projects Contributing to Low Carbon Old Capital based on City-to-City Cooperation between Vientiane and Kyoto (Vientiane).

Source: New Mechanisms Information Platform HP
http://www.mmechanisms.org/e/index.html

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