Session 3C: Prof. Dr. Atsushi Fukuda

Presentation entitled:
Toward Low Carbon Society for Sustainable Transportation in Mega Cities in Asia

Biographic Data of Speaker

Atsushi Fukuda
Head of Department of Transportation Engineering and Socio-technology, College of Science and Technology, Nihon University
7-24-1 Narashinodai, Funabashi, Chiba, 274-8501
JAPAN
Tel: +81-47-469-5355 Fax: +81-47-469-5355
E-mail: fukuda@trpt.cst.nihon-u.ac.jp

Education:
Ph.D., M.Eng., B.Eng. in 1982,1984,1988 from Nihon University, Japan

Work Experience:

2009-Present	Director of Transportation Research Center, Nihon University
2008-Present	Head of Department of Transportation Engineering and Socio-technology, College of Science and Technology, Nihon University
2005-Present	Professor, Nihon University
2001-2005	Associate Professor, Nihon University
1992-2001	Assistant Professor, Nihon University
1989-1991	Assistant Professor, Asia Institute of Technology (JICA Expert)
1988-1992	Research Associate, Nihon University

Honors and Awards:

2009	International Activity Incentive Award, Japan Society of Civil Engineers (JSCE)
2006	Excellent Practice Paper Award, the 3rd National Transport Conference, Ministry of Transport, Engineering Institute of Thailand, Khonkean University
2003	Best Paper in the Decision Technologies Track Award, 36th Annual Hawaii International Conference in System Sciences
1997	Best Presenter Award, 52th Annual Meeting of JSCE
1988	IATSS Dissertation Award, International Association for Traffic Safety and Science

Main Professional Experiences related ODA (within last decade):

2008 - 2009	Member of Study on Environmental Action Plan by MLIT
2008 - 2009	Chairman for Research Committee for Study on Market Mechanism for Green House Gas Reduction for Vessel by Ocean Policy Research Foundation (committed by MLIT)
2008	Chairman of the Study on CDM Promotion in Construction Sector by NTT Data Management Research Institute (committed by MLIT)
2008	Study Member of the Project for Traffic Safety Human Resource Development in Hanoi by JICA
2007 - 2008	Member for Expert Meeting on International Effort for Global Environment and Energy in Transportation Sector by MLIT
2007 - 2008	Member for Research Committee on Carbon Offset in Transport Sector by Foundation for Promoting Personal Mobility and Ecological Transportation (committed by MLIT)
2007	Overseas professional judge of CDM/JI Judgment Committee, Japan Quality Assurance Organization (JQA)
2006 - 2007	Chairman for working group for the Future CDM Study (committed by METI)
2005 - 2006	Member of Advisory Committee for assistance to develop the Urban Transportation Planning Contents by JICA
2003 - 2006	Chairman of Advisory Committee for the Study on Promotion of Clean Development Mechanism, in Thailand (committed by MLIT)
2004 - 2005	Chairman of Advisory Committee for the Study on Promotion of Operational Entity for Clean Development Mechanism (committed by MLIT)
2003	Member of Advisory Committee for the Study on Promotion of Operational Entity for Clean Development Mechanism (committed by MLIT)
2002 - 2003	Chairman of Advisory Committee for Ecological Transportation Study in Costa Rica (committed by MLIT)
2002	Member of Study Team for Feasibility to Transfer Traffic Control Technology to Vietnam (committed by National Police Agency)
2002	JICA Short Term Expert for the Project to Improve Urban Development Technology in the Kingdome of Thailand by JICA
2002	JICA Short Time Expert for Executive Seminar on Environment and Transportation Management (EXETRAM)-V, at University of the Philippines by JICA
2001 - 2002	Chairman of Advisory Committee for Transportation Environmental Improvement Study in Chiang Mai City, the Kingdome of Thailand by JICA
2001	Chairman of Advisory Committee for Ecological Transportation Study in Bangladesh (committed by Ministry of Land, Infrastructure and Transport)
2001	JICA Short Time Expert for Executive Seminar on Environment and Transportation Management (EXETRAM)-III, at University of the Philippines by JICA
2000	Chairman of Study Team on Transportation Environmental Improvement Study in Chiang Mai City, the Kingdome of Thailand by JICA
2000	Chairman of Advisory Committee for Ecological Transportation Study in Bangladesh (committed by Ministry of Transport)
2000	JICA Short Time Expert for Executive Seminar on Environment and Transportation Management (EXETRAM) -II, at University of the Philippines by JICA
1998 - 1999	Member of Advisory Committee for the Study on Master Plan for Domestic Airport in the Kingdome of Thailand by JICA

Current Main Academic Services:

- Chairman of Engineering Education Program Evaluation Committee, JSCE
- Deputy Secretary of International Committee, JSCE (-June/2011)
- Member of Research Planning Committee, JSCE (-June/2011)
- Chairman of IATSS Forum Program Committee, IATSS
- Secretary of Criteria Committee, Japan Accreditation Board of Engineering Education (JABEE)
- Board Member and Secretary General of Japanese Chapter of System Dynamics Society
- Councilor of City Planning Institute of Japan
- Board Member of EASTS Japan
- Board Member of ATRANS
- International Editorial Board for Transactions on Transportation Sciences, the Czech Ministry of Transport

TOWARD LOW CARBON SOCIETY FOR SUSTAINABLE TRANSPORT IN MEGA CITIES IN ASIA

S6-5 Research Group consisting of Nagoya University, Nihon University, Yokohama National University and Tokyo Institute of Technology has studied on "Realization of Measures for Low Carbon Transport System in Asia" under S6 Research Project on "Establishment of Methodology to Evaluate Middle to Long-term Environmental Policy Options toward Asian Low-Carbon Society" sponsored by Ministry of Environment, Japan.

Even the measures and policies which were proposed will be carried out; it is very hard to achieve required huge GHG emission reduction to tackling Global Warming problem. Thus, S6 Research proposed the idea to establish the future vision of low-carbon society first and set up the roadmap by applying back casting approach.

S6-5 study group mostly classified measures and policies in "Avoid", "Sift" and "Improve" and developed the approaches to estimated CO2 emission reduction. Also S6-5 study group tried to examine the possibility of low-carbon transportation system under the scenarios including "Avoid", "Sift" and "Improve" measures and policies regarding urban structure and technological innovation also.

S6-5 Research on Realization of Measures for Low Carbon Transport System in Asia under
S6 Research Project on Establishment of Methodology to Evaluate Middle to Long-term Environmental Policy Options toward Asian Low-Carbon Society sponsored by Ministry of Environment, Japan

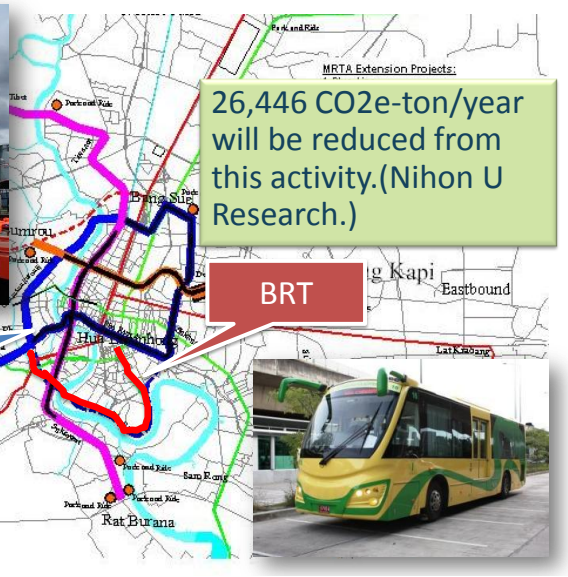
Toward Low Carbon Society for Sustainable Transport in Mega Cities in Asia

PL Prof. Yoshitsugu HAYASHI : Nagoya University
(1) Dr. Kazuhiro KATO : Nagoya University
Dr. Kazuki NAKAMURA: Nagoya University
(2) Prof. Atsushi FUKUDA : Nihon University
Dr. Teppei OSADA : Nihon University
Dr. Tetsushiro ISHIZAKA : Nihon University (UC-Riverside)
(3) Dr. Hinya HANAOKA : Tokyo Institute of Technology
(4) Prof. Fumihiko NAKAMURA : Yokohama National University
Dr. Toshiyuki OKAMURA : Yokohama National University

S6-5 Research on Realization of Measures for Low Carbon Transport System in Asia

S6-5 (2)
Thailand:
Dr. Tuenjai FUKUDA, Nihon U & ATRANS
Dr. Varamete VICHIENSAN, KU
Dr. Sittha JAENSIRISAK, UBU
Dr. Thanead SATHIENNAM, KKU
Dr. Paramete LUATHEP, PSU
Vietnam:
Dr. Khuat Viet HUNG, TU
Mr. Nguyen Van TRUONG, TU
The Philippines:
Dr. Alexis FILLONE, DLU

Limit of Single Project in Transport Sector



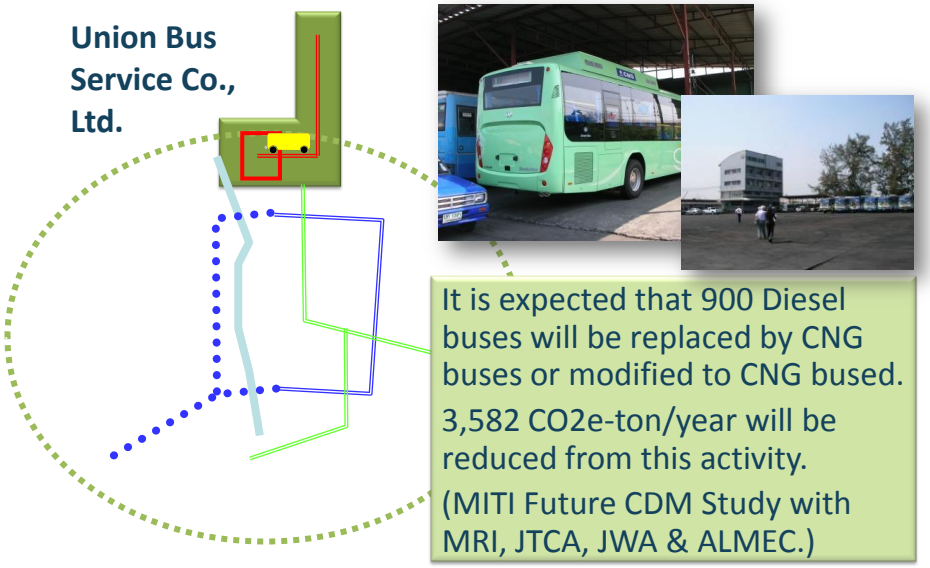
26,446 CO2e-ton/year will be reduced from this activity.(Nihon U Research.)

BRT

MRT
Blue Line Extension

312,440 CO2e-ton/year will be reduced from this activity.(OTP)

Limit of Single Project in Transport Sector



It is expected that 900 Diesel buses will be replaced by CNG buses or modified to CNG bused.

3,582 CO2e-ton/year will be reduced from this activity.

(MITI Future CDM Study with MRI, JTCA, JWA & ALMEC.)

Limit of Single Project in Transport Sector

NM0233 Palm Methyl Ester – Biodiesel Fuel (PME-BDF) production and use for transportation in Thailand (MLIT Study with JTCA, JWA & ALMEC)

Limit of Single Project in Transport Sector

Mass Transit	CO_2 Emission reductions (t/yr)	CER (M$ /yr)	Remarks
BRT South Line	26,446	0.85	50 % reduce, wLCA
Biodiesel production	147,000	4.09	JTCA,JWA, ALMEC
CNG Bus Replace	3,582	0.07	900 buses
MRT Blue Line ext.	120,450	3.41	OTP, yr. 2010
	312,440	6.25	OTP, yr. 2020

1%

2%

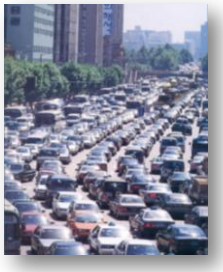
15,908,723

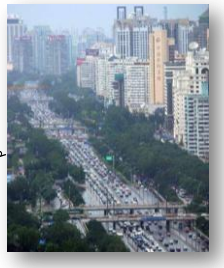
Fundamental Idea of S6 project

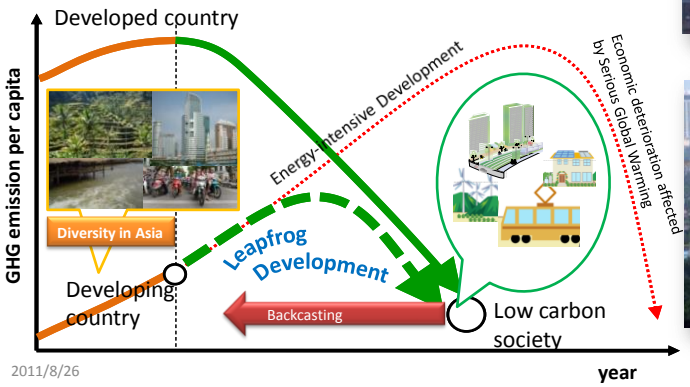
Economic growth

Risk to be energy-intensive society (high-carbon)

Necessary of leapfrog development

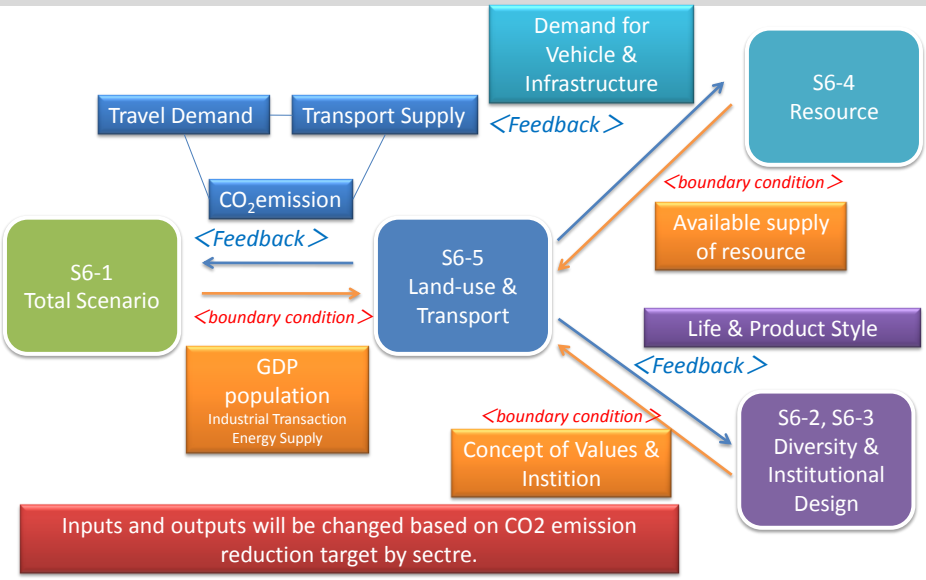






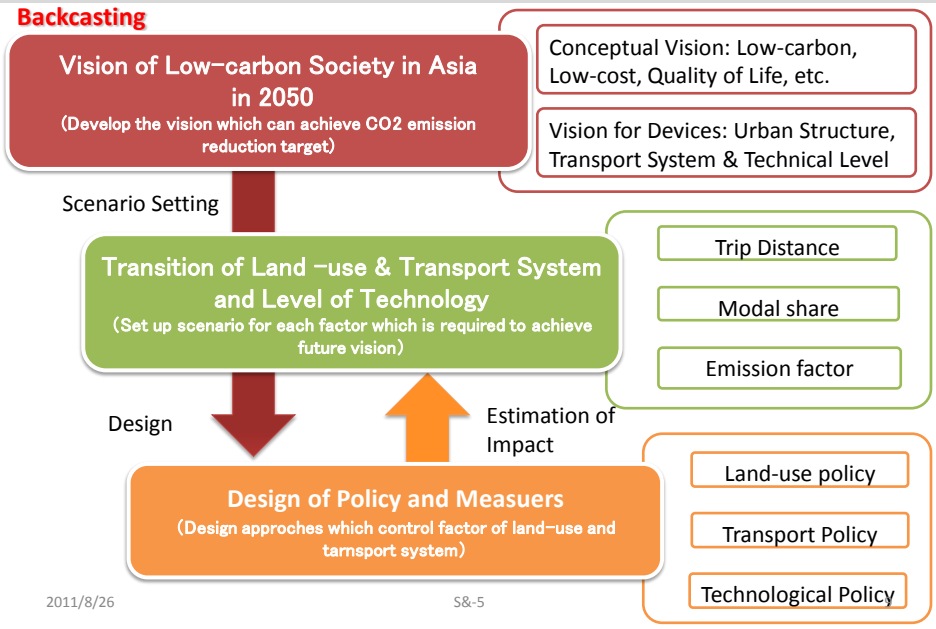
2011/8/26 7

Relationship between S6-5 and other subgroups in S6

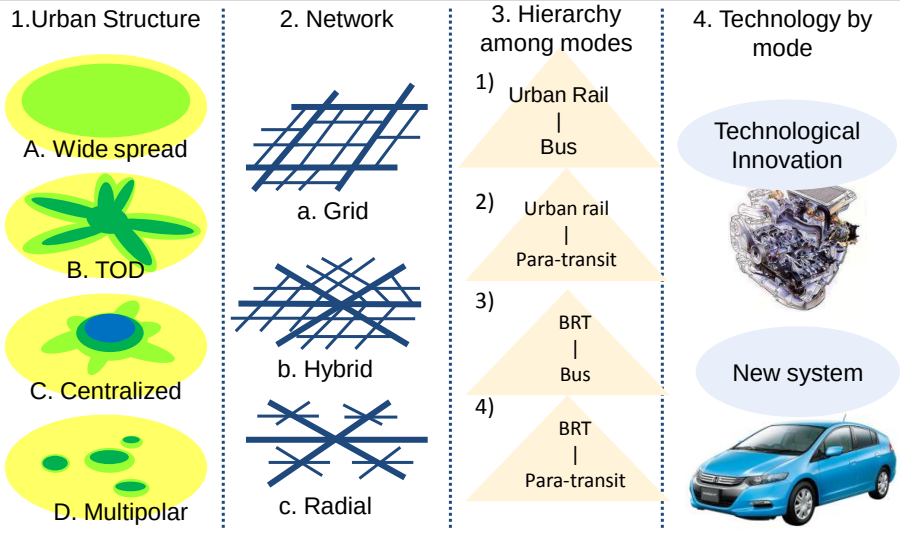


2011/8/26 S6-5 8

Research Approach in S6-5



Factors to Setup Future Vision of Low-carbon Transport System in Asia

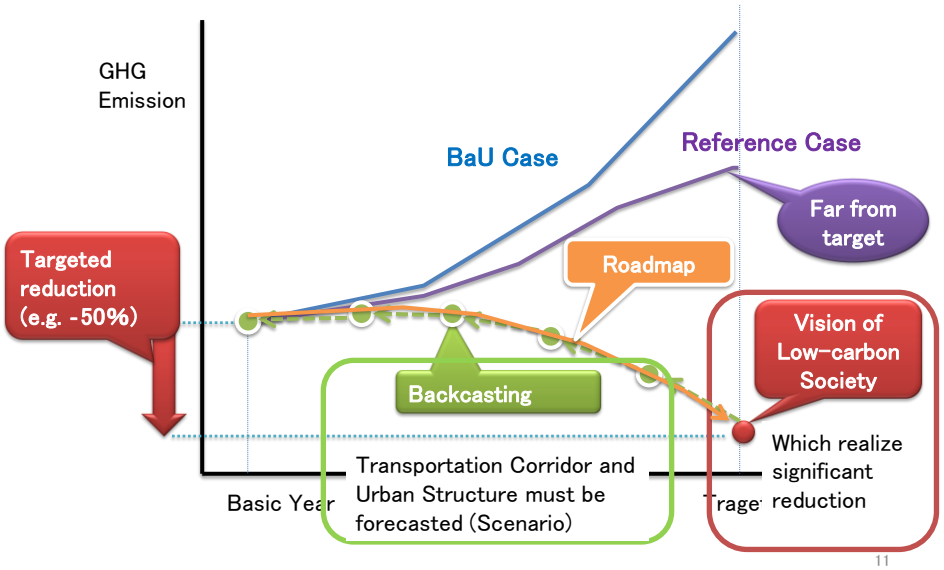


Combination considering characteristics of each city

Seeking future image of low-carbon transport

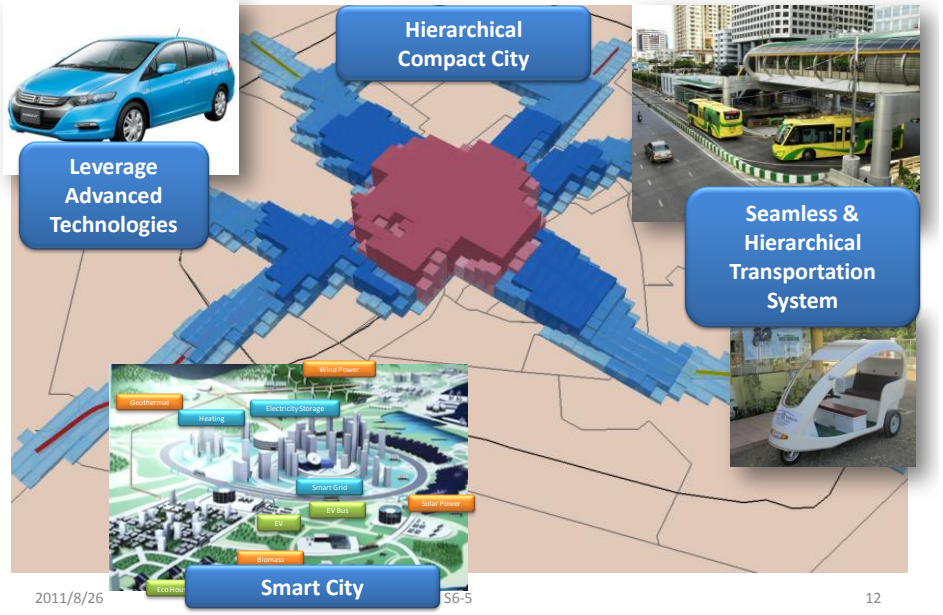
10

Development of Roadmap to Realize Low-carbon Transport System in Asia



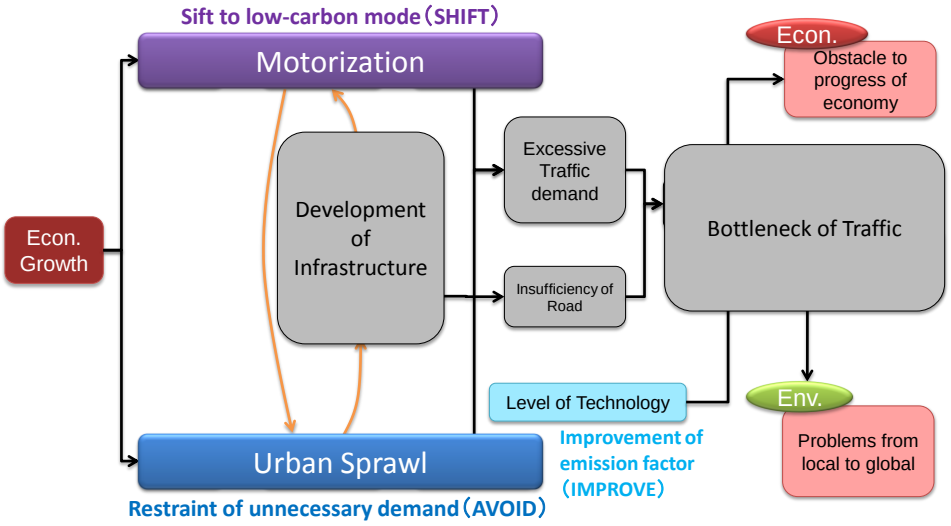
11

Future Vision of Low-carbon Society Centering on Transportation System



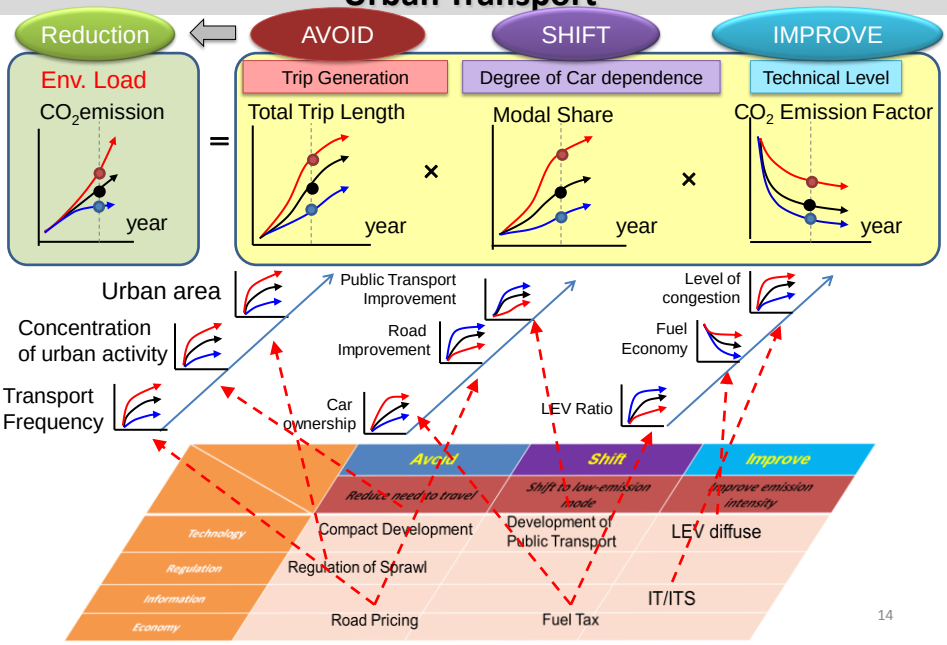
2011/8/26 S6-5 12

Causal Relationship on CO2 Emission from Transport
Negative Spiral between Motorization and Urban Sprawl



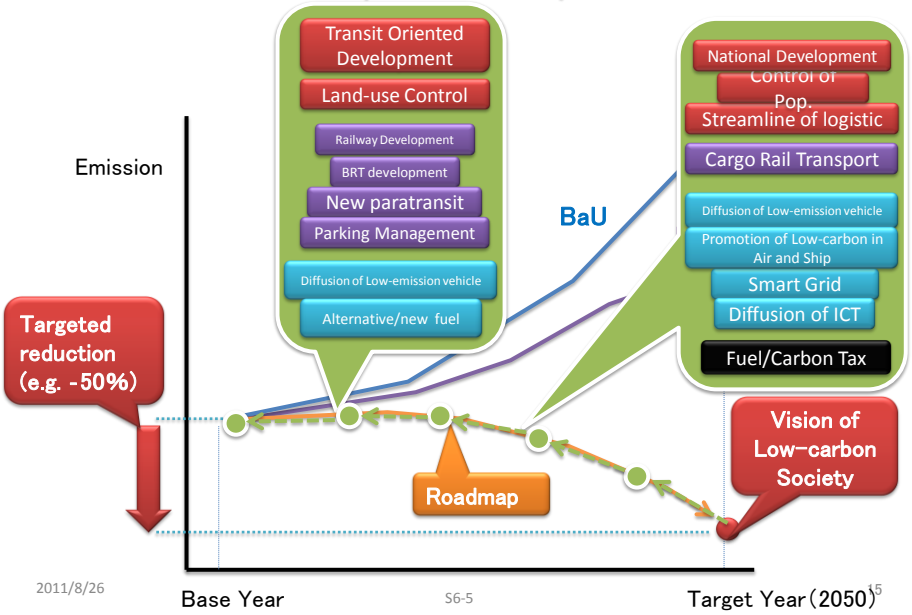
2011/8/23 名古屋大学 林良嗣 13

Structural Formula for Environmental Load from Urban Transport



14

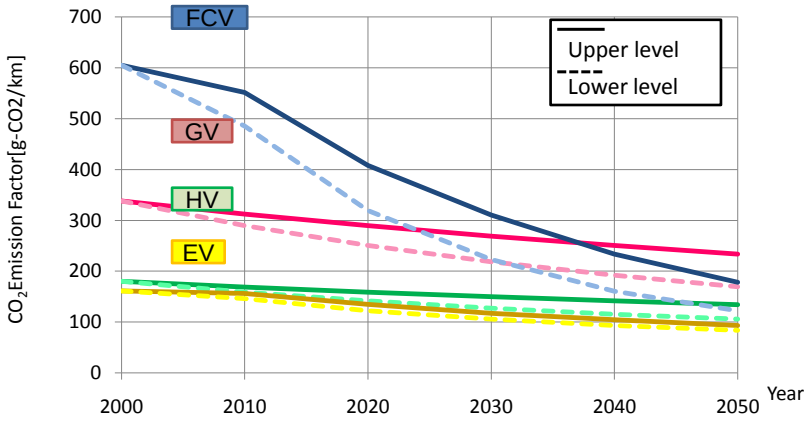
Concrete Measures and Policies to Achieve Low-carbon Transportation System in Asia



IMPROVE

Scenario for Improvement of Power Source and Fuel in the Case of Bangkok

- Scenario for CO2 Emission Factor Improvement was set based on estimation in Japan
- Production of electricity will be estimated based on scenario increased use of renewable energy



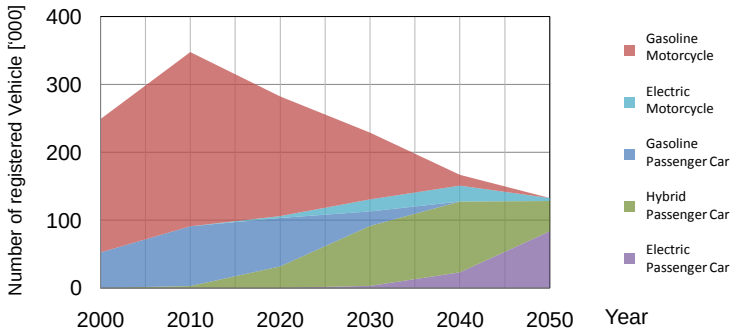
CO2 Emission Factor for Passenger Vehicle

* Result of the study of Nagoya Univ.

IMPROVE

Scenario for Low-emission Vehicle Diffusion

Based on Estimation in Japan, passenger car using gasoline will be 0% with the scenario that motorcycle will sift to passenger car,

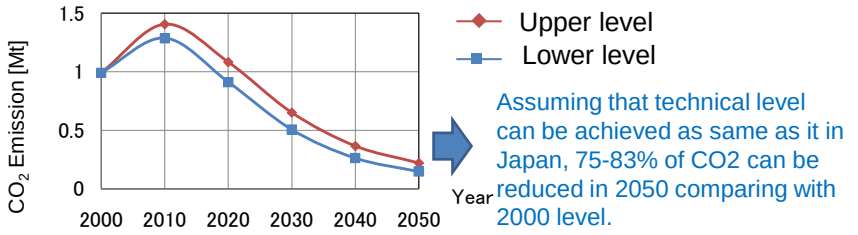


* Result of the study of Nagoya Univ.

IMPROVE

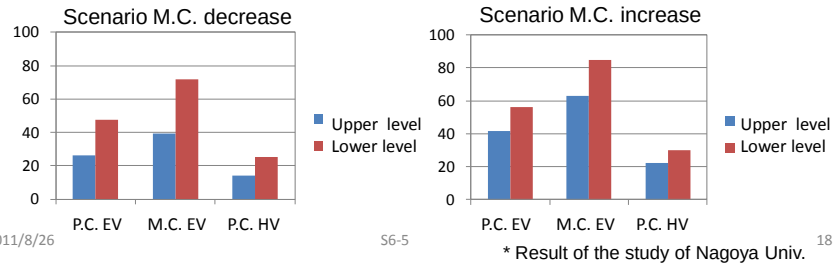
Available CO2 Emission Reduction from Passenger Car and Motorcycle by technical innovation in BKK

Differences on CO2 emission reduction by improvement level of fuel economy.



Assuming that technical level can be achieved as same as it in Japan, 75-83% of CO2 can be reduced in 2050 comparing with 2000 level.

Diffusion rate of low-emission vehicle to achieve redaction target in 2050 (50% comparing 2000 level).



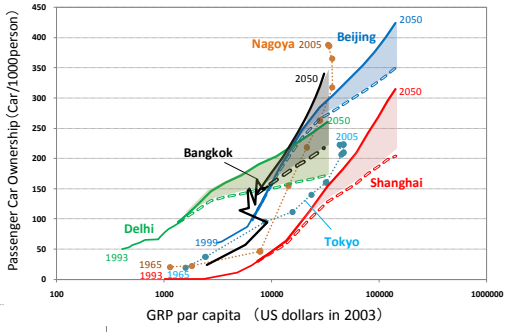
* Result of the study of Nagoya Univ.

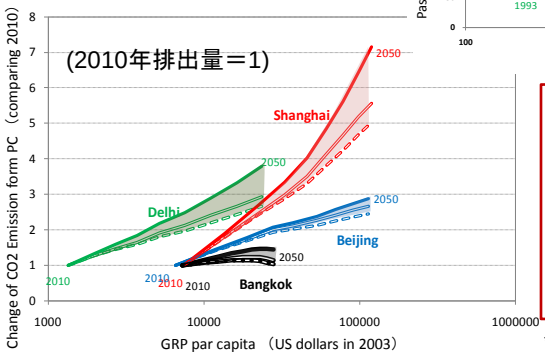
SHIFT

CO2 Emission Reduction from Passenger Car by Railway Development

By 2050, railway will be developed as same level in Tokyo in 2005.

- Without Railway
- Development during mature stage (2030～2050)
- Developed during early stage (2010～2030)





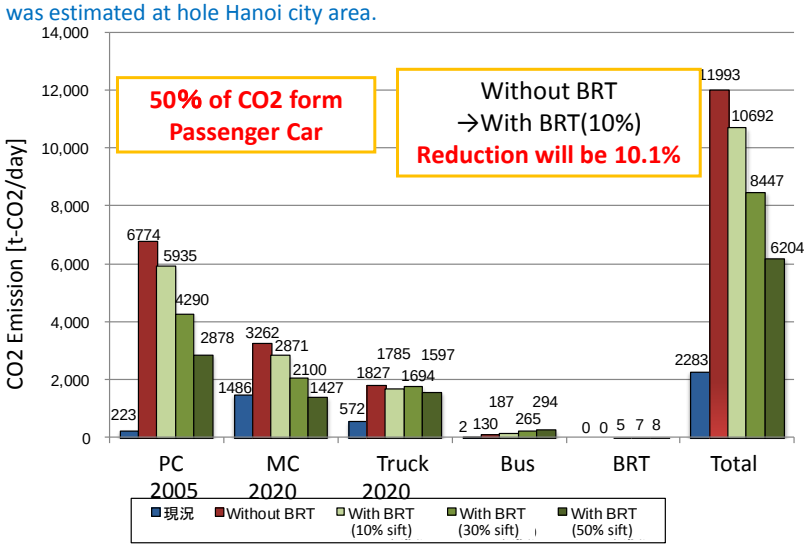
If railway might be developed during early stage, 36% of CO2 can be reduced. If including technological innovation, around 80-86% of CO2 can be reduce.

* Result of the study of Nagoya Univ.

SHIFT

CO2 Emission Reduction from Passenger Car by BRT Development in Hanoi

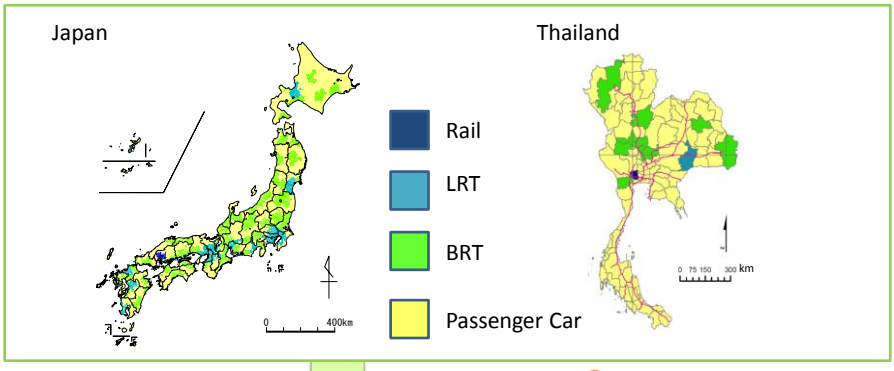
Assuming sifting rate from passenger car and motorcycle to BRT in 2020, CO2 Emission was estimated at hole Hanoi city area.



* Result of the study of Nihon Univ.

Identification of Adequate Low Carbon Transportation System and Urban Structure for Each Urban Area

<Nagoya Univ.>



<YNU>

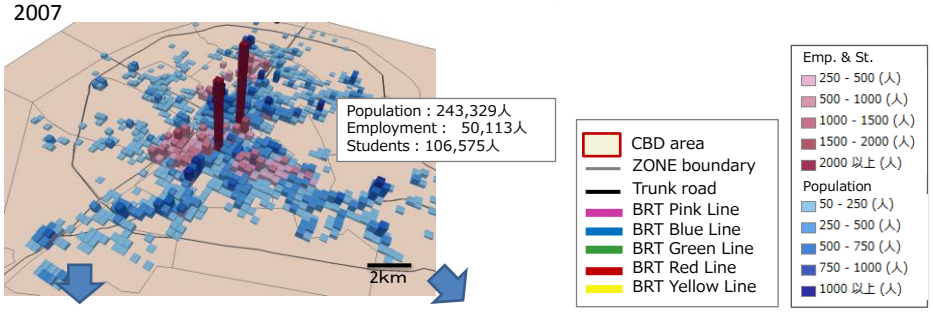
Identification of Transportation System and Urban Structure for each city

- Promotion of Public Transport Type, Promotion of Vehicle Technology Innovation Type, etc.
- Feasibility study by QOL and estimated cost
- Evaluation of environmental improvement by factors

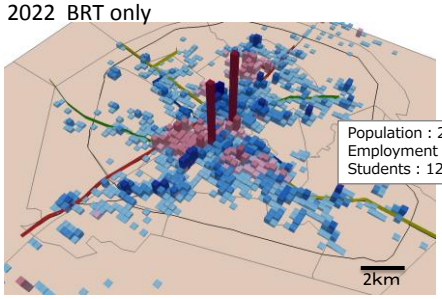
SHIFT
AVOID

CO2 Emission Reduction by BRT and Transit Oriented Development in Khon Kean

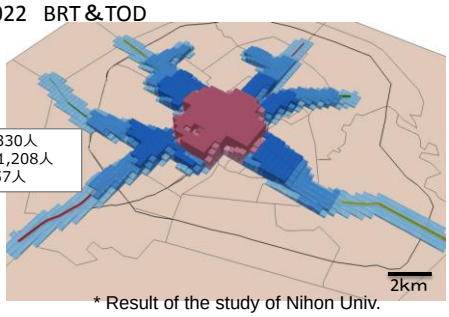
2007



2022 BRT only



2022 BRT&TOD

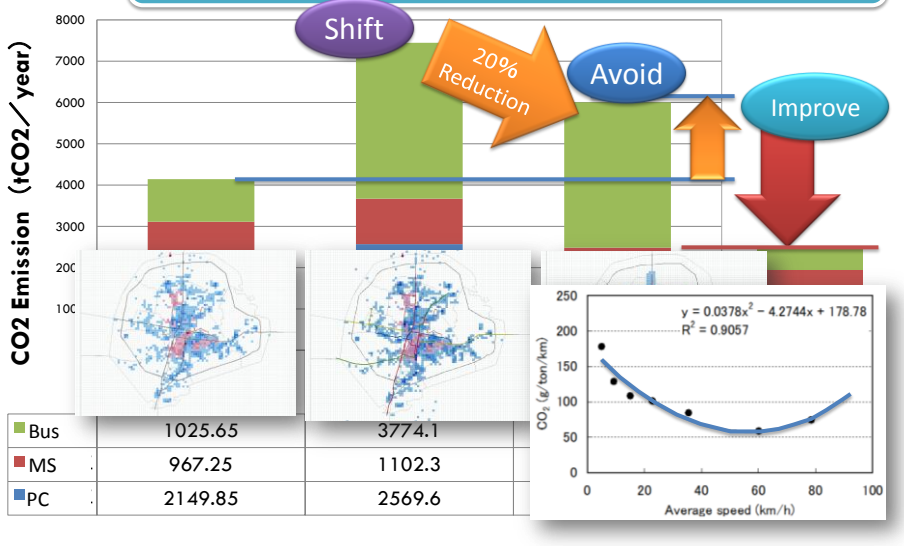


* Result of the study of Nihon Univ.

SHIFT
AVOID

CO2 Emission Reduction by BRT and Transit Oriented Development in Khon Kean

We need technological innovation and integration of transportation systems to enhance sustainable transport

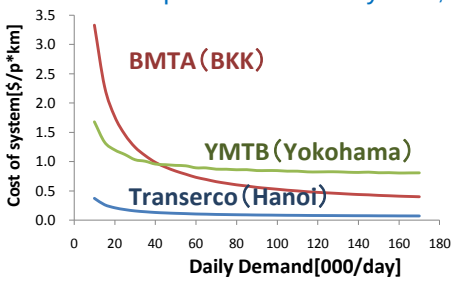


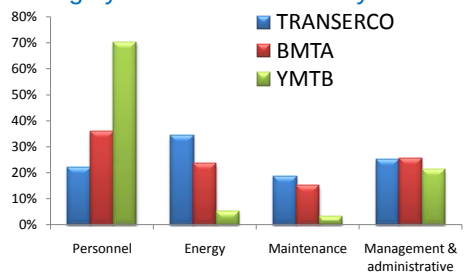
Bus	1025.65	3774.1
MS	967.25	1102.3
PC	2149.85	2569.6

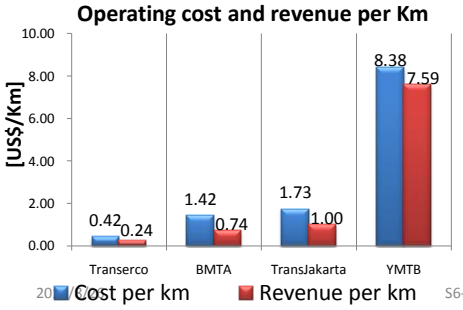
SHIFT
IMPROVE

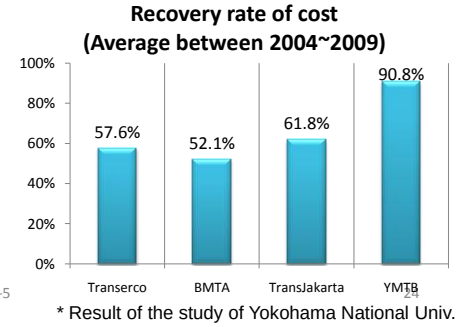
Evaluation of Bus Operating System

To develop effective BRT system, operating system should be analyzed.









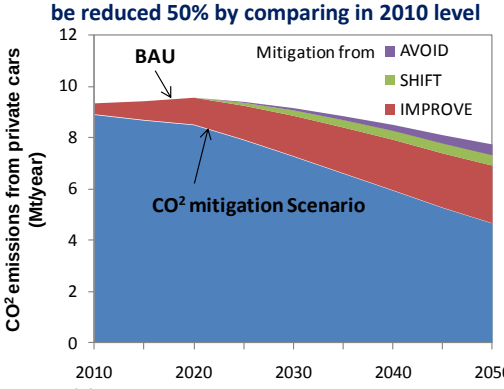
* Result of the study of Yokohama National Univ.

Example of Backcasting for Comprehensive Strategy to Achieve CO2 Emission Reduction Target

Strategy	Reduction rate by each strategy
IMPROVE	40.9%
SHIFT	4.6%
AVOID	4.5%

Contribution of each strategy will be set based on capability of reduction

CO2 emission from passenger car in2050 will be reduced 50% by comparing in 2010 level



* Result of the study of Nagoya Univ.

Scenario
（Promoting Automobile Technology）

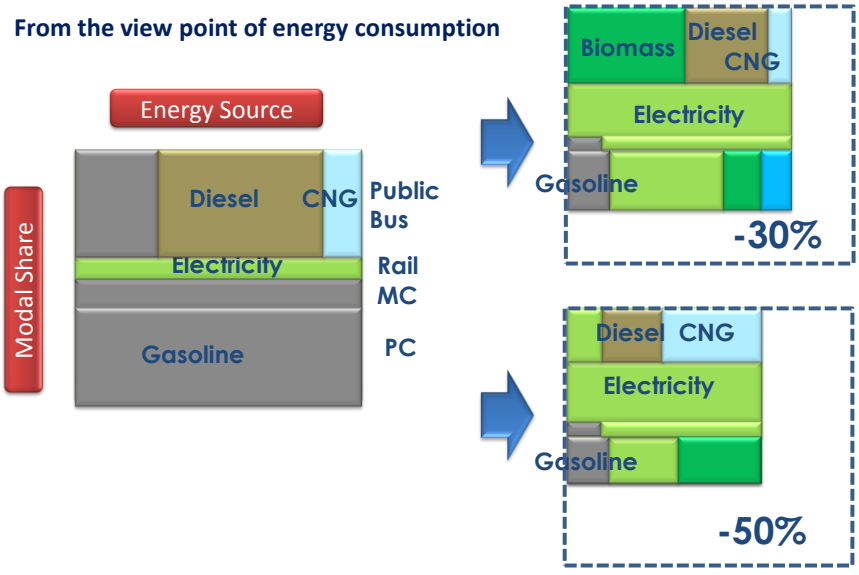
IMPROVE
Diffuse of LEV and Improve Fuel Economy
（Based on Estimation in Japan, 50% level was assumed in 2050）

SHIFT
Railway development
（Railway Station will be increase 1.46 times of the plan by 2050）

AVOID
TOD and Land-use control
（Developed floor space near railway station will be increased 1.22 times and urban area will be decrease 2%）

Comprehensive Strategy to Achieve CO2 Emission Reduction Target

From the view point of energy consumption



Conclusion

- To realize the low-carbon society, leapfrog development is necessary in Asian developing city.
- Thus, the future vision of low-carbon society which will achieve huge reduction of CO2 emission should be established firstly.
- Impacts of each avoid, sift and improve measures should be clarified.
- Then, effective combinations of them should be examined through backcasting approach.
- Finally the available scenario should be set up for the roadmap of each city.