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Critical Issues and A Backcasting Approach to Design Low-Carbon Transport Systems in Asia

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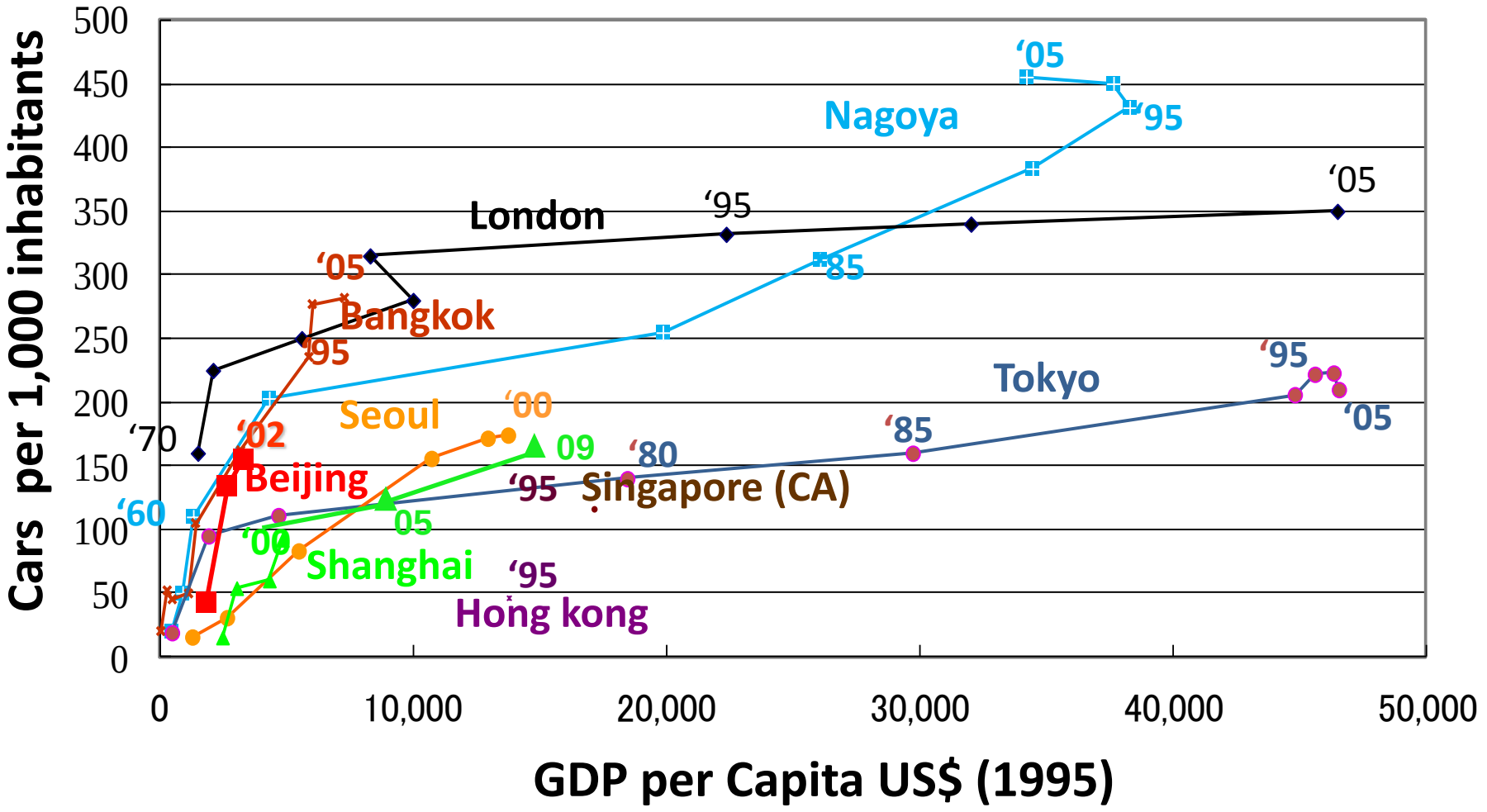
A) Critical Issues in Sustainability in Asia

Transport as

1) Causer of CO_2 and pollution
2) Supporter for CO_2 and pollution causers (industries)
3) Victim of climate change
4) Barrier for sustainability

A-1) Causer of CO_2 and pollutions

Car Ownership

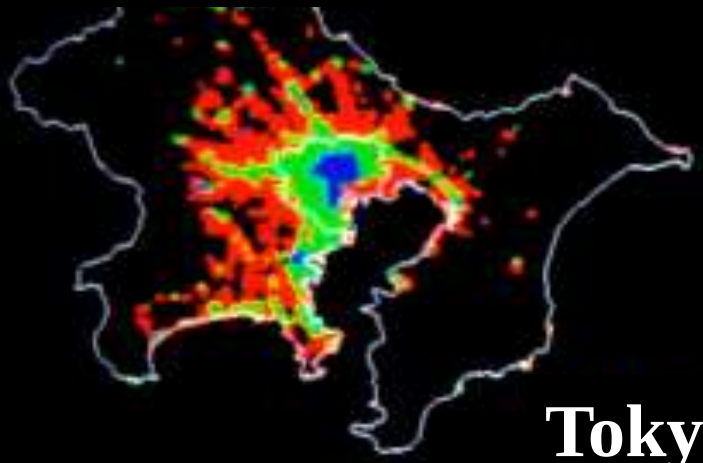


Yoshi Hayashi, Sep. 2010

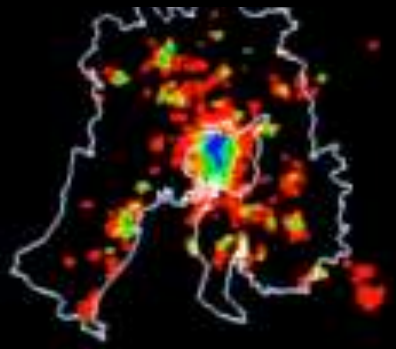
Failure of Urban Transport System

Urban Sprawl

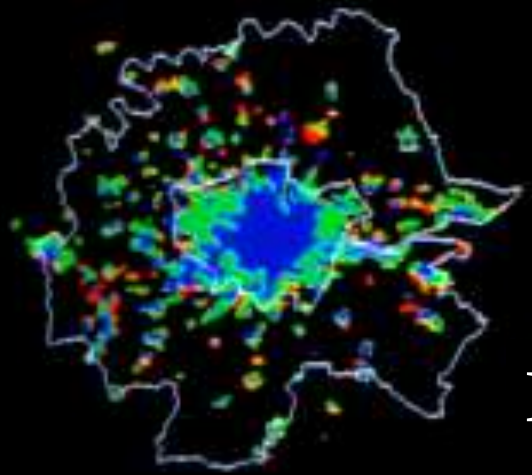
Changes in Built-up Areas



Tokyo



Nagoya



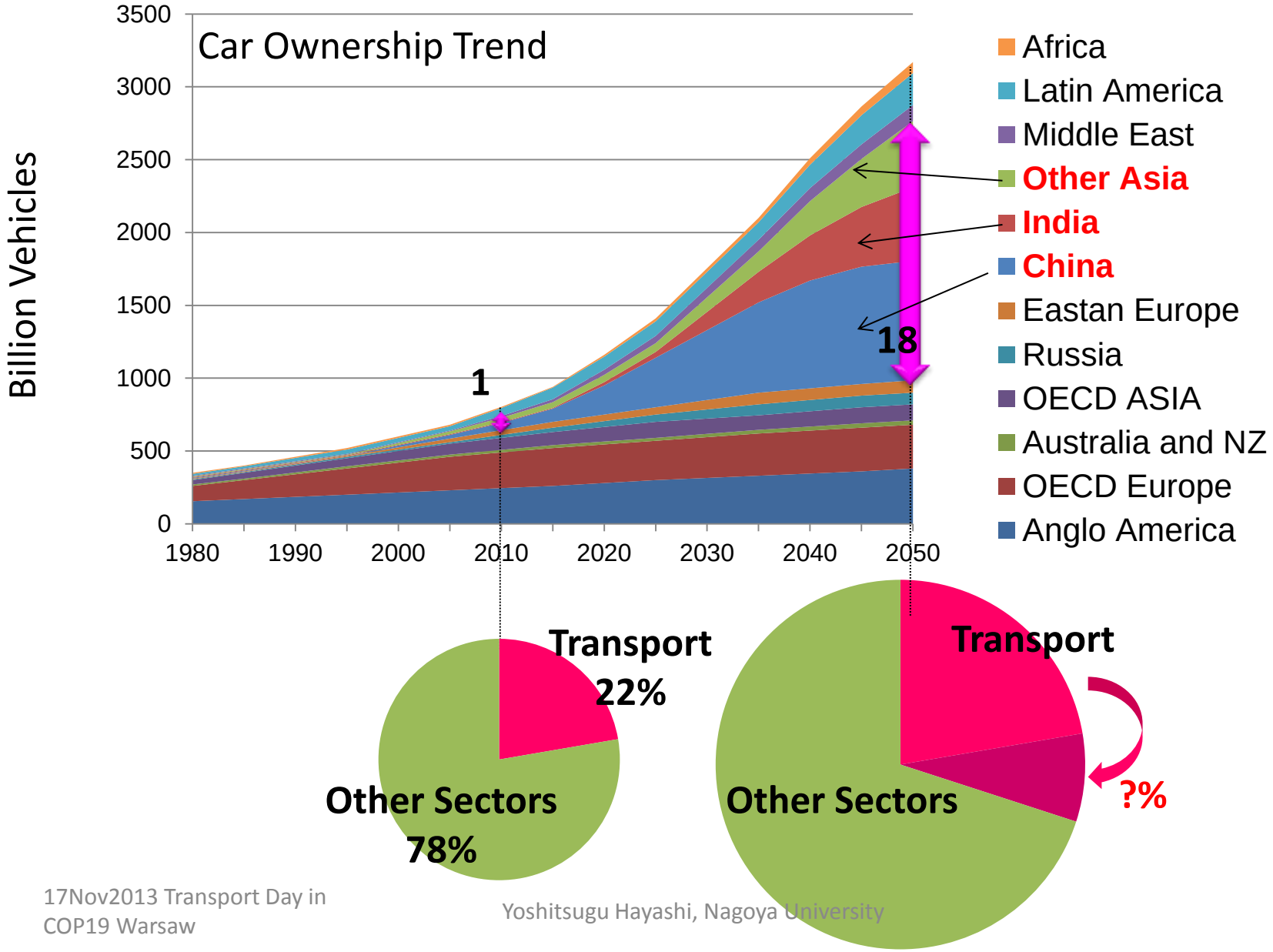
London

Bangkok

0 50 km

1910
1965
1985

Upgrading Transport to a Key Sector



A-2) Supporter for CO_2 and pollutions causers

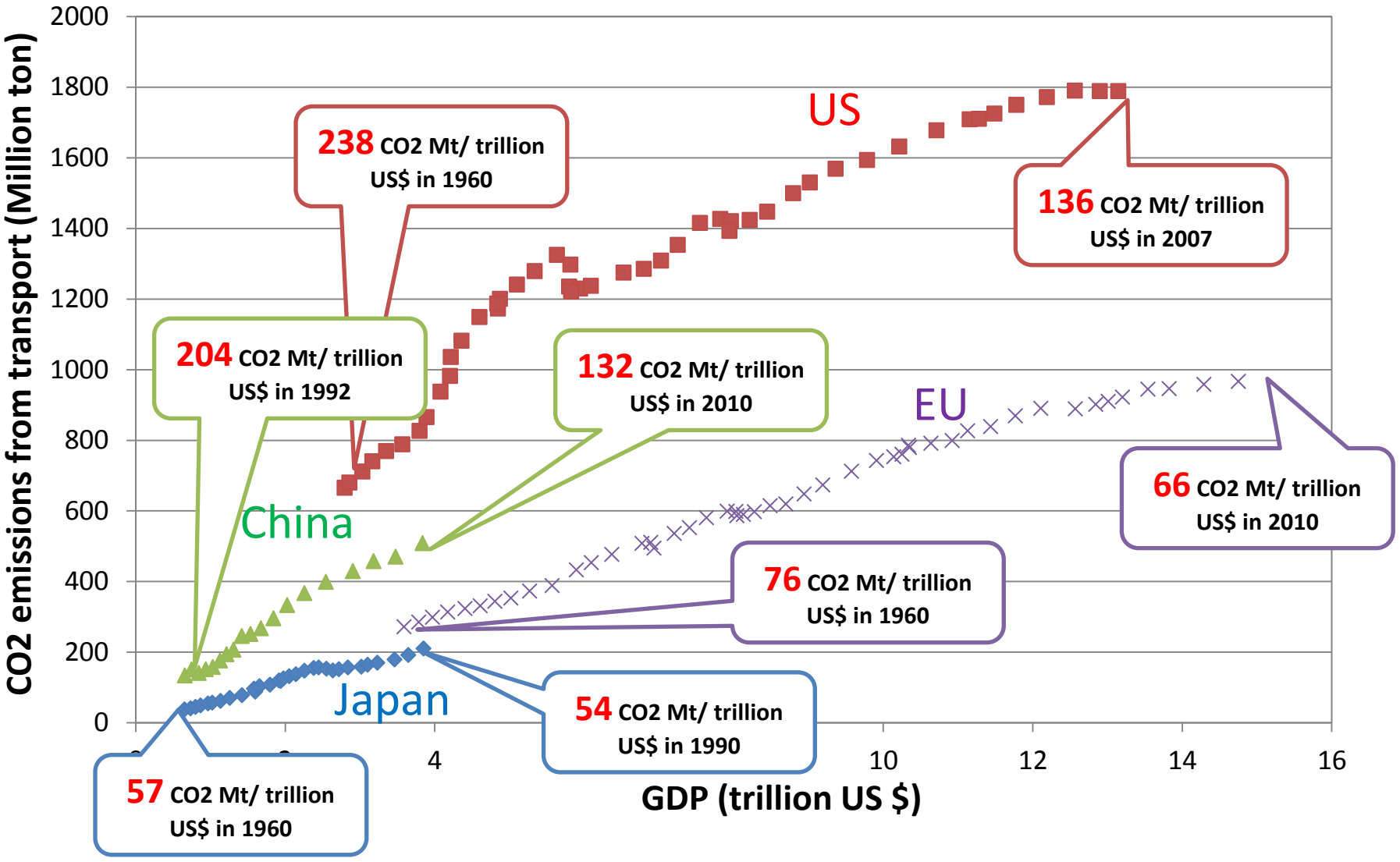
- Decentralisationof industries
- Construction of motorways for linking production places and consumption places
- Unsustainable model for economic development

Serious Air Pollution Jointly by Industry, Household and Traffic

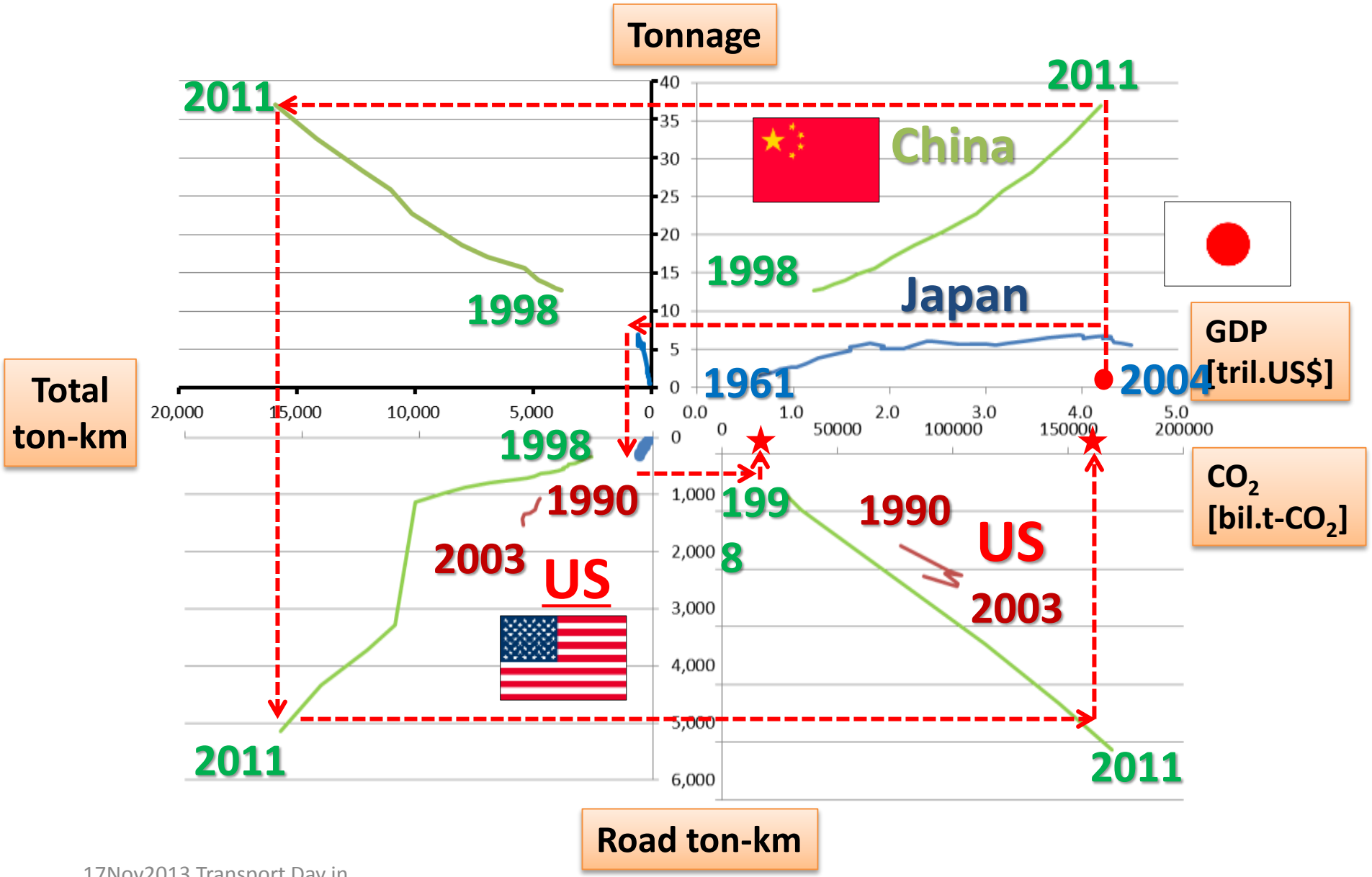
Air Pollution Blowing Housings

Emissions from Motorways Occupied by Lorries as a Result of Road Transport based Industrial Development

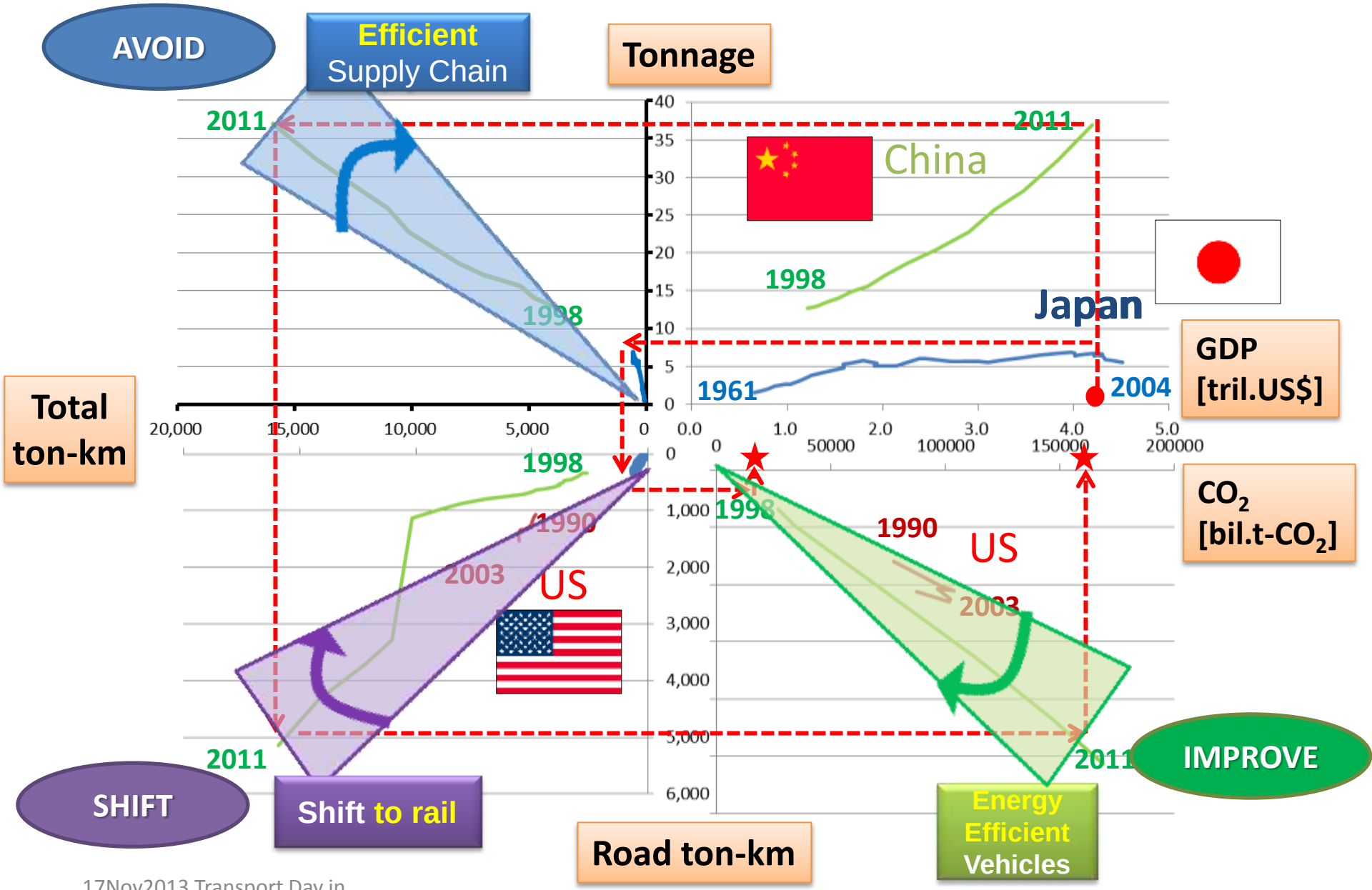
CO2 Emission Growth in Transport from Economic Growth



China vs Japan



Change the slope by AVOID/SHIFT/IMPORVE



B) Revolutional success in SHIFT from road to rail getting rid of hyper-congestion

- Case of Bangkok -

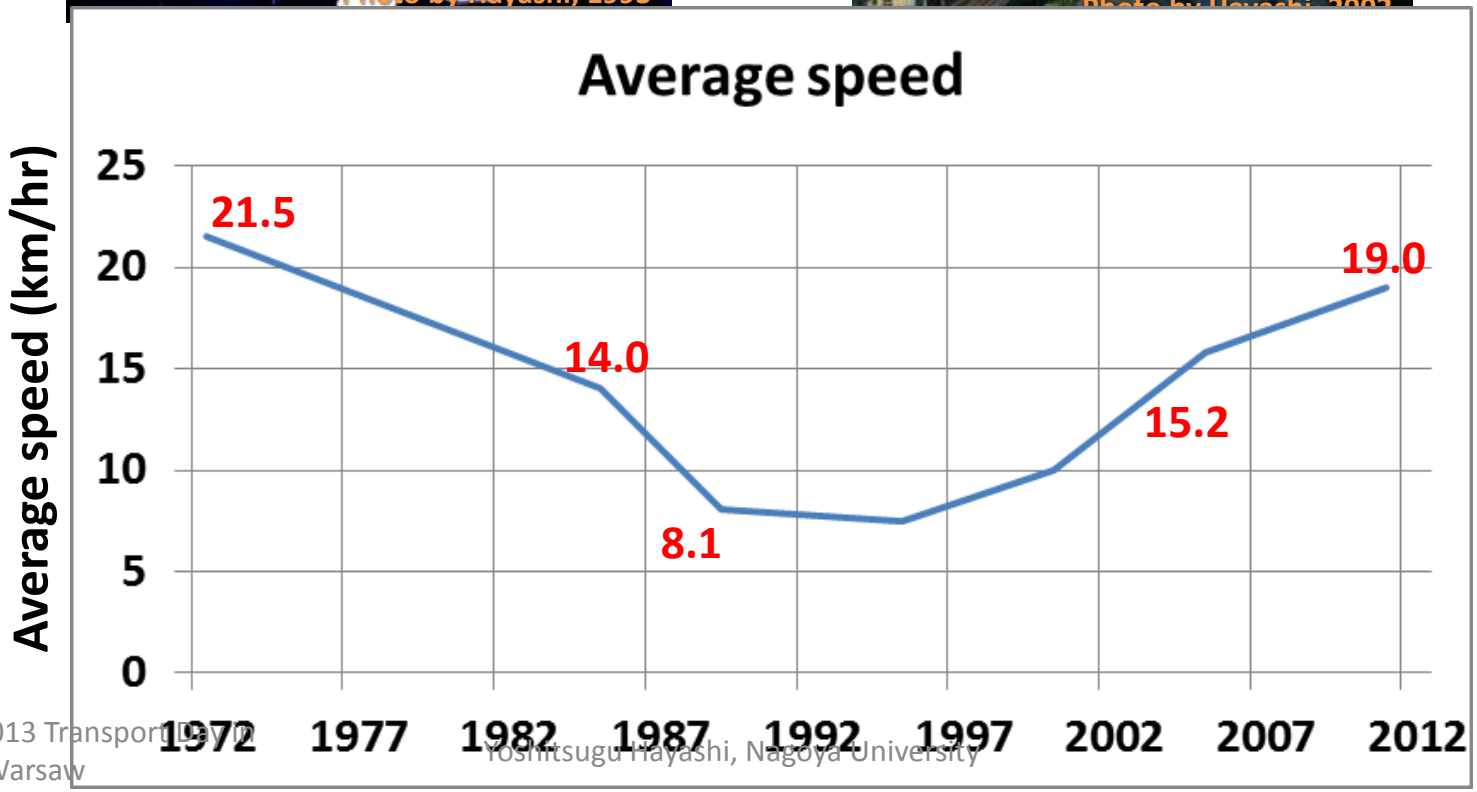
Policy/technology options (GIUTE Matrix)

Strategies / Means	AVOID	SHIFT	IMPROVE
Technologies	• Transport oriented development (TOD) • Poly-centric development • Efficient freight distribution	• Railways and BRT Improvement • Interchange improvement among railway, BRT, bus and para-transit modes • Facilities for personal mobility and pedestrians	• Development of electric vehicles • Development of biomass fuel • "Smart grid“ development
Regulations	• Land-use control	• Separation of bus/para-transit trunk and feeder routes • Local circulating service • Control on driving and parking	• Emissions standards • “Top-runner" approach
Information	• Telecommuting • Online shopping • Lifestyle change	• ITS public transport operation	• "Eco-driving" • ITS traffic-flow management • Vehicle performance labeling
Economy	• Subsidies and taxation to location	• Congestion Charge • Cooperative fare systems • Value capture	• Fuel tax/carbon tax • Preferential taxation to low-emissions vehicles

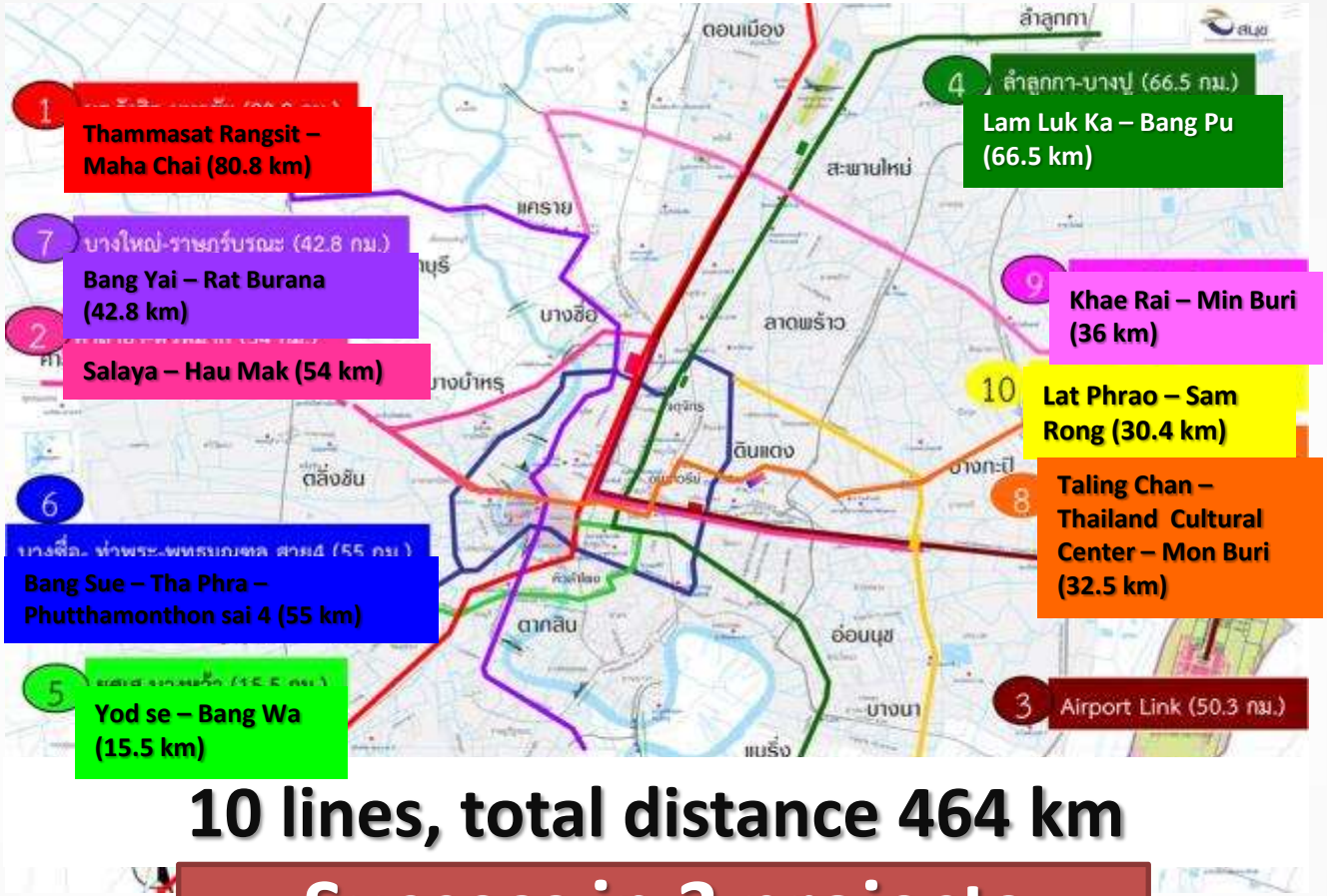
Trend of Traffic Congestion in Bangkok

1990s
(Before MRT Development)

2000s
(After MRT Development)



Mass Rapid Transit Master Plan in 2020



10 lines, total distance 464 km

Success in 3 projects

↓

More public support

↓

Government policy shift to Railway (2011)

Bangkok Airport Link: Rolling Stock

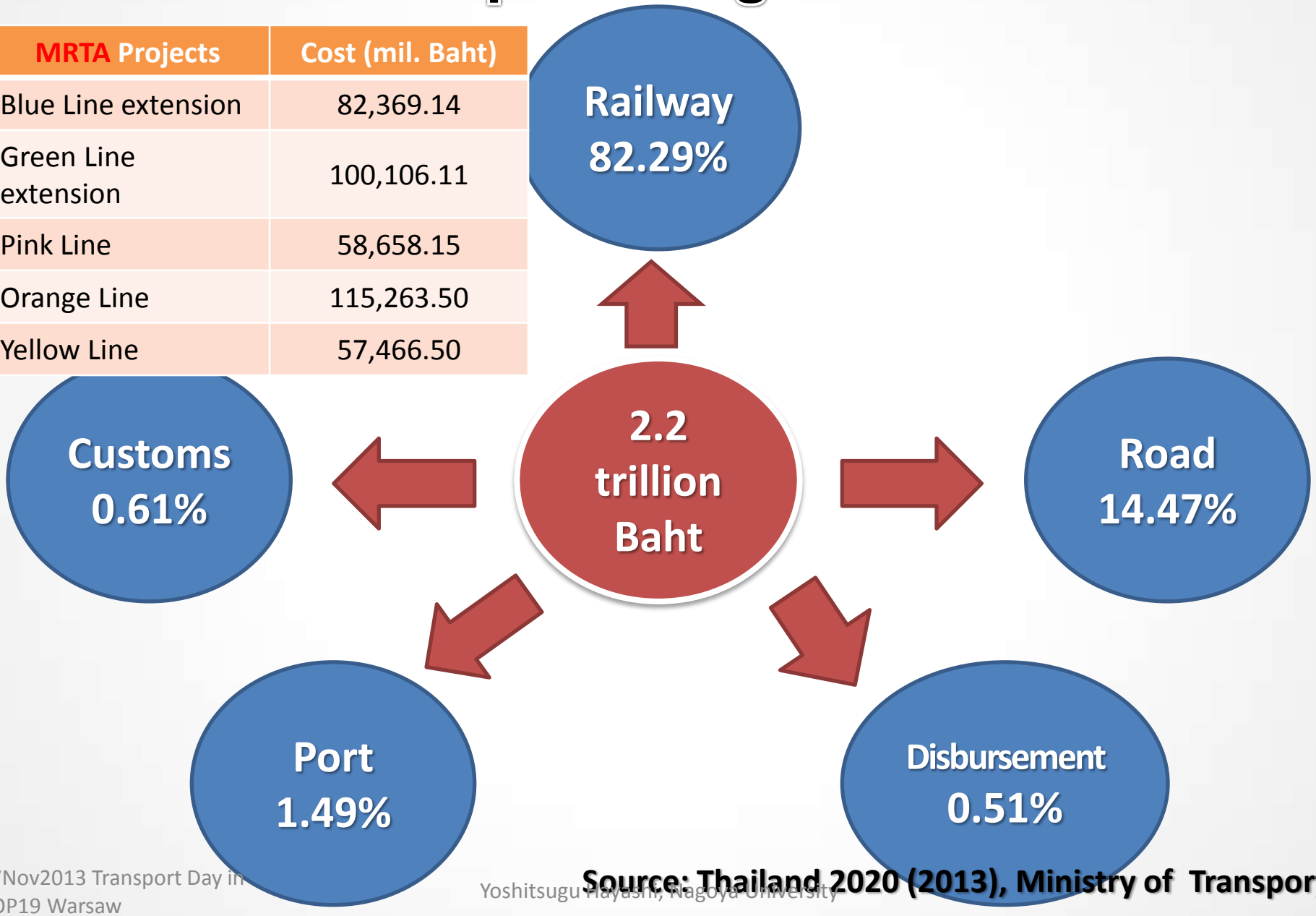
SA Express (4-car train)

SA City Line (3-car train)

Source: Dr. Krit, State Railways of thailand

Thailand 2020:
Rail in transport budget 2013 - 2020

MRTA Projects	Cost (mil. Baht)
Blue Line extension	82,369.14
Green Line extension	100,106.11
Pink Line	58,658.15
Orange Line	115,263.50
Yellow Line	57,466.50



Source: Thailand 2020 (2013), Ministry of Transport

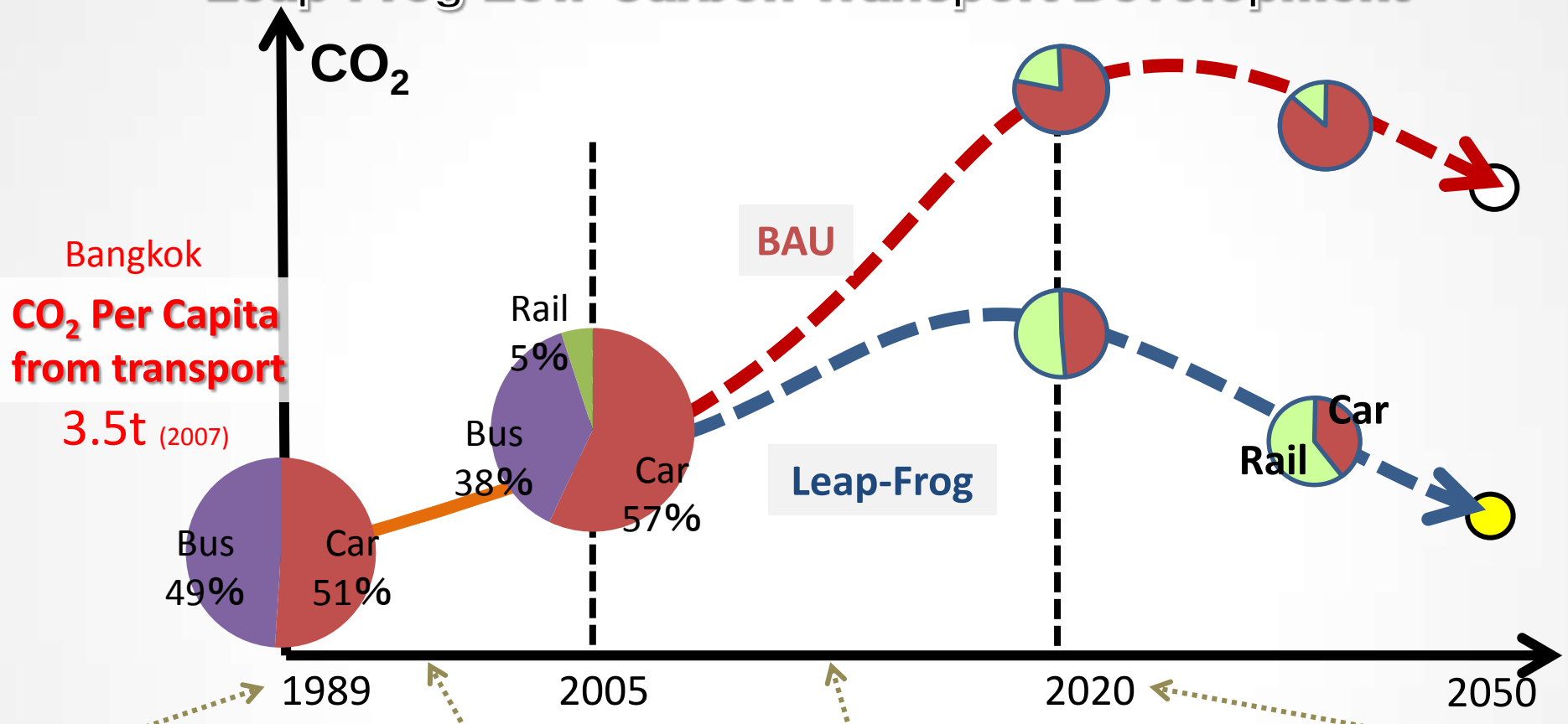
C) Backcasting Approach towards Future Low Carbon Transport

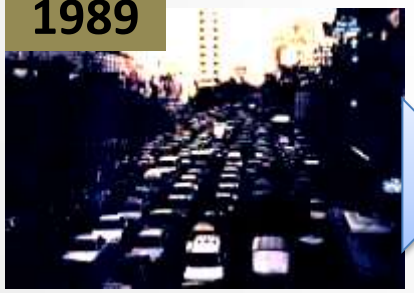
- Methodology for MRV in NAMAs-

C-1) Backcasting Approach towards Future Low Carbon Transport

- Urban Transport-

Leap-Frog Low-Carbon Transport Development





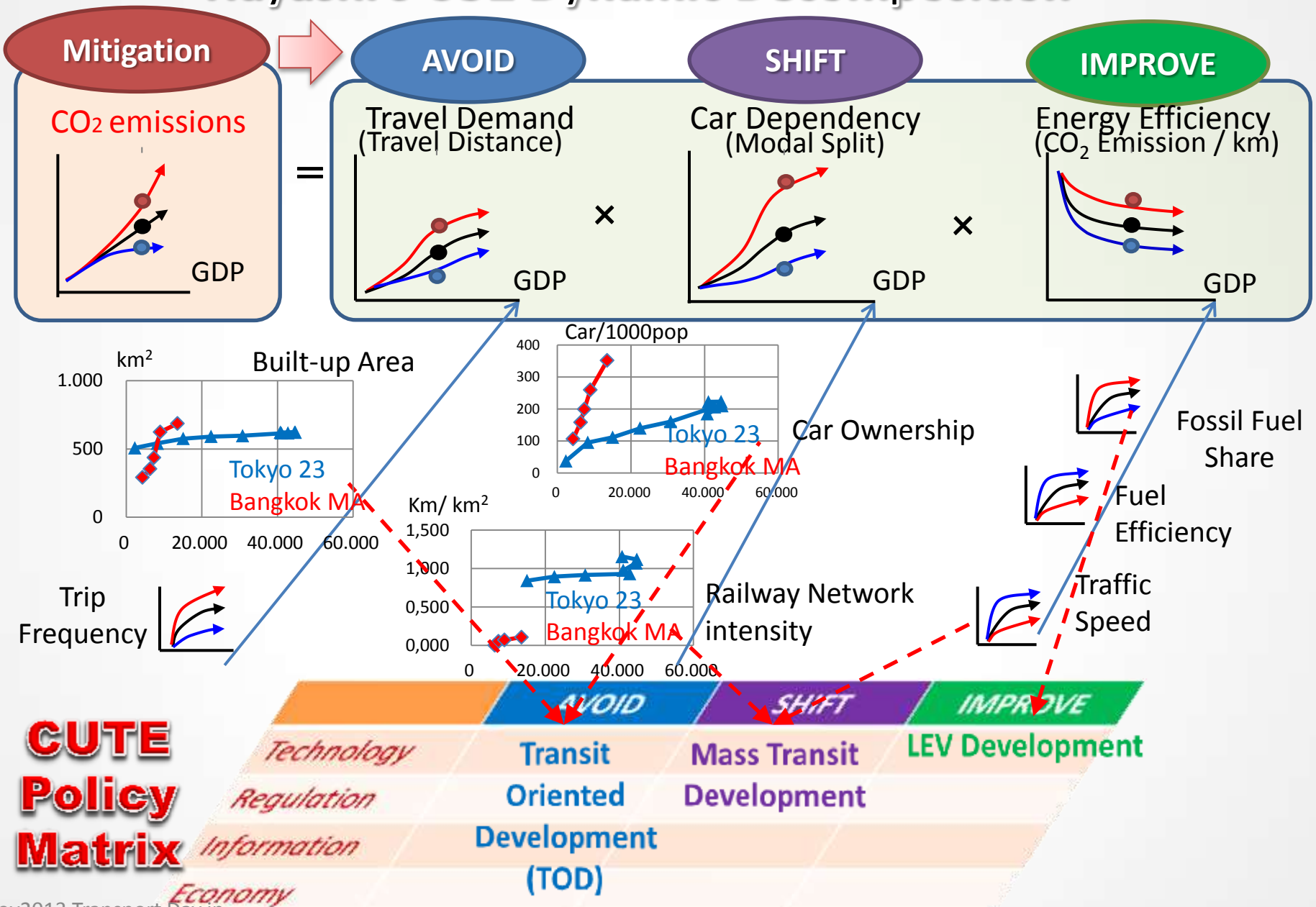
Heavy Congestion

BTS Sky Train **20**km

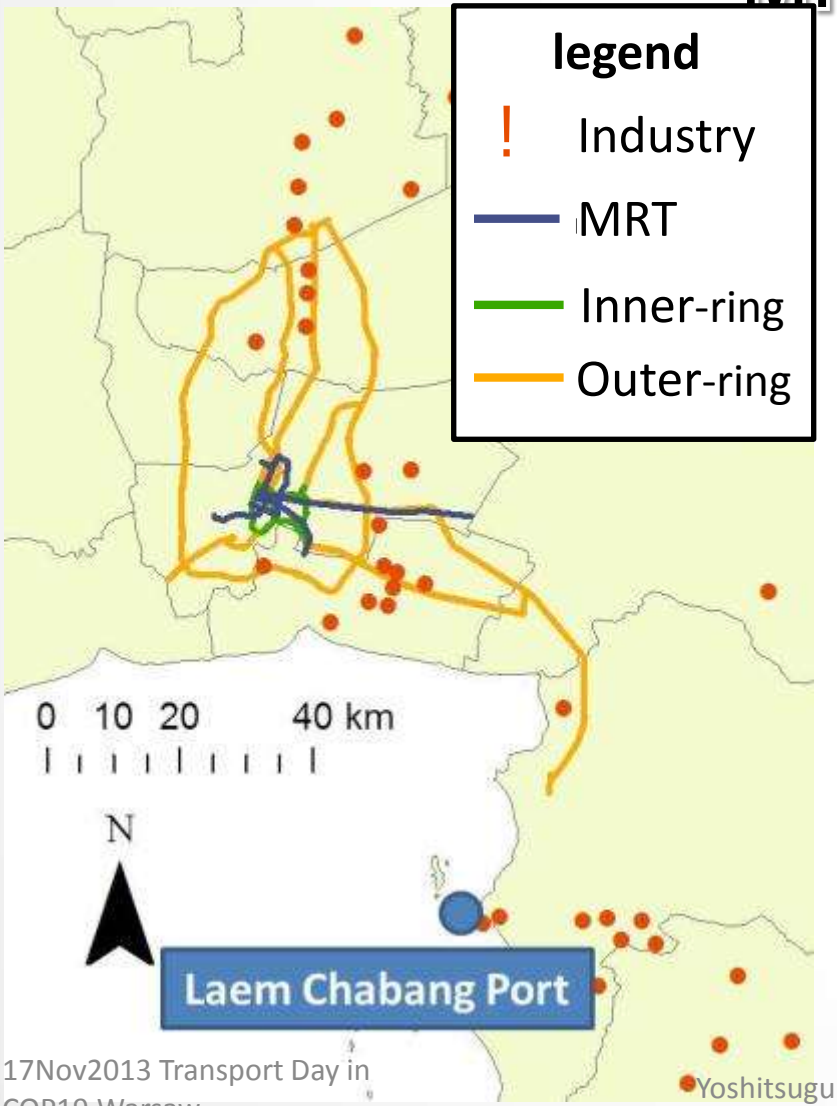
MRT Development **81**km

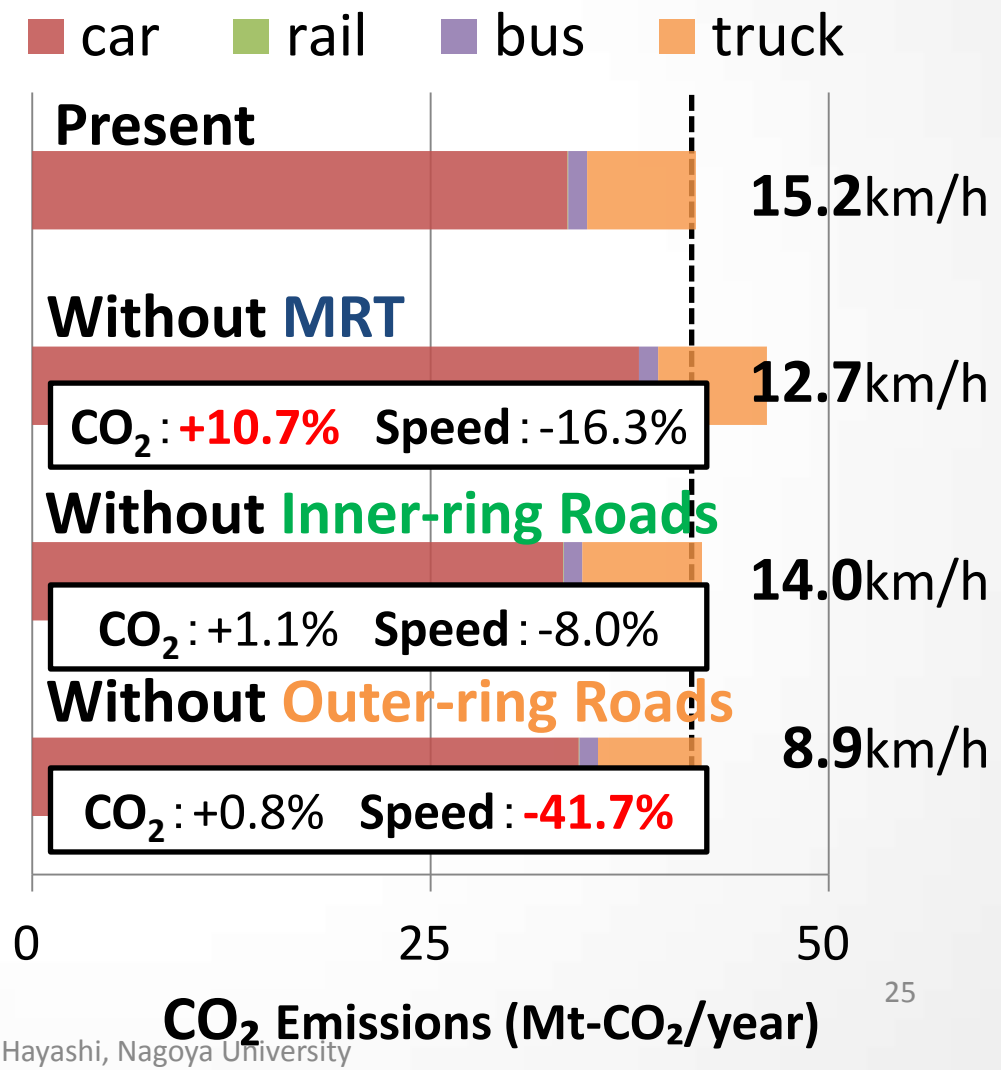
10lines total **464**km

Hayashi's CO2 Dynamic Decomposition



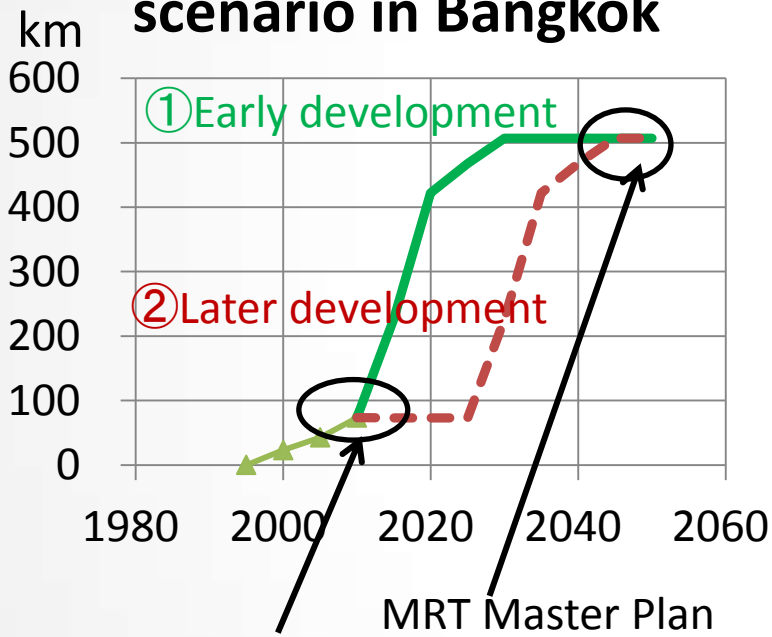
The Effects of Integrated Transport Systems on Traffic Congestion and CO_2 Mitigation



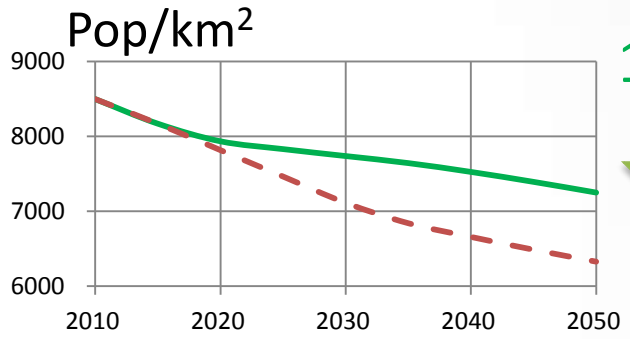


The Effects of Early MRT Development

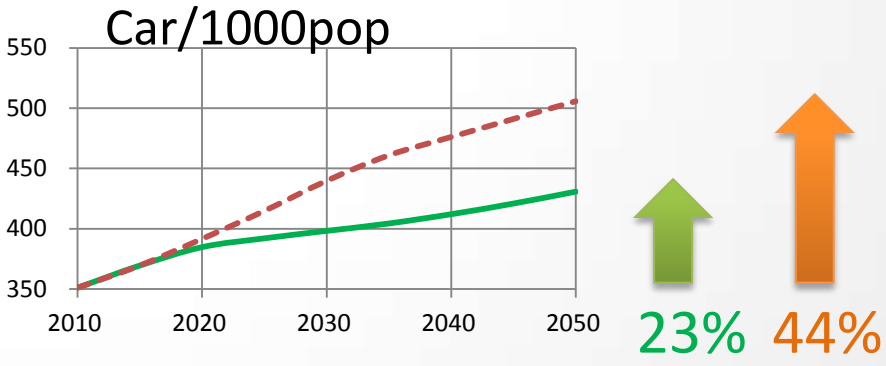
MRT development timing scenario in Bangkok



Urban sprawl calming by high density development around stations

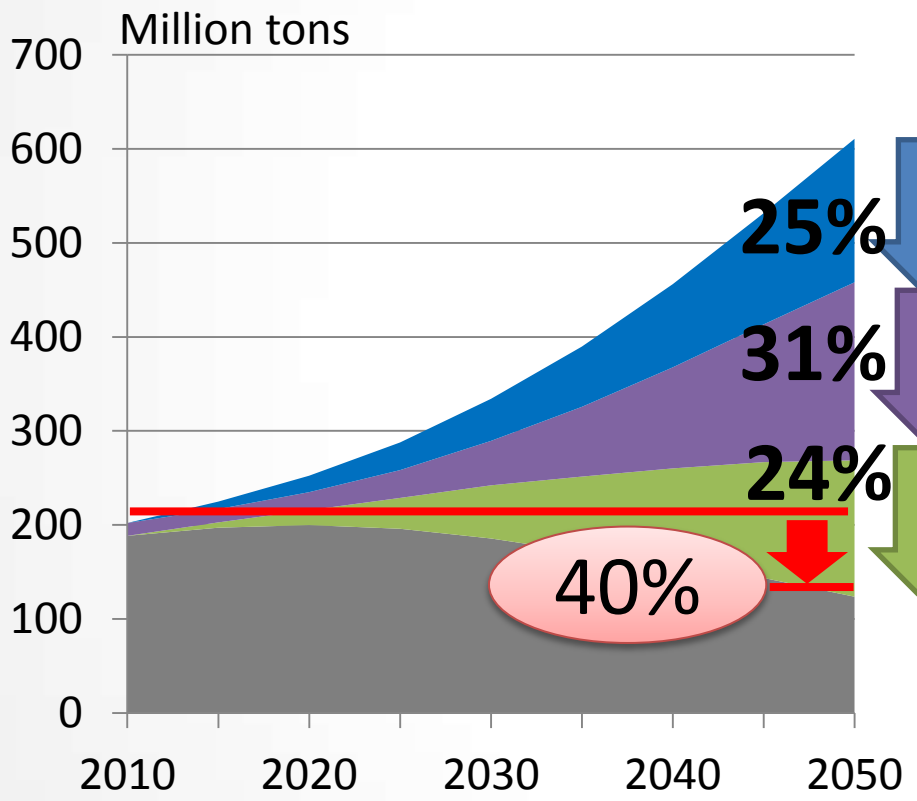


Car ownership growth calming by rail-oriented travel habit



The Roadmap for Low-Carbon Urban Transport Development in ASEAN Megacities

CO_2-emission reduction



AVOID

Land-use control (3% less annual expansion of built-up area)

SHIFT

4,568 km MRT development, (6cities, Ave.: 760 km/city)

23,337km BRT development (23cities, Ave.:1015km/city)

IMPROVE

Increasing LEV share (EV76%, HV23%),
Improving Fuel Efficiencies (by 28%)
Emission intensity of power generation
(2005:1269g-CO_2/kwh
2050: 546g-CO_2/kwh)

C-1) Backcasting Approach towards Future Low Carbon Transport

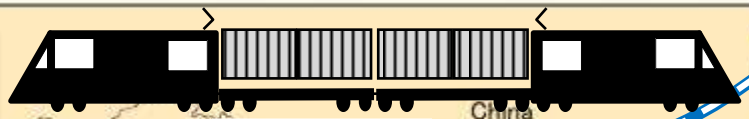
- Inter-regional Transport-

Proposing Vision:

Mainstreaming Rail and Water in Interregional Transport

Inland Freight High Speed Rail (HSR) Development between Port Hubs

GMS (Greater Mekong Sub region)



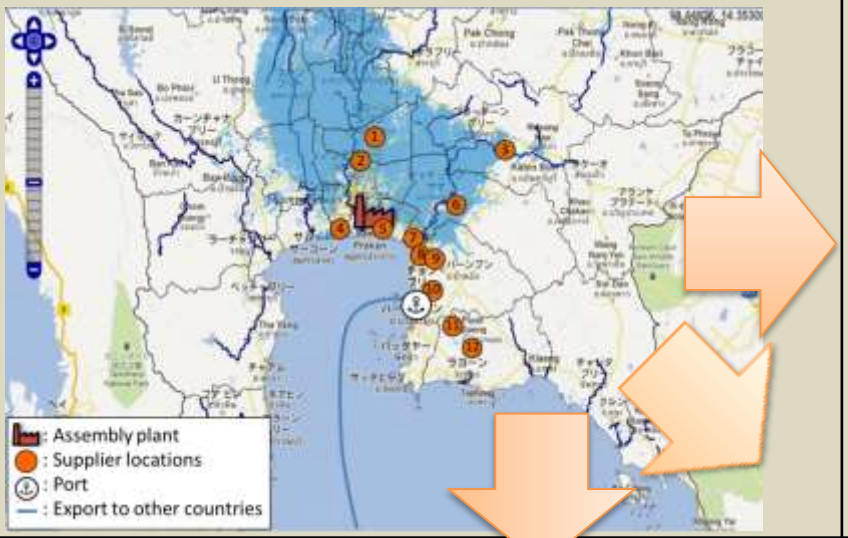
Shanghai
Kunming
High Speed Rail
Kyaukpyu Port
Hanoi
Yangon
Road(Economic Corridor)
Bangkok
Phnom Penh
Singapore
Local Cities on HSR
Megacities on HSR
Cities on Local Freight Rail
Light Industry
Advanced Industry & Commercial
Heavy Industry
AVOID
SHIFT
IMPROVE
Industrial Rail-Oriented Development (ROD) Corridor
Rail/Water Oriented Intermodal Transport System
Low-carbon Vehicles, Aircrafts, Vessels

Interregional Vision

Efficient Industrial Supply Chain

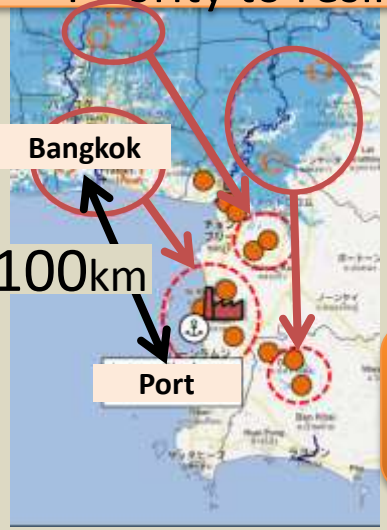
Impact analysis to reduce CO_2 emissions by plant location change

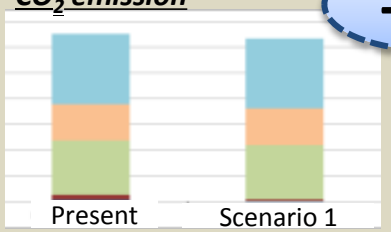
Current Industrial location (Bangkok)



Scenario 1 :

Priority to resilience for disaster





-3%

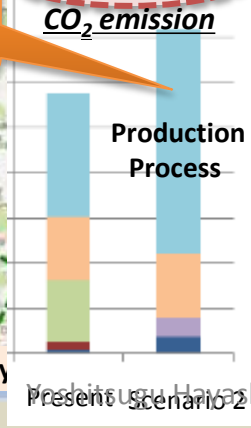
Proximity location of Assembly plant and supplier

Scenario 2 :

Priority to low labor cost (Cambodia)

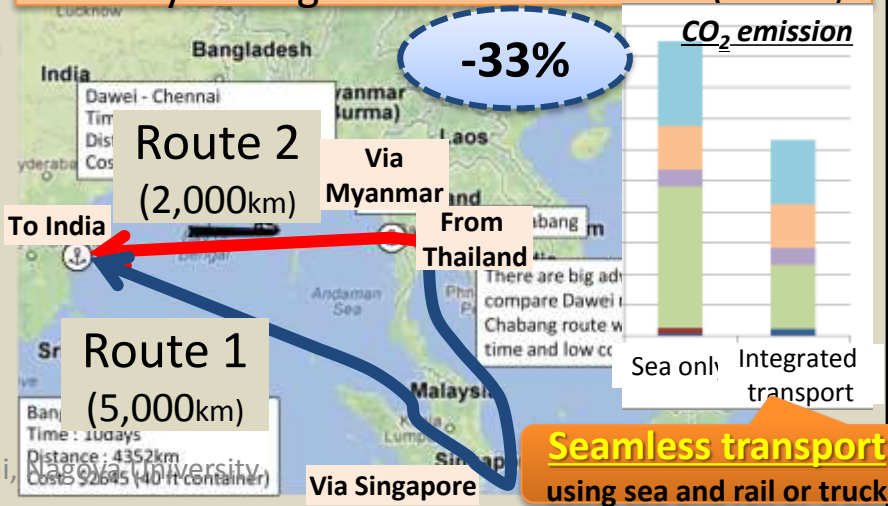
Need of improving Production process

+25%



Scenario 3 :

Priority to larger economic market(Indian)

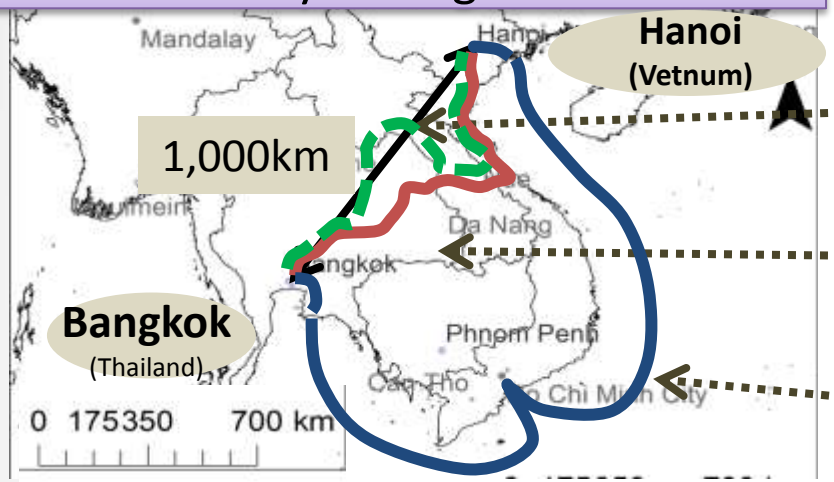


-33%

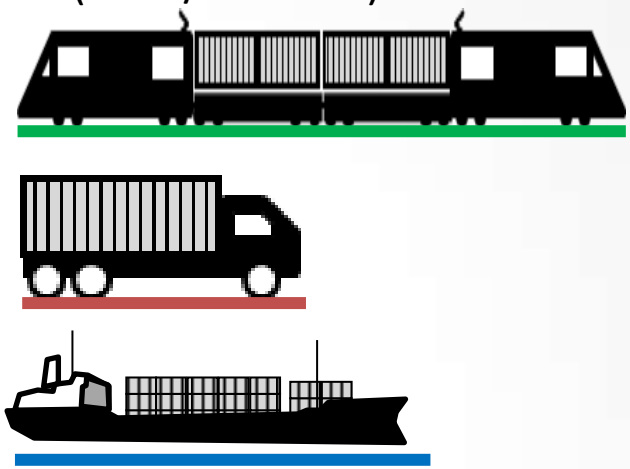
Seamless transport using sea and rail or truck

Targeting Necessary Rail Use for Low-Carbon Interregional Development

Case Study: Bangkok – Hanoi

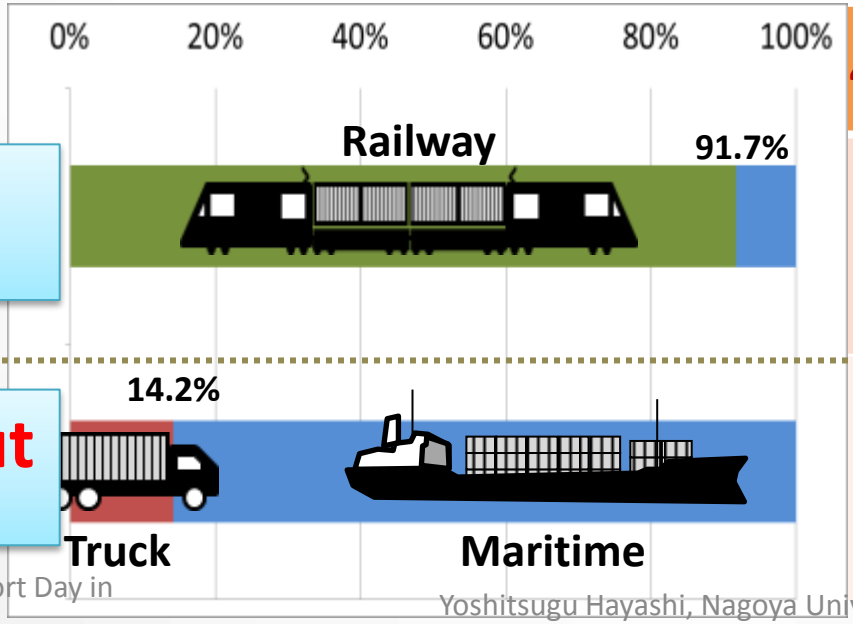


(with / without)



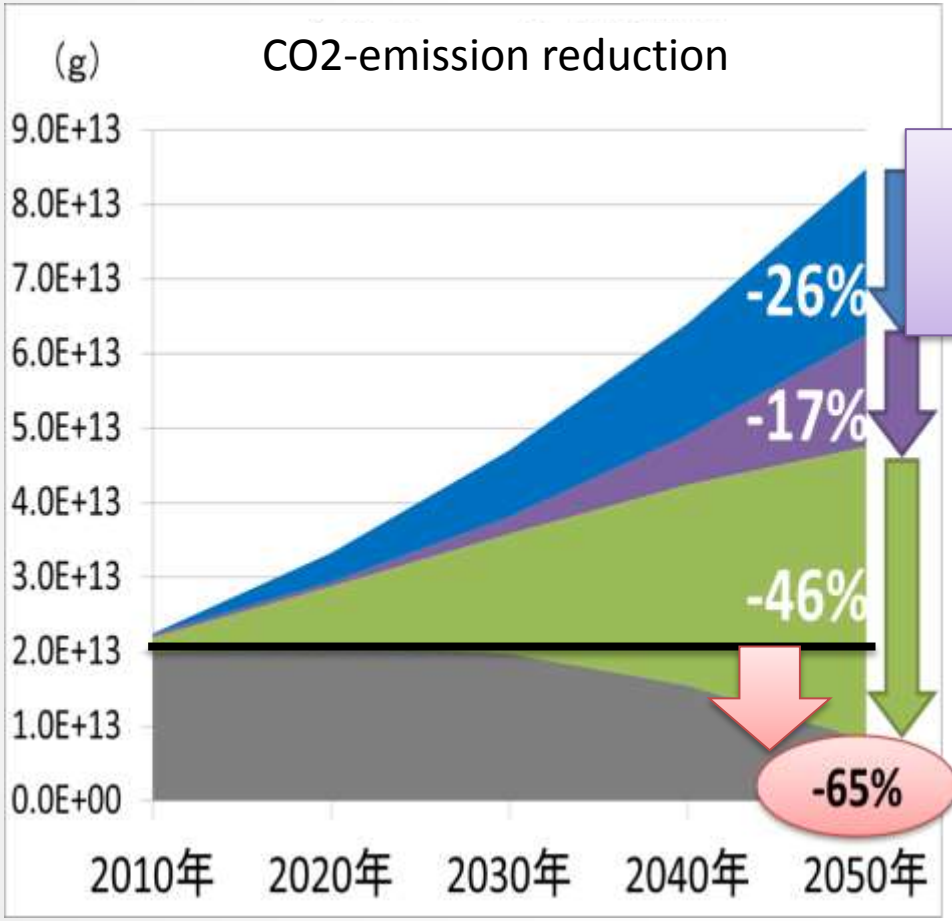
Optimal Modal Splits for reducing 40% CO_2 emission

30% time Saving



40% CO_2 mitigation	30% time saving
○	○
×	○

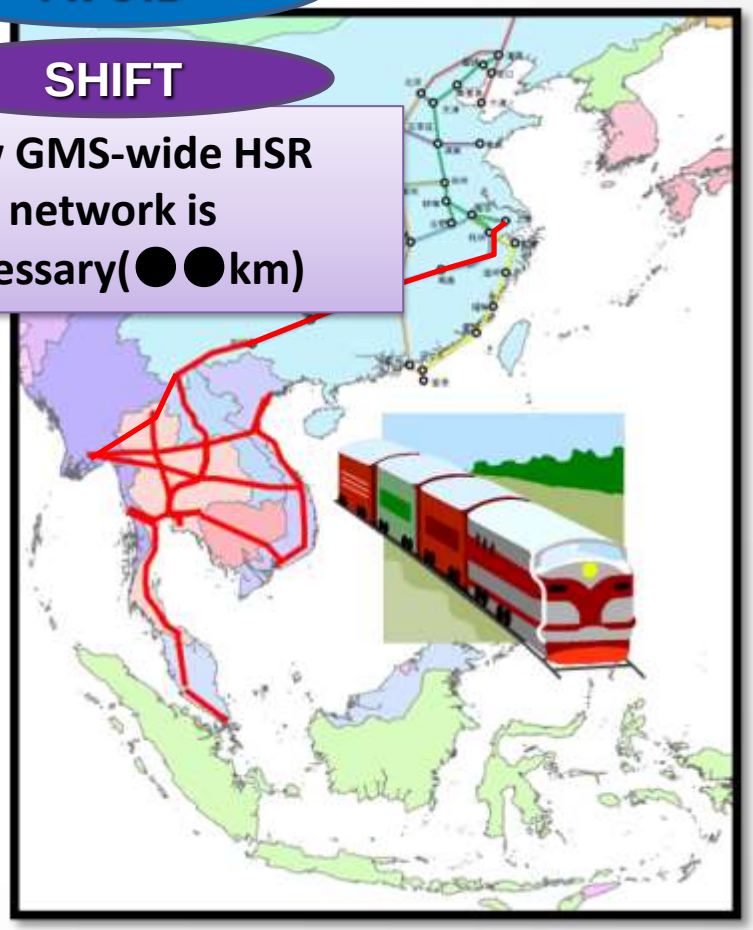
The Roadmap for Low-Carbon Interregional Transport Development in ASEAN and China



AVOID

SHIFT

New GMS-wide HSR network is necessary(●●km)



Key Massages

- Transport is "causer" as well as "victim" of climate change
- Simultaneous achievement of Sustainability + Resilience →Co-benefits
- We are developing robust instruments for MRV in NAMA allowing more transport projects
- Good signs to reverse common sense from road to rail → Bangkok (Rail: 0% in 90's →82% now)
- Transport can trigger innovations in styles of production(*Efficiency*) and life (*Sufficiency*)