Yoshitsugu Hayashi
Distinguished Professor, Tokaigakuen University & Chubu University
Executive Committee Member, The Club of Rome
Ex-President, World Conference on Transport Research Society

Quality Road for Sufficiency

EST Forum 2024

10 December 2024 @ ADB, Manila

Topic 1

From Economic Efficiency to Personal Sufficiency

- Conventional Cost-Benefit Analysis (GDP/Construction and Maintenance Cost) is still used.
- GDP is an indicator to show only the mass economic (money) flow passing in a country/region during a year.
- GDP indicator does not tell anything about if "No one left behind", which is the most important view point of SDGs.
- GDP seeking has not made people happy but is Galapagos of 20th century. Today in 21st century, we should seek for happiness (Quality of Life) for differently attributed each citizen.
- An evaluation for Sufficiency (QOL/Social Cost) is required.
- QOL Accessibility Model is proposed

→ *Hayashi, Y., H. Takeshita and KE. Seetharam eds. (2023) Quality of Life Assessment in Urban Development and Transport Policymaking, ADBI Press (e-Book free download)*

Content 1

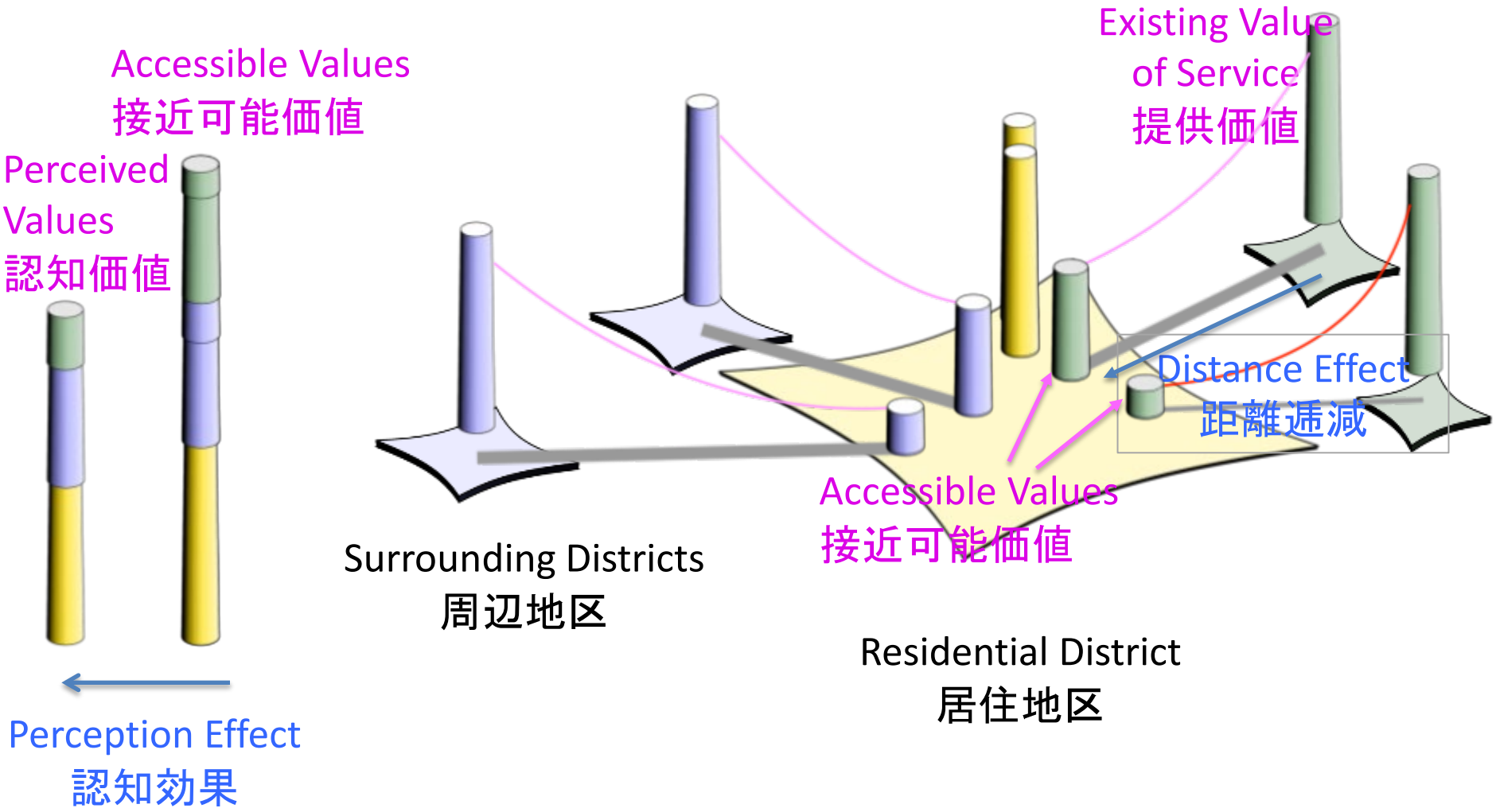
Measuring Happiness

– QOL Accessibility Model –

QOL Mainstreaming in Transport Planning

- From Mass Economic **Efficiency**
  to Individual's **Sufficiency**
- From **Cost-Benefit Analysis**
  to **QOL Accessibility Model**
  - by different Age, Gender, Income level
- Towards **SDGs**: No one left behind

Hayashi's QOL Accessibility Model



QOL Accessibility Model

Accessible Value

$$A_{ij}^{m} = V_{j}^{m} \cdot e^{-\alpha c_{ij}}$$

- ***m***: QOL factor
- ***i***: Mesh block with residents living in
- ***j***: Mesh block with objective value of QOL factor ***m***
- α^{m}: Impedance parameter for traveling from mesh block ***i*** to mesh block ***j***
- c_{ij}: Travel cost between mesh block ***i*** and mesh block ***j***
- ***Vjm***: Existing value of QOL factor ***m*** exists in mesh block ***j***
- ***Aijm***: Accessible Value of ***Vjm*** for residents living in mesh block ***i***.

Perceived Value

$$QOL_{i}^{k} = \sum W^{mk} A_{ij}^{m}$$

- ***k***: Population group ***k*** with certain social-economic attributes
- ***Wmk***: Weight of QOL factor ***m*** for person ***k*** among all factors
- ***QOLik***: Perceived Value=Quality of life for person ***k*** living in mesh block ***i***

Gross Regional Happiness

$$GRH^{k} = \sum_{i} P_{i}^{k} \cdot QOL_{i}^{k}$$

$$GRH = \sum_{k} GRH^{k}$$

【Goal】 **Higher QOL**

【Endogenous Conditions】

＜Domestic＞	＜Int'l＞
Low birth rate	Growth of Asia
Aging	Globalization
IT	IT

Economy ⟷ Ecology

A. Economic Opportunity	B. Living & Cultural Opportunity	C. Amenity	D. Safety & Security・	E. Burden on Environment
●Opportunity for Income ●Accessibility to Agglomeration of Industries/Population	●Service ●Education/Culture ●Health/Medical Care ●Shopping/Service ●Amusement/Travel	●Housing ●District Landscape ●Nature of Region ●Identity of Region ●Comfortability / Punctuality of travel ●Time for leisure/cultural life	●Risk of Natural disaster ●Risk of Building / Facility disaster ●Risk of Chemical Pollution ●Risk of Traffic Accident ●Resource Preservation ●Criminal Rate	●Burden from Industry ●Burden from Domestic ●Burden from Transport ●Heat Island ●Noise

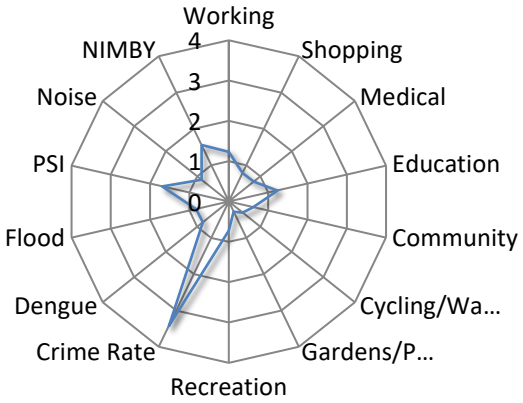
Content 2

Choice of QOL Policy Options

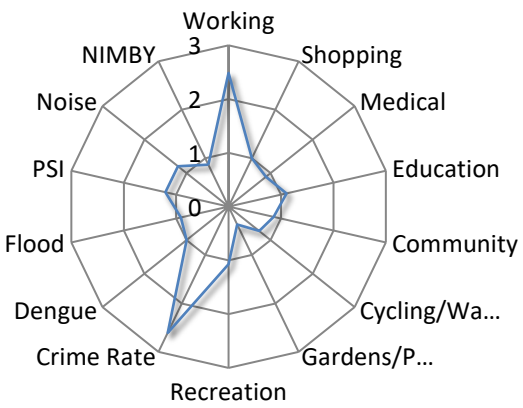
-Singapore-

Weights between QOL Factors (Singapore)

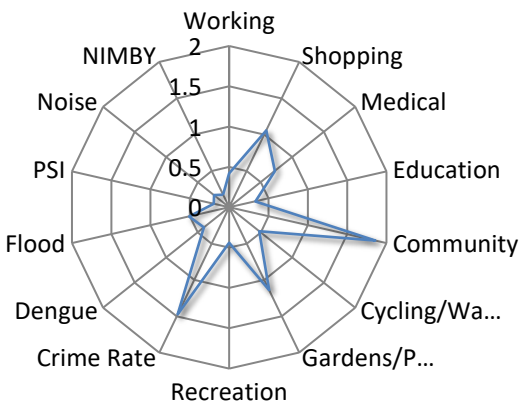
Young / Female



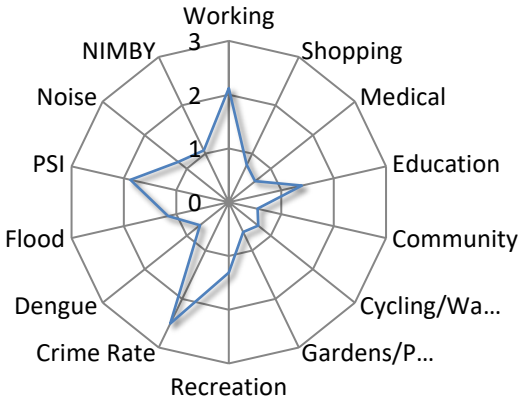
Middle-aged / Female



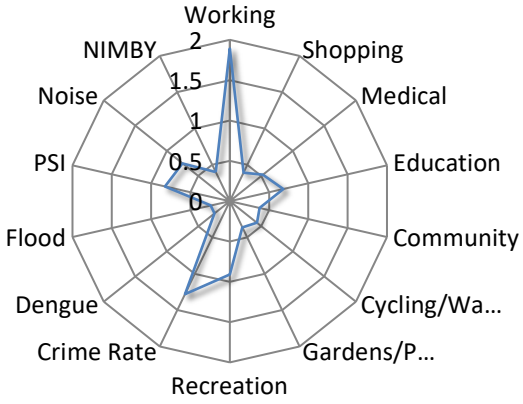
Aged / Female



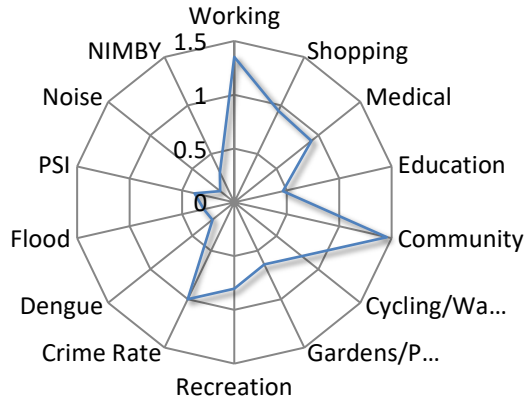
Young / Male



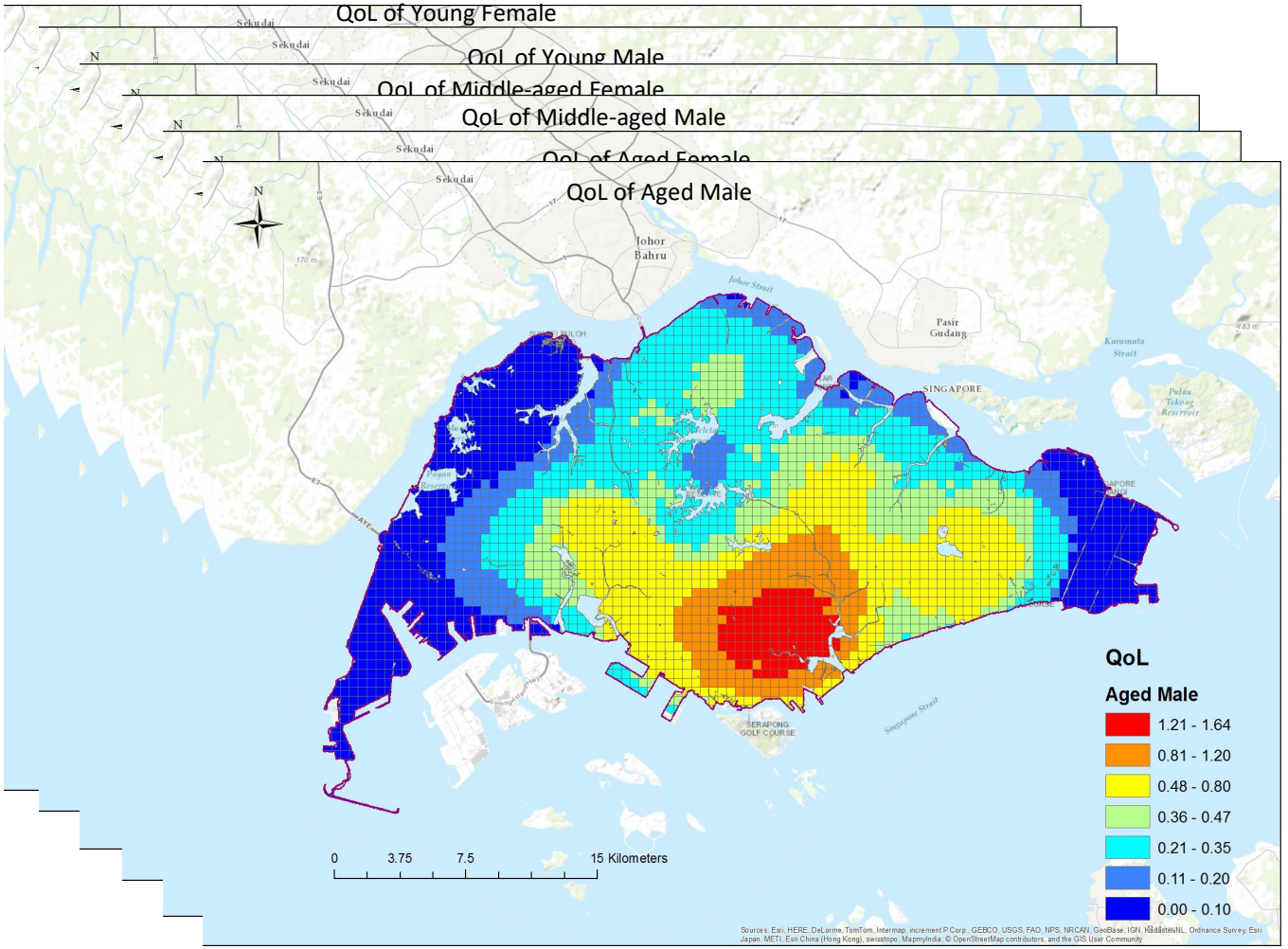
Middle-aged / Male



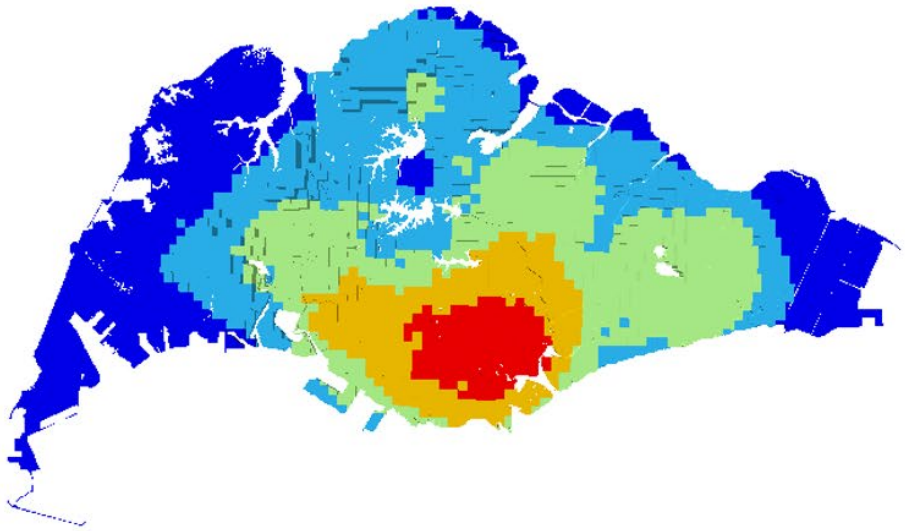
Aged / Male



QOL Spatial Distribution in Singapore
(by age, gender)



Policy Options
- Transport Network or Compact City –



Total Volume = GRH (Gross Regional Happiness)

Source: Master Thesis of Yong Jian Khoo,
supervised by Yoshitsugu Hayashi, Graduate School of Environmental Studies, Nagaya University, 2015

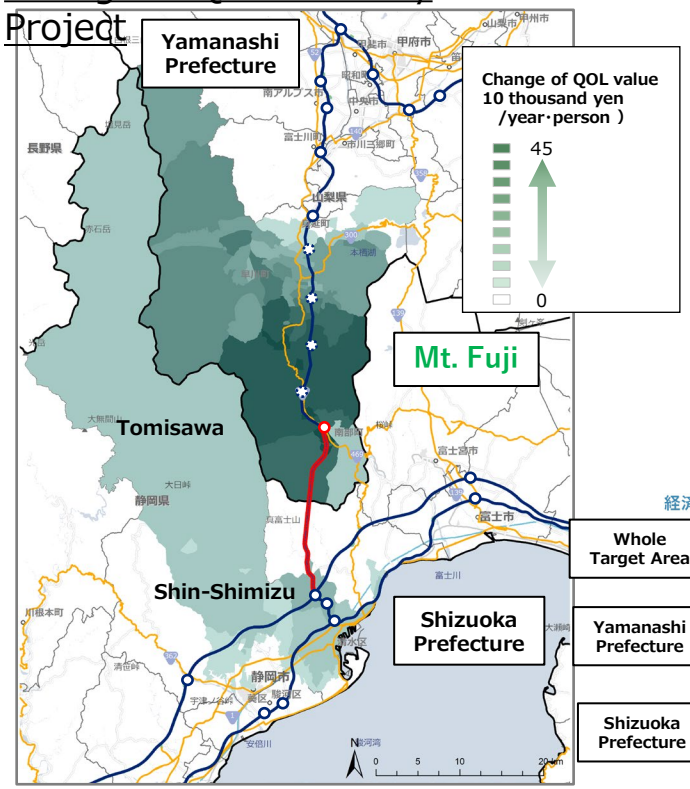
Content 3

Assessment of A New Motorway
-Chubu-Odan Motorway-

Case study: Chubu-Odan Motorway

(near Mt.Fuji)

Change of QOL Value by Project



Average Value per capita in Target Area

9,700 yen/person･year

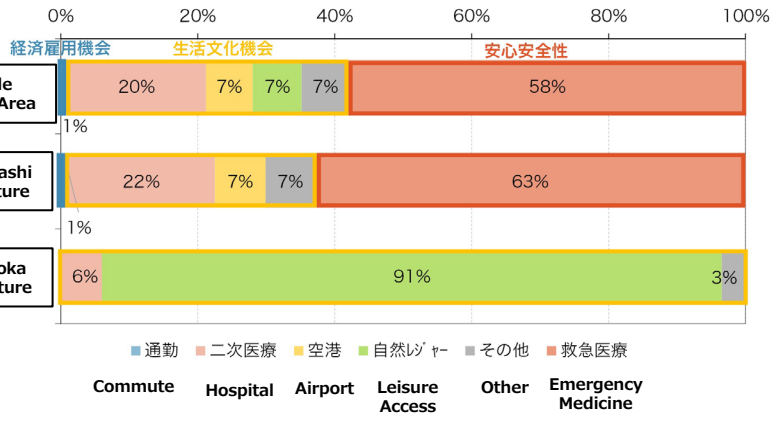
×

Population in Target Area

About 250 thousand

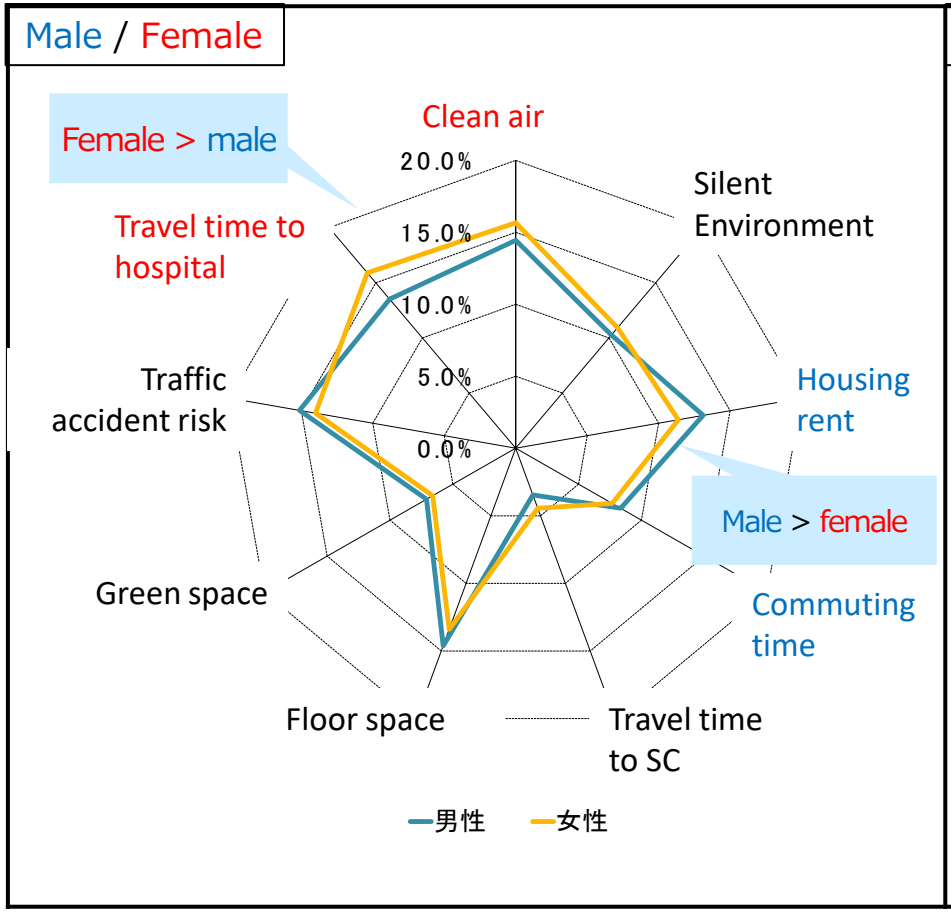
=

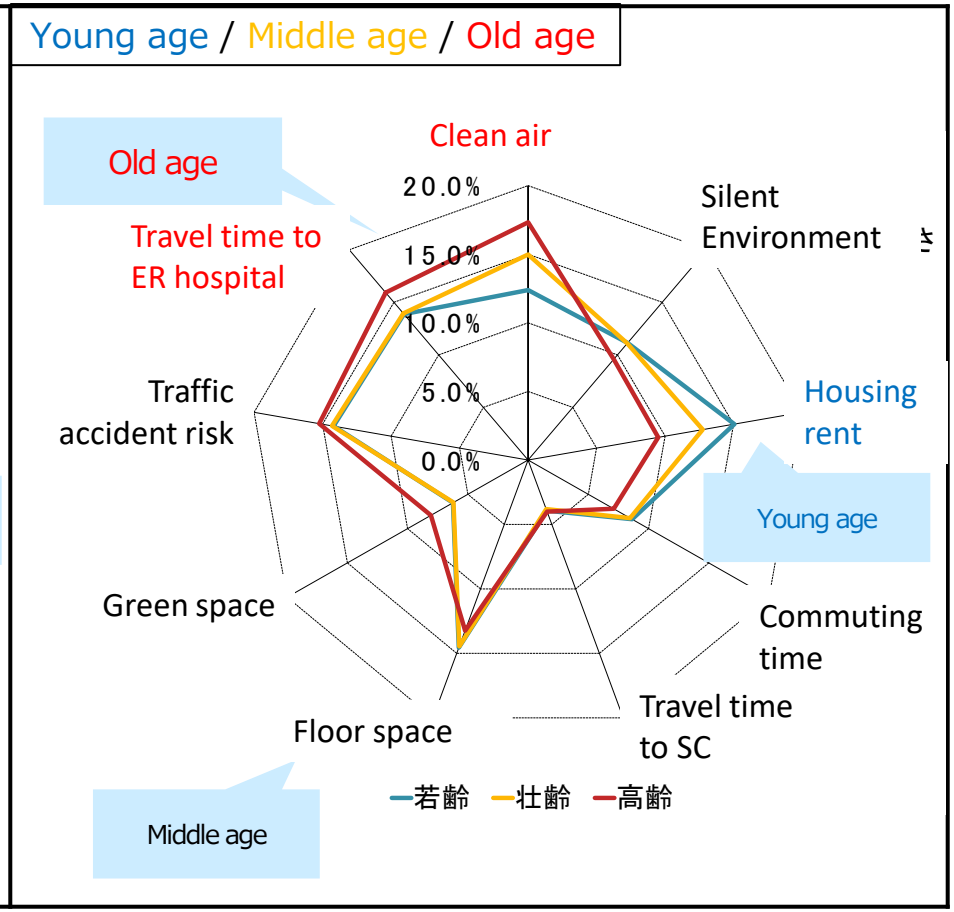
24.4 billion yen/ year



Difference in Individual Perception by QOL factor in Across Chubu Motorway project

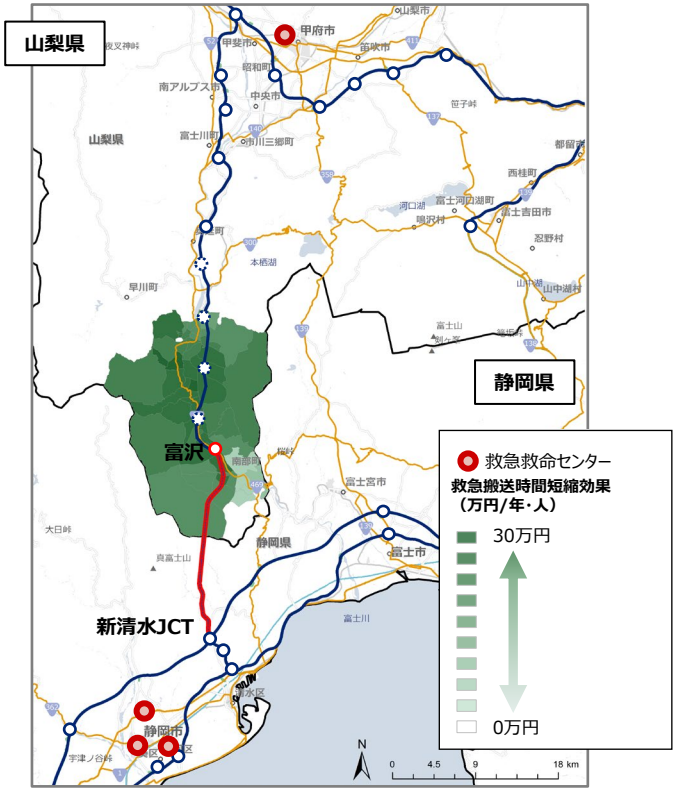
E.g. Difference in gender, age group 男女・年令層による違い



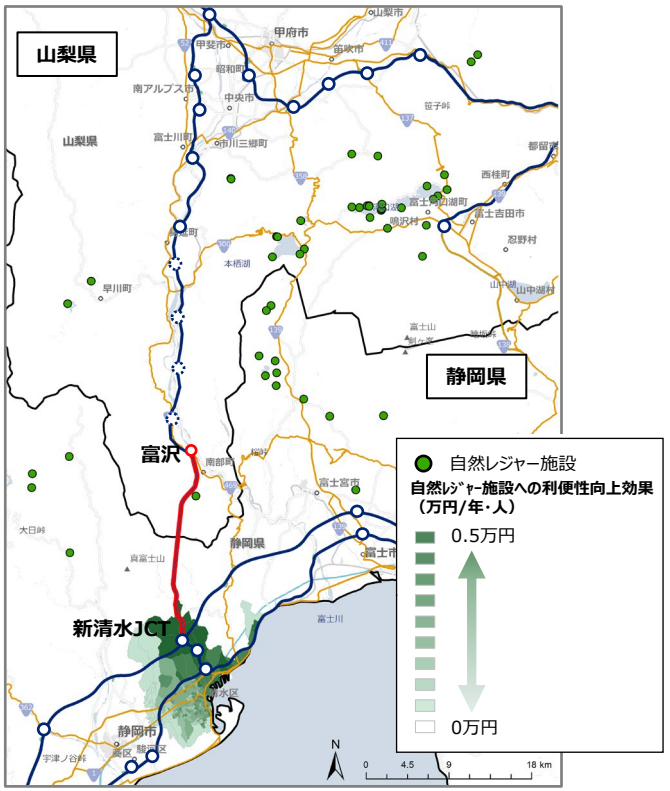


Chubu-Odan Motorway
(Difference in reasons for QOL)

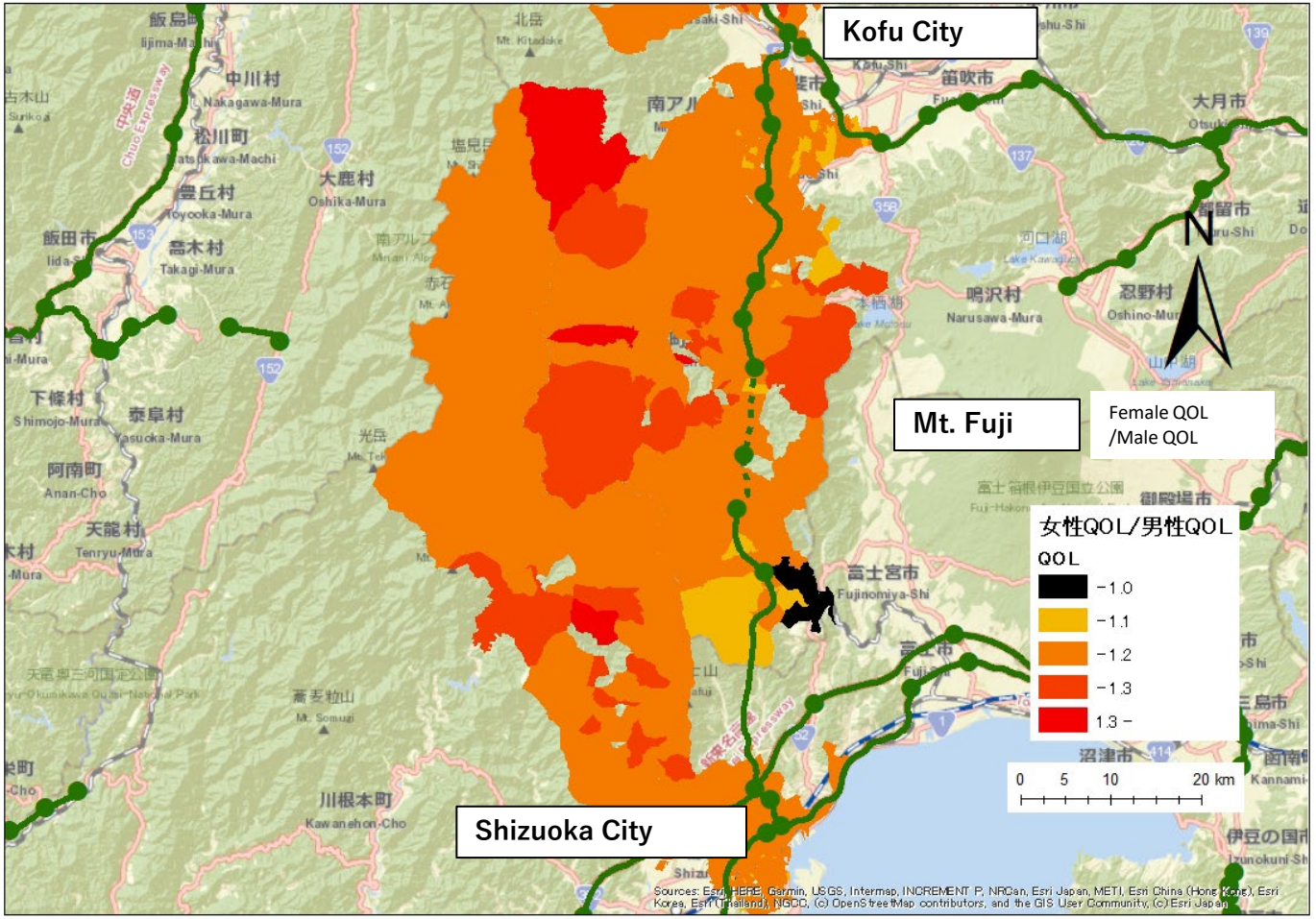
Emergency Medical Service



Leisure Access



QOL Comparison (Female vs. Male)



Topic 2

Land use – transport integration and value capture

- Integrated urban and regional management of land use and transport and value capture are crucial, but the reality has been reverse.
- In developing countries, metropolises have been sprawling. This will create future huge debt for the country and city, burdening on the next generations.
- Aging has already started in several Asian countries.
- The future generations, who will become poorer, cannot bear.

→ *Stefan KLUG, Yoshitsugu HAYASHI (2010)* ***Infrastructure Costs and Urban Sprawl – An International Case Study****, 12th WCTR, Lisbon*

Content 4

Transforming Stupid Mobility in 20th century to Sufficient Mobility in 21st century

Understanding "The Limits to Motorization" along Economic Development Stages

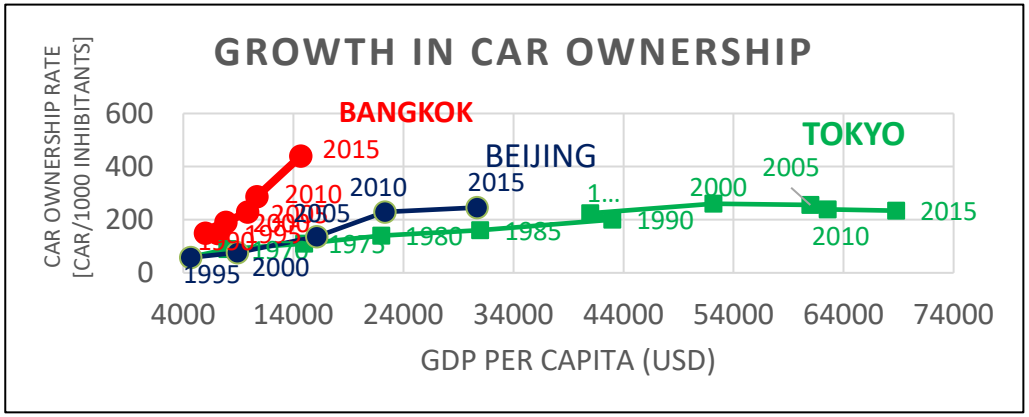


Photo by Hayashi(1993)

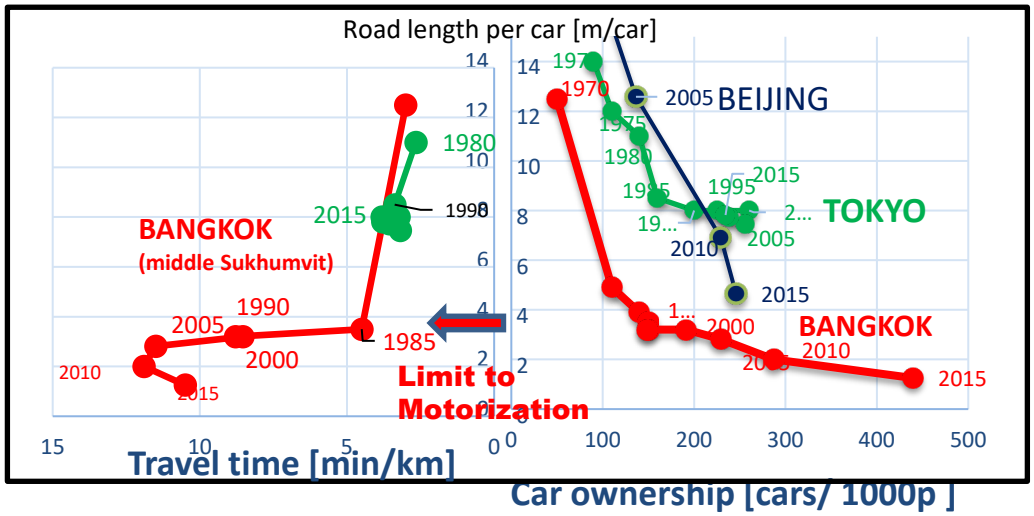


Photo by Hayashi(2018)

Mobility Transformation

- Emergence from 20 Century's Stupid Habits -

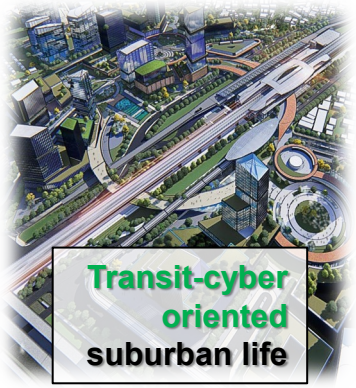
20th century Stupid Mobility → for Mass Economy with High Carbon

Car-oriented sprawling suburb

Over 90% of the time, cars are parked

Not walkable environment

Fixed time/destination commuting



Transit-cyber oriented suburban life

Cyber-support Sharing and Hierarchical transport network

Lively (*Sabai*) street built environment

Flexible workplace/ commuting timing

21st century Smart Mobility → for People with High QOL/Low Carbon

Damages caused by Mobility (World, Thailand)
- Effects on Mortality, Health & Well-Being -

1. Traffic Congestion

Average Travel Speed

Thailand **15** km/hr.

World

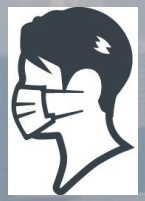
2. Road Accident

3 people die every hour

66 people die everyday from accidents

1.35 mil. died (2020)

3. Air Pollution & health

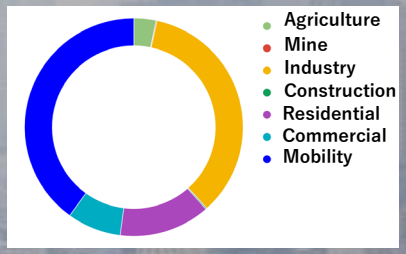


Asthma rate reaches **15-20%**

c.f. 5% in 1980

6.5 mil. died (2020)

4. Energy & GHG

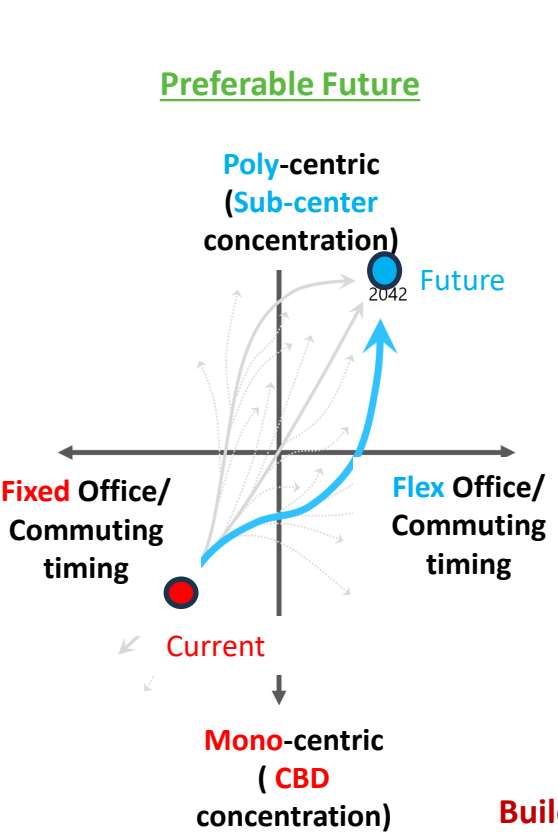


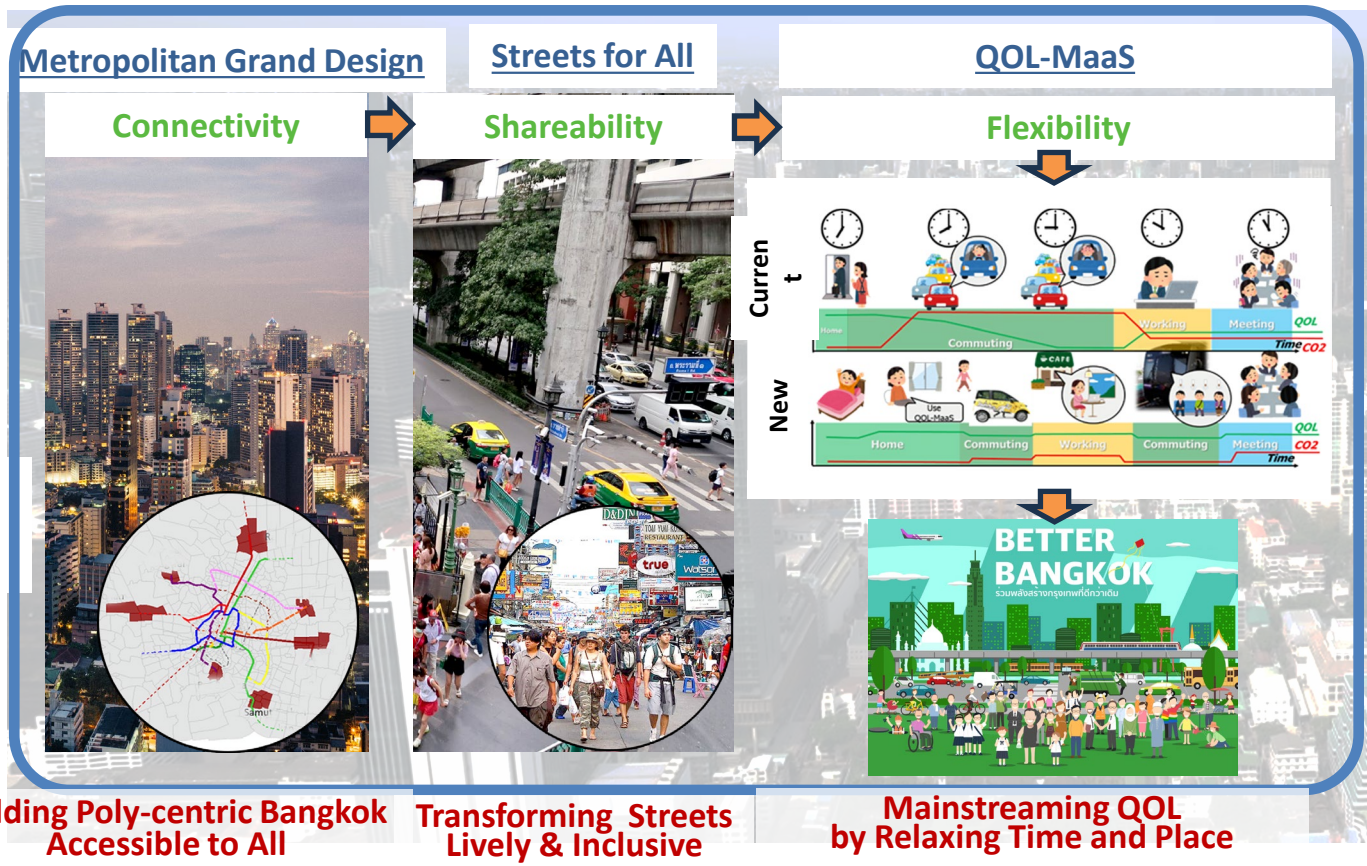
Transport Energy Consumption **40%**

35%

Courtesy by Pawinee Iamtrakul

The Sukhumvit Model





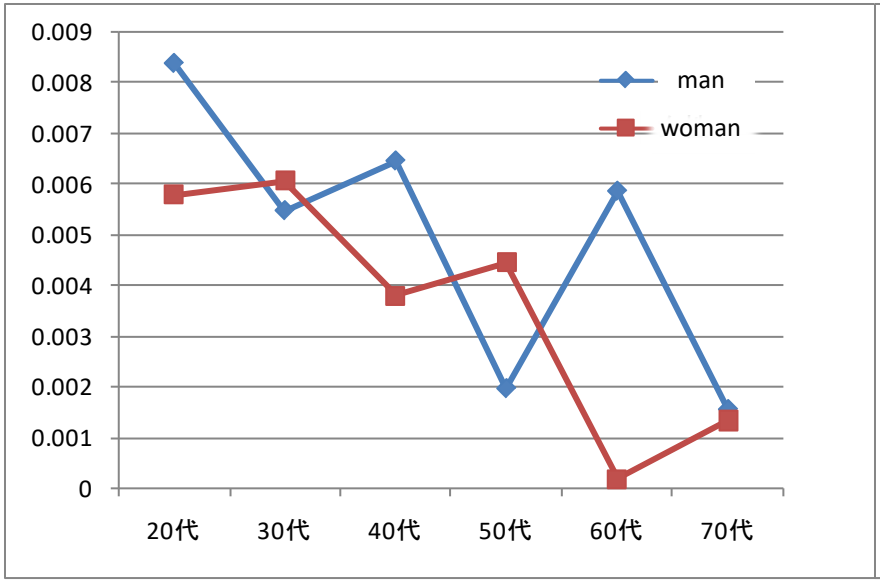
Content 5

Smart Shrink Strategy based on Sufficiency (QOL/Life-cycle Cost) -Nagoya Metropolitan Region-

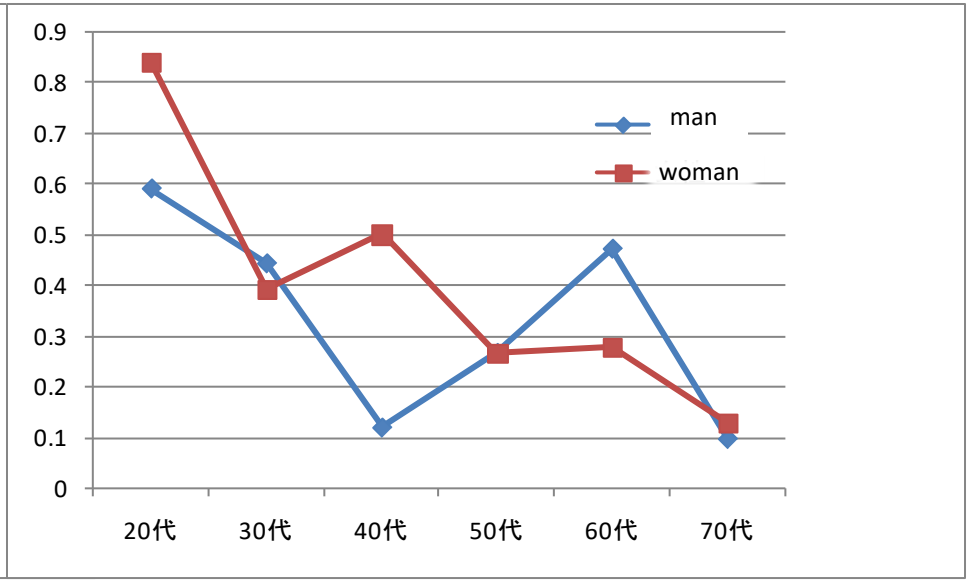
Comparison of Weights

(Women vs. Women)

LE1 Living Space Quality
（Total floor area per capita）



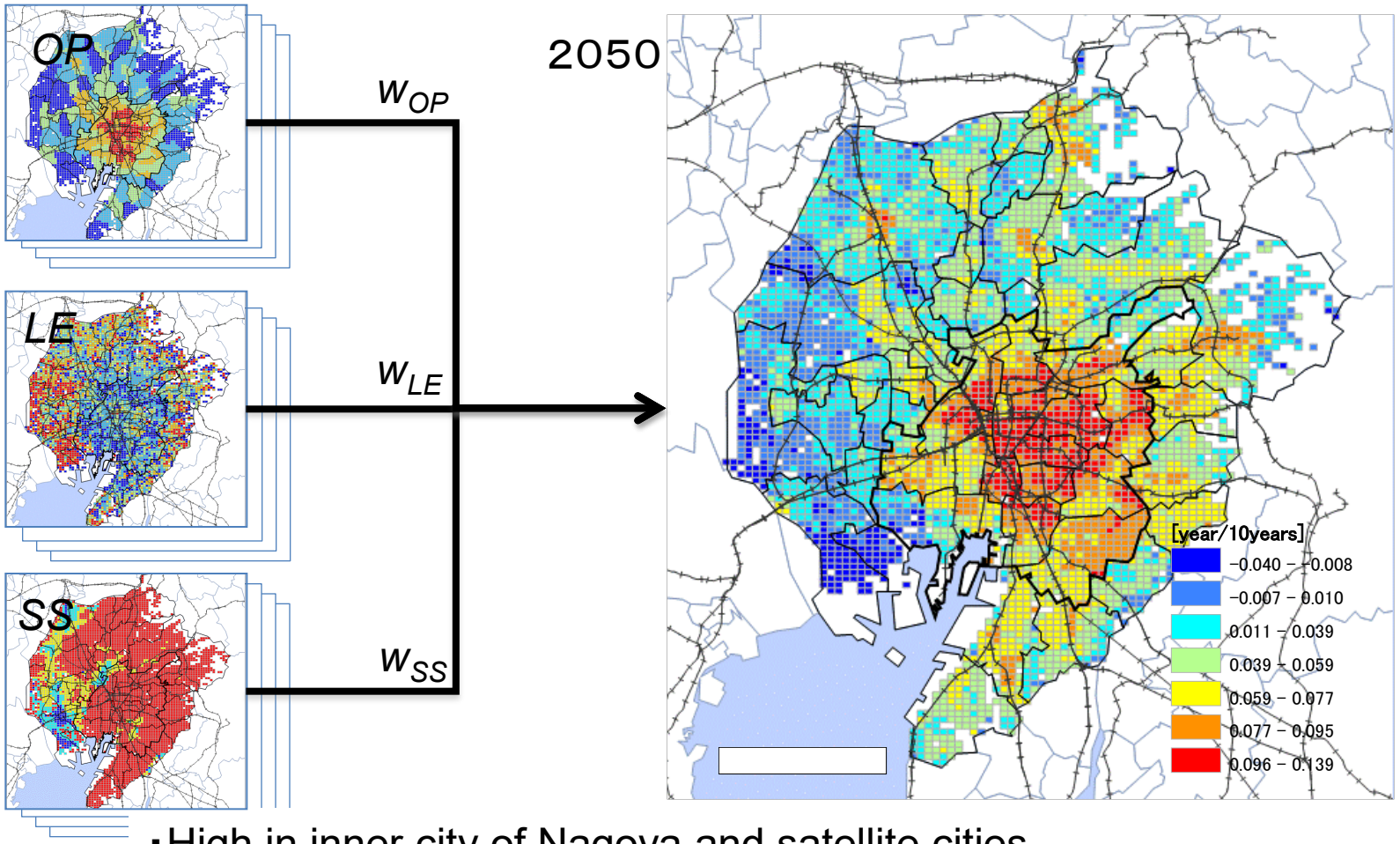
OP4 Shopping And Service Occasion
（ Accessibility of large retail stores ）



- Younger people prefer bigger floor space
- Higher weight in shopping accessibility in women ages 20’s-40’s and in men ages 60’s-above

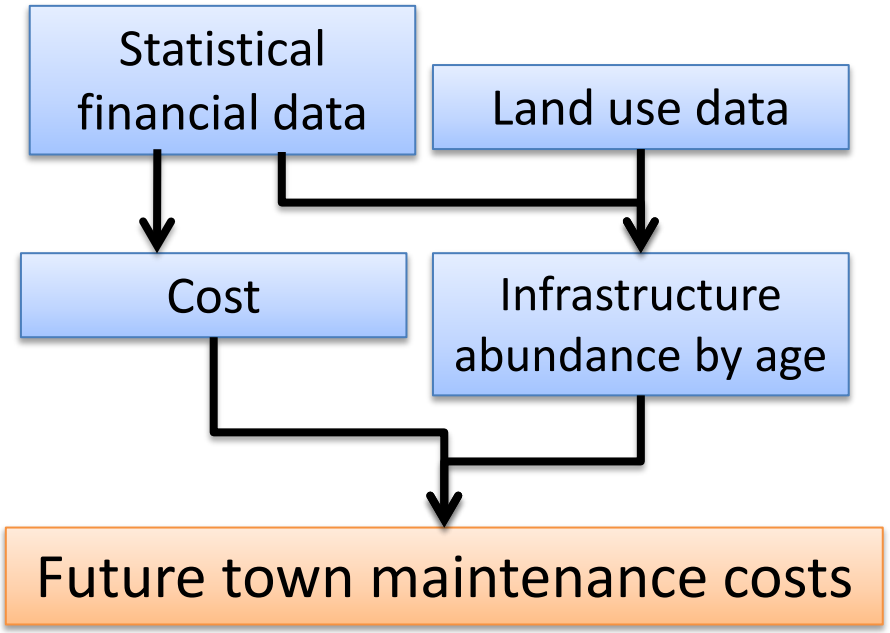
Designing the cities should consider the change in people’s needs due to future change in age structure.

QOL（for average citizen）

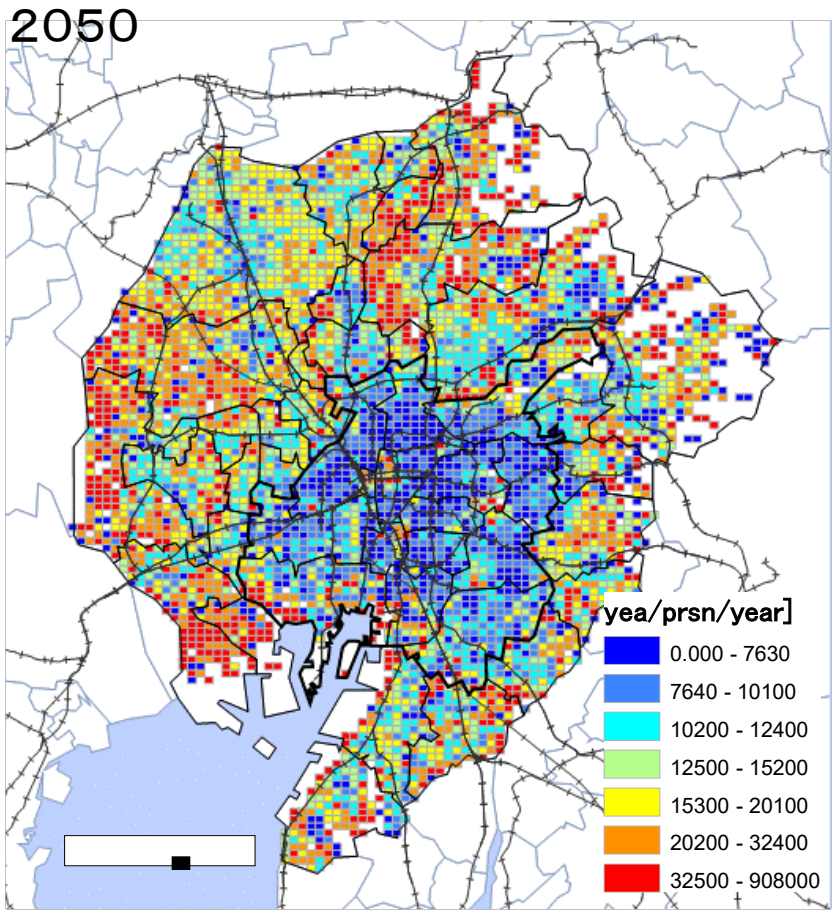


・High in inner city of Nagoya and satellite cities
→influenced by transport accessibility
・Low in West and High in East
→influenced by earthquake and flood risk

Per capita Future Social Cost（Infrastructure Maintenance ）



Targets of estimation:
Municipal roads, water supply, sewerage, agricultural community drainage, joint treatment and septic tanks



- Low in densely populated areas, such as Nagoya City and the center of its peripheral cities
- In 2050, cost will be particularly higher in the western area where population is drastically decreasing

Setting criteria for Smart Shrink (retreat + re-concentration)

"Classification based on social value and social cost of land"

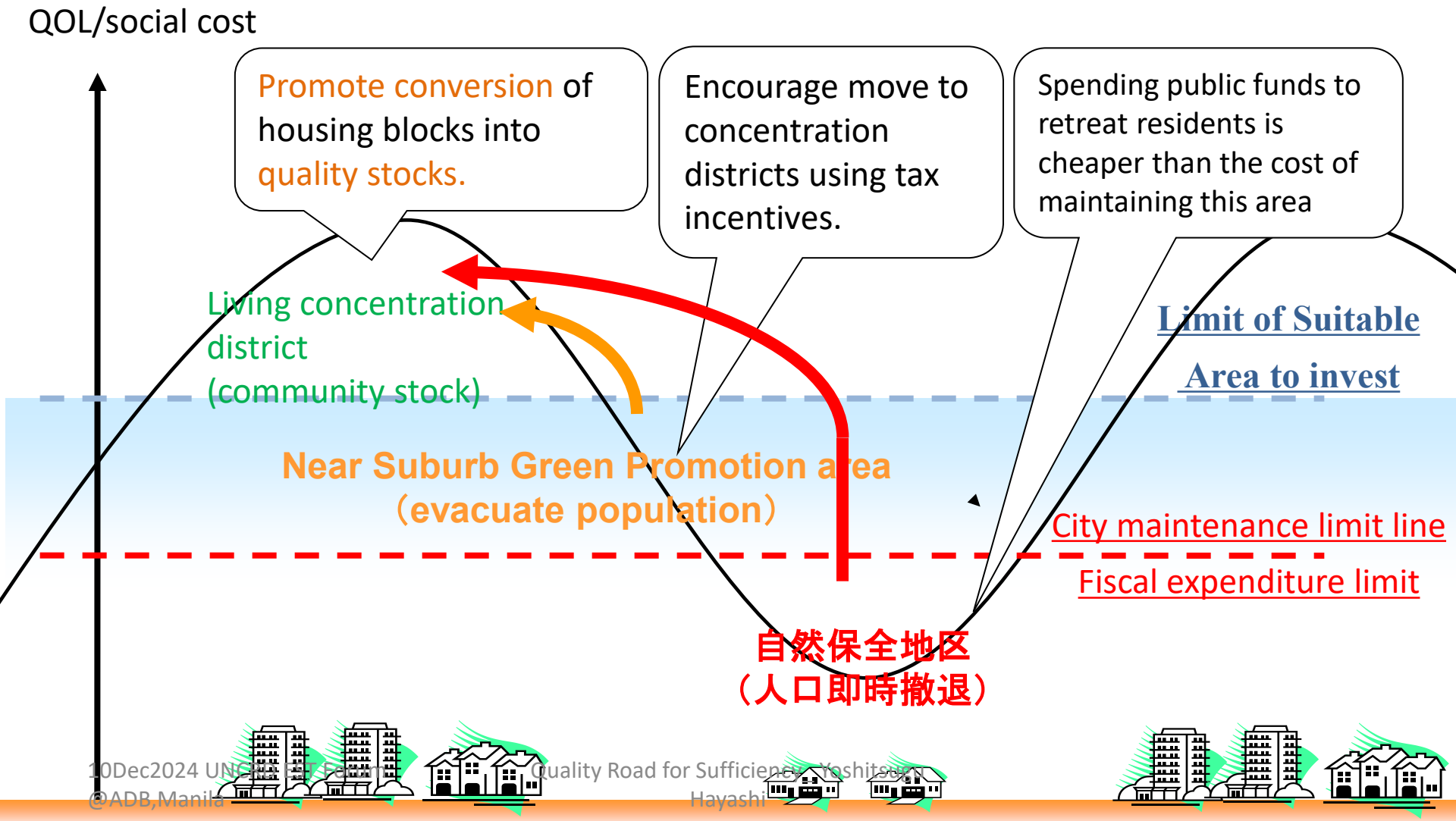
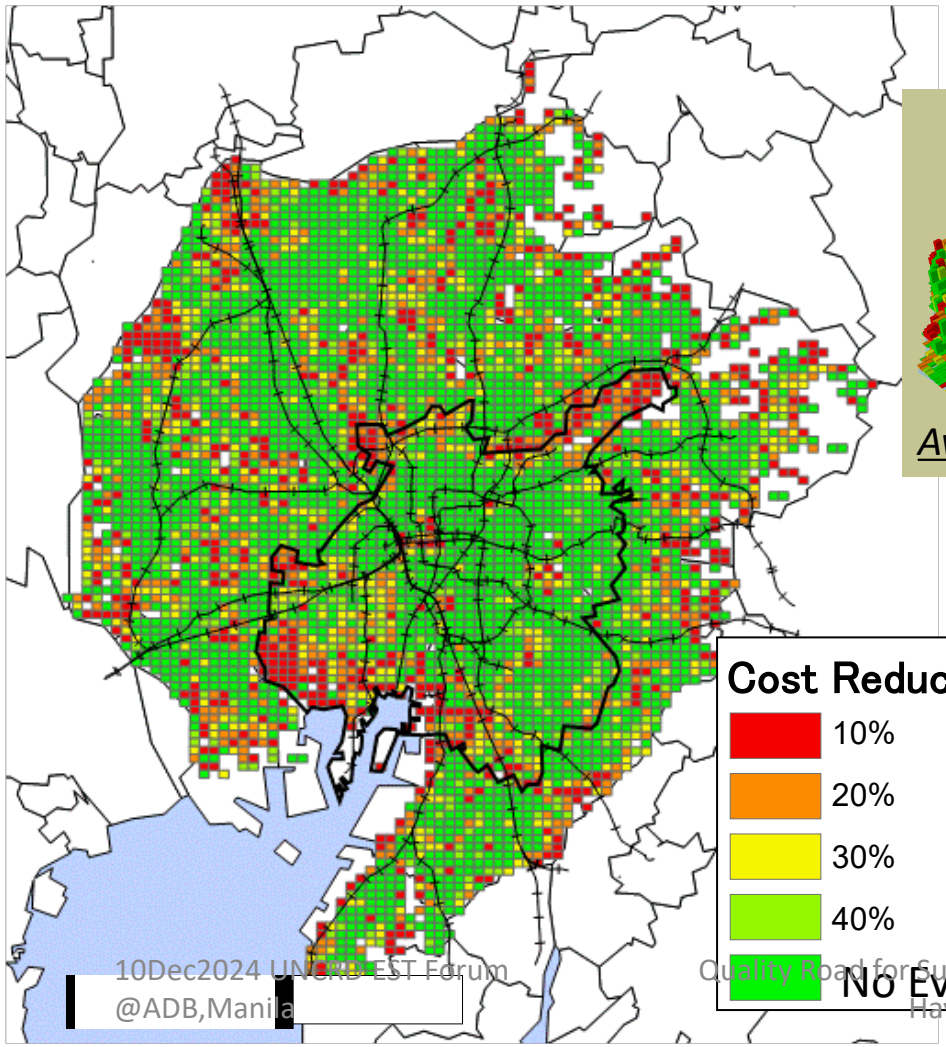


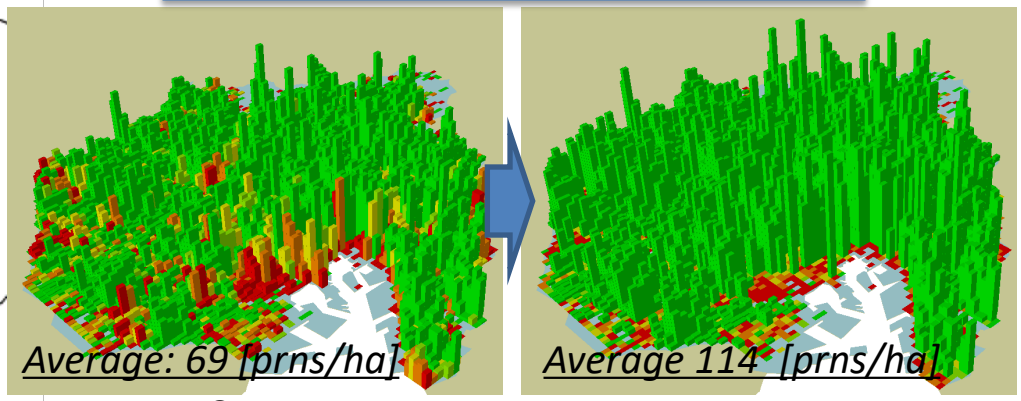
Fig. 21: Smart shrink: Selection of districts for retreat (2)

- Select retreat districts necessary to achieve the maintenance cost reduction target.
- Retreat from districts with low-cost efficiency (QOL/cost)

＜Additional condition: Concentrate populations within the boundaries of municipalities＞



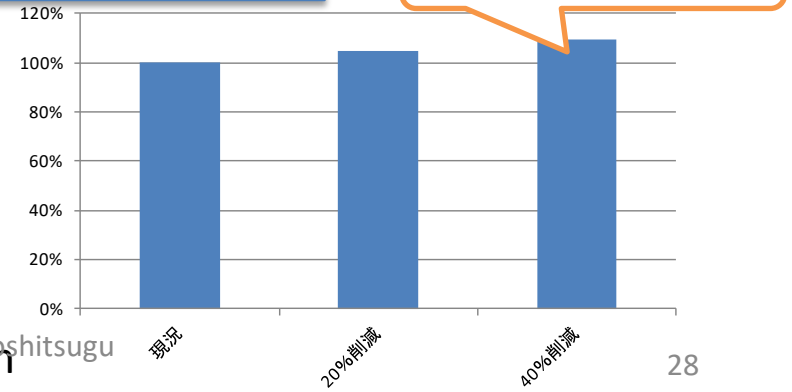
Change in Population Distribution



Current

Case of 40% Reduction

Impact on QOL



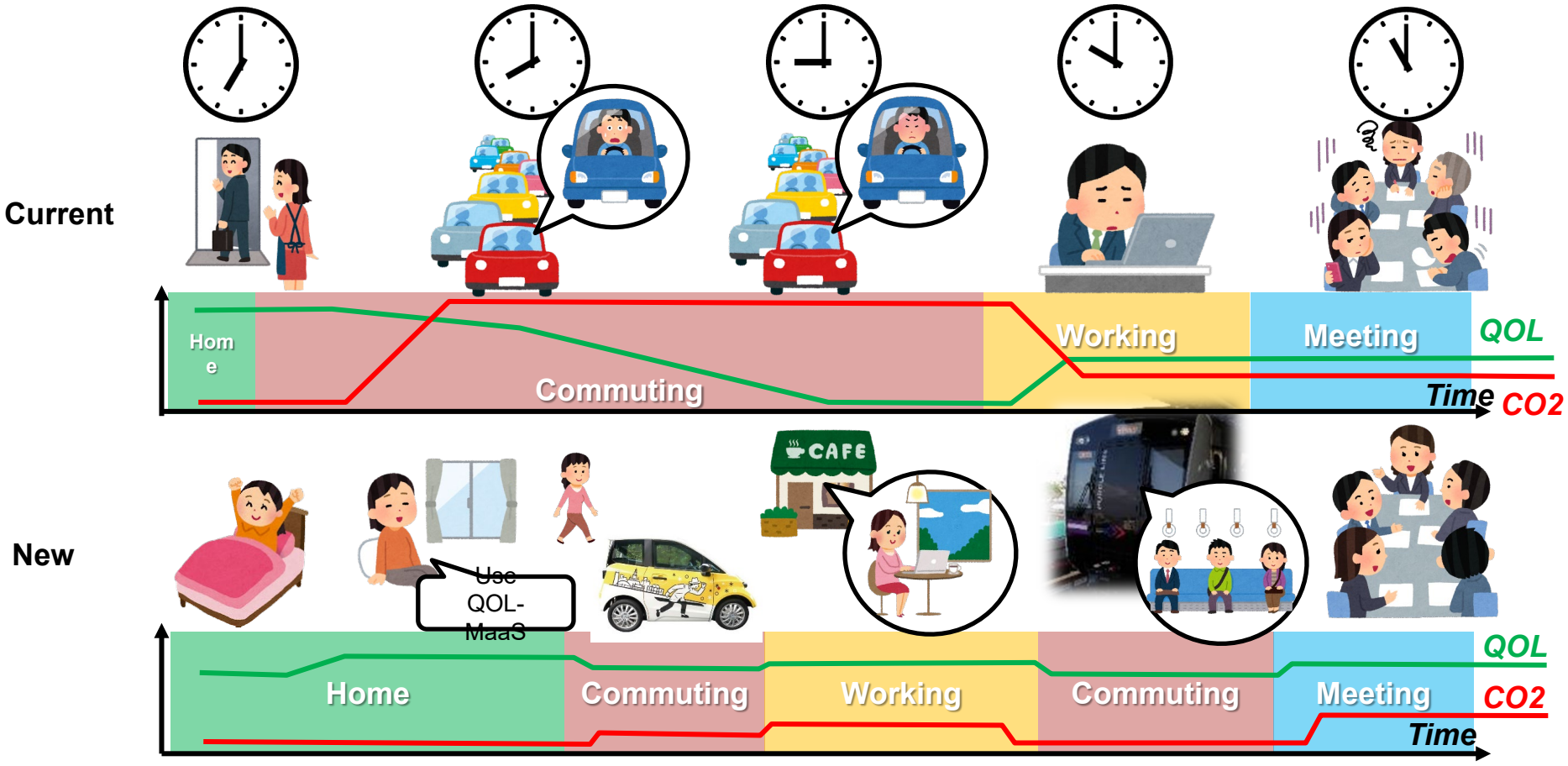
※Improvement rate compared to Current(100%)

Content 6

Transforming Work-Life Style

-Bangkok-

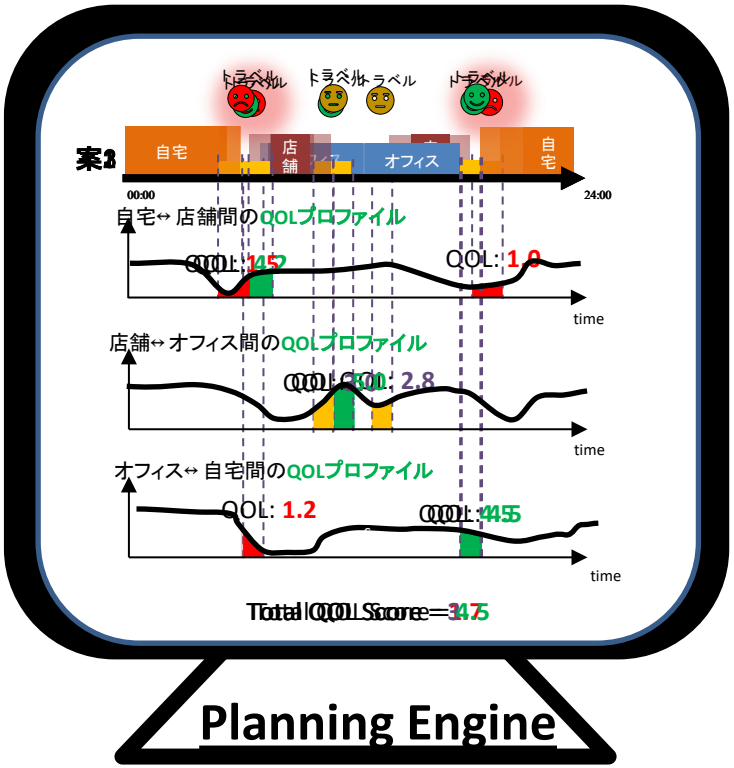
QOL-MaaS: Work-Life Style Changer for 21st Century



From JICA/JST SATREPS Project 2018-2024"Smart Transport for Thailand 4.0"(Leader: Yoshitsugu Hayashi)

DX → “QOL MaaS”

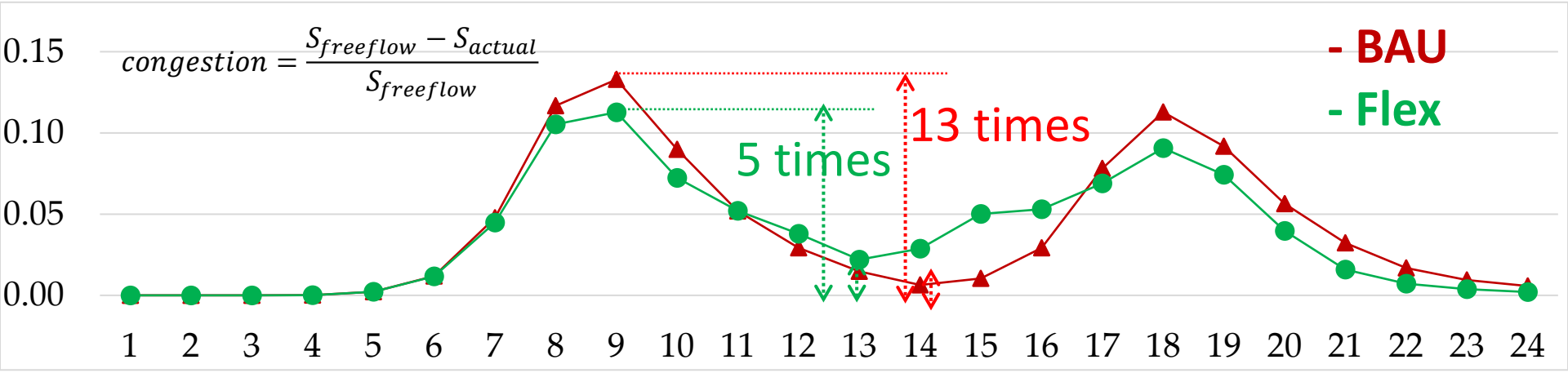
Guiding to Max QOL Sequence Plan of Activity 6 Travel



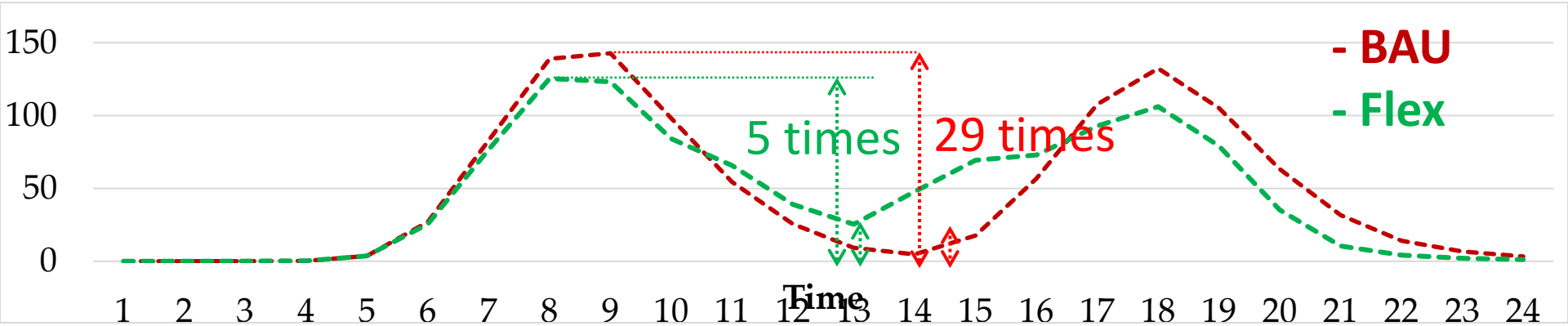
From JICA/JST SATREPS Project 2018-2024“Smart Transport for Thailand 4.0”(Leader: Yoshitsugu Hayashi)

Effects of Location – Time Shift of Activity & Travel

1. Daily Traffic Congestion

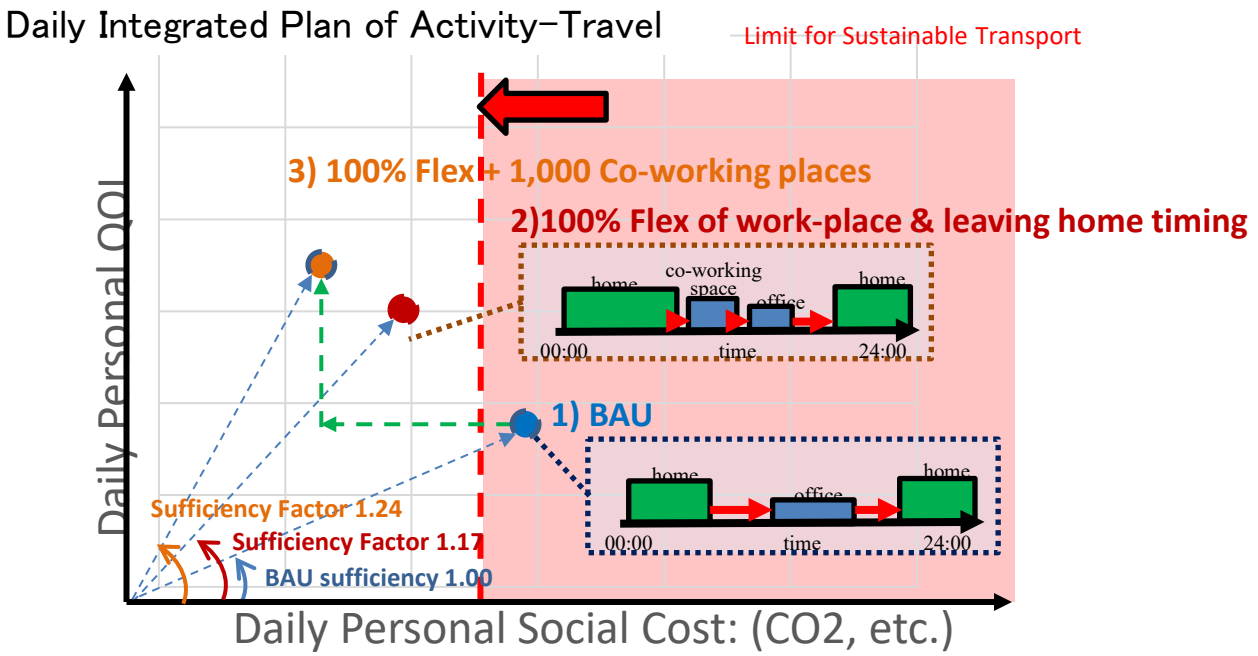


2. Hourly CO2 Emission (ton/ 100,000agents)



From JICA/JST SATREPS Project 2018-2024"Smart Transport for Thailand 4.0"(Leader: Yoshitsugu Hayashi)

"Sufficiency" Factor X



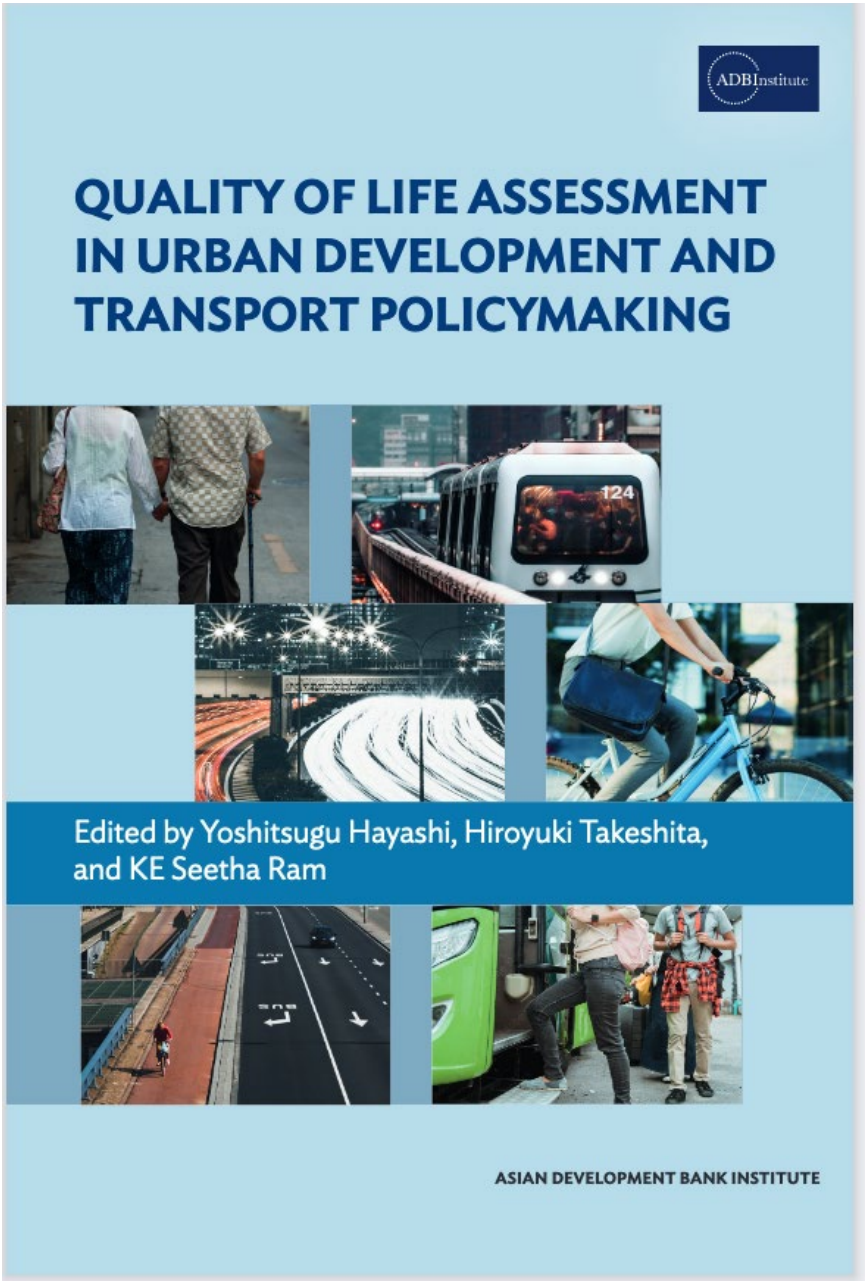
From JICA/JST SATREPS Project 2018-2024"Smart Transport for Thailand 4.0" (Chair: Yoshitsugu Hayashi)

QOL-MaaS
Strategy for Mobility-Lifestyle Transformation

- Solution in Mobility Supply-side
  - Railway Extension (1999:23.5km→2023:275km→2029plan: 509km)
  - Poly-centric Bangkok (Sub-centers accessible for All)
  - EV for Cars, FCV for Heavy Duty Trucks, e-Fuel
- Solution in Mobility Demand-side
  - Fixed Workplace & Commuting Timing → both Flexible
  - "New Normal Lifestyle" in Post COVID-19 Era
  - "QOL-MaaS"
- QOL
  - GDP (20th Century) → Personal QOL (21st Century)
  - GDP → GNH (Bhutan)
  - High Carbon → De-Carbon (CO_2)
  - "Efficiency" (GDP/ Direct Cost) → "Sufficiency" (QOL/ CO_2)→ SDGs
- Better Mobility for Better Bangkok

Content 7

QOL Book (Eds: Y.Hayahi, ADBI Press) & Bangkok Sukhumvit Project brochure



QOL New Book

- Just Published, July 2023
- Asian Development Bank Institute Press
- e-Book: free download

- Editors: Yoshi Hayashi, Hiroyuki Takeshita, K.E.Seetharam
- Authors: include Yoshi Hayashi, Werner Rothengatter, Roger Vickerman, Yves Crozet, Jamie Leather

A pathway to Better Mobility for a Better Bangkok

- The Sukhumvit model -

Principal Investigator
Yoshitsugu Hayashi
Project Director
Thanaruk Theeramunkong

JICA SATREPS - JCC
1 February 2024
Sukosol Hotel, Bangkok

Quality Road
Sufficient and Inclusive
Better for Everyone !

Thank you for your attention !