

인구감소와 고령화 사회문제 완화를 위한 일본의 수요대응형 대중교통정책

주최 · 주관 : 충남연구원 지역도시연구부

일시 : 2016년 02월 24일(수) 15:00~16:30

장소 : 충남연구원 회의실(3층)

진행순서

15:00~15:10 개회 및 참석자 소개 (사회 : 김원철 책임연구원)

15:10~16:20 발제 및 질의응답

Prof. Akimasa Fujiwara (Hiroshima University, Japan)

"Demand Responsive Policy to Alleviate Depopulation and Aging Issues in Japan"

16:20~16:30 폐회 및 정리

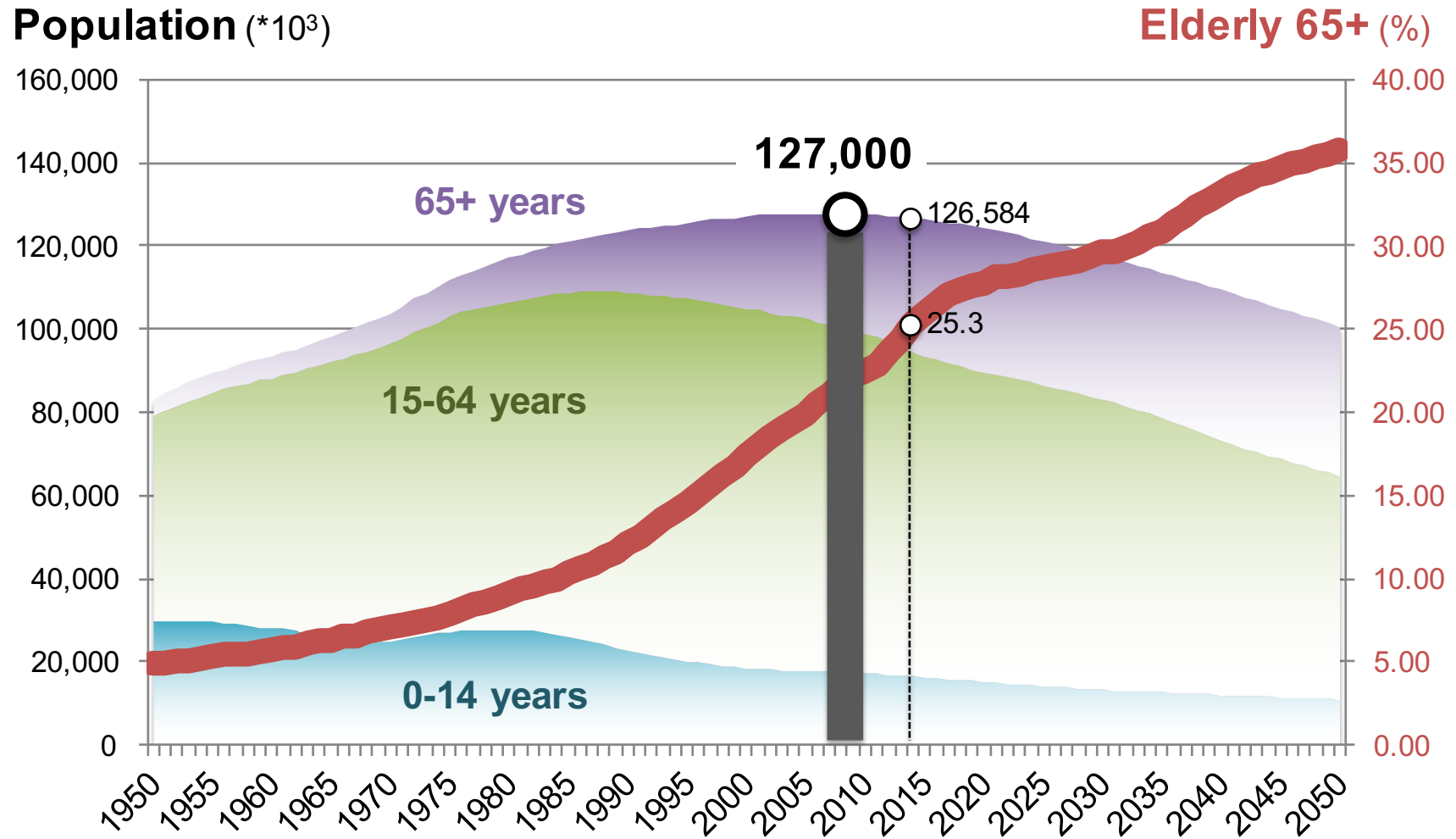


Demand Responsive Policy to Alleviate Depopulation and Aging Issues in Japan

Akimasa Fujiwara, Hiroshima Univ.
afujiw@hiroshima-u.ac.jp



Depopulated Aging Society



Demand Responsive Policy

- **Demand**
 - Revealed + Latent
- **Responsive**
 - Short term on-demand
- **Policy**
 - Mobility planning + Urban planning

1. **Optimal operation planning of Demand Responsive Transport**
2. **Personal mobility usage in old newtowns**



1

Optimal Operation Planning of DRT

Basic Plan on Transport Policy

Feb. 2015

Socioeconomic issues

- Local revitalization under plummeting population & super-aging
- Globalization
- Imminent large-scale disasters, aging infrastructure
- Global environmental issues
- Dramatic advances in ICT and technology innovation
- Reconstruction from the Great East Japan Earthquake
- Tokyo 2020 Olympic and Paralympic Games

A. Realize user-friendly transport that contributes to the rich lives of the citizens

B. Build up the inter-regional / international passenger transport and logistics networks that create a foundation for growth and prosperity

C. Create a foundation of sustainable, secure and safe transport

Target 1 Reconstruct the regional transport networks under local governments' initiatives, coordinating with town planning policies

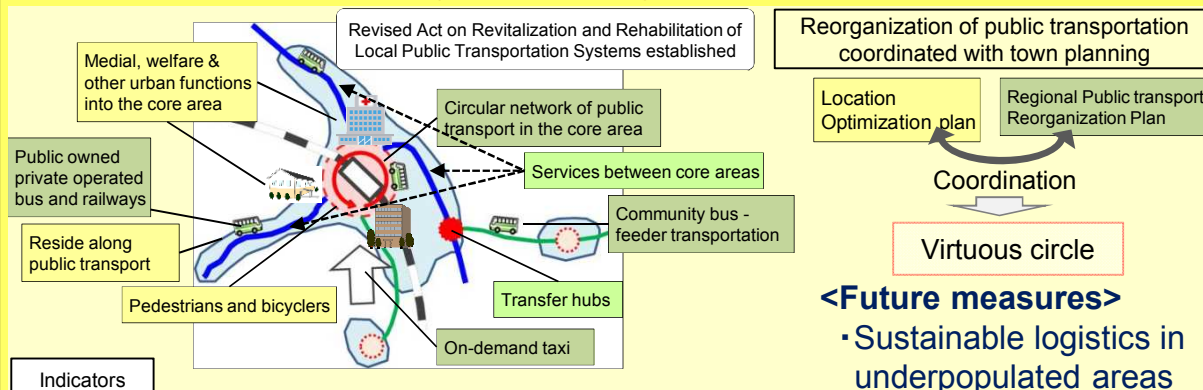
Target 2 Encourage deployment of various transport services taking into account local circumstances

Target 3 Make barrier-free transport more familiar

Target 4 Further raise the service levels for passenger transport and logistics

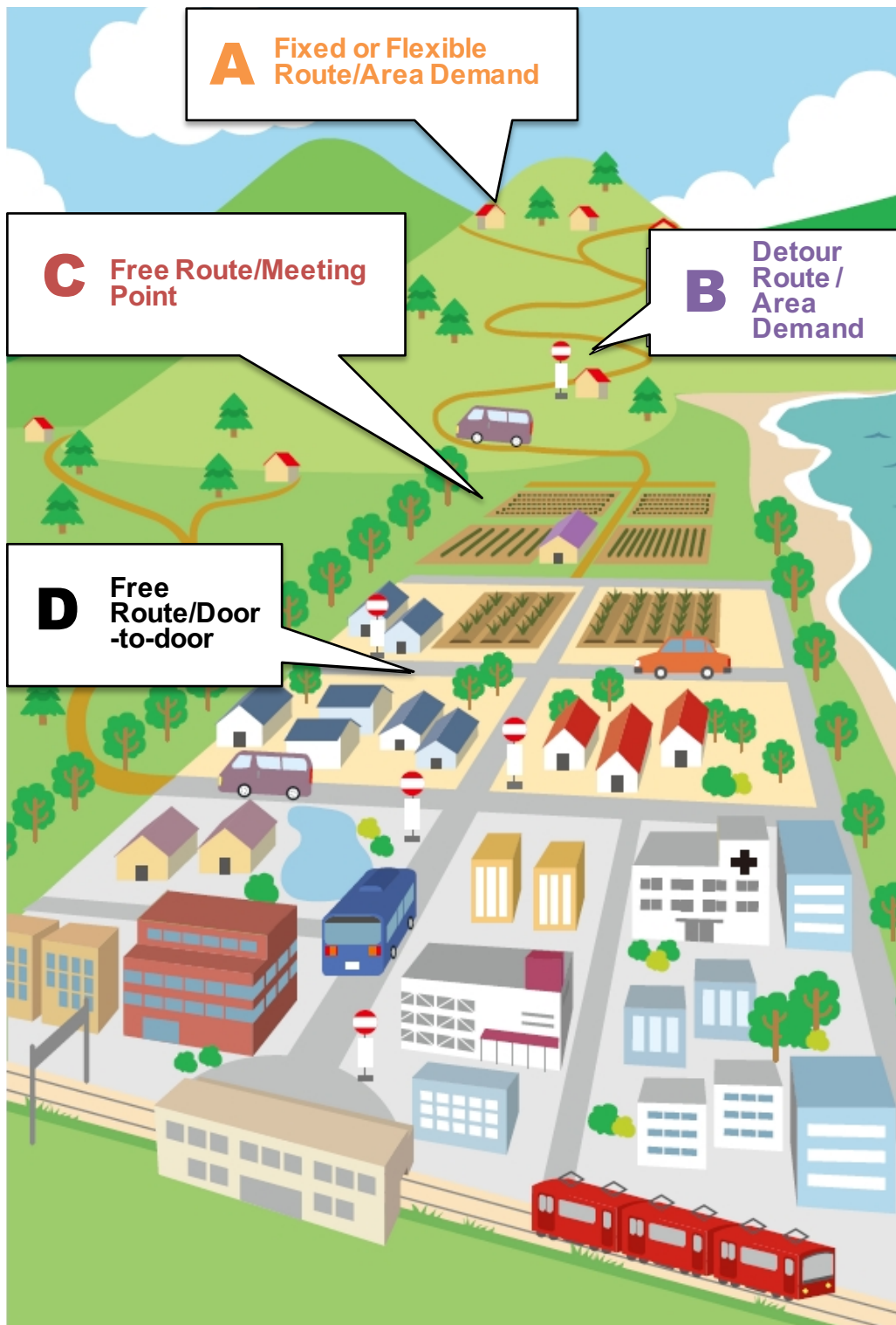
Existing measures with further efforts

- Enact "Regional Public Transport Network Plan" and "Location Optimization Plan" and accumulate successful cases to help build "compact + network".

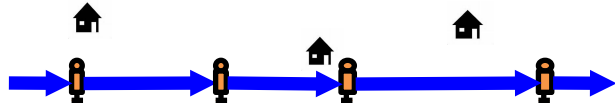
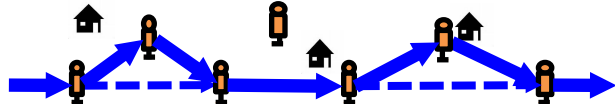
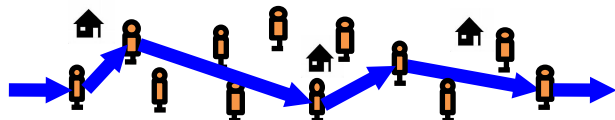



Goal

- Regional public transport network plans: **100 plans**
- On-demand transport services
311 municipalities (2013)
-> **700 municipalities (2020)**



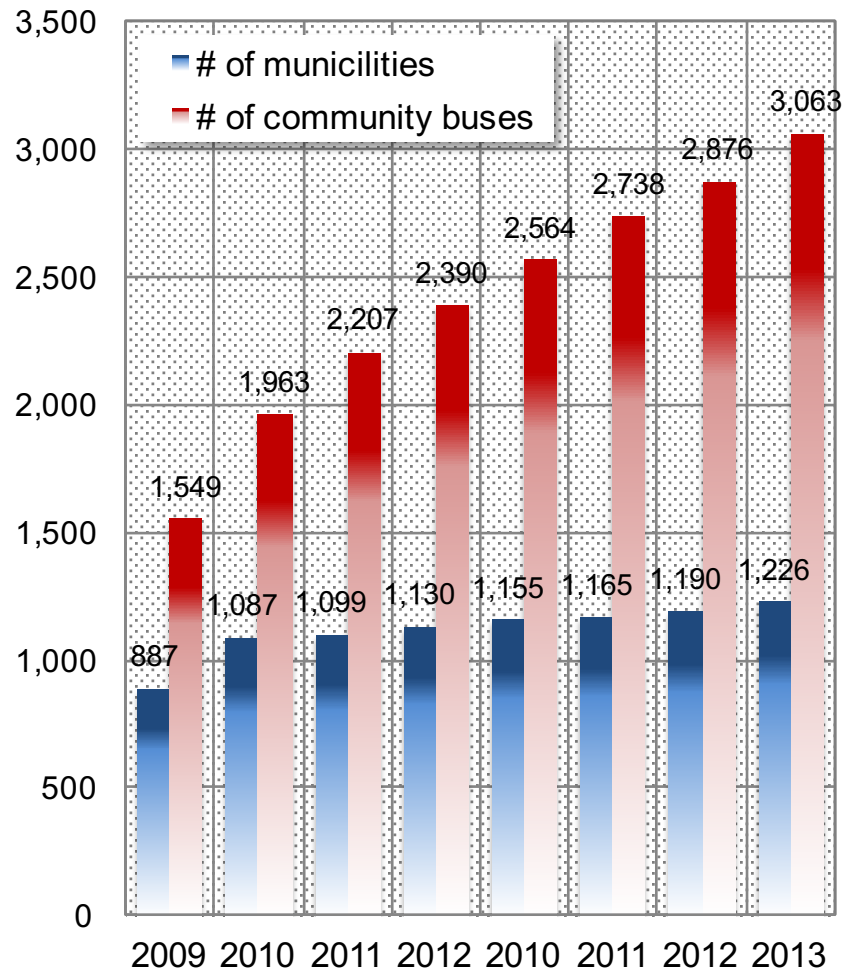
Demand Responsive Transport

A Fixed route	Passengers get on/off at scheduled stops. It operates only when it has reservations. 
B Detour route/ Area demand	Based on fixed routes, it detours to meeting points according to reservations. 
C Free route/ Meeting points	It detours to meeting points flexibly according to reservations without any fixed routes. 
D Free route/ Door-to-door	Without fixed routes and meeting points, it goes the rounds in the area. 

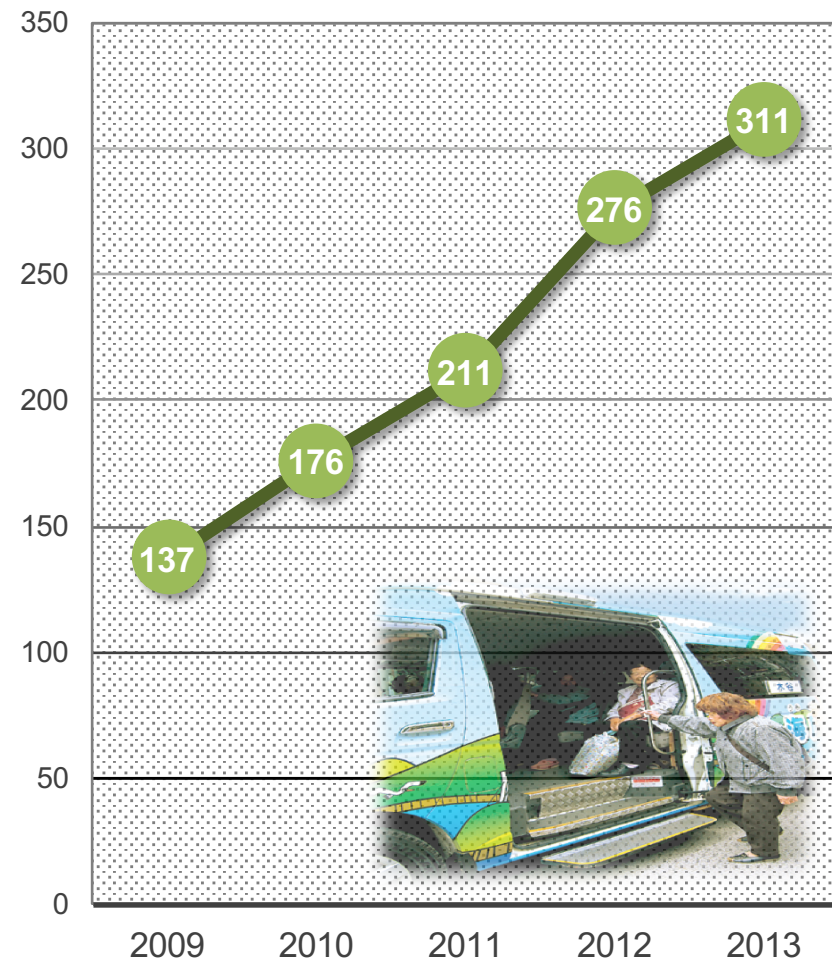
Source: MLIT, Chubu District Bureau
 (https://www.tb.mlit.go.jp/chubu/tsukuro/joho/zoku_demando/index.html)

Demand Responsive Transport

Number of Community Buses



Number of On-demand Transports



Source: White paper on transportation policy, MLIT (2015)

Travel Demand in Depopulated Aging Society

- Anti-economic principle
 - Unknown value of time: 25 JPY 25/min?
 - Faster is better?: Communication on board
- Multi-series conditions
 - Uncompensated utility function: $U \neq \beta_1 * \text{cost} + \beta_2 * \text{fare}$
- Non-negligible latent demand



ComPASS + ComMASS

Community-bus Planning Aid Simulation System

GIS-based application to decide the best community bus services including DRT

- Local governments and operators make decisions to choose an optimal alternative among many public transit services inherent in their own region
- Free application for local governments by MLIT, Chugoku District Bureau

- ComPASS: 27 cities, ComMASS: 26 cities, ComPASS & ComMASS: 51 cities
- Sea-Compass: 4 cities
- WEB ComPASS: 253
 - Local government: 107
 - bus operators: 10
 - Consultants: 99
 - Recommended by MLIT: 37



(As of January 22, 2016)

WEB ComPASS System

Regional information data

- Population by age in each community
- Facilities at community center
- Surveys

Bus operation data

- Route, fare, frequency
- Bus stop

Input

WEB ComPASS

- Demand analysis based on uncompensated utility function
- Operation cost calculation
- Evaluation of alternatives



output

Profit index

- Expected monthly demand
- Expected monthly operation cost

Current analysis

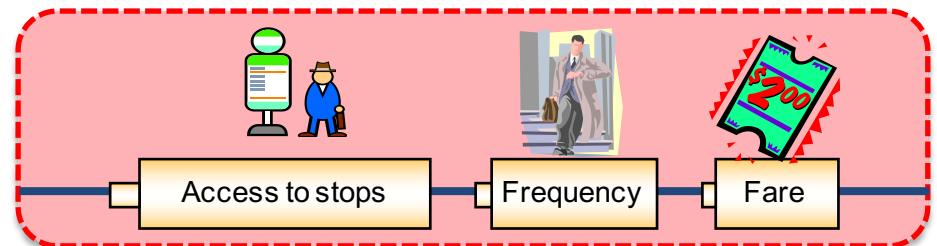
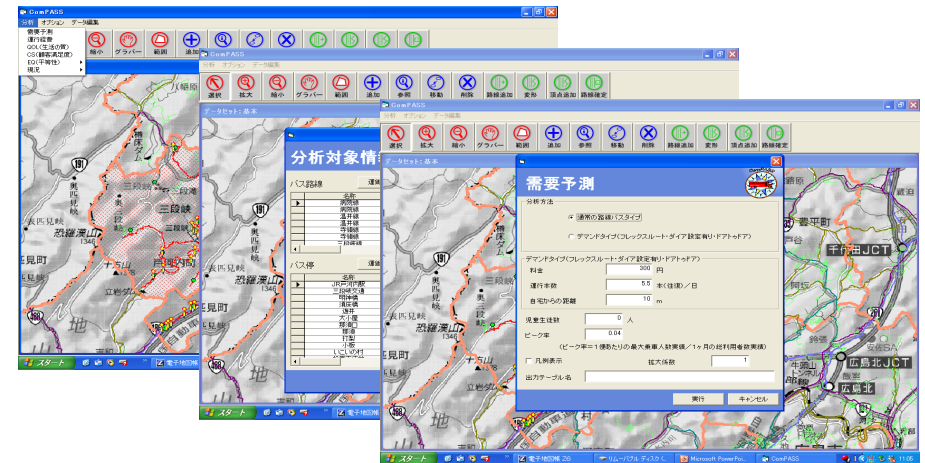
- Catchment population, aging rate
- Areas with no bus service

Other indices

- Quality of life
- Customer satisfaction
- Equity among communities

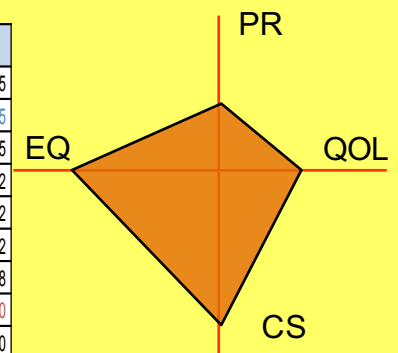
Support to claim subsidy

- Expected monthly demand
- Expected monthly operation cost



Output

Type	Fare	Freq.	Demand	Income	Ope. cost	Profit
0 Route bus	100	4 or 5	1,617	161,650	1,261,965	-1,100,315
	200	4 or 5	1,071	214,200	1,261,965	-1,047,765
	300	4 or 5	732	219,660	1,261,965	-1,042,305
A Fixed route DRT	100	4 or 5	2,017	201,690	1,288,972	-1,087,282
	200	4 or 5	1,806	361,120	1,288,972	-927,852
	300	4 or 5	900	269,880	1,288,972	-1,019,092
D Free route/ d2d DRT	100	5.5	1,294	129,372	945,500	-816,128
	200	5.5	825	165,000	945,500	-780,500
	300	5.5	475	142,380	945,500	-803,120



DRT to secure daily transport

- Tsuwano Town: population size 7,634, aging rate 41.6%.
- Meets the needs of local residents and tourists
- A joint public-private enterprise
- Scheme of separating infrastructure and operation
- 4 plug-in hybrid vehicles & 1 van-type taxi



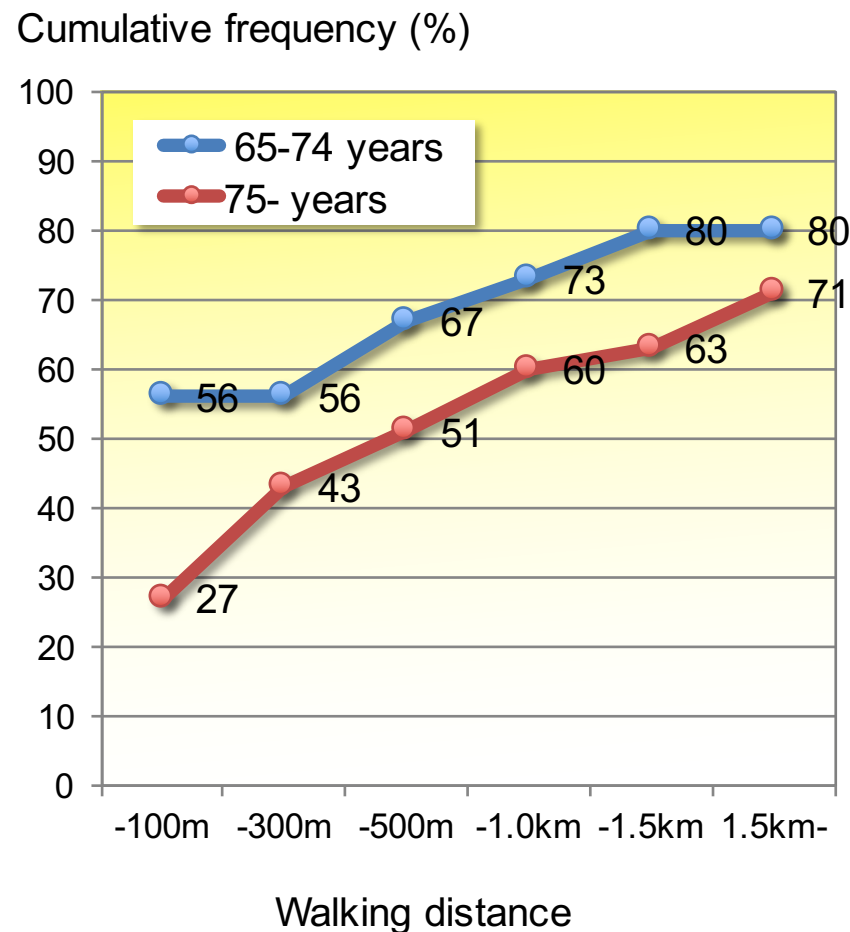


2

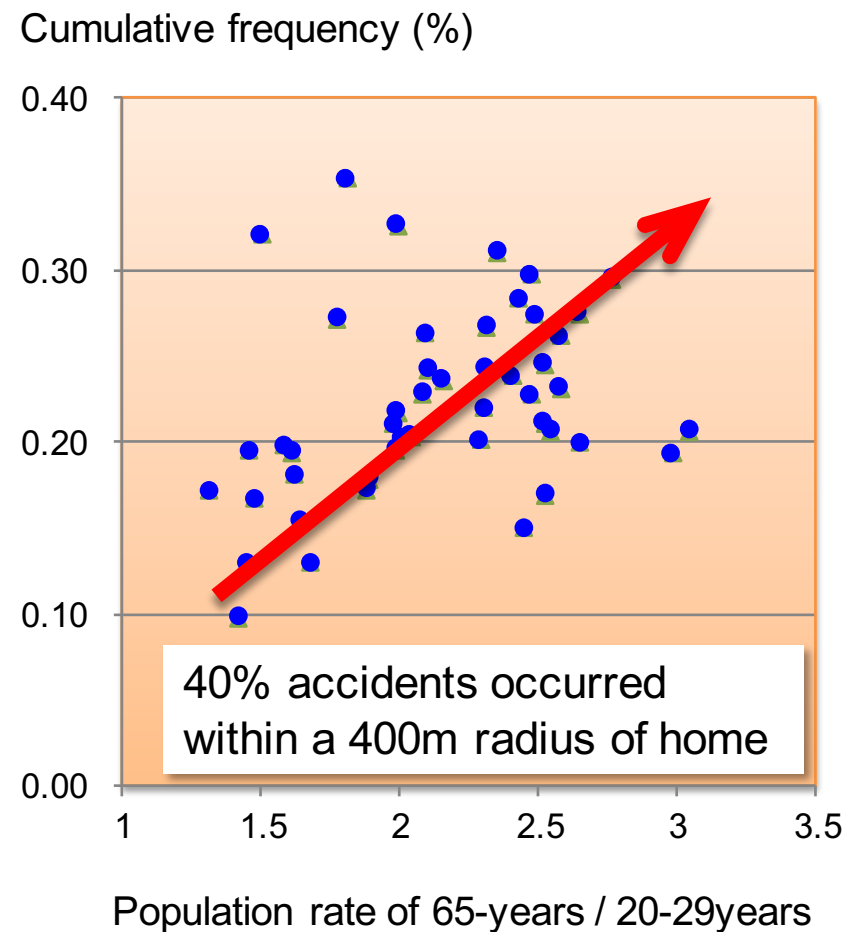
Personal Mobility Usage in Old Newtowns

Mobility of Elderly People

Walking Distance



Traffic Accidents



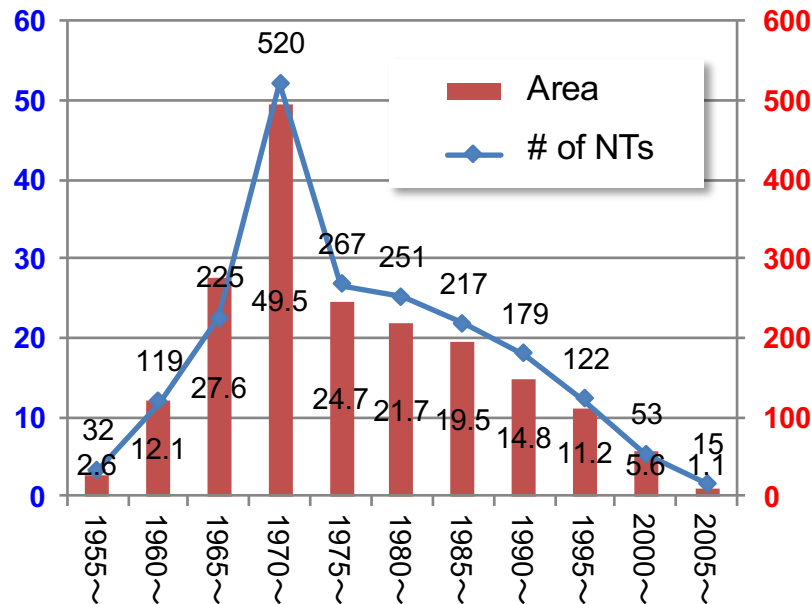
Appearance of “Old Newtowns”

Newtown Development Boom



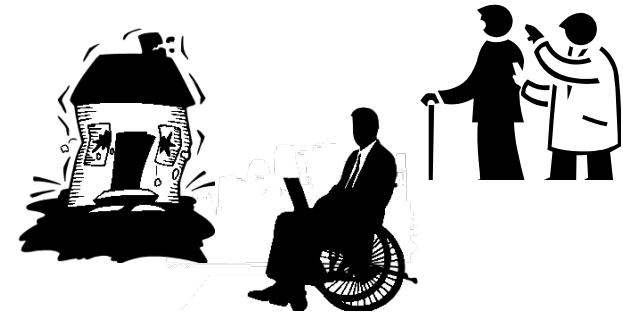
of Newtowns

Area (10³ ha)



High Economic Growth '70-90

Old Newtown



Aging Newtown

- Old building & infrastructure
- Vacantlands & houses
- Unused facilities
- Aged people
- Drain of young people
- Depopulated
- Restricted mobility of elderly
- Collapse of community



Restricted Mobility



- **Geographical barriers**
 - Hilly areas
 - Slops and stairs
- **Physical barriers**
 - Physical ability decline
 - Driving ability decline
- **Social barriers**
 - Decline of families and acquaintances
 - Weaken community
- **Transport barriers**
 - Car-dependent transport
 - Poor services of public transport

Personal Mobility Vehicles

Definition by MLIT

It is a single or double personal vehicle, that is more compact, environmentally friendly and can easily turn around. And it could take a role of convenient access transport in a community.

Safety

Physical weakness

Sharing possibility

Alternative mode to car



**Mobility Scooter
(SC: Senior Cart)**



**Power-assisted
bicycle (EB)**

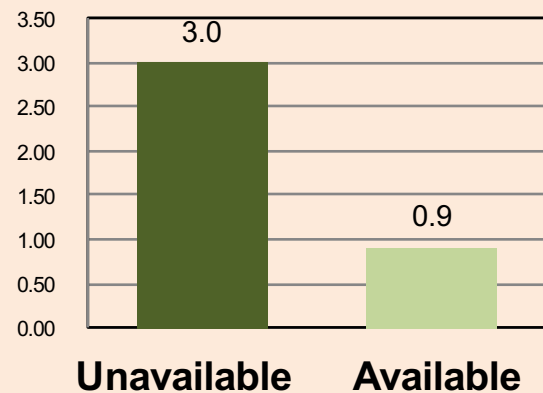


**Small Electronic
Vehicle (EV)**

Transport-related Exclusion of Elderly

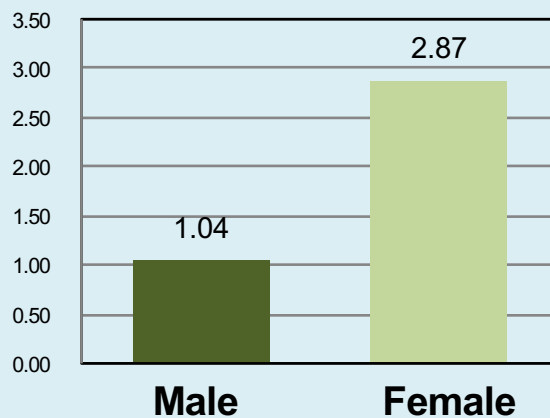
Car availability

Non-trip Days



Gender

Non-trip Days

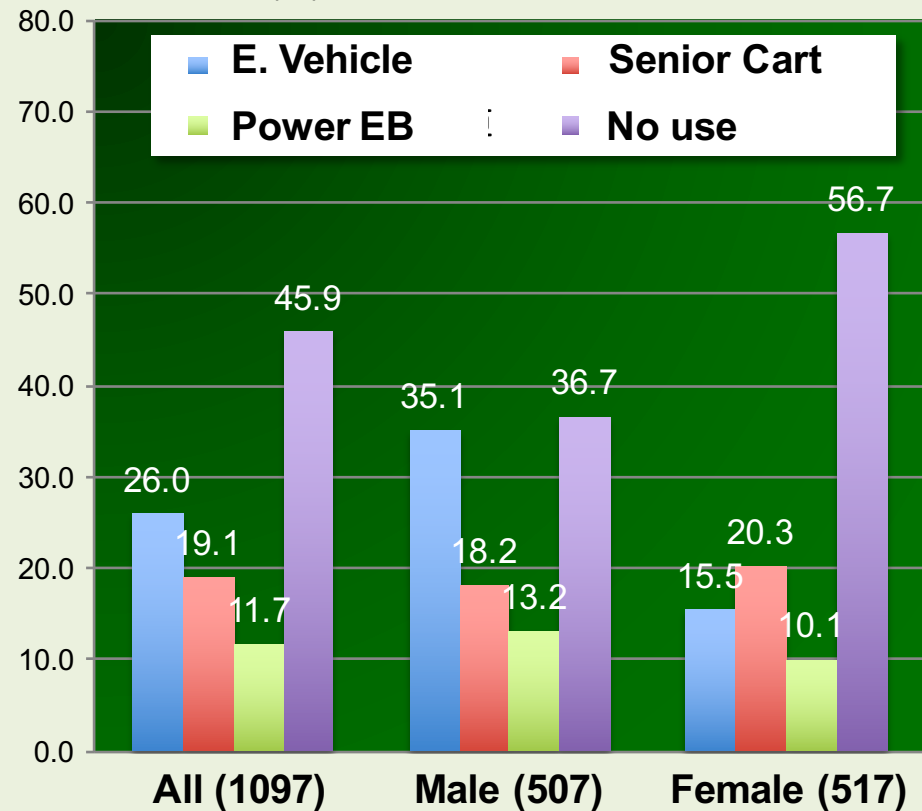


Intention to use PM

- Average 50%

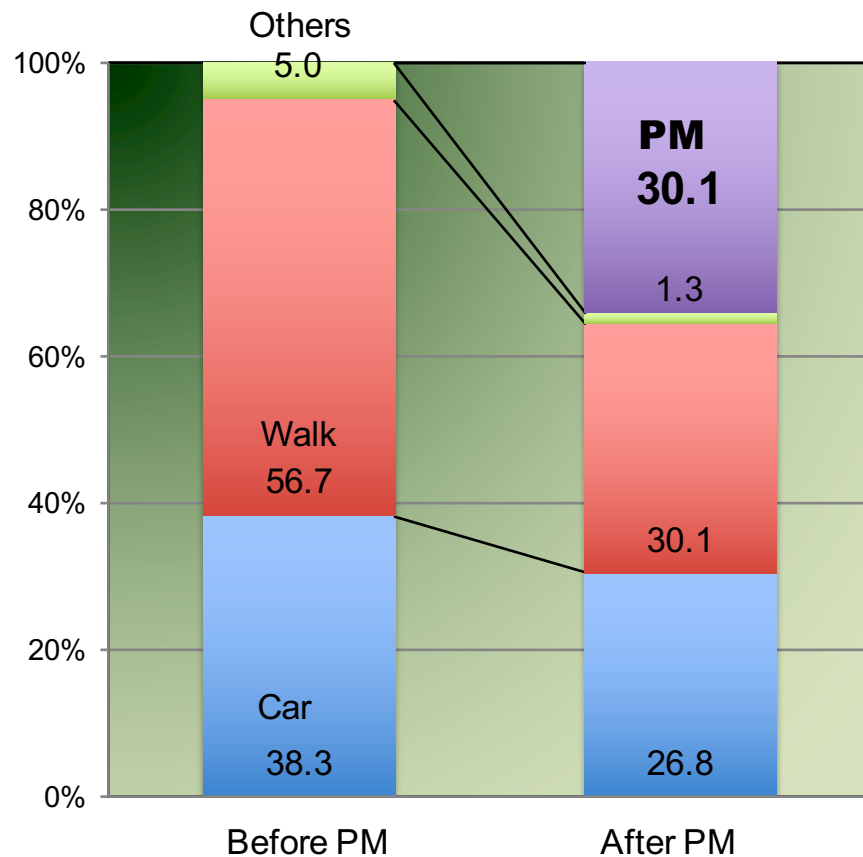
- EV  > SC  > EB 

Intension to use (%)

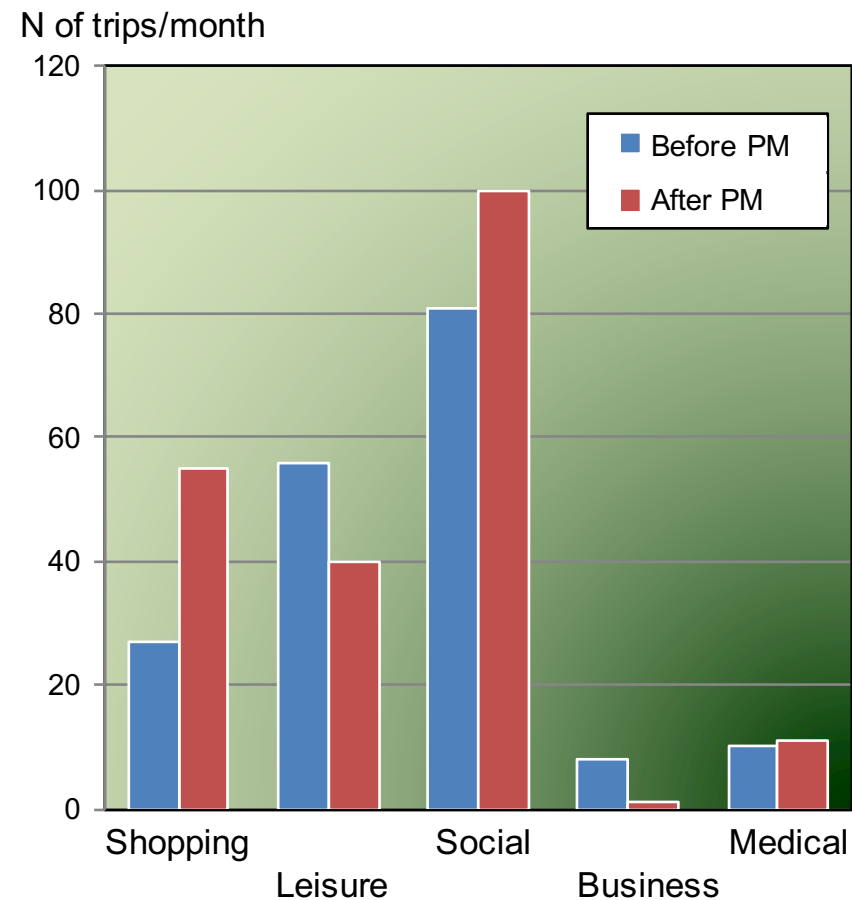


Effects of PM Use

Modal share change



Trip generation change



Summary

- Optimal operation planning of DRT can improve the level of mobility (LOM) in depopulated regions
- Short distance mobility (PM) can alleviate the transport-related exclusion issues in old newtowns

Fallacy of Composition

While **short-term** on-demand services contributes LOM in current local residents, they may increase elderly residents who remain wedded to live in disadvantaged regions/areas in **long-term** aspect



HIROSHIMA UNIVERSITY

Discover the joy of learning.



Thank you
afujiw@hiroshima-u.ac.jp