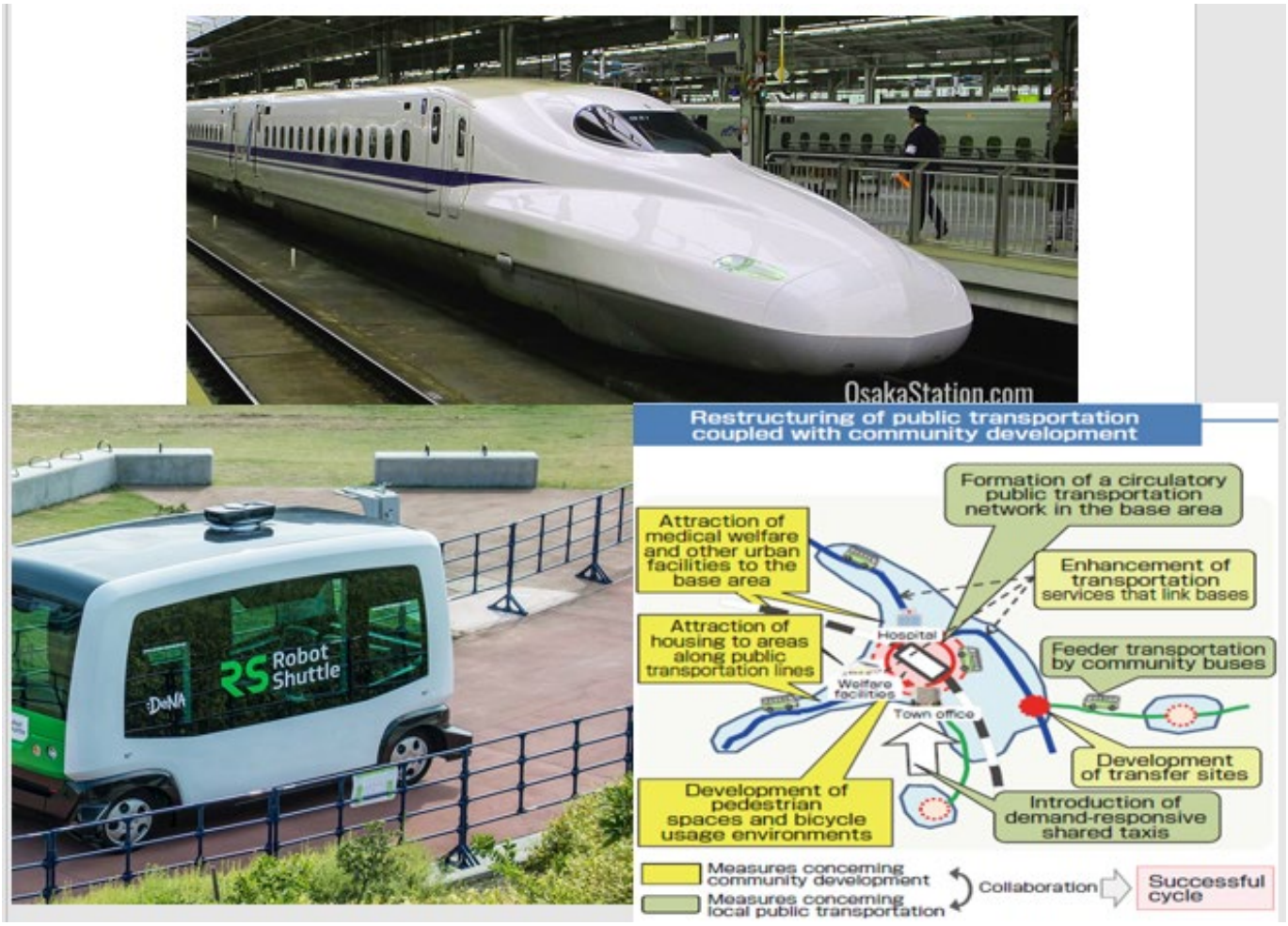
SUSTAINABLE AND SMART MOBILITY IN JAPAN

HANS JEEKEL



REPORT STUDY TOUR, MAY 2018

OUTLINE

PREFACE

Between 19 May and 26 May 2018 I visited Japan. I had ten sessions with Japanese professionals on mobility and transport, and gave a lecture at the Waseda University in Tokyo.

My aim was to understand the situation on sustainable mobility and smart mobility in Japan. I concentrated on performances, concepts, narratives, challenges and problems. The idea for a study tour to Japan found its source in astonishments. Looking at the data it became clear to me that among the richer OECD countries Japan has the best performance on sustainable mobility, with CO2 emissions decreasing, and with a modal split in kilometers travelled that is far more sustainable than in any other country. And on smart mobility I noted that technology development in Japan is related to societal goals and objectives.

I was even more astonished to learn that in most other OECD countries there seemed to be a lack of attention for Japan's performances, by policy makers and in academia in the transport world. Both communities mostly work from global, more Anglo Saxon frames, and Japan just does not fit in these frames. I had to visit Japan to see with my own eyes whether my idea that Japan is best "state of art" in sustainable mobility and smart mobility was correct. I have not been disappointed. This report is the result of the study tour.

Many people have made my study visit a success. At first I would like to thank the Innovation Team, headed by Hein Jan Chrisstoffels , of the Dutch Embassy, and then especially Mihoko Ishii. And I would like to thank the colleagues from Eindhoven University of Technology who have been supportive.

But mostly I would to thank the 11 professionals that offered me the important insights;

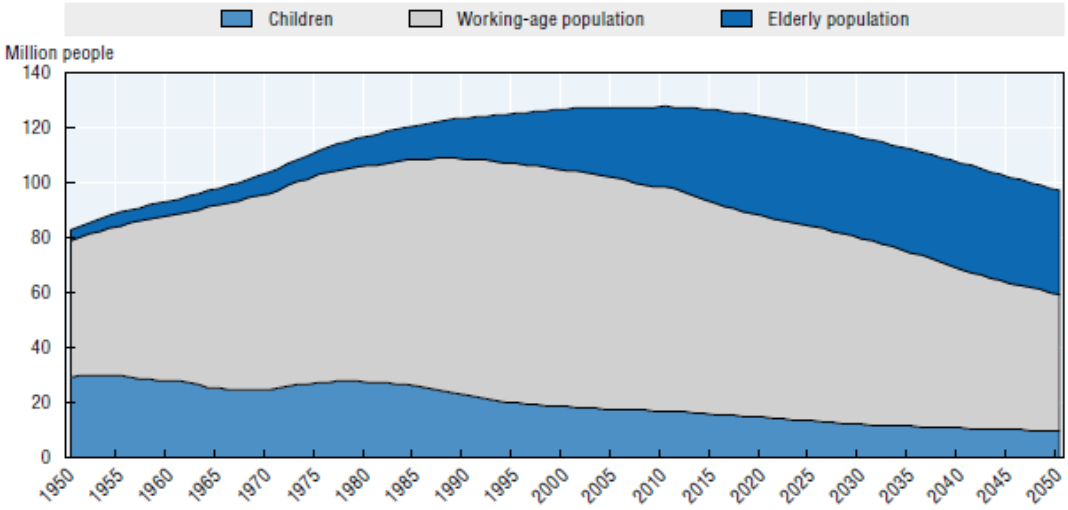
Dr. Hirotsugu Maruyama, Eco-Mo Foundation
Prof. Takashi Oguchi, University of Tokyo, ITS Center
Dr. Fumio Kurosaki, Institute of Transportation Economics
Prof. Yasuhiro Daisho, Waseda University, Tokyo, Next Generation Vehicles
Dr. Hidenori Yoshida and Dr. Azusa Goto, National Institute for Land and Infrastructure Management (NILIM), ITS Division, Tsukuba
Prof. Kiyohito Utsuminoya, Kansai University, Faculty of Economics, Osaka
Prof. Hironori Kato, University of Tokyo, Department of Civil Engineering
Dr. Keisuke Matsuhashi, National Institute for Environmental Studies (NIES), Tsukuba
Dr. Yasunori Muromachi, Tokyo Institute of Technology, School of Environment and Society
Prof. Fumihiko Nakamura, Yokohama National University, Urban Transportation Planning.

Thank you all for your support and your collegiality. I look forward to further cooperation, but first this dissemination of results.

INTRODUCTION TO JAPAN

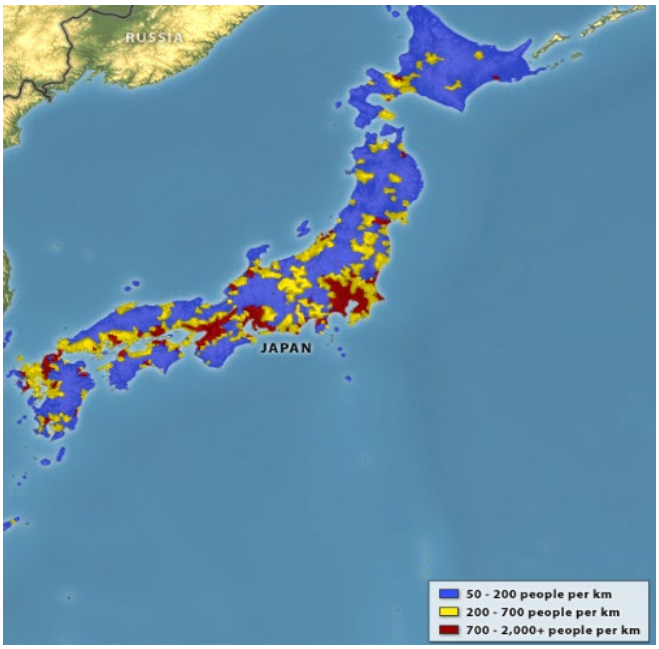
Japan, the third economy in the world, is shrinking in population, due to very low fertility rates (OECD,2016). And the decrease in population goes fast, as this figure shows.

Figure 1.1. **Japanese population and age structure, 1950-2050**



Source: OECD (2015a), "Historical Population Data and Projections (1950-2050)", *https://stats.oecd.org/Index.aspx?DataSetCode=POP_PROJ* (accessed 16 October 2015).

With the Japanese population and age structure there is simply no way to sustain high living standards and quality public services in a "super- aging" Japan, unless the country is able to achieve much higher productivity growth. Productivity growth is now concentrated in Tokyo, where 30 % of the total Japanese population lives. Tokyo is the great job creator and has at the same time the lowest fertility rate in the country (OECD, 2016; 1,19), fitting in the law that "*density is always negatively correlated with fertility*" (OECD, 2016, 149).



The geography of Japan is interesting. Japan has an area of 380.000 km2, and most of the country consists of mountainous regions and complicated coastlines. Almost 70 % is forested, only 12 % is cultivated and only some 40 % is habitable. This creates high densities in the habitable areas. No other OECD country has such a high share of its total population (127 mln) living in high-density areas (60 %), nor is any country experiencing the kind of dramatic demographic change that is unfolding in Japan.

The very low fertility rate of Japan seems related to the price of living for households, with high budgets needed for education and housing in the major cities. But there

is a more important institutional reason, which is the rather low share of women in the labor market. In most Japanese households only one income is available, so calculation leads to not being able to raise many children. There is a dominant societal pattern, and here I would like to quote the OECD Territorial Review on Japan (2016,48); "*Women with children find it particularly difficult to sustain regular, full time employment owing to the country's long- hours culture.. Moreover, the commutes are very long, employment practices can be relatively inflexible for regular workers and child- care is lacking. And labor markets still tend to force a choice between career and child- bearing"*

The three main major urban areas (Tokyo, 39 mln. Nagoya, 9 mln and Osaka-Kyoto-Kobe 18 mln) house more than half of the Japanese population and are responsible for even more than half of the GDP creation. Tokyo urban area has a relative better performance than the other two areas. Not Tokyo is the problem but the lack of economic vitality in the rest of the country. Outside the three major urban areas economic vitality is rather low in smaller regional cities, and somewhat higher in the rural areas.

From the OECD Territorial Review the following state of art arises. Japan spends high budgets on innovation, but scores rather bad on entrepreneurship, as Japanese society is relatively risk- averse. Regional innovation systems are Japan- centered and disconnected from each other. And the education system is expensive for households, and not directed at stimulating creativity.

Japan is, due to its geography, the most infrastructure intensive major economy in the world. Not only in the major cities, where networks of public transport dominate, but also in rural regions, where investments in bridges, tunnels and earthquake proof constructions are necessary. Much of the infrastructure was built in mid- 20th century and is now deteriorating, leading to high maintenance costs, now and in the next decades.

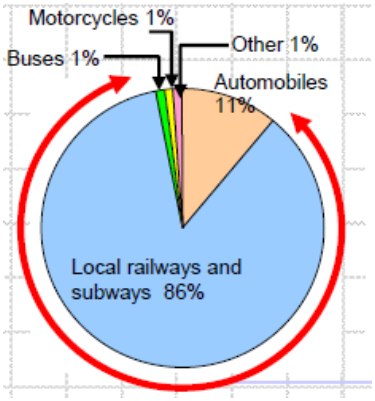
Japan faces at least four major challenges; economic vitality, population decline, aging society, and global warming, and these four, together with creating earthquake proof structures, are the key of the governance agenda in Japan, with the attention on global warming somewhat declining after the Fukushima disaster of 2011.

MOBILITY IN JAPAN : GENERAL ASPECTS

Looking at the mobility state of art of Japan, what immediately strikes every researcher is the high share of public transport in the statistics of kilometers travelled. Where in Europe Switzerland has the highest share (18%), in Japan a share of 30 % - plus can be noted. Car mobility has a share of 60 % (most richer OECD countries; 80 %).

			2012	2013	2014
port volume[1])	Passengers (×100 million passenger-kilometers)	Total	13356	14000	14285
		Motor vehicles for private use	7924	8389	8522
		Motor vehicles for commercial use	739	757	746
		Railways	3951	4044	4144
		Maritime	30	31	33
		Aviation	712	779	841

Data from ; Japan Research Center for Transport Policy (2015).



Responsible for this high share of public transport are the major urban areas, where 65 % of all kilometers travelled are made by rail, metro or bus (the 86 % here is without cycling and walking, and is inner Tokyo, 23 wards, 9 mln.).

Car ownership in Japan has figures comparable to other OECD countries. 80 % of all households own cars, and on average car owning households have 1,45 cars. This leads to 77 mln. passenger cars in Japan or 595 cars per 1000 inhabitants.
The great difference is in the car usage. A car in Japan drives yearly on average 5200 kilometers, whereas a car in the Netherlands drives 11.800 kilometers. Japanese households on average do not use their cars pretty much. Here a great difference can be noted between car use in the major cities (nearer to 2000-3000 kilometers yearly) and the rural areas (levels comparable with the Netherlands).

In Japan also cycling and walking have some importance, at least in the urban areas. Especially in modal split of trips this can be seen. Urban Japanese people like to walk, or see the need to walk to reach the PT connections.

Japan has with its high densities an interesting position in the world of mobility. A figure from OECD (2016) could clarify.

Table 3.1. **Advantages and disadvantages of high urban densities**

	Potential advantages of high urban densities	Potential disadvantages of high urban densities
Mobility	• Reduce fossil fuel emissions/carbon footprint by decreasing the total number of vehicle trips and the number of kilometres travelled per trip. • Enhance accessibility, as people live closer to where they work, shop and play. • Make transit more economically viable and efficient. • Enable public health benefits from more walkable and bike-friendly environments. • Create efficiencies in mixed-use developments through shared parking.	• Exacerbate traffic congestion, parking problems; increased traffic accidents. • Create pedestrian congestion and congestion in public transport. • In compact, monocentric cities may only have significant positive environmental effects when a greater share of commuters use mass transit.

The importance of rail transport in Japan leads to important narratives. Rail companies are important stakeholders in Japanese society, as will be explained later in this document.

Outside the urban areas mobility presents another picture. In the rural areas, the regional cities and the outlying suburbs cars dominate mobility. Here modal shares for public transport are almost never higher than 10 % of kilometers travelled.

In fact, **Japan shows from mobility perspective a very polarized society**. On the one hand, there are (A) the three major urban areas, where public transport dominates, and car mobility is relatively low. On the other hand, rural areas, outlying suburbs, but also the regional cities, with sometimes a population of 600.000 inhabitants (B), are fully car country, with diminishing public transport.

All stories about Japan and its mobility originate in Japan A, and Japan B (with nearly the same population) tends to be forgotten. But in Japan itself the problems of mobility in Japan B are taken very serious, as we will see later in this document.

In the near future only the Tokyo region will increase in population, not from child birth, but from in migration from younger , well – educated singles from Japan B (Xiong, Zhang and Kayama, 2016). All other Japanese regions will decline in population, with huge decreases especially in the smaller regional urban areas. Until now it is quite unclear what this will mean for mobility. Important here is whether population in the declining areas will just become more dispersed, as we know dispersal always leads to more car mobility, or whether spatial policies aiming for more concentration of the remaining population will succeed. This is a central issue in chapter 4.

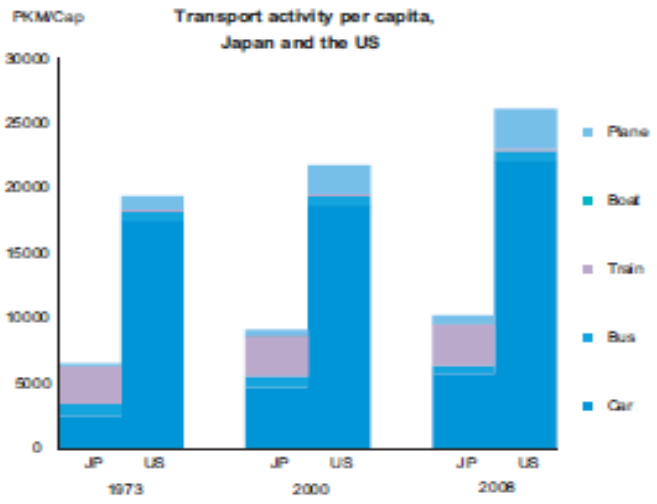
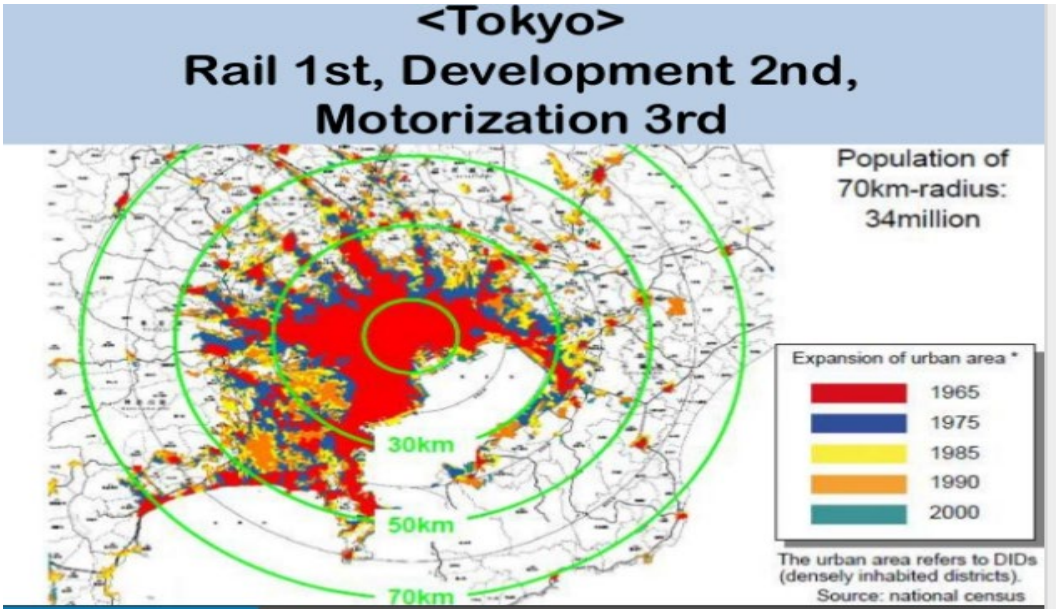


Fig. 2. Transport activity per capita, Japan and the US.

In an overview article *Energy efficiency in the Japanese transport sector* (Lipscy and Schipper, 2013) it was concluded that Japanese travel shorter distances and are more prone to travel by rail. And Japanese travel only 40 % of the distance travelled by Americans. Commuting distances in Japan are far shorter (in distance, not in time) also compared with the data of the Netherlands.

Important in the general mobility in Japan is the unfolding process of infrastructure. Rail infrastructure was developed since the early twenties of the last century, and cities were developed in relation to rail infra. The highway network was created rather late in Japan (David,2014) and all highways are tollways. The costs of highway routes were to be recovered by these tolls paid by users, by cross subsidization from other routes and by some public funding. Only recent housing is built in relation to the highways. But as population growth in the last decades was relatively minor, still most build- up areas are connected to the dense rail network.

Tokyo is an interesting example, as Nakamura (2018) describes. First on the development stages;



Secondly, on the automobile modal share. In the figure below (Morio et.al, 2018) can be seen that within the 40 kilometer zone the car modal share is very low with 0 to 40 %. In the suburban zones, mostly at 45 kilometer – plus from CBD this rises to 60 % and higher.

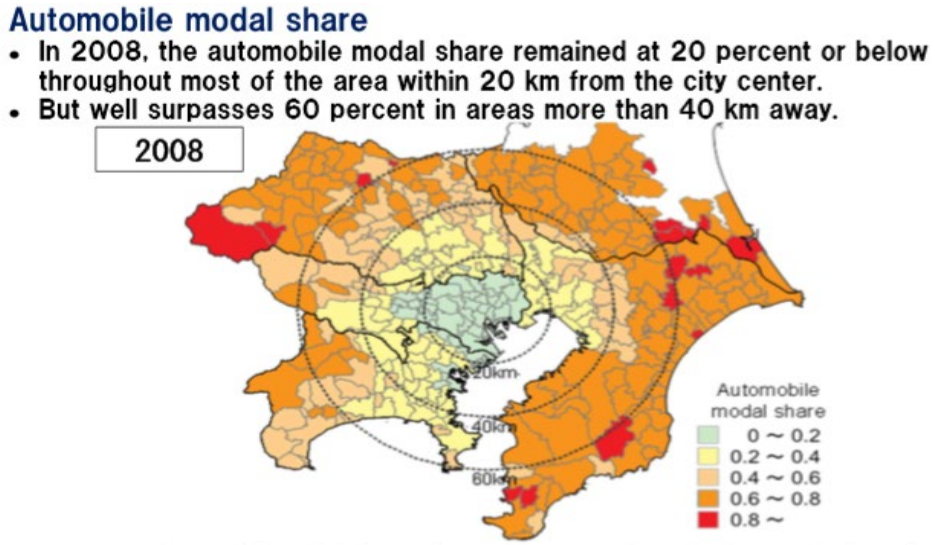


Figure. Automobile modal share of transportation volume by destination (2008)

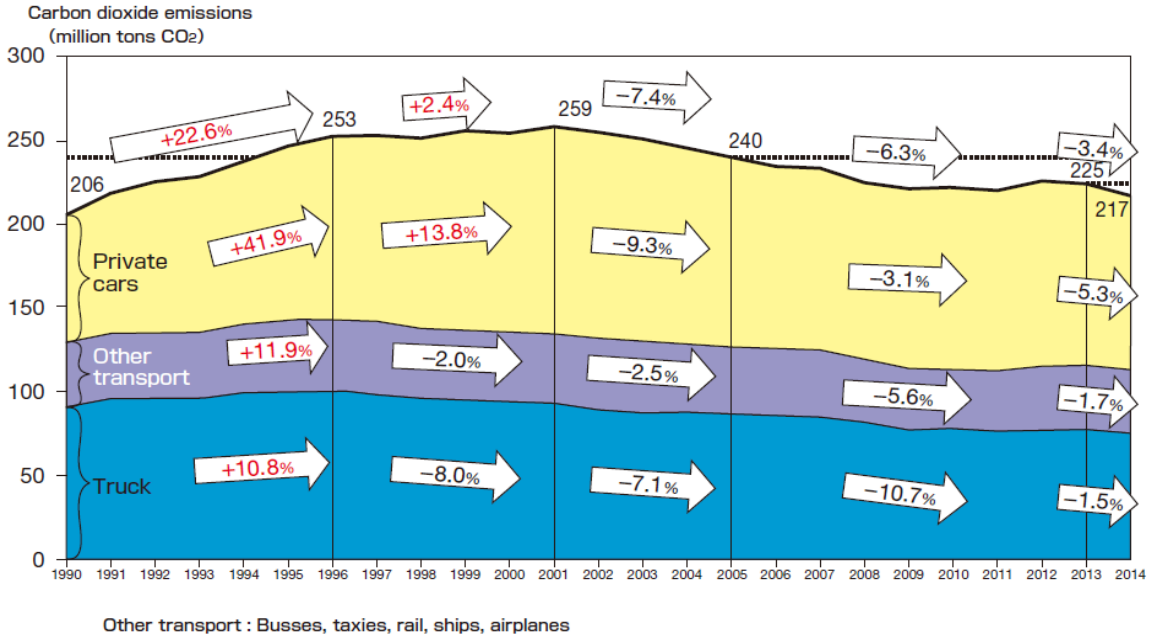
27

CHAPTER 2 VEHICLES, INTELLIGENT TRANSPORT SYSTEMS AND GLOBAL WARMING TARGETS

Japan is one of the few OECD countries that has succeeded in decreasing its share of CO2 emissions from mobility in the last decade. As known, in most OECD countries these emissions have more or less remained at the same level or have grown. However, in Japan in recent years this decrease is slowing down. What are reasons for the decrease, and what are reasons for this slowing down?

First the decrease. These are the data for the period 2001-2014, on CO2 emissions (mgtons).

	2001	2008	2014	% total	In first period
cars	129	113	107	-19%	70 %
trucks	90	80	75	-16%	66 %
Other	40	35	35	-12%	100%
overall	259	226	217	-17 %	75 %

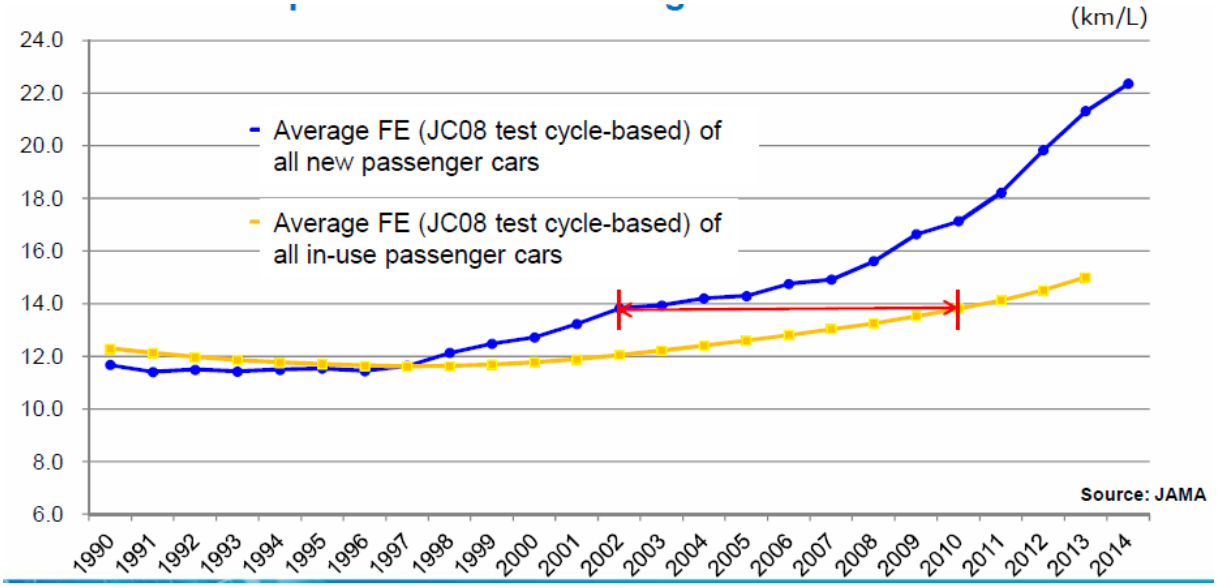


Other transport : Busses, taxies, rail, ships, airplanes

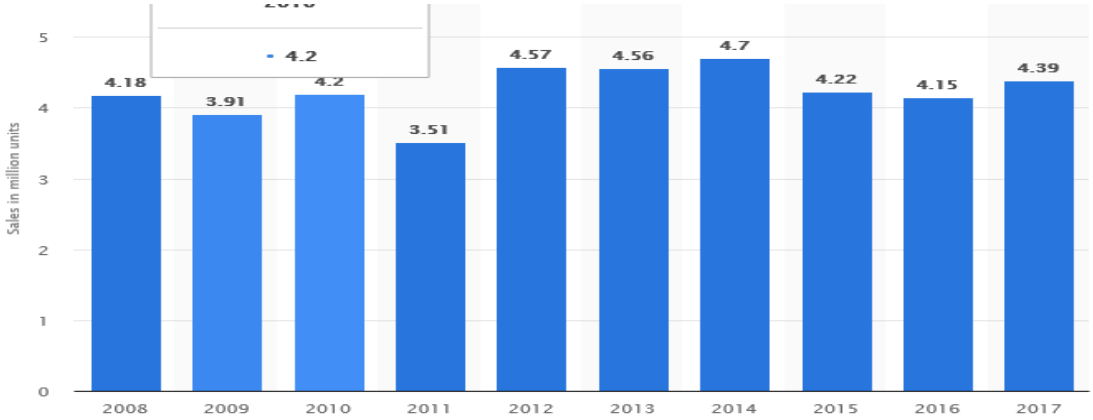
Source: MLIT website (Tentative Translated by Eco-Mo Foundation)

The main factors in the reductions of CO2 emissions stem from the following sources (1990-2010) (JAMA, 2017). For trucks ; improved load efficiency in trucks use (made possible because the market for truck transport in Japan is dominated by only 20 big companies, and targets were negotiated between national government and these companies), eco- driving and improved traffic flow. And for passenger cars ; improved fuel efficiency, and improved traffic flow. As we concentrate here more on passenger mobility, the increase in fuel efficiency is the result of programs concluded between national government and car manufacturers. Average certified fuel efficiency is increasing yearly and car manufacturers are pretty confident in keeping track here.

It takes 8 years before the average fuel efficiency of cars in use can catch up with the fuel efficiency of new cars (JAMA, 2017).



This is important whereas from 2008-2011 less new cars were sold, so the impact of greater fuel efficiency in passenger cars will probably decrease in CO2 statistics between 2016 and 2019.



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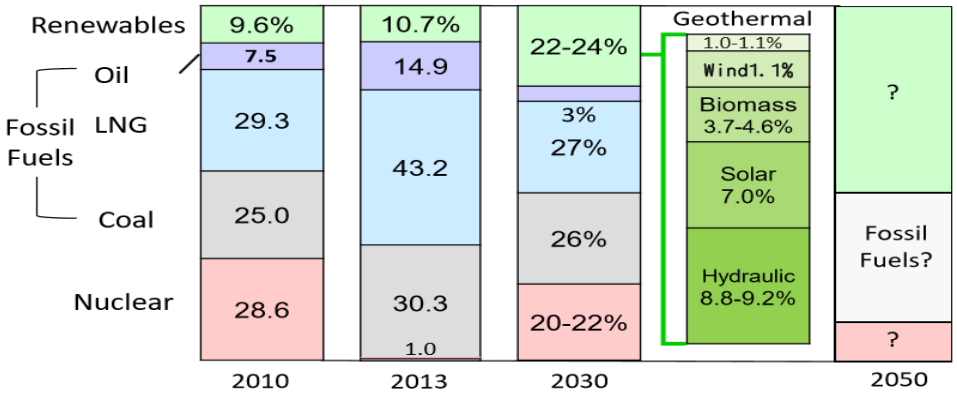
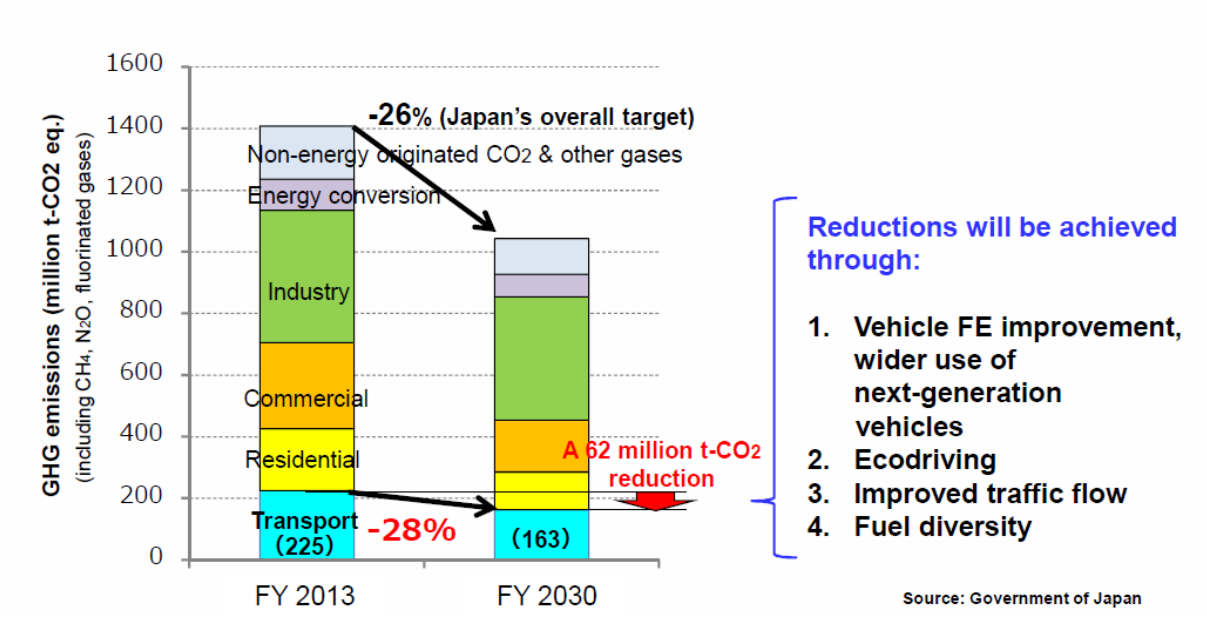
Important is the fuel mix in Japan. Here are the data (Daisho, 2018)



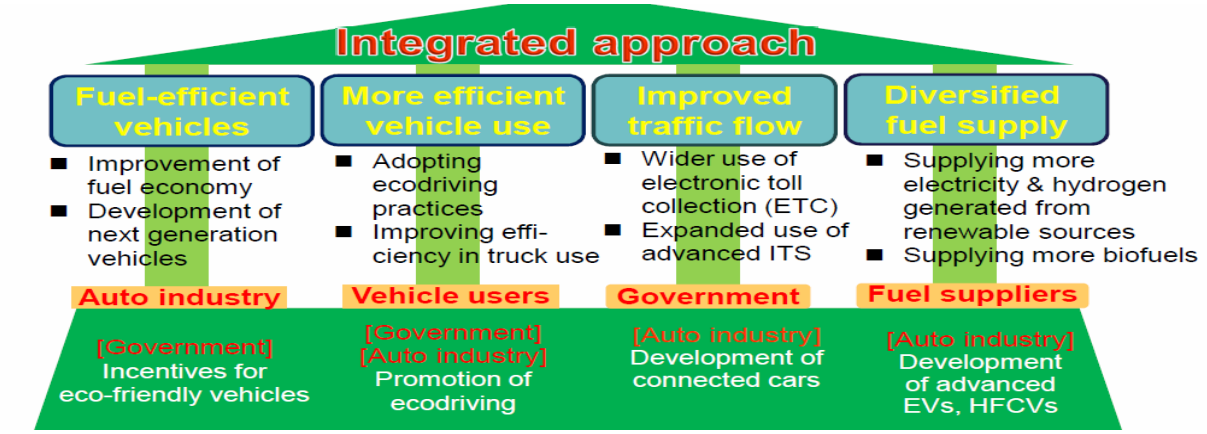
After Fukushima, nuclear energy was considered no longer to be an option. This meant that Japan had to move back to fossil fuels as can be seen in the data for 2013 (from 61,8 % to 88,4 %). Japan has a strategy for a more sustainable energy mix for 2030, with a fast increase in renewables, and an increase in nuclear again. And Japan tries to be as independent from fossil fuel producers as possible (for a broader perspective: Chrisstoffels ,2007).

Japan is not putting all its cards on electric driving and electric cars, but gives great attention to creating fuel efficiency in ICE cars. Average fuel economy could reach 50 km/L in 2050 by using higher efficiency hybrid systems together with using plug-in systems and lightweight materials (Daisho, 2018). Power generation will have to be low-carbonized for recharging the battery units. The focus is mostly on plug- in hybrids with a huge increase in fuel efficiency. But there are also investments in electric and fuel cells.

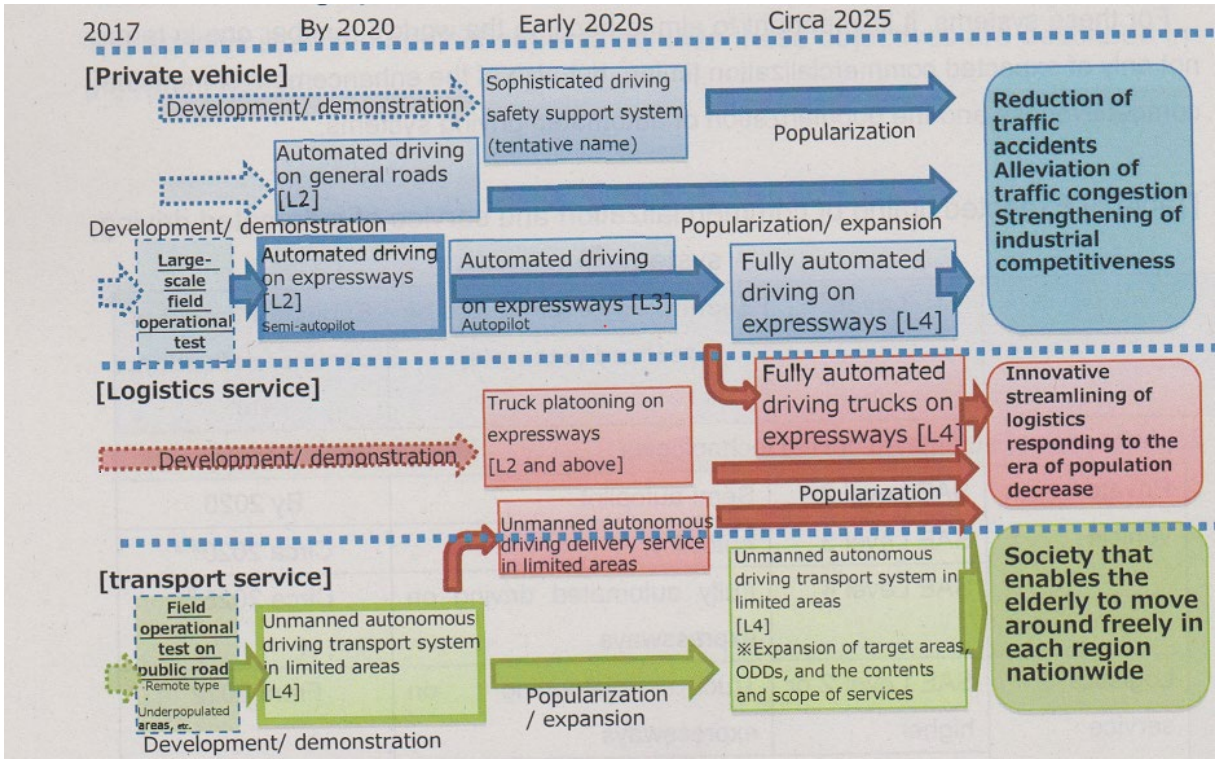
This fits in the Japanese approach to reduce CO2 emissions in general. Japan has presented its target for 2030 CO2 decrease at -26 % , related to basic year 2013 (after Fukushima!).



The target for transport is set at -28 % in 2030 (related to 2013). And for transport the Japanese government did present a four pillar approach (JAMA, 2017)



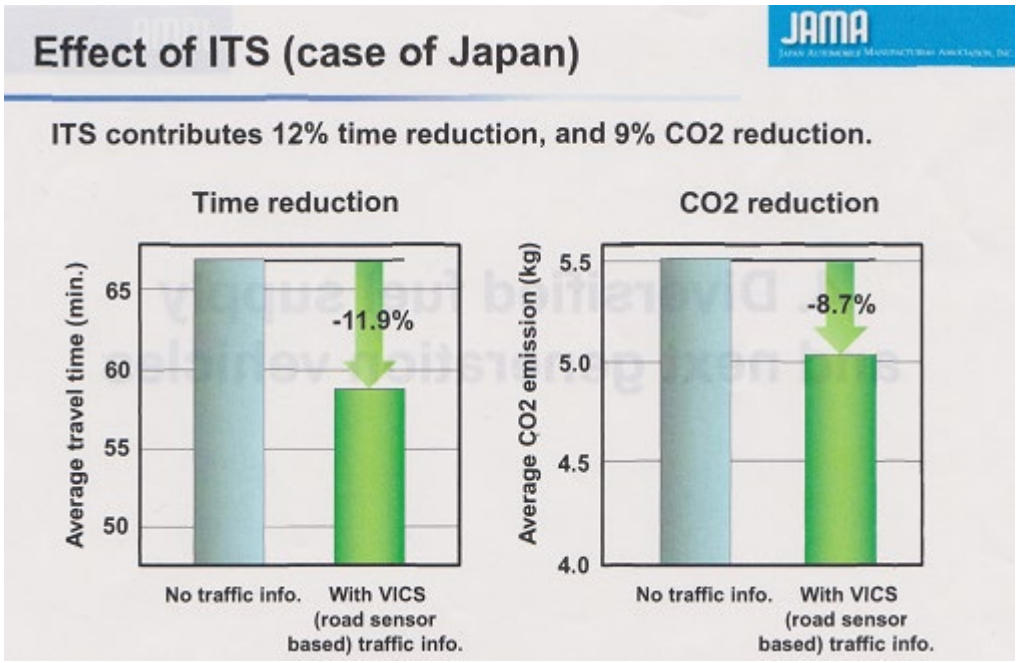
On *fuel efficiency* the key focus is on improvement of the fuel economy. In 2020 a level of 20,3 km/ltr should be reached, and hoped/expected figures for 2030,2040 and 2050 are 30, 40 and 50 km/ltr respectively. Also in Japan there is a difference between test fuel economy and real fuel economy in road driving (Mishina and Muromachi, 2017).
The other focus is on the development of next generation vehicles. This is a core theme in an important research and innovation program, the so called S-IP program (Daisho, 2015). It is interesting to note that work on *automated driving* is immediately related to societal goals, such as safety, transport for the elderly in rural areas, and automation in public transport (Strategic Conference, 2017, 27)



Eco-driving is considered important in Japan. It seems more focused on truck use than on passenger car use, and is about driver education. It leads to an increase in fuel efficiency and to a reduction in the number of accidents. Japan has an eco-driving promotion consortium consisting of three ministries and the National Police. And the EcoMo Foundation, an active organization from promoting activities on environment and transport, working nationwide on mobility management, mobility education, and certification of green management in the transport sector holds the secretariat (Foundation, 2017).

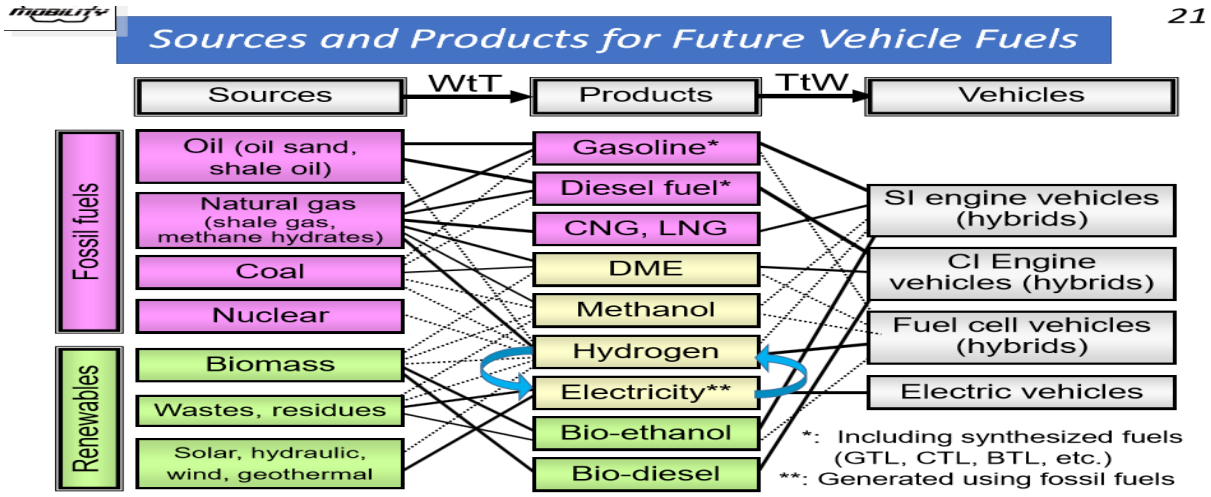
Improved traffic flow is related to the unfolding of *ITS* Intelligent Transport Systems. The idea is that stimulating a good flow in car traffic is helpful in two aspects, less congestion, and better CO2 performance. Traffic should just be organized properly, in cities (smart city, ecotowns) and on highways. The establishment of Electronic Toll Collection on highways is important in this respect. At Tokyo University prof. Oguchi is the director of a lab, named after him, that is working on ITS, with an orientation on basic theories and empirical studies on traffic flows, the development of traffic simulation models and its application to policy evaluations, and studies on traffic policies (Ogushi, 2017). The government part of this work is found in the NILIM, the National Institute for Land and Infrastructure Management, in the ITS Division (Yoshida,2018). Here a program on ETC 2.0 runs, on upgrading existing services, with a focus on smart tolls, big data, probe data from cars. In practice the work is on Vehicle to Infrastructure communication, on congestion avoidance, on safe driving support. In recent days a program on Collective ITS started concentrating on information for road management, and look ahead information.

Japan tries to quantify the impact of ITS, but acknowledges that figures are still rather soft.



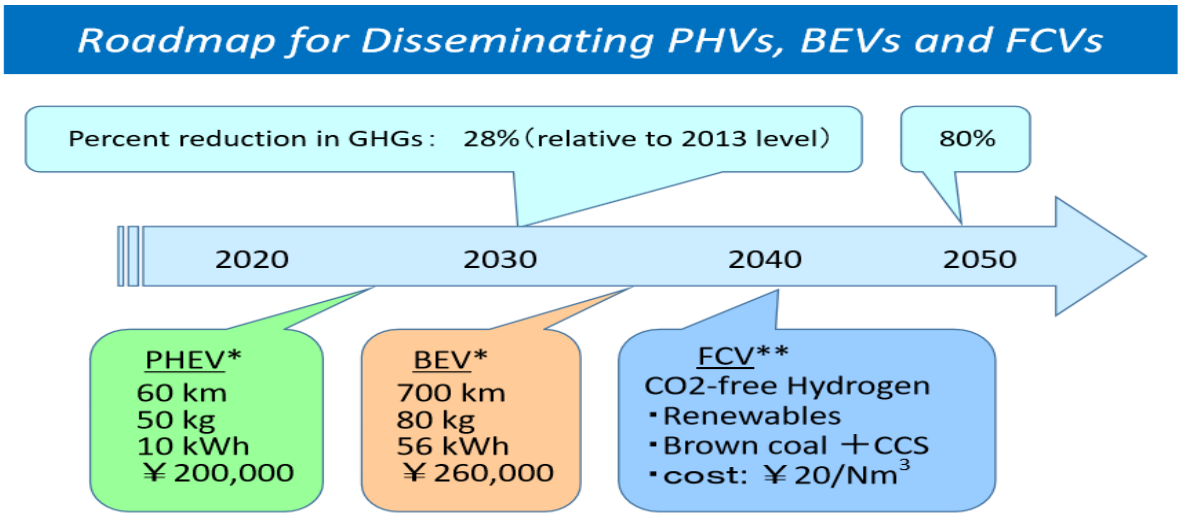
Japan wants to have “the world safest and smoothest road traffic society” and prepared for this objective a road map on Public- Private ITS (Strategic Conference, 2017). Researchers presented jointly a proposal on cooperative Its for safe and sustainable transportation in Japan at the ITS World Conference in Japan (Sakai et.al, 2017). Six development areas; mobility support, operation of vehicles, physical distribution of goods, road use, support for administrations, and use in information and data.

The last element in the integrated approach is the *diversified fuel supply*. Japan has an elaborate policy here, not focusing on one vehicles type or one fuel type in particular. The basic picture used looks a follows (Daisho,2018) *;

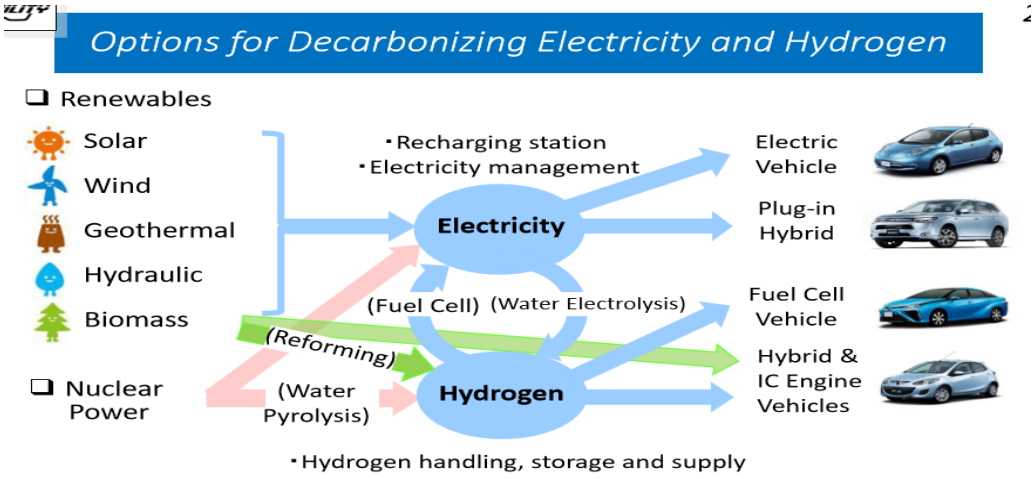


A CI engine is **compression ignition** engine while SI engine is a **Spark ignition** engine.

In the first period until 2050 the focus will be on plug-in hybrids with a great fuel efficiency, as there are too little alternatives yet for decarbonizing electricity and hydrogen.



As noted, renewables and nuclear energy 2.0 should increase rather fast in the Japanese energy mix , which would lead to a new situation around 2030-2035.



And although the national government and the car manufacturers share the direction for the policy , targets still differ, with car manufacturers showing significantly greater reluctance.

< Targets Achieved by Automakers' Efforts >

Vehicle Type		2020	2030
Conventional Vehicles		>80%	60 - 70%
Next Generation Vehicles		<20%	30 - 40%
	Hybrid Vehicles	10 - 15%	20 - 30%
	EVs and Plug-in HVs	5 - 10%	10 - 20%
	Fuel Cell Vehicles	<1%	1%
	Clean Diesel Vehicles	<1%	<5%

< Government Targets >

Vehicle Type		2020	2030
Conventional Vehicles		50 - 80%	30 - 50%
Next Generation Vehicles		20 - 50%	50 - 70%
	Hybrid Vehicles	20 - 30%	30 - 40%
	EVs and Plug-in HVs	15 - 20%	20 - 30%
	Fuel Cell Vehicles	<1%	<3%
	Clean Diesel Vehicles	<5%	5 - 10%

This means that still a policy gap needs to be overcome, with speeding up the energy transition and creating subsidies on purchase of next generation vehicles. This will be the debate in the next years. Japanese automakers are required to make continued efforts to achieve the increasingly stringent fuel economy targets, resulting in suffering from inevitably increased costs. The government has been and will be providing customers with tax incentives to enhance the share of next generation vehicles sales by reducing substantial vehicle prices.
This tax policy concept has been verified to be very effective along with a " top runner energy conservation law" to disseminate lower emissions and higher efficiency passenger cars (pers. message, Daisho, 2018).

Institutional it is interesting to note that the debate on these issues in Japan seems to be less hype-dominated. After presenting a joint direction the stakeholders and especially the national government and the car manufacturers start considering all technical and financial options. The consultants- and media based approaches leading to discussions when 100% electric driving could be the case is not the Japanese frame! The Japanese Automotive cluster can be seen as a strong network (Garuda Putra et.al, 2016)

At this moment in Japan there are 5,8 mln hybrids and 170.000 full electric vehicles. Jointly this is 8% of the Japanese car fleet. There is a subsidy on purchasing an electric car, with some tax exemptions and a small purchase subsidy. When an electric car is more expensive than a gasoline car, the price will be decreased (JAMA, 2017).
Fujisaki (2014) concluded that higher fossil fuel pricing in Japan will lead to higher ownership of lighter cars, to lower car ownership, to lower fuel consumption and to higher use of public transport.

Research on next generation vehicles, ITS, innovative combustion technologies, but also on smart mobility solutions for transport in mountainous areas or infrastructure maintenance is concentrated in the so called Cross-ministerial Strategic Innovation Promotion Program (SIP). A new SIP will start late in 2018, but the themes will remain more or less (Oguchi, 2017).

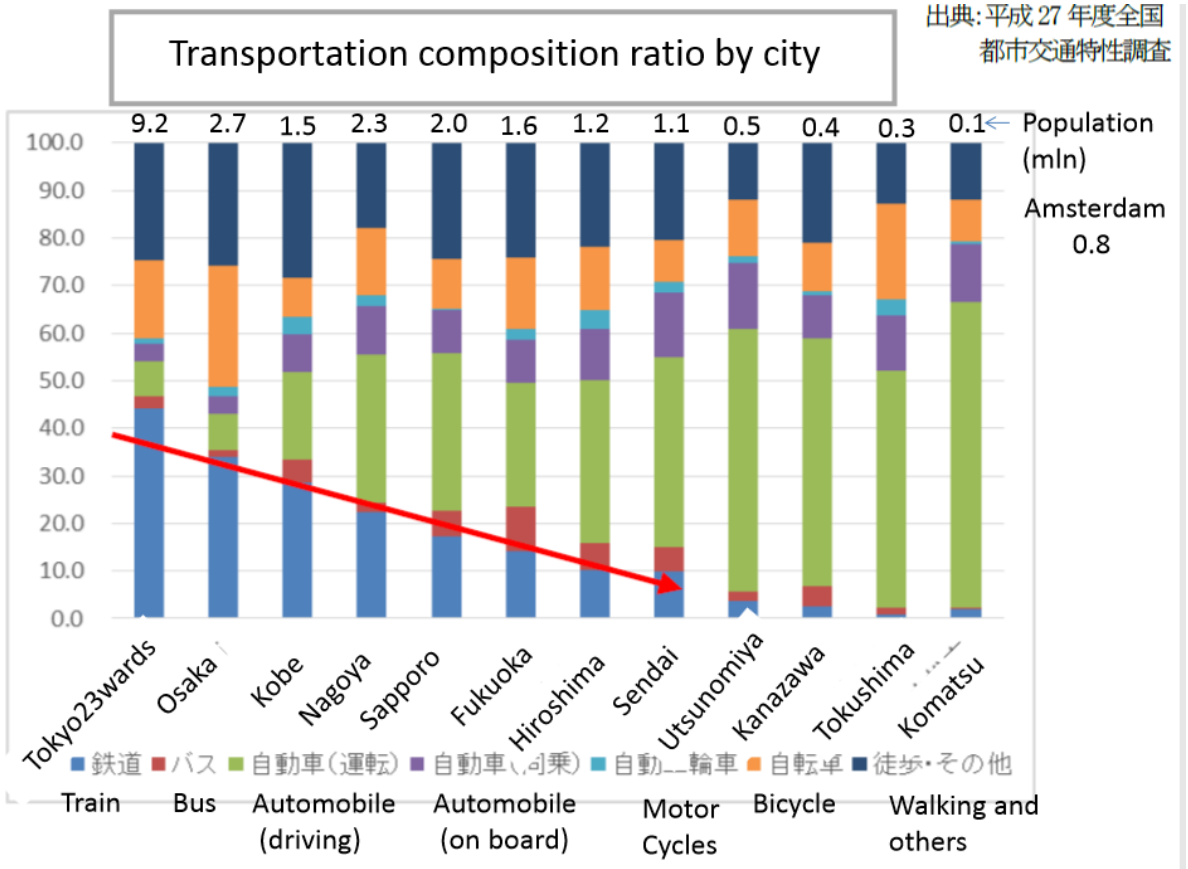
Societal Issues	Themes
Energy	Innovative combustion technology
	Next-generation power electronics
	Innovative structural materials
	Energy carrier
	Next-generation ocean resources development technologies
Next-Generation Infrastructures	***Automated Driving System***
	Technologies for maintenance/upgrading/ management of infrastructures
	Reinforcement of resilient function for preventing and mitigating disasters
	Cyber-Security for Critical Infrastructure
Local Resources	Technologies for creating next-generation agriculture, forestry and fisheries
	Innovative design/manufacturing technologies

CHAPTER 3 JAPAN A ; MAJOR URBAN AREAS, PUBLIC TRANSPORT, TRANSIT ORIENTED DEVELOPMENT AND CAR DISCOURAGEMENT

Japan A consists of three major urban areas, Tokyo area, Nagoya area, and the Osaka- Kyoto-Kobe area, and the spaces between these areas. Together Japan A is home for near to 70 mln. Japanese (some 55 % of the population). area, Japan A will in the coming decades, thanks to the Tokyo area, increase its share in the Japanese population. It is expected that in 2040 two thirds of the Japanese population will live in Japan A.

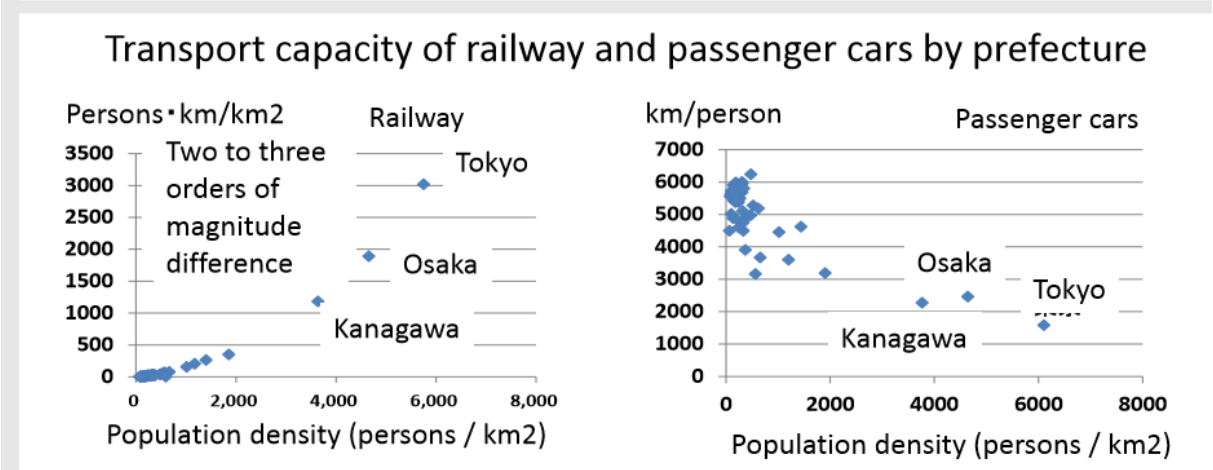
Modal split in Japan A; role of railways

Mobility in Japan A is pretty much related to public transport. However, PT in the modal split of trips differs, as can be seen here (Iwai, 2018);



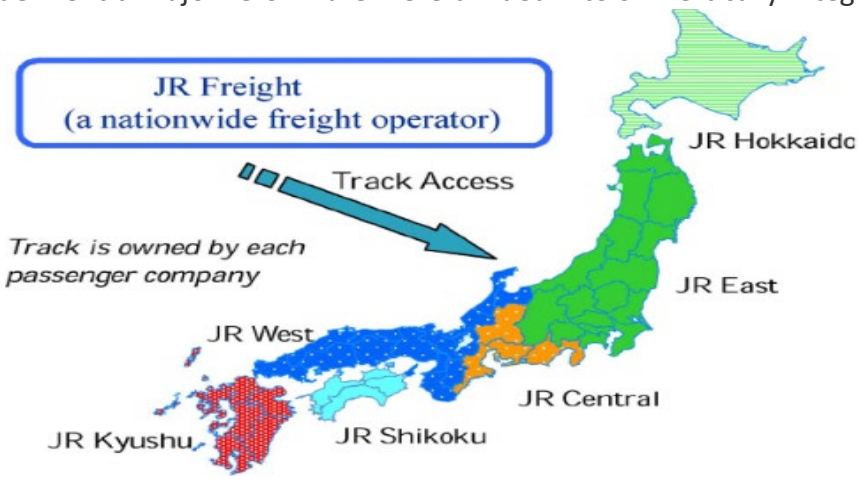
Almost 50 % of trips in Tokyo and 40 % of trips in the broad Osaka urban area are made by PT, and in kilometers travelled this share is even higher, in Tokyo near to 65 %. Car trips account for only 10 % in the Tokyo area, and 15 % for the Osaka area. Nagoya is the exception here with some 25-30 % of car trips. Nagoya is a newer city, with strong ties to the Toyota car company.

An explanation for these high rates on PT can be found in the density (Iwai, 2018). Density of population leads to higher shares of PT in the modal split, all over the world. But in Japan this



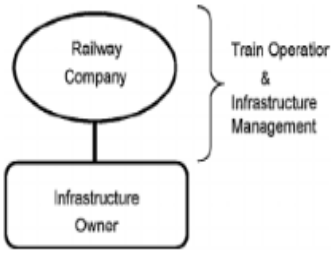
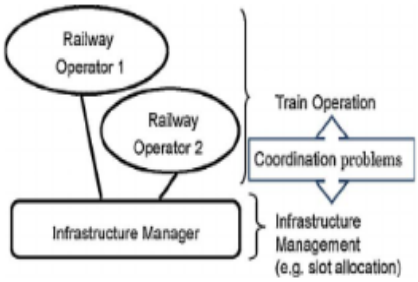
Railways ; vertical integration and promoting convenience of travel

The role of the railway companies needs further elaboration. Until 1987 the important railway companies in Japan were part of the government. In that year the Japanese National Railways underwent a major reform are were divided into six vertically integrated companies. In this privatization these railway companies have been successful, as their share in transport volume and their efficiency has increased (Kurosaki and Alexandersson, 2014, Kurosaki, 2017). The three Honshu companies, JR East, JR Central and JR West have lifted their shares, and the three smaller JR's on the islands of Hokkaido, Shikoku and Kyushu have managed their operations more efficiently (Kurosaki, 2009). Japan also has non-JR private railways (see later).



In Japan the passenger railway companies all operate and manage both infrastructure and

Comparison of vertically separated railways in Japan and Europe.

Vertical Separation in Japan	Vertical Separation in Europe
	
< Characteristics > A railway company implements all factors of the railway operation including infrastructure management. Thus, they do not have many coordination problems through vertical separation.	< Characteristics > Railway operation is separated into different independent organizations. Railway operators perform train operations, and an infrastructure manager performs infrastructure management, such as track maintenance and signaling. Thus, the sector faces coordination problems through vertical separation.

Source: Revision of Kurosaki and Okuda (2013).

1) JR Lines

2) Metros

3) Private Railways*
*: JV (private & public) is included

Metropolitan Areas e.g. Tokyo, Osaka

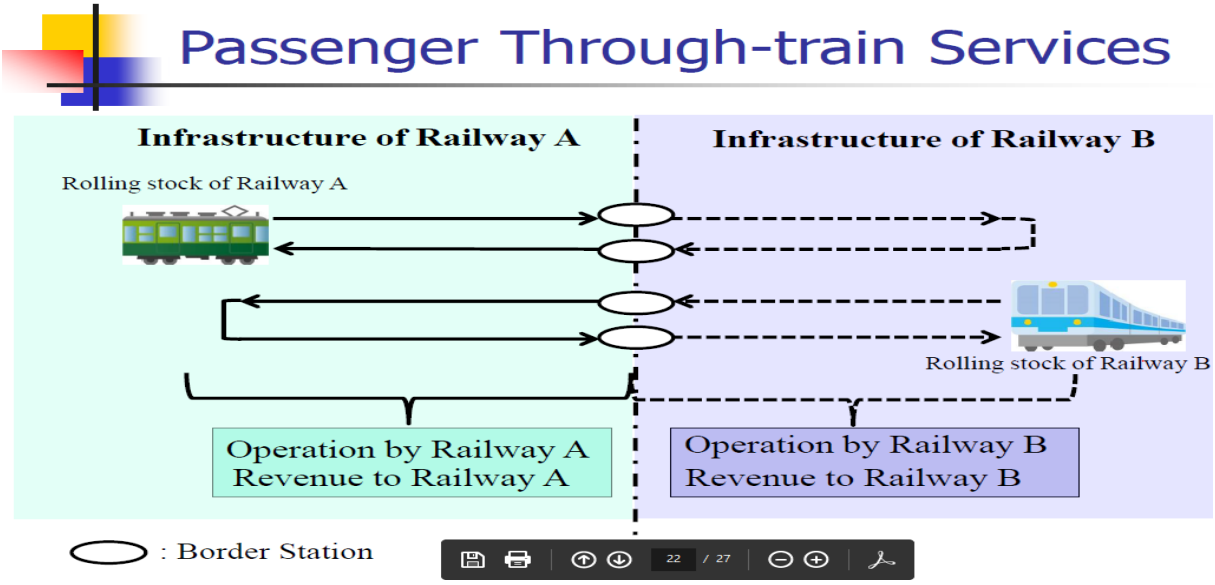
Short-distance	Medium-distance	Long-distance

Combined Utilization

+

Convenient bus services from/to stations

And as a traveler you are not confronted with any boundary problems thanks to the combined utilization. It feels as a seamless urban rail network.



In 2005 a law was issued related to this construction, the Law for Promoting the Convenience of Urban Railways, which aims to enhance the network functions of railways using trough-services, as well as to develop and integrate stations with their surroundings. Based on this law, approved urban railway facilities such as the shortcuts between two lines can be constructed using public funds, even if a private railway takes over operations (Kurosaki, 2009). This law relates to a specific weakness, the so called missing link problem. Different railway or metro lines are near to each other, but the companies see no business need to make the shortcut that can be very useful from travelers point of view (Kato, 2016). An extra challenge will be to create PT-systems also fully fit for the growing number of elderly and disabled persons in Japan's urban areas.

Major urban areas are in Japan connected by the High Speed Rail Network. The share of rail transport in interurban transport is high. Building the infrastructure for the high speed lines is a responsibility of the national government, and is one of the cases where infra and operations are not in the same hand. The public institution owns the infrastructure and JR companies pay a lease, based on the expected benefits to the company (Kurosaki, 2009). As Japan A is so densely populated, and rail transport has a high share of the interurban passengers, services are very frequent. This creates a strong urban network, even over fast distances (Tokyo- Osaka is 560 kilometer and 2.20 minutes by Shinkansen). New Shinkansen lines lead to shortening of travel times, to great increase in the number of railway users and to positive effects in connected regions (Kojima, Matsunaga and Yamaguchi, 2017)

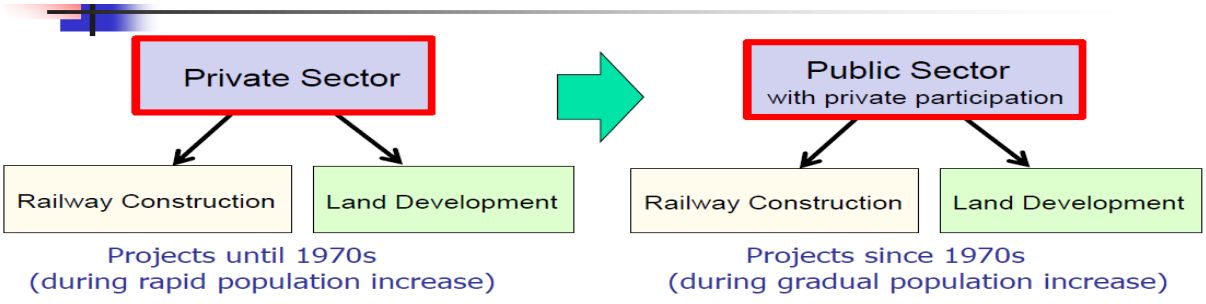
Railway companies as actors in real estate and urban (re) development

Railway companies are allowed to work in other domains, such as real estate and urban (re) development. Railway companies can be considered to be major players and stakeholders in organizing the Japanese urban fabric. As Calimente (2012) states, by the time the automobile did start its rise in Japan in the mid- 1960s, Tokyo's dense rail network and its station area communities were already well established. And to quote *"high quality, frequent rail service to dense, mixed-use, safe, pedestrian-friendly developments has allowed Tokyo to achieve*

enviable rates of public transit usage and given Tokyoites the freedom to view automobile ownership and use (HJ) as a lifestyle choice rather than as a necessity" (Calimente, 2012,19).

This possibility for railway companies to be also active in other related domains resulted more or less from a Nationalization Act of 1906 nationalizing 17 of the than existing 37 private railways. Forced to diversify a strategy was made, pioneered by Ichizo Kobayashi, president of Osaka Electric Railway, to develop and sell land along the train lines, constructing and operating department stores at stations and building tourist attractions along rail routes. This strategy can be seen as the start of transit- oriented development (TOD). Calimente (2012) takes this even broader and speaks about "rail integrated communities", as an alternative to car dependent communities, which now exist all over the world. Indicators for these "rail integrated communities" are ; density, minor car parking space, quality of streetscape design, property value within and beyond 500 meter of stations, pedestrian safety, quality of services and number of mode connections. The expansion of densely inhabited districts in Tokyo and the crucial role of rail transport is clarified in Mberego and Yi (2017).

In recent decades the relation between public and private in urban development did change, related to the new Integrated Development Law (Kurosaki, 2018).



This Law was created to realize better integration between railway (and railway oriented) construction and land readjustment. The railway companies now work jointly with the public sector. How this functions could be seen in the construction of the Tsukuba express, from Tokyo central to a new town (Kurosaki and Ogura, 2013).

Rail integrated communities do not need to look as fully high rise built -up cities. I was struck by seeing the urban patterns of Tokyo. It is certainly not everywhere high- rise. To present a few pictures :


Broader avenue


Street leading to this avenue


In central Tokyo

Abe and Kato (2017) present in *What led to the establishment of a rail oriented city? Determinants of urban rail supply in Tokyo, Japan, 1950-2010* an interesting insight in the societal dynamics related to transit oriented development. They concluded that a lag structure exists. The demand for rail services is each time greater than the supply, but suppliers in Tokyo seem to have been able to provide new services at a rather short time lag. However, a differentiation between areas in Tokyo should be noted (Kato, 2014) as in central areas this urban rail even gets stronger, whereas on the edges of the metropolitan area a decrease of population leads to a decline in rail demand, and a greater orientation towards automobile-oriented lifestyles. We are almost entering Japan B here!

Public transport; full prices, no subsidies

In Japan, decision makers and households are familiar with the circumstance that public transport functions without subsidies. This finds its rationale in the other business model for public transport companies, as they are allowed to create revenues from the market as private or privatized companies. Sometimes the share of these other revenues is greater than the revenues from providing public transport (Kurosaki, 2013). Other element is that employers in Japan take care of the costs of public transport to and from work. On average net household costs in Japan for transport are slightly lower than average (most richer OECD countries 15 %, Japan 13 %, also Lipscy and Schipper, 2013).

Already now, but certainly in the future, with the decreasing population it will become more problematic to offer intensive public transport without any form of subsidy, at least outside some tracks and outside the major urban areas (Saito, 2015). Whether a railway company is profitable also depends rather strongly on transport density, and in most areas this density will decline in the next decades.

Table 1 Basic Data on Japan's Passenger Railway Operators (Fiscal 2011)

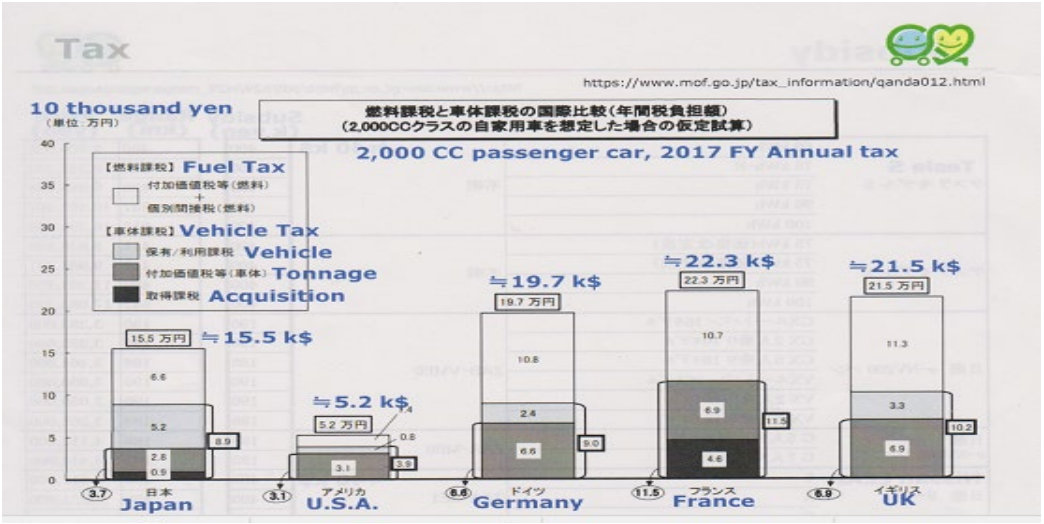
Classification	No. of Operators	Line Length	Passenger-km (million)	Revenue (¥billion)
JR Passenger	6	20,124 (72.6%)	246,942 (62.6%)	3693.7 (62.4%)
Major Private	16	2917 (10.5%)	116,609 (29.5%)	1,453.0 (24.6%)
Quasi-Private	4 + *1*	195 (0.7%)	2,202 (0.6%)	34.3 (0.6%)
Public Operated	11	615 (2.2%)	19,131 (4.9%)	485.0 (8.2%)
Smaller Private	106 + *16*	3,646 (13.2%)	7,943 (2.0%)	185.3 (3.1%)
Others*	33 (+17**)	231 (0.8%)	1,961 (0.5%)	67.5 (1.1%)
Total	176 + *17*	27,728 (100%)	394,788 (100%)	5918.8 (100%)

Number of operators in *italics* is for railway infrastructure companies.
* Operators of monorails, guideway transit, cable railways, etc.
** Supplemental business by operators not included in Others.
12 other freight railway operators including JR Freight are not included in the above table.
Source: Prepared from data in *Suji de Miru Tetsudo 2013* published by Institution For Transport Policy Studies.

Busses are not so successful as trains. Where trains get the biggest share of revenues in major cities and interurban high speed connections, busses operate at smaller scales and in intermediate regions.

Aspects of car ownership and car use in Japan A

Car ownership in Japan is above average of richer OECD countries, with 595 cars per 1000 inhabitants. Most households in Japan buy new cars. The tax system related to car purchase is rather difficult, and taxes are more or less on the same level as in the Netherlands. Since the early 1920s the Japanese government has promoted small cars to suit the income level, the road conditions and the shape of the Japanese people (Enoch and Nakamura, 2008).



Higher gasoline prices in Japan seem related to lower ownership of larger cars, to higher ownership of smaller and lighter cars, to lower car usage and higher PT ridership, and the impact is greater in Japan A than in Japan B (Fujisaki, 2014). However car use is far lower than in most richer OECD countries, with only 5200 kilometer travelled per car yearly (Netherlands

for example ; 11.800). Whereas in Japan B car kilometers travelled is more in line with OECD averages, the great difference originates in Japan A, with on average some 2000-2500 kilometer travelled by car.

Japan A has circumstances which create this situation of very low car use. The first and foremost is the very high densities of the major urban areas. Car driving means long travel times, especially in cities where there is no grid pattern. For example in Tokyo and Osaka car travel in kilometers is only 14 – 18 % of all kilometers travelled.

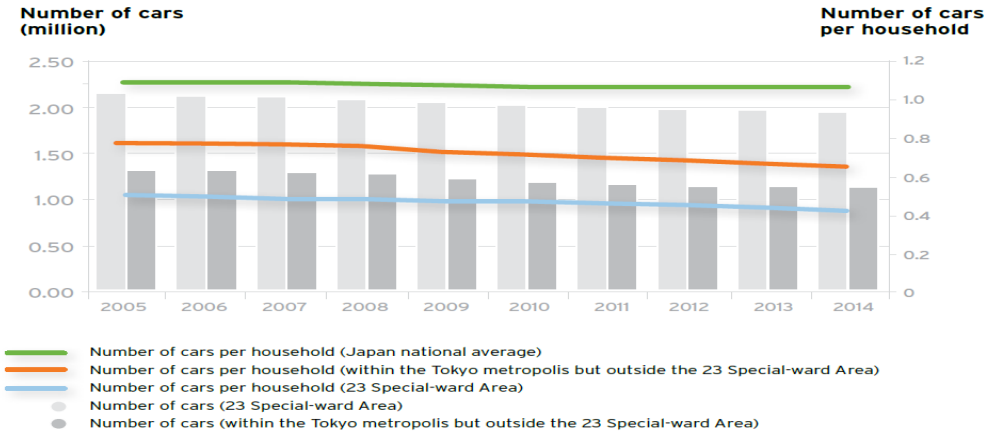


Figure 6.5. Number of Vehicles in Tokyo Metropolis and 23 Special-Ward Area (Excluding Kei Cars)
SOURCE: Kanto District Transport Bureau; AIRIA.

Travel in general is rather expensive in Japan regardless to mode share (not taking into account the role of employers), and among modes, car travel is particularly costly in comparison to other developed economies. Employers pay in Japan for travel to and from work 40 % of costs made by car travel and 100% made by public transport. When there is a good PT alternative, as is the case in Japan A, most Japanese employees thus prefer the PT alternative.

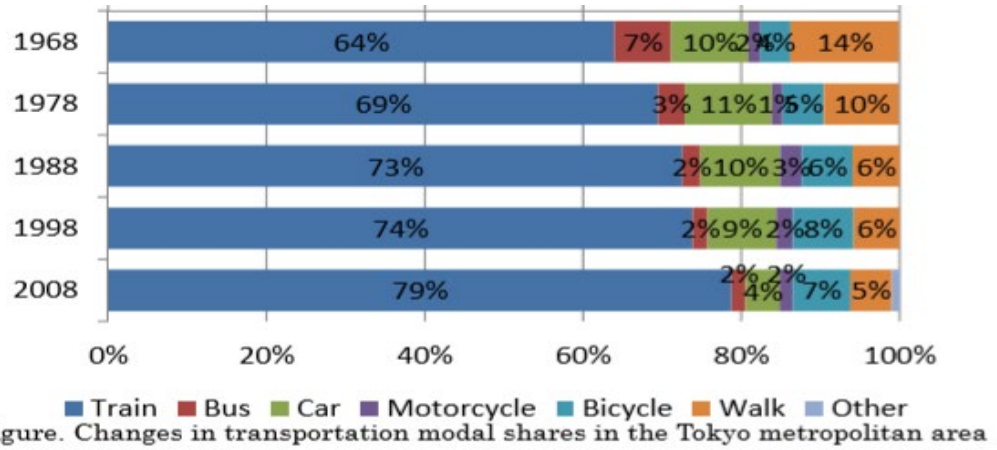


Figure. Changes in transportation modal shares in the Tokyo metropolitan area

In Japan A in recent years the share of car use is decreasing, in Japan B this share is increasing (Japan Nationwide Person Trip Survey, 2017).

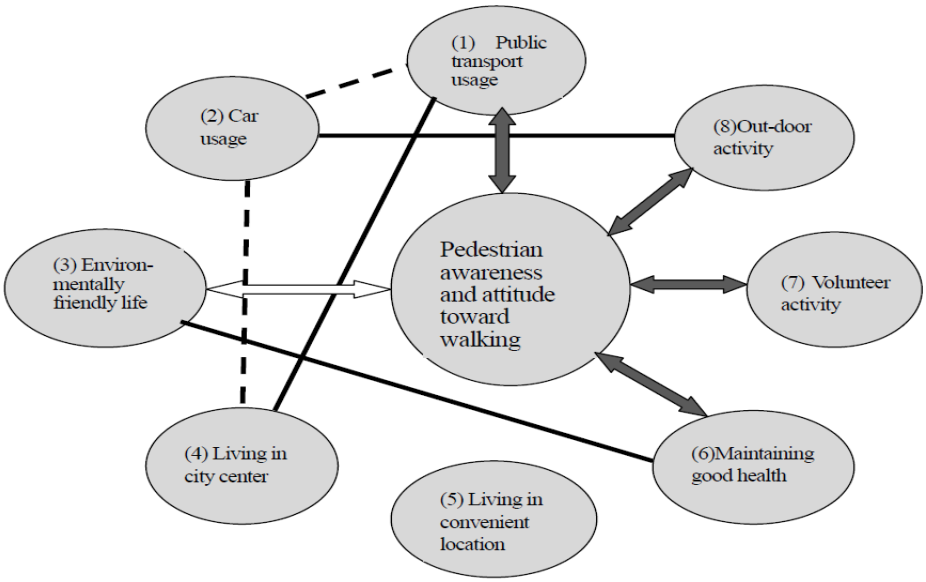
There are extra costs, as each three years cars have to undergo a test on their quality, and these tests are tight, with many extra investments needed for the cars. And there is the specific parking policy (Kato and Kobayakawa, 2018). In 1962, the national government issued

a unique act related to the storage areas for cars, the so called “Garage Act”. This Act requires that all individuals provide garage spaces for their own cars. This Act led to less cars in urban areas, but also to fraud. The Act was revised, including on- street parking, but only for limited time. And the strategy went from just enforcement to active management of car parking. In recent days there is investment in the relation of urban parking policies with land- use planning. Policies encourage car parking to be developed at the urban fringe, and not inside the major urban areas, but as a reaction private entrepreneurs develop a network of small parking lots, created by tearing down older smaller houses near city centers.

All in all, in Japan A some forms of discouragement of car use can be noted, partly related to the spatial set-up of Japan A, partly related to specific policies. Car sharing is still a minor alternative, also because longer than 10 minutes walking from PT stations discourages car sharing arrangements (Kato, Inagi and Igo, 2013). More in general, especially in the urban central areas car trips are substituted by cycling and walking trips, as explained for Osaka in Waygood, Sun and Letarte (2015).

Figure 4. Modal share by built environment type.

Walking is also related to lifestyle indicators, as Tajima et.al (2013) concluded for five urban areas in Japan and for Sydney.


(1) Public transport usage
(2) Car usage
(8)Out-door activity
(3) Environ-mentally friendly life
Pedestrian awareness and attitude toward walking
(7) Volunteer activity
(4) Living in city center
(6)Maintaining good health
(5) Living in convenient location

CHAPTER 3 JAPAN B ; RURAL AREAS, REGIONAL CITIES, CAR DEPENDENCE , DECREASING PUBLIC TRANSPORT, AND ACCESSIBILITY PROBLEMS

Japan B is car country, and is seen as problematic for the provision of public transport in the next decades. However, solutions to the lack of accessibility for non- car households are created. Japan B is not well – known outside Japan, but in Japan problems of mobility in Japan B are taken serious. Tokyo and other urban areas (Japan A) have developed railway networks and are enjoying inexpensive and convenient transportation systems. However, in less dense areas, convenient public transportation systems are not in place, and cars are necessities for daily life.
Japan B is in decline, at least in its rural areas and in its regional cities. When Japan B is still growing in population it is in the outlying suburbs of the major urban areas. It handles about the suburbs that are not or only weakly connected to the urban rail networks.

Modal split in Japan B; car dependence

I came across Japan B when visiting Tshukuba (see picture), a newly built city some 55 kilometer from Tokyo where two government institutes , the NIES (National Institute for Environmental Studies) and the NILIM (National Institute for Land and Infrastructure Management) are located, almost fully unconnected to public transport services. Almost all employees travel by car. I had expected a smart city but arrived in a fully American oriented suburb. This is also Japan.

And I came across Japan B in many talks with the Japanese professionals. In most parts of Japan B vast number of young people migrate from rural areas and smaller cities to the three major urban areas as they see better perspectives there (Xiong, Zhang, Kayama, 2016). Overall satisfaction among young adults with their life in Tokyo, Nagoya or Osaka is higher. Younger adults are happier there than in other areas (Xiong and Zhang, 2016). There seems a need to invest more in mobility in medium sized cities (in Japan between 100.000 and 600.000 inhabitants). Take as an example the city of Mito.

Mito is a city in North Honshu, has 260.000 inhabitants and is after stagnation since 1995 now losing population. For its public transport the bus line network in Mito city is not well organized and most lines are not doing well economically. The city is very car dependent, which causes the decline of the city center. And young

people want to move to the major areas where it all happens. In fact, there are many Mito's in Japan.

Yubari, Hokkaido. Following the closure of it's coal mine and a city bankruptcy last decade, the town which once boasted a population of around 70,000 had (as of 2010) only around 10,000.

Here is an extreme example: Yubari on Hokkaido. Following the closure of its coal mine and a city bankruptcy last decade, the town which once boasted a population of around 70,000 has now only around 10,000 inhabitants.

Japan B is highway oriented country. Historically, Japanese roads were not well developed. Until 1862 only the emperor was allowed to use a wheeled vehicle, and bridge building was also restricted. After 1862 railways came to dominate travel. In the 1950s Japan still had a weak road structure with less than 6% of the national highways paved. Late 1950s highway planning started, at first borrowing heavily from American highway planning ideas and techniques (David, 2014). In 1956 the JHPC, The Japanese Highway Public Corporation Act was established. The network was constructed with loans from the World Bank, and from frameworks made by the Ministry of Transport. For each highway there was a specific toll system. Since 1972 a system of toll was created areawide, with uniform toll rates. The highway network was constructed using borrowed money and debts were to be repaid with the pooled tolls of the highway users. The costs of each route were to be recovered by tolls paid, by cross-subsidization for other routes and from public funds. Japan is moving towards privatization and has an ambitious debt repayment program. It is questionable whether the Japanese highway system can ever lose its tolls, that increase the price of driving.

In Japan B the modal split is dominated by car use, see the results of the 2015 Nationwide Person Trip Survey for the Regional Urban Areas, and note that PT is very weak here (left; weekdays, rivht ; weekend).

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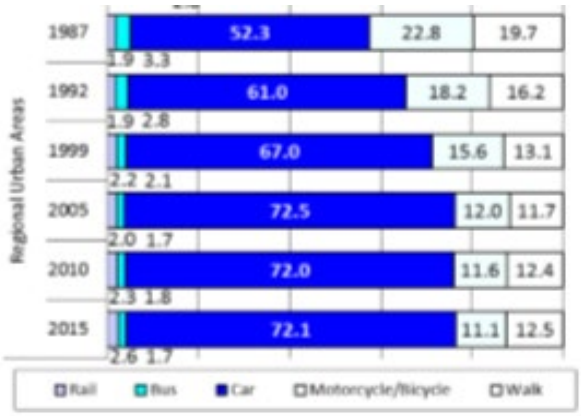
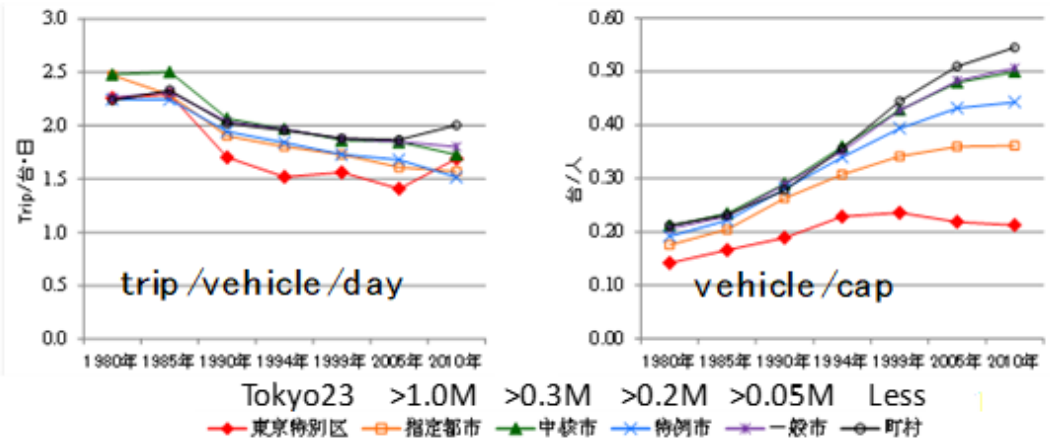
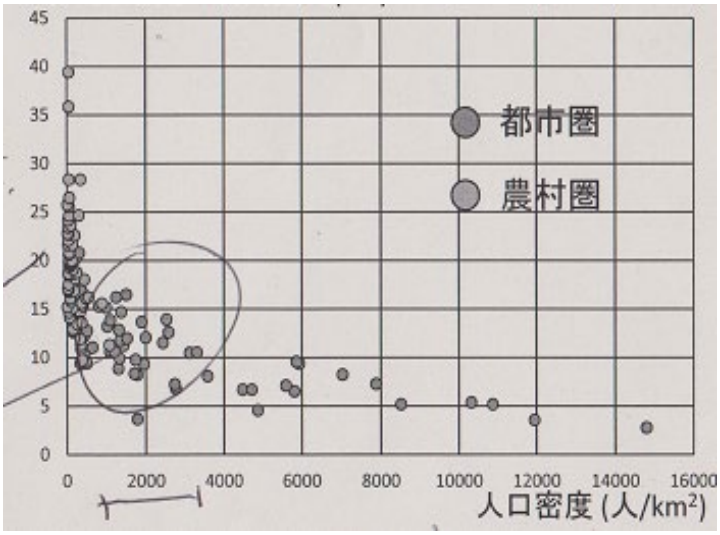


Ownership of cars is higher, as is the amount of kilometers travelled by car (figures below, right, offered by Matsuhashi, during our meeting).





However the average number of kilometers travelled by car in Japan B seems lower than 10.000 kilometer. An explanation could be that commuting distances are smaller in Japan than in most OECD countries, a function of density. This figure (Kato, presented during our meeting) presents at the X- axis the population density of area and at the Y – axis the average commute distance. Note that even with low density the average commute distance is around 20 kilometer.

A rather strong decrease in population is expected in Japan B. As Yagi and Managi (2016) write this will, without policy measures, lead to an acceleration in car ownership, as remaining households will in future live in less densely populated areas, and the universal law *"lower population density means more car ownership"* will do its work. Especially elderly will remain driving, as driver cessation is only accepted when there is a driving alternative, for example with volunteers. But this will not be so easy in aging local societies (Ichikawa, Nakahara and Takahashi, 2016).

Shrinking public transport and accessibility in Japan B

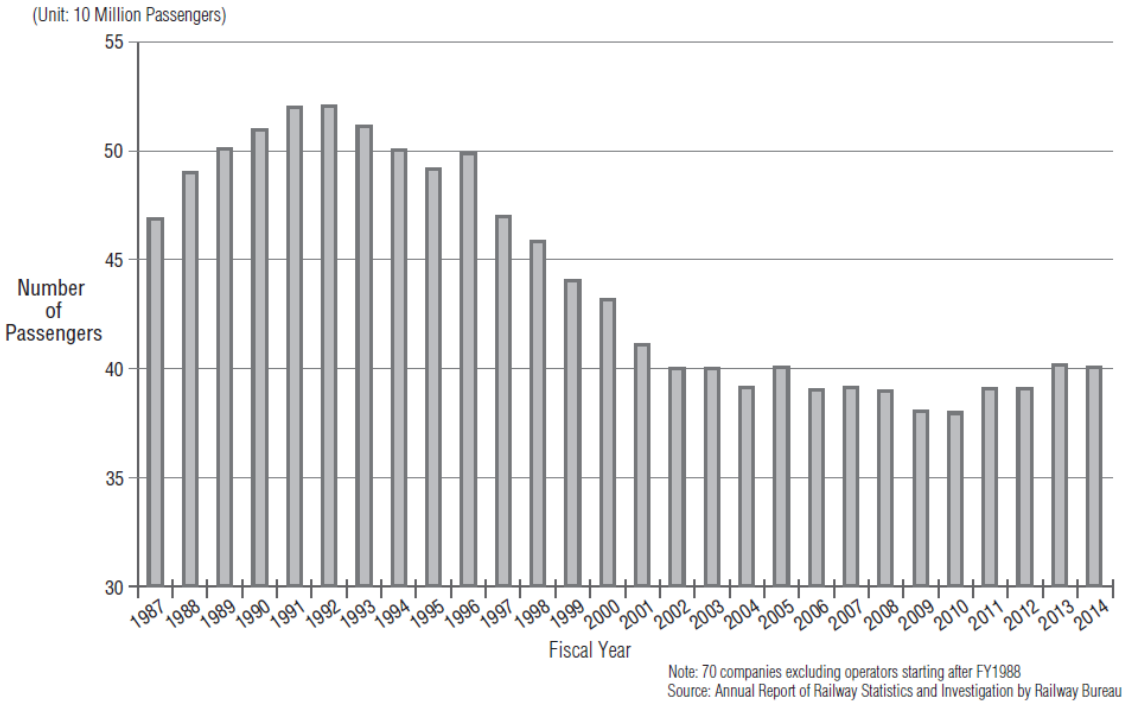
Until relatively recently the PT arrangement in Japan did function; PT companies could get profit also from other activities than transport provision, PT had no government funding, and when there were losses on certain track cross -subsidization did do the job. With an increasing population this functioned. However with stagnating and even decreasing populations transport companies in less densely populated areas are running into problems. Two

examples; without help JR Hokkaido needs to block half of its service, and a railway line from Kobe to its outer suburbs will have to stop services.

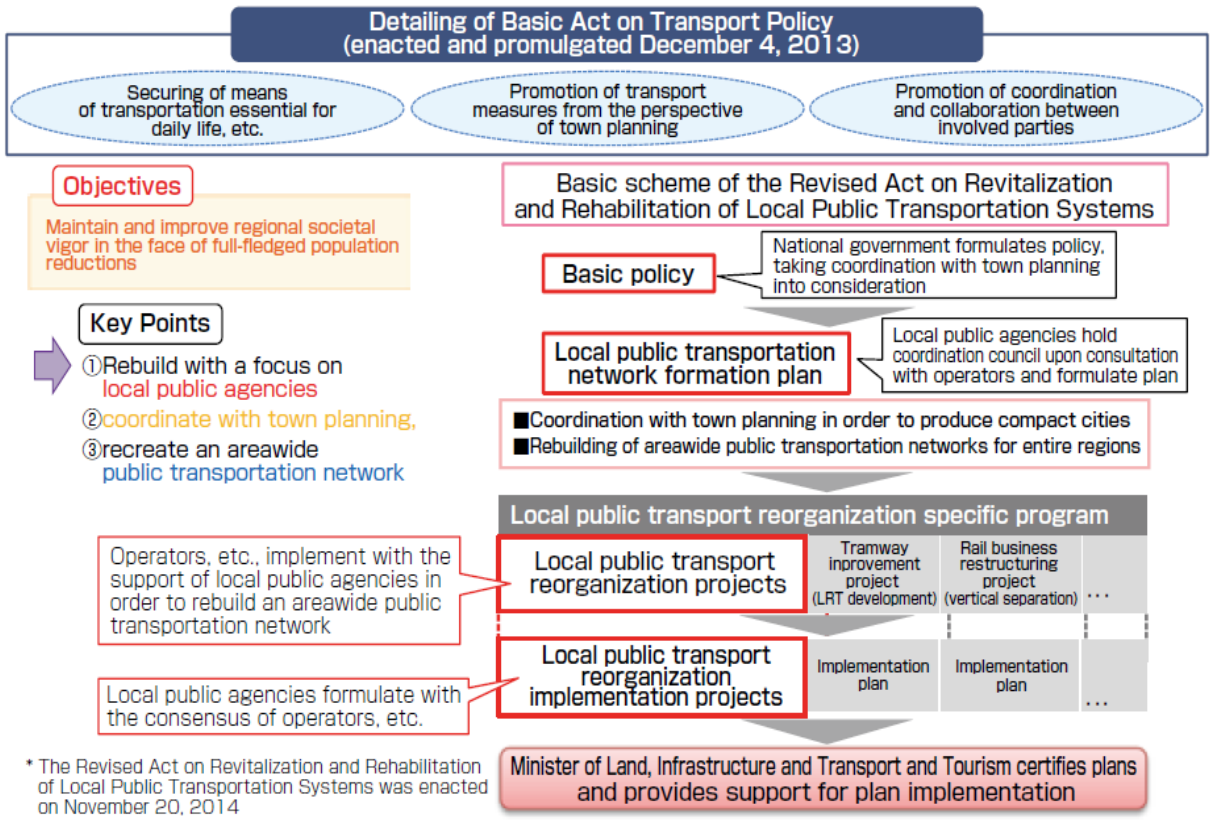
As Kurosaki (2017) notes, in many sparsely- populated areas there are growing concerns about the operational losses being incurred by local railways. Japan has not established a firm legislative system to sustain unprofitable railways in provincial areas. Cross subsidization can help, to a certain extent, but weakens the profitable segment of railway companies.

There has been already a decline in services (Utsunomiya, 2016), for busses between 2006 and 2011 2,7 % of total bus services, and railways lost since 2000 650 kilometer track, also 2,7 % .

Figure 1 Change in Local Railway Passenger Volumes



Local public transport in Japan is run by private companies of which many now have serious problems. But providing public subsidies to commercial companies has many difficulties in Japan due to legal restrictions (Saito, 2015). In 2007 the Act on Revitalization and Rehabilitation of Local Public Transportation Systems was signed. Under this Act regional councils did receive the responsibility for establishing policies for PT by municipalities whereas the national government provides support for projects decided by these regional councils. On paper this all looks arranged, but in practice most governments and politicians are reluctant to spend tax payers money on PT, as this has never been the case.



Source: MLIT (Tentative Translated by Eco-Mo Foundation)

Saito (2015) warns; " *under transport policies that rely too heavily on the principle of transport business making a profit, it becomes difficult to foster sustainable transport systems that contribute to overcoming global environmental issues, deal with the greying society, and supply transport services that will satisfy the populace*".
This especially holds true for many rural areas. Population will become more dispersed, and, by lack of appropriate PT services, more car dependent. From a sustainability perspective this should not be the road ahead. Part of the problems arise because in cost- benefit analyses on local railways the social and environmental benefits of rail compared with other modes not or only minor taken into account (Utsunomiya, 2018).

There is some research on accessibility problems faced by rural elderly citizens of Japan. Nursing care services are less necessary and less used when hospitals and shops are more easily accessible. And clinics are more used with increasing accessibility (Sasaki, Aihara and Yamasaki, 2017).

But underserviced areas are not synonymous with remote areas, as Matsumoto et.al (2013) found ; there are also non- remote communities facing accessibility problems to health care.

And in Seto City (130.000 inhabitants, see picture) the highest densely populated neighborhoods had rather low accessibility to all urban facilities (Suzuki and Suzuki, 2015). It seems that this research area needs further elaboration.

Revitalizing Rural Japan ; societal solutions

Mobility and accessibility of services are only two of the problems the households in Japan B, and then especially on the more rural side of the spectrum, are facing. With the decrease trends in population many communities face severe aging and decline. The solutions for planning for decline are not so easy. From a European perspective it is clear that governments should start to support and subsidize local public transport for citizens not wanting or unable to use cars. However, it is also clear that this will be a quite expensive solutions as long as population decrease and dispersal of population will speed up.

From the literature I note a three layer structure in solutions ; concentration, regeneration and subsidizing public transport. At first more concentration of the remaining population would be wise. I noted a plea for concentration to local centers. It seems necessary to invest intensively in local center cities, to provide high-quality employment and education for young people, and to promote the settlement of young people by bringing together commercial and cultural facilities in local center cities. The key phrase here is bringing together (Kato, 2014). This is also useful from a transport perspectives, as Nakanishi, Matsuo and Black (2013) did show in a study about relocation related to communities struck by the East Japan Earthquake and Tsunami of 2011.

Related to concentration is rural regeneration. Degradation of living conditions went from hilly and mountainous areas to hamlets, to villages, to smaller regional cities, and is now entering the suburbs, and especially the resident of housing complexes. In these so called “old- new towns” the speed of aging seems to surpass that in mountainous areas (Odagiri, 2011, 40). Rural regeneration could stop the cultural processes of decline by revitalizing the social capital of the remaining locations. Participation is important, creating new businesses for example in tourism is, and more general this is about bringing pride back to communities.

Dilley, Shinzato and Ando (2017) describe the process of creating affectual attachments to place via a fictionalized example of a village called Matsutani (this picture is from the existing Matsutani Valley). This is about participation, self – initiated volunteer activities and creating a network of intermediaries. From a mobility perspective this is about creating systems of drive sharing and voluntary support in overcoming distances to services and shops.

Revitalizing Rural Japan ; smart mobility solutions

The framing of smart mobility does not exist in Japan. There is ITS. There is research on automated vehicles. And there are initiatives with a more societal goals, whereby cars and people movers with new IT technology are introduced. All in all it seems to me that in Japan development of new technology is more directly related to reaching societal goals and seems far less seen as just technics development for its own sake with the hope that it eventually new technical elements can be sold to individual customers and companies. And what I even like more is the non- existence of a hype culture. Japan seems to miss three hype- creating groups ; technology professors with media exposure but with a lack of interest in society, journalists hoping for new nice narratives, and consultants telling too optimistic stories. Especially the absence of consultants, rather ubiquitous in richer OECD countries, did positively strike me.

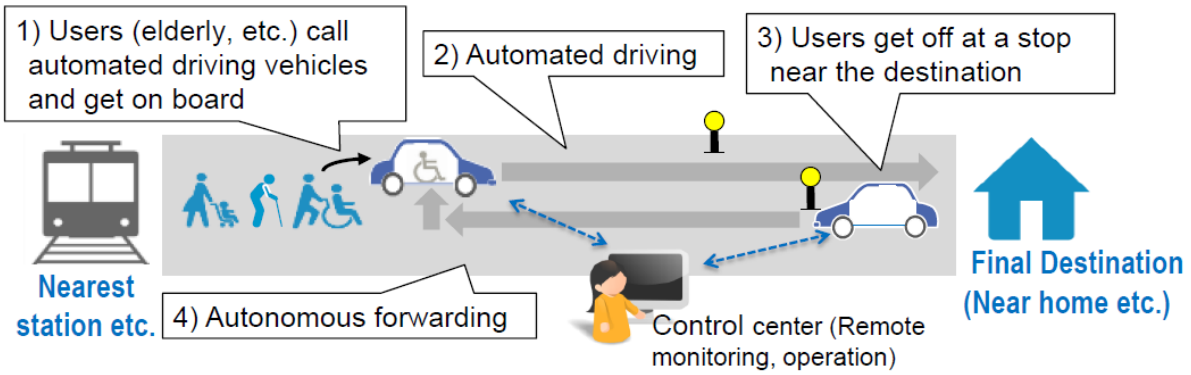
Japan has a tradition of road side stations (Koike, 2017). There is the Michi-no-eki, the planned road side station. Michi- no- eki' s have three functions, resting area, information for travellers, and shopping and dining function. There are now 1000 Michi-no- eki's in Japan. And there is the Machi-no- eki ; the human station. Machi- no – eki' s are not situated near roads, and attract also walkers, cyclists and public transport users. Also Machi-no- eki' s are planned.

Michi-no- eki

Machi-no-eki

Both types of station connect a specific area with the Japan broad transport networks. And both types are start and ending points for new forms of public transport. Hashimoto and Kato

(2016) presented an exemplary demonstration project for the last miles mobility system with automated and connected vehicles in a dedicated zone. This is the main approach (Yoshida,2018) ;

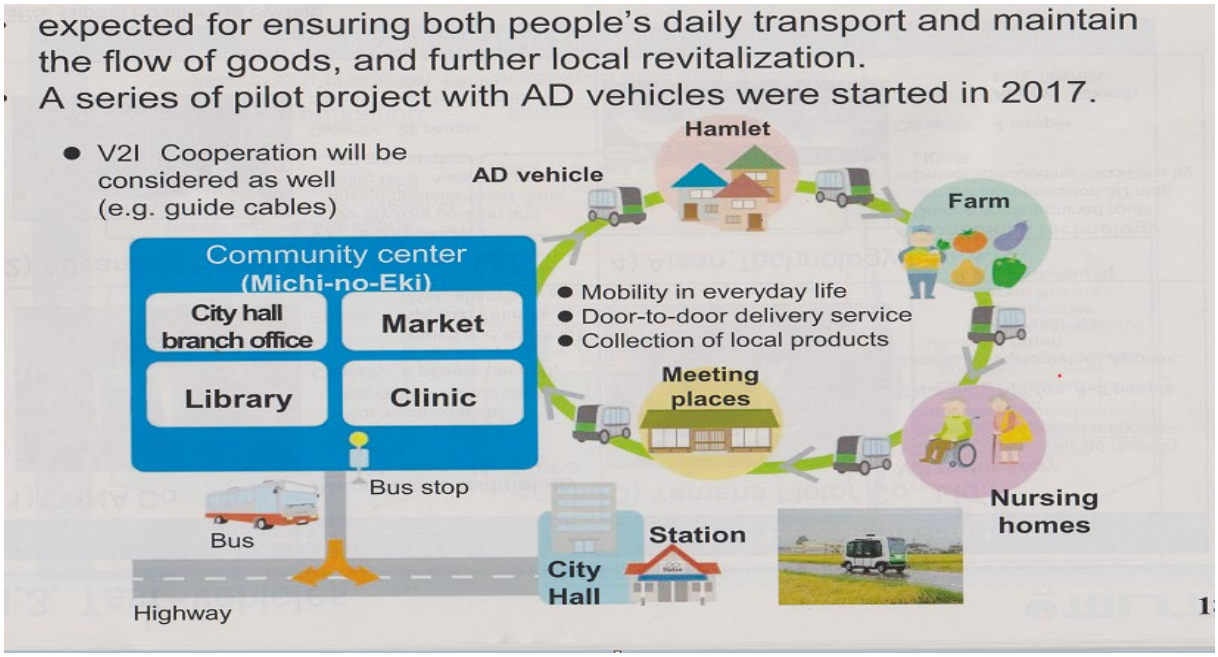


Service image

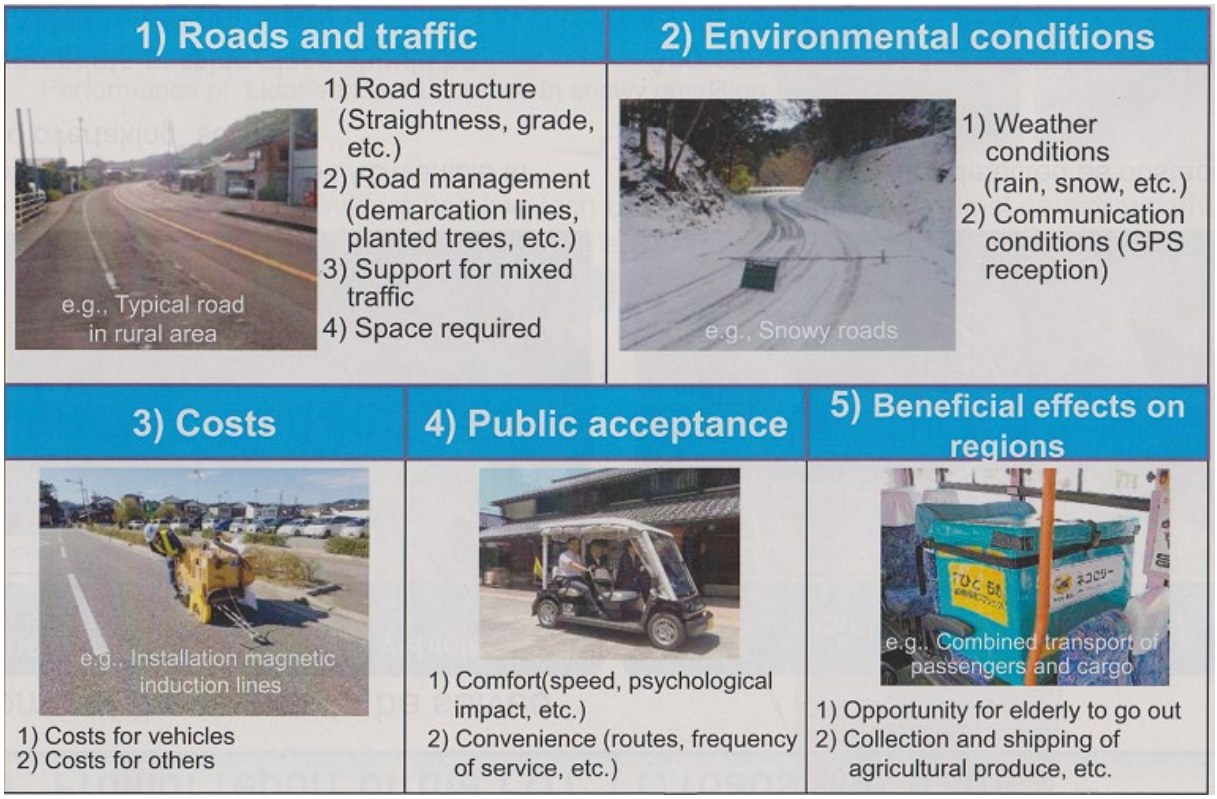
"Smart E Cart"

"Smart bus"

Automated people movers without drivers travel with low speed (15-20 km) in sparsely populated rural areas. People will be brought to machi or michi- no – eki' s where services are. For a broader range of services people can pick up busses at the no- eki' s (Yoshida, 2018).



On 13 locations now field operational tests are held. And technical verification and business model verification are designated. These are the evaluation topics (Yoshida, 2018);



Please note that there are also pilots with drivers, and that for automated driving sometimes designated roads are constructed. The combination of use of new front- edge technology for explicit societal goals (transport and accessibility for rural elderly who could not drive, or have lost the ability to drive) is interesting to follow.

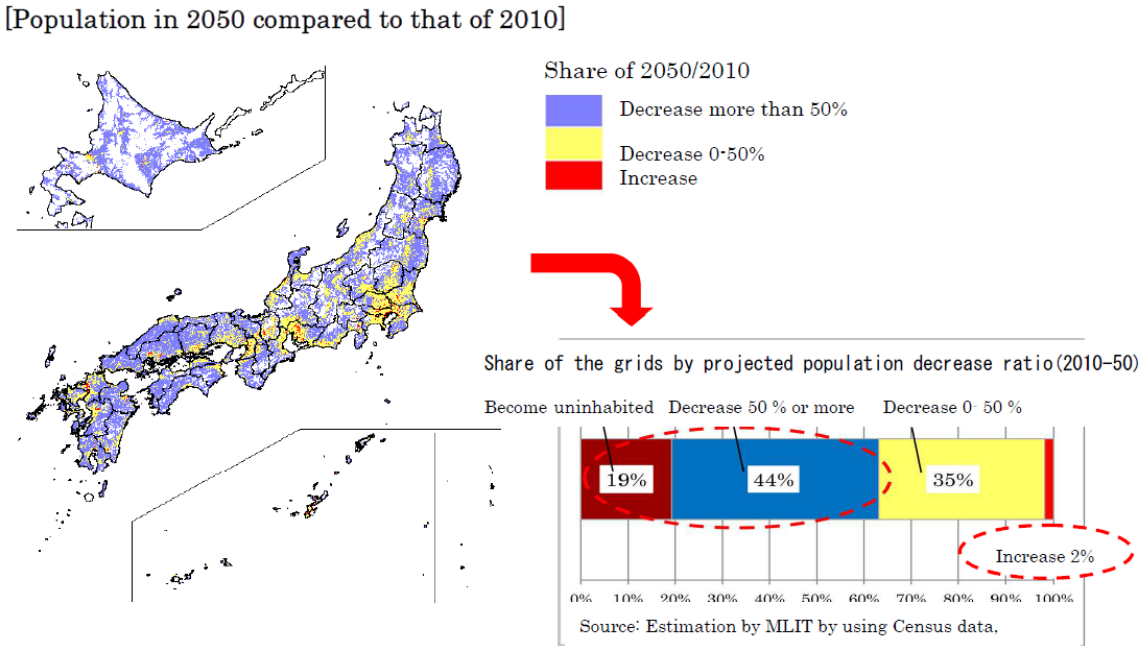
CHAPTER 4 LAND USE AND MOBILITY, AND TRANSPORT POLICY FOR THE FUTURE

In this chapter the focus will be on newer concepts and on more generic policies. The start is for the spatial planning, and next the planning for sustainability in urban areas will be introduced.
The last element will be the new transport policy of Japan, based on the Transport Act.

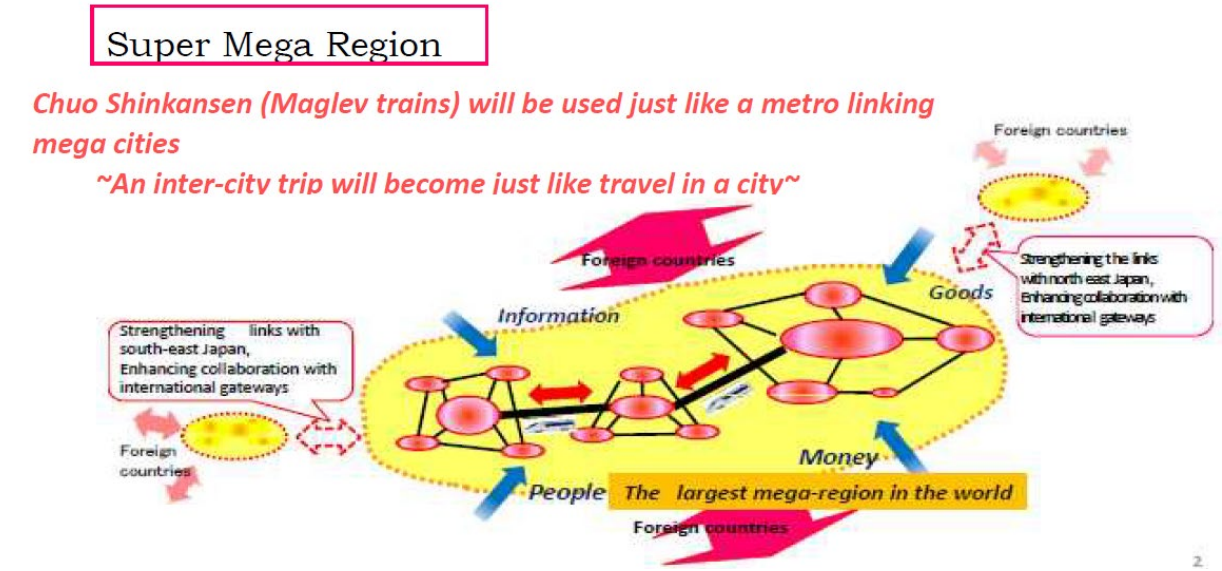
Spatial planning; Grand Design and National Strategy

The Japanese national government formulated in the last 60 years five CNDP's, Comprehensive National Development Plans (Ono, 2008). These plans are long- term physical and spatial plans which identify the ideal state of the Japanese territory on land use, natural and water resources, social infrastructures, industrial locations and tourism. In its core these plans are about the spread of population and resources over the territory of Japan and form a generic framework for spatial planning at the lower levels of governance with a focus on balanced development. The balanced development is not so easy to reach in Japan, as the major urban areas act as magnets for population and investments. A general line in all CNDP's has been to provide the other regions with conditions for economic growth, to create job opportunities in local labor markets, and to diminish excessive rural- urban migration. Recent challenges relate to depopulation, to aging of society and to creating welfare in a globalized world.

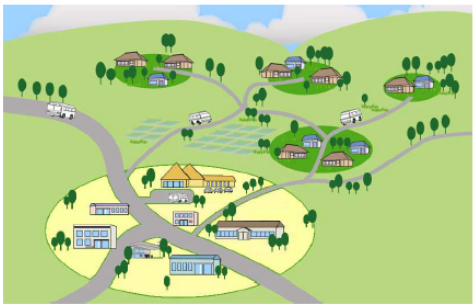
In 2015 the national government issued the National Spatial Strategy, in fact the 6th National Plan. This strategy is related to a Grand Design, issued in 2014, presenting a vision on national spatial development towards 2050. Core element in the Grand Design is the population prognosis.



- Creating a supra mega region Tokyo-Nagoya-Osaka



- High grade linking of cities, creating for more interactions between cities
- Creating small stations in rural areas as key for service delivery and regional innovation



Concentrating basic services delivery hubs supporting life, including daily shopping and medical services at former elementary schools, or town halls.

Sustaining regions by the networks of transport and information

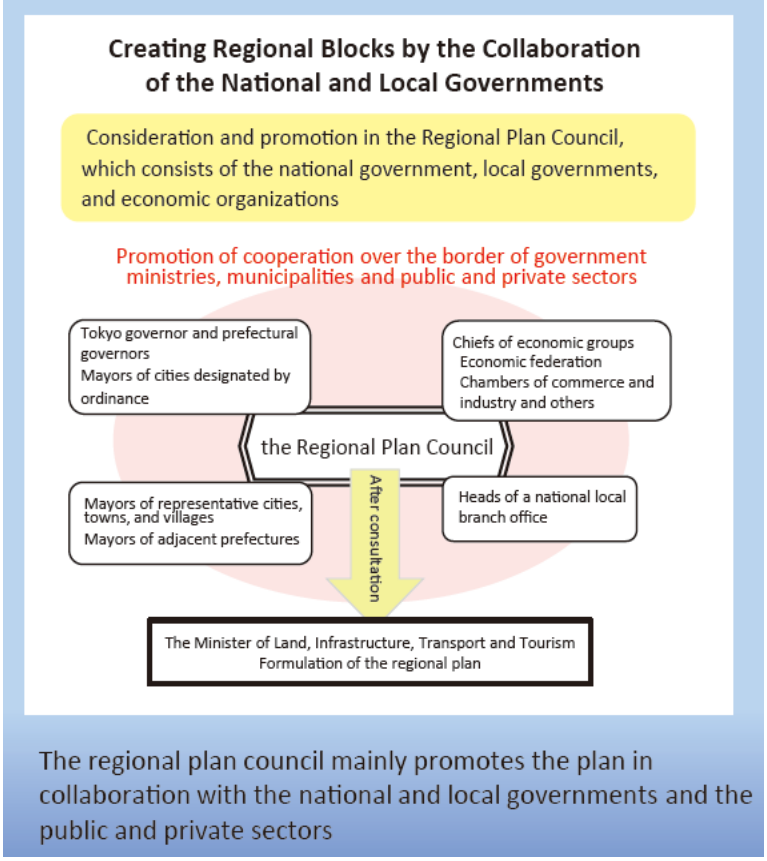
Creating new employments in collaboration with the existing "roadside stations", as centres of regional innovation, or diverse actors producing local specialties by bridging primary, secondary and tertiary industries, the "sixth industries", and promoting locally based renewable energy generation.

In the National Spatial Strategy (2015) this Design is translated for the first period and three interactions are seen as central; between urban and rural areas (with focus on promoting people 's flow from urban to rural), between rural cities (sharing roles in maintaining high levels services in a declining population), and between the large metropolitan areas (developing a super- mega- region triggering innovation). And in the National Strategy the theme of compactness is introduced. Decision makers in Japan fear the situation that with population decline the population density decreases, creating problems with service provision, accessibility, and far more car dependence and car travel. Third important element is to correct the excess concentration in Tokyo, jointly with keeping its position as an economic and innovation powerhouse.

Interesting to note is an extra strategy, that is non- spatial and is related to increasing the levels of women and aged in the labor market (Kaneko and Kiuchi, 2017). This is called ; "reconstruction of communities to live both children and elderly people" and can be seen as a community building approach that needs implementation. It is relevant that this theme is included as ; *"In order to build a society where people can fully demonstrate their capabilities irrespective of gender, we must realize a society where women can actively participate. Compared with Western countries, Japan sees a higher percentage of women quitting jobs on*

the occasion of childbirth and a lower employment rate for women with children. To allow women to realize their hopes to advance their careers even after childbirth, we will seek to realize a society of women's active participation, enabling women to work easily and bear and raise children while working. From the perspective of national spatial development, therefore, we will attempt to build communities where residences are close to workplaces and childcare facilities or communities that support childrearing. We will also seek to promote telework to improve the employment environment. In addition, it is important to encourage women to start up business. Women's implementation of work styles to harmonize their work with childrearing can be expected to hope among young people ".

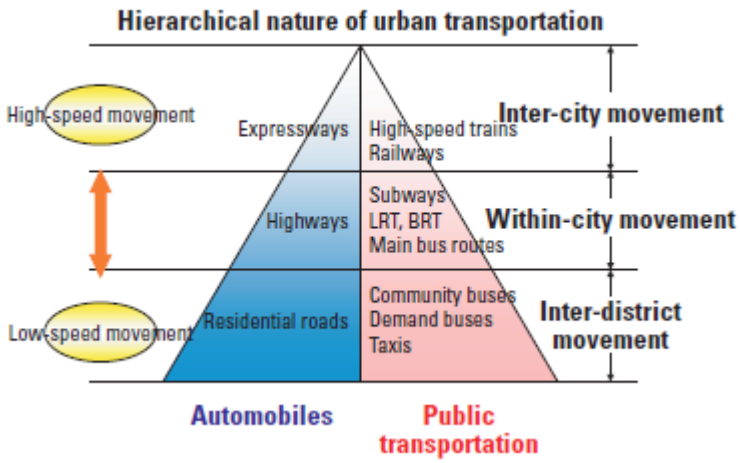
How is implementation of this National Spatial Strategy foreseen? In the spatial planning line, there will be 8 regional plans created, and this works via interaction. The process is clarified in a note from MLIT.



The regional plan council mainly promotes the plan in collaboration with the national and local governments and the public and private sectors

For each of the blocks a number of vision points are presented as a starting point for these regional plans. For example for the Kinki Area (Osaka-Kyoto-Kobe) the base is interaction through history and innovation, and a strategy on infrastructures is presented.

Mobility and transport should be supportive for the Grand Design and the National Spatial Strategy. Morimoto (2016) clarifies how this could work, and introduces four themes ; compact cities, transit- oriented development, traffic management and transport assessment and next generation transport systems. For this last topic he presents a hierarchical system for urban transportation, striking balances between automobiles and public transport.

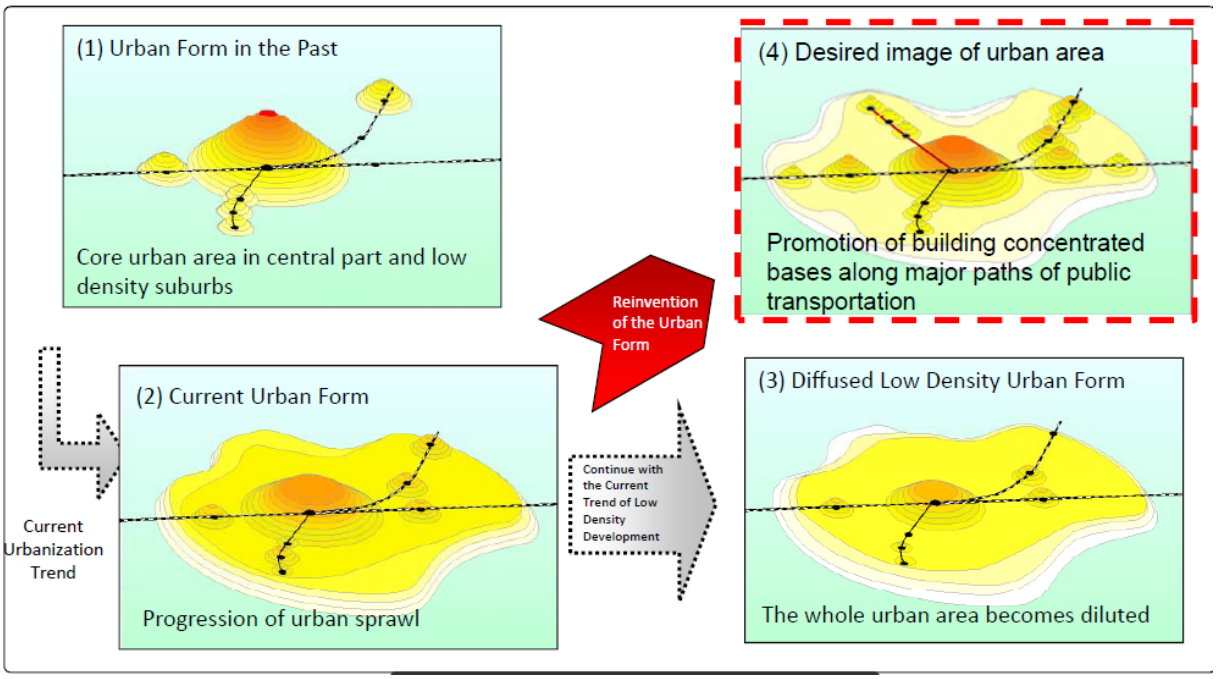


Striving for compactness

Approaching a depopulating society in Japan the realization of compact cities is considered necessary. This realization has two objectives; keeping costs of services acceptable and keeping accessibility at normal levels, and creating more sustainable cities. For this last objective other words are often used, such as Eco Towns (Foundation, 2017), or Low Carbon Cities (Onashi and Kobayashi,eds, 2011).

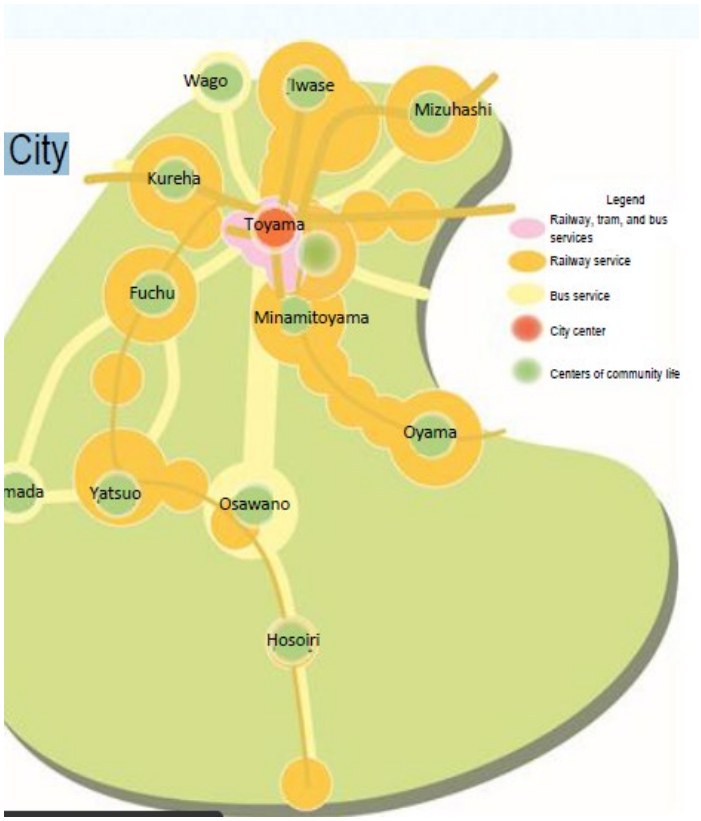
Starting with compact cities, their main objective is to keep costs of maintenance and delivering services low, in a situation could increase with the decrease of population densities. To give a few examples; public transport will decrease with lower populations that can be reached within a certain time frames, and large scale housing complexes could face a lack of occupants. Japan has now already many empty houses, figures for 2008 (MIAC, 2008) are 57,6 mln. houses of which are empty 7,6 mln. (is more than 13 %). City centers in the regional cities are also facing problems, not only from declining numbers of customers, but also because commercial facilities tend to relocate in old factory sites and in suburbs.

On paper , the strategy is rather simple, and is about building concentrated bases along major

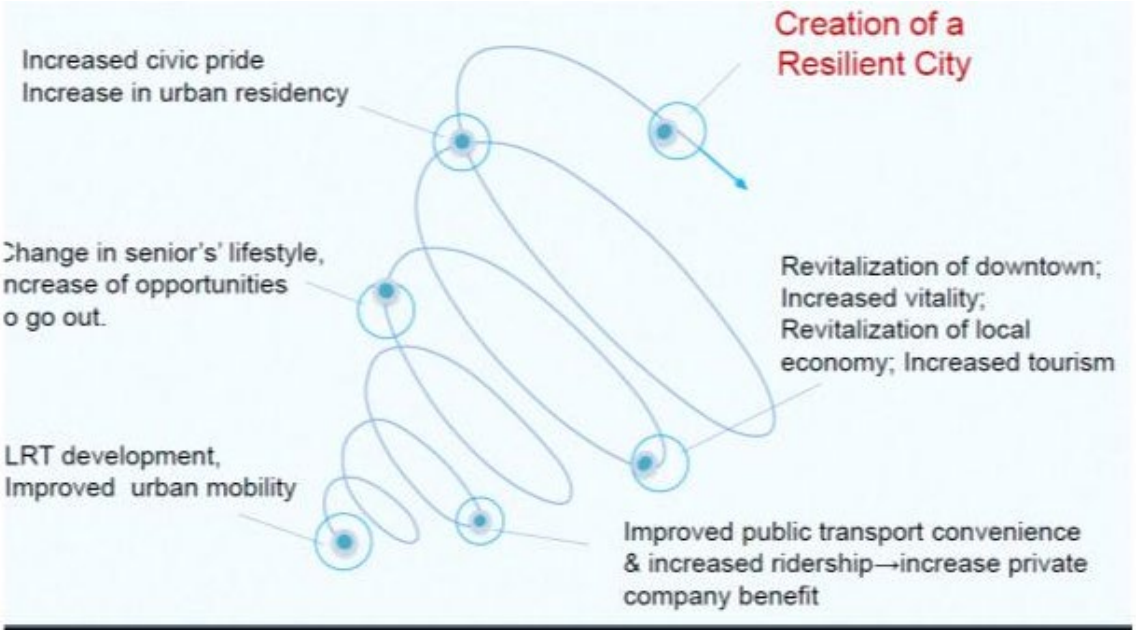


paths of public transport. But is reality it mains restructuring of housing stock, removing old premises, and trying to convince households to relocate. Many investments will be needed.

Japan has a showcase on compact cities, and this the only hype I noticed in Japan. The city is Toyama, a middle sized city of 400.000 inhabitants (Mori, 2014, PWC, 2016) The population density of this very car oriented city was very low, and population is declining rapidly. A new and very active mayor concluded a complete urban redevelopment strategy, called “dumplings and skewers”. Dumplings are the central hub areas, and the local hub areas. Dumpling are connected by Light Rail Transit and modern busses. Huge investments were made, and there is (new for Japan) a transportation discount program for senior residents. Ridership on public transport increased in the last decade, as are population densities, with population shifts back to the center. Great investments were needed, but Toyoma is moving in the wished direction.

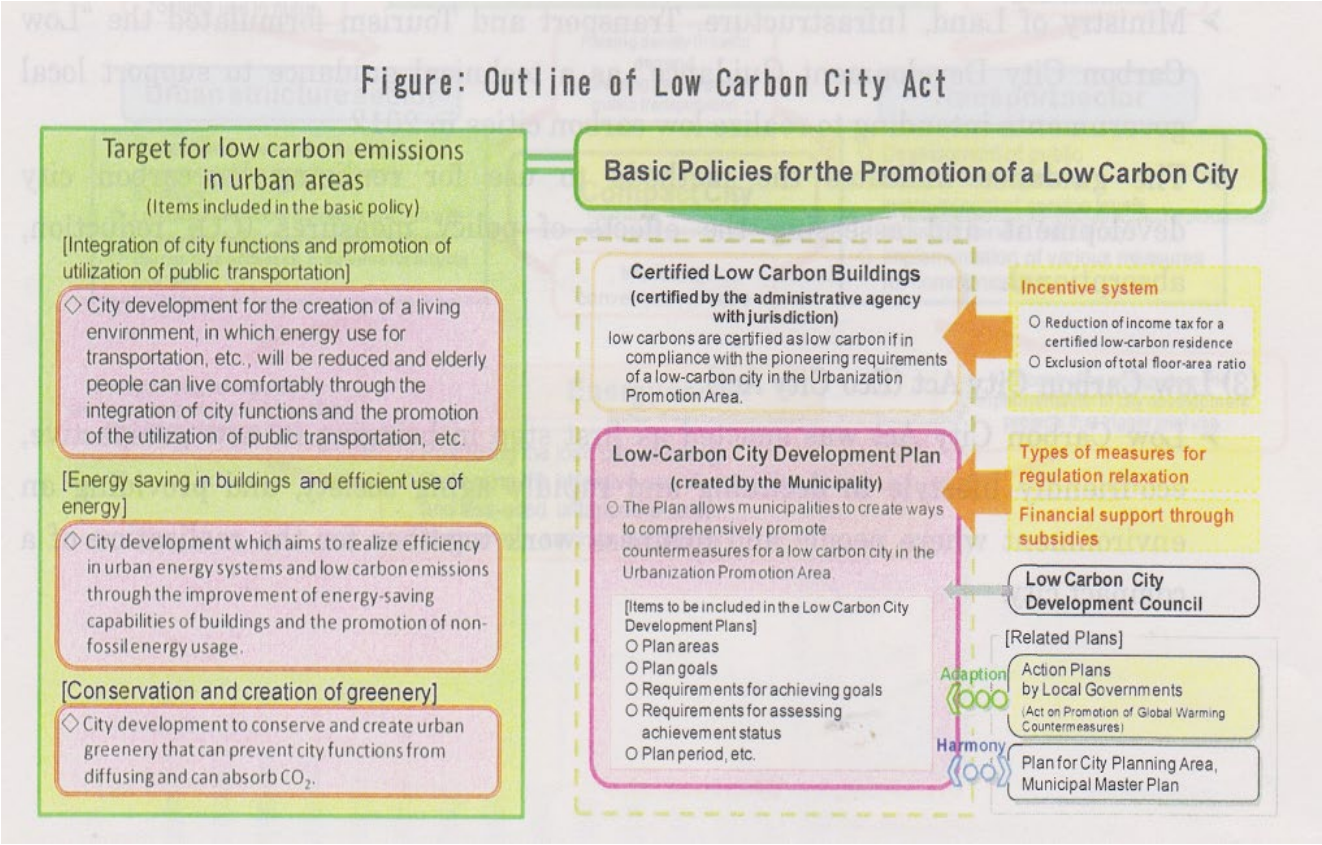


This the spiral that is expected.

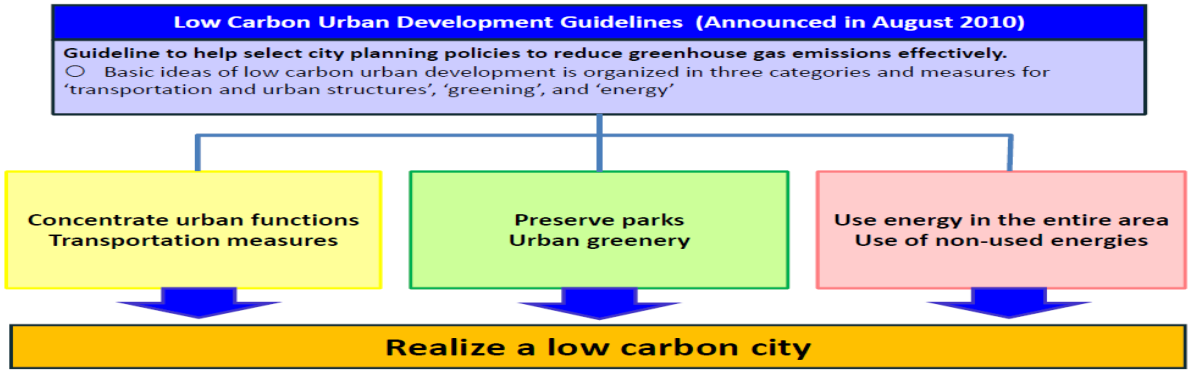


However, the fact that Toyoma is always presented marks the possibility, but also the difficulty, in creating compact cities. This is not about concepts, but also about investments and reluctance to move, as systematic shrinkage is not popular. Relocation of population accompanied by coercive force and voluntary incentives takes time and effort. The processes of relocation of residents followed by depopulation of the area is a key process, with only minor past experience (Kaneko and Kiuchi, w.y.).

The other objective for compact cities is related to sustainability, or to smaller to decreasing CO2 emissions. Makido, Dhakal and Yamagata (2012) did research on the relationship between urban form and CO2 emissions and published evidence from 50 Japanese cities. Less fragmented and more compact cities produce less CO2 than sprawling cities, and less complex cities produce less CO2 than more complex cities. Thus, the best CO2 performance is reached by somewhat smaller, denser cities. These are also target cities for the Low Carbon Cities approach.



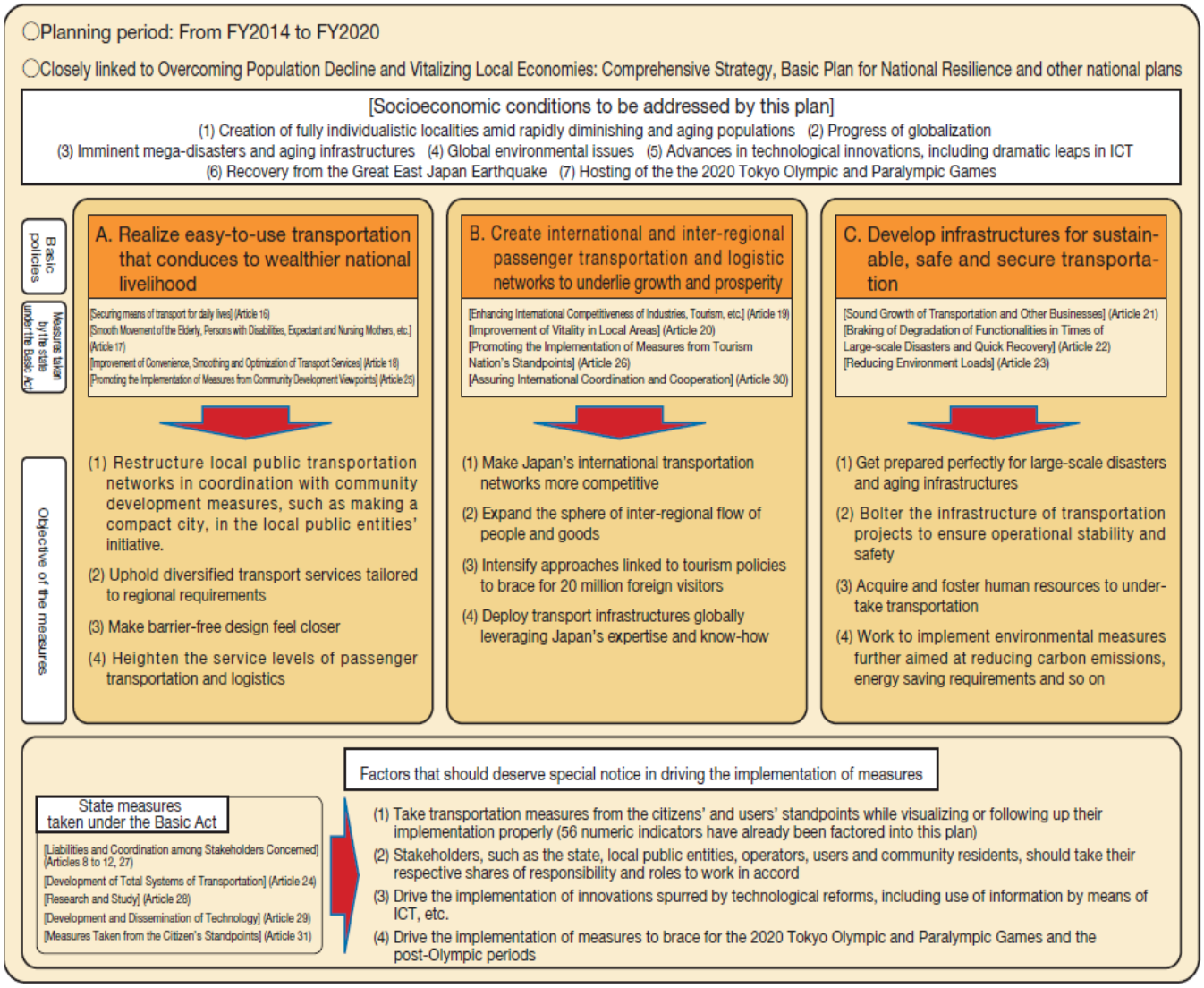
This act sees upon urban energy systems, low carbon building, and preserving greenery, and municipal plans for low- carbon city development can get financial support (Foundation, 2017,42).



Whereas the Low Carbon City is meant for the three objectives of green and energy, the Eco Model Cities program is broader in scope. Next to CO2 emissions the selection criteria are related to handling environmental, ultra- aging and unique regional issues. There are now 23 of this type of cities. In this program there are many cities that are situated in the Fukushima disaster area. Although especially this program could be seen as related, Japan has as yet no Smart City strategy on its own.

Transport policy of Japan

Japan decided in 2013 on an Basic Act on Transport Policy. This Act has five key policy areas. These five areas have been comprised to three pillars in the First Basic Plan on Transport Policy, based on the Act, and published in 2014 (Ministry of Land, Infrastructure, Transport and Tourism Japan,2014). Two pillars are almost the same as in all other countries; establishing international and interregional passenger and freight systems as a basis of growth and prosperity, and creating safe and sustainable transport. But the third pillar (pillar A) is the interesting one, as it is about the creation of easy to use transportation which contributes to the rich lives of citizens.



For the total plan 93 key performance indicators have been developed, of which 11 relate to this pillar;

Target	Intent	Performance indicators
Reconstruct the regional transport networks under local governments' initiatives, coordinating with town planning policies	Vitalize local public transport services under coordination with relevant measures to create active and unique communities, taking into account population decrease, super-aging, and reliance on automobiles.	Regional public transport network plans： 100 plans On-demand transport services： 311 municipalities (2013) 700 municipalities
Encourage deployment of various transport services taking into account local circumstances	Provide new transport services with convenience, comfort, and efficiency	Proportion of light rail vehicle： about 25% (2013) to 35%

Target	Intent	Performance indicators
	responding to changing society with population decrease and super-aging	Community cycle： 54 municipalities (2013) to 100 municipalities
Make barrier-free transport more familiar	Realize the smooth transportation in the super-aging community and the society where all can participate in, considering Tokyo 2020 Olympic and Paralympic games.	Accessible bus ： 44% (2013) to about 70% No gap on major railway stations： 83% (2013) to almost 100% Platform doors ： 583 stations (2013) to about 800 stations Indicators
Further raise the service levels for passenger transport and logistics	Improve worldwide leading field in transporting people & goods to help realize the rich lives of the citizens	Prefectures where interoperable transport smart cards not available： 12 prefectures (2013) to 0 ・Number of lines with bus location system： 11,684 lines (2014) to 17,000 lines

There is also a relation with the National Infrastructure Plan, that was enhanced in 2015. This Plan has been developed in coordination with the National Spatial Strategy and the Basic Plan on Transport Policy.
This all is a rather rich framework, not to be found in other OECD countries. However, Shibayama (2017) presents a caveat to too much optimism, as Japan's transport policy is still too much single mode oriented, and most criteria are relatively easy to be met.

Japan's transport policy takes a route to inclusiveness. In this respect, in an article the transport situation of elderly in Australia and Japan was compared (Somenahalli et. al, 2016). Ageing issues are seen in Japan as opportunities rather than as burden, creating platforms and bringing resources and technologies. It is seen as important , and conditioned by law, to build barrier-free passenger and traffic facilities, vehicles, homes and public facilities. To cite ; "another important difference in Japan's public transport's policy is that the developments are planned as social infrastructure responsive to the ageing society and not just to increase competition with car usage". Social inclusion related to transport is high on the agenda and it should be reminded that the roots for this state of art are long standing. Japan has never introduced neo- liberal ideologies, but remained to its own social policy, in which the family and solidarity related to location have important roles.

CHAPTER 5 THE INSTITUTIONAL SETTING OF MOBILITY POLICY

This chapter is shorter and less fact- based than the other chapters of this report. It contains a number of insights that I obtained on how Japanese (mobility) policy in relation to society functions.

Planning Culture
Japan definitely is a planning culture. The future and its challenges are never far away. Making plans and programs is seen as normal. There is spatial planning, transport planning, planning for decline and for decreasing population. For almost all themes mentioned in this report there are objectives, targets, laws, procedures, guidelines, programs formulated. It looks as if societal challenge cannot be met without doing all this useful work.

Culture of deliberation and consulting
Policies from governments and companies seem to be developed in joint efforts. I did not notice fights between public and private organisations in the domains I studied. Many colleagues I spoke were in some way involved in advisory units, boards or dialogue platforms for the themes they studied or researched. I had the idea that in Japan creating common narratives is considered important, immediately from the start of a theme.

Governments are there to endorse, follow and structure
Which means that other stakeholders are leading. I felt that within urban regions the role of railway companies was very important. And I noticed the great influence of car companies and car related networks in designing and defining global warming policies. Also important are joint structures, with public and private interests combined.

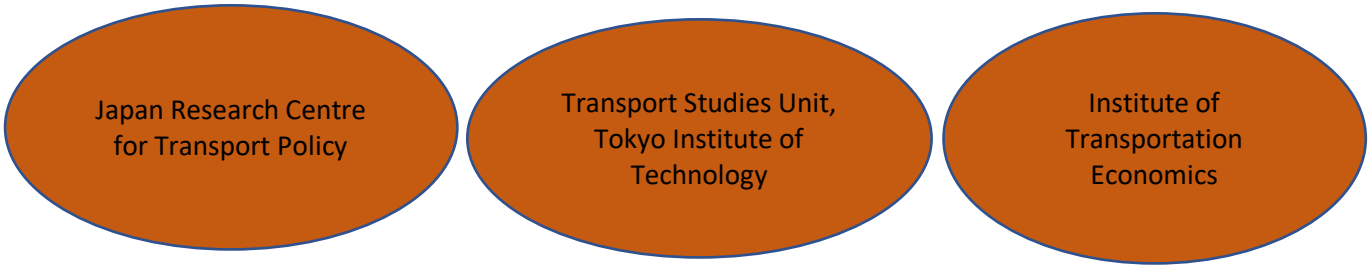
Policy formulation is immediately from its start technical oriented
When a policy has to be defined, or a new policy designed, from the start the dialogue is near to the available research and knowledge. Designing policy on the basis of hypes, expectations and nice sounding but not elaborated concepts looks non- Japanese. I noticed a lack of consulting companies and start-ups, often motors of forms of hype oriented policy making.

Technology development is from the start related to societal challenges
Whereas in many OECD countries technology development seems to be a stand -alone activity, at best leading via forms of high- level tinkering to patents and customer products, or related to enterprise and private party interests, in Japan I noted the vision that technology should be from its start helpful and supportive in reaching the common good defined in societal goals such as social inclusion, or helping the aging population.

A network of knowledge institutes related to policy design and implementation exists
There is a well - defined structure of knowledge institutes and universities related to the policy formulation. Often these institutes do function as think thanks from the government, or are related to government funding. In a figure ;

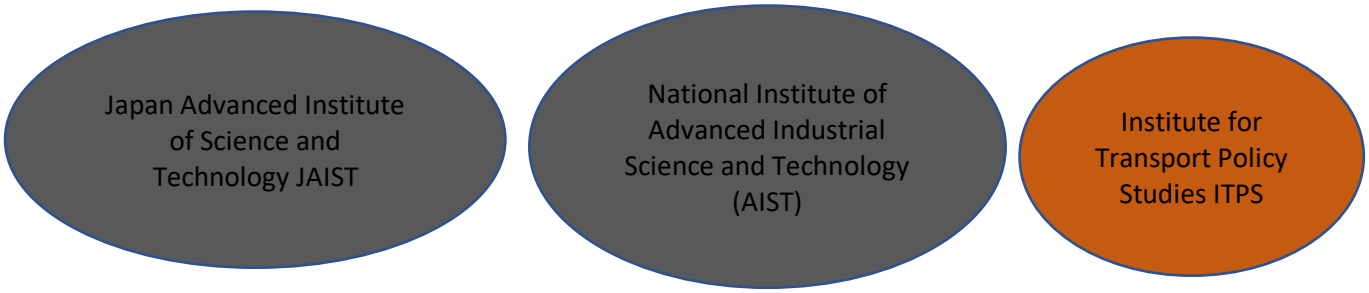
Sustainability

Transport research and policy



Urban Planning and Mobility

Smart Mobility



Accepting the full price of mobility

Japanese households consider paying the full price for rail service or for road use (with tolls) as normal. They do not see the provision of public transport or roads as a government

responsibility. Part of their payments return to them via their employers. This situations blocks solutions that need forms of subsidy in mobility.

Low support for neo- liberalism and Anglo Saxon style solutions
Japan sees society not as existing from lonely particles. In Japan "there is such a thing as society", to contra- quote Margaret Thatcher. Tradition and inclusion of all people is a motor for policies. Efficiency is not a prime objective, clever organisation is.

Trying to remain as independent as possible
I get the idea that part of the Japanese strategy on vehicles and CO2 finds its rationale in trying to remain as independent as possible from foreign companies and foreign countries. On energy this is a long standing culture (Chrisstoffels, 2007)

"Be good and tell it" is not very Japanese
It did strike me how far advanced Japan is in its formulation and implementation of working policies for transport and mobility, whereas there seems to be no felt need or strong wish to communicate on this performance with professionals from other OECD countries. A lot of important reports and research results are only available in Japanese.

Hierarchy and even more experience are cherished
Japan misses the new and rather strange idea that "science is also only an opinion". I saw no development in the direction of "alternative facts". And I noticed that younger, less experienced researchers and policy people look up towards their peers. Blunt and well communicated radical insights do not receive an enthusiastic reception.

All in all, I really like policy formulation Japanese style. I think a lot can be learned here. And I consider the Dutch style of policy making, often related to joint effort and consensus building as nearer to the Japanese style than most styles in other OECD countries. However, the Dutch preference for explicit debate is unlike the more introvert Japanese start.

CHAPTER 6 LEARNING FROM JAPAN

Research on the implementation of sustainable mobility and smart mobility in the richer OECD countries brought me on the road to Japan. I was struck by the performance of Japan, and even more by the lack of attention for this performance among researchers from other countries. Most transport researchers in the world work from rather undefined Anglo-Saxon frameworks, mostly based on (implicit) neo liberal insights. Chinese researchers publish much in English, so they are taken into account, but most dominating researchers tend to forget research published in other language areas, and thus tend to forget experiences, practices and performances in for example France, Germany and Japan. I consider this a real abuse, and I brought in much German and French research in my new book *Inclusive Transport* (to be published end of august 2018 with Elsevier), and I wanted to visit Japan.

What was the specific performance of Japan, that I noticed in the literature? Four elements ;

- The best performance on decreasing CO2 emissions from mobility and transport
- The best performance for public transport in the modal split in the richer OECD world
- The societal embeddedness of transport and mobility policies
- An elaborate network of institutes and professionals working on smart and sustainable mobility.

After my visit I must state ; I have not been disappointed. Yes, on some topics the picture is not as successful as expected, and I came across real mobility problems of Japan B, the other part of Japan, even less well known to most mobility researchers. But Japan is a country where much can be learned.

In this final chapter I will present ***five areas for learning***. For me personally, this was the first introduction, and from now on I will remain very attentive on Japan's performance in mobility and transport themes.

1. Creating urban areas with high shares in public transport (above 30 %)

In Europe we want higher shares of PT in modal splits. And we make plans, have stimulation programmes. I would advise ; visit Japan. Japan A is the "real life " for bringing public transport and its related institutions and companies in the first position.

2. Elaborated and well balanced policies on vehicles, renewal, and global warming

Japan does not like hypes. But Japan wants to reach the global warming objectives of Paris, and is fully committed to create the best routes towards these objectives. That means ; working on a complete package of renewable energy, electric vehicles, great increase in fuel efficiency, fuel cell technologies, not choosing only one route to follow. Governments and industry create common grounds and common narratives. I put my cards on Japan, and not on our Dutch approach, too much focussing on electric driving only.

3. Smart mobility for societal goals

Smart mobility is not seen primarily from a technological perspective. On ITS, on research for automated driving, on field operational tests not technology is leading but the function of all new elements in reaching societal goals such as more safety for the aging population, better accessibility of rural areas, or social inclusion.

4. Planning for decline

Japan will be the first country experiencing huge population decline. Japan is at this moment busy with creating objectives, planning, visioning for coping with decline. How to create a thriving and flourishing society when the population is decreasing. Japan will be experienced when European countries will start with population decrease. Especially for the Netherlands, in the next three decades the population will remain around 18 million inhabitants, which will lead to decreasing populations in many areas. There is a lot to learn here. What will work, what will fail? Is for example systematic shrinkage possible?

5. Creating a functioning network of institutes and professionals

It looked as if in Japan the leading people in smart mobility and sustainable mobility work in and from the same framework, and work on the same narratives. Discourses are more technical and less based on wishes and nice sounding ideas than in the Netherlands. And the distance between ideas and implementation seems smaller in Japan. Japan also has a planning culture, but planning leads In Japan to action and important investments, and not to new reports and only smaller pilots. Japan lacks the intermediate world of consultants, with are often more busy with their own portfolio than with creating magnitude. And smart mobility and sustainable mobility now need magnitude, in behavioural change, and in investments. The time for discussing concepts is over!

On these five areas I will follow Japan in the future. I would like to thank all my Japanese counterparts. I pretty much liked talking with you; you have learned me a lot!

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