

Proposal of social strategies in Japan until 2040

**— Coping with problems of housing, land use and
infrastructure management caused by population decline —**

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Since 2008, Japan has not only been a rapidly aging, low-fertility rate society but has also been a depopulating society. The population decline is expected to cause a number of social problems as well as a significant impact on Japan's infrastructure.

This paper aims at discussing the possibility of the impact of population decline by conducting a comparison between Japan and Germany. This is because Germany is known as a typical depopulated country within OECD (Organisation for Economic Co-operation and Development) countries.

During the ten years after German reunification, the eastern part of Germany faced severe increases in the number of vacant houses and land because of industrial decline and the subsequent social migration. Now, the number of houses are increasing in order to improve their quality and to stimulate the regional economy. To manage this situation, federal and local governments have promoted the demolition of vacant properties.

Considering the differences in the social backgrounds of Japan and eastern Germany, such as social domestic migration related to sudden political change versus nationwide population decline, a faster population decline in eastern Germany, the prevalence of collective ownership of houses and the much higher ratio of aging houses in eastern Germany than that in Japan, it is possible to say that it is unlikely that the problems caused by population decline that are observed in eastern Germany will easily occur in Japan. On the other hand, in Japan, the pace of the increase in the number of houses has already surpassed the pace of the increase in the number of households, and this will probably lead to problems in terms of vacant houses.

While the population and the number of households are certainly declining, the longer it takes to solve the problems of vacant properties, the more severe will be the effect on the construction and housing industry, infrastructure managers and individual property owners. Accordingly, this problem requires urgent resolution.

For this, not only introducing compact city policy, but also introducing other policies, such as charging an additional tax on vacant properties, introducing cap and trade regulations on housing construction/demolition rights, collecting housing ownership and so on, are expected in order to reduce the social costs related to disasters, provision of infrastructure services and public works administration.

I Introduction

Since 2008, Japan has not only been a society with rates of low fertility and rapid aging but has also been a depopulating society (Note 1). The official population projection of Japan indicates that the future population in Japan will decline by 10 percent by 2030 and by 30 percent by 2055 compared to the population in 2005 (Figure 1).

In addition to the population decline in Japan, the latest official forecast suggests that the decline in the number of households in Japan will have also begun by 2015 (Figure 2).

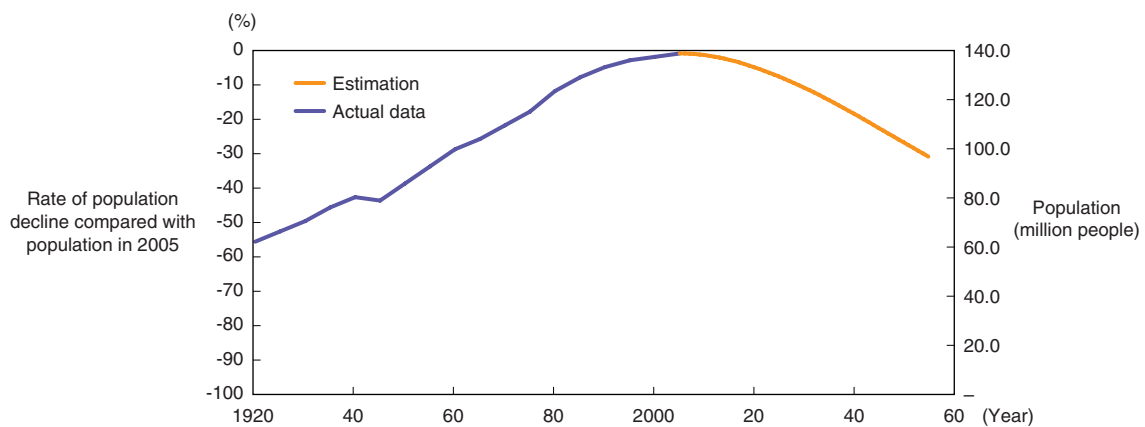
Population decline is not a novel problem. Not only in Japan, but also all over the world, depopulation in rural areas has been known as a typical problem (Note 2). Population decline is not a problem inherent in rural areas. In urban areas, industrial decline can also cause population decline (Note 3). Of course, population decline and urban decline are not exactly synonymous, but a typical case of a decline in urban population is seen in the urban area, such as the city of Manchester in the U.K. (Note 4). Another famous case of a decline in urban population was caused by domestic social migration from east to west after Germany's reunification

(Note 5). In these cases, the regional population declined but the national population continued to increase at the same time (also see Figure 4).

In contrast, the population decline in Japan is different from previous world experiences because it is expected to be a nationwide decline. The main cause of Japan's population decline is a natural decline owing to a fertility rate that is too low to sustain Japan's population. Not only a regional population decline but also a national population decline has been occurring (Figure 3). All regions in Japan except for two prefectures, Tokyo (metropolitan) and Okinawa (remote islands), are expected to suffer a population decline by 2030, and the national population decline will be 10 percent by 2030 compared with the population in 2005. At the same time, seven prefectures (colored black in Figure 3) and rural areas are highly likely to suffer from severe population declines, that is, more than a 20 percent population decline compared with the population in 2005. It could be considered that this estimate shows the impacts of metropolization.

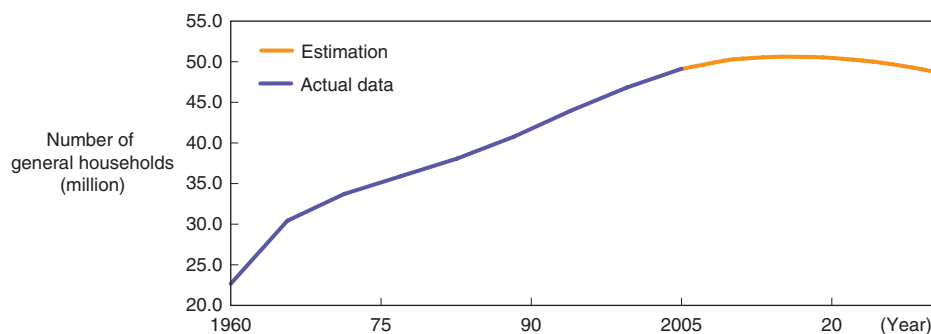
A naturally assumed solution for a country's population decline is to accept immigrants and foreign labor forces. Even so, the total population of Germany has declined in spite of its acceptance of immigrants equal to 9 percent of its total population owing to a much greater

Figure 1. Long-Term Population Trend in Japan



Sources: "Actual data" is from the National Institute of Population and Social Security Research (2006), Table 1-1 and "Estimation" is from the National Institute of Population and Social Security Research (2009); Table 1-4.

Figure 2. Long-Term Projection of the Number of General Households in Japan



Sources: "Actual data" is from the National Institute of Population and Social Security Research (2008), Table 1. "Estimation" is from the National Institute of Population and Social Security Research (2009), Table 7-1.

decline in the original German population (Figure 4). Consequently, Germany is expected to lose a significant portion of its population, as is Japan (Figure 5). This situation in Germany suggests that immigrants and foreign labor forces will not be able to fully resolve a nationwide population decline.

The low possibility of assuming Japan would accept immigration now is also observed in the survey. At this moment, any academic research and any public opinion polls of whether to accept migrants to mitigate the impact of population decline in future depopulated Japan cannot be found. Figure 6 displays the results of only one public opinion poll in terms of accepting foreign

labor forces in 2000 and 2004 in the literature review for this research. The results in both years indicate that only slightly more than 15 percent agree with accepting foreign labor forces. Around half of all respondents considered this the last choice after other measures such as utilizing elder and female employees, improving labor productivity and so on would be tried to resolve the situation. Around 25 percent of respondents in both surveys rejected the acceptance of a foreign labor force in the future even if Japan's own labor force would be insufficient. Interestingly, from 2000 to 2004, the percentage of responses to passive acceptance had declined by 8.2 percent but the percentage of responses in the rejecting answer increased by 6 percent.

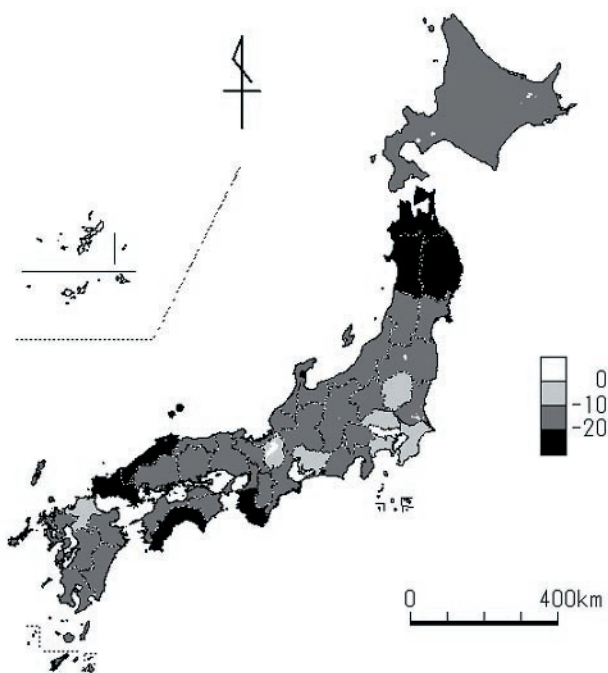
Although no similar surveys have been conducted recently, it can be said that this result suggests that psychological resistance to accept foreign labor forces in Japan still exists to a certain extent. Consequently, Japan is urged to manage population decline and its effects without considering immigration as a solution.

Furthermore, China's population is also expected to decline after 2030 (Note 6). Sooner or later, the world will face a serious situation resulting from population decline. In terms of emigration from Japan due to business activity, the authors were unable to find any previous literature. Therefore, the impact of globalization on urban hierarchy is unclear at this moment.

As mentioned above, Japan cannot solve the effects of population decline by controlling demographic factors. Instead it must otherwise cope with those effects and social changes caused by population decline.

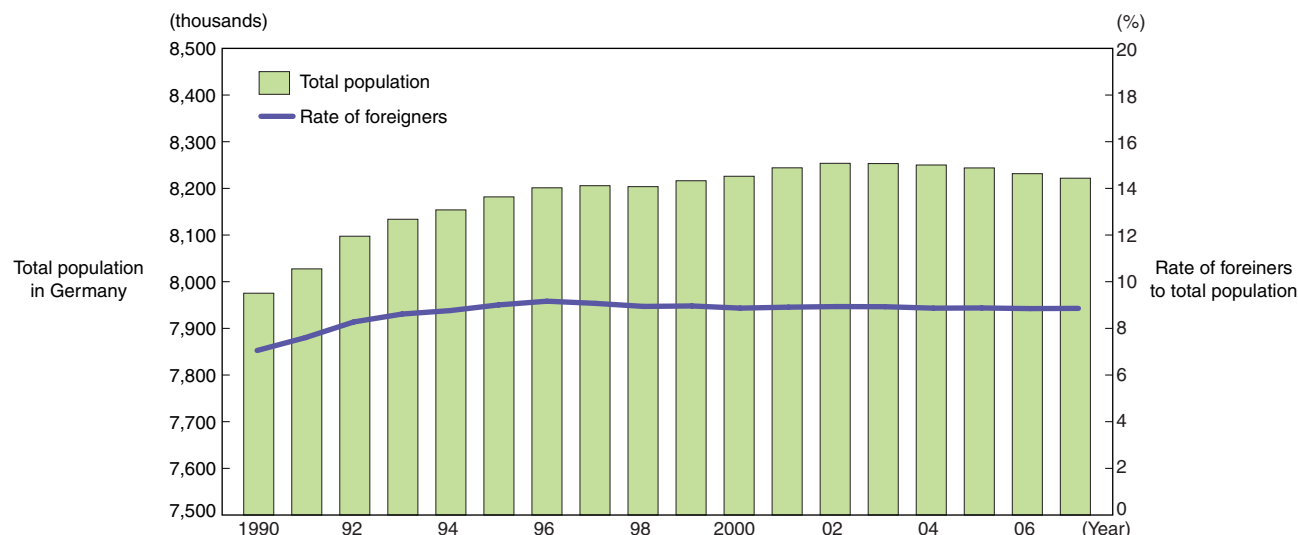
The effects of population decline will be numerous. Some researchers have pointed out that decline in the national economy (Notes 7, 8), decline in the size of the labor force (Note 8), imbalance of financial burdens and benefits between the present generation and future generations in social security such as pensions (Note 9) and

Figure 3. Rate of Population Decline by Prefecture in Japan



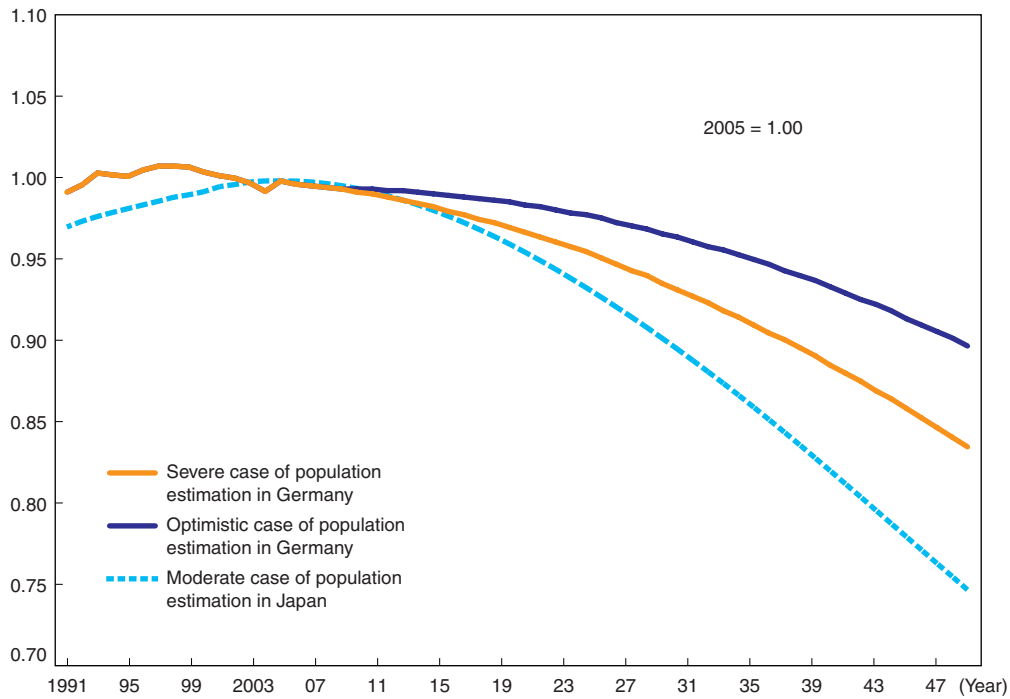
Source: Compiled by the author based on the National Institute of Population and Social Security Research (2007), Table 1-1.

Figure 4. Rate of Foreigners and Total Population in Germany



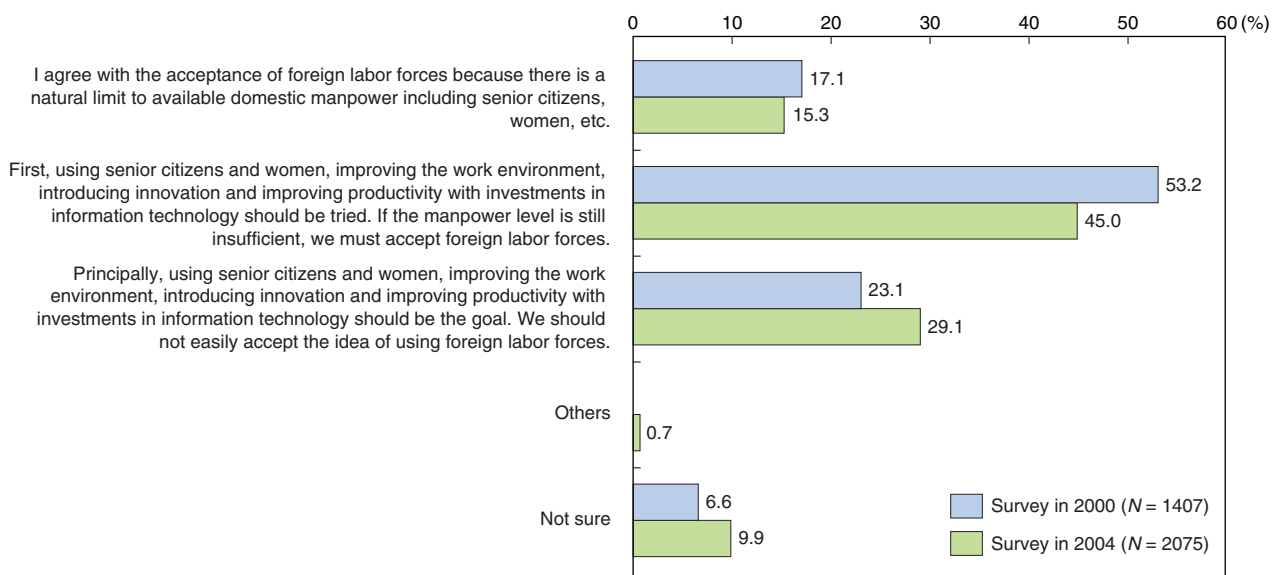
Sources: GENESIS-Tabelle: Temporär, Bevölkerung: Deutschland, Stichtag, Nationalität.

Figure 5. Estimated Population Trends of Germany and Japan



Sources: Between 1991 and 2005: Japan: National Institute of Population and Social Security Research (2009) Jinkou Toukei Siryou-syu [*Demographic statistics 2009*], National Institute of Population and Social Security Research, Tokyo. (<http://www.ipss.go.jp/syoushika/tohkei/Popular/Popular2009.asp?chap=0>, obtained on April 29, 2009)
 Germany: GENESIS-Online Table 12211-0001. (<https://www-genesis.destatis.de/genesis/online/online?Menu=Willkommen> obtained on April 29, 2009)
 After 2005: Japan: National Institute of Population and Social Security Research (2006) Nihon no Suikei Jinkou (Heisei 18 nen 12 gatsu Suikei) [*Population projection of Japan (December, 2006)*], National Institute of Population and Social Security Research, Tokyo.
 Germany: Statistisches Bundesamt (2006) Germany's population by 2050. Results of the 11th coordinated population projection, Statistisches Bundesamt, Wiesbaden.

Figure 6. Current Public Opinion about Accepting Foreign Labor Forces in Case of Insufficient Labor Forces in Japan



Note: Response to the question, "Hereafter, considering the likelihood of a lack of labor forces in Japan's future owing to a declining fertility rate and increasing aging, what do you think about accepting foreign labor forces as one possible solution to compensate for such an insufficient labor force?"
 Source: Public relations office of Cabinet office (2004).

management of physical assets such as land and infrastructure (Note 10) will most likely occur.

The problems of land use related to population decline, including housing and infrastructure development, have often been pointed out by German

researchers (Note 11). This is because eastern Germany experienced a severe population decline after reunification and obvious problems of vacant houses, property, land and an inefficient infrastructure network have consequently appeared.

After reunification, the new construction of housing in order to improve low-quality housing, which was built by the German Democratic Republic (GDR) and equals 0 percent of the housing supply (800,000 units) in eastern Germany, resulted in about 14 percent vacant houses. Half of them can be considered as inventory waiting for future tenants but the other half is estimated as having been abandoned for more than ten years and uninhabitable (Note 12). This increase in the rate of vacant houses also resulted in a decline in housing prices in depopulated German cities (Note 13). The low housing prices have not improved liquidation of the housing market and, on the contrary, liquidation has become relatively lower than before because property owners expect the property price to increase and are waiting to sell their vacant properties (Note 12).

The closure of factories to a great extent in eastern Germany after reunification also produced many neglected facilities and land. In addition, shrinkage of regional economies and the modernization of logistics also resulted in huge vacant switchyards. The military bases of the Soviet Union also became abandoned land after reunification (Note 14). This land has a high potential for soil contamination, so developers could not redevelop quickly. In addition, the areas of the land are relatively too large for the regional economies to redevelop (Note 14).

Increases in the number of vacant houses and the occurrence of such huge vacant land in urban areas sequentially caused cold spots on the network type of infrastructure. The partially, relatively and remarkably low efficiency on the infrastructure network has led to a decline in the overall efficiency of the infrastructure network (Note 14). For example, not only a decline in water consumption but also a decline in the efficiency of water delivery has increased management unit costs in the water sector (Notes 11, 14, 15, 16, 17). The possibility that a decline in wastewater would lead to the long-term presence of wastewater in pipes, which causes odors and underground water contamination, has also been pointed out in the wastewater sector (Notes 18, 19, 20). The dispersion of urban areas in the process of population decline has increased commuting distances to offices, schools and shopping in some areas (Note 20). In this way, the various effects of population decline can be observed in various sectors of infrastructure.

Germany has experienced severe effects from population decline owing to the rapid domestic social migration after reunification. Is Japan also expected to similarly suffer from population decline? This is the starting point of this research.

This paper aims at discussing what sort of effects on housing, land use and infrastructure management are expected to occur and how those effects can be managed in the future in Japan. The authors base their discussion of the following points on the facts of sequential land

use in Japan. It is difficult to find clear differentiation between rural and urban areas in Japan.

In particular, first, comparison studies of social backgrounds and current phenomena between Germany and Japan based on previous research results conducted in eastern Germany were conducted in order to discuss how those phenomena easily become problems and are difficult to manage. Second, the rate of vacant housing, which can be considered as a critical path, is estimated and the importance of the problem in the future is analyzed. Third, measures to cope with the problems are proposed and how to combine them are discussed in the latter half of the section.

The structure of this paper is as follows. Chapter II describes the methodology employed in this paper. A review of the literature and the methods of some estimation are introduced. Chapter III explains the results of the comparison studies and estimated results of the rate of vacant houses up to 2040 in Japan. Proposed measures to deal with the problems are introduced Chapter IV. Finally, a summary of this paper and future research tasks are presented.

Note that this paper is a reorganization of three of the authors' recent papers (Notes 21, 22, 23) on this issue in Japanese.

II Methodology

1 Case study areas

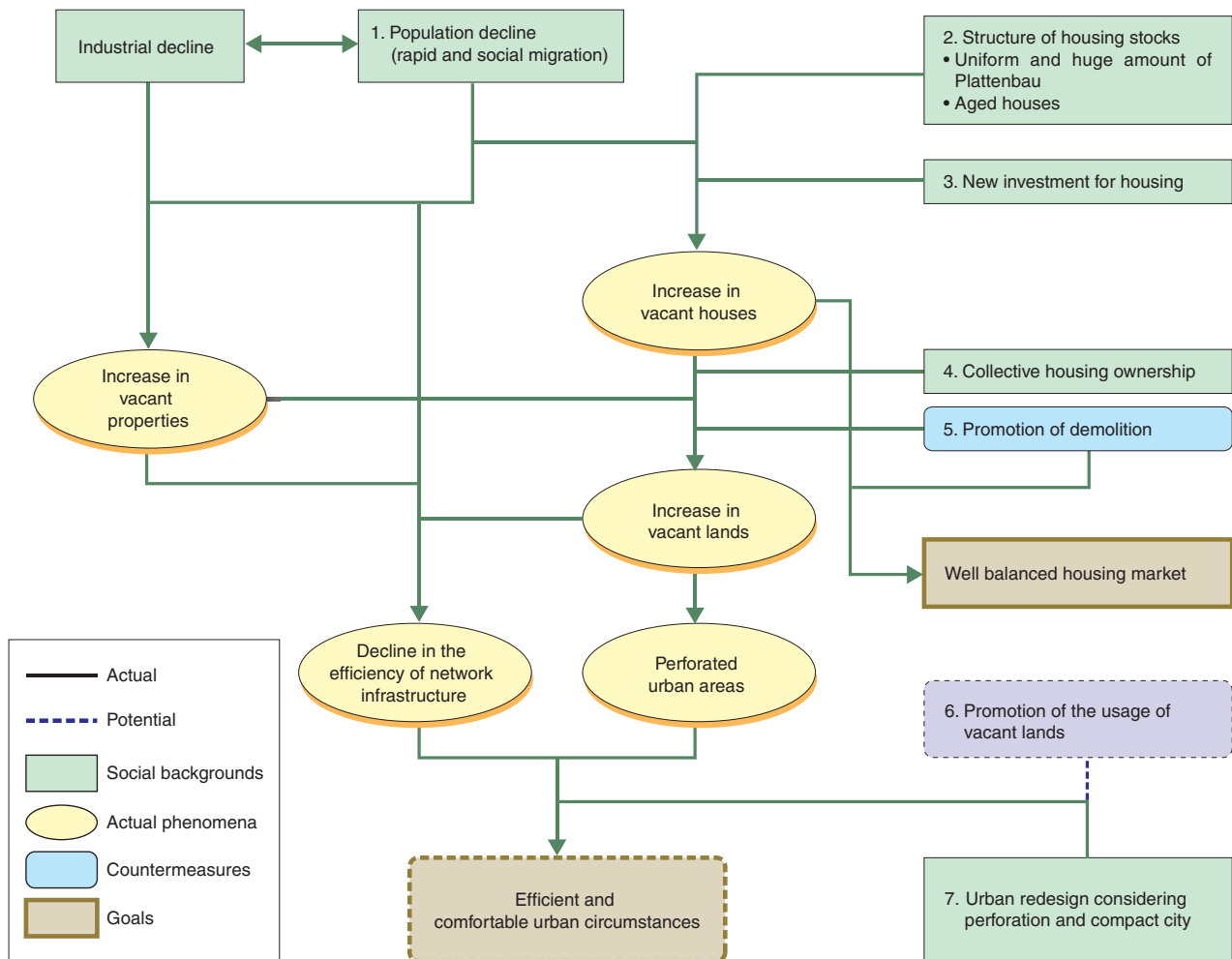
This paper mainly focused on the eastern German cities of Eisenhüttenstadt, Dresden, Stendal, Halle/Saale, Leipzig, Cottbus and Chemnitz, which suffered from severe population decline. In contrast, no Japanese cities were surveyed as case study areas because the seriously depopulated cities in Japan at the moment are suffering from out-migration owing to mine closures and the cause of the population decline is different from a nationwide cause of population decline in the future.

2 Discussion framework

With reference to previous research discussing the phenomena and problems caused by population decline on housing, land use and infrastructure management in eastern Germany, all discussion points in this paper are hypothetically developed as shown in Figure 7.

Assuming social backgrounds affect population decline owing to rapid and domestic social migration, industrial decline leading to domestic social migration, a housing market structure composed of uniform and huge numbers of "Plattenbauten" and aged and deteriorated houses in old towns, the investment for new housing construction after reunification concentrated housing ownership by the previous GDR's housing corporation.

Figure 7. Hypothetical Process Causing the Impacts of Population Decline Observed in Depopulated Regions in Eastern Germany



As a challenging phenomena, the increased amount of vacant houses and vacant land and shrinking urban areas plus deteriorated efficiency of infrastructure networks are assumed. In previous literature, the measures for dealing with these problems were demolition, promotion of the use of vacant land and properties and compact cities. Through a discussion for coping with the problems of population decline, well-balanced housing markets and cities with more efficient energy usage and more comfortable living circumstances were regarded as the goals.

3 Literature review

When conducting a review of relevant literature, the terms “population decline,” “infrastructure,” “land use” and “houses/housing” were mostly used. In addition, the literature related to greening vacant lands, micro-grids and renewable energy were also surveyed. The literature used in this paper is listed in the reference section.

The research fields surveyed were urban planning, regional science, geography, housing, infrastructure management, demography and so on.

4 Datasets

(1) Secondary data

Several sets of statistics are also used in this paper.

As official statistics, the number of houses was taken from Jyutaku Tochi Toukei Chousa (the report on the statistics of houses and land) published each year by the Ministry of Internal Affairs and Communications and the number of houses constructed was taken from Kenchiku Chakkou Toukei Chousa (the report of construction statistics) published each year by the Ministry of Land, Infrastructure, Transportation and Tourism. The number of demolitions was also taken from Kenchikubutsu Messhitsu Toukei Chousa (the report on the demolition statistics of buildings) each year and the number of households was taken from Kokumin Seikatsu Kiso Chosa (the basic survey on national life) published by the Ministry of Health, Labour and Welfare.

The official estimate of the number of households was taken from the National Institute of Population and Social Security Research (2008). The authors extended the estimate for the period between 2031 and 2040 by following the trend until 2030.

(2) Questionnaire

This paper is based on two surveys, as follows.

First, a survey on the municipal officers in 918 depopulated municipalities that have lost population between 1975 and 2000 was conducted via mail in August 2008 in terms of the effect of population decline on infrastructure management. The response rate was over 50.5 percent and the distribution of responses in each population size of the municipalities was nearly the same (Note 24).

Second, a survey on choices of houses was conducted in June 2009 via the Internet. The respondents were living in Japan and aged from 20 to over 70 years old. The composition of the respondents in each cohort was segmented by every ten years of age and was the same as the overall composition of the population of Japan (Note 25).

5 Estimate of rate of vacant houses

In this research, we estimated the future rate of vacant houses. However, it is difficult to estimate the rate accurately because the amount of housing construction is determined by natural demands with increases in the number of households, economic revitalization by the government, changes in regulations such as strengthening seismic regulations and impartial dynamic distribution of demands caused by social change. Therefore, the future trend of the number of houses was given as a parameter and five patterns of sensitive analysis using the parameters were conducted on the condition of constant house demolishing during the entire period.

The formulas in the first forecast are as follows:

$$(1) R_t^v = \frac{N_t^{\text{Housing}} - N_t^{\text{Households}}}{N_t^{\text{Housing}}}$$

$$(2) N_t^{\text{Housing}} = N_{t-1}^{\text{Housing}} + C_t^{\text{Housing}}$$

$$(3) C_t^{\text{Housing}} = \alpha \times N_t^{\text{Construction}} - N_t^{\text{Demolition}}$$

where R_t^v is rate of vacant houses in period t , N_t^{Housing} is the number of houses in period t , $N_t^{\text{Households}}$ is the number of households in period t , C_t^{Housing} is the net change of the number of houses in period t , $N_t^{\text{Construction}}$ is the number of houses constructed in period t , $N_t^{\text{Demolitions}}$ is the number of houses demolished in period t , t is a positive integer and indicates a 10-year period ($t=1$ is 1978, ..., $t=10$ is 2023) and α is a parameter for analysis sensitivity ($\alpha=1$ in the case of actual data).

Five simulation patterns were prepared. The first case uses the following formula:

$$(4) N_t^{\text{Constructions}} = 1.0643 \times (N_t^{\text{Households}} - N_{t-1}^{\text{Households}}) + 4167.6, \text{ where } R^2=0.346$$

The second case assumes $N_t^{\text{Constructions}} = N_t^{\text{Demolitions}}$. In the third to fifth cases, $\alpha=1.0$ (business as usual) in the third pattern, $\alpha=0.5$ in the fourth pattern, and $\alpha=0.333$ in the fifth pattern were used. In addition, the averaged net change of the number of houses between 1992 and 2007 was given for C_t^{Housing} as a constant.

Second, the ratio between the number of houses constructed in 2008 and the possible number of houses constructed, which would keep the rate of vacant houses at the level of 2008, that is, 13.1 percent, was forecast using formulas (5) to (7).

$$(5) AR_t^{\text{Construction}} = \frac{AN_t^{\text{Constructions}}}{N_7^{\text{Constructions}}}$$

$$(6) AN_t^{\text{Constructions}} = AN_t^{\text{Housing}} - AN_{t-1}^{\text{Housing}} + N_t^{\text{Demolitions}}$$

$$(7) AN_t^{\text{Housing}} = N_t^{\text{Households}} \times (1+13.1\%)$$

where $AR_t^{\text{Construction}}$ is the possible ratio between the number of houses constructed in 2008 and the possible number of houses constructed to keep the level of the rate of vacant houses in 2008 in period t , $AN_t^{\text{Constructions}}$ is the possible number of houses constructed in period t and AN_t^{Housing} is the possible number of households in period t .

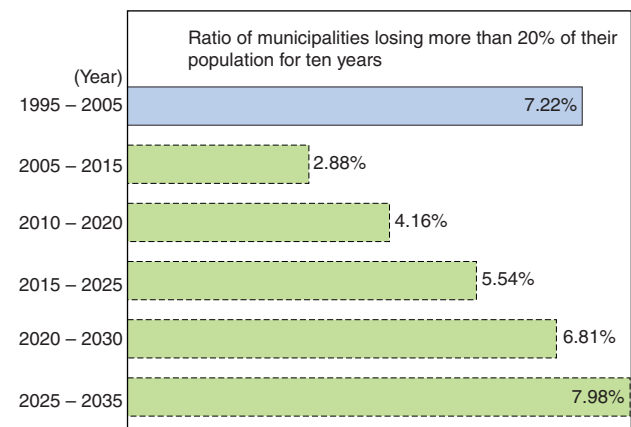
III Better and worse in Japan than in Germany

1 Results of comparison study of Germany and Japan

(1) Moderate population decline in urban areas in Japan

The population declines in the cities of Eisenhüttenstadt, Cottbus and Stendal in the previous GDR region were from 20 percent to 30 percent for only twelve years and

Figure 8. Ratio of Depopulated Municipalities



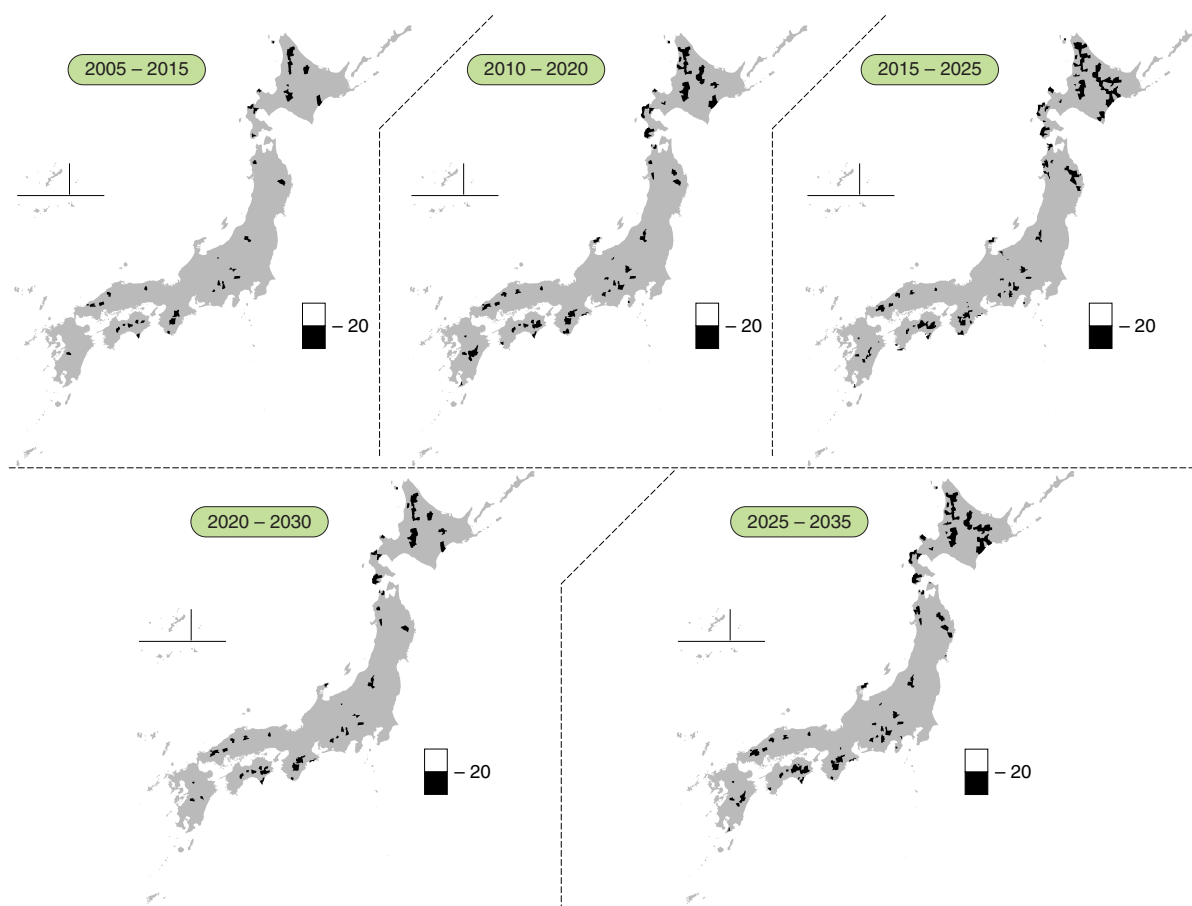
Source: National Institute of Population and Social Security Research (2008) Nihon no Shi-ku-cho-son betsu Syourai Suikei Jinkou (Heisei 20 nen 12 gatsu Suikei) [Population forecast in each municipality (Dec. 2008)], National Institute of Population and Social Security Research, Tokyo and Statistics Bureau (each year) National Census, Ministry of Internal Affairs and Communications, Tokyo.

fairly rapid (<http://www.citypopulation.de/Deutschland.html>). On the other hand, the population decline in Japan is expected to be a natural decline caused by the low fertility rate and to be slower than that in eastern Germany. In fact, the ratio of municipalities with a rate of population decline of more than 20 percent to all municipalities in Japan for each 10-year period is expected to drop from 7.2 percent between 1995 and 2005 to 2.88 percent between 2005 and 2015 and then slowly increase to 7.98 percent between 2025 and 2035 (Figure 8).

In addition, when the municipalities that are expected to lose their population by 20 percent for ten years in each 10-year period are displayed on a map of Japan, most of them are located in rural areas, particularly on islands, peninsulas and mountainous areas (Figure 9).

Accordingly, it is hard to consider that Japan will suddenly face the type of severe situation experienced in eastern Germany for the next ten years. In addition, even in the long term until 2035, it is not likely that the problems caused only by population decline on housing, land

Figure 9 Geographical Distribution of Depopulated Municipalities



Source: National Institute of Population and Social Security Research (2008) Nihon no Shi-ku-cho-son betsu Syourai Suikei Jinkou (Heisei 20 nen 12 gatsu Suikei) [Population forecast in each municipality (Dec. 2008)], National Institute of Population and Social Security Research, Tokyo and Statistics Bureau (each year) National Census, Ministry of Internal Affairs and Communications, Tokyo.

Table 1. Age Structures of Housing Stock in Japan and the Previous GDR Region

| Year of construction | Previous GDR Region | | Japan | |
|---|---------------------------------|-----------------------|---------------------------------|-----------------------|
| | Housing Stock (Thousand houses) | Ratio to total houses | Housing Stock (Thousand houses) | Ratio to total houses |
| Before 1948 (in previous GDR) Before 1950 (in Japan) | 1,705 | 23.4% | 2,316 | 5.3% |
| Between 1949-1989 (in previous GDR) Between 1951-1990 (in Japan) | 2,375 | 32.6% | 30,874 | 70.3% |
| After 1990 (in previous GDR) After 1991 (in Japan) | 380 | 5.2% | 9,650 | 22.0% |
| Others (incl. not sure of construction year) | 2,830 | 38.8% | 1,083 | 2.5% |

Sources: Glock and Häußermann (2004) and Statistics Bureau (1998) Jutaku-Tochi toukei in 1998 [Statistics of houses and land in 1998], Ministry of Internal Affairs and Communications.

use and infrastructure management would occur. The problems of population decline are expected to occur only in rural areas and small- and medium-sized cities.

(2) Structure and ages of houses

Most residential buildings before World War II in the previous GDR region were constructed using bricks and blocks. In contrast, the buildings in the GDR era were constructed using concrete blocks called “Plattenbauten.” These structures in Germany are probably easier to be demolished than the structures in Japan, which has anti-quake building standards. Actually, the average demolition cost of houses and buildings is estimated at 70 euro per square meter in Germany (Note 26). On the other hand, the average demolition cost of public housing in Japan was more than 100 euro per square meter in 2008 (Note 24), making the cost in Japan higher than that in Germany.

In terms of the age of housing stock, there are still many old houses constructed before World War II in eastern Germany, while most Japanese houses were built after World War II and 22 percent of housing has been constructed since 1991.

Accordingly, it is difficult to assume an increase in vacant houses owing to aging. Furthermore, when a vacant house needs to be demolished, more cost will be required in Japan than in eastern Germany.

(3) Rate of vacant houses

In Japan, as can be seen in Figure 10, the point combining the number of households and houses every five years between 1978 and 2003 has shifted from the lower left corner to the upper right corner. In other words, both figures have constantly increased during this period. Fur-

thermore, the increase in the number of houses has passed the increase in the number of households. This gap between the increases in the number of households and the number of houses led to the increase in the rate of vacant houses.

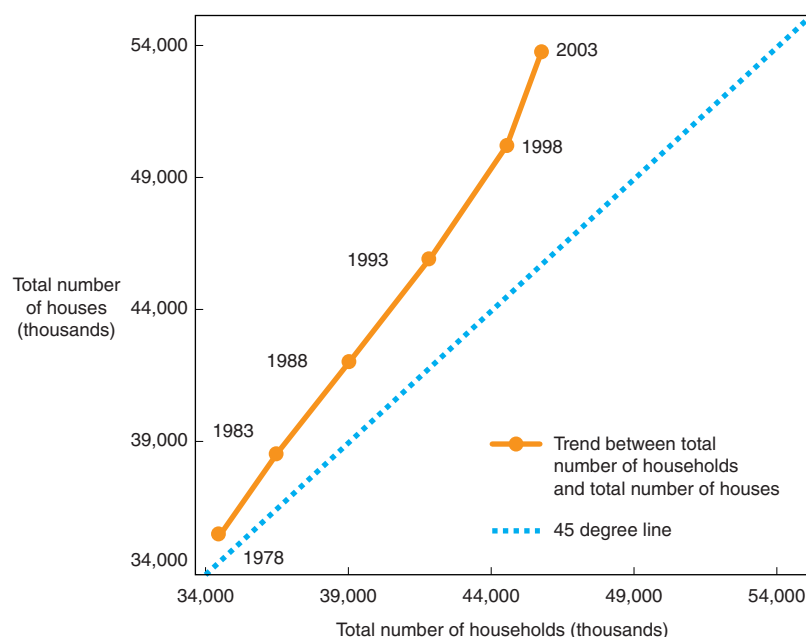
Figure 11 shows the trend of the rate of the number of vacant houses from 1953 to 2003. The rate has constantly increased since 1953 and has rapidly risen between 1998 and 2003 even though the increase in the number of households became much less than before during the same period (also see Figure 10).

It can easily be understood that the increase in the number of houses over the increase in the number of households directly results in an increase in the rate of vacant houses. Because investments for new houses after reunification in eastern Germany adversely affected the rate of vacant houses in the region, new housing construction without commensurate demolition is naturally expected to cause an increase in the rate of vacant houses. As is well known from the German experience, an increase in the rate of vacant houses is also expected to lead to urban sprawl, perforated reverse sprawl, decline in the efficiency of land use and poor infrastructure management. Accordingly, how to control the increase in the rate of vacant houses can be considered as a key point in order to prevent such negative effects from occurring.

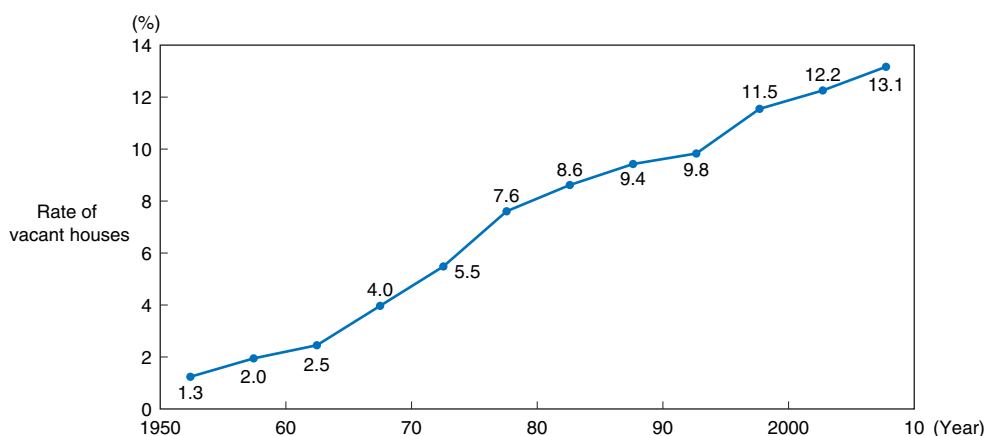
(4) Ownership of housing

More than 40 percent of houses were partially or totally owned by public housing corporations in eastern Germany (Note 26). For example, two public housing corporations, GEWI and EWG, owned and managed all houses in the new town area in Eisenhüttenstadt constructed during the GDR era (Note 3). In other cases,

Figure 10. Relationship between the Number of Total Households and Total Houses



Source: Number of households is taken from the Basic Survey of National Life in each year. The number of houses is taken from the Statistics of Houses and Lands in each year.

Figure 11. Time Series Data of Rate of Vacant Houses

Source: Ministry of Internal Affairs and Telecommunications (every five years), Houses and Land Survey in each year.

Table 2. Ownership Structure of Houses in Japan

| | Detached houses | Tenement or row house | Apartment buildings | Others |
|-------------------------------|-----------------|-----------------------|---------------------|-------------|
| Privately owned houses | 52.5% | 0.8% | 8.9% | 0.1% |
| Publicly owned rental houses | 0.1% | 0.7% | 6.3% | 0.0% |
| Privately owned rental houses | 4.1% | 1.4% | 24.9% | 0.0% |
| Total | 56.7% | 2.9% | 40.1% | 0.1% |
| Grand total | | | | 100% |

Source: Statistics Bureau (2003) Joutaku Tochi Toukei Chousa, Ministry of Internal Affairs and Communications.

SW GmbH owned and managed all houses in the old town of Stendal (Note 27) and 18 percent of houses were owned by WOBA in Dresden (Note 28).

In contrast, public entities and public housing corporations have owned only 7.0 percent of the houses in Japan (Table 2) and 60 percent of all housing stock consists of privately owned houses. Accordingly, the ownership of houses is rather spread out in Japan. In addition, collective houses make up only 40 percent of all housing stock and the others are independently standing houses. Consequently, when governments intend to engage in demolition in order to solve a rate of vacant housing that is too high, they will have to negotiate with the individual owners of private houses in the future.

Even in the case of Germany, demolitions in eastern Germany have been mostly in new towns where house ownership was concentrated in public housing corporations (refer to the Leipzig case). On the other hand, the dispersion of housing ownership will continue in the future in Japan so that the demolition of vacant houses will probably become rare and be limited to special cases.

(5) Lack of demolition promotion

Several types of subsidies were used to promote the demolition of vacant houses in eastern Germany from the structure fund of the European Union, the federal government of Germany, state governments in Germany

and each municipality (Note 26). On the other hand, although Japan faces a higher rate of vacant houses, no subsidies or financial support for individuals are available for promoting the demolition of vacant houses. This is in contrast to the existence of a public system for supporting the liquidation of vacant land, the so-called Yu Kyu Tochi Seido (vacant land reuse promotion system), which is regulated by articles 28 to 35 of the National Land Use Act and Tochi Katsuyo Bank (Land reuse promotion bank system). Even for public housing and infrastructure owned by local governments, there are no subsidies for demolition after they are no longer useful. Consequently, the demolition of government-owned properties is also constrained by budget; vacant public facilities often remain as is (Table 3).

(6) Regenerating vacant lands

The trend in the amount and area of vacant land owned by individuals and private companies is shown in Figure 12. The amount of vacant land increased between 1998 and 2003. Vacant areas owned by private companies increased during the same period, while areas owned by individuals decreased. This suggests that fractioned lands owned by individuals are more likely to become vacant.

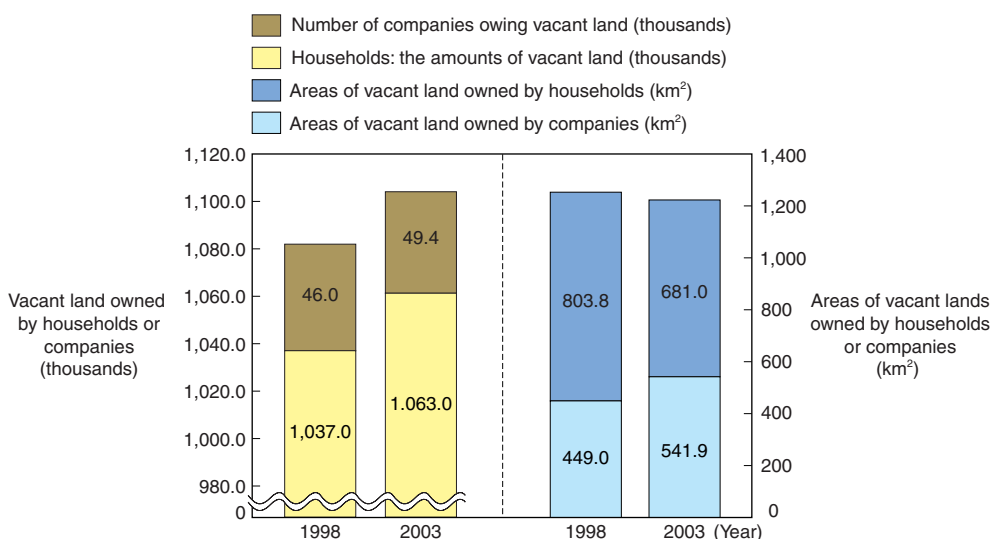
Between 1998 and 2003, the reuse of vacant land did not progress, while the population and the number of households did increase, as can be seen in Figure 1 and

Table 3. Situation of Surplus/Vacant/Abandoned Infrastructure in Municipalities in Japan

| | Total responses | Overcapacity | Rate of occurrence of overcapacity | Derelict infrastructure owing to lack of funds | Rate of dereliction |
|---|-----------------|--------------|------------------------------------|--|---------------------|
| | a | b | b/a | c | c/a |
| Education | 464 | 362 | 78.0% | 93 | 25.7% |
| Public housing | 457 | 88 | 19.3% | 21 | 23.9% |
| Life support facilities | 459 | 74 | 16.1% | 28 | 37.8% |
| Water supply and waste-water management | 464 | 17 | 3.7% | 2 | 11.8% |
| Transport | 129 | 8 | 6.2% | 2 | 25.0% |
| Roads | 464 | 2 | 0.4% | 0 | 0.0% |

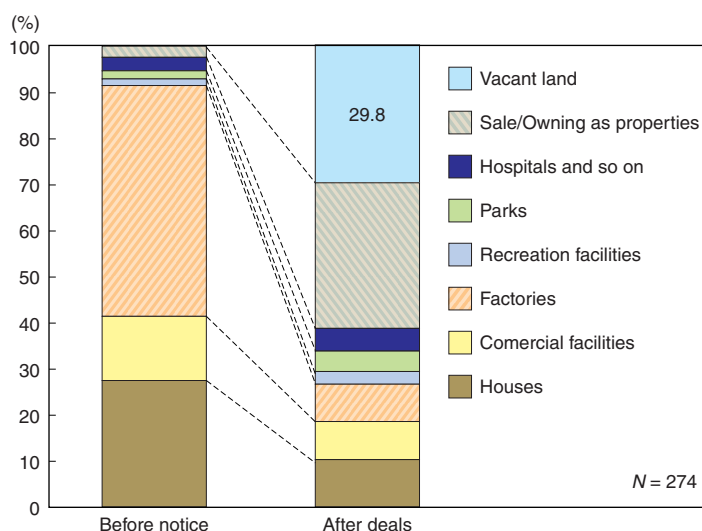
Source: Nomura Research Institute (2008).

Figure 12. Comparison of the Amount of and Area of Vacant Land



Sources: Table 47-1 and Table 47-2 of Tochi Kihon Toukei in 1998, Table 47-1 and Table 47-2 of Tochi Kihon Toukei in 2003, Table 44-1 and Table 44-2 of Houjin Tochi Kihon Chousa in 1998, and Table 71 and Table 75 of Houjin Tochi Kihon Chousa in 2003.

Figure 13. Progress of Reuse or Resale of Vacant Land under the Institution of Vacant Land



Original source: Ministry of Land, Infrastructure and Transport, Department of Land and Water Resources, (no information about year) Yukyu Tochi Jittai Chosa. (Jan. 2005)

Source: Kokudo Shingikai Tochi Seisaku Bunkakai Kikaku Bukai, Tei/Mi Riyouchi Taisaku Kentou Sho linkai, Chuukan Torimatome, Sankou Shiryou (Heisei 18 nen 7 Gatsu), (available on May 27, 2009. http://tochi.mlit.go.jp/pdf/02/06/sankou_shiryou.pdf).

Figure 2. Greater delay in the reuse of vacant lands is likely in a depopulated society in which the demand for land is reduced.

Yukyu Tochi Seido (vacant land reuse promotion system) offers an advisory system by prefectural governments for owners of certain larger areas and who satisfy the location conditions of vacant land in order to promote their reuse. Even in cases subject to this system, 29.8 percent of vacant land has remained vacant (Figure 13). Accordingly, not only eastern Germany but also Japan now similarly faces the hard task of reusing vacant land.

(7) Rethinking urban design

Stendal and Eisenhüttenstadt, cities in the previous GDR, made their urban areas so they would be mono-centrally compact. In contrast, Leipzig has experienced perforation caused by many demolitions in urban areas. Similarly, in Japan, the cities of Aomori and Kagoshima also aimed at a mono-centric type of compact city while the city of Toyama moved to a disintegrated type of compact city (Notes 29, 30). Perforation is also observed in some cities as well, such as the city of Okayama (Note 31). The actual types of urban shrinkage depend on the original urban structure; however, we can observe several routes of urban shrinkage in both Germany and Japan.

(8) Summary

A summary of the comparison study between Germany and Japan is shown in Table 4. The pace of population decline, the physical and age structure of housing, ownership of houses and social system of promoting demolition shows the contrasts between Germany and Japan, while the increase in the number of houses against population decline, the difficulty of redeveloping vacant land

and properties, the perforation and the compactization of urban areas are similar in both countries.

Figure 14 shows the effects of these differences between Germany and Japan on the possibility of the occurrence of related problems of population decline in Japan in addition to a summary of the comparison study results.

The differences in the causes of population decline is expected to mitigate the effects of population decline because natural decline may cause slow and moderate population decline and government agencies will probably be able to cope with the social effects of population decline before they become more severe.

In terms of housing structure, the features of Japanese housing are that they are younger and more able to cope with disaster. This suggests that more money may be required for demolition. The scattered ownership of housing in Japan is also likely to cost much more, both in regulatory costs and financial costs of either reorganizing ownership or compensating owners of houses if the government would demolish vacant houses. In addition, the large investment for housing construction over an increase in the number of households would probably exacerbate the problem of vacant houses. In this way, the factors related to houses will make the situation much worse. In particular, the increase in the number of houses over the increase in the number of households is a key element in managing this situation under the constraint that the age of the houses and their durability cannot be changed in Japan. The reorganization of ownership is also difficult work and will require a long time.

Finally, the redevelopment of brownfields is considerably difficult work both in Germany and in Japan. The phenomena caused by population decline observed in urban areas are also similar in both countries. Accordingly, the effects on land use of population decline cannot produce the differences between Japan and Germany.

Table 4. Summary of Comparison Study between Eastern Germany and Japan

| | | Previous GDR regions | Comparison | Japan |
|----------------------------|---------------------------------|---|------------|---|
| Social context | 1. Causes of population decline | Rapid population decline owing to domestic social migration from the east to the west after reunification | Different | Moderate nationwide natural population decline |
| | 2. Housing structure | Aged housing and huge number of Plattenbauten | Different | Relatively new houses and strong structures built to withstand earthquakes |
| | 3. Housing investment | Boom of new housing construction after reunification relevant to 10 percent of housing stock | Similar | Continuous increase in the number of houses against a slowing of the increase in the number of households |
| | 4. Housing ownership | Collectively owned houses | Different | Dispersively, mainly privately owned houses |
| Corrective measures | 1. Social institutions | Policies such as subsidies and citizen's charter supporting demolition of vacant buildings | Different | No policies supporting demolition even for publicly owned housing |
| | 2. Land use | Delay in reusing brownfields after demolition | Similar | Delay in reusing brownfields after demolition |
| | 3. Urban design | Perforated and compactized urban areas | Similar | Perforated and compactized urban areas |

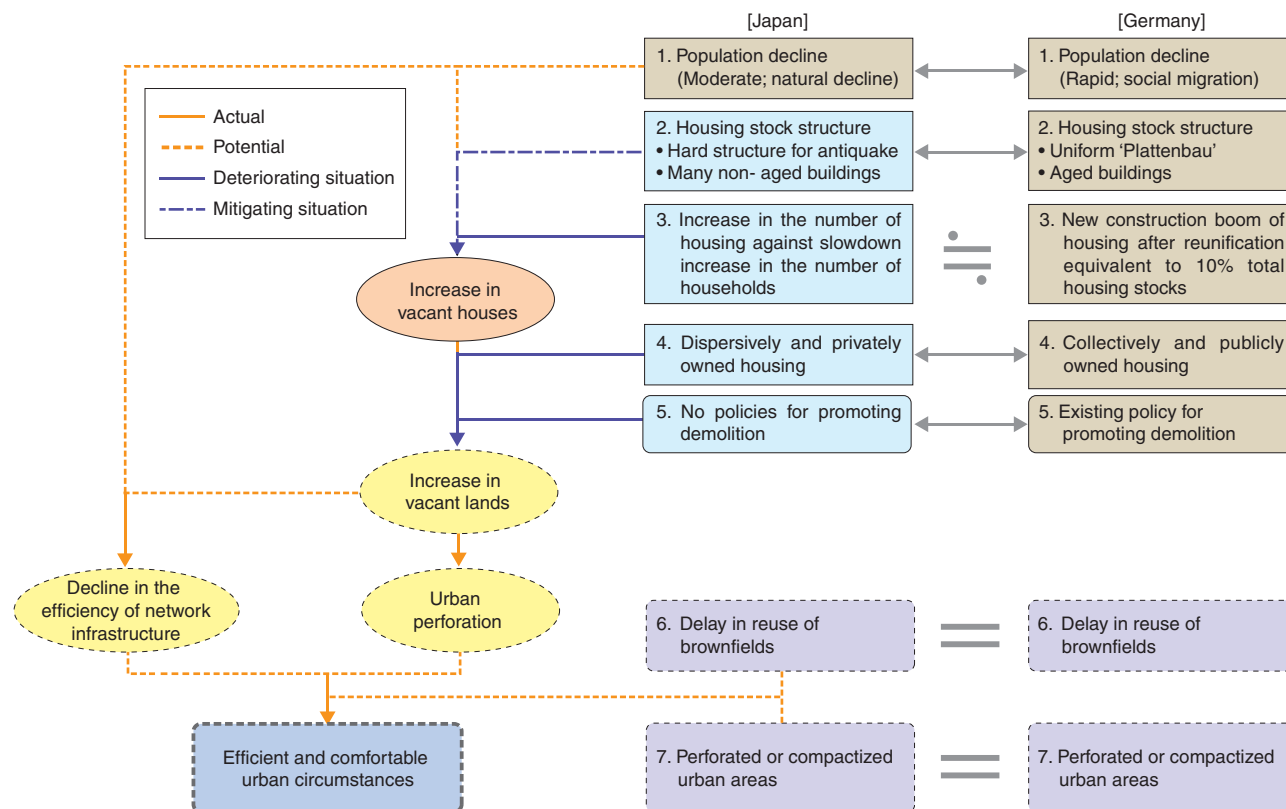
In summary, population decline itself might not cause a more severe situation in Japan compared with the experience in Germany. The future trend in the number of houses will, however, possibly cause the situation to become more severe. The forecast of the rate of vacant houses will be reviewed in the next section in order to discuss the extent of the seriousness of the effects of population decline in Japan in case the current trend continues in the future.

2 Estimation of rate of vacant houses in Japan up to 2040

Figure 15 shows the results of forecasting the rate of vacant houses.

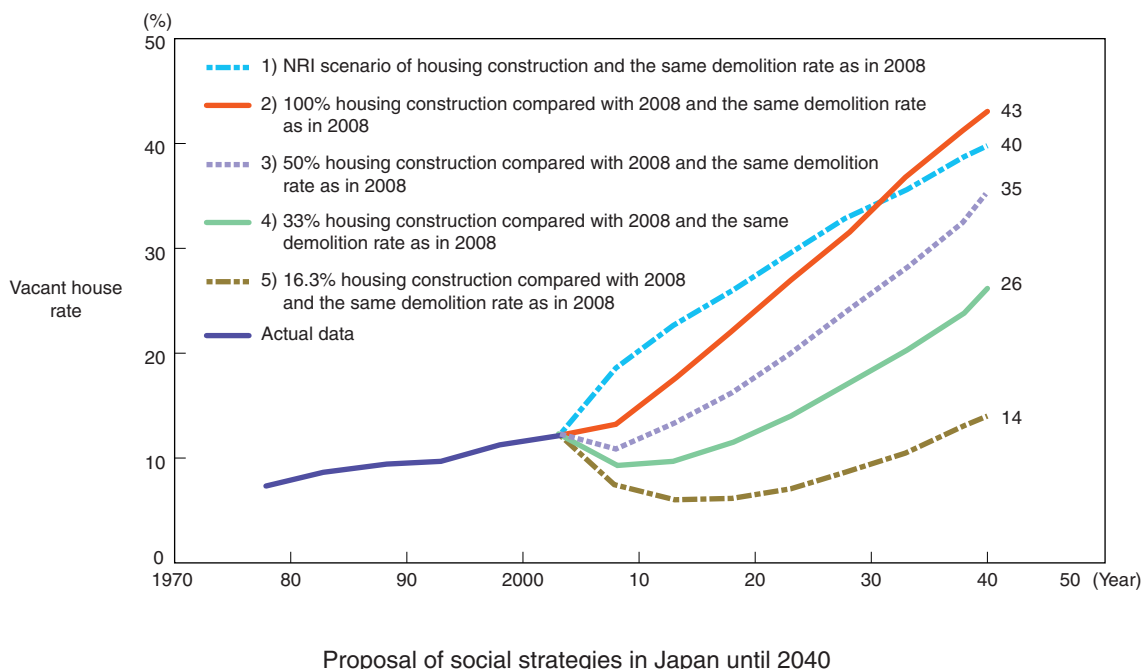
Given that the same net current increase in the number of houses could be sustained (Pattern 2), the rate of vacant houses in 2040 in Japan is expected to be over 40 percent. If the number of houses constructed is halved to

Figure 14. Comparison of the Factors Affecting the Process of the Effects of Population Decline in Japan and in Germany



Note: Brownfield means land that was once used for factories, housing and so on.

Figure 15. Estimation Results of the Trend of Vacant House Rate



what it is at present and the number of demolitions remains the same, the rate of vacant houses in 2040 (Pattern 3) is expected to be over 30 percent. Moreover, even in the most ideal case, that is, forecast pattern 5, the rate of vacant houses is likely to reach 20 percent. With reference to the German experience, these estimation results suggest that Japan will face severe problems related to vacant houses in almost half of the country.

Indeed, the market mechanism can also be expected to control an increase in the rate of vacant houses by resulting in a large number of demolitions and lowering the rate of vacant houses, but such a mechanism worked poorly in eastern Germany. Rather, a decline in the growth of the number of households might possibly pull down the supply of houses based on the fact that the number of new house constructions in June in 2008 was 32.4 percent less than that in 2007.

Of course, the housing supply is not only decided by demand but also by other factors such as economic revitalization, so that it is too much to expect that the market can adjust the housing supply and demand perfectly. In addition, the places where new houses are constructed is another significant point even if the market mechanism can restrain excessive construction. Still, in this case, urban sprawl might occur and result in the expansion of unplanned urban areas and perforation in urban areas. These unexpected situations will also lead to an increase in the total social cost against population decline.

IV Possible actions to be taken in Japan up to 2040

1 The cause of housing vacancies

In order to formulate appropriate policies to cope with increases in the rate of vacant houses, the amount of

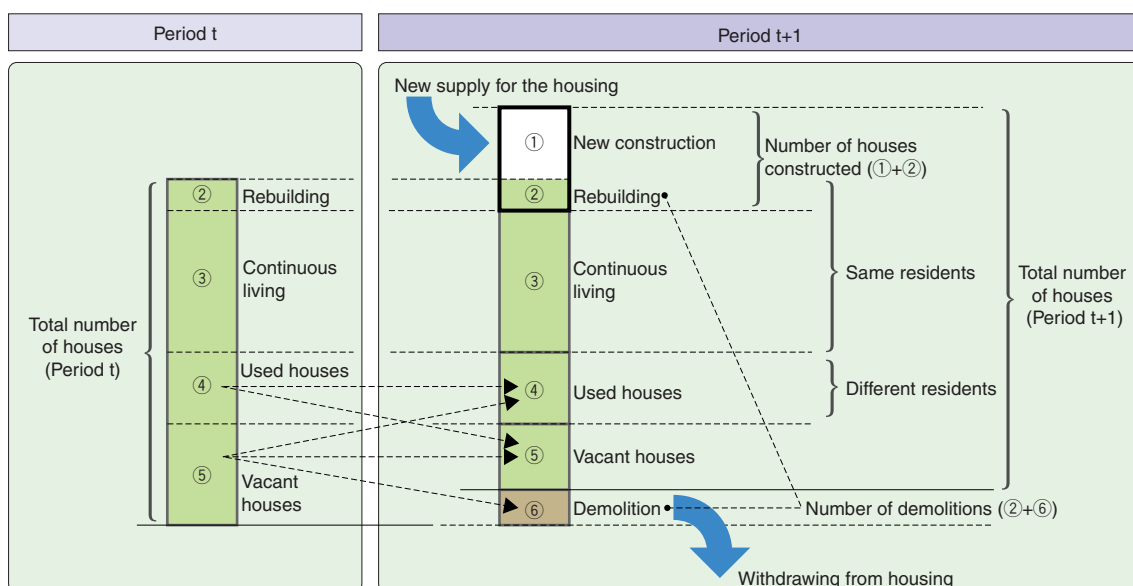
vacant land and so on, it is of utmost importance to understand how the composition of the housing market such as new construction, rebuilding, secondary residences, vacant houses and so on shifts annually.

The makeup of the housing market is divided into six parts: new construction, rebuilding, continuous residences, secondary residences, vacant houses and demolished houses (Figure 16). The definition of terms is that new construction is housing construction on land developed for new houses; rebuilding is housing construction by the same owners on the same land where previous houses were located; the difference between vacant houses and secondary residences is that the former assumes a change of residents between period t and period $t+1$ and the later assumes no resident. The statistics of housing construction include information on new construction and rebuilding and the statistics of demolition include information on rebuilding and demolition. The vacant houses in period $t+1$ are the differences between the total number of houses and the subtotal of both new construction, continuous habitation and secondary residences. The rate of vacant houses can also be considered as the number of vacant houses divided by the total number of houses.

In this paper, there is no special consideration given to rebuilding and continuous habitation because they have no relation with the net change of the total number of houses and the demolition of houses. Of course, continuous habitation sometimes produces another type of social problem such as an increase in social costs due to houses located in an area of high social cost such as a flood plain in the context of population decline. This will be discussed in the following sections on land use regulations and urban planning.

New construction can scarcely be reduced to zero when the population and the number of households decline. To consider the reason for this, let us assume the

Figure 16. Conceptual Model of the Transition of Residences in the Housing Market



following situation. Elderly people move to a region where abundant medical services are available for aged people. Of course, houses where the elderly can live should be prepared in this area. Hospitals and care facilities sometimes provide accommodations for these people but often existing houses are considered as sufficient accommodation.

If there are no suitable houses for the elderly, such houses will have to be constructed or existing houses refurbished. Existing vacant houses in the area provide the possibility of renovation or rebuilding. This suggests that the relationship between new construction and secondary residences somehow have a partial trade-off relationship with each other.

In another case, a used house, in which somebody lived during period t , might become vacant in period $t+1$ due to social economic obsolescence (e.g., redundant space caused by children growing up) and moving from the house. After moving, when the owner refurbishes the house in accordance with demands, the house will most likely be used as a used house in period $t+1$. Even in the case that the owner refurbishes the vacant house in period t , the vacant house might be used as a used house in the next period. In contrast, if the house is too old to be used, it will be removed and can be considered as demolished in period $t+1$. In this way, whether a used house becomes vacant depends on continuous investments by the owners in maintaining their house (Figure 16).

Based on the above-mentioned structural change of housing stock, it is important to reduce the gap between new construction and house demolition in period $t+1$ in order to prevent problems with the vacant house from developing. In particular, taking the decline in the number of households into consideration, it is expected that subtracting the number of demolitions from the number of new houses constructed should be negative in the future. The following three ways can be considered in order to achieve a net decline in the number of houses.

- (1) Lessen the number of new houses constructed as much as possible (restraining from constructing new houses)
- (2) Enlarge the number of demolitions as much as possible (promoting demolition of houses wherever necessary)
- (3) Lessen the gap between new house construction and house demolition (controlling the net increase in the number of houses)

The differences between (1), (2) and (3) is the point that, on the one hand, (1) and (2) consider new construction and demolition separately; on the other hand, (3) considers both to be related. Of course, the combination of (1) and (2) is similar to (3), but the method of actualizing (3) is not necessarily the same as ways (1) and (2).

Indeed, simply regulating new housing construction is one of the ways of restraining the construction of new

houses, but the refurbishing, rebuilding and liquidating of existing houses such as vacant houses and used houses can be considered another path. On the other hand, promoting demolition and attracting demolition can be considered as ways for increasing demolitions. The assumed promotion policies of demolition should include subsidies for demolition, introducing excess taxes on vacant properties and inadequate buildings and assembling the scattered ownership of vacant houses.

The third way expected to control the net increase in the number of houses is to combine both the policy for restraining new housing construction and promoting the demolition of houses. In the case of indirect linkage between both, it might be impossible to actually restrain a net increase or net decline in the number of houses. The policy regarding the number of houses as a control variable is the cap and trade system on the number of houses. This measure is expected to cause significant social impact, so it is only expected to be introduced if other measures don't work sufficiently, the rate of vacant houses increases to an extreme and causes severe social problems and government agencies can understand how to cope with those problems as quickly as possible.

Not only measures controlling the number of houses, but also solutions considering the location of vacant houses are important. The problems of vacant houses lead to a decline in the efficiency of land use and infrastructure usage and also magnify related social problems. Even if the net increase in the number of houses can be controlled, the risk of reducing the efficiency of land use and infrastructure usage still remains on the location of urban sprawl. The possibility of adversely affecting the financial situation of municipalities caused by the expansion of urban areas in a depopulating society has already been pointed out. In addition, the social cost of infrastructure management in sprawling urban areas is greater than that in well-planned urban areas in depopulating societies (Note 31). In order to avoid the increases in social costs that accompany future problems with vacant housing, not only controlling the net increase in the number of houses, but also reorganizing and integrating housing locations is necessary (Figure 17).

2 Restraining construction of new housing

Even in a depopulated society, it is impractical to think that new construction will be prohibited in order to adjust the gap between the changes in demand for houses with migration, aging and an increase in the number of households and the stock of existing houses even in a society with a declining number of households. However, regulations for the location of new houses should be introduced in order to improve the expectedly declining efficiency of infrastructure and land use. This is not a policy for housing, but for matters regarding land regulation or urban planning.

In contrast, there are numerous policies to promote the utilization of used houses. For instance, the central government has increased the tax exemption for loans to purchase used houses. Municipalities have promoted the use of vacant houses for providing services in small and multi-functional care for the aged in houses. Private companies have also provided services utilizing used or vacant houses such as “Shinchiku Sokkurisan (Sumitomo Realty and Development Co. Ltd.), “Ever loop (Sekisui House Ltd.)” and “A, la, ie (Tokyu Corporation).” In particular, Tokyu Corporation renovated houses along the Tokyu lines from which the elderly moved out and rented or sold the renovated houses to young families. This service aims at eliminating the gap between housing supply and demand in the region (Note 32).

Not only such government policies and private services, but also residents have changed their minds as to what they choose as their home. Almost half of the respondents answered positively regarding the possibility of choosing used houses as their homes (Table 5).

Indeed, the answer could be considered obvious, but it is necessary to ask the respondents who choose new houses as their home at this moment to also consider used houses in order to increase the choices of used houses as a home in the future. Those who preferred new houses have a more negative image of a used house

because of possible structural deterioration, disagreeable because of the actions of former residents, unappealing equipment, view and floor plan than those who live in used houses (Figure 18). It is difficult to eradicate the subjectively negative image of disagreeability, concerns about the deterioration of structure and equipment, view and floor plan even when the house has been improved by reinforcement and renovation.

In the future, the transparency of the compliance situation for construction regulations such as anti-earthquake measures, third-party assessment and certification for disaster risks, adjustments of insurance costs and introduction of tax incentives for used houses is required in order to promote living in used houses. These housing policies are expected to contribute to not only sustaining the efficiency of land use and infrastructure usage, but also corresponding to global warming issues, coping with disasters and improving the quality of houses in Japan in the 21st century.

3 Promoting demolition of vacant housing

(1) Methods of promoting the demolition of vacant housing

There are two methods of promoting the demolition of vacant houses. The first is to temporarily withdraw

Figure 17. Policy Ideas to Cope with Problems of Increases in the Rate of Vacant Houses

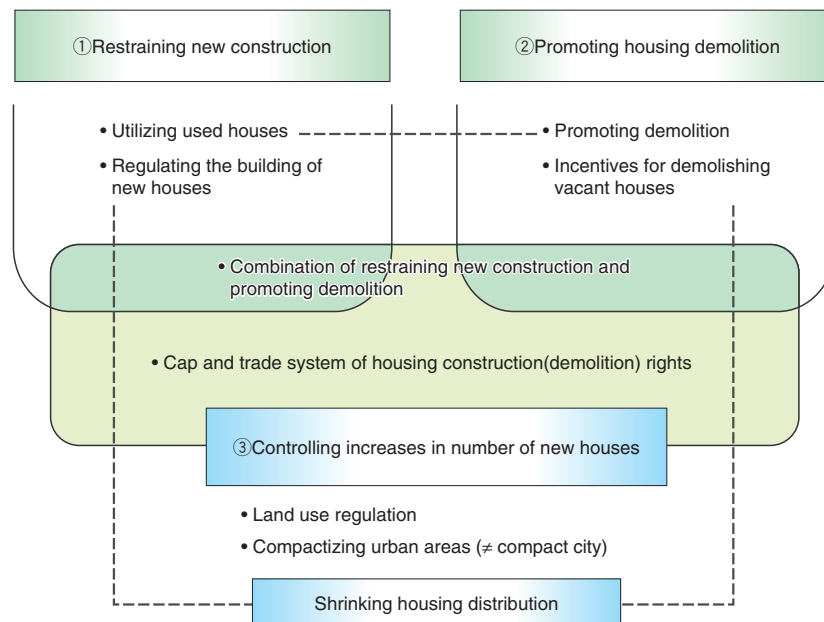
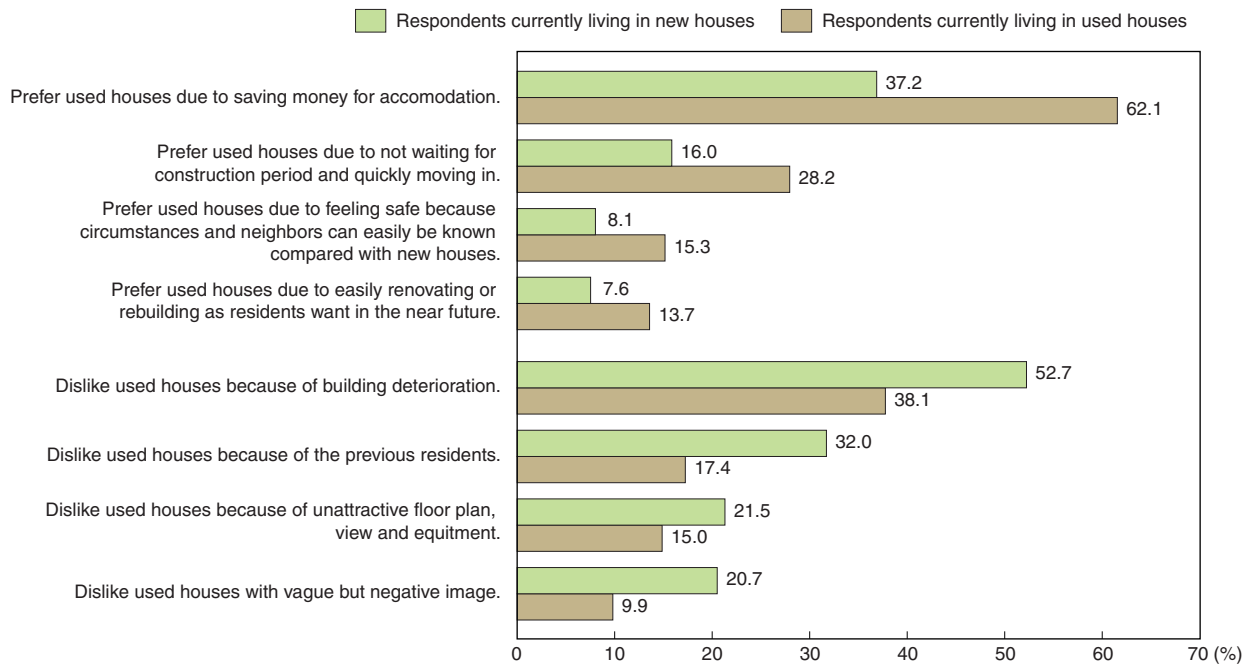


Table 5. Actual Choices of Types of Houses

| N = 851 | Owned houses | Rented houses | Subtotal |
|-------------------|--------------|---------------|----------|
| Newly constructed | 44.7% | 7.9% | 52.6% |
| Used | 20.1% | 27.4% | 47.5% |
| Subtotal | 64.8% | 35.3% | 100.0% |

Note: This survey was conducted of those who plan to move. They were asked which type of house (owner-occupied or rental, new or used) they preferred. Source: Nomura Research Institute (2009) Survey on choosing type of house.

Figure 18. Images of Secondary Housing

Source: Nomura Research Institute (2009) Survey on choosing the type of houses for living.

vacant houses from the housing market (①). The second is demolition of vacant houses. Demolition can also be divided into two types, direct demolition and indirect demolition. Direct demolition is further subdivided in two ways as well, demolition either by the original owners (②) or by an owner who buys vacant houses earmarked for demolition (③). Indirect demolition is supposed as using an economic incentive or disincentive for demolition (④). Details of this method are explained in the following section.

① Introduction of the “Sleeping beauty” policy

The “Sleeping beauty” policy is the idea of not demolishing vacant houses, but temporarily withdrawing them from the market. The windows and doors are closed and locked and walls painted in order to prevent vandalism and not harm the landscapes until such vacant houses are once again required. This policy can hardly be applied to wooden houses but is useful for aged concrete houses stacking up in the housing market because of the low liquidity of the property market (Note 33).

② Subsidies for demolitions

As introduced in “Stadtumbau Ost” by the federal and state governments of Germany, subsidies for aged houses and houses inadequately satisfying regulations are common ways to give owners incentives to remove them. The financial resources for the subsidies become challenging but the process can be considered to remove privately owned vacant houses effectively.

③ Accumulating ownership of the properties

Normally, owners of vacant properties don’t want to sell their properties because they expect that the price of

land will rise in the future even in the condition of remarkable depopulation. In eastern Germany, which is famous for its success in the demolition of vacant houses, public housing corporations, which traditionally own most of the houses in the region in the GDR era, played a significant role in removing vacant houses and greening the land after demolition. The ownership of houses in Japan is relatively dispersed and reorganization of house ownership can be considered the first step in demolishing and/or rearranging vacant houses. The “city block trust” proposed by Uemura and Uto (Note 32) is one of the ways of separating the ownership and use of houses and to actualize their long-term area management in Japan.

When reorganizing residential areas where the ownership is relatively dispersed, the ability for long-term management of the areas and sufficient finance of the entity are necessary. The desired entities are public housing corporations, public land corporations, private developers, housing construction companies and so on. These entities usually have the necessary experience of housing management, land management and urban redevelopment. In addition, the opportunities to acquire vacant properties can be considered as chances for business because new housing developments are expected to decline in a depopulating society.

Actually, the Urban Renaissance Agency (Note 34), which was previously a kind of Public Housing Corporation, started to support urban regeneration projects such as regeneration of housing complexes. Other local public housing corporations owned by local governments are also expected to not only demolish their own aging houses, but also to obtain and remove private vacant houses in the region.

Recently, local public housing corporations have been considered as being in the traditional role of supplying good quality, good rental housing for low-income people. A discussion of privatizing them has also been seen (Note 35) because the number of households is becoming saturated and the owners of private properties now supply relatively higher quality rental housing than before. In contrast, the demolition of vacant private houses involves complicated tasks and public participation is sometimes required to resolve the situation of an inventory of vacant houses. Accordingly, the role of local public housing corporations should be reviewed in accordance with the coming depopulated society.

④ Enforcing charges on vacant properties

It can be considered that the key solution to demolishing a huge number of vacant houses and to reuse the vacant land is to increase the cost of owning vacant property. For this, it is necessary to add the status of property use to the tax bases of property tax (Note 23).

This type of policy, named the vacant land tax, was discussed in 1975 in order to introduce it as a local discretionary tax (Note 36). At that time, the previous Ministry of Internal Affairs officially answered in the Diet that there was a possibility that a tax on vacant land might be doubled for vacant properties based on the existence of the property tax. It simultaneously answered that there might be room for introducing it in the case that the government could justify the theory that this avoided duplicate taxation. This was stated by Mr. Iwami who had been working for the previous Ministry of Internal Affairs (Note 36). There is, therefore, a possibility that a vacant land tax system could still be introduced now.

A property tax system based on the status of land use has proved to promote the use of vacant lands by economic model analysis and it has been confirmed that the tax system also has limited effects on a decline in land prices under certain conditions (Note 37).

It is necessary to conduct further analysis of an actual system design and implementation but just facing the

growing number of vacant properties now is an apropos time to seriously discuss such a vacant land tax system again.

(2) Incentives for demolishing vacant houses

Demolition of either vacant houses, aged houses or houses inadequately meeting current regulations might also depend on the benefits of the redevelopment of vacant houses. The various types of redeveloping vacant land can be considered in view of regional conditions (Table 6). Note that typical sorts of use, such as constructing new houses, parking spaces and so on are omitted from the table.

① Greening

There are various types of greening from temporal greening such as open spaces with simple vegetation and allotment gardens to permanent greening such as urban forests and agricultural fields of crops for biofuel (Note 38). Urban agriculture has also been suggested as a possible use for land after urban shrinkage in Japan (Note 39).

The number of fatalities due to the aging population and the demand for tombs are also expected to increase. In general, a memorial park is considered a nuisance in Japan and neighbors don't always welcome such developments. To mitigate the resistance from neighbors, it is possible that vacant land located on the periphery of urban areas could be converted to memorial parks dubbed "Jumoku-Sou," which use trees as tombs (Notes 40, 41). The Tokyo Metropolitan Government and the City of Yokohama have already introduced the idea of a Jumoku-Sou type of memorial park named "Memorial Green," "Shou Kukaku Syuukei Bochi [Small cell tomb harmonizing landscape]," "Jyurin Bochi [Forest tomb]" and "Jyumoku Bochi [Trees tomb]." In these ideas, Yokohama has already implemented Memorial Greens (Note 42).

Greening usually leads to an increase in land prices of commercial facilities and residential areas within 100 m

Table 6. Possibilities for Land Reuse after Demolition

| Size of vacant land | City center | Periphery |
|---------------------|---|--|
| Large area | <ul style="list-style-type: none"> • Parks and green fields • Areas for drainage into the ground (Possible conventional redevelopment) | <ul style="list-style-type: none"> • Parks, green fields, neighborhood produce gardens • Graveyards with memorial trees • Agricultural fields for biofuel • Urban forests • Sites for electric power generators using renewable energy, such as solar, wind and so on to regional grid system |
| Small area | <ul style="list-style-type: none"> • Parks and green fields • Areas for drainage into the ground • Parking spaces for car pooling • Shared facilities, such as batteries in segmented grid system for housing and small buildings • Battery charging points for electric vehicles • Art exhibition spaces | <ul style="list-style-type: none"> • Parks, green fields, neighborhood produce gardens • Parking spaces for car pooling |

or 200 m (Notes 43, 44, 45). Land prices tend to fall in depopulated societies and proper greening in the region is expected to help sustain land prices.

② Measures for urban disasters

Some Japanese cities have recently suffered from sudden heavy raining. The vacant land in the city might be useful to cope with such type of rain, that is, vacant land could be converted to penetrable areas for the water to sink into the ground. The soil is changed to highly penetrable soil and the altitude becomes less than surrounding areas.

This change enables rainwater overflow to enter the penetration areas and go into the ground. In addition, greening of the fields can enhance the ability to evaporate the water on the surface through the vegetation. Formerly, rice fields in or near urban areas served the same function but vacant land is expected to play such a role in a depopulated society.

③ Use for parking vehicles

A typical use of small vacant land is coin-operated parking spaces. Leipzig, however, introduced a car-sharing system using such small areas of vacant land in urban areas (Figure 19). Several spots were developed using the land vacated after housing demolition.

Car-sharing has spread in Japan as well resulting from previously severe increases in gasoline prices and changing consumer consciousness. Orix, Park24, Gulliver International Co., Ltd., JR-East Rent-a-lease, Car-sharing Japan, and so on have entered this business field (Note 46). The similar use of vacant land in Japan as in Leipzig is likely to be seen in the near future.

④ Renewable energy power generators and microgrids

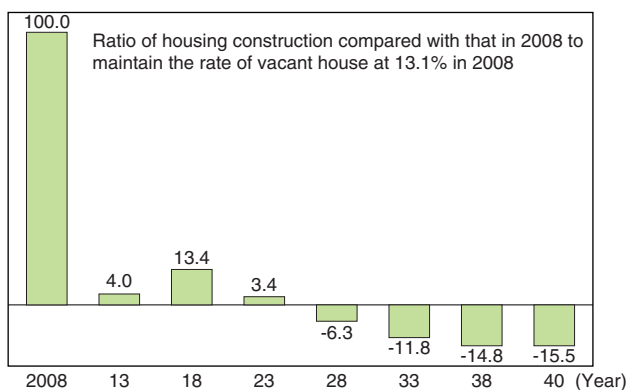
Promoting microgrids for electricity distribution is also being discussed in Japan. A field test of a microgrid for 533 houses in “Gunma ken Oota shi Jyousai no Mori” [“Jyou-sai no Mori” in the city of Oota in Gunma Prefecture] has already been conducted (Note 47). In another case, a cogeneration system for four or ten individual houses using electricity, heat and hot water supported by a fuel cell consuming gas through a reforming machine has been tried (Note 48). These tested microgrids require common facilities such as a capacitor depending on the system structure. Vacant land can be considered as a reasonable space for such common facilities in a local microgrid.

In addition, once plug-in hybrid cars and electric vehicles become common, batteries charged with electricity, which is generated by renewable energy resources such as solar power, wind power, and so on, will be used for other purposes but also automobiles. In such an era, vacant land and abandoned gas stations in the city can be used as battery recharging points for such vehicles.

Figure 19. Parking Spaces for Car-sharing



Figure 20. Enabling Construction of Houses to Maintain the Rate of Vacant Houses



Electric vehicles don't need any more gasoline but need electricity so that we must develop more electric power generators, which will substitute for gas consumption. In order to achieve a low-carbon consumption society to help prevent global warming, renewable energy should be increasingly developed. To accomplish this, large amounts of vacant land around cities will probably provide enough space to develop either solar or small wind-driven power plants.

4. Controlling the net increase in the total number of houses

(1) Necessity of combining both restraining new house construction and promoting demolitions

In order to maintain a rate of vacant houses, that is, 13.1 percent, in 2008 by only restraining new construction (excluding replacement), only 4 percent of new house construction in 2008 is expected to be allowed in 2013. After 2028, the estimated number is negative, meaning that no new construction would be allowed in 2028 (Figure 21).

On the other hand, according to the sensitivity analysis that the future number of new houses constructed is based on NRI's scenario (Note 49) and the amount of demolition is controlled to a 0 percent

Figure 21. Results of Sensitive Analysis of Rate of Vacant Houses by Extending Demolition

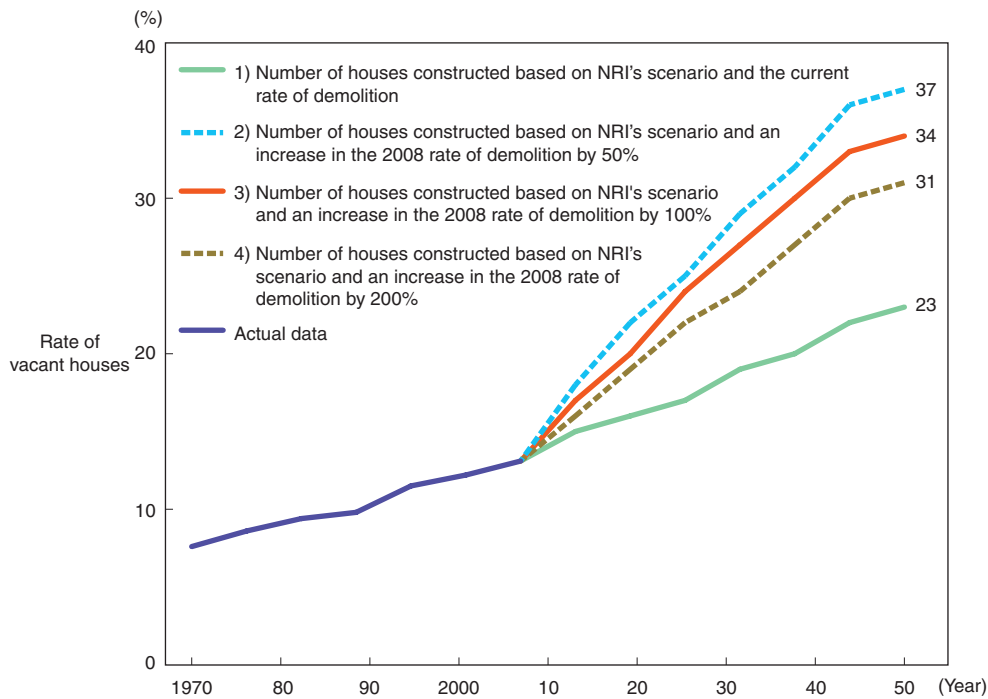
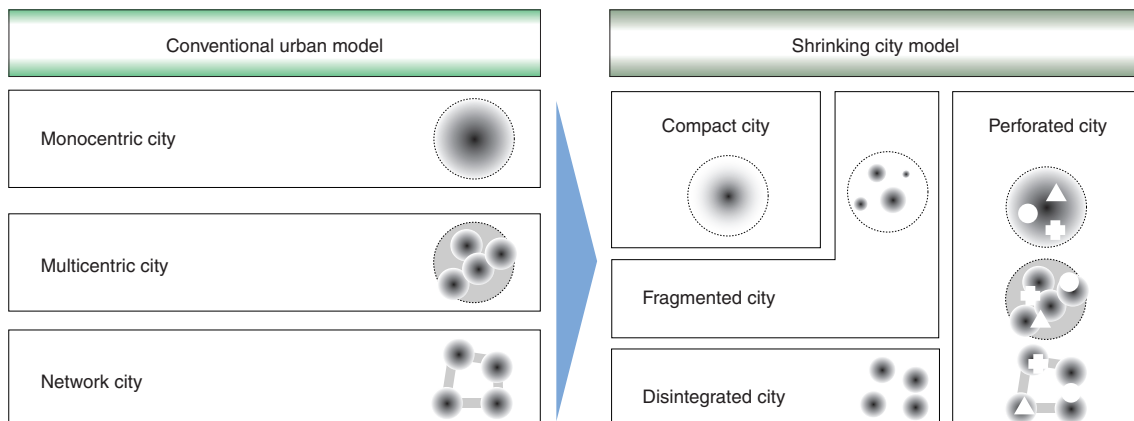


Figure 22. Comparison between Conventional Urban Models and Shrinking City Models



increase, 50 percent increase, 100 percent increase (twice as much) and 200 percent (three times as much) as that in 2008, the pace of demolition becomes three times greater than business as usual in order to lower the rate of vacant houses to 30 percent in 2040 (Figure 22).

These results suggest that controlling only either new construction or house demolition will not succeed in adjusting the balance in the supply and demand of houses. Accordingly, a combination of controlling new construction and demolitions is required. How to combine them is discussed after introducing the cap and trade system of housing construction (or demolition) rights, strengthening land use regulations and various styles of urban shrinkage.

(2) Cap and trade system of the rights for demolition of vacant housing and construction of new housing

It is possible to consider a cap and trade system for housing construction and demolition that aims at con-

trolling the total number of houses by taking the number of households and household structures into consideration in order to reduce the rate of vacant houses directly when a large rate of vacant houses results in serious social problems.

When we consider a cap and trade system in the era of a slight decline in the number of households, we may simply focus on the construction of new houses and the demolition of vacant houses. Once the number of households obviously declines in a particular region, a certain number of rebuilt houses should also be included in the cap. This control system of the total amount of houses is against national policy in Japan, which promotes the idea of obtaining individual houses after World War II. Accordingly, designing an actual system for such a plan, developing a national consensus for it, formulating an implementation system in the central government and municipalities, mitigating the effects of it on property developers, housing contractors, and

construction companies should be considered. However, it is necessary to implement a control system for the total amount when more serious social problems related to vacant houses occur in the future.

Specifically, first, the central government establishes a total cap on the number of houses in each category of households. Second, the government adjusts the substitution rate step-by-step between housing construction and demolition for about ten years according to the number of households in each category of household populations. For instance, if there are too many houses for one resident, two vacant houses for that resident should be substituted by the construction of one new house.

Of course, it is impossible to demolish only the vacant part of apartments in big buildings, so some exemption periods should be assumed prior to demolition. Otherwise, the government will have to introduce a policy of standardizing vacant houses by unit area or number of houses and of easily giving priority to demolishing vacant houses. Furthermore, a market where construction rights or demolition rights can be traded and clearing them of houses should be also introduced.

These social systems can be considered similar to commodity forward trading and the emission trading system of carbon equivalents for coping with global warming issues so that the system designs will be able to be copied using the design of those systems.

This total amount control system of the number of houses may be slightly strange, but not only the above-mentioned trading systems but also a similar system for the entry of some entities into the market of elderly care services provided in the houses or special facilities or for exchanging the floor-area ratio in the city center has already been introduced in Japan.

This total amount control system of the number of houses adds value to the demolition of vacant houses. As a result, the value of used houses is highly likely to rise more than cases based on the current system even in depopulated society. Furthermore, the cost to construct new houses will relatively increase. Consequently, used houses are expected to be used much more and any decline in the density of land use is expected to be avoided.

5 Various urban designs and enhancement of land use regulations

(1) Enforcing land use regulations

Land use regulations in Japan refers to “use regulations (crossed regulations, use districts, etc.),” “density regulations (building coverage of plot, floor area ratio, etc.)” and “shape regulations (slant regulations).” A development permission system has already been introduced in urbanized areas and urbanized control areas in the current urban planning system in Japan. In particular, public investments in infrastructures in urban control areas have

basically been prohibited in the current system. Nevertheless, the reason urban areas sprawled out in Japan is that farmers could build their families’ houses in the urban control areas and the new residential areas have continuously developed in the outer areas of the urban control areas, which is also outside the urban planning areas. Once these new houses were constructed, roads for agriculture to prepare the space to develop network types of infrastructures such as water supplies, wastewater management, and so on were built. In addition, some regulations related to infrastructure provisions, e.g., the Water Supply Act, determine the duty of governments to provide infrastructure services for residents without exception. This regulation has led to unplanned infrastructure development in the suburbs of Japan and no one has so far been able to control the efficiency of infrastructure use (Note 50).

In order to make land use and infrastructure use more efficient, even in a depopulated society, housing development, land use and infrastructure development have not been separately considered, but land use should be regulated by relating housing development, land use, and infrastructure development. In addition, it is necessary to change the usual way that housing construction is permitted in other than regulated areas to regulations that new housing construction is only allowed in permitted areas.

(2) Assuming various types of shrinking cities

Consideration of integrated urban design in a depopulated society is required in order for urban areas to function by combining various land use regulations. Three types of shrinking cities other than the compact city are known (Figure 22, Note 38).

- Perforated city
- Fragmented city
- Disintegrated city

The concept of a perforated city was proposed by Lütke Daldrup who worked for the urban planning division in the city of Leipzig. He had observed the actual situation of the city of Leipzig in terms of perforations in the urban areas by population decline since 1966 and concluded that it is the natural pattern of urban shrinkage (Note 51).

A fragmented city assumes that a city with multiple centers is gradually declining by leaving their multicity centers and the city will result in an accumulation of fragmented areas (Note 52). In other words, the used land areas are connected with each other but vacant land and lower-use land areas are dispersed in perforated cities, while vacant land and lower-use land areas are connected with each other but used land areas are isolated in fragmented cities. A typical example of a fragmented city is Chemnitz in the eastern region of Germany. The city has a fragmented city type of urban

regeneration plan in 2020. The plan calls for dense residential areas as islands in greening areas (Figure 23).

Network cities, which is a situation in which small cities continuously locate and form an integrated urban area and its urban areas function like one big city, e.g., the previous Shizuoka urban area in Japan, will be divided from each other by population decline and each small city in the previous network of cities might behave as individual cities. This situation is hypothetically assumed and called a disintegrated city. This type of city has not yet been observed (Note 52).

The three above-mentioned types of shrinking cities are recognized as destroying the ideals of returning to a conventional European city model, a compact city (Note 53). In any event, shrinking cities in Japan should not necessarily aim at becoming a compact city, and assum-

ing that perforated cities and disintegrated cities easily occur in depopulated society, reviewing land use regulations for housing and building construction, and making appropriate urban structures compact in accordance with a depopulated society is required.

6 Policy mix in accordance with increasing rate of vacant houses

All sorts of the measures discussed above have different priorities depending on the different levels of the rate of vacant houses. Basically, the direct measures proposed should be added to the indirect measures proposed in accordance with an increase in the rate of vacant houses. Furthermore, in order to mitigate the social effects caused by the measures, it can be considered likely that the more difficult and time-consuming the countermeasures are, the earlier they should be introduced, while the easier they are, the later they should be introduced. These perceptions determine the combinations of measures according to the extent of the rate of vacant houses (Figure 24).

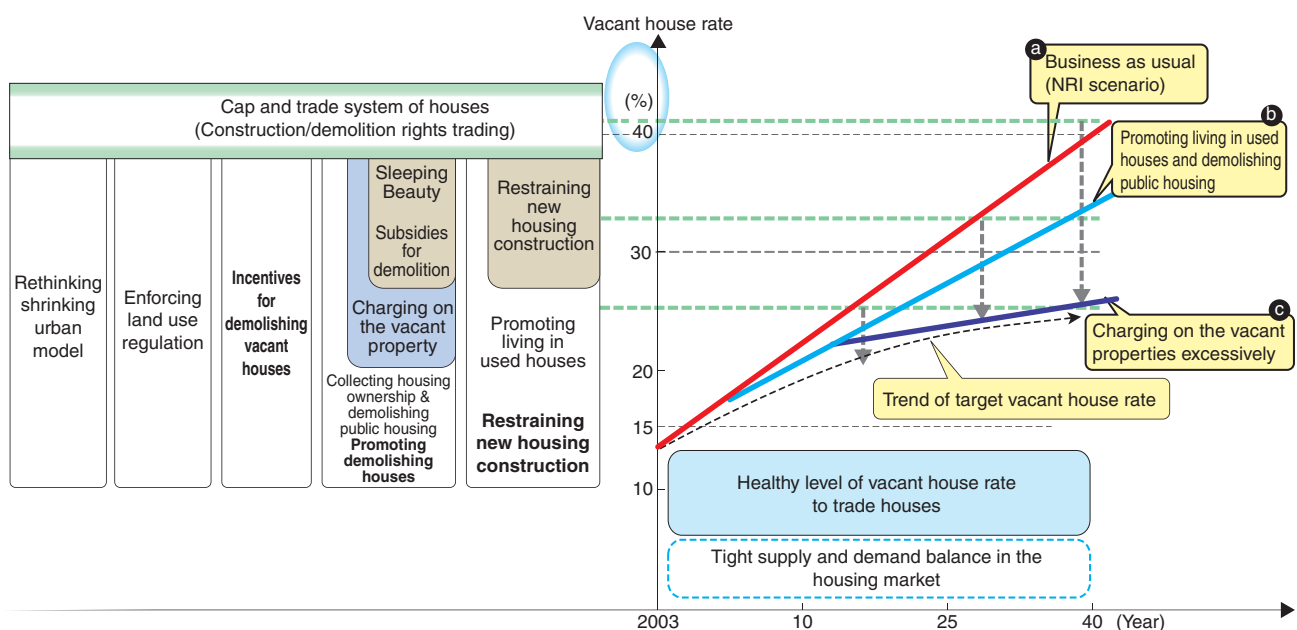
According to the “Business As Usual” scenario (NRI scenario in Figure 24), the rate of vacant houses is expected to be over 30 percent in 2030 but to be less than 20 percent for the next several years. In this situation, the promotion of using used houses, gathering the ownership of vacant houses by municipal housing corporations and municipalities and removing houses that do not meet seismic regulations can restrain the rate of vacant houses. To achieve this, private developers are also expected to cooperate with these measures because not enough houses are owned by public entities for reorganizing vacant houses in Japan. This is because it can be considered to some degree that the public funds will be invested in purchasing private vacant houses to reorganize the present situation. Limited cases are expected

Figure 23. Urban Regeneration Design in 2020 in Chemnitz



Note: The dark color on the map indicates the areas of high residential density in the future.
Source: http://www.chemnitz.de/chemnitz/de/stadt_chemnitz/stadtentwicklung/ng/stadtumbau/downloads/Gesamtstadt.pdf

Figure 24. Hypothetical Combination of Policy Ideas to Cope with an Increase in the Rate of Vacant Houses



Proposal of social strategies in Japan until 2040

to be observed in the case of either failure to pay municipal property taxes and inheritance taxes or reverse mortgages in which municipalities engage.

Based on these occurrences, even if the pace of the increase in the rate of vacant houses shifts from current scenario (a) to scenario (b), considering the promotion of using used houses and adjusting the balance of supply and demand of the housing market with publicly owned houses, the rate of vacant houses will still exceed 30 percent by 2040. A rate above 30 percent suggests emergence of social problems related to vacant houses, so that a consensus for policies that strictly constrain private property rights by the public can be easier to accomplish than before. During that period, scenario (c), which includes enforcing land use regulations and additional charges for vacant properties, is expected to be introduced. This shift from scenario (b) to scenario (c) is expected to achieve the target rate of vacant houses and prevent the occurrence of social problems.

In that case, policies including direct and indirect regulation for controlling vacant houses, more direct policy for demolition, such as subsidies for demolition, prohibition of new housing construction and so on should be consecutively introduced. In addition, introduction of the cap and trade system of construction (or demolition) rights should be considered in order to control the rate of vacant houses more effectively.

To what extent policies are finally required depends on the policies introduced by the government, the preferences of residents and services provided by private companies. If property owners would like to expand their freedom in dealing with their property, governments should propose socially desirable land use and property owners should cooperate by supporting the plan.

V Necessity to develop comprehensive urban plan including housing, land use and infrastructures

Considering the differences in the social backgrounds of Japan and the previous GDR region, it can be difficult to believe that the phenomena of a huge amount of vacant houses and land and a decline in the efficiency of infrastructure networks are expected to be seen right away in Japan in the near future. Nevertheless, it is possible that the same type of phenomena will occur with regard to Japan's housing policies.

To prevent such problems from occurring in Japan's depopulated society, either restraining housing construction or promoting the demolition of vacant houses or both is essential. Considering existing inadequate houses for construction regulations such as anti-earthquake regulations, their quality could actually be improved by restraining new construction, promoting the rebuilding

of vacant houses and refurbishing secondary residences by strengthening their structures rather than by prohibiting all housing construction.

In this process, land use regulations should also be strengthened along with the control of housing construction, and residential areas should be reorganized from areas with high social costs, such as cliffs, flood plains, and so on, to areas with low social costs, such as areas near train and bus stations, places where transportation is convenient and infrastructure services are available (Note 54). In addition, to encourage this reconcentration, other types of related policies, such as taxes on vacant properties, should also be introduced. Taxes on vacant properties are expected to raise the cost of occupation so that owners might liquidate their vacant properties (Note 23). Actually, this effect was theoretically proved in previous research (Note 37). It is also important that the actual situation and spatial distribution of vacant houses and households should be known and future situations should be forecast as accurately as possible.

The premise in this paper that a 30-percent rate of vacant houses will contribute to social problems is based on the German experience. The threshold of what level would cause such problems in Japan should also be specifically examined in the future. Similarly, the effect of the measures proposed in this paper to resolve such problems should also be verified quantitatively. In addition, the differences in the occurrences of these issues between urban and rural areas are expected to be large. The differences in the occurrences of the problems at the municipal level should be considered in accordance with the detailed results of the national survey on houses and land in 2008.

At present, there are not so many vacant houses. However, in order to ensure the high quality of life in society in 2040, for the baby boomers to spend the ends of their life sufficiently happy and for the second generation of baby boomers to enjoy their lives after retirement, property owners and related industry should cooperate to prevent the occurrence of problems related to houses, land and infrastructure management from now on.

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