

# Improving Sustainability in Rural Communities through Structural Transitions, Including ICT Initiatives

*Takumi Fujinami*

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## Summary

1. Japan has entered an era of significant population decline. In this article, we will look at measures to improve the sustainability of regional areas, especially rural communities, which have been affected by population decline for many years.
2. The outflow of young people from rural areas to Tokyo tends to be seen as a problem, but the population structures of municipalities throughout Japan show little variation in the percentages of second-generation Baby Boomers (aged 40-44) and people in their early 20s. This suggests that in fact the concentration of population in Tokyo has not accelerated in recent years. The idea that Japan's population is gravitating toward Tokyo reflects a tendency to take a pessimistic view of the situation.
3. In rural areas affected by population decline, suburban development in the regional cities has continued, and population density is still falling. However, depopulated communities that were once believed to be on the verge of dying have survived longer than expected, with new houses being constructed in surrounding areas. More than 15 years have passed since "compact city" policies began to attract interest. Yet far from becoming more compact, residential patterns are actually becoming more widely dispersed.
4. This dispersion of residential areas is also attributable to the development of sophisticated road, logistics and communications networks. Driving and Internet access have made life in the suburbs extremely comfortable, but the question is how residential lifestyles can be maintained by those with poor access to these three networks, such as elderly people living in depopulated communities.
5. In villages where the majority of people are elderly and there is little industry, the lack of jobs makes it difficult to retain the young people needed to maintain communities. For the elderly to continue living in these communities, we first need to provide effective support by using the three networks and advanced technology to create lifeline infrastructure in forms that match the capabilities of residents.
6. In addition, businesses that provide the services needed to maintain lifestyles in these regions will need to adopt new business models that diverge from the concepts of the past. Businesses that rely on the provision of a single service are unlikely to survive in the low-demand environment of rural communities. They will need to use the concept of economies of scope to raise business efficiency by providing multiple services. They will also need to maximize added value per worker by using advanced technology and other resources to handle the maximum amount of work with the minimum number of workers.
7. Another essential concept is the creation of local employment through the partial monetization and marketization of services that have previously been provided for free under the concept of self-help and mutual assistance. Efforts to generate employment through marketization are already emerging. For example, in some communities, businesses have started to provide shopping and housekeeping support as paid services.
8. Major benefits can be achieved by introducing new technologies and ideas in depopulated communities and other areas with poor living condition. Even if cities cannot be made more compact, it should be possible to create communities with enhanced sustainability and comfort.

## 1. Introduction

According to the 2015 census, the total population of Japan has fallen for the first time since the census began in 1920, with a decline of 947,000 from the 2010 census to 127.11 million. This is a major turning point and indicates that Japan has entered an era of significant population decline. It also means that the fall in population density, which has previously been confined to certain types of areas, such as depopulated regions, aging “new towns”, and central city areas that have been “hollowed out,” can now be expected to occur in every region in Japan in the years ahead. A fall in population density erodes the efficiency and profitability of various private sector services that are indispensable for daily life, prompting the withdrawal of the companies that provide those services. The result is a vicious circle in which deteriorating convenience for local residents causes further population outflows.

Population densities began to fall in regional cities in the 1990s, leading them to focus on the compact city concept ahead of Tokyo and other major cities. Several cities, such as Aomori and Toyama, started to promote policies based on inner city residence. From an economic perspective, the compact city concept is seen as enhancing the efficiency of service delivery, and both the national and local governments have supported compact city policies.

However, no region has so far succeeded in creating a compact city in the sense of a collective living space. Policies designed to attract residents and raise the population density of central urban areas have yielded limited benefits in regional cities, and the expected improvements in productivity have not materialized. In addition, compact city initiatives based on the construction of symbolic buildings in Aomori City, for example, have ultimately become a burden on regional finances.

There has been little progress on compact city policies, and there is little hope of significant progress in the future. For this reason, we should assume that regions and cities will not become more compact and instead prepare for the next best option. In this article, we will explore the policies needed to counter the effects of falling populations and population densities and build sustainable communities.

## 2. Rural Communities<sup>1</sup> Today

### (1) Significant Declines in Numbers of Young Workers and Population Density

#### A. Shrinking Youth Population

Japan’s total population is shrinking for the first time since the beginning of the census. In all regions other than the Tokyo metropolitan area (referred to as “regions” in this article), populations peaked out around 2000. The downward trend has continued since then, with regional populations falling by 1.6% over the past five years. The trend has been especially conspicuous in rural areas, where populations have shrunk by 4.9% since the previous census.

Fig. 1 traces changes in Japan’s population pyramid by age group in five-year increments. Each age group is represented as a ratio, where the 40-44 age group, which corresponds to second-generation Baby Boomers, equals 1.0.

The representative age group for the younger generation is 20-24. The population in this age group is equivalent to only 65% of the second-generation Baby Boomer age group for males and 63% for females, which means that there has been a 30% point population decline, even though the

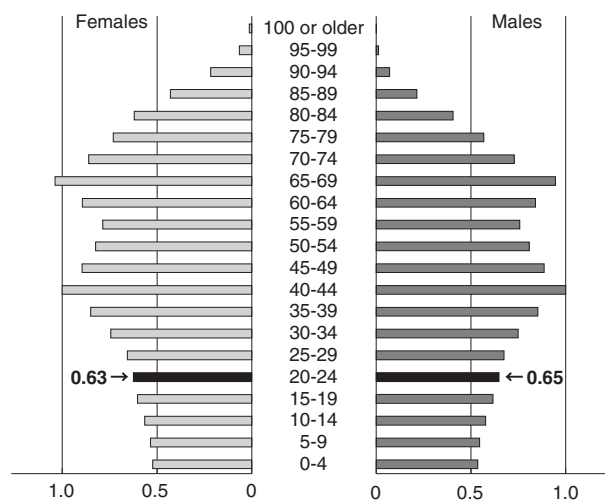
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<sup>1</sup> A “rural community” is a somewhat vague term that can perhaps be defined as a non-urban residential area located between agricultural flatlands and mountainous areas. Conceptually, it is the opposite of a high-density urban residential area.

age difference is only around 20 years. A commonly held view is that the shrinkage of the young generation is a problem mainly in rural areas. However, there has been a conspicuous decline in the youth population throughout Japan, reflecting the fall in Japan's birthrate. Moreover, this trend is unlikely to improve in the short term (Fig. 2).

There has been concern in recent years about the gravitation of young people to Tokyo, but this is not entirely borne out by the data. Looking first at the percentages of rural and urban populations, we find that while some young people raised in rural areas are choosing to live in cities, the census data show that the percentage of rural residents in the 20-45 age group has generally remained in

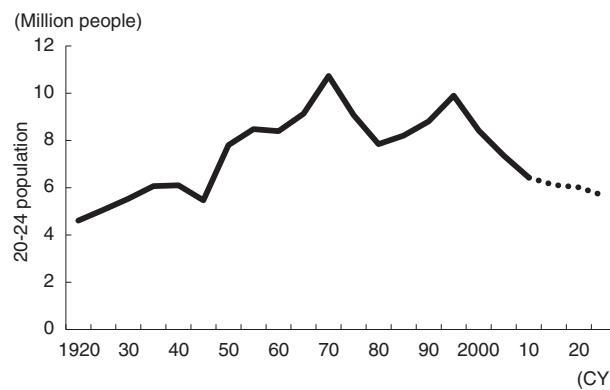
**Fig. 1 Japan's Population Pyramid (Second-Generation Baby-Boomer Age Group Represented as 1.0)**



Source: Ministry of Internal Affairs and Communications, 2015 Population Census of Japan

Notes: Second-generation Baby Boomers (aged 40-44) are indexed as 1.0 for both males and females.

**Fig. 2 Current Trends in and Forecasts for the 20-24 Population in Japan**



Source: Ministry of Internal Affairs and Communications, 2010 Population Census of Japan, National Institute of Population and Social Security Research, Population Projections for Japan (January 2012)

Notes: The dotted line from 2010 onwards represents estimates by the National Institute of Population and Social Security Research.

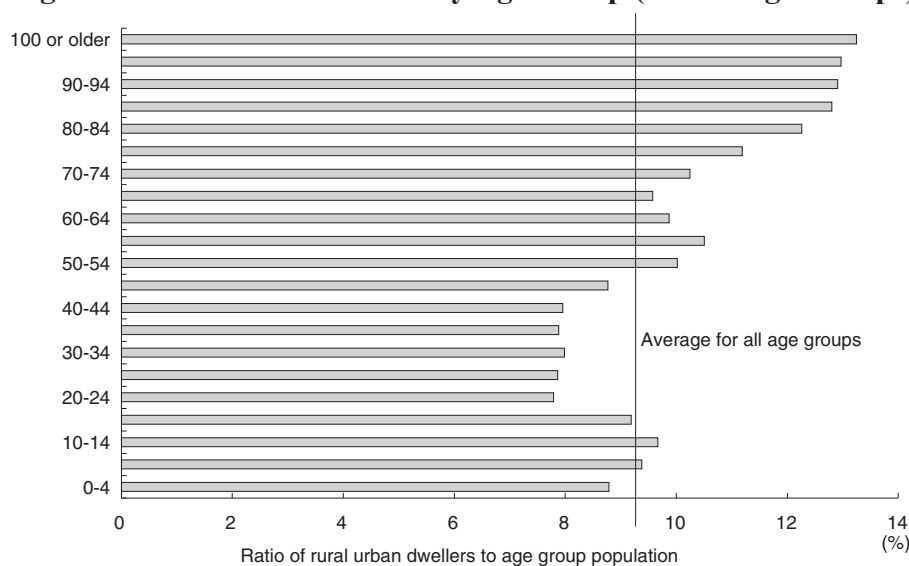
the 7% range (Fig. 3). This figure is admittedly lower than 8.6% average for all age groups and the ratio for teenagers. However, the tendency for young people to live in cities had already been established in the generation slightly older than the second-generation Baby Boomers and has changed little in recent years.

Moreover, if we calculate the ratios of the 20-24 population to the second-generation Baby Boomer population for municipalities throughout Japan using the same approach as in Fig. 1, we find that variation among municipalities is not especially large. The variance among all municipalities is 0.021, indicating there is no difference between the urban and rural averages (Fig. 4, left). In other words, while there is a certain amount of migration from rural to urban areas in the under-45 generations, an analysis of the resulting age group population ratios (relative to the second-generation Baby Boomer population) shows that the percentage of young people (20-24 age group) remaining in rural areas is no different from the 20-24 age group population ratio in urban areas.

On the right side of Fig. 4, 20-24 populations are compared with the Baby Boomer generation. The deviance for all municipalities is 0.040, indicating that there is greater variation than with the second-generation Baby Boomers. This means that a higher percentage of Baby Boomers are living in rural areas compared with people in their early 20s and second-generation Baby Boomers.

Known as the “golden eggs” of the high-growth era, Baby Boomers are known to have moved to Tokyo and other large cities in large numbers. After the economy began to stagnate in the 1970s, however, a significant number of them moved back to the regions, including their former home villages. This appears to explain why the percentage of people who have settled in rural areas is greater than that for the second-generation Baby Boomers. The number of people working in primary industries was already falling at that time, although the number employed was still comparable to the number working in manufacturing industries. We can infer from this that some of the people who returned to their home regions inherited businesses in the farming, forestry, and fishery industries (Fig. 5). In addition, while the number of employees in secondary industries other than construction throughout Japan peaked out as a result of the oil crises, the government

**Fig. 3 Rural Residence Ratios by Age Group (5-Year Age Groups)**

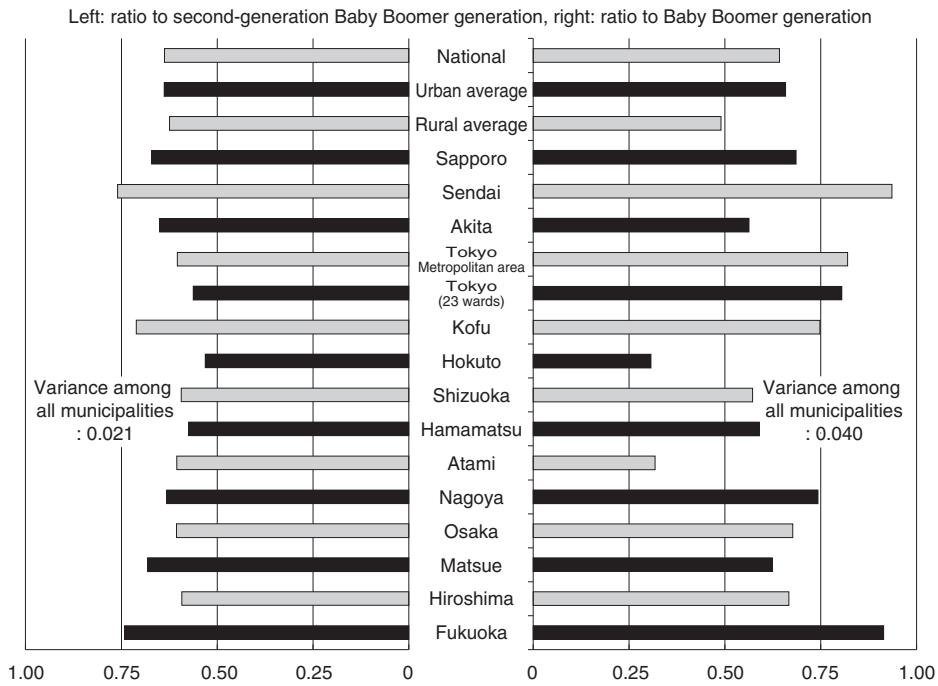


Source: Ministry of Internal Affairs and Communications, *2010 Population Census of Japan*

Notes: Rural dwellers in each age group ÷ age group population × 100

continued to implement policies designed to induce the establishment of businesses and factories in the regions with the aim of reducing inter-regional economic disparity. This resulted in a continuing rise in the number of workers employed in manufacturing industries in rural areas. Other factors

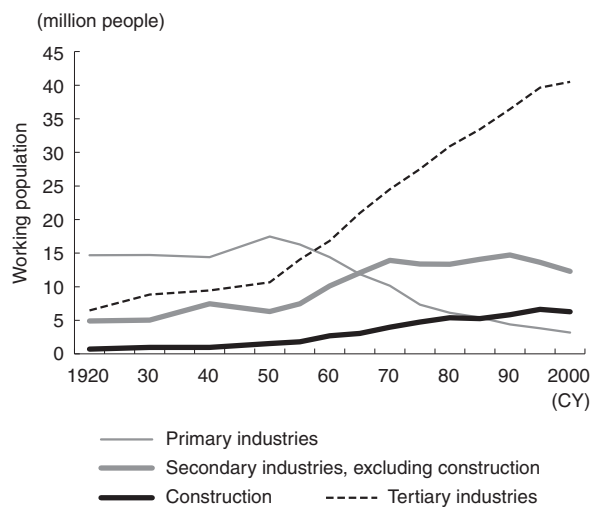
**Fig. 4 Percentage of Population in 20-24 Age Group**



Source: Ministry of Internal Affairs and Communications, 2015 Population Census of Japan

Notes: 20-24 population as ratios of the second-generation Baby Boomer population (40-44) in the left graph, and as ratios of the Baby Boomer (65-69) population in the right graph.

**Fig. 5 Working Population by Industry in Japan**



Source: Ministry of Internal Affairs and Communications, Population Census of Japan

Notes: Based on the old industry categories

included the expansion of public works projects and other activities in rural areas under Japan's national development policies, which in that period were based on a balanced development philosophy. As a result, there was a growing trend toward settlement in regional areas among Baby Boomers and people in the subsequent generation, who are now in the 50-plus age group.

While Baby Boomers showed a strong tendency towards settling in rural areas, there is an established trend toward the migration of a significant number of people into urban areas among generations now under the age of 45, although this pattern is also subject to the influence of the economic cycle. This tendency toward urban living since the second-generation Baby Boomer generation is attributable to structural changes in Japanese society, including a rapid rise in the percentage of people receiving university education, and a shift from manufacturing to tertiary industries, which tend to create employment opportunities in urban areas, as the main focus of job creation (Fig. 5).

As is apparent from the lack of any major change in the percentages of young people in urban and rural areas over a period of 25 years, the tendency of people in younger generations to move to urban areas is not a new phenomenon. Despite this, we frequently hear comments about the outflow of younger generations from rural areas as a result of the excessive concentration of population in Tokyo. This perception appears to reflect an overly pessimistic view of the situation due to a tendency to focus on the low youth population throughout Japan, and on extreme demographic aging in depopulated communities, with the result that people overlook the real situation, which is that there has been little change in the percentage of young people in regional populations of depopulated communities.

## **B. Falling Population Densities**

While there has been a tendency for part of younger generations to migrate to urban areas, this has not directly stimulated efforts to create compact cities. Development is still continuing in outlying areas of cities, and most people migrating to urban areas chose to live in newly developed residential neighborhoods rather than inner city areas.

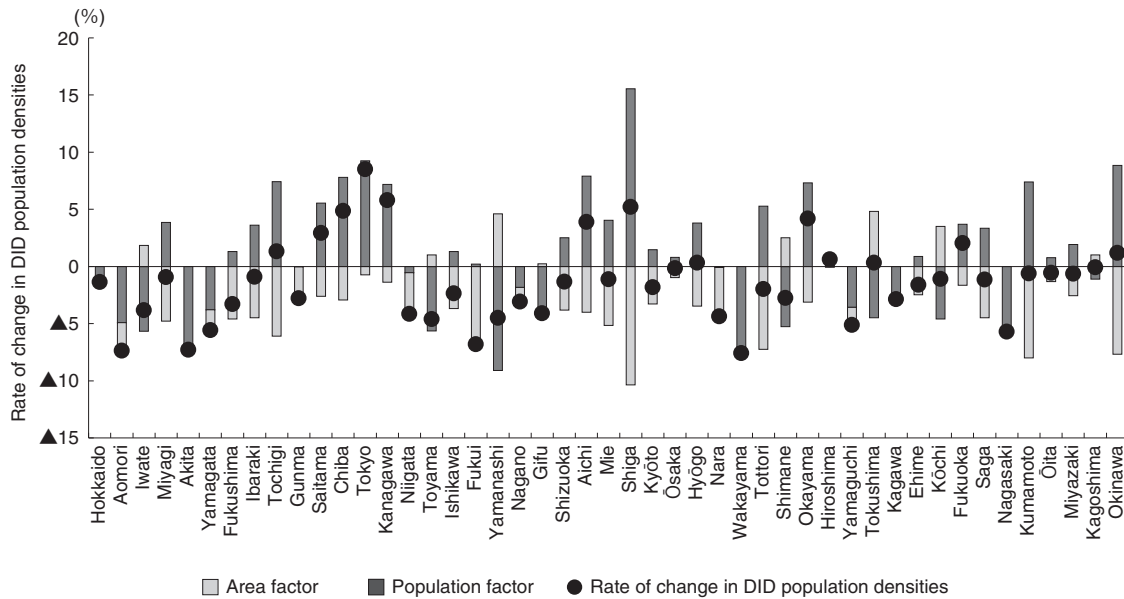
Fig. 6 shows the results of an analysis of factors causing changes in densely inhabited districts (DIDs) between 2000 and 2010. The graph shows that population densities fell in 34 prefectures nationwide. The DID area factor shows downward movement in the majority of prefectures, indicating that population densities have come under pressure from DID area expansion. Even where the population of DIDs is increasing, DID areas are expanding even faster, with the result that population densities are falling in many prefectures.

This is confirmed by census mesh statistics. Fig. 7 displays changes in the population of Yamanashi prefecture between 2000 and 2010 using one kilometer mesh data. Areas showing population growth are clustered in the suburbs of Kofu rather than the city center, indicating that the city is expanding. While there has been a partial migration back to the city center in response to increased condominium construction resulting from a decline in land prices, the overall trend is characterized by the continuing expansion of suburban residential areas. This pattern runs counter to moves to create compact cities and is reflected in an increase in the number of cities with low population densities.

## **C. The Survival of Depopulated Communities**

In reality, very few depopulated communities have disappeared entirely as a result of population outflows to urban areas. In 2015, the Ministry of Internal Affairs and Communications conducted a survey on communities in areas disadvantaged by depopulation and other factors. The survey, which covered around 60% of municipalities with depopulated areas throughout Japan, focused on the maintenance and loss of community functions in the approximately 65,000 communities

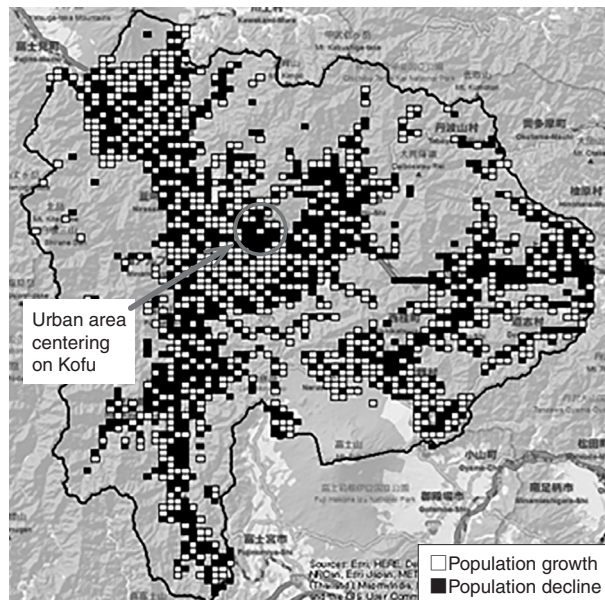
**Fig. 6 Analysis of Factors Causing Change in Population Densities in Densely Inhabited Districts (DIDs) by Prefecture (2000-2010)**



Source: Ministry of Internal Affairs and Communications, *Japan Statistical Yearbook*

Notes: A downward area factor for a DID indicates that area expansion is putting downward pressure on population density.

**Fig. 7 Population Changes in Yamanashi Prefecture (2000-2010, 1km mesh)**



Source: Ministry of Internal Affairs and Communications, *Population Census of Japan*

Notes: Areas where the population fell to zero are shown as population decline areas, and those where housing development occurred in areas that previously had zero population as population growth areas.



disadvantaged by depopulation and other factors in these municipalities.

Based on the results of the previous survey in 2010, 452 communities (0.7% of the total surveyed) were identified as likely to disappear within 10 years. When the latest survey was carried out five years later, it was found that only 41, or 9.1%, of the communities that were expected to disappear within 10 years had actually been abandoned. A similar survey conducted between 2006 and 2010 led to the conclusion that only 8.3% of the communities for which abandonment was predicted in 2006 had actually disappeared four years later in 2010, and that the majority of the communities still existed.

There are also cases in which communities not classified as likely to disappear within 10 years have been abandoned for various reasons, such as the relocation of residents to make way for public works. While the survey results show that 174 communities disappeared in the five years after 2010, this total represents only 0.3% of the total number of communities in the regions covered by the survey. Contrary to strident warnings about communities at risk of disappearance, the number of communities that have actually been abandoned is extremely small.

Most of the communities identified in the surveys as being at high risk of disappearance are depopulated rural communities where over 50% of the residents are elderly. The at-risk communities are also remote from government agencies. Based on characteristics such as these, we certainly cannot rule out the possibility that these communities will eventually disappear. However, many communities have defied these predictions and continue to survive, thanks to the return of former residents, albeit in limited numbers, as well as the relocation of city dwellers to rural areas (known as in Japan as the “I-turn” phenomenon). This suggests that the sustainability of real communities is being misinterpreted by those who make simplistic predictions of imminent community extinction based solely on population structures and aging at the time when the surveys are conducted. The conclusion that emerges from the data is that rural communities are unlikely to disappear overnight as places where people live.

#### **D. Expansion of New Residential Areas**

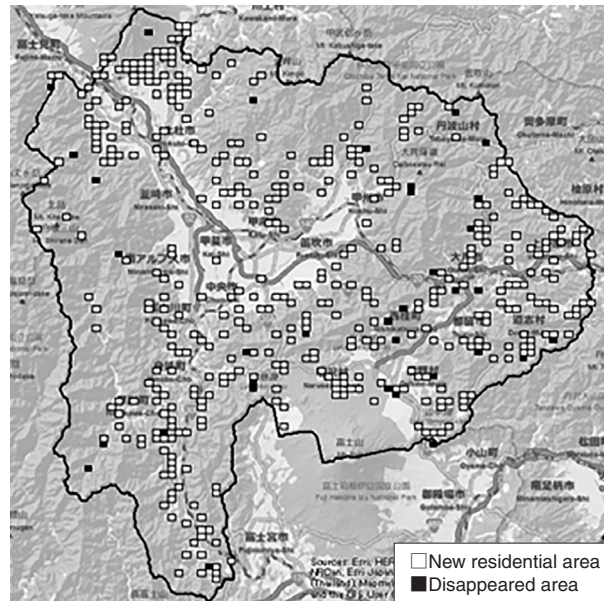
While some communities are dying, others are being created. According to census mesh statistics (1 km meshes), Yamanashi Prefecture has 10 times more new residential areas (meshes) than areas (meshes) where communities have disappeared (Fig. 8).

Residents and municipal officials tend to focus solely on the survival of long-standing communities and the risk that they will disappear. As noted above, however, these communities are resilient. Also, we should not overlook the fact that new residential areas are rapidly being established in areas that were previously uninhabited.

Various analyses and data show that population densities are falling in regional areas because of population decline and the dispersal of residential areas. In rural communities, there has been an increasingly serious weakening of the personal and community relationships that have supported life in these areas. With a shrinking number of people to support community functions, communities are becoming unable to sustain various tasks that were previously carried out through self-help and mutual help in families and communities, including day-to-day nursing care, transport and other forms of support for the elderly, as well as festivals and events involving entire communities, water management in agricultural areas, and roof re-thatching.

In addition, many essential services in these locations, such as public transportation, logistics, and retailing, have traditionally been provided by private enterprises. However, service providers are being forced to withdraw from these areas by poor prospects for long-term profitability due to diminishing demand, as well as a lack of people to run the services. Regular bus services provided by private companies are increasingly operating at a loss and can only be maintained by obtaining government subsidies and cutting routes or the frequency of services. A significant number of gas

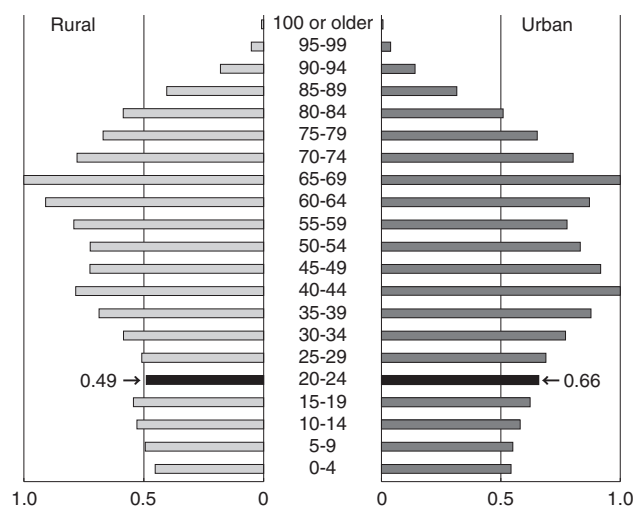
**Fig. 8 New Residential Areas and Disappeared Areas in Yamanashi Prefecture (2000-2010, 1km mesh)**



Source: Ministry of Internal Affairs and Communications, *Population Census of Japan*

Notes: Only new residential areas and Disappeared areas are shown.

**Fig. 9 Urban and Rural Population Pyramids (Baby Boom Generation = 1.0)**



Source: Ministry of Internal Affairs and Communications, *Population Census of Japan, 2015*

Notes: The Baby Boom generation is represented as 1.0 for both urban and rural areas.

stations and grocery stores have also closed as a result of dwindling customer numbers. Furthermore, providers of essential services in communities with many elderly people, such as day-care and nursing care services, have shut down their operations because of a lack of personnel and a

shrinking economic pie.

Worker recruitment has already emerged as a serious problem. The Baby Boom generation, which has played an important role as a population bulge, is now in the 65-plus age group, while those in younger generations are tending to live in urban areas. As a result, shortages of workers to provide various services in rural communities are now becoming an increasingly serious issue (Fig. 9, left).

## (2) Questions about Compact City Policies

### A. Does Compactness Increase Productivity?

According to an estimate by the National Institute of Population and Social Security Research, even Tokyo's population will start to shrink by 2020, and population density will fall in all regions of Japan. A decline in population density is seen as a cause of reduced efficiency, especially in service industries. Since most services industries, such as nursing care and retailing, are characterized by simultaneous production and consumption (Box 1), a high population density is preferable from the viewpoint of efficiency improvement. Because service industries require direct interaction between service providers and users, the improvement of service efficiency is seen as dependent on the existence of supply and demand and the presence of multiple users in close proximity from each other.

#### Box 1: Simultaneity of Production and Consumption

We will use the nursing care industry as a specific example of this concept.

In the nursing care industry, the demand for services is met by supplying services through direct interaction between those needing care and helpers. In the case of home-based care, helpers need to visit care recipients' homes by car or other means of travel. If there are multiple care recipients living in given location, the efficiency of the services supplied to that location will improve through the reduction of travel distances.

However, given that the compactification of municipalities is not progressing smoothly at present, alternative methods inspired by new concepts will be needed to overcome the challenge of achieving simultaneity of production and consumption (the simultaneity barrier).

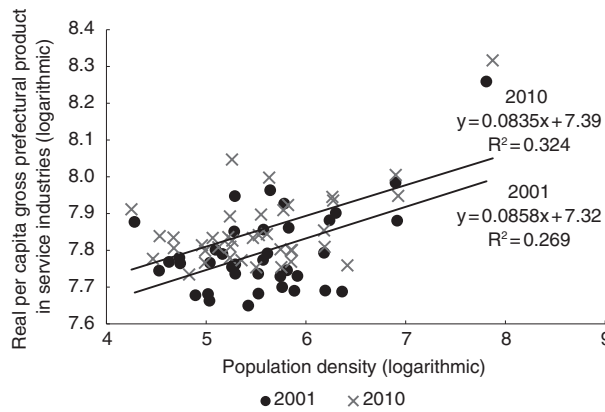
If we focus solely on efficiency, the best option is to transfer services for those requiring a high degree of care from helpers to care facilities, which can be seen as the ultimate high-density residential environment.

If we plot the relationship between the density of population and business density and service industry productivity (real per capita gross prefectural product) for each prefecture on a scatter graph, the approximation line rises toward the right (Fig. 10, 11). Calls for development of compact cities in the *White Paper on the Labour Economy* and the *White Paper on Economic and Fiscal Policy* are based on this type of data<sup>2</sup>.

However, we need to focus on the angles of incline of the straight lines rising to the right. Those angles signify the elasticity of population (business) density to productivity. In Fig. 10 and 11, elasticity ranges between 0.08 and 0.10, which is not especially high. Elasticity is also generally

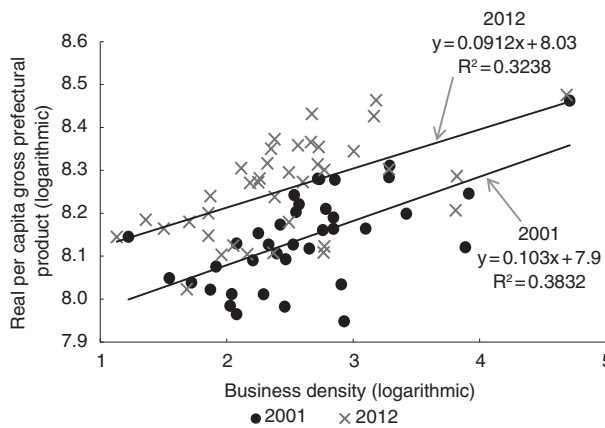
<sup>2</sup> Ministry of Health, Labour and Welfare, *White Paper on Labor and the Economy*, pp.196-197 (Japanese version), Cabinet Office, *White Paper on Economic and Fiscal Policy*, pp.110-111 (Japanese version)

**Fig. 10 Relationship between Population Density and Real Per Capita Gross Prefectural Product per Service Industry Worker (2001, 2010)**



Source: Cabinet Office, *Prefectural Accounts*, Ministry of Internal Affairs and Communications, *Japan Statistical Yearbook*

**Fig. 11 Relationship between Business Density and Real Per Capita Gross Prefectural Product (2001, 2012)**



Source: Cabinet Office, *Prefectural Accounts*, Ministry of Internal Affairs and Communications, *Economic Census*

Notes: Okinawa Prefecture is not included.

low in scatter graphs included in the aforementioned *White Paper on the Labour Economy*. The elasticity of productivity to population density for the wholesale and retail sector is relatively high at 0.27, but the figure for service industries (private and non-profit) is 0.08, while the elasticity of productivity to business density is 0.13. With elasticity around 0.1, even if density could be doubled, productivity would rise by only around 10%. In other words, even if population density can be increased through compact city policies, there would be only limited productivity gains. For this reason, we need question the effectiveness of policies designed to encourage relocation to urban areas as a way of increasing housing density.

Conversely, a low elasticity value means that there is the potential to mitigate productivity declines caused by reductions in population density. A comparison of figures from 2001 and 2010 (2012 for the business density graph) indicates that despite declines in population and business density in many prefectures, the approximation lines are being pushed upwards, indicating that there has been an overall improvement in productivity (Fig. 10 and 11). This means while it is not easy to raise productivity by increasing population density, other factors can cause productivity to rise. There is a tendency to focus on the need to raise population densities and productivity and claim that compact city policies should be implemented urgently. Perhaps there is room to reassess this view.

All of data shown here relate to prefectures. Population densities in actual cities and communities may vary. We need to be aware of the inherent limitations of prefectural data when discussing the productivity of service industries supplying individual cities and communities.

## **B. Improving Productivity through Factors Other than Compactness**

We will look next at the factors that are leading to higher productivity in various prefectures, despite declines in population densities due to population shrinkage and the expansion of residential areas. In general people have always formed and lived in cities and settlements, where they can enjoy the various advantages that result from the deepening of relationships that occurs as a result of clustering. This is why Japan's population decline has focused attention on the compact city concept.

However, thanks to new technologies and infrastructure development, people no longer need to be bound to cities or settlements. Even remote mountainous areas now have fiber optical cable links, and high-speed Internet access is available everywhere. Roads are also being improved, so provided that they can drive cars, people can live even in remote mountainous regions. In addition, advances in logistics technology and the development of logistics networks covering every part of Japan ensure that home delivery and shopping support services can be obtained within a short period of time.

Roads, logistics, and the Internet—the three networks—are all changing people's lives dramatically. While shopping has become a problem for people in some areas, many people are moving to rural villages and suburban areas, where they can build houses and make effective use of the three networks. The relocation of people to newly developed suburbs is one of the consequences of the evolution of residential formats made possible by advances in technology and infrastructure development.

Furthermore, while the three networks encourage the dispersal of housing to suburban areas, they not only have the potential to mitigate downward pressure on productivity due to population density factors, but they also appear to contribute to the improvement of productivity.

For instance, markets for most agricultural, forestry and fishery products have historically been limited to Japan, but thanks to advances in logistics technology and the Internet, even small producers are now able to trade their products globally. Similarly, the advent of Internet commerce has made it possible to engage in business without being tied to a particular location. As a result, some companies have adopted a strategy of establishing warehouses and business sites in locations where rents are low and using the resulting cost savings to improve services and increase their profits.

Entrepreneurs have also benefited. The development of crowdfunding and similar mechanisms means that entrepreneurs can easily procure the funds needed to start up and operate businesses without necessarily basing their operations in major cities like Tokyo.

Most importantly, before giving absolute priority to a compact city approach, which is unlikely to yield major benefits in the short-term future and is based on the development of concentrated

housing, which may not be readily achievable, we should first create strategies that can deliver productivity improvements through factors other than population density, while also curbing the development of new suburban housing areas and the expansion of residential areas through city planning and other means.

### **3. The Need for Demand-Supply Structure Changes in Rural Communities**

As discussed in the previous sections of this article, the people that are most likely to take up residence in suburban areas are those who have skills needed to utilize the three networks and are suited to the residential environments that are being created through the development of those networks. Problem arises in long-established communities with many elderly people who are unable to drive and find the Internet difficult. Because these communities also lack employment opportunities, young people who could help to maintain community life are unlikely to settle.

For elderly people and others to continue living in communities where these conditions exist, action will be needed on the following three points.

- (1) Initiatives to lower the simultaneity barrier by using the three networks and ICT
- (2) Productivity improvement through economies of scope and the concentration of work
- (3) Employment creation through the marketization of some functions based on self-help or mutual help within families or the community

We will now look at examples each of these points and explore approaches that could contribute to the improvement of sustainability in rural communities. We will also look at some innovative case studies.

#### **(1) Using the Three Networks and ICT to Overcome the Simultaneity Barrier**

With populations shrinking, businesses need to find ways other than high-density living to overcome the simultaneity barrier resulting from the simultaneity of production and consumption, especially in service industries. The only way to achieve this in rural communities is through the proactive introduction of new technologies and new mechanisms. Outlined below are three examples of approaches and specific initiatives that provide hints about how this can be achieved.

##### **A. Improving Interfaces for the Three Networks**

Many elderly people have limited affinity for the three networks. To deliver the benefits of the latest technology to those people, we need to improve the environment so that they can use new technology without keyboard input and special control operations for computers and other equipment.

In the near future, the scene inside the home of an elderly person living alone in an isolated community is likely to include a robot capable of providing day-to-day conversation and companionship. Such a robot, which would not need to be anthropomorphic, would also keep watch over the resident and monitor his or her physical condition, including temperature, pulse, appetite, and activity patterns. If necessary, the robot would contact a medical or nursing institution. Of course, the robot would also manage the resident's medication, ensuring that the correct medications are taken at the right times. If the resident needs to go outside, the robot would automatically select the optimal route and make the necessary reservations at hospitals or care facilities. In addition, the robot would arrange the means of transport, such as an on-demand bus or self-driving car, or find a car that could be shared. The robot would order dinner ingredients or ready-made meals from a

supermarket, handle some housekeeping tasks, and manage the household budget.

What is important is that these services can be obtained via voice and image recognition or sensor input, without the need for the individual to provide input via keyboard or other equipment. There is the potential to improve life in isolated communities dramatically, provided that we can improve the human interface so that elderly people can easily and effortlessly access the latest technology.

This is not a vision for the long-term future. In fact some of technology has already been developed. The individual element technologies have already been developed, and it should be possible to introduce such systems in the near future. The keys are to introduce the technology systematically in communities and homes, and to improve human interfaces. Ideally the system should be introduced on a trial basis in designated special zone. In addition, platforms should be created to allow collaboration among multiple service providers, including government agencies, medical and care institutions, transport and logistics companies, and retailers, as well as ICT businesses, and leasing companies.

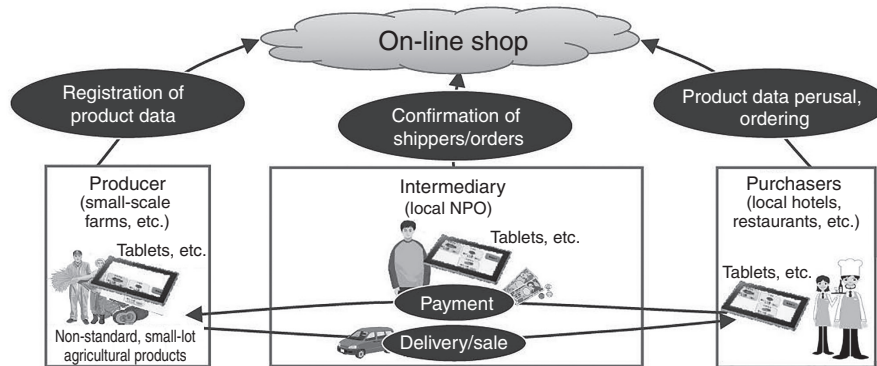
## **B. Using ICT to Revitalize Communities**

With assistance from the Ministry of Internal Affairs and Communications, the island community of Kumejima in Okinawa Prefecture has established a wi-fi network covering the entire island, as well as an information facility (cloud center). The community is using this new ICT infrastructure to enhance various community services (Fig. 12). So far, the infrastructure has been used to provide free wi-fi access for tourists, and to facilitate sales of surplus local agricultural products from the region. Surplus products that were previously left unharvested in the fields are now supplied to local restaurants and other users through a cloud-based matching system. The products are collected and delivered by Fukushishikai, a general incorporated foundation that is primarily involved in the provision of home-based nursing services. In addition to this matching service for surplus agricultural products, Fukushishikai also helps to meet the shopping needs of elderly people by operating a mobile store. It has started to assemble a range of activities based on the concept of economies of scope, as discussed in the following section.

In addition to this project, Kumejima is also exploring ways to use its ICT infrastructure in other areas, including disaster prevention, tourism promotion, and renewable energy. There are especially high hopes for the role of ICT in tourism, which is the island's core industry. The number of visitors to Kumejima has been stagnating for many years, but in 2015 the number rose for the first time in 12 years to over 100,000. The community now aims to achieve even greater growth and is experimenting with new initiatives, such as the use of augmented reality (AR) to provide tourist information to visitors.

Yahoo! Japan is also exploring ways to use ICT to support communities. It uses its Internet-based payment system to provide a tax payment facility to affiliated local governments and communities. Another focus is the training of people with knowledge of digital technology. High school students who have undergone training in digital technology are using ICT to create structures for community revitalization, including the establishment of online shops for local goods on the Yahoo! shopping site, and the development of systems for use in tourism promotion, such as a visitor data base and an environment for behavior pattern analysis. The support structure provided by Yahoo! is based on the perspective that community revitalization must ultimately be driven by local people. That is why Yahoo! has given priority to the development of ICT infrastructure to support these activities, and to human resource development.

**Fig. 12 Surplus Agricultural Produce Distribution System Created through the Beautiful Island Kumejima Revitalization Project**



Source: Ministry of Internal Affairs and Communication (documentation distributed at the eighth ICT Community Development Promotion Conference), No. 8-1, *Machi, Hito, Shigoto no Sosei to ICT Machizukuri* [ICT Community Development and Communities, People, and Job Creation

## (2) Improving Productivity through Economies of Scope and Work Concentration

Worker recruitment is a key issue for organizations trying to maintain services in the face of population decline. However, it is becoming increasingly difficult to recruit staff to provide nursing care and public transportation services in regional areas, and the situation is unlikely to improve under existing business models. There is a need for new service industry business models that focus primarily on the improvement of worker productivity.

In this section, we will look at case studies of NPOs and businesses that have started to develop new business models.

### A. Efficiency Improvement by Private Sector Organizations Using Economies of Scope

In regional rural communities, population decline is paralleled by the shrinkage of various types of demand. Businesses that specialize in the provision of just one type of service are becoming unable to maintain their business operations on the same scale as in the past. For example, companies that specialize in one type of business, such as retailers, gas stations, and care facilities, including providers of home-based care and daycare services, are becoming unable to maintain their services because of shrinking sales and profits, and many private sector companies have been forced to withdraw from these business areas.

These businesses need to apply the concept of “economies of scope” (Box 2), which offers a way to improve productivity by raising the operating rates for human and physical resources through the provision of multiple services by a single economic entity. This strategy ensures overall business viability through the expansion of the range of services provided by a single business entity, and through the provision of composite services.



**Box 2: Economies of Scope**

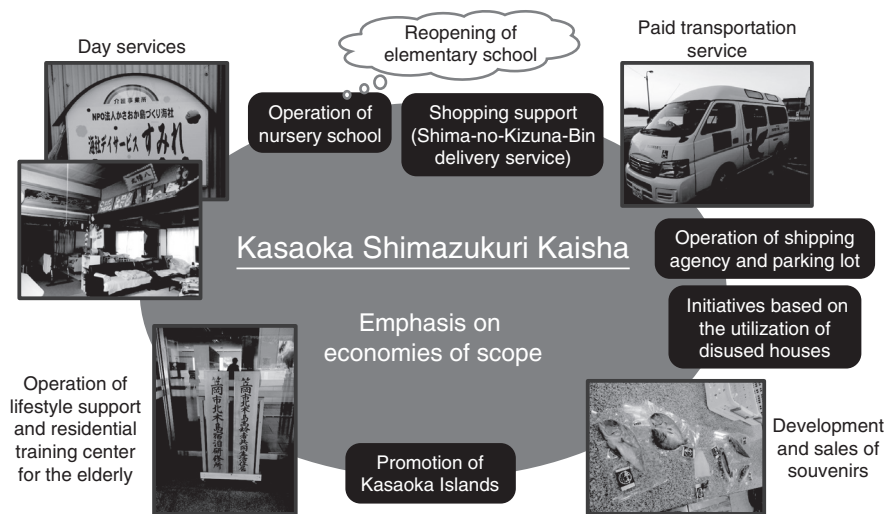
With economies of scope, the aim is to reduce costs by supplying a wider range of products and services using the same platform and production capacity. It is the opposite of economies of scale, through which costs are reduced by producing large quantities of a single product. The economies of scope concept is used to reduce the cost of products for which there is limited demand, and it can also be applied to service industries in regional areas. The aim is to deploy and utilize personnel and resources more efficiently by providing multiple services.

Examples of sixth-sector industrialization in the area of agricultural products include the use of equipment with low operating rates to produce other goods, and the use of vehicles that are needed infrequently to provide paid transportation services, such as transportation for children or the aged, and the carriage of freight.

Kasaoka Shimazukuri Kaisha, an NPO based in Kasaoka City, Okayama Prefecture, was established to provide community services. The seven inhabited islands in the Kasaoka Islands have a combined population of 1,954, of whom 66% are elderly (as of October 1, 2015). Kasaoka Shimazukuri Kaisha provides a diverse range of community services with the aim of solving various issues affecting island life (Fig. 13). Its wide-ranging activities include day services, the operation of community buses, shopping support through the Shima-no-Kizuna-Bin delivery service, souvenir development, the operation of a playschool, empty home countermeasures, and the promotion of the Kasaoka Islands. It is working to improve efficiency by optimally allocating personnel, equipment and other resources to its various business operations.

The organization already has four day service facilities, including a facility taken over after the withdrawal of a private business operator, as well as remodeled disused houses. It aims to offer an even wider range of welfare facilities for the elderly. The Shima-no-Kizuna-Bin delivery service is a lifeline for people living on the islands, where there are few shops. Kasaoka Shimazukuri Kaisha takes delivery of products ordered from a mainland supermarket at its port facility and then sorts them for home delivery.

**Fig. 13 Kasaoka Shimazukuri Kaisha—An NPO Created to Support Island Communities**



Source: Compiled by JRI on the basis of interview results

Kasaoka Shimazukuri Kaisha operates Ayumi-en playschools on Mushima Island where there are multiple preschool children. The facilities, which were established by Kasaoka City in 2006, are run by Kasaoka Shimazukuri Kaisha as publicly established/privately operated facilities. The establishment of this childcare environment led to the reopening of the Mushima Elementary School in 2007, which had been temporarily closed for four years.

As is apparent from the withdrawal of the private operator that had previously provided day services for the elderly, demand for all these services is limited, and it would be difficult to maintain them as individual business operations. No company would be able to earn sufficient profits to remain in business solely from the low-margin shopping support service, or initiatives based on the utilization of disused houses, which basically provide no income.

Kasaoka Shimazukuri Kaisha supports local community life by playing a public role in areas such as welfare in collaboration with the city office and other agencies. It has established a viable business by using its resources efficiently as an all-round service provider. There is also the potential to avoid the waste and inefficiency that would occur if these services were provided solely by government agencies. In addition, Kasaoka Shimazukuri Kaisha is creating a certain number of local jobs.

## **B. Maintaining and Creating Employment through Work Concentration**

Another essential concept in an environment where demand is shrinking and labor is short supply due to population decline is the bundling of demand and the concentration of work so that it can be handled by a smaller number of people.

In April 2016, Yamato Transport Co., Ltd. launched an integrated delivery system in Tama New Town for items aggregated from other delivery firms. Sagawa Express Co., Ltd. and Japan Post Co., Ltd. drop items at a community base established by Yamato Transport in Tama New Town. Yamato Transport then delivers these items, together with its own consignments, to individual homes (Fig. 14).

This initiative by a delivery firm has improved customer satisfaction, since residents can now receive deliveries from various companies at one time. It is also reducing environmental loads through the improvement of local logistical efficiency. Other benefits include enhanced safety due to the reduction of vehicle traffic. The system was introduced to provide benefits from the viewpoint of consumers and residents. If it is successful in Tama New Town, the same approach is likely to be used in other communities.

In addition to its original aims, this type of collaboration among companies also offers benefits from an economic perspective. By concentrating work, participating companies can expect to gain improvements in their operating efficiency, which means that this approach could be extremely useful in regions affected by shrinking demand and labor resources. Tama New Town is already an aging community, and its population is expected to shrink in the future. Even if there is a decline in the total quantity of items handled across the entire community, the volume of items can be increased by bundling the work and integrating the individual delivery process, which tends to be inefficient, under a single delivery contractor. The firms that consign the items also benefit, since they can redeploy personnel to more productive operations.

Yamato Transport is also working to maintain and improve community infrastructure and maintain bus route networks by combining passenger and freight services on trains and buses. This will allow collection and delivery staff in communities remote from urban areas to spend more time on collection and delivery work. Companies need to prepare for demand shrinkage by thinking flexibly about ways to provide services as good as or better than those provided in the past with fewer personnel.

ATM Japan, Ltd., a major provider of outsourced management and monitoring services for ATMs

**Fig. 14 Community Support Using a Yamato Transport's Community Base**



Source: Yamato Transport website (used with permission)

installed in banks and convenience stores, is rolling out a “shared outlet” service for regional communities. The aim of this plan is to combine essential community facilities, such as government offices and post offices, by creating integrated service outlets under contracts with multiple banks, post offices, and local government agencies.

Under this scheme, organizations that were considering the closure branches and offices in areas where profitability has fallen due to low demand will be able to provide manned outlets in those areas. To cope with customer inquiries that require advanced knowledge, ATM Japan plans to create an environment in which customers will be able to communicate with the headquarters of the organizations concerned via video telephone links and other systems.

Compared with the establishment of their own outlets, participating banks and organizations will be able to maintain and improve the convenience of services for local residents, while minimizing the number of customer service personnel required. These outlets have the potential to become essential facilities in regional areas as locations providing one-stop access to face-to-face services for the elderly and others, including banking, government, and postal services.

Some organizations have already started to use advanced copier terminals in convenience stores to issue residence certificates and other documents automatically. The spread of this type of services can be expected to enhance convenience for residents. However, there are a number of disadvantages, including high costs for local governments that introduce the system. In addition, people using the system need to produce their My Number cards and Basic Resident Register cards. As result, only 289 municipalities use the system to issue residence certificates, and just 29 use it for family register certificates (as of December 1, 2016 in both cases).

### **(3) Job Creation through the Marketization of Self-Help/Mutual Help Functions**

Two requirements for young people to live sustainability in rural communities and other regions are the provision of reliable employment and income, and the reduction of the burden of community activities. In some communities where a high percentage of the population is elderly, younger people are forced to accept an excessive burden of community activities. In such communities, it

will be necessary to create employment by outsourcing services that have previously been provided free within families and communities, such as nursing care, transportation, water supply management, and roof re-thatching, as paid services.

Not only in regional areas, but throughout Japan, an increasing number of people need to rely on others to carry out shopping and other tasks that they once did for themselves as a matter of course. Shopping support services are already being introduced throughout Japan. We also need to move away from the idea that other types of home services should rely on mutual assistance in neighborhoods, so that we can create systems to provide these services in return for reasonable payments.

The new community base established by Yamato Transport in Tama New Town is being used not only to aggregate items for delivery, but also for the provision of various home support services (Fig. 14). Shopping support and housekeeping services for the elderly are provided on a fee-paying basis. Yamato Transport views this community service structure as a model for a new type of hub for community revitalization in urban areas and aims to develop its community base as a center for the provision of various services in an aging society. Of course, business models based on this concept should also be propagated in regions affected by serious population decline and aging, including rural communities, where people currently rely on self-help and mutual help for these services.

Tokushimaru, Inc. is a business model that emerged from Tokushima Prefecture, a region affected by population decline. It is an evolved version of the mobile shops that we used to see everywhere. The innovative features of the Tokushimaru concept are that it engages in proxy selling under agreements with supermarkets, and that it adds a 10-yen margin to the products sold. To avoid the risk of unsold goods, which is a problem when individual business operators buy stock for mobile shops, Tokushimaru has adopted a business model based on selling fresh produce, household goods, and other items, on behalf of affiliated supermarkets. In addition, a 10-yen margin is added to products to provide income for the operator. Even with the extra margin, shopping is cheaper for consumers who would otherwise have to pay for public transport or taxis when they go shopping. Partnership with mobile shop operators also offers major benefits for supermarkets<sup>3</sup> by allowing them to find customers and secure sales in an era of population decline. The Tokushimaru business model has already spread throughout Japan<sup>4</sup>.

Supermall Lucky, a shopping mall in Yokote City, Akita Prefecture, operates free shuttle buses between communities with limited access to transportation and supermarkets, under shopping support agreements with mutual help organizations in those communities. Although the provision of free bus transport results in higher costs for the shopping mall, the service is expected to result in increased customer numbers and sales, while also helping to reduce the stock purchasing costs.

This scheme can also be seen as a structure under which part of the bus operating costs are passed on to users through product purchases. It is a successful example of marketization through the outsourcing of mobility services for the elderly living in areas with poor transportation services, which are commonly provided by local volunteers or through government support, with those involved sharing the cost.

Initiatives such as this need to be viewed as concepts that can help to reduce the burden of self-help and mutual help services on the small number of young people living in these communities,

<sup>3</sup> Supermarkets that enter into agreements with Tokushimaru are required to pay a contract fee and monthly royalties to Tokushimaru.

<sup>4</sup> In May 2016, Oisix.daichi Inc. announced that it had acquired the shares of Tokushimaru, making it a consolidated subsidiary. According to its press release, Oisix.daichi Inc. aims to increase the annual sales of Tokushimaru from approximately 1.5 billion yen at present to 10 billion yen over the next three years.

while also generating service income that will provide livelihoods for those in younger generations.

#### **4. Composite Community Service Businesses (Organizations) Needed in Regions Affected by Falling Population Densities**

We will next consider the types of organizations that are needed to contribute to the sustainable provision of community services and the creation of employment for young people in regions affected by a continuing decline in population densities by applying the concepts of economies of scope and work concentration.

##### **(1) Vision for Organizations**

As shown in the previous sections, rural communities affected by falling population densities need community service businesses (organizations) that can provide transport, logistics, housekeeping support, community support, nursing care, education, and other services. From the perspective of economies of scope, such organizations should be established as composite service providers. There is also a need for participation by organizations managed as private sector businesses that can combine these functions with the operation of profit-making activities.

Because of the declining number of workers in these communities, these organizations will need to concentrate their business activities, while introducing new technologies. For example, scheduled bus services and taxis are struggling both with shrinking demand and a dwindling number of workers. Rather than using workers to operate vehicles, companies in these areas should gradually shift to business models based on income from the operation and management of autonomous vehicles and ride sharing systems.

Instead of the simple provision of passenger transport, companies should also move into other industries as providers of diverse community services. As shown in the case studies, Yamato Transport and Japan ATM have responded to social changes resulting from demographic aging and population decline by experimenting with the creation of new service businesses. The regions with the most problems are also the greatest source of undiscovered business opportunities.

##### **(2) Potential Participants**

The business operators that are likely to move into these areas include companies that already have regional networks, such as logistics and transportation companies and convenience store chains. There is also significant potential for participation by companies in totally different fields, such as Japan ATM and Yahoo! Japan. Other organizations that can be expected to expand the scope of their activities include leasing companies, designated managers of roadside stations, and forestry and farming cooperatives, which have facilities that could function as community bases, as well as the expertise needed to provide new services.

Of course, venture companies and social enterprises also have excellent potential as new business operators. The entrepreneurial environment in regional areas is improving dramatically with the emergence of crowd funding and entrepreneurship support from regional banks. In some cases, NPOs like Kasaoka Shimazukuri Kaisha will become key players. However, the private company format is preferable from the viewpoint of improving profitability and providing integrated bases for community revitalization.

Private sector companies that participate in the provision of community services start up small or appropriately sized business operations and manage their organizations flexibly by making course corrections when issues arise. The free shuttle bus service run by Super Mall Lucky initially began

with just one route, but the popularity of the service has resulted in its expansion, and there are now multiple vehicles operating on various routes. There are still issues affecting the bulk home delivery system, but the operators are improving the service from the customer's perspective by tweaking differences in the services of the participating companies.

### (3) Employment Scale

According to a survey by the Ministry of Internal Affairs and Communications<sup>5</sup>, there are 6,500 core communities dispersed across the regions as focal points for the approximately 65,000 isolated communities scattered throughout Japan. As outlined below, we have estimated the number of jobs that could be created by placing one integrated community business (organization) in each of these core companies.

Kasaoka Shimazukuri Kaisha currently operates under an analog business model with a turnover of around 100 million yen per year. An estimate of the employment effects using the Input-Output Table for Okayama Prefecture indicates that the business has directly created 17 jobs. To allow for the labor-saving effect of ICT and other technologies, we will assume that business of this type will create 10 jobs. This means that all social enterprises throughout Japan could create 65,000 new jobs from business activities worth 650 billion yen. The number of jobs is not especially large compared with the 167,000 jobs provided by Japan's 1.5 trillion yen fisheries industry, but it is greater than the 48,000 jobs in the 450 billion yen forestry industry. (The data were obtained from the Ministry of Agriculture, Forestry and Fisheries website and are for 2014 or 2015.)

Outsourcing of services that have previously depended on self-help and reciprocal help can be expected to lead to further industrial growth through the diversification of the services provided by the business entities. We need these businesses to evolve alongside fisheries and forestry as a key industry in isolated regions. We also need these businesses to develop further as vital entities for community life.

## 5. Conclusion

When we hear about technological innovation and structural reforms, we tend to envision initiatives in major cities. However, it is in areas with disadvantageous conditions, such as depopulated communities, that the greatest benefits can be obtained through the introduction of new technologies and ideas. Because of the shortage of workers in these areas, there is a need for innovative technologies that allow the provision of services that are equal to or better than those provided in the past, while minimizing the number of workers required.

For example, it would obviously be easier to introduce self-driving vehicles quickly in regional cities and rural communities, where vehicle and pedestrian traffic is low. This approach is likely to be more feasible and sustainable than bus services based on mutual assistance by residents or fiscal expenditure, which are unlikely to be sustainable.

While Japan cannot make its cities more compact, the availability of new tools and systems should make it possible to build regional societies that provide greater comfort and sustainability than in the past. Since Japan's population will continue to decline in the future, we should accelerate structural change in society and actively embrace the challenge of new initiatives and technologies.

(December 1, 2016)

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<sup>5</sup> Based on a March 2011 report concerning the status of communities in isolated regions, etc.

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