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The reconstruction of transportation and environmental infrastructure in rural areas

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ABSTRACT

On March 11, 2011 a massive, magnitude 9.0 earthquake destroyed most of the rural areas along the Pacific Coast of eastern Japan, an area that had been facing issues of depopulation and aging even before the earthquake. In this paper I discuss reconstruction plans for depopulated rural areas from the perspectives of transportation infrastructure, residential areas, agriculture, forestry, fisheries, consensus building, and nature restoration. We must take a "backcasting" approach to sustainable development, one in which planning strategies lead to successful outcomes. An organizational and planning support platform is needed to build a consensus within an area.

1. Introduction

A massive, 9.0 magnitude earthquake struck the northwest Pacific off northeastern Japan on March 11, 2011, triggering tsunami damage in the coastal areas of the Tohoku and Kanto regions and severely damaging the Fukushima Daiichi nuclear power plant. Notably, many small settlements along the Sanriku Coast were totally destroyed by the tsunami. Most local governments in the Sanriku coastal area, ranging from the middle-east part of Miyagi Prefecture to the southeast part of Aomori Prefecture, were already suffering from depopulation and aging populations. Ishinomaki City is the biggest in the area, with approximately 150 thousand people. The second biggest city is Kesennuma, which had over 73 thousand people before the earthquake. Kesennuma City had merged with Karakuwa Town in 2006 and Motoyoshi Town in 2009, however, its population density was approximately 220 people per square kilometer. The population density of all other local governments in the area other than Ishinomaki City was fewer than 200 people per square kilometer.

Most areas in Miyagi and Iwate Prefectures that were damaged by the tsunami also suffered from huge tsunamis in 1896 and 1933. Many people died from these disasters, but the population recovered with the rapid increase of the total population of Japan. The population of Japan is said to have begun decreasing this decade. In 2010, a Long-term Perspective Committee, of which I am a member, was established under the National Land Council of Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT). In late February 2011, the committee announced its midterm report on the outlook of Japan for the year 2050. Based on last year's statistics, we estimate that if trends continue at their current pace about 20% of the currently inhabited land will lose all its population by 2050, and an additional 20% or so of Japan's land will have fewer than 10 residents per square kilometer. In other words, we project that about 40% of the currently inhabited areas will be virtually uninhabited by 2050. The Sanriku coastal area is no exception.

The population of the most damaged local governments decreased by 5% or more from 2005 to 2010, and the percentage of the population aged 65 and over was approximately 30% or more in 2010, according to the national censuses in 2005 and 2010. Comparing the population density per square kilometer in Kesennuma City for 2005 and that estimated for 2050 by the committee (Fig. 1), it is clear that the population of the city will decrease. The percentage of the elderly is not included in the figure but will exceed 50% in most areas. The recent earthquake is likely to accelerate the tendency toward depopulation and aging in the Sanriku coastal area.

Japan now faces a serious financial crisis. When a huge earthquake struck central Japan in 2004 the Japanese government responded by investing over 100 billion yen in Yamakoshi Village (population 2000), which subsequently merged into Nagaoka City. This was possible because the scope of the damaged area was limited. But can the government now support local governments affected by the recent earthquake in the same way? The affected areas span from the Kanto to the Tohoku region, with over 270 thousand buildings and houses destroyed. How can we reconstruct these rural areas?

In this paper, I review the damage situation in rural areas, especially along the Sanriku Coast. Then I discuss what we must do to reconstruct the rural areas given the issues of rapid depopulation and aging. Finally, I focus on consensus building and partnership in local reconstruction planning.

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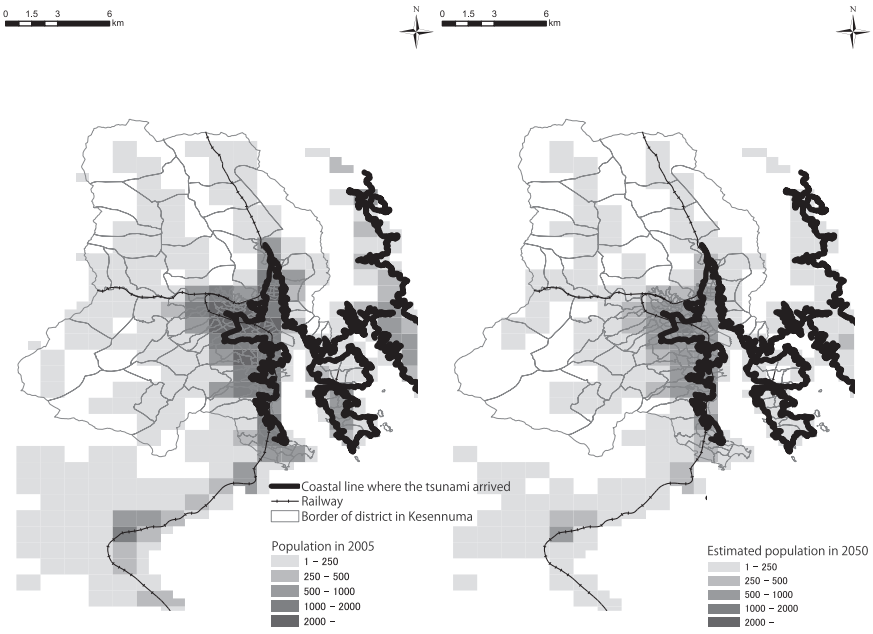

Fig. 1. Population density in 2005 (and estimate for 2050) for central Kesennuma City.
By Ohba, A. (Keio University) using data from MLIT.

2. Reconstruction of settlements in rural areas

Many people took refuge in schools, community centers, or other public facilities just after the earthquake. The local governments of Iwate, Miyagi and Fukushima Prefectures had closed all such facilities by the end of December because most people had moved into temporary housing. The government has constructed 52,120 temporary houses (according to an MLIT announcement at the beginning of December 2011). 328,903 people had lost their homes and had moved to a temporary housing or other locations, such as apartments or relatives' homes (according to a government announcement on November 24, 2011). Many settlements were totally destroyed by the tsunami, while the earthquake caused land subsidence of as much as 0.7 m that makes it impossible to reconstruct houses and buildings in the same places. The government has suggested relocating such settlements to a higher ground. The third supplementary budget for this fiscal year passed the National Diet on November 21, 2011, and relocation to a higher ground will be totally supported by the government. Relocation plans are now being discussed at many settlements, especially in small fishing villages. If more than five households want to move together to a higher ground, the cost of constructing a residential site will be fully supported.

Relocation to a higher ground is not a new solution. Some relocations took place after the huge tsunamis in 1896 and 1933. Yamaguchi reports examples of relocation after the tsunami of 1933 [1]. Some settlements that relocated after these tsunamis were destroyed again, either because the height of the relocation was inadequate or because the settlement had sprawled into the lowland in subsequent decades. The damaged rural areas can be divided into four types (Table 1). The first is areas with little damage to the settlement due to an effective previous relocation, such as the Yoshihama District of Ofunato City. The second is areas where relocated settlements had little damage, but sprawl areas were heavily destroyed, such as the Ryori District of Ofunato City. The third is areas damaged because their relocations were not high enough, such as the Oya District of Kesennuma City. The fourth is areas that were totally destroyed because they were not relocated after previous tsunamis, such as the Taro District of Miyako City. Taro was famous for having the highest breakwaters in Japan. In the 1933 tsunami, 911 people perished in Taro Village, which merged with Miyako City in 2005. Taro decided to construct ten-meter breakwaters around the central settlement to prepare for the next tsunami. There was a big tsunami in 1960 along the Sanriku Coast caused by a massive earthquake in Chile, but Taro was unscathed owing to its high breakwaters. The tsunami caused by the recent earthquake, however, destroyed the breakwaters and caused serious damage to the settlement.

Table 1
Four types of districts as damaged by the tsunami on March 11, 2011, in relation to previous relocations after past tsunamis.

District	City	Damage by this tsunami	Old relocation	Damaged area
Yoshihama	Ofunato	Slight	Yes	Agricultural land use
Ryori	Ofunato	Heavy	Yes	Sprawled area
Oya	Kesennuma	Heavy	Yes	Relocated area
Taro	Miyako	Heavy	No	Surrounded by breakwaters

I researched relocation plans for some small settlements in Kesennuma City and found some problems. First, it is difficult to discuss plans with former residents because they now live apart in several temporary housing complexes or other places. Sometimes even community leaders have no information about who is where. In addition, there is no place to hold meetings. The larger temporary housing complexes have meeting houses, but only for the use of the new community living within the complex. Another problem is aging and depopulation, which were serious problems even before the earthquake. Since the earthquake, many young families have moved to larger cities like Sendai, the capital of Miyagi Prefecture. If a new relocation site is constructed, how many people will move back to live there? The government will support the cost of constructing such sites, but people are responsible for building their own houses. Construction will take years. New settlements could become ghost towns in a decade if young people do not come back or newly migrate. Constructing relocation sites requires a huge budget, so we need to consider plans for restoration of sustainable communities.

3. Restoration of agriculture, forestry and fisheries

The government announced on June 24, 2011 that the amount of damage caused by the recent earthquake totaled 16.9 trillion yen, excluding the damage caused by the Fukushima Daiichi nuclear power plant accident. The amount of damage in primary industries was