



Impact of Modernization on Disaster-prone Regions as Factor of Increasing Vulnerability: Case of Ishinomaki and Kesenuma, Miyagi, Japan

KOJI MIWA*

*Extension Center, Institute of Environmental Rehabilitation and Conservation, Tokyo, Japan
Email: koji.miwa.0104@gmail.com*

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Abstract Natural disasters have caused many impacts on the modern society mainly in disaster-prone regions. Although modernization has improved disaster prevention measures based on science and technology, it has also changed the human lifestyle from the traditional to the modern way, which may increase the disaster risks. This paper studies the relationship between modernization and its adverse effect on a disaster-prone region from the sociological and geo-historical approach to analyze the root cause of disaster. It takes up the case of rural area, Ishinomaki and Kesenuma cities, Miyagi Prefecture, Japan - where are historically vulnerable to geophysical disasters such as earthquake and tsunami. Both cities were significantly damaged by the Great East Japan Earthquake in 2011 despite the modernized society. The study is based on the qualitative method which mainly constitutes of literature analysis. The main conclusion is that the Japanese modernization started since 1868 entailed increased risks for the society. Modernization has certainly produced effective disaster prevention measures based on advanced science and technology and centralized measures led by the government and economy-oriented development. However, the modernization which brought from the West where natural disasters are not as critical as Japan was not always prioritized over the political and economic competition. Hence, it caused the disaster-prone area more vulnerable when a disaster topples the capacity of such modern system by increasing the exposure to hazards under diplomatic and security issues and economy-oriented development.

Keywords natural disasters, modernization, vulnerability, root-cause, historical geography

INTRODUCTION

Modernization or ‘developmentalism’ has been regarded as production of wealth and improvement of living condition under capitalism diffused by the West. However, according to Smith (2004), the trend of disaster in the modern society is resulted from the exploitation of nature, the rapid population growth, urbanization, social and economic inequality, climate change, political change, economic growth, technical innovation, social expectations and global interdependence, as the consequence of modernization. Modernization has certainly brought a great improvement in disaster prevention measures with the advanced science and technology. However, the modernization have also deprived the societies in disaster-prone regions of the community-based adaptation based on their local cultures and environment. Therefore, several sociologists and anthropologists have criticized the Western-centric view of development for such byproducts. These locally adapted measures are considered more effective prevention measure than transferring the Western technology based on the centralization and economic development (Smith, 2004).

Although Japan has developed with the world-leading technology, it was not able to prevent huge earthquake disasters, such as the Great Hanshin Earthquake in 1995 with 6,437 deaths, and the Great East Japan Earthquake in 2011 with 15,883 deaths and 2,676 missing (Japanese Cabinet Office, 2011a). Most of the casualties in the latter case were caused by tsunami disaster despite that the region is historically prone to tsunami and has been equipped with the world-leading hard measures. Even the government and researchers had predicted 88 percent of possibility of the occurrence of

great tsunami triggered by a huge earthquake in the Miyagi off-coast by 2023 and they had been warning the local people and improved evacuation measures (Imamura, 2013, pp. 50). The cause of the disaster has been attributed to several reasons in the previous studies, such as the failure of tsunami warning system (Japanese Cabinet Office, 2011b), the insufficient evacuation road (Sekiya, 2011), the loss of culture of disaster in the society (Sekiya, 2011; Yoshihara, 2013; Tanaka, 2013), and the loss of the local community ties (Yoshihara, 2013). However, there has been no study which looked into the root cause of the disaster. As “human sensitivity to environmental hazards is a combination of physical exposure, or the range of potentially damaging events and their variability at a particular location” (Smith, 2004, p. 10), it is important to investigate the cause why the society was developed in the vulnerable locations.

OBJECTIVE

The overall research aim of this paper is to study whether the modernization of the Japanese society led to increased vulnerability to natural disasters by the time of Great East Japan Earthquake in 2011. It applies sociological and geo-historical approach to analyze the root cause of the disaster. The history of modernization in Japan starts in 1868 and entails not only development of economy, science and technology but also diplomatic or security issues. The study takes up the tsunami disaster and focuses on geographical location of affected areas as the main risk factor in Ishinomaki and Kesenuma cities, Miyagi Prefecture. To limit the study, the research question puts an emphasis on why and how the population had located themselves in such vulnerable area in the process of modernization by the time of the disaster.

METHODOLOGY

This study applies a qualitative method which constitutes literature and data analysis. In order to understand the impact of modernization of Japan in the target areas, it studies their historically and socially significant phenomena during the modernization. Sources of literature, map and population census are collected from the official documents and reports published by both city and national governments and other Japanese authorities as well as the literature about the Japanese history from both Japanese and foreign authors for the accuracy and objectivity of historical events. Based on the collected data, the cause of increased disaster risks by developing along the coastal areas was. Kesenuma and Ishinomaki cities, Miyagi Prefecture were chosen as case study as they suffered the most and the third largest respectively among all the devastated municipalities in the disaster.

RESULTS AND DISCUSSION

At first, the old maps and the post-disaster maps are compared as seen in Fig. 1 and 2. The old map of Kesenuma is from 1916 (GSI, 1916) and the one of Ishinomaki from 1929 (GSI, 1929) on the left side of both figures. In the old maps, the darkened part is mainly populated area inside the circle. The rest parts are mainly paddy fields or agricultural lands, and few houses for both areas. In the post-disaster map, red color indicates the limit of tsunami invasion, blue is heavily damaged residential area created by Tsunami Damage Mapping Team, Association of Japanese Geographers (2011).

As observed from the map comparison, most parts of the heavily damaged area (marked by blue in the post-disaster map) were not neither populated nor developed at all in the initial stage of modernization in both cities. They were mainly unused land, paddy fields, agricultural land, or even the sea.

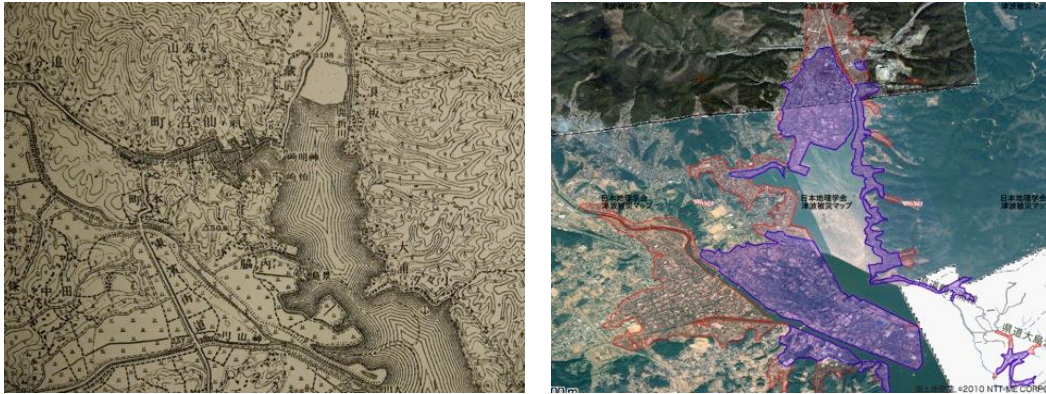


Fig. 1 Maps of Kesennuma in 1916 (left) and the post-2011 disaster (right)

Source: The 1916 map of Kesennuma is a scale of 1:50,000 from Geographical Information Authority of Japan (GSI) (1916), and the post-disaster map is “Tsunami Damage Map” from the Tsunami Damage Mapping Team, Association of Japanese Geographers (2011)



Fig. 2 Maps of Ishinomaki in 1929 (left) and the post-2011 disaster (right)

Source: The 1929 map of Ishinomaki is a scale of 1:50,000 from GSI (1916), and the post-disaster map is “Tsunami Damage Map” from the Tsunami Damage Mapping Team, Association of Japanese Geographers (2011)

Table 1 Population changes in Kesennuma and Ishinomaki from the early modern period

| Kesennuma | | | Ishinomaki | | |
|-----------|------------------|----------------|------------|------------------|----------------------|
| Year | Total population | Kesennuma Town | Year | Total population | Ishinomaki Town/City |
| 1882 | 17,411 | N/A | 1889 | N/A | 18,573 |
| 1920 | 43,824 | 9,788 | 1920 | 102,953 | 22,067 |
| 1940 | 63,656 | 17,973 | 1940 | 137,327 | 36,442 |

Note. Total population for Kesennuma and Ishinomaki contains population of municipalities which had not been merged with both cities in these periods but were a part of both cities as of the time of disaster occurrence, 11 March 2011.

Source: Data for population of Kesennuma city in 1882 from Kesennumashi-shi-hensan-iinkai (1990); for population of Ishinomaki city in 1889 from Ishinomakishi-shi-hensan-iinkai (1998); adapted for population of Kesennuma and Ishinomaki in 1920 and 1940 from the 1920 and 1940 Population Census (Statistics Bureau, Ministry of Internal Affairs and Communications of Japan [MIC]), URL: <https://www.e-stat.go.jp/en>, accessed on 12 October, 2013.

Table 2 Population changes in Kesennuma and Ishinomaki Cities for the post-1945 period

| Kesennuma City | | | Ishinomaki City | | |
|----------------|------------|---|-----------------|------------|---|
| Year | Population | Population density (per km ²) | Year | Population | Population density (per km ²) |
| 1920 | 43,824 | 131.5 | 1920 | 102,953 | 185.2 |
| 1950 | 76,391 | 229.5 | 1950 | 176,925 | 318.5 |
| 1980 | 92,246 | 276.6 | 1980 | 186,094 | 333.5 |
| 2010 | 73,489 | 220.4 | 2010 | 160,826 | 289.4 |

Note. Total population for Kesennuma and Ishinomaki from 1920 to 1980 contains population of municipalities which had not been merged yet with both cities in the periods but were a part of both cities as of the time of disaster. Population density in 1920 is calculated by using the area of each city as of 2010.

Source. Adapted from the 1950, 1980, and 2010 Population Census (Statistics Bureau, MIC), URL: <https://www.e-stat.go.jp/en>. accessed on 16 October, 2013.

The population increase in both cities occurred since the late nineteenth century through modernization as seen in Table 1 and 2. Based on these facts, the vulnerable coastal areas were significantly developed and populated, increasing the exposure risk to hazards during the process of modernization. Both cities also developed their urban area and increased land development for housing and commercial use. In Kesennuma, the urban area increased from 3.2km² in 1975 to 6.4km² in 2005. In Ishinomaki, the population in the urban district was 61,573 in the district area of 6.60 km² in 1960. It increased up to 103,518 and 23.40km² respectively by 1995 and 94,342 people and 25.89km² in 2010 by the time of disaster.

The next section looks into the historical causes of these increased risks. Firstly, it discusses the early modern period from 1868 to 1945, and then the post-1945 period up to 2011.

The Early Modern Period (1868-1945)

Since modernization started in 1868 in Japan, its economy-oriented development in the country was launched under the pressure of the West, especially the U.S. which was seeking for more capital resources in the East Asia at that time. Although there was a strong domestic resistance to the US demand for opening the Japanese market to the West in the beginning, the Japanese leaders finally gave in. The main terror was the Western military and armed forces as well as the strong industrial economy which were too strong for then Japan. By concluding unequal treaties with the West, Japan undertook modernization quickly, aiming to catch up with the industrialized nations. Political, economic and cultural modernization occurred hand in hand with militarization and industrialization. In this way, Japan started modernization following the Western technological model, though the aim was to abolish the unequal treaties and establish an equal relationship with the West under the slogan of ‘fukoku-kyohei’ (literally rich country, strong country). (Duus, 1998; Cullen, 2003; Kito, 2010)

Under such circumstance, Kesennuma and Ishinomaki which were mere small villages at the initial stage of modernization were soon included in a part of the national modernism plan and encouraged to increase the fishery activity as a means of capital industrial economy. As well as other industries, fishery and its related industries were rapidly modernized by the lead of the central government. The intention was to resist to the western fishing in the Japanese adjacent waters. As the West advanced in the Japanese adjacent water, the U.S. and the U.K. were overfishing whales and Russia was hunting sea otters and fur seals to a significant extent. The then Japanese government was afraid of drying up of her natural resources by the West. Although the people in the area mainly produced crops and only engaged in coastal fishery just for a self-sufficient living in the pre-modern period, they were urged to shift to the pelagic fishery under the governmental plan. In 1897 Pelagic Fisheries Encouragement Act was issued by the central government to subsidize fishery boats, fishery tools and crews. The government encouraged economic activity by forming the fisherman’s union. Fish processing industry became the main industry in the area and a number of factories were constructed in both coastal cities. Such industry was also important to supply to the military during the war period to feed the people in the battle fields. Besides the fishing industry, sericulture industry

developed in both cities and the number of its factories rapidly increased. Because of the Western demand, silk was the pivotal source of the Japanese exports to them during the time under the unequal treaties and helped Japanese modernization. In this way by the end of the Meiji era (1868-1912), the whole town of Kesennuma and Ishinomaki became a place of production. As both cities were engaged in the primary industry, the development in the coastal area was highly important for the convenience of transportation. With such changes, the population grew rapidly in both cities as seen in Table 1.

To conclude this period, development and urbanization of both cities were primarily attributed to the country's security and diplomatic issues under the threat of the West and the capitalistic competition with them. Vulnerability of the area to tsunami disaster seems to have not been prioritized at all by the then government because the security issue is a more urgent issue for the country's survival than natural disasters. Therefore, even after the case study area experienced the 1896 Meiji-Sanriku Earthquake which caused 21,959 deaths, the both cities kept developing.

Post-1945 Period

With the loss in the WWII, Japan launched a policy of 'economism' under the US support by the Liberal Democratic Party (LDP) which stayed at the first position in the parliament for a long time in this period. The country was initially put under the control of the Supreme Commander for the Allied Powers, the US occupant authority. The occupation aimed to transform Japan into an ally of the U.S. Although the U.S. aimed to restrain Japan from her economic development as a punishment of the WW II, they decided to make Japan "the chief factory of Asia" as the Cold War loomed problematic for them (Duus, 1998, p. 272). Japan aimed to be independent of the US occupation, to return to the international community, and to reconstruct the country. For these, the people were united and worked hard which led to the rapid reconstruction and high economic growth since 1950s. With technological improvement, the Japanese farming was mechanized and thus increased its productivity and efficiency. It led to a substantial decrease of rural population with a labor force increasing in service industries in cities. However, to secure the parliament seats by collecting more votes the LDP distributed money to the countryside, main industries and powerful corporations. This caused excessive land development and promoted industries in the countryside. For the U.S. it was important to decrease anti-US sentiment to make Japan a good ally under the Cold War. Under the Eisenhower's "New Look" and "Atoms for Peace", the U.S. accelerated nuclear energy production in Japan with advertisement of good images of the U.S., and economic development with cooperation of Japanese corporations. (Duus, 1998; Cullen, 2003)

Based on the economism, the fishing industry was also promoted to expand its economy further. Since 1951, "gyokoseibichokikeikaku" (literally, long term project of fishing port arrangement) was launched as a national policy, and the Kesennuma port was selected as one of the targets. Since then the area of the Kesennuma port was developed with a large investment by the government. Since 1969, the national budget was used for the Kesennuma port selected as a port which needs a 'special development'. With the development plan, the area around the port became filled with industries and residential houses and the land was extended by reclamation of the sea. (Kesennumashi-shi-hensaniinkai, 1993)

Ishinomaki fishing port was also selected as a 'special development' was needed in 1973. After the WW II, Ishinomaki also followed a national policy that focuses on the economic growth. Ishinomaki city planned to develop the Ishinomaki port and offered industries in the hinterlands of the ports along the coast, aiming for a 'marine products city'. The city organized the inter-industrial relationship for marine products industries and eventually many manufacturing industry and factories were built in the coastal industrial zone. (Ishinomakishi-shi-hensaniinkai, 1998)

As the result of economism, economic development in the coastal areas, where are vulnerable to tsunami disaster, was significant in both cities. It led to the population growth and construction of factories or any other economic activities along the coastal area.

To conclude this period, the causes of increased risks in the both cities by developing in the vulnerable area are mainly attributed to the US occupation and their political and economic strategy

as well as the global economic competition, continued from the pre-war period. They were more critical and certain issues for the Japanese over unpredictable natural disasters. In addition, the economic development was important for the Japanese people to recover their confidence after the loss and collapse in the war. It led to the further economic development, losing the local adaptation skills to natural hazards. The absence of huge natural disasters or tsunami in Japan during the economic growth period might also promote the people to lose consciousness of the disaster risks.

CONCLUSION

The main driving force that led to the population increase in vulnerable areas in both cities was the diplomatic and security issues for Japan and economy-oriented development caused by the Western occupation and the global economy. Under such circumstance, both cities were assigned to develop the fishery and silk industries for the country's survival. It led to the population increase and land reclamation along the coast. Even after the WW II and the modern technology and science developed, the people kept developing in the vulnerable area under the economism. For the generalization of the result of this study, because the diplomatic, security and economic issues can be more urgent and critical than natural disasters for a country's survival, such pressure can lead a country in disaster-prone region to increasing disaster risks, thus vulnerability. Therefore, dispute settlement and peace building are important matters than employment of modern technology or economy to achieve sustainable and resilient society. The current global economy standardize the way of living and the competitiveness regardless of whether a country is in a disaster-prone region. There is a need for system which can prioritize disaster risk reduction and mitigation over profit-maximization.

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