

# Economic scenario planning after Tokyo metropolitan earthquake.

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**ABSTRACT:** This paper tries to formulate an economic scenario after the occurrence of an earthquake in the metropolitan area of Tokyo. Japan's Ministry of Education, Culture, Sports, Science and Technology estimates a 70% probability for the South Kanto area (beneath the Tokyo metropolitan area) to be struck by an earthquake measuring approximately 7.0 on the Richter scale in the next thirty years. In terms of establishing effective countermeasures, the challenges with respect to responding to and recovering from earthquake disasters are considerable, serious, and complex owing to uncertain economic circumstances after an earthquake. Scenario planning is considered the tool for decision making during such uncertainties. By developing the economic scenarios, this paper tries to apply scenario planning in disaster management policies with regard to an earthquake in the Tokyo metropolitan area.

*Keywords:* scenario planning, economic recovery, urban disaster

## 1. INTRODUCTION

In the next 30 years, according to the MEXT in Japan, an earthquake of approximately M 7.0 in South Kanto area (beneath the Tokyo metropolitan area) has been predicted with a 70% probability. The Central Disaster Management Council, a supreme governing authority on Japanese disaster management policy, has been assuming that an earthquake with a magnitude of approximately M 7.0 and directly affecting the Tokyo metropolitan area will occur soon; thus, they assign the highest policy priority in reducing the damage caused by the earthquake.

The damage that would be caused by this earthquake is estimated to be catastrophic. In the worst-case scenario, human casualty is expected to be approximately 11,000 people. The economic damage could be rather enormous: approximately 112 trillion Japanese yen, which is as much as 20% of the annual Japanese GDP. Thus, it would undoubtedly be a disaster unlike anything that has ever occurred before. The indirect damage caused by this earthquake is estimated to be as much as 1/3 of the total economic damage, considering that Tokyo is an economic center for not only Japan but also the world. This implies that, with regard to economic damage, a quick and smooth recovery strategy as well as physical damage reduction should be considered.

In this paper, we try to establish some economic recovery scenarios by using the scenario-planning method. Scenario planning is considered a tool in decision making under high levels of uncertainty. Traditional decision-making processes have been based on decisive models and quantitative forecasts. Decision makers will automatically have to commit to one scenario, and they will be ill equipped to change the strategy when the circumstances change. Scenario planning, however, does not stick to the accuracy of the forecast. Instead, scenario planning seeks to have several "plausible" stories about the future in order to change or adjust the strategy very flexibly (Heijden, 1996). There are several studies that apply scenario planning to economic policy making (Forge et al., 2006) (Forge, 2009).

## 2. THE FRAMEWORK

The scenarios developed here focus on the economic recovery process of the Tokyo metropolitan area and Japan. The expected year of the occurrence of the earthquake is between 2020 and 2030. The target period of the scenario approximately ranges from two months to five years after the earthquake has occurred. The aftermath of the earthquake is excluded from the scenario for the following reasons. There would be little, or even biased information about the damage caused by the catastrophe immediately after the event. International financial markets would be catapulted into confusion for a few months, and the economic variables might change unexpectedly. Most of those changes would not reflect the fundamental structure of the economy and the nature of the damages.

## 3. KEY DRIVING FORCES

### 3.1 Reduction of the net national asset

The Central Disaster Management Council estimates the direct damage and, hence, the reconstruction costs to be as much as 66.6 trillion yen. In contrast, Japanese households have net assets of as much as 1,063 trillion yen, which is as much as 16 times the damage incurred. There would be few problems to procure the reconstruction costs even from the domestic financial market. Hence, it is unlikely that the disaster solely increases the credit risk of the Japanese government.

However, situations will drastically change in the very near future. The first factor will be the increase in public debt, which is expected to be as much as 863 trillion yen by the end of FY 2010, only 200 trillion yen less than the net household assets. The second factor is the decrease in the rate of saving due to an aging population, which dropped to 2.2% in 2007, and is unlikely to improve again. IMF discussion papers estimate that in 2020, the public debt of Japan will exceed the Japanese household net assets, assuming that the saving rate of Japan remains constant at 2.2% (Tokuoka, 2010). This implies that the Japanese government has to finance the reconstruction costs from international markets.

### 3.2 Globalization

Globalization is the second key. Thanks to the developments in information technology, the distances between financial markets have reduced, information about investments can easily be shared, and hence, large amounts of money can be transferred around the world in a flash. Globalization is advantageous for disaster recovery, since obtaining financing from abroad is very simple and at a low cost. However, on the other hand, globalization can be disadvantageous in case the reconstruction project is not considered cost effective by investors. Even domestic investors do not necessarily prefer domestic projects to international ones.

The goods and service market is also exposed to global competition. There are many international companies in Tokyo. Their products are consumed not only in domestic markets but also in international ones. Once the economic activities are suspended, they risk losing their market share to other companies. Such a condition requires the reconstruction process to be very quick in order to compete with international markets.

### 3.3 Shrinking construction sector owing to a soft economy

The third key driving force is the shrinking construction sector. During the recovery process from the Great Hanshin-Awaji earthquake in 1995, a slight increase in the price of construction materials and labor was observed. In the case of Hurricane Katrina in 2005, house rents sharply increased to as much as double the previous rates. Richardson (2007) explained that this is because of construction capacity limitations in Louisiana, which constructed 13,600 housing units annually during the 1990s; however, the reconstruction demand after Katrina was approximately 200,000.

This situation would be almost the same after an inland earthquake in Tokyo. In 2008, 157,169 housing units were constructed in Tokyo, which is only 9.6% of the estimated 1.62 million collapsed houses. Even the number of housing units constructed across Japan is 1.09 million, only 67.5 % of the estimated number of collapsed houses. It is obvious that the housing supply capacity will be too small in comparison to the damage incurred.

Supply of office buildings would be more severe. The city of Tokyo has the largest floor space in the world, which is one of the most important infrastructural assets in a central economic city. However, 41.6% of this floor space was constructed before 1981, the year when the previous building code was amended (Akai, 2009). Estimated damage to the building structures was 55.2 trillion yen, while annual construction in Tokyo in monetary terms was 3.1 trillion yen, as of 2007. In Japan, annual construction in monetary terms was estimated to be 28.8 trillion yen, as of 2008. This is as much as 5.5% and 52.0% of the estimated damage, respectively.

In addition, the construction sector in Japan has been shrinking. According to the Research Institute for Construction and Economy (RICE), the nominal construction investment in Japan was 79 trillion yen in 1995 and has declined to almost half, that is, 41.6 trillion yen, in 2010. The number of workers in the construction sector has also been decreasing by 77%, which is not proportional to the investment.

This implies that there would be a certain level of excess capacity in the current construction sector. However, in the very near future, there must be significant changes made in the industrial sector since it is not likely to reverse the downward trend of the construction sector.

## 4. UNCERTAINTIES OF THE SCENARIO

We set two uncertainties in the scenario. The first is the possibility of procuring international finances for reconstruction work. The availability of finance would depend on several factors such as the financial situation of the Japanese government, economic trend of Japan, and political leadership. It would be very difficult to assert that Japan can attract foreign capital.

The second uncertainty is the openness of the construction and labor markets. As discussed earlier, there would be a significant excess demand in the construction sector. Most of the workers in the soft economy do not prefer manual labor. Certainly, market openness is a policy variable, and hence, this should not be an uncertainty. However, the opening of the labor market would have been big on political agendas and would have significant impact on Japanese economy and society. It is not only the matter of disaster recovery of Tokyo. These two uncertainties divide economic recovery into three scenarios, as is shown in Fig. 1.

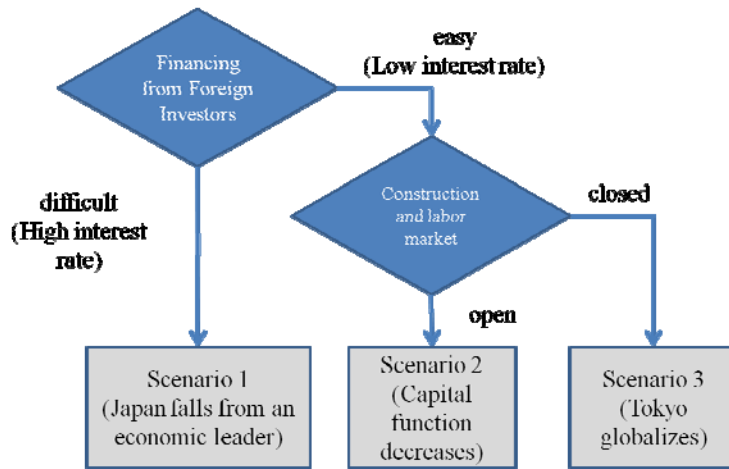


Fig. 1: Structure of scenarios

## 5. SCENARIOS

### 5.1 Scenario 1: Japan falls.

As the scale of the damage caused by the earthquake becomes clear, the long-term interest rate in Japan will increase, since markets will expect the Japanese government to issue a large number of public bonds in the very near future. Private companies try to cover the damage by financing international markets. However, foreign investors request a premium for recovery lending as they are skeptical about the resurgence of Tokyo, as was seen in 1980. The companies that were put up for recovery in Tokyo disappeared from the Japanese market. The situation of small local businesses was more severe. Owing to an increase in interest rates, many of them gave up reviving their businesses. The supply of office space was sparse, and there were many vacant spaces in downtown Tokyo.

The price of land and construction material does not change significantly. Housing reconstruction progresses in comparison to office spaces. However, the working opportunity has gradually been lost and wages have also been decreasing. Owing to this, many people, from among those who reconstruct their houses, claim bankruptcy.

As for national public finance, annual debt servicing cost for interest has increased. The withdrawal of foreign capital from Japanese markets leads to the depreciation of the yen. Because of this, prices of imported commodities increase. Since domestic investment in R&D has shrunk, Japanese products have lessened special value and are exposed to price competitions with emerging countries.

As a result, the price of the land gradually depreciates, and many banks are burdened with bad loans.

### 5.2 Scenario 2: Function of Tokyo weakens

Foreign investors expect that the use of land in Tokyo will be more efficiently upgraded, since old office buildings are being reconstructed and several large redevelopment projects have commenced. Foreign capital flows very rapidly to these project without any premium.

The cost of construction increases owing to excess demand of the domestic construction market. Nevertheless, the construction rush continues because the expected returns from reconstruction projects are much higher than the increased rate of prices. On the other hand, small local cities in Japan are shrinking owing to the concentration of money, labor, and construction materials in the larger cities. The value of the yen is appreciated because of the flow of foreign capital, and this significantly damages the car and machine industries that rely on exports. Thanks to the reconstruction demand, domestic markets become active.

People who have lost their homes find it very difficult to reconstruct their houses because of the increase in construction costs. Thanks to the increase in the land prices, some people sell their houses and buy condominiums. The landscape of the city drastically changes from densely inhabited to high-rise condominiums. The old and the poor, who previously lived in rented apartments, cannot move out of their temporary homes because they cannot afford the new rents, which have increased on

account of the reconstruction. Debris has not been removed in some residential areas, and some of the people who used to live there decide against reconstruction and move out of Tokyo into the smaller cities.

The upgraded land use has not progressed as expected. Companies that were temporarily evacuated from Tokyo cannot establish themselves again. The function of Tokyo city has been declining, and this leads to the additional exit of the companies. Shanghai has now usurped the position of being the economic center of East Asian countries; a position that Tokyo used to hold. The development of huge commercial buildings in the disaster area was too late. Tokyo suffers from a vacancy of 50% of its tenants.

### 5.3 Scenario 3: Tokyo globalizes

Foreign investors expect that the land use in Tokyo will be more efficiently upgraded, since old office buildings are reconstructed and several large redevelopment projects have commenced. Foreign capital flows very rapidly to these projects without any premium.

The slower pace of reconstruction in Tokyo becomes a political agenda. Manufacturing and construction industries are lobbying for the opening of the labor market. Public opinion necessarily accepts this because otherwise the economic situation in Japan would not be beneficial. The Japanese government decides to open the job market. China offers aid for the large amount of waste disposal that the Japanese government has to undertake. Instead, Chinese reconstruction companies undertake several reconstruction projects in Japan.

A massive number of houses and office buildings are constructed in a very short period without inflation, thanks to cheap labor from overseas. However, many issues between contractors and clients are reported with regard to the errors and after-sales service. The bankruptcy of domestic contractors increases despite massive reconstruction demands owing to the price competition with foreign contractors.

As reconstruction demands shrink, the unemployment of foreign workers becomes a big social issue. On the other hand, a free labor market and upgraded infrastructure attracts many companies to invest in Tokyo once again. New job opportunities are generated in Tokyo. There are many cases in which foreign workers are paid higher than Japanese ones. It fuels a political movement to exclude foreign workers, requesting security of employment for the Japanese.

Migration into Tokyo from local cities has accelerated, and land prices are persistently rising. Owing to the asset effect, consumption and investment is also increasing. However, some foreign investors warn that Japan is stepping up a ladder leading to a bubble economy.

## 6. CONCLUSIONS

This study tried to develop economic recovery scenarios arising from the disasters caused by an earthquake in the Tokyo metropolitan area. The best scenario for most Japanese nationals would be scenario 3; however, there are several big problems that need to be considered. Scenario 2 seems undesirable for Japanese nationals; however, it could be a good opportunity to decentralize the nation, restricting reconstruction investment to the lowest level. The development of these scenarios has made it possible to discuss recovery strategies.

Further challenges remain. The scenarios presented here are not the final versions. We need additional experts to enrich the scenarios. Discussing the scenarios with many experts and Japanese citizens would be necessary to create a consensus on them, and it is necessary to formulate the best strategy for the economic recovery of Tokyo.

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