Tsunami In Japan and Indonesia: Geographic Vulnerabilities and The Role of Government Strategies in National Development

Jiayue Bai

Basis International School Hangzhou, Hangzhou, China

Sophia.baihz@outlook.com

Abstract. Environmental determinism suggests that geography is the primary foundation of all inequalities. Building upon this theory, this paper will demonstrate how Japan uses government strategies to overcome environmental disadvantages. An environmental determinist assumption might be widely accepted: natural geographic features play a crucial role in countries' level of development. If this is the case, Japan, a country that has limited natural resources and frequent natural disasters, should face significant drawbacks which could lead to struggles with poverty problems and hindered economic development. However, it has become one of the most developed countries with the help of successful government strategies of efficient prevention and recovery plans against natural disasters and shifts in energy policies. This paper contrasts Indonesia with Japan's development, encountering similar natural disasters, Japan and Indonesia had dissimilar post-disaster responses, leading to distinct economic development levels. This paper shows how countries could implement applicative policies to overcome uncontrollable disadvantages.

Keywords: Sociology; natural geographic features; governmental strategies; environmental determinism; economic development.

1. Introduction

Today, countries' GDP, policies, and economic structures vary greatly. For instance, The United States, ranking first of countries by GDP per capita, has a GDP per capita of $83,320 in 2024, while Syria only has a GDP per capita of $754 [1]. GDP per capita suggests the living quality of residents and the economic health of a country. The huge gap between the two countries' GDP per capita reflects how their living quality varies. Environmental determinism suggests that geography is the primary foundation of all inequalities, as nations have unequal access to resources.

In this paper, Japan would be used as an example to challenge the idea of environmental determinism, by proving how environmental disadvantages could be resolved through proper reactions and choices. Japan, a country that holds limited natural resources and has experienced frequent natural disasters, has today become one of the most developed countries in the world. This paper will compare Japan with Indonesia, which has undergone similar issues caused by natural geographic features, made different choices under changing circumstances, and resulted in a completely contrasting status quo.

2. Environmental Determinism

Environmental determinism, affirming that environmental factors such as natural resources, natural disasters will determine a region's development, could be supported by some examples in the history of humanity. Thousands of years ago, the establishment of the cradles of civilization depended on geographic features. The major ancient civilizations – the Mesopotamians, the Ancient Egyptians, the Indus Valley civilization, and the Ancient Chinese dynasties were all located alongside rivers. The Mesopotamian civilization was situated between the Tigris and the Euphrates rivers, the Ancient Egyptian civilization prospered near the Nile River, the Indus Valley civilization was established along the Indus River, and the Ancient Chinese civilization was located beside the Yellow River

Valley. Rivers can offer a source of fresh water for essential daily usages such as drinking and cooking; they can also ensure fertility of lands for the development of agricultural practices through irrigation.

Additionally, rivers provide an efficient method for transportation and trade, encouraging the exchange of goods and culture. Thus, the establishment of these early civilizations was largely based on a specific geographic feature- rivers, and the future development and cultural formation also depended on how the natural geographic features allowed them to take shape.

Geographic features do not only affect the location of the civilization but also influences the culture and lifestyle of a specific group of people. For instance, the early Mesopotamian civilization established the first writing system-Cuneiform. This style of writing was invented and spread because of papyrus, a kind of plant that grew in early Mesopotamia; the Mesopotamians made papyrus into a rough kind of paper to write on.

Moreover, natural geographic features can also affect a civilization's urban planning. The early Indus River Valley civilization had grid-like streets and city formats; this is because the Indus River Valley had flat plains, which benefited city planning. Religion could also be impacted: the early Yellow River Valley had been influenced by unpredictable flooding, and the natural disaster induced the belief that the floods were punishments that gods gave to humans. Overall, natural geographic features do significantly affect the way people practice their lifestyles and economic activities.

3. Natural Challenges for Japan and Indonesia: Earthquakes and Tsunamis

3.1. Japan: Fukushima Daiichi Nuclear Accident

Natural disasters such as tsunamis, earthquakes, and volcanic eruptions can greatly discourage a country's economic activities and thus slow down development. In 2011, a 9.0 magnitude earthquake erupted in Great East Japan, devastating the coastal area.

Initially, all nuclear power plants were successfully shut down. However, after an hour, a tsunami followed the earthquake, and it disabled both the electrical generators outside the Fukushima Daiichi plants and the diesel used for emergency backup. The total power of the plant was leaked, and soon, the cooling system was shut down, leading to a meltdown [2]. This accident caused no immediate death after the accident, but it still negatively influenced over 150000 residents. These residents had to move out from the radiated area, and losing their livelihoods since fishing and agriculture all experienced contamination by nuclear radiation.

Additionally, the Tohoku earthquake and tsunami – the earthquake that caused the Fukushima Daiichi accident has led to much more significant destructions. It resulted in over 18,000 people dead or missing, the destruction of more than 123,000 houses, and a loss of $220 billion USD [3]. This accident greatly discouraged Japan's energy usage: many reactors were shut down because of the protest for safer energy practices, and thus an increase in energy costs summoned the need to import more fossil fuels from other countries arose, making Japan more dependent politically.

3.2. Indonesia: Indian Ocean Tsunami of 2004

Lots of other countries have also experienced similar events, in 2004, a 9.1 magnitude earthquake landed on the coast of Indonesia, and it later triggered a tsunami across the Indian Ocean. 14 counties had been affected by the tsunami, killing over 225,000 people. Countries that have been mainly affected were Indonesia, Sri Lanka, India, and Thailand, in which Indonesia was the hardest-hit country. The death toll exceeded 200,000, particularly in a province in Indonesia, the casualties of the disaster extended even after the disaster was over because of lack of food, clean water, and medical treatment. This lack of necessities made residents even more vulnerable and at larger risk; the roads had been blocked by collapsed buildings, making the recovery program even more complicated [4].

Reconstruction cost $4.9 billion USD, and millions of people were rendered homeless. It had also led to environmental problems, solid waste and disaster debris were the most critical ones. This debris contained toxic chemical substances such as oil fuel and other industrial chemicals. Such destruction

doubtlessly resulted in contamination of soil and water. Nearby rivers and groundwater had been polluted by the runoff of the toxic chemical, reducing freshwater aquifers. Soil fertility was affected, agricultural yields decreasing in the long term. 20% of the seagrass bed, 30% of coral reefs, and 35% of wetlands were damaged in Indonesia. The mangrove forest was especially damaged by the Tsumani strike.

The mangrove is a type of plant that can help reduce erosion and help build soil, this damage toward a plant with such a critical function was unquantifiable. Within these 14 countries, lots of the countries' economy largely depended on tourism and still do. Because of this disaster, many coastal infrastructures collapsed, greatly affecting the country's economic activities. Erosions led to increased salinity of soil and exacerbated water quality, also affecting fisheries [5].

4. Government Strategies as a Result of Disasters

4.1. Prevention and Recovery Plans

What plays a significant role in the development of a nation is public policies. The reason the death toll and recovery period after a disaster varies between developing and developed countries, is not that developed countries experience fewer or lighter natural disasters, but they suffer fewer deaths and economic losses because of their recovery policies [6].

For instance, Japan practices advanced disaster preparedness and response systems. The most significant way they prepared for disaster was through public education, which raises public awareness through practicing comprehensive disaster simulation drills at the national level. Drills were gone through regularly to help residents stay alert and prepared, and thus able to correctly respond to a disaster when it happened. They would also give a chance for residents and the government to test out the emergency plans for prevention and make improvements accordingly. As a result, volunteers and government officials were trained to better handle real-life disasters. They practiced proper procedures for emergency transport, preparing supplies of goods after the disaster, medical treatment, and familiarizing their roles during the disaster to act prepared and organized in real emergencies [7].

While Japan is well prepared for any future disasters, Indonesia 's disaster management paradigm still has a lot of obstacles. There are only limited amounts of funds available for research, and because of such shortage, scientific and efficient policies cannot take shape. Because of the limited budget, Indonesia also lacks disaster-resilient infrastructure. Also, what is especially significant for Indonesia is that its economy is largely dependent on tourism, and thus, drill practices are almost impossible with the proper functioning of tourism sectors ensured [8].

In these cases, what slows down the actual development of a nation is government strategies, proving how policies can benefit or hinder a country's development. Japan and Indonesia have experienced similar events, but what leads to contrasting results is the difference in the way of their governments organize and plan before and after the disaster. By setting up efficient policies, countries can maximize the benefits geographic features can bring. Even though some people might think environmental factors determine social inequalities, some of the development can be controllable, just like how the example of Japan has demonstrated.

4.2. Shifts in Choices of Energy Sources

Further differences in post-disaster responses in the cases of Japan and Indonesia are the economic activities they practiced, and the energy sources being chosen. After the Fukushima Daiichi nuclear accident, Japan's energy consumption has shifted toward renewable energy sources such as solar, wind, and some fossil fuels instead of nuclear power plants after this accident. Because of the failure in nuclear power plants, there were uprising anti-nuclear protests. Thus, Japan renewed its political policy for nuclear power.

Since Japan had always been in a lack of natural resources and was isolated from other countries, it had seriously considered self-sufficient energy as a key component of national security. To avoid

becoming dependent politically and losing political power, Japan shifted its major energy sources to renewable sources. In Japan, the percentage of renewable energy rose from 9 percent in 2011 to 15 percent in 2016 and more than 22 percent today. Thus, the shift in power sources solved the lack of natural resources and the loss of nuclear power as an important energy source due to natural disasters [9].

On the other hand, while Indonesia's industrialization started in the mid-20th century after its independence, its economy stayed agriculturally based. Problems of deforestation arose since timber had been heavily exploited as a common source of energy in Indonesia. Over the past 40 years, the population of Java almost doubled, and the population in Sumatra even more than doubled in 2010. The drastic increase of population led to transmigration programs since the inner land became increasingly crowded, with people logging over forests for settlement and more agricultural practices, further threatening forestation and the whole ecosystem [10].

5. Outcomes: Current and Future Economic Developments

Today, Japan is already a developed country, ranking 38th in the world nominal GDP per capita in 2022, with a GDP per capita of $33,850. On the other hand, Indonesia is still a developing country, ranking 96 in the world nominal GDP per capita in 2022, having a GDP per capita of $4,731. Japan's GDP per capita is about seven times that of Indonesia [11]. GDP per capita indicates the average economic output in the specific country, higher GDP per capita suggests higher living standards and more access to goods. Japan's GDP per capita is about six times that of Indonesia's, implying much better economic wellbeing in Japan.

The Rostow's model provides a straightforward view of the contrast between the two countries' economies. Rostow's model presents the economic growth of countries with a classification of five different stages – the traditional society, preconditions for take-off, take-off, drive to maturity, and age of high mass consumption. With previously mentioned choices of energy sources and economic activities, the two countries are currently in different stages in Rostow's model. Japan is already in the final age of the mass consumption stage, as Japan has already focused on the consumption of goods and become economically developed, they have even faced economic challenges because of its aging population.

In contrast, Indonesia is still categorized as the take-off stage because it is still a developing country experiencing primary industrialization and urbanization, practicing an agricultural-based economy. Problems of poverty and limited access to education remain, 19% of the total population in Indonesia are landless without cattle and regular work, and 32% of the total population are often old and disabled people, are those who are unable to make a living, they face regular food shortages with poor hygiene and health [12]. Different positions on the stages of Rostow's model clearly demonstrate the great disparity between the economic develop of the two countries.

6. Conclusion

To conclude, a country's development will be greatly determined by geographic features, however, countries will be able to overcome environmental challenges by implementing efficient strategies. Countries with limited natural resources and frequent natural disasters are still able to become one of the most developed countries. This article has demonstrated such possibility with the example of Japan: it experienced a natural disaster of a similar magnitude just like Indonesia but directed itself to a distinct outcome. With timely and scientific choices such as fully prepared prevention and recovery plans, and shifts in the choice of energy sources, Japan would have been able to limit the drawbacks brought by natural geographic features.

This paper argues that having advantages in holding natural geographic features would have played a crucial role in leading to the country's development. However, this paper has also shown how countries can overcome and minimize geographical limitations by implementing proper government

strategies. Looking into the future, such belief could bring more confidence to countries and people facing adverse circumstances caused by limitation of natural resources or destruction brought by natural disasters.

References

[1] World Population Review (2024). GDP Ranked by Country. Retrieved on October 10, 2024, from: https://worldpopulationreview.com/countries/by-gdp.

[2] Kan, N. (2017). The Fukushima Nuclear Power Plant Disaster and The Future of Renewable Energy. Ithaca, NY: Cornell University Press. https://doi.org/10.7591/9781501726941.

[3] NCEI (2021). "On This Day: 2011 Tohuku Earthquake and Tsunami." Retrieved on October 10, 2024, from: www.ncei.noaa.gov/news/day-2011-japan-earthquake-and-tsunami.

[4] Britannica, T. Editors of Encyclopaedia (2024, September 16). Indian Ocean tsunami of 2004. Encyclopedia Britannica. https://www.britannica.com/event/Indian-Ocean-tsunami-of-2004.

[5] Srinivas, H. (2015). The Indian Ocean Tsunami and its Environmental Impacts. Global Development Research Center. https://archive.nyu.edu/handle/2451/40699.

[6] Kahn, M. E. (2005). "The Death Toll from Natural Disasters: The Role of Income, Geography, and Institutions." The Review of Economics and Statistics 87(2): 271-284.

[7] Takeuchi, Ko., 2017. Learning from disaster simulation drills in Japan, World Bank Group. United States of America. Retrieved on October 10, 2024, from: https://coilink.org/20.500.12592/6thr90 on 10 Oct 2024. COI: 20.500.12592/6thr90.

[8] Vermonte, P. J., Dzakwan, M. H. A. & Centre for Strategic and International Studies, P. (2020) Research & activity report on strengthening disaster preparedness in Indonesia. [Jakarta, Indonesia: Centre for Strategic and International Studies] [Pdf] Retrieved from the Library of Congress, https://www.loc.gov/item/2020308388/.

[9] Wieczorek, I. (2019). Energy Transition in Japan from Consensus to Controversy, German Institute of Global and Area Studies (GIGA).

[10] Casson, A. (2014). Large-scale plantations, bioenergy developments and land use change in Indonesia. Center for International Forestry Research.

[11] Worldmeter (2022). GDP Per Capita. Retrieved on October 10, 2024, from: www.worldometers.info/gdp/gdp-per-capita.

[12] Nooteboom, G. (2015). Forgotten People: Poverty, Risk and Social Security in Indonesia. Brill.