| *Human Factors* | *Physical Factors* |
|---|---|
| | - Japan lies near a convergent plate boundary where the denser oceanic Pacific Plate is being subducted beneath the Eurasian Plate. |

## TECTONIC HAZARDS

**Explore:** how the effective management of hazards is dependent on a range of factors.

**Research:** the management of a range of hazardous events in both developed and developing countries.

## CASE STUDY: *2011 Tohoku Earthquake and Tsunami - Japan*

Level of economic development: *(high income, developed country)*

*GDP US$:* $4.383 trillion
*GDP US$ per capita:* $34,523.701
*HDI:* 0.903
*Population:* 126,958,472
*Source: World Bank Data*

**Background Information**

- The earthquake as the most powerful to have struck Japan in over a thousands years. It struck in March 2011.
- It measured 9 on the richter scale, ranking the 5th strongest earthquake globally
- The focus was 25km below the Pacific Ocean, 100km of the cost of Japan.
- It occurred close to where the denser oceanic Pacific Plate is being subducted beneath the Eurasian Plate.

**Factors influencing the management of this hazardous event**

| *Link to Model* | *BEFORE (modify human vulnerability, modify the event, modify the loss)* | *DURING (modify the loss)* | | *AFTER (modify the event, modify human vulnerability, modify loss)* |
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| Parks (1991)<br><br>Disaster Management Cycle (Warfield, 2008)<br><br>Expand-Contract Model | *Pre-Disaster*[1]<br><br>As soon as the earthquake hit automatic warning systems were immediately triggered on television and mobile phones giving people time to shelter<br><br>The strident building regulations proved successful in the capital Tokyo, preventing any major damage<br><br>Regular earthquake drills meant that people knew how to protect themselves during the earthquake<br><br>Defensive sea walls built on the coastline of Japan were built in preparedness of a tsunami however these were not high enough to prevent it reaching inland.<br><br>Warning sirens of the oncoming tsunami meant that people could reach higher ground, however 16,000 people died as a result of the tsunami. | *Relief*[1]<br><br>In the immediate aftermath of the earthquake the Japanese government was criticised for the slow response.<br><br>However within the first two days of the earthquake and tsunami 50,000 personnel from the Japan's self defence force, safely agencies and national police were mobilised. | *Rehabilitation*[1]<br><br>Two month after the disaster 160,000 national police, Japanese self defence force and safely agencies were helping with the continued relief and rehabilitation of the country.<br><br>After only just two weeks the major highway through the Tohoku region was reopened<br><br>The Shinkansen (bullet train) was reopened and fully operational by the end of the April<br><br>70,000 tempers homes were built in order to house 300,000 people who had lost their homes in the disaster<br><br>In May, just 2 months after the disaster, and operation to clear the north east coast was started. It as estimated to coast £144 billion with 25 million tonnes of debris needing to be moved. | *Reconstruction*[2]<br><br>- There was heavy criticism about the reconstruction efforts. It took 11 months for the country to establish as Reconstruction Agency (compared to the Kobe earthquake where it took just 4 months).<br>- Eventually in February 2012 the Reconstruction agencies set out the following principles for reconstruction:<br><br>1. focus on local communities affected and on human linkages<br>2. Accept that the disaster has occurred and that recovery from it is needed<br><br>They also said that the reconstruction needed to take into account the fact that Japan has an ageing population.<br><br>The reconstruction in Japan though was found to be difficult due to the topography of the land being so mountainous it was difficult to find good land to rebuild on. There were also difficulties in securing funds for reconstruction. |

| DRE Disaster Risk Equation<br><br>Degg Model, (1992) | *Frequency/magnitude of the hazard*<br><br>Japan has a fairly low frequency of earthquakes, with at most there being 4-5 per year. | *Level of vulnerability*<br><br>Vulnerability to earthquakes in Japan is fairly low due to the fact that they have invested heavily in warning systems, educating the public about what to do in the event of an earthquake, as well as aseismic building design. However their vulnerability is slightly increased due to the fact that they have an ageing population. | *Capacity of the population to cope*<br><br>Japan has an extremely good capacity to cope in earthquakes due to the strong governance of the country, wealth, development and invested in earthquake monitory and prevention methods. |
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[1] *Morrish, Micheal, 2013, Case Study of Costal Flooding: The Japanese Tsunami of March 2011 - Impacts, recovery, env[illegible]d economic repercussions*
[2] *Refern, David, 2014, Tohoku 2011, Hope beyond the disaster?*