

Great Eastern Japan Earthquake 2011

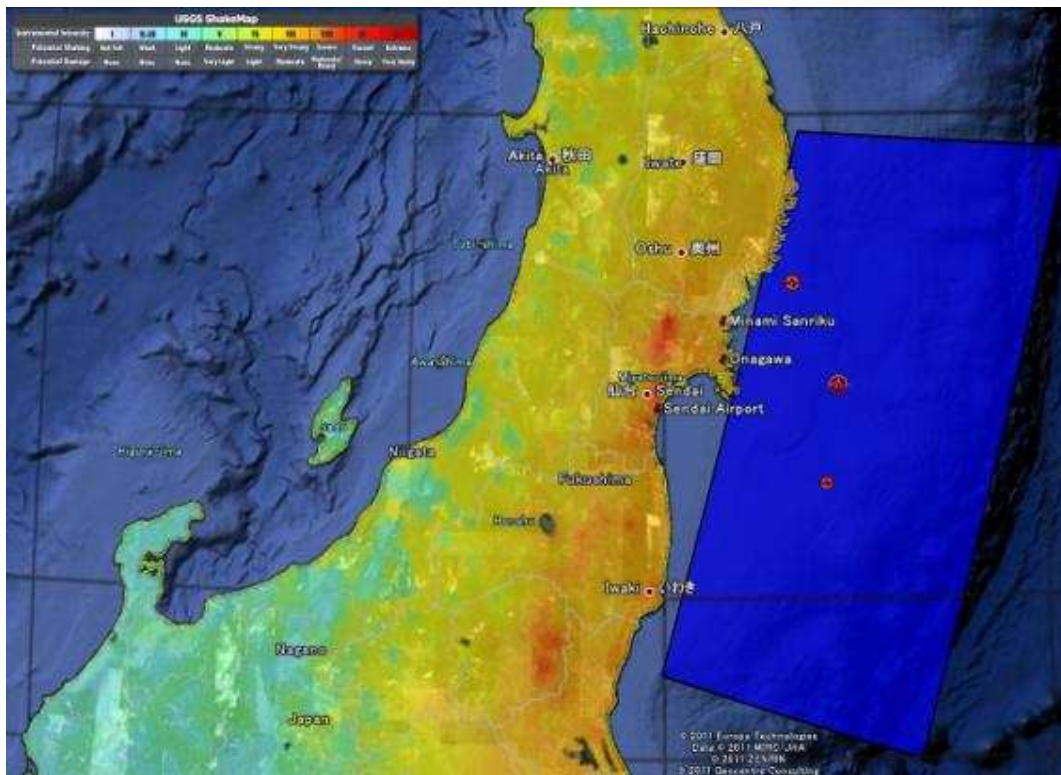


Figure 1. Tsunami Field Survey points for Tohoku Offshore Earthquake & Tsunami. (Shake Map – USGS / Location – Google Earth)

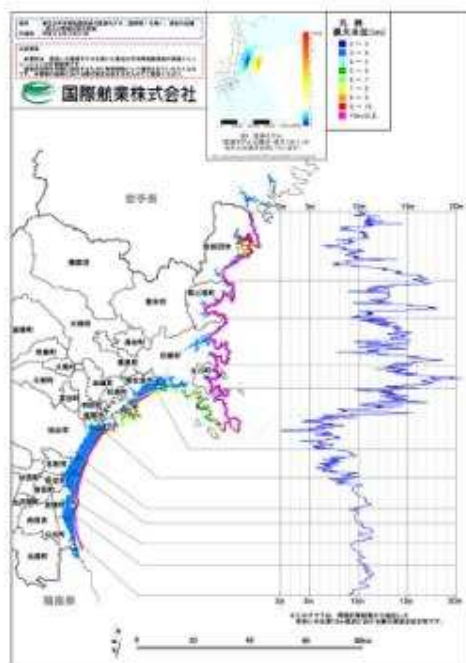


Figure 2.

Tsunami Height Distribution Map.

Natori (Sendai Airport): 10m;

Onagawa: more than 20m;

Minami Sanriku: 18m.

(Kokusai Kogyo Group from tsunami simulation)

Natori – Sendai Airport (24.03.2011)

1. Tsunami height aprox. 10m.
2. Inundation limit 4km to 5km.
3. Greenbelt was not enough because some trees were young and not so big.
4. Trees were cracked from roots or at aprox. 40cm from ground on their main branch.



Figure 1. Damages to Sendai Airport (Left: before; Right: after)

Left picture taken from <http://www.japan-i.jp/traffic/airplane/d8jk7l0000000qo3.html>



Figure 2. Left: Sendai Airport – International block, view from seaside

Right: Inundation at the back left picture, aprox. 3.5m

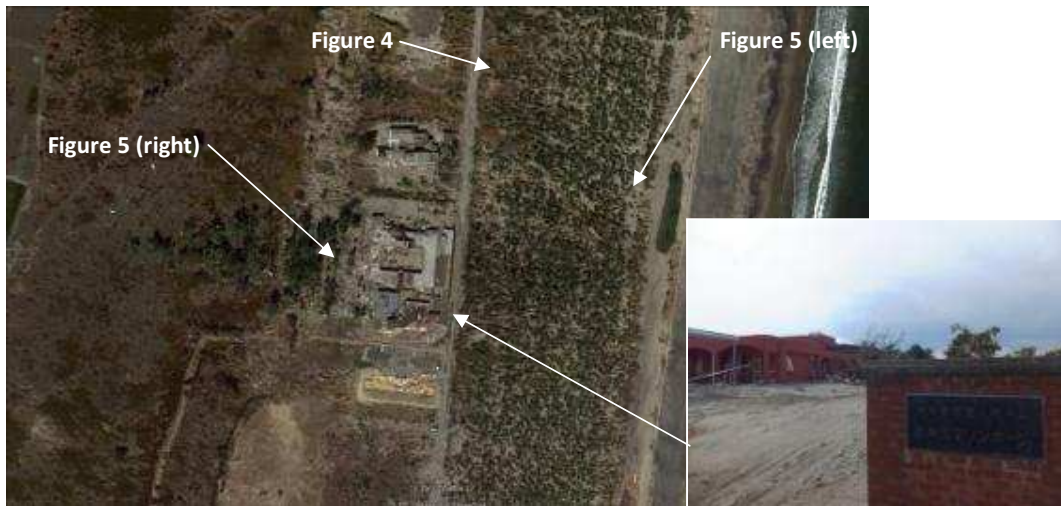


Figure 3. Image from Google Earth, south of Airport. Even the presence of Greenbelt could not stop tsunami damages and inundation into far inland.



Figure 4. Trees dimensions were measured to assess a resistant threshold in the future.



Figure 5. Front of greenbelt and trees at the back of buildings. (see Figure 3)



Figure 6. Inundation limits were over the 4km, tsunami traces and fishes were found on the way to confirm the observation.

Minami Sanriku (25.03.2011)

1. Tsunami height aprox. 18m
2. RC Evacuation Building remained after the EQ&T, however 22 persons died here because it was inundated.
3. A monument for past tsunamis of Chile, Showa and Meiji era were washed away, while a 2.6m tsunami monument from Chile T collapsed.
4. Even a school which was designated as evacuation shelter was washed away.
5. Around 10,000 people died and are missing.



Figure 1 Several RC buildings resist the tsunami impact, however almost all of them were inundated at all its floors.



Figure 2. Tsunami Evacuation Buildings resist tsunami impact and saved lives, on the contrary other shelters like a school was washed away.



Figure 3 Scour on foundations and other structures like tsunami poles (monument in the right picture) resulted on structural damages.

Onagawa (29.03.2011)

1. Tsunami height aprox. 20m
2. Coast subsided aprox. 70cm
3. RC buildings collapsed entirely as whole blocks.
4. Tsunami inundation got far inland and run-up around the hospital on the hill (inundated inside)
5. An oil tank was found probably was empty before the tsunami came.
6. Other towns in Onagawa and Oshika peninsula were completely destroyed.
7. Roads present cracks and subsidence



Figure 1. Almost entire city was washed away, only RC buildings stood still, however many of them failed from their pile foundations.



Figure 2. RC building fallen entirely, probably pile foundations failed and tsunami buoyancy force knocked the whole building down.



Figure 3. Tsunami inundation overtopped houses and buildings, wooden houses became floating debris.



Figure 4. Inundation level went up to the hospital at the hill, even inundating the first floor. In the right picture sea level inland due to subsidence (aprox. 70cm)