

## Estimated total amount of debris washed out by the Great East Japan Earthquake

### Summary

Ministry of the Environment has conducted a study to estimate the total amount of debris washed out by the tsunami triggered by the Great East Japan Earthquake of March 11, 2011. Estimation suggests that debris from Iwate, Miyagi and Fukushima Prefectures will be about 5 million tons in total. Its 70 percent (3.5 million tons) deposited on seabed along Japan coasts and the remaining 30 percent (1.5 million tons) became floating debris of immediate aftermath of the Earthquake. Some of the debris, however, are thought to have been collected or have sunk already, so that, we think the floating debris still drifting are less than 1.5 million tons.

### I. Limitations

- a. Included in the present estimation as major marine debris are collapsed houses, cars, driftwoods from disaster-prevention forests, ships such as fishing vessels, aquaculture facilities, fixed fishing nets, and cargo containers.
- b. Covered geographically Iwate, Miyagi and Fukushima Prefectures which are near the seismic center and are seriously damaged.
- c. Estimated total amount is as of immediate aftermath of the Earthquake.
- d. Estimation is based on information available as of March 5, 2012.

### II. Estimations

(Unit: thousand tons)

Waste Type	Floating debris	Debris on Seabed	Sum
Houses	1,336	2,783	4,119
Cars	—	313	313
Driftwoods	199	—	199
Ships	1	101	102
Aquaculture facilities	—	16	16
Fixed fishing nets	—	18	18
Cargo containers	—	35	35
Total	1,536	3,266	4,802 = ca. 5,000

### III. Methods for Estimation

- a. Total amount of houses washed out to the ocean  
Amount of houses collapsed but brought to temporary storages is deducted from the amount of houses presumed to have been demolished by Tsunami, to provide total amount of houses washed out to the ocean. It is assumed that woody parts of them have drifted away while concrete debris has sunk. Their ratio in debris in the temporary storages is used to divide the washed-out houses to floating

debris and debris on seabed.

- b. Total amount of cars washed out to the ocean  
Number of cars brought to temporary storages is deducted from the number of cars presumed to have been in areas submerged by Tsunami, to provide the number of cars washed out to the ocean. This number is then multiplied by the average amount for cars to obtain the total amount of cars washed out to the ocean.
- c. Total amount of driftwoods from disaster-prevention forests along the coast  
Area of the devastated disaster-prevention forests along the coast is multiplied by the average amount of driftwoods from unit area, and then further multiplied by their washout rate to the ocean presumed on the basis of our present experiences, to obtain the total amount of driftwoods washed out to the ocean.
- d. Total amount of ships, such as fishing vessels, washed out to the ocean  
Number of drifting ships identified by Japan Coast Guard is multiplied by the average amount for ships to obtain their total amount. Number of drifting ships and those washed up onto the land is deducted from the number of affected ships to obtain the number of sunken ships, and this number is then multiplied by the average amount for ships to produce the total amount of sunken ships.
- e. Total amount of aquaculture facilities washed out to the ocean  
All of the aquaculture facilities are presumed to have been washed out, and their area/length is multiplied by the average amount per unit area/length for aquaculture facilities, to obtain the total amount of aquaculture facilities washed out to the ocean.
- f. Total amount of originally-fixed fishing nets washed out to the ocean  
All of the fixed fishing nets are presumed to have been washed out, and their total number is multiplied by the average amount for fixed fishing nets, to obtain the total amount of originally-fixed fishing nets washed out to the ocean.
- g. Total amount of cargo containers washed out to the ocean  
Number of cargo containers washed out from container wharfs in the devastated area is multiplied by the average amount for containers to obtain the total amount of cargo containers washed out to the ocean.