

Managing post-disaster debris: the Japan experience

United Nations Environment Programme



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Report of the International Expert Mission to Japan



Contents

Foreword 2
The event 5
The debris challenge 9
The Japanese Government's response
UNEP's International Expert Mission17
Sendai City23
Miyako City 27
Ofunato City
Ishinomaki City
Soma City 35
Tokyo
The debris that floated away 41
Learning points for Japan 45
Sharing the lessons in managing post-disaster debris 49
Acronyms and abbreviations 51
Acknowledgements 51



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Foreword

The Government of Japan and the United Nations Environment Programme (UNEP) have a long history of collaboration which dates back 40 years to UNEP's inception.

In the aftermath of the tragic events in Japan of 11 March 2011, I am pleased UNEP has been able to contribute to the post-disaster effort. It is impossible to look at images of the devastation without feeling enormous sympathy for the people of Japan's Tohoku region, who are still enduring great upheaval and disruption to their daily lives.

Due to its location, extent and intensity, the Great East Japan Earthquake has created one of the most challenging and expensive disaster debris management operations in history.



This makes Japan's clean-up efforts all the more remarkable. It has been a recovery effort around which an entire nation has rallied and approached with resolute determination. Following a UNEP International Expert Mission to the post-disaster zone, this report documents how – despite their own personal tragedies – the officials of impacted cities have made extraordinary progress in the past 12 months. Commendable emphasis has been placed on waste segregation and recycling, and some segregated materials are already being reused. However, the sheer scale of the disaster means that cleaning up the debris will take several more years.

UNEP's expert mission had two objectives: firstly to bring global experience in disaster response to the Japanese officials who are handling this massive challenge; and secondly to document and share the methods and lessons learned in Japan to help other countries be better prepared to handle debris generated by future natural disasters.

UNEP hopes to use data gathered by its expert mission to assist in developing an international methodology on estimating the volume of debris in post-disaster settings. Such a methodology would prove invaluable in terms of estimating the associated workload and cost of cleaning up after disasters.

Importantly, the expert mission is also the first step in setting up an international network of disaster-debris management specialists, so that their knowledge and experience can be combined and made available to any country dealing with a future major disaster.

I look forward to UNEP's continued collaboration with the government and people of Japan, in particular through UNEP's International Environmental Technology Centre in Osaka.

Achim Steiner United Nations Under-Secretary-General Executive Director United Nations Environment Programme

Foreword

Japan experienced an unprecedented disaster in March 2011 – the Great East Japan Earthquake. Following the disaster, we received many warm messages of condolence and heartfelt support from all over the world.

Now that more than one year has passed since the disaster, Japan is on the robust path toward reconstruction. Many new "Kizuna" (bonds of friendship) were born out of this process between Japan and nations of the world, one of which is the bond created through disaster waste management.



The earthquake generated tremendous amount of debris. Prompt

management of debris is an extremely important task in the process of reconstruction. The UNEP International Environmental Technology Centre (IETC), with its headquarters in Osaka, has carried out diverse activities on the dissemination of environmental technologies since its establishment in 1992, and it offers an insight into waste management.

Recently, a group of international experts, who have engaged in different disaster waste management projects, visited Japan and exchanged views with three affected prefectures as well as the Tokyo Metropolitan Government so that they could contribute to the prompt reconstruction of the affected areas.

Because of the frequent occurrence of natural disasters, building a resilient society against natural disasters is more important than ever. Japan intends to share its experiences and lessons learned from this earthquake and the reconstruction process with the international community. Japan would like to cooperate with UNEP/IETC to make this newly born Kizuna of some help to reconstruction of the affected areas and to further expand the network of Kizuna throughout the world for facilitating more resilient society.

Koichiro Gemba Minister for Foreign Affairs, Japan

Boat swept into the centre of Ishinomaki City by the tsunami

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The event

On 11 March 2011, at 14:46 local time, a massive earthquake occurred off the Pacific coast of Japan. Its epicentre was approximately 70 km east of Japan's Oshika Penisula, while its hypocentre was 35 km underwater. With a magnitude of Mw 9.0, this was the strongest earthquake ever to hit Japan and one of the five most powerful earthquakes measured in the world since modern record keeping began in 1900.

Such was the earthquake's force that it moved the island of Honshu – Japan's mainland, or largest island – 2.4 m east, and is also believed to have shifted the earth on its axis by between 10 cm and 25 cm.

The earthquake triggered a massive tsunami which reached Japan's east coast in less than one hour. Like the earthquake, the tsunami's severity was unprecedented, both in height and reach. A number of coastal cities were completely inundated. In the northern city of Miyako, the flooding from the tsunami reached a height of 40.5 m. In some of the rivers in Sendai plane, the tsunami impacts could be felt up to 10 km upstream.

The tsunami impacted Japan's entire east coast, from Naha in Okinawa prefecture in the south to Nemuro in Hokkaido prefecture in the north. However, the most heavily impacted areas were in the three prefectures of Miyagi, Fukushima and Iwate, which lay closest to the earthquake's epicentre.

The earthquake also damaged the Daiichi Nuclear Power Plant located in the Fukushima prefecture. The reactors were shut-down automatically after the earthquake but the tsunami subsequently destroyed the emergency generators which were needed to cool the reactors. Over the following three weeks, there were explosions, containment vessels were damaged and radiation was released into the region. The Japanese authorities declared a 20 km radius around the power plant a 'no-go' zone and local residents were evacuated. Japan is situated in a highly hazard prone area and has faced multiple natural disasters in the past. The country has developed substantial defenses against natural hazards, including:

- better engineering of buildings to withstand earthquakes;
- planning restrictions, such as coastal protection forests, physical defenses against tsunamis (solid brick or cement walls) and tsunami gates to prevent tsunamis from entering rivers;
- protection forests planted along the coast to form natural defenses against disasters;
- early warning systems;
- designated shelters and safe areas;
- · community-based disaster response training, and
- robust emergency response systems.

The events at the Daiichi plant were rated at level 7 on the International Nuclear Event Scale (representing a major release of radioactive material with widespread health and environmental consequences requiring implementation of extended counter measures). The power station was closed and is not expected to reopen.

Japan is considered one of the best disaster-prepared countries in the world. Yet the triple disaster left close to 20,000 people dead or missing (in total 15,854 dead and 3,155 missing as at March 2012, according to official Japanese Government figures). Hundreds of thousands of houses and other buildings were damaged and more than 400,000 people were displaced. With damage estimated at more than USD 210 billion (¥16,800 billion), this event is not only tragic in terms of its human toll; it is the most economically devastating disaster in history.

The earthquake and ensuing Tohoku tsunami have become collectively known as the Great East Japan Earthquake. Key statistics about the event are set out in Box 1. One year after the disaster, the environmental, economic and social costs are still unfolding. A number of communities who were uprooted from their coastal villages may never return to those areas. Some of the disaster debris which was washed into the sea may yet turn up in other countries. The final closure and decommissioning of the Daiichi reactors in Fukushima remains a challenge, as does the rehabilitation of the no-go zone around the reactor.

The disaster and Japan's response to it has been closely watched by the international community. The lessons from this disaster are expected to change the rules of the game in a number of areas, from early warning to improved safe operation of nuclear industries.

Box 1. Great East Japan	Earthquake: vital statistics
Epicentre:	.38° 19' 19.2" N, 142° 22' 8.4" E
Earthquake magnitude:	.Mw 9.0 ⁽¹
Peak acceleration:	.3 g
Aftershocks:	.1,235
Casualities:	.15,854 deaths ⁽² 3,155 missing 26,992 injures
Building damage:	.129,225 (fully collapsed) ⁽² 254,204 (half collapsed) 691,77 (partially damaged)
Economic damage estimate:	. USD 210 billion (¥16,800 billion) (3)
Sources: 1) US Geological Survey	2) National Police Agency, Japan 3) The Economist

This report focuses on the enormity of the post-disaster debris challenge and documents the response by the people of Japan and key learnings one year after the event.



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