

Indian Ocean Earthquake- Tsunami of 26 December 2004

UNDAC Rapid Environmental Assessment Republic of Maldives



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1 Overview

On 26 December 2004, an earthquake measuring 9.0 on the Richter scale caused powerful tsunamis that reached the Maldives around 9:30 in the morning.

A United Nations Disaster Assessment and Coordination (UNDAC) team was deployed on 27 December in the Maldives, to carry out rapid assessment of priority needs and to support national authorities and the United Nations Resident Coordinator to coordinate international relief on-site. Upon request of the Ministry of Environment and Construction (MEC), a rapid environmental assessment of the impacts of the tsunami on the Republic of Maldives was undertaken by the UNDAC environmental team member. Assessment missions were carried out, together with humanitarian missions, to identify any life threatening environmental emergencies as a result of the tsunami. The main findings of the assessment include:

- There are no major life threatening environmental emergencies as a result of the tsunami that struck the Maldives on 26 December 2004;
- Areas of major environmental and human health concern have been identified and include emergency waste management and an oil spill on Thilafushi Island;
- Severe damage to vegetation and crops, pollution of groundwater and the potential damage to the coral reefs system are of serious concern and the medium and longer-term impacts of the environment should be fully assessed.

The negative environmental impacts of the tsunami exacerbated the plight of an already fragile environment, which suffered from years of neglect.

2 Introduction

The Joint UNEP/OCHA Environment Unit (Joint Unit) is the integrated United Nations mechanism with a mandate to assist countries facing environmental emergencies.

On Sunday 26 December, the Joint Unit received a request for urgent environmental assistance from the Ministry of Environment and Construction of the Republic of Maldives. An earthquake of 9.0 on the Richter scale for the west coast of Northern Sumatra, Indonesia, caused tsunamis which inundated all 199 inhabited islands of the Maldives. On 14 January, 82 people were reportedly killed, while 26 were missing. Over 20,000 people became displaced when houses collapsed or became uninhabitable.

The Maldives consists of 1,192 low-lying coral islands as part of 26 atolls. The distance between the North and South is 860 km while the distance between east and west is 130 km. The dispersed nature of the islands presented the greatest challenge to aid delivery and communication as all transport has to take

place by boat or by seaplane. The maximum elevation of the islands is nowhere higher than 2,5 m and facing rising sea levels and climate change, the tsunami has proven again the extreme vulnerability of small island states.

As part of the United Nations Disaster Assessment and Coordination team (UNDAC), an environmental expert of the Joint Environment Unit arrived on 28 December and undertook, as part of the UNDAC assessments, a rapid environmental assessment to identify environmental emergencies resulting from the tsunami. The findings of this assessment are presented in this report.

3 Methodology

In consultation with the UNDAC team and the Ministry of Environment and Construction, site assessment missions were undertaken to three representative inhabited islands that were severely impacted by the tsunami: Guraidhoo Island (Kaafu Atoll), Vilifushi and Guraidhoo Islands (Thaa Atoll) and two sites of specific environmental interest were also visited: Male harbour and the main landfill on Thilafushi Island.

In addition, interviews and discussions took place with relevant officials of the Ministry of Environment and Construction, the Ministry of Planning, Ministry of Health, Ministry of Fisheries, Agriculture and Marine Resources, WHO country office, UNDP and UNICEF country offices.

4 Main findings

4.1 Waste

The tsunami destroyed an enormous amount of houses on numerous islands. At the time of writing the Government of the Maldives had registered 3997 houses that had been damaged. The amount of construction/demolition waste consists from individual cement bricks to complete intact walls that have collapsed. On some of the worst affected islands, such as Vilifushi on Thaa Atoll, all the houses have been completely destroyed.



The amount of waste generated, poses a challenge to all islands, as waste management practices are generally of poor standard. In general, waste management takes place by dumping household waste on the shoreline or on designated places on the islands itself. Only little separation and no protective measures for the dumpsites are in place.

The tsunami has exacerbated already poor waste management practices

The increased demand for construction materials following the emergency phase can lead to the use of coral as a construction material. As some of the Islands are less affected than others, reconstruction and repair of houses will start soon, if not already started. Although there is an official ban on coral harvesting, during the assessment houses were observed that had recently been constructed with use of coral and cement as a basis. The damage in the entire region will also contribute to an increased regional demand for construction materials such as sand, cement, metal sheets and concrete.

Waste on most islands is dumped in one location on the island or in the sea as a foundation of land reclamation. According to the Ministry of Health, there are no proper facilities to disinfect medical waste generated in medical facilities on the islands, hence, medical waste is mixed with household waste and dumped.

As an effect of the tsunami, some islands are completely covered in a layer of debris as the waste sites have been spread over the islands and mixed with the demolition waste.

In addition to the mixing of medical waste, a large number of the houses are clad with asbestos cement roof sheets. The broken parts of the corrugated sheets are now also mixed with the household and construction waste and will most likely be dumped on the islands posing a health threat during the handling and transportation.

4.2 Oil spill on Thilafushi Island

Thilafushi is an island close to Male and consists of three main parts; storage houses, light industries and the main waste dump site of the Maldives. On the part of the island where the waste is being dumped approximately 300 drums of 205 liters containing used oils are being stored next to the water. No containment walls or foundation against leakage are in place.



Poor storage facility and waste oil spill threaten the marine environment

The waste oil is collected and used as fuel to burn the waste that is being dumped and burnt in open air. The drums are in very poor condition: rusted and some of them are open. An area of approximately 200 m² has been polluted with a layer of waste oil. At the moment of the site visit, oil was still flowing into the

sea. To the responsible staff present, the urgent recommendation was made to immediately build a small dam to prevent further seawater contamination. A further clean up and proper treatment of the polluted soil is required.

4.3 Coral reefs

The tsunami had most likely, but yet unconfirmed, a physical impact on the coral reefs. Sedimentation is most likely also affecting the reefs close to the islands. The Ministry of Environment and Construction, in cooperation with the Marine Research Centre and the Ministry of Fisheries, Agriculture and Marine Resources, is currently identifying sites for Rapid Marine Assessments based on anecdotal evidence of professional divers, fisher folks, aerial photographs and video's. The MEC is in close contact with the IUCN and Coral reef Damage in the Indian Ocean (CORDIO) who will undertake similar work in Sri Lanka.

The most important sectors of the Maldives rely entirely on the coral reef ecosystem. Reef fish is being used by fisher folks to catch tuna for consumption and export, while the tourism is based on a mix of uninhabited coral reef islands and water sports such as diving.

4.4 Damage to biodiversity and vegetation

The main impact of the tsunami on the biodiversity of the Maldives is through the intrusion of seawater in the fresh water aquifers on the almost 1,200 islands. The immediate impacts were visible within two days after the disaster on the vegetation. Agricultural land, back yard farming, wetlands, as well as mangrove and other coastal vegetation have all been affected. Medicinal plants, that play an important role in the life of the island population, have also been severely impacted.

The islands consist of a mixture of coral sand, debris and unconsolidated shell. Topsoil is thin (20cm and less) and freely draining. The coral rock is found approximately at 10m while the fresh water lens can be found at approximately 1 m, floating on brackish water.

The impacts of saltwater in the swamps and wetlands can have further impacts on the flora and fauna, including bats and crows.

The effects will be felt hardest in the livelihoods of people working in the agriculture sector, as well as by people with backyard gardens (i.e., chili's, breadfruit, papaya, and banana). Agricultural land is now covered with a salty mud layer and crops have been washed off on some of the islands. According to the Ministry of Fisheries, Agriculture and Marine resources, 30 islands are licensed for commercial agriculture.



Dieback of vegetation occurred within days after the tsunami

The Government and soon the Food and Agriculture Organization of the UN are undertaking more assessments on the situation and subsequent needs.

4.5 Groundwater



The use of open wells contributed to the intrusion of salt water into the fresh water lens

Islands contain small water lenses not too deep from the surface. Households have open wells in their house and use the groundwater for washing and laundry purposes (see photo). Rainwater is being harvested from roofs and stored for drinking water. Only in prolonged dry periods (dry monsoon) some islands have to use the groundwater for drinking purposes.

4.6 Hazardous chemicals

In the direct aftermath of the tsunami, people used bleach (chlorine) as a measure against the odor of rotting organic material (plant material, dead fish). The bleach was not diluted and directly applied on the rotting material. Apparently the Ministry of Health depleted its stocks within the first week and through the World Health Organization country office, 8 metric tones were ordered.

After consultations with the Ministry of Environment and Construction and the Ministry of Health, guidelines are now being issued in which it was recommended that bleach only be used for disinfections (hands, drinking water storage tanks) and that organic material should be collected separately and burnt.

4.7 Diesel storage tanks

Electricity is generated with diesel-fueled generators. During the site visits, no damage was observed to the diesel storage tanks. The Government, who undertakes very detailed assessments, did not report any damage either. The fuel storages on islands close to the airport also did not undergo any damage as a consequent of the tsunami. Within the first two weeks, electricity had been restored on the majority of the islands, even if it is only for one hour a day for communication purposes.

Anecdotal evidence further suggested that on some islands diesel drums have been washed away. Diesel pollution of the groundwater can pose a risk, as it would further limit the use for washing and cooking.

4.8 Harbour

A site inspection was undertaken to the harbour of Male. The main function of the harbour is storage of freight containers and no environmental irregularities were observed.

4.9 Sewage

Sewage systems on the islands consist of a mixture of pipes with outlets in the sea and septic tanks. The tsunami will most likely have impacted the piped sewage system and resulted in human excreta being mixed in the groundwater layer. Septic tanks might have ruptured and/or overflow. This poses a serious health risk to the population and the Ministry of Health, together with the World Health organization, is continuously monitoring the health status on all islands.

5 Conclusions and recommendations

- There are no major life threatening environmental emergencies as a result of the tsunami that struck the Maldives on 26 December 2004;
- Areas of major environmental and human health concern have been identified and include emergency waste management and an oil spill on Thilafushi Island;
- Severe damage to vegetation and crops, pollution of groundwater and the potential damage to the coral reefs system are of serious concern and the medium and longer-term impacts of the environment should be fully assessed.

6 Limitations

The findings of this rapid environmental assessment should be read taking into consideration the following:

- Not all islands are affected equally. Out of the almost 1200 islands, only 199 are inhabited. Some islands have hardly any physical damage to houses, while others are completely destroyed;
- The dispersed nature of the islands over a 860 by 130km wide area poses a major challenge to the emergency relief phase therefore assessments mission were only undertaken in combination with humanitarian teams and when clear indications of environmental concern.
- Only four out of a 199 uninhabited islands have been visited and parts of the conclusions are based on anecdotal evidence form interviews.

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