

Indian Ocean Tsunami Disaster of December 2004

UNDAC Rapid Environmental Assessment of Aceh, Indonesia



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Section 1: Introduction

Overview

On Sunday, 26 December 2004, a major earthquake measuring 9.0 on the Richter scale occurred off the west coast of northern Sumatra. This was followed by aftershocks ranging from 6.3 to 7.0 in severity. The earthquakes triggered powerful tsunamis up to 10 meters in height that caused immense damage and loss of life in coastal areas of the Indian Ocean.

Tsunamis and urgent environmental issues

Acute environmental impacts with immediate effects on human lives and direct relevance to response efforts can be expected in the face of such a disaster. The Joint UNEP/OCHA Environment Unit (Joint Unit), integrated in the Emergency Services Branch of the United Nations Office for the Coordination of Humanitarian Affairs, is the principal United Nations mechanism mandated to assist countries facing environmental emergencies. The Joint Unit is supporting rapid environmental assessments (REA) in collaboration with the United Nations Disaster Assessment and Coordination (UNDAC) teams that were mobilized to assist national and international tsunami response in the region. The REA objective is to identify acute environmental issues with immediate implications for human welfare and response efforts, and, based on this, to provide humanitarian partners with effective support and analysis.

In Aceh, Indonesia the REA identified:

- No major life threatening environmental emergencies resulted from the tsunamis;
- Acute issues that must be addressed urgently, chief among them the management and disposal of immense amounts of debris and waste;
- Medium-term and long-term impacts of the disaster, few of which have been quantified.

Methodology and scope

The REA was conducted in the areas most affected by the tsunami around Banda Aceh and the west coast of Aceh Province, in northern Sumatra. Difficulties of access meant that direct observation were made only in these areas. Other observations in this report are based on interviews and local reports.

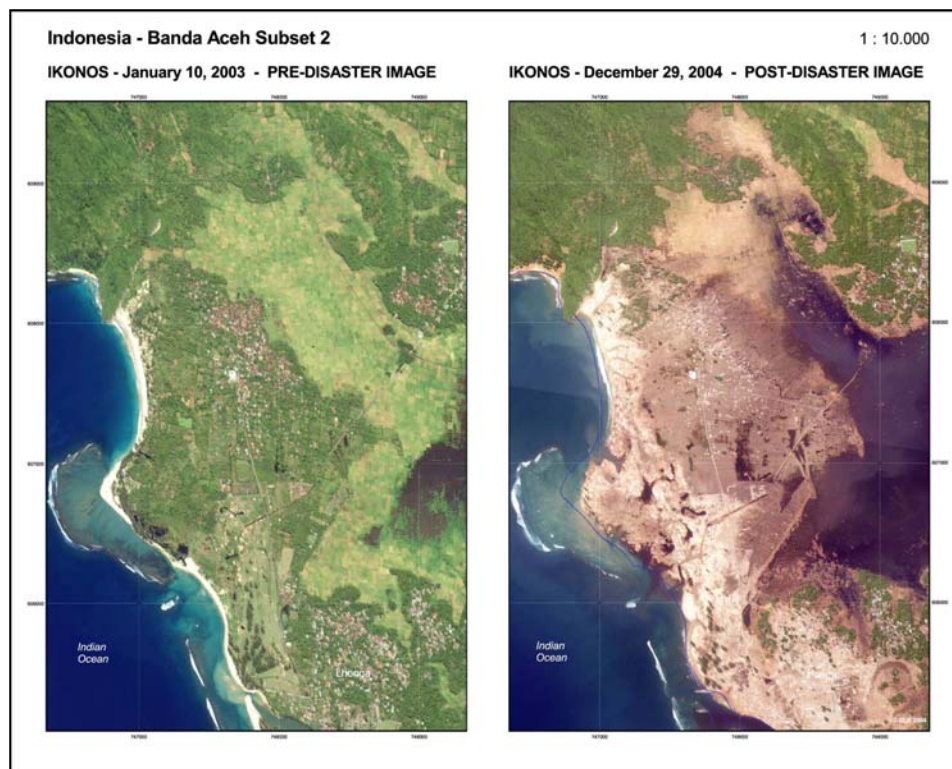
An environment expert supported by the Dutch National Institute for Public Health and Environment (RIVM) and the Dutch Ministry of Housing, Spatial Planning and Environment (VROM) conducted the REA. This expert was deployed as a full member of the UNDAC team, in collaboration with the Joint Unit.

The REA is based on site visits, observations and interviews conducted by the UNDAC team environmental expert. It was carried out in close cooperation with the special environmental task force of the Indonesian Ministry of Environment, including their rapid assessment team, and the local authorities concerned with environmental issues (BAPEDAL).

The first three days of the assessment were conducted and coordinated with a team of three employees from the Ministry and an environmental consultant funded by the German governmental organization, GTZ. The national team mainly focused on community and organizational aspects of the rapid environmental assessment methodology. The UNDAC member assessed potential acute risks caused by the tsunami.

This report describes REA findings, and makes recommendations to ensure that support and assistance can be mobilized and coordinated effectively to reduce environmental risks. The report is intended for humanitarian, disaster management and environmental professionals in national governments, international organizations, and non-governmental organizations involved in response activities in the region.

The REA did not provide in-depth analysis, nor was it all-inclusive. Conditions in the region including limited access precluded this.



Pre and post-disaster images at Banda Aceh

Section 2: Main findings

Key environmental findings from the REA are that:

- No major life threatening environmental emergencies resulted from the tsunami;
- A number of acute issues must be addressed urgently, chief among them the management and disposal of immense amounts of waste and debris;
- There are numerous medium-term and long-term impacts of the disaster, and few have been quantified. In general, however, these issues cannot be addressed until more immediate issues are resolved.

Key environmental findings

Management of waste and debris

Enormous amounts of waste and debris remain in former settlement sites, along roads, trapped in ruins and near the sea. The waste and debris includes household goods, refrigerators, cars, motorcycles, wood, concrete, galvanised iron sheeting, oil drums, furniture, plastics and clothes. The REA also found that in some areas the debris is mixed with oil, chemicals, contaminated water and sewage. It often blocks river courses and other surface water channels.

Following the tsunami, some of the debris was dumped in unsuitable locations such as the sea, beaches, swamp areas and rivers. Some waste piles catch fire, which also presents an ongoing problem.

Solid waste management is the responsibility of local governments. However, these authorities were badly affected by the tsunami, and a reported 30 per cent of employees lost their lives. Therefore, these institutions are not fully operational.

The REA found that, despite initial clearing efforts, the huge amounts of waste and debris pose an urgent problem and that safe disposal is required to avert additional environmental and humanitarian risks.



Waste and debris in Banda Aceh

A pilot project for waste sorting and recycling has been approved by municipal authorities and regional governments. The *Tsunami Recovery Waste Management Program (TRWMP)*ⁱ is based on a model developed during the tsunami response in the

Galle District of Sri Lanka, and is being implemented in Indonesia in cooperation with the United Nations Development Programme (UNDP). The project objectives are to:

- Advise the government on sustainable waste management practice and implement technical assistance programs to build capacity;
- Develop tsunami and longer-term municipal waste management strategies for affected communities; and,
- Enable the rapid implementation of waste management pilot projects.

The proposal is to begin with small-scale projects under UNDP's *Immediate Employment through Labour Intensive Works Program* and expand to a full-scale project as resources including heavy and specialized equipment become available.

Sanitation and sewage issues

The Aceh province is rich in water resources, including rivers, lakes, wetlands and ground-water systems. In the rural areas, shallow wells provide water for agricultural and domestic use. A general concern identified during the REA is that water supplies in the province are susceptible to contamination due to their shallowness.

More specifically, the REA determined that, in many areas, sanitation systems have been compromised. For example, the sewage treatment facility in the north of the Aceh peninsula, its access road and sludge trucks, were all damaged. It should be noted, however, that there are reports that this facility may have been out of service even before the tsunami.

The camps and settlements that house Indonesia's estimated 555000 internally displaced people (IDPs) are also reported to present environmental challenges, including safe disposal of waste and sewage, and the placement of latrines too close to wells. Efforts to close these IDP sites and relocate populations should address many issues, but will not resolve the most immediate problems. The REA found that current and planned relocation sites are generally of acceptable standards in terms of site selection, water supply, planning of solid waste disposal, and the use of septic tanks.

Potential human health risks from contaminated water and sanitation issues were not specifically covered in the REA. Relevant sector groups in Banda Aceh involving international organizations, national authorities, and others addressed these issues.

Risks of chemical exposure

Destruction on the scale caused by the tsunami can potentially create risks such as chemical leaks and spills from the destruction of industrial facilities. These, in turn, can create risks of human exposure to toxic chemicals. Industrial sites were therefore assessed as part of the REA, where circumstances permitted. The UNDAC environmental expert also received additional reports of possible areas of environmental concern, and investigated these where it was feasible to do so.

In general, the area covered by the REA had no heavy industry using or producing substantial amounts of hazardous chemicals. However, there were some sites where potentially toxic chemicals were manufactured, stored and used. These chemicals

consisted mainly of agricultural pesticides and insect repellents. There were also stocks of products such as diesel, kerosene and lubricants for retail sale in the area.

The following briefly describes investigations that took place during the REA at sites that were believed to be of particular concern.

- **Banda Aceh** Two pesticide depots and a retail oil depot near the harbour were almost completely destroyed. Three underground fuel containers, each containing between 5000 and 10000 litres of oil, remained at the oil depot. These were found to be properly locked, and are believed to be undamaged. Small oil slicks were visible on the harbour water, in mud patches and among the rubble and debris. The contents of warehouses and vessels in the harbour are unknown, as no documentation or personnel survived.
- Other facilities visited by the environmental expert in the area such as a hospital and cement factory were found to pose no significant environmental problems.

- **Krueng Raya (40 km north of Banda Aceh)** Three of eight fuel oil storage tanks, each with a 2.5 million litre capacity, were displaced with the absolute loss of their contents. They were estimated to have been 20% full at the time of the tsunami. Numerous filled barrels were also dumped nearby and there is evidence of oil slicks. One covers an area of about 100m².



A displaced fuel storage tank in Kreung Raya

Throughout the whole area, oil is mixed in with mud and water.

- **Meulaboh area.** Two areas of concern were investigated in this area by helicopter visit. The first was the site of oil storage tanks. Three of the four oil storage tanks at the site were damaged and displaced by the tsunami. Their contents were washed into the sea, leaving no visible traces. The second was the site of a red/orange mud slick north of Meulaboh that was identified as a possible concern. The colour of the slick is believed to result from high natural iron concentrations in the soil. The oil-like film on the surface of the mud slick is known to be excreted by the bacteria that transform the iron into its red form. This, and a lack of industrial sources in the area, supports an interim conclusion that the mud slick does not represent a significant environmental risk. Further investigations should be carried out once the area is fully accessible.
- **Tanah Pasir Lhoksumawe.** Black mud in this area was perceived by the surrounding population to be toxic and cause health problems such as skin irritation.

Available evidence suggests that the mud contains natural high concentrations of sulphur. This could explain both the colour, and acidity that could cause the reported skin irritation. The site was not visited, however, and further investigation is necessary to confirm this.



Red mud slick at Meulaboh: sites of possible concern were investigated wherever possible.

Overall, no major environmental emergencies were found at any of the sites investigated. Furthermore, information available when the REA was conducted suggests that the existence of any other major areas of significant environmental concern is unlikely, due mainly to the fact that most sites of potential risk were completely destroyed and washed clean by huge quantities of water during the tsunami.

Longer-term issues

The tsunami's medium-long term effects on the environment include potential damage to coral reefs, loss of fertile soil, loss and degradation of vegetation (including e.g. mangroves and sea grass), and salt intrusion into soil and inland water.

The environment may also be threatened by the relocation of populations and the rehabilitation of settlements. Two particular areas of concern are the Pulau Weh Marine Reserve (3,900 ha) and the Kepulauan Banyak Marine Recreation Area (227,500 ha).

Section 3: Recommendations

Waste and debris management

The REA found that addressing waste and debris should remain the top environmental priority. Greatest focus should be placed on sites vulnerable to further contamination, for example those around damaged oil storage depots, rivers and other surface waters.

More specifically:

1. To achieve adequate disposal of the enormous quantities of debris and waste, donors and the international community should consider additional support to meet immediate needs for both heavy specialised equipment such as aggregate crushers, wood chippers and compacters, as well as fire fighting equipment to deal with the ongoing problem of burning debris.
2. There are urgent needs for additional support to local authorities, as noted below in *Mobilization and capacity issues*.

Donors may wish to consider this type of support within the context of a full-scale *Tsunami Recovery Waste Management Program* (see p. 3 for details).

Mobilization and capacity issues

1. In view of the scale of the disaster and the losses sustained by local authorities, additional environmental capacity to support local staff is a key priority. Specifically, donors and the international community may wish to consider providing experts in waste management (including landfill design and construction) and other environmental experts to support authorities such as BAPEDAL, until staff shortfalls can be addressed on a permanent basis. Additional expertise is also required to ensure both environmentally sound population relocation, and safe environmental conditions in existing IDP camps.

Sanitation and settlements

1. Donors may wish to consider support for projects to increase waste collection, including from septic tanks.
2. Office of the United Nations High Commissioner of Refugee (UNHCR) tools and experience in addressing refugee camp environmental issues (e.g. site screening and awareness tools) should be adapted for Indonesia and disseminated. Related environmental training programs should be made available to NGOs and other personnel involved in camp management.
3. Agencies that sponsor UN Volunteers could consider increasing environmental field support in IDP settlements through assigning environmental tasks to current volunteers, or short-term redeployment. The Joint Unit and CARE International could consider environmental training of UN Volunteers and others where appropriate.

Longer term Issues

At a later stage, additional capacity may be needed in areas such as habitat planning, re-establishing sustainable agriculture, repairing ecosystems and rehabilitating coastal zones. Furthermore, it may be possible to identify environmental 'lessons learned' from the tsunami and subsequent response efforts, based on this REA and other evaluations. These could be consolidated, disseminated, and used to support future risk reduction activities such as training programs. However, the REA found that in the immediate term, efforts must remain concentrated on acute impacts and relieving more urgent needs.

ⁱ UNDP/UNDAC Indonesia. *Tsunami Recovery Waste Management Programme Project Concept and Summary*, 02 February, 2005.