

## Samoa Tsunami Rapid Environmental Impact Assessment (EIA) Recommendations (October 3<sup>rd</sup> to 7<sup>th</sup> 2009)

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### Cluster: Early Recovery (Head Georgina Bonin, UNDP Apia, Samoa)

#### Context

The environment sub-cluster was tasked by the Prime Minister to carry out a rapid environmental impact and needs assessment to be included in the assessment for the Rapid Recovery Cluster. Nearly all coastlines that were affected by the tsunami were visited and systematically assessed with an expert team between October 3<sup>rd</sup> to 7<sup>th</sup> 2009 – hence starting four days after the Tsunami itself. Assessments for remaining small sections of coastline without road access had to rely on aerial photographs. Agriculture (including horticulture) is being assessed by the Ministry of Agriculture and Fisheries in collaboration with FAO and reported on separately. A detailed account of the EIA is appended to the Summary Framework and available from the Apia office of UNEP (contact Dr Greg Sherley care of UNDP).

#### General Observations

- Significant environmental damage was sustained on the south and east coast of Upolu and Manono island including coastal erosion, salinisation of coastal areas, damage from building debris and pollution from solid waste and sewage in village areas
- Sensitive marine habitats including coral reefs and seagrass beds are expected to have sustained significant damage
- Environmental damage was greatest at the far eastern and southern coast of Aleipata and generally diminished westwards
- Bathymetry and coastal morphology and topography, including distance of reef from shore and the location of channels had a major influence on the damage sustained
- More detailed environmental assessments are needed especially for sensitive marine habitats such as coral reefs and seagrass beds and terrestrial ecosystems such as coastal marshes, mangrove areas and near shore islands.

#### Initial Marine Assessment

Impact/Vulnerability	Recommendation
<p><b>Submerged marine habitat</b> (coral reefs, lagoons, sea-grass) -expected high impact (physical damage) in Aleipata and Falealili districts. Impact becomes patchy but still significant further west (e.g. Tafitoala).</p>	<p>Plan and resource a comprehensive and safe in-water marine assessment. Include focus on damaged areas where previous information exists e.g. Aleipata and Safata MPAs and fish reserves.</p>

<p>Physical damage to the corals will predispose them to disease (bacterial, fungal) and further loss of reef biodiversity.</p> <p><b>Ava/channels</b> - clear that ava (channels) funneled the wave inland causing greater damage in these areas</p> <p><b>Beaches and foreshore</b> – heavily impacted, significant removal of sand and adjacent land based sediment.</p>	<p>Natural recovery should be monitored and additional stressors be minimized (e.g. reclamation sand mining, commercial fishing harvest).</p> <p>Channel impact patterns need to be considered in terms of rebuilding settlements because they indicate permanent higher hazard zones.</p> <p>Requires stabilization in the short term to prevent further sand/sediment loss especially in advance of rainy season and restoration in the longer term. New impacts e.g. reclamations, and mining should not be allowed in impacted areas. Multi-disciplinary approach to restoration required. Increased use or repair of seawalls needs to be carefully considered because their use can be negative e.g. by giving the wave “teeth”</p>
<p><b>Debris and solid waste in lagoon and reef</b> -significant debris from land in lagoon, possible debris on outer reefs. Some debris will pose health risk.</p>	<p>Manual clean-up (not dredging) of lagoon areas is necessary. Reusable and recyclable material will need to be sorted.</p>
<p><b>Debris/rubbish in mangroves and on beaches</b> -significant debris eg housing material</p>	<p>Clean-up &amp; remove debris after useful material has been salvaged by owners and villagers.</p>
<p><b>Sedimentation</b> -high expected impact of sediment including scouring by sand and expected smothering of coral from sediments (sand and earth). Likely cause major changes in habitat/species composition and reduced ability to support food resources.</p>	<p>Sedimentation impact must be considered in marine assessment of reef and fisheries impact.</p> <p>Beaches/foreshore/land based sources e.g. streams need to be stabilized to reduce ongoing impact especially with advent of rainy season.</p>
<p><b>Pollution</b> - Potential contamination from sewage, hydrocarbons, possible agricultural chemicals, organic waste, pesticides</p>	<p>In heavily impacted areas, communities should be warned against harvesting lagoon food resources (particularly shellfish) until assessments have proved them safe to eat.</p>
<p><b>Marine Protected Areas and Fisheries Reserves</b> -high impact.</p>	<p>Must be considered in marine assessment: many reserve areas compromised in terms of ongoing ability to support regeneration of marine food sources outside of these zones.</p>

	<p>Early remarking of fish reserves and MPA no-take zones and assessment of these areas to be able to recover and still be functional (some may need to be relocated).</p> <p>Pre-impact information from these sites is available and valuable to assess true impact (short and longer term) – should be a key focus of marine assessment.</p>
<p><b>Marine Food Sources compromised in impacted areas</b> – The combined affect of the aforementioned impacts may influence marine food resources with respect to volume, quality and safety.</p>	<p>Communities will need to have the ability to replace or substitute traditional marine subsistence food sources with other food sources e.g. access to fish from outside of the district.</p> <p>Safety of marine food sources needs to be assessed (e.g. shellfish from contamination) in impacted and vulnerable areas.</p> <p>Boat capacity should focus initially on helping impacted villages get access to offshore fish resources e.g. replacement of Alias. Consider a possible ban on commercial access to offshore resources in these areas.</p> <p>Restore inshore boat capacity (e.g. Alia’s and pao pao need extensive rebuilding).</p>
<p><b>Aleipata Wharf</b> - Serious damage has been incurred on the wharf and there has been significant impact on the only large seagrass bed in the district. Pollution has probably occurred (e.g. oils and fuel).</p> <p>There is high concern about the continued vulnerability of the area with regard to the wharf rebuild</p>	<p>Recovery of oil drums that were washed away (approximately 40 x 44 gallon drums are unaccounted for) and any other loss of chemicals/fuels assessed. Area must be safety certified.</p> <p>Significant debris clean up and stabilization of wharf are required. There is a high risk of increased sedimentation of the surrounding marine environment with advent of the rainy season washing unstabilised sediments into the sea.</p> <p>Local people should be warned against harvesting lagoon food resources from the wharf area until samples have been taken, assessments done and safety certification notified.</p> <p>An in depth environmental risk assessment is required before a decision to rebuild is taken.</p>

## Initial Terrestrial Assessment

Impact	Recommendations
<b>Solid Waste</b> - Large volumes of solid waste (including vehicles). Some waste aggregation has begun but clearing and disposal is still a significant issue	Solid waste management plan including sorting waste into disposable, hazardous and recyclable. Note the Japanese International Cooperation Agency has started a clean up project.
Illegal/improper dumps exposed by wave action with consequent solid waste pollution issues (e.g. Tuialemu, Lalomanu)	Cleanup of dumps and proper disposal of waste – has implications for human health, hygiene, vermin etc Review and write a new plan for local waste collection process. There are implications around this issue regarding revival of tourism in these areas.
<b>Coastal Impacts</b> - Patterns of high wave impact clearly observed with implications for future land use.	Implement CIMP (Coastal Infrastructure Management Plans) for coastal areas Ensure that findings from incoming geo-science teams are fed into planning processes including revision of CIMP plans as required
Observed damage to sensitive coastal ecosystems eg. Marshlands and river habitats. This may have impacted some fish nurseries and some of these sites include unique ecosystems.	Clean-up of trash and debris required. All sensitive areas need to be assessed. Identify potential restoration activities
Salinisation of coastal lowland areas. Some coastal trees are stressed and losing leaves but observations showed that others are resilient.	Replanting in these areas should focus on native salt tolerant species and species that are able to hold the coastline together. In addition, ability to withstand wave damage is important for replanting near settlements as shallow rooting trees can be uprooted.
Evidence of seawall rocks displaced by the Tsunami causing significant damage up to 50 metres inland	Rebuild to proper standards according to codes of environmental practice as appropriate – in some areas natural alternatives may be preferable
<b>Waterways</b> - Riverine systems were heavily impacted along the coasts up to 1 km inland, due to funneling affect of valley systems	Formal and detailed assessment of impacts. Plan activities to mitigate potential future impacts
<b>Sewerage</b> - Septic tanks were displaced/ emptied/ uncovered with obvious negative environmental and human health impacts	Pump clean at risk tanks. Replace with septic tanks that meet appropriate health and environmental standards as per resettlement protocols
<b>Agriculture and horticulture</b> - Noted impacts on agricultural crops eg. Taro, bananas, breadfruit etc	MAF and FAO have surveyed this and will provide recommendations

**Results of the Environmental Impact Assessment with implications and relevant information for Disaster Risk Reduction will be included in the final report.**

Many of the impacts of the tsunami may have been mitigated if the CIMPs had been fully implemented. Preparation of a tsunami hazard zone map for the Samoa archipelago is required. In addition a review of the national coastal hazard zone mapping assessment is required together with a review of the content of the CIMPs and implementation requirements.

**Available capacity to meet identified needs (notes - this list is not comprehensive; potential partners highlighted)**

**Marine related** – University of the South Pacific (**USP**) and South Pacific Geoscience Commission (**SOPAC**) scientists are ready and willing to travel to Samoa. CI has funds ear-marked to support further EIA work and are prepared to assist a Samoan Government led. **SPREP** has marine pollution expertise which could be available upon request.

**Solid waste (on land)** – Japanese International Cooperation Agency (**JICA**) has started assessing the quantity of the solid waste and have plans to fund a clean up programme. **SPREP** has solid waste expertise which could be available upon request.

**Coastal Infrastructure Management Plan** - Samoan Government agencies have capacity, as do local consultants, such as the Pacific Environmental Consultants (**PECL**).

**Marine protected area management** – Conservation International (**CI**), **SPREP**.