

Hazard Identification Tool Tsunami – Samoa – 30 September 2009 TS-2009-000210-WSM

Disclaimer

The present hazard identification has been carried out based on publicly available information. An attempt has been made to identify locations of facilities and objects as precisely as possible. However, the list is not exhaustive or conclusive; other hazards may be present in the area and some of the identified locations may be obsolete. Furthermore, the estimated impact types should not be used as a basis for decision making on response measures, but further investigations should be made to verify the information provided in the HIT and to assess the actual impact.

➤ **Objective**

The objective of the Hazard Identification Tool (HIT) is to alert the UN Country Team and emergency responders to potential secondary risks after a natural disaster posed by large infrastructure and industrial facilities containing hazardous materials located in the affected area. This information can be shared with competent local and national authorities as appropriate. Any actual secondary risk should be addressed at the earliest possible stage.

➤ **Methodology of the HIT**

The methodology of the HIT is based on the Flash Environmental Assessment Tool (FEAT), a rapid assessment methodology to identify the most acute hazards to human health and the environment after natural disasters. The HIT is compiled based on research using publicly available information sources and provides a list of "big and obvious" facilities and objects that may pose a risk to human health and life, as well as the natural environment. The list includes indications of the substances that are expected to be present in these facilities, as well as the hazard types associated with these substances and related **estimated** impact types. Wherever the (expected) location of a facility could be identified, this information has been filled into the first column of the HIT. If the facility is expected to be present, but no location could be identified, this has been indicated. Whenever the location field has been left blank, it is not expected that these facilities are present in the country.

➤ **Event**

An earthquake of magnitude 8.3 and depth 33 kms struck in the Samoa Islands Region. Death toll in Western Samoa has risen to 62 and is expected to rise. Samoa has declared a State of Disaster and requested assistance from foreign missions and the United Nations.

➤ **The Joint UNEP/OCHA Environment Unit**

The Joint UNEP/OCHA Environment Unit is the United Nations mechanism to mobilize and coordinate the international response to environmental emergencies caused by natural disaster, technological accidents and complex emergencies.

List of Hazards

Location	Actual Hazard			Estimated Impact Type 
	Facility	Substances	Hazard Type	
<p><i>These facilities may be present in the affected area</i></p> <p><i>(Standard facilities in HIT)</i></p> <p>Food processing of coconut cream, coconut oil, noni (juice of the nonu fruit, as it is known in Samoan), and copra for export. Locations undetermined.</p>	Hospital / sterilizing industry	ethylene oxide	gas toxic to humans, carcinogenic, mutagenic	Direct impact on human health
	Winning, preparing and distribution of drinking water (with chemicals)	chlorine	gas toxic to humans, gas toxic to the environment	direct impact on human health
	Electricity distribution	ammonia	gas toxic to humans, gas toxic to the environment	direct impact on human health, life support and nature direct
	Production of food and drink, incl. slaughterhouse	ammonia	gas toxic to humans, gas toxic to the environment	direct impact on human health, life support and nature direct
	Aerospace manufacture / repair (land-side)	hydrofluoric acid, cyanide	liquid toxic to the environment, liquid toxic to humans , liquid toxic after contact with water	direct impact on life-support functions and nature (direct impact on human health)
Largely agricultural economy in Upolu and Savaii. Exact locations undetermined.	Agricultural services (incl. small storage)	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health
<p>Known traces of the following pesticides for agricultural use</p> <p>Type of POPs Type of Chemical</p> <ol style="list-style-type: none"> 1. Aldrin Pesticide 2. Dieldrin Pesticide 3. DDT Pesticide 4. Heptachlor Pesticide 5. Chlordane Pesticide 6. PCBs Pesticide, Industrial chemical 7. Polychlorinated dibenzo-p-dioxins (Dioxins) By-product 8. Polychlorinated dibenzo-furans (Furans) By-product 9. HCB Pesticide, Industrial chemical, By-product <p>These are imported and stored by companies such as the ASC Agriculture Store Corporation.</p>	Agriculture (animals, crop, forestry, fruit, etc.)	organotin pesticide, organochlorine pesticide, phenoxyacetic acid derivative pesticide, carbamate pesticide, substituted nitro phenol pesticide, organophosphorus pesticide, pyrethroid pesticide, triazine pesticide, mercury based pesticide, dithiocarbamate pesticide, mixed chemicals (fire)	toxic/persistent, carcinogenic, mutagenic, liquid toxic to the environment, liquid toxic to humans, flammable liquid, gas toxic to humans, (toxic smoke)	long-term impact, direct impact on life-support functions and nature (direct impact on human health)
Upolu (Faleolo International Airport in Apia and Fagali'i Airport in Fagali'i 'reportedly closed), Savai'i (Asau Airport in Asau, Lalomalava	Airports (air-side)	kerosene	liquid toxic to the environment, toxic/persistent	long-term impact, direct impact on life-support functions and nature

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Location	Actual Hazard			Estimated Impact Type 
	Facility	Substances	Hazard Type	
Airport in Lalomalava and Maota Airport in Maota).				
	Artificial ski run	ammonia	gas toxic to humans, gas toxic to the environment	direct impact on human health
Exact locations undetermined. Most meet is imported.	Breeding and keeping animals	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health
Likely to be present in Apia on Upolu.	Bus-, tram- and metro, taxi stations	solvents, cleaning agents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic, flammable liquid, toxic/persistent	direct impact on human health, long-term impact
Likelz to be present in area surrounding Apia on Upolu. Exact location not available.	Car scrap yard	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact, direct impact on life-support functions and nature
	Defense	hydrazine, fuel, explosives	liquid toxic to the environment, liquid toxic to humans, flammable liquid, toxic/persistent (explosive)	long-term impact, direct impact on life-support functions and nature (direct impact on human health)
Oil based energy. Exact location undetermined.	Energy production and distribution (steam, propane / butane, oil and solvents, etc.)	natural gas, propane, butane, ammonia	flammable gas, gas toxic to the environment, gas toxic to humans	direct impact on human health
	Environmental services	mixed chemicals (fire)	gas toxic to humans, (toxic smoke)	direct impact on human health
	Fish farming	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health
	Forestry and -services (incl. small storage)	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health
	Galvano industry	chromium (III)	toxic/persistent, carcinogenic, mutagenic, solid toxic after contact with water	direct impact on human health
	Gas distribution	natural gas	flammable gas, gas toxic to the environment	direct impact on human health
LPG gas, and fuels all dock at Apia Harbour in Upolu. Other storage sites undetermined.	Gas service stations (with LPG)	liquefied petroleum gas (LPG)	flammable gas, gas toxic to the environment	direct impact on human health
	Glass production	hydrogen fluoride	explosive, solid toxic after contact with water	direct impact on human health
	Hydro dams (large)	- - -	- - -	Dam stability might be

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	Facility	Substances	Hazard Type	
				affected, dammed water, high voltage electricity
	Ice skating rink	ammonia	gas toxic to humans, gas toxic to the environment	direct impact on human health
	Iron and steel foundries	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	direct impact on human health, direct impact on life-support functions and nature, long-term impact
Likely to be present both on Upolu and Savaii islands in resort and densely populated areas. Exact locations undetermined.	Laundry, carpet clean, hair dresser, undertaker, fitness, etc.	dibenzoyl peroxide, chlorosilane, hydrogen peroxide	liquid toxic to the environment, liquid toxic to humans, toxic/persistent, gas toxic to the environment	direct impact on life-support functions and nature (direct impact on human health)
Apia Harbour (Upolu, Samoa) Mulifanua Wharf (Upolu, Samoa) Salelologa Wharf (Savaii, Samoa)	Loading and storage ships (oil and solvents, hazardous, etc.)	oil and solvents, fire	liquid toxic to the environment, toxic/persistent, combustible	direct impact on human health
	Manufacturing synthetic fibers	acrylic acid	liquid toxic to the environment, flammable liquid	direct impact on life-support functions and nature
	Marshalling yards	chlorine, liquefied petroleum gas (LPG)	gas toxic to humans, gas toxic to the environment, flammable gas	direct impact on human health
	Mining: gold, copper, nickel etc.	arsenic, mercury, cyanide	toxic/persistent, carcinogenic, mutagenic, solid toxic after contact with water, liquid toxic to the environment, liquid toxic to humans, liquid toxic after contact with water, gas toxic to the environment	long-term impact (direct impact on human health, direct impact on life-support functions and nature)
	Oil and gas mining (on-shore, off-shore)	oil and solvents, natural gas	liquid toxic to the environment, toxic/persistent, flammable gas, gas toxic to the environment	direct impact on human health
Likely to be present in Apia on Upolu. No address available.	Photo and film development	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact

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Location	Actual Hazard			Estimated Impact Type 
	Facility	Substances	Hazard Type	
Transformers with PCB are then placed in the allocated stockpiles at the EPC Vaitele depot, in the new industrialized region of Apia.	Production of accumulators and batteries	mixed chemicals (fire)	gas toxic to humans, toxic/persistent (toxic smoke)	direct impact on human health
	Production of agricultural chemicals	chlorine, carbon disulfide	gas toxic to humans, gas toxic to the environment, liquid toxic to the environment	direct impact on human health
	Production of cardboard and paper	chlorine bleaching	gas toxic to humans, gas toxic to the environment	direct impact on life-support functions and nature
	Production of chemicals - other	dimethylsulphate, chloride salts	liquid toxic to the environment, liquid toxic to humans	direct impact on human health, direct impact on life-support functions and nature
There is some garment production on Upolo island. Exact location undetermined.	Production of clothing (incl. painting and printing)	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact
	Production of cokes	oxigas	flammable gas, gas toxic to the environment	direct impact on human health
	Production of cokes electrodes	liquid acid, hydrogen, methanol	liquid toxic to the environment, flammable liquid, flammable gas, gas toxic to the environment, carcinogenic, mutagenic	direct impact on life-support functions and nature (direct impact on human health, long-term impact)
	Production of color and paint	solvents	liquid toxic to humans, liquid toxic after contact with water, carcinogenic, mutagenic	direct impact on life-support functions and nature
	Production of electro motors- and generators	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact, direct impact on life-support functions and nature
	Production of fertilizer	ammonium nitrate, ammonia	liquid toxic to the environment, liquid toxic to humans, gas toxic to humans, gas toxic to the environment	direct impact on human health
	Production of fireworks	ammonium nitrate, ammonia	liquid toxic to the environment, liquid toxic to humans, toxic/persistent, gas toxic to humans, gas	direct impact on human health

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Location	Actual Hazard			Estimated Impact Type 
	Facility	Substances	Hazard Type	
			toxic to the environment	
	Production of industrial gasses	monovinylchloride, ethene, hydrogen chloride, propane, oxygen	gas toxic to humans, carcinogenic, mutagenic /gas toxic to the environment/gas toxic to humans, gas toxic to the environment/flammable gas, gas toxic to the environment/GMR	direct impact on human health
	Production of inorganic chemical base materials	ammonium nitrate	explosive, solid toxic after contact with water	direct impact on human health
Yazaki Corporation on Apia, manufactures automobile electrical harnesses for which soldering is required. http://maps.google.com/maps?q=Yazaki+Corporation,+Samoa&oe=UTF-8&ie=UTF8&hl=en&t=h&ll=-13.739385,-171.878357&spn=1.912877,2.463684&z=9	Production of iron and steel base materials	oxigas	flammable gas, gas toxic to the environment	direct impact on human health, direct impact on life-support functions and nature
	Production of lacker and varnish	toluene diisocyanate	liquid toxic to the environment, toxic/persistent	direct impact on human health
	Production of lamps	hydrogen	flammable gas, gas toxic to the environment	direct impact on human health
	Production of leather	galvano, zinc bath	liquid toxic to the environment, liquid toxic to humans, toxic/persistent	direct impact on human health, long-term impact, direct impact on life-support functions and nature
	Production of lubricants	oil and solvents	liquid toxic to the environment, toxic/persistent	long-term impact, direct impact on life-support functions and nature
	Production of oil and solvents products (base materials)	oil and solvents	liquid toxic to the environment, toxic/persistent	long-term, direct impact on life-support functions and nature
	Production of organic chemical base materials	organotin compound (liquid), n.o.s., dibromomethane, tetrabromoethane, pentachloroethane, chromic fluoride (solution), arsenic compound - liquid, n.o.s., arsenic chloride, hexachlorobenzene, butadienes (inhibited), pentachlorophenol,	toxic/persistent, carcinogenic, mutagenic, liquid toxic to the environment, liquid toxic to humans, flammable gas, gas toxic to the environment, gas toxic to humans, explosive	direct impact on human health, long-term impact, direct impact on life-support functions and nature

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Location	Actual Hazard			Estimated Impact Type 
	Facility	Substances	Hazard Type	
		acrylonitrile, monovinylchloride, organic peroxide, bromine, chlorine, dimethylsulphate, fluorosulfonic acid, acrolein (inhibited), mercury compound (liquid), n.o.s., vinyl bromide (inhibited), fluorine, butane, trichlorobenzenes-liquid, hydrazine, anhydrous, bromomethylpropanes, chlorobenzene, hexachlorocyclopentadiene, formaldehyde (solution), vinyl chloride (inhibited)		
	Production of perfumes and cosmetics	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact
	Production of pharmaceutical base materials	methanol, ammonia, isopropanol, pentane, medicine	liquid toxic to the environment, carcinogenic, mutagenic /gas toxic to humans, gas toxic to the environment/ flammable liquid/ST	direct impact on human health
	Production of photochemical products	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	direct impact on human health, long-term impact
	Production of rubber (incl. tires)	chloroprene	carcinogenic, mutagenic, liquid toxic to the environment	long-term impact
	Production of soap and detergents	chloride salts	liquid toxic to humans, liquid toxic to the environment	direct impact on human health
	Production of steel pipes	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact, direct impact on life-support functions and nature
	Production of sugar	sulfur dioxide	gas toxic to humans, gas toxic to the environment	direct impact on human health, direct impact on life-support functions and nature

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Location	Actual Hazard			Estimated Impact Type 
	Facility	Substances	Hazard Type	
	Production of synthetic resin	toluene diisocyanate, acrylic acid	liquid toxic to the environment, liquid toxic to humans, toxic/persistent, flammable liquid	direct impact on life-support functions and nature
	Production of textiles	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact
	Production of wood	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact
	Radioactive and nuclear industry (Nuclear plants incl. cooling towers; research reactors)	radioactive material	<i>specialized expertise needed</i>	direct impact on human health, long-term impact
	Railway stations (no marshalling)	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	direct impact on human health, long-term impact, direct impact on life-support functions and nature
	Recycling	fire	combustible	direct impact on human health
	Recycling of liquids and rubber	trichlorobenzenes, trichloride ethanes	liquid toxic to the environment, liquid toxic to humans, carcinogenic, mutagenic, toxic/persistent	long-term impact, direct impact on life-support functions and nature
	Recycling of oil and solvents and lubricants	oil and solvents	liquid toxic to the environment, toxic/persistent	long-term impact
Coconut and copra oil production for local consumption and export. Exact locations undetermined.	Refinery of vegetable oil, solvents and grease	ammonia	gas toxic to humans, gas toxic to the environment	direct impact on human health, direct impact on life-support functions and nature
	Refinery of oil and solvents and gas (incl. storage)	oil and solvents, natural gas	liquid toxic to the environment, toxic/persistent, flammable gas, gas toxic to the environment	direct impact on human health
	Scrap yards (collection)	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact, direct impact on life-support functions and nature
	Ship dismantling	cleaning agents, solvents	liquid toxic to the environment,	direct impact on human health, long-

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	Facility	Substances	Hazard Type	
			flammable liquid, toxic/persistent, liquid toxic after contact with water, carcinogenic, mutagenic	term impact, direct impact on life-support functions and nature
Swimming pools for tourism industry.	Swimming facilities	chlorine bleaching	gas toxic to humans, gas toxic to the environment	direct impact on life-support functions and nature
	Synthetic manufacturing	phenolic resin	liquid toxic to the environment	direct impact on life-support functions and nature
	Tanker cleaning	oil and solvents, cleaning agents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic, liquid toxic to the environment, toxic/persistent	direct impact on human health
	Tanning industry	aniline, cyanide, ammonium sulfate, sulfuric acid, arsenic, chromium (III)	carcinogenic, mutagenic, liquid toxic to the environment, liquid toxic after contact with water, liquid toxic to humans, toxic / persistent, solid toxic after contact with water	direct impact on human health, long-term impact
	Textile industry (dyes)	naphthalene, benzene, bromine, chlorine, alkali, sodium nitrate, sodium sulfide	toxic / persistent, solid toxic after contact with water, carcinogenic, mutagenic, liquid toxic to the environment, liquid toxic to humans, gas toxic to the environment, gas toxic to humans	direct impact on human health
Likely to be present on all islands. Exact locations undetermined.	Trading and repair cars, motorcycles, service stations	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic / persistent, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact, direct impact on life-support functions and nature
	Trading professional fireworks (large enterprises)	fireworks	explosive	direct impact on human health
	Truck and (rail) lorry repair shops	cleaning agents, solvents	liquid toxic to the environment, flammable liquid, toxic/persistent	long-term impact, direct impact on life-support functions and nature
	Wholesale chemical products	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health
	Wholesale fertilizers	ammonium nitrate	explosive, solid toxic after contact with water	direct impact on human health
	Wholesale fire products (SME)	fire	combustible	direct impact on human health
	Wholesale liquid and	oil and solvents,	liquid toxic to the	long-term impact,

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	Facility	Substances	Hazard Type	
	gas fuels	natural gas	environment, toxic/persistent, flammable gas, gas toxic to the environment	direct impact on life-support functions and nature (direct impact on human health)
	Wholesale mineral oil and solvent product (excl. fuels)	oil and solvents	liquid toxic to the environment, toxic/persistent	long-term impact
	Wood treating industry	pentachlorophenol, creosote, chromium (III), arsenic, copper salts	liquid toxic to humans, solid toxic after contact with water / liquid toxic to the environment, carcinogenic, mutagenic / toxic / persistent	direct impact on human health, direct impact on life-support functions and nature

Explanation of the impact types

	Direct impact on human health - adverse health effects, possibly leading to immediate death
	Long-term impact on life-support functions, nature and humans - toxic persistent substances entering the food chain and natural ecosystems and effects of carcinogenic substances.
	Direct impact on life-support functions and nature - crops, fish resources, agricultural land, water supply - biodiversity and ecosystems

Indication of priority

The colors in the 'Impact column' indicate the priority to be given to this specific hazard.
(Red = Priority nr. 1, Orange = Priority nr. 2, Blue = Priority nr. 3)

Information sources

- **World Energy Council: Survey of Energy Resources 2007**
http://www.worldenergy.org/publications/survey_of_energy_resources_2007/default.asp
- **UNEP/GRID Arendal – Maps and Graphics Library**
<http://maps.grida.no/>
- **Official Energy Statistics**
<http://www.eia.doe.gov/emeu/cabs/index.html>
- **IAEA Country profiles and databases on Nuclear Power Plants and Research Reactors**
http://www-pub.iaea.org/MTCD/publications/PDF/cnpp2003/CNPP_Webpage/pages/countryprofiles.htm
<http://www.iaea.org/programmes/a2/index.html>
<http://www.iaea.org/worldatom/rrdb/>
- **ICOLD World Register of Large Dams**
<http://www.icold-cigb.net/recherchedidentification.aspx?typrech=rg>
- **Stockholm Convention on Persistent Organic Pollutants (POPs) - National Implementation Plans**
<http://www.pops.int/documents/implementation/nips/submissions/default.htm>
- **UNEP PCDD/PCDF Inventories**
http://www.chem.unep.ch/pops/pcdd_activities/inventories/default.htm
- **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal**
<http://www.basel.int/natreporting/compilations.html>
- **Maps of Oil and Gas infrastructure**
http://www.lib.utexas.edu/maps/map_sites/oil_and_gas_sites.html
- **International Minerals Statistics and Information**
<http://minerals.usgs.gov/minerals/pubs/country/>
- **MineSite – Information on World Mining Operations**
<http://www.infomine.com/minesite/>