Hazard Identification Tool
UNDAC Disaster Response Preparedness Mission
Papua New Guinea – April 2009

Disclaimer

This list has been compiled 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 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 asses the actual impact.

➢ Hazard identification in disaster response preparedness

In case of a **sudden-onset natural disaster**, the Joint UNEP/OCHA Environment Unit applies the Hazard Identification Tool (HIT) to alert the UN Country Team and emergency responders to potential secondary risks posed by large infrastructure and industrial facilities containing hazardous materials located in the affected area.

The present HIT has been prepared for the **UNDAC Disaster Response Preparedness Mission to Papua New Guinea in April 2009** and can be shared with competent local and national authorities as appropriate (for reference, see the Generic Terms of Reference for environmental experts on UNDAC disaster response preparedness missions). It serves several purposes:

1. The list of facilities in this document may serve as a check list and provides a basis for in-country investigations and on-site assessments of actual risks. The information provided below should be verified and supplemented by giving exact locations and adding locations for further facilities and/or objects.
2. It should be assured that environmental emergency preparedness is included in the overall preparedness plans, systems and institutions. Useful in this regard may be UNEP's APELL program which is designed to help communities in risk areas to deal with emergencies by giving them tools to put in place an overall effective emergency plan. (For more information on APELL: http://www.unep.fr/scp/sp/programme/about.htm)

➢ 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.

➢ 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	
These facilities may be present in the affected area *(Standard facilities in HIT)*	**Hospital / sterilizing industry**	ethylene oxide	gas toxic to humans, carcinogenic, mutagenic	Direct impact on human health
	Winning, preparing and distribution ofdrinking 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)
	Agricultural services (incl. small storage)	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health
These facilities are expected in the affected area, but an exact location could not be identified.	**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)
Major: Buka: Chimbu; Daru; Girua; Goroka; Gurney; Hoskins; Kavieng; Kerema; Madang; Mendi; Momote; Mount Hagen; Nadzab; Port Moresby Jacksons Intl; Tokua; Vanimo; Wapenamanda; Wewak Intl.	**Airports (air-side)**	kerosene	liquid toxic to the environment, toxic/persistent	long-term impact, direct impact on life-support functions and nature
	Artificial ski run	ammonia	gas toxic to humans, gas toxic to the environment	direct impact on human health
These facilities are expected in the affected area, but an exact location could not be identified.	**Breeding and keeping animals**	mixed chemicals (fire)	gas toxic to humans (toxic smoke)	direct impact on human health

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
These facilities are expected in the affected area, but an exact location could not be identified.	**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
These facilities are expected in the affected area, but an exact location could not be identified.	**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)
	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
Key cities associated with freshwater fish farming. Goroka; Aiyura; Lae; Port Moresby	**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
These facilities are expected in the affected area, but an exact location could not be identified.	**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
(nearest river, town) YONKI (Ramu, Goroka; RAMU (Ramu, Lae); ROUNA 2 (Laloki, Port Moresby); SIRINUMU (Laloki, Port Moresby)	**Hydro dams (large)**	- - -	- - -	Dam stability might be affected, dammed water, high voltage electricity

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
	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
These facilities are expected in the affected area, but an exact location could not be identified.	**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)
Port facilities: Alotau, Bialla, Buka, Daru, Kavieng, Kieta, Kimbe, Lae, Lorengau, Madang, Oro Bay, Port Moresby, Rabaul, Samarai, Vanimo	**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
Leading primary export commodity. Mines: Lihir (gold), Porgera (gold), Ok Tedi; Porgera; Misima; Tolukuma;	**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)
Producing oil from Southern Highlands Province. Extensive natural gas reserves	**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
	Photo and film development	solvents	liquid toxic to the environment, liquid toxic after contact with water, carcinogenic, mutagenic	long-term impact
	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	direct impact on human health

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
			toxic to the environment	
	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
Several facilities in Port Moresby, Boroko, Lae, Waigani, Mount Hagen, Hohola, Jacksons *(and possibly additional locations)*	**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 toxic to the environment	direct impact on human health
	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	direct impact on human health

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
			environment/flammable gas, gas toxic to the environment/GMR	
	Production of inorganic chemical base materials	ammonium nitrate	explosive, solid toxic after contact with water	direct impact on human health
	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, 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,	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

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
		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
	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
Several facilities in Port Moresby, Boroko, Lae, Waigani, Mount Hagen, Hohola, Jacksons *(and possibly additional locations)*	**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.	radioactive material	*specialized expertise needed*	direct impact on human health, long-term impact

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
	cooling towers; research reactors)			
These facilities are close to non existent	**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
	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
These facilities are expected in the affected area, but an exact location could not be identified.	**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, 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
	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

List of Hazards				
Location	Actual Hazard			Estimated Impact Type
	Facility	Substances	Hazard Type	
	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
Several facilities in Port Moresby, Boroko, Lae, Waigani, Mount Hagen, Hohola, Jacksons *(and possibly additional locations)*	**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
These facilities are expected in the affected area, but an exact location could not be identified.	**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
These facilities are expected in the affected area, but an exact location could not be identified.	**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
These facilities are expected in the affected area, but an exact location could not be identified.	**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 gas fuels	oil and solvents, natural gas	liquid toxic to the environment, toxic/persistent, flammable gas, gas toxic to the environment	long-term impact, 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/rechercheIdentification.aspx?typrech=rg
- **Stockholm Convention on Persistent Organic Pollutants (POPs) - National Implementation**
  Planshttp://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/