Environmental Emergency Response to the Lebanon Crisis

Consolidated report on activities undertaken through the Joint UNEP/OCHA Environment Unit

November 2006

UNITED NATIONS

United Nations Office for the
Coordination of Humanitarian Affairs
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Summary

In July 2006, open hostilities broke out between Israel and *Hezbollah*, with heavy aerial bombardment of Lebanon, especially south Lebanon and south Beirut. The conflict resulted in loss of life, injuries and considerable damage to Lebanese industrial installations and infrastructure. The conflict has immediate and longer-term environmental impacts.

The Joint UNEP/OCHA Environment Unit (Joint Environment Unit) is the United Nations mechanism for mobilising and coordinating international response to environmental emergencies. The Joint Environment Unit provided assistance to the Ministry of Environment in Lebanon to assess and mitigate the environmental effects of the recent conflict, and coordinated environment–related international emergency response assistance to the crisis. It maintained a presence in the region from early August until late September 2006. The Joint Environment Unit focussed particular attention on a major oil spill that resulted from the bombing of the fuel storage at the Jiyeh power plant, and on identifying potentially acute risks arising from other damaged or destroyed industrial infrastructure, for example those related to hazardous waste**.**

Key environmental emergency response activities that were undertaken by the Joint Environment Unit, in close cooperation with the Ministry of Environment, UNDP-Lebanon and other key partners, included:

- Assisting in the establishment and running of an *Oil Spill Operations and Coordination Centre* (OSOCC) within the Ministry of Environment to lead oil spill clean-up related activities;
- Facilitating two aerial surveillance flights along the coastline of Lebanon to determine the scale and physical state of any oil at sea. These flights occurred during the air and sea blockade;
- Identifying potentially hazardous sites requiring further assessment, to determine the need for mitigation measures to reduce any humanitarian impacts; and,
- Information sharing (including satellite imagery), and coordinating international environmental assistance with national and international stakeholders.

During the conflict, the Ministry of Environment played a key role in containing the oil spill and preventing it from turning into a much larger disaster. After the cessation of hostilities, oil spill clean-up activities intensified. As of October 2006, the most urgent priorities have been met. There is no major free oil floating at sea or trapped in confined areas. There is still much work to do, however, in cleaning up beaches and rocky areas.

The waste generated by the aerial bombings continues to pose a major challenge for long-term reconstruction efforts. There is an obvious need for further assessment and follow up work. Efforts to integrate environmental concerns into the recovery and reconstruction phases are being continued by the Ministry of Environment, in close cooperation with UNDP-Lebanon and UNEP, in particular the UNEP Post-Conflict Branch (PCoB).

These longer-term needs and activities are the subject of separate post-conflict activities led by UNEP PCoB. The post-conflict environmental assessment report is due in mid-December 2006.

Introduction

Overview and purpose of report

In July 2006, Lebanon experienced a devastating cycle of violence when open hostilities broke out between Israel and *Hezbollah.* Over 1,100 Lebanese were killed and more than 4,000 wounded, according to the Government of Lebanon. Sustained heavy shelling and air strikes by the Israeli Defense Force (IDF), targeted at southern Lebanon, the southern suburbs of Beirut and the Beqaa Valley, have caused widespread destruction of the country's infrastructure, including hospitals, schools and road networks[i]. The IDF sea, air and land blockade worsened already-mounting hardships confronting the civilian population. Serious concerns were voiced on humanitarian grounds and about the environmental impacts of the conflict.

The Joint Environment Unit, in line with its mandate to mobilise and coordinate international response to countries affected by environmental emergencies, provided assistance during the emergency response phase of the crisis and helped secure an effective transition to the post-conflict phase of response activities.

The purpose of this report is to provide donors and partners with an account of Joint Environment Unit activities in Lebanon from the onset of the crisis until the recent transition to post-conflict activities.

Joint Environment Unit response to the crisis

Scope of Joint Environment Unit involvement

A key function of the Joint Environment Unit is to assess the acute environmental impacts of industrial accidents, natural disasters and other emergencies, and to mobilize assistance to address them. Assistance focuses on the initial, emergency phase of disaster response, rather than longer-term recovery/rehabilitation issues. During this phase, the Joint Environment Unit can provide services including technical support and advice to national authorities, coordination support to national and international organizations, and can mobilize specialized technical support and equipment.

A Joint Environment Unit presence in the region was established in Syria on August 8, 2006, pending United Nations security clearance to enter Lebanon. That presence was continued in Lebanon from August 13, until the beginning of the post-conflict environmental activities led by UNEP PCoB in late September 2006.

Joint Environment Unit activities in response to the Lebanon crisis – overview

The Joint Environment Unit provided a range of services at both national and international levels to ensure an effective response to environmental issues that resulted from the crisis.

At a national level, institutional support was given by the Joint Environment Unit to the Ministry of Environment to strengthen coordination of oil spill response activities.

At the international level, many organizations were involved in the addressing environmental impacts of the disaster, including the United Nations Development Programme (UNDP) in Lebanon, World Health Organization (WHO), International Maritime Organization (IMO), various UNEP branches, the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC[1]), World Bank, European Commission Monitoring and Information Center (EC-MIC), World Conservation Union (IUCN), and donor governments. The Joint Environment Unit provided coordination and information-sharing support so that all parties could benefit from the same information base, and to ensure no overlap or duplication of effort. The Joint Environment Unit participated directly in assessments of the environmental effects of the crisis, and helped broker support for assessment activities such as aerial surveillance flights, during the air and sea blockade of Lebanon.

Specific activities included:

- Institutional support to the Ministry of Environment
- Rapid environmental assessments
- Coordination within the international community

Institutional support to the Ministry of Environment

On arrival in Lebanon, the Joint Environment Unit established a presence within the Ministry of Environment. In close cooperation with the European Commission and Ministry of Environment staff, it developed and implemented a proposal to establish an *Oil Spill Operations and Coordination Centre* (OSOCC)[2] to ensure an effective oil spill clean up under the leadership of the Ministry of Environment.

The Director-General of the Ministry chaired the OSOCC and Ministry staff fulfilled essential functions such as logistics, finance and media. International experts, such as those deployed by the European Commission and REMPEC, provided expert advice and training on clean-up methodologies, priority setting and the coordination of international assistance. The Lebanese Navy also formed part of the OSOCC and played a crucial role in the early clean up activities in the Byblos harbour and the Movenpick marina in Beirut.

Immediate national response - During the hostilities, the Ministry of Environment initiated an emergency committee of 7 staff and started assessing impacted sites along the coast, often with danger to their own lives. One of the most important mitigation measures was taken at the still-burning fuel storage of the Jiyeh power station. Through concerted effort between the Lebanese Army, Civil Defense, private contractors and power station staff, 20,000 tonnes of heavy fuel oil was reportedly prevented from leaking into the Mediterranean.

Source: http://www.moe.gov.lb

The *National Action Plan for Oil Spill Clean Up* was drafted by the OSOCC. The National Action Plan contained priorities for site-specific clean up activities, an assessment strategy, an outline of the financial and material needs for an effective clean-up, and guidance for clean-up activities.

[1] REMPEC is set up within the framework of the Regional Seas Programme of UNEP and is administered by the IMO.

[2] The term originates from *'On-Site Operations and Coordination Centers'* that are set up by United Nations Disaster Assessment and Coordination and/or by Urban Search and Rescue teams in the response to natural disasters worldwide.

Daily coordination meetings were held in the Ministry of Environment to discuss progress, determine daily logistical needs for site clean-up and to assist visiting expert teams from donor countries, non governmental organizations (NGOs) and other partners.

The OSOCC continues to fulfill its role and oil spill activities are still underway.

Rapid environmental assessments facilitated by the Joint Environment Unit

A key task was to assess the environmental impact of the crisis on local populations before response strategies were put in place. Assessment activities during the crisis phase included:

An inventory of potential environmental emergency sites. The Joint Environment Unit monitored public information sources, in cooperation with UNEP PCoB, for details on the Lebanese sites targeted. Particular emphasis was given to data on the possible presence of hazardous materials, as these can cause local environmental emergencies that might require international assistance. The inventory of critical areas and possible risks was drawn up in cooperation with UNEP PCoB, to support national and local response activities. The greatest areas of concern were associated with power stations, areas for the refining and storage of major amounts of fuel oil, and aviation and military fuel depots. Annex 1 shows an inventory of potential environmental emergency sites, their location and potential hazards and risks.

The inventory also provided a basis for post-conflict environmental assessment activities carried out by UNDP and UNEP PCoB.

- ***Oil spill assessment - Syrian Coast.*** The Joint Environment Unit participated in an IMO/REMPEC-led assessment mission to determine of the scale of the oil spill along the Syrian Coastline. The assessment took place from 8 - 11 August 2006[3]. In summary, the assessment concluded that the oil spill had no extensive impacts on the Syrian coast and that existing measures to combat it had been reasonably effective.

Rapid waste assessment. A waste management expert of the Swiss Agency for Development and Cooperation (SDC) was deployed through the Joint Environment Unit to assist the Ministry of Environment with a rapid waste assessment. The assessment focussed on the volume and composition of waste in the southern suburbs. The possible presence of unexploded ordnance (UXO) in the rubble was thought to pose a serious risk and the greatest impediment to clearing and demolition activities. Most buildings in the area visited were between 6 and 10 floors, and built of concrete re-enforced by steel. A rough estimate of the debris composition (in percentage) from this assessment is noted in Table 1. In some areas visited, an estimated that 80% of the buildings were completely destroyed. The assessment did not detect toxic gases or radioactivity above expected background levels.

[3] The full report can be found at http://ochaonline.un.org/DocView.asp?DocID=5085.

Table 1. Estimate of debris composition from rapid waste assessment	
Concrete	50-70%
Steel/iron	5-8%
Bricks	10-25%
Other metals	2-5%
Plastics (including foam)	5-15%
Organic waste (including food)	2-8%
Hazardous waste	<2%

Based on this assessment, recommendations were made to the Ministry of Environment for the establishment of a temporary waste recycling and storage sites in order to promote the recycling of various waste streams. The objective was to reduce the pressure on natural resources, including the negative impacts of quarrying in Lebanon.

Samples of oil from a beach in Beirut were also taken by the expert deployed by the Joint Environment Unit, and analysed in Switzerland with financial support from the SDC. Based on the analysis, guidance was produced by the Joint Environment Unit, in collaboration with UNEP Chemicals and their network, with a focus on the appropriate use of protective personal equipment during clean-up activities, consumption of fish and disposal options for waste generated by the oil spill clean-up activities.

A rapid waste assessment helped determine identify the composition of waste and supported response planning. Source: R. Nijenhuis

Aerial surveillance flights along Lebanese Coast. A key priority of the *National Action Plan for the Oil Spill Clean-up* was to visually identify the conditions, appearance, locations and quantities of oil remaining at sea. Oil spill experts in Lebanon considered this inspection a vital complement to satellite imagery to determine needs for, and scale of, clean up operations at sea.

This goal was hampered by the land, air and sea blockade on Lebanon. UNEP's Executive Director brokered an agreement whereby the Israeli

Ministry of Environment facilitated aerial surveillance flights to assess the oil spill, subject to prior notification and approval of each flight. The Joint Environment Unit subsequently coordinated between various stakeholders to implement this plan, which included requesting helicopters from national governments through the OCHA Civil-Military Coordination Section.

Two aerial surveillances were carried out on 28 and 29 August from Sidon (south of Jieh) to the Lebanese-Syrian Border in the north. International experts and Ministry of Environment staff visually inspected the entire coastline at a distance of 3 nautical miles (nm) and 6 nm from the shore. The Palm Island Nature reserve, situated off the coast in the North, was also surveyed.

Oil pollution was observed along the coastline from Jiyeh to the Lebanese-Syrian border, with some exceptions where oil had not reached the coast or had already been collected. Importantly, no large oil slicks at sea were observed. The major implication of this was that there was no need for sea-based clean up operations.

A helicopter departs for surveillance to support oil spill response planning. Source: R. Nijenhuis

Coordination within the international community

Many organizations and programs were involved in the environmental response efforts at the international level, giving rise to a need for effective coordination. At the international level the response to the oil spill involved REMPEC, which was responsible for the operational elements of the response, the EC-MIC, which was able to mobilize a range of expertise and resources from its member states, and the IMO. The Joint Environment Unit helped coordinate activities between these stakeholders through:

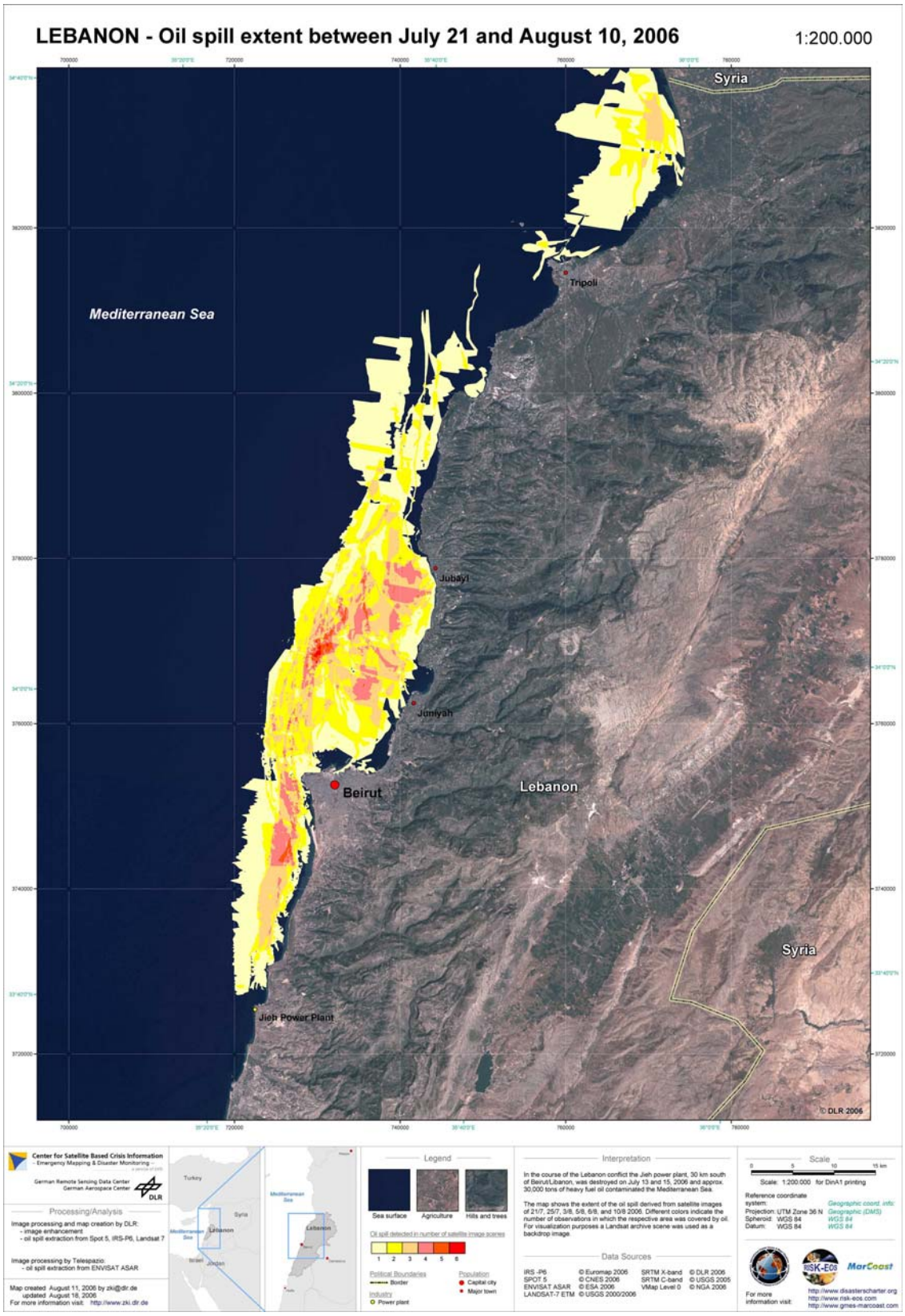
Information dissemination. From the onset of the crisis, the Joint Environment Unit and its partners collected information for collation and distribution to stakeholders to ensure that all could benefit from the same base of information. For example, the Joint Environment Unit circulated satellite images related to the oil spill that were obtained free of charge through EC activation of the International Charter on Space and Major Disasters, and from other sources. In addition, reports on the oil spill and other major environmental issues were prepared by the Joint Environment Unit and distributed on July 27, August 4 and August 24[4]. Information was also incorporated into OCHA Situation Reports on a regular basis. These efforts aimed to ensure coherence of efforts between the activities of REMPEC, IMO and others involved. The Joint Environment Unit also participated in an international meeting organized in Athens by IMO and UNEP to support oil spill response activities.

Stakeholder conference calls. Regular conference calls were organised and chaired by the Joint Environment Unit with a wide range of partners including UNEP

[4] Environmental updates can be found at http://ochaonline.un.org/webpage.asp?Page=2204

sections and programmes - such as the Regional Office for West Asia (ROWA), Chemicals and the Mediterranean Action Programme - OCHA, UNDP, IMO, as well as REMPEC, EC, IUCN, Greenpeace and others. These calls proved to be a valuable tool, providing a forum for information sharing, and helping to maximize the effectiveness of efforts and avoid overlap.

Oil spill clean-up activities in Lebanon: acute needs have been met, but longer-term challenges remain. Source: R. Nijenhuis



Source: DLR Center for Crisis Based Satellite imagery

Transition to the post-conflict phase

As noted, the Joint Environment Unit is responsible for mobilizing and coordinating international response during the initial, acute phase of a disaster, while other parts of UNEP and development agencies (in particular UNDP) are mandated with later activities related to recovery and rehabilitation. To ensure that efforts are sustainable and effective, there must be coherent transition between these phases and the actors involved. The Joint Environment Unit, UNDP-Lebanon and UNEP-PCoB undertook a number of activities to this end.

Specifically, to address recovery and rehabilitation aspects of the crisis, and at the request of the Ministry of Environment, a multi-disciplinary team led by UNEP-PCoB traveled to Lebanon to provide practical technical support and advice to national authorities and international partners through a post-conflict environmental assessment (PCEA). The groundwork was in place for a smooth transition as UNEP-PCoB and the Joint Environment Unit had been in close contact throughout the emergency phase. Then, in late September, the Joint Environment Unit handed over leadership of the environment dimension entirely to the UNEP-PcoB, with dialogue maintained between UNEP-PCoB, UNDP Lebanon and the Joint Environment Unit. Moreover, it was agreed that further assistance would be available from the Joint Environment Unit to UNEP-PCoB at any time should any acute environmental effects come to light during their recovery and rehabilitation work.

The PCEA was divided into a range of thematic areas:

- Marine and coastal
- Surface and groundwater
- Solid and hazardous waste
- Land contamination (chemicals/hydrocarbons)
- Asbestos and air pollution
- Unexploded ordnances and concerns related to the weapons used

The PCEA took place between 30 September - 21 October 2006. No acute environmental issues were identified during the course of this assessment, and, accordingly, the Joint Environment Unit's involvement in Lebanon ended. The PCEA will, however, make a range of important recommendations regarding medium-longer-term measures required to allow Lebanon to recover fully from the environmental aspects of the conflict. The final PCEA report will be available in mid-December.

Annex 1

During August 2006, the Joint Environment Unit and partners developed this inventory of environmental issues based on public sources and shared it widely to support future assessment and rehabilitation efforts.

Date: 24 August 2006

Category 1: Large combustible storage or processing facilities			
Name and type of facility	Location	Potential hazards and risks	Comments
Power plants and storage			
Jiyeh Thermal Power Plant, 346 MW, powered by fuel oil[ii]. Fuel storage facility S and E of power plant (appx. 25 tanks with appx. 300,000 tons total capacity)[iii]	28 km S of Beirut, directly on coastline. Coordinates: 33 38 45 N 35 44 00 E[iv]	Heavy fuel oil PCB: has the largest volume of PCB in transformers in the whole country. POP Report LEB states is as Pyralene (French product) and Sibanol (Japanese product), 37.1 tons in total, 500,000 ppm in one tested oil sample[v]. Constitutes complete LEB inventory of PCB together with Zouk power plant.	Linked to major oil spill covering 150 km of LEB and 10 km of SYR coastline (10 – 30,000 tons reported leaked, other tanks burnt out after IDF attacks July 13&15)[vi] The plant itself and the PCB-containing transformers were reported to be intact on August 23[vii]
Zahrani Thermal Power Plant, 435 MW, powered by fuel oil[viii].	9 km S of Saida (Sidon) [45 km S of Beirut], directly on coastline. Coordinates: 33 29 45 N 35 20 15 E[ix]	Heavy fuel oil	Bombed by IDF July 14, storage tanks burnt[x]. No reports of pollution or contribution to oil spill.
Zouk Thermal Power Plant, 607 MW (largest in Lebanon), built in the mid-1980s, powered by fuel oil.[xi]	12 km NE of Beirut, directly on coastline, coordinates: 33 58 15 N 35 36 15 E. 2 large (ca. 8,000 m3) storage tanks W of plant on coast, 2 large and ca. 10 smaller fuel tanks E and NE of power plant.[xii]	Heavy fuel oil PCB: has 4.7 tons PCB (from US production). Constitutes complete LEB inventory of PCB together with Jieh power plant.	No details of damage or attacks.
Refinery and storage			
Zahrani Refinery and storage tanks	Immediately S of power plant, directly	Gasoline, naphta, hydrofluoric acid,	Bombed by IDF July 21[xiv], damage reports

	on coastline. Coordinates: 33 29 30 N 35 20 15 E[xiii]. Storage tanks immediately SW of refinery. 15 large tanks 1500m E of refinery	propane, butane, ethylene, propylene, mercaptan, liquefied natural gas and other combustibles	sparse and inconclusive. No reports of pollution or contribution to oil spill.
Fuel Storage			
Beirut International Airport – fuel storage tanks	Beirut, 8 km south of city centre. Fuel storage tanks E of terminal building and NE-SW runway, coordinates: 33 49 15 N 35 30 15 E[xv]	Kerosene (jet fuel) and other combustibles	Bombed by IDF July 13, 14 and repeatedly since, fuel tanks burnt out[xvi].
Rayak Military Air Base – possible fuel storage tanks	Rayak, 45 km E of Beirut Coordinates: 33 51 00 N 35 59 30 E[xvii]	Kerosene (jet fuel) and other combustibles	Bombed by IDF July 13/14[xviii]
Service and petrol stations across the country	Across the country with small-scale temporary storages	Gasoline, diesel, propane	LEB gvt reports 22 as damaged or destroyed country-wide
Category 2: Transport of petroleum or gasoline			
Name and type of facility	Location	Potential hazards and risks	Comments
No reports			
Category 3: Pipelines (except those used for fixed installations)			
Name and type of facility	Location	Potential hazards and risks	Comments
"oil cable"[xix]	Jamhour, 8km SE of Beirut	Oil leak (either pipeline or oil-insulated cable) – to be checked further	Damaged before 24 July
Category 4: Specific basic products			
Name and type of facility	Location	Potential hazards and risks	Comments
Maliban Glass factory	Taanayel, Zahle, Beqaa (Bekaa Valley), 35km E of Beirut	Hydrofluoric acid	Destroyed by IDF air raid July 19 [xx]. Reportedly produces glass bottles (FT article).
Snow Wood Industry	Chouwaifat, Aley, Mount Lebanon, 15km SE of Beirut	Formaldehyde, impregnation agents	
Category 5: Specific chemical products			
Name and type of facility	Location	Potential hazards and risks	Comments
Sai El-Deen plastics	Tyre, South, 75km S	Ethylene, Propylene,	

facility	of Beirut	Vinyl chloride, acrylonitrile, chlorine, toxic combustion products	
Category 6: Explosives			
Name and type of facility	Location	Potential hazards and risks	Comments
UXO (Unexploded ordnance)	Country-wide at all targeted sites, "inheritance" from Lebanese Civil War and other military actions also possible	▪ Risk of explosions for all humanitarian, relief and recovery operations, including clearing, demolition, recovery, transport and movement ▪ Toxic substances in ordnance	Includes unexploded grenades, shells, missiles and sub-munitions, e.g. cluster bomb bomblets. Incidence in military campaigns typically 10% of expended ordnance[xxi]. Lebanese official sources and maps claim up to 70% of country area to be affected[xxii]
Category 7: Large cooling facilities			
Name and type of facility	Location	Potential hazards and risks	Comments
Liban Lait dairy plant	Hosh Steed, Baalbek, Baalbek Hermel (65 km NE of Beirut)	Ammonia	Bombed by IDF July 17, burned out and destroyed[xxiii]
Category 8: Metallurgic and electronic industries			
Name and type of facility	Location	Potential hazards and risks	Comments
No reports			
Category 9: PVC industries			
Name and type of facility	Location	Potential hazards and risks	Comments
No reports			
Category 10: Laundries			
Name and type of facility	Location	Potential hazards and risks	Comments
No reports			
Category 11: Storage or processing sites for hazardous wastes			
Name and type of facility	Location	Potential hazards and risks	Comments
No reports			
Category 12: Public areas and services			
Name and type of facility	Location	Potential hazards and risks	Comments
Drinking water filtration plants	various sites	Chlorine	Several reported destroyed[xxiv]

Sewage treatment plants	various sites	Chlorine, hydrogen peroxide	Several reported destroyed[xxv]
Hospitals	various sites	Oxygen, gas and various solvents, x-ray machines	
Category 13: Other issues			
Name and type of facility	Location	Potential hazards and risks	Comments
Damaged transformers (power stations/electricity grid)	Country-wide	PCBs (polychlorinated biphenyls)	LEB gvt report: mainly lines and connectors cut / damaged, no transformer references[xxvi] National inventories (confirmed by UNEP Chemicals) and initial assessment report by Swiss expert in Beirut indicate country-wide possibility of PCB-containing transformers
Debris from collapsed buildings (industrial and residential)	Country-wide	Asbestos	
Risk of UXO and pollution from ammunition used	all targeted sites could potentially cause risk	UXO, toxic substances in ordnance	Refer to LEB gvt strike maps and DPKO strike maps
Health care waste from hospitals and field clinics	Country-wide, linked to hospitals and strike sites	Health care waste build-up and improper treatment	

Annex 2

Results of sample analysis
August 29, 2006

The information below is compiled by the Joint UNEP/OCHA Environment Unit from the results of laboratory analysis of the samples taken by Dr. Jürg Zaugg. Comments on those result were provided by:

- Dr. Jürg Zaugg, Swiss environmental expert – deployed to Beirut, Lebanon August, 2006
- Dr. Heidelore Fiedler, Scientific Affairs Officer, UNEP Chemicals Branch
- Dr. Dieter Schrenk, Department of Food Chemistry and Environmental Toxicology, Kaiserslautern University - Germany
- Centre of Documentation, Research and Experimentation on Accidental Water Pollution (Cedre) - France

The testing and laboratory analysis was provided by Labor SIUM Engineering AG, Dielsdorf, Switzerland

SAMPLES OF SAND AND TAR MIXTURE:

Protocol of Sampling

Date: 21st August 2006 11:20 – 11:40 a.m.

Place: Lebanon, Beirut, Beach of Moewenpick Hotel, sea level,

N 33°53'05.6''
E 035°28'23.6''

Weather: clear, sunny, hot with ca. 31 C°, calm, wind < 1.0 m/sec.

Sea: calm, no waves < 0.1 m at waterline

Precise place of sampling: ca. 8 m NE of front building water resort (ca. 30m NE of swimming pool) Movenpick Hotel

Describing of the samples (additions and optical impression):

Sample Nr. 608/01
Sample 608/01 was taken ca. 5m behind actual water line;

Fine sand, oil/tar is penetrated about 8-15 mm into the sand. Colour black & dark grey, typical odour of HC and tar.

50 % sand 0.1 ….1.0 mm
10 % sand 1.0 … .2.0 mm
40 % oil/tar mixture, high viscous liquid

Sample Nr. 608/02
Sample 608/02 was taken ca. 3 m behind actual waterline.

Fine sand, oil/tar is penetrated about 12…20 mm into the sand. Colour black & dark grey, typical odour of HC and tar.

60 % sand 0.5 ….3.0 mm
40 % oil/tar mixture, high viscous liquid

Amount of samples: **ca. 200 ml** (= ca. 400 g) each, small cylindrical plastic box (polyethylene) with screw-on lid, waterproof.

RESULTS:

PCB (polychlorinated biphenyls):

The PCB content of both samples taken from the beach in Beirut is low".

sample 608/01 PCB 0.06 mg/kg

sample 608/02 PCB 0.14 mg/kg

Heavy Metals:

There is no substantive contamination by heavy metals. Traces of arsenic, lead and zinc were found, but within normal ranges. Their presence could be as a result of the sand portion of the samples and not as a result of the oil.

This result would indicate that there is no hazardous waste mixed into the storage tanks of the affected power plant.

Polycyclic aromatic hydrocarbons (PAH):

PAH are found higher concentrations in tar, which is a by-product of the refining process. Refined oil and diesel contains no, or trace amounts of PAH.

The samples indicate that PAHs are present, including benzo(a)pyrene. Results are expressed as concentrations for the sum of 16 PAH and separately for benzo(a)pyrene (BaP).

Concentrations: PAH 127 mg/kg, BaP 6.6 mg/kg

Thus, the concentrations in the "oil" are high. (It is unclear how PAHs could have contaminated the oil, but it could be explained by direct and indirect contact with the fire. Given the fire was burning for two weeks the combustion process of the oil could have produced PAHs. The indirect cause could be the burning of other materials that contained PAH and contaminated the oil.)

If some of the samples would be classified as "soil", then action levels for different uses according to German regulation are as follows (all on dry matter):

Children playgrounds:	5 mg PAH/kg or 0.5 mg BaP/kg
Residential areas:	25 mg PAH/kg or 2.5 mg BaP/kg
Industrial Areas:	100 mg PAH/kg or 10 mg BaP/kg

This result leads to a series of conclusions regarding equipment for response personnel, disposal and consumption of fish.

Endnotes

[i] Flash Appeal Lebanon Crisis 2006, United Nations Consolidated Appeals Process.
[ii] Electricite du Liban website (www.edl.gov.lb/AboutEDL.htm#4)
[iii] Estimate from GoogleEarth satellite imagery
[iv] GoogleEarth
[v] Information supplied by Dr. Heidi Fiedler, UNEP Chemicals, referring to Lebanese Persistent Organic Pollution National Contingency Plan
[vi] e.g. http://www.guardian.co.uk/worldlatest/story/0,,-5955060,00.html and http://news.bbc.co.uk/2/hi/middle_east/5226502.stm
[vii] by the Italian environmental expert team on the ground (deployed following bilateral agreement Italy – Lebanon)
[viii] Electricite du Liban website (www.edl.gov.lb/AboutEDL.htm#4)
[ix] GoogleEarth
[x] http://www.bloomberg.com/apps/news?pid=20601087&sid=aiz7q_Yf5qOE&refer=home
[xi] www.edl.gov.lb/AboutEDL.htm#4
[xii] GoogleEarth
[xiii] GoogleEarth
[xiv] http://www.tass.ru/eng/level2.html?NewsID=10644110&PageNum=0
[xv] GoogleEarth
[xvi] http://news.bbc.co.uk/2/hi/middle_east/5175160.stm, http://news.bbc.co.uk/2/hi/business/5186890.stm, http://www.nytimes.com/2006/07/19/world/middleeast/19cnd-mideast.html?pagewanted=2&ei=5070&en=5733d1e11fad976a&ex=1155182400
[xvii] GoogleEarth
[xviii] http://www.guardian.co.uk/worldlatest/story/0,,-5949469,00.html,
[xix] Lebanese Government Damage Statistics, p.7 bottom
[xx] http://www.dailystar.com.lb/article.asp?edition_id=1&categ_id=3&article_id=74508, http://www.irinnews.org/report.asp?ReportID=54993&SelectRegion=Middle_East&SelectCountry=LEBANON
[xxi] Indication of waste management expert, deployed through Joint Environment Unit
[xxii] See official communication site on the issue www.lebanonundersiege.gov.lb, especially the most recent update and the maps of sites targeted
[xxiii] http://www.alertnet.org/thenews/fromthefield/carintern/115340087328.htm, also on ReliefWeb http://www.reliefweb.int/rw/RWB.NSF/db900SID/AMMF-6RVJCM?OpenDocument
[xxiv] Lebanese Government Damage Report, p. 8
[xxv] ibid.
[xxvi] Lebanese Government Damage Report, pp. 6 and 7