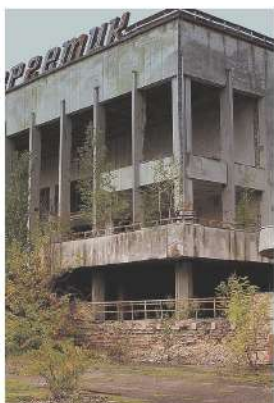


UN
environment
programme



50
1972-2022



25 Years of Crisis Response

Table of Contents

<i>1994: RUSSIAN FEDERATION, Oil Spill in Komi Republic.....</i>	<i>4</i>
<i>1996 : PHILIPPINES, Marcopper Mining Disaster</i>	<i>5</i>
<i>1997: UKRAINE, Post-Chernobyl.....</i>	<i>5</i>
<i>1999: KOSOVO, Assessing the possible consequences for the environment and human settlements of the Kosovo conflict</i>	<i>6</i>
<i>2000: FYR OF MACEDONIA, Managing the environmental consequences of the Kosovo conflict</i>	<i>9</i>
<i>2002: ALBANIA, Managing the environmental consequences of the Kosovo Conflict</i>	<i>11</i>
<i>2002: SERBIA AND MONTENEGRO, Post-conflict assessment and clean-up in Serbia and Montenegro</i>	<i>14</i>
<i>2002: BOSNIA AND HERZEGOVINA, Measuring environmental impacts from depleted uranium contamination</i>	<i>17</i>
<i>2003: AFGHANISTAN, Laying the foundations for sustainable development.....</i>	<i>20</i>
<i>2003: IRAQ, Cleaning-up and reconstructing after Second Gulf War.....</i>	<i>23</i>
<i>2003: LIBERIA, Mapping environmental vulnerabilities after the civil war.....</i>	<i>26</i>
<i>2004: INDIAN OCEAN, Assessing the impact of the 2004 tsunami in the Indian Ocean...</i>	<i>29</i>
<i>2004: RWANDA, Moving from conflict to environmentally sustainable development....</i>	<i>30</i>
<i>2005: SUDAN, Developing a solid technical basis for sustainable development</i>	<i>33</i>
<i>2005: GAZA STRIP, Assessing the environmental impact of Israeli settlements and armed conflict in the Gaza Strip.....</i>	<i>36</i>
<i>2006: LEBANON, Crisis, oil spill, and establishing a path towards sustainable development</i>	<i>39</i>
<i>2006: INDONESIA, Yogyakarta Earthquake and Volcanic Activity.....</i>	<i>42</i>
<i>2006: NIGERIA, Assessing the extent of environmental contamination from the oil spill in Ogoniland</i>	<i>43</i>
<i>2006: IVORY COAST, Managing hazardous waste dumped by the Probo Koala</i>	<i>46</i>
<i>2007, Former Yugoslav Republic (FYR) of Macedonia: Wildfires</i>	<i>49</i>
<i>2007: UKRAINE, Assessing the environmental impacts of the Kerch Strait oil spill</i>	<i>50</i>
<i>2008: Philippines, MV Princess of the Star pesticide spill</i>	<i>53</i>
<i>2007, DEMOCRATIC REPUBLIC OF THE CONGO (DRC), Assessing environmental damage from Africa's World War.....</i>	<i>54</i>

2008: CHINA, Building back better after the Wenchuan Earthquake	57
2009: KENYA, Guiding the expansion of the support bases in Mombasa	59
2010: HAITI: Increasing Haiti's resilience to disasters	61
2010: SOMALIA, Mitigating environmental impacts of military bases in Mogadishu	63
2010: CÔTE D'IVOIRE, Post-Conflict Environmental Assessment after a decade of conflict	65
2011: JAPAN, The Great Eastern Japan Earthquake	68
2012: ITALY, Costa Concordia Cruise Ship Accident.....	70
2012: SOUTH SUDAN, Assessing solid waste dumping in Juba and water harvesting structures in Eastern Equatoria, Western Equatoria, and Lakes States	71
2013: PHILIPPINES, Typhoon Haiyan/Yolanda	74
2014: BANGLADESH, Sundarbans Oil Spill	75
2015, PARAGUAY: Electric Depot PCB Fire.....	77
2016 : HAITI, Hurricane Matthew.....	78
2016: IRAQ, Dam Failure in Mosul Response	79
2016: IRAQ, Chemical Hazards in Mosul Response	80
2017: IRAQ, Picking up the pieces: rebuilding after ISIL.....	82
2017: UKRAINE, Chemical Contamination in Conflict.....	85
2017: BANGLADESH, Refugee Influx.....	85
2018: COLOMBIA, Hidroituango Dam	86
2019: MOZAMBIQUE, Cyclones Idai and Kenneth.....	88
2019: BAHAMAS, Hurricane Dorian	89
2020: BEIRUT, Port Explosion	90
2021: EQUATORIAL GUINEA, Ammunition Explosion.....	91
2021: ST. VINCENT AND THE GRENADINES AND BARBADOS: Volcano Eruption	92
2021: SRI LANKA, MV X-Press Pearl.....	93
2021: HAITI, Earthquake	95
2022: TONGA, Volcanic eruption and tsunami	96
2022: PERU, Oil spill.....	97

1994: RUSSIAN FEDERATION, Oil spill in Komi Republic

On 1 October 1994, a major environmental disaster occurred when the Karyage-Usinsk pipeline – in the Usinsk region of the Komi Republic – ruptured, leading to one of the largest oil spills of the Russian Federation's modern history. It is estimated that between 100,000 and 2,000,000 barrels of heavy crude oil spilled from the pipeline.

As the pipeline is located in the arctic region of the country, the spilled oil has soaked the permafrost and posed major environmental damage to the fragile environment and ecosystem of the region. The spill has reached the Kolva River, a tributary of the Pechora River, which falls into Barents Sea. The slick's size was estimated at one metre deep, 9.5 to 14 kilometers long and 12 metres wide. It was reported that leaks from the pipe have been occurring since February 1994 and leaking oil was held behind an earthen dam, which collapsed in October.

Local authorities conducted preliminary assessments and initiated clean-up operations in the affected areas. In addition, four coffer-dams on minor water courses and dikes were constructed and collapsed in October, due to heavy rains. The accident was considered as extremely hazardous to the environment by the Ministry of Environment of the Russian Federation.

In December, following an official request for assistance from the Ministry of the Russian Federation for Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters (EMERCOM), the Joint UNEP/DHA (Department of Humanitarian Affairs) Environment Unit dispatched a team of eight experts from Canada, Norway, United States of America and the European Union to provide expertise on arctic oil spill response and clean-up, environmental impact assessment and pipeline engineering. The mission lasted 8 days, after which the team deployed briefed the Russian Federation's authorities, UNEP and DHA on results from the assessments of the spill's extent and potential transboundary pollution, and provided recommendations for further actions.

[Situation Reports](#) available on Relief Web.



@rkomi.ru

1996: PHILIPPINES, Marcopper mining disaster

In late March 1996, a massive flow of mine waste started escaping from a drainage tunnel of the large open pit copper mine located on Marinduque Island into the environment. The total seepage amounted to approximately 2.4 million tons of mine tailings. This affected rivers, coastal areas, 6–10 hectares of cropland and about 2,000 people according to national authorities.

The Philippines Government immediately responded to the emergency by providing humanitarian relief to affected families, collecting tailings samples to determine the wastes' toxicity to human beings and livestock, and mining operations have been suspended. After what, it requested, through the UNDP Resident Representative in Manila, UNEP and DHA to deploy a mission embedding environmental assessment expertise to review the situation and provide recommendations.

The Joint UNEP/DHA Environment Unit dispatched a team of 6 experts embedding impact assessment and rehabilitation of mine spillage expertise in late April-early May. The missions comprised field visits to the accident site, supplemented by meetings with relevant national authorities. Preliminary findings and recommendations were presented to the Government of Philippines, non-governmental organizations, relevant UN agencies and the private sector, including the mining company concerned. The disaster led to drastic reforms in the country's mining policy.

[Situation Reports](#) available on Relief Web.



@EarthRights International

1997: UKRAINE, Post-Chernobyl

Many years after the disaster, the Chernobyl nuclear accident continued to have a devastating impact on the population of the three affected countries: Belarus, Ukraine and the Russian Federation. The governments of these countries spent a large proportion of their national budgets on alleviating human suffering caused by the accident. The UNEP/OCHA Joint Environment Unit is involved in post-disaster assessments.



1999: KOSOVO, Assessing the possible consequences for the environment and human settlements of the Kosovo conflict

When the Rambouillet accord failed, and the North Atlantic Treaty Organization (NATO) air strikes started on 24 March 1999, alarming reports and images about the environmental damage caused by the bombing began to appear. Whilst the immediate humanitarian consequences of the conflict were clear, public opinion was more divided over the possible consequences for the environment. This was the dilemma the Joint UNEP/UNCHS (Habitat) Balkans Task Force (BTF) faced from its establishment in early May 1999.

Whilst the immediate humanitarian consequences of the conflict were clear, public opinion was more divided over the possible consequences for the environment. On one hand, there was fear of widespread ecological damage and destruction in the Federal Republic of Yugoslavia and neighbouring countries. On the other hand, NATO argued that its use of sophisticated weapons against carefully selected targets would minimise environmental and other 'collateral' damage. This was the dilemma the Joint UN Environment/UNCHS (Habitat) Balkans Task Force (BTF) faced from its establishment in early May 1999.

Environmental problems caused by the stream of refugees also became an issue, with sanitation and drinking water services under enormous pressure in the overcrowded refugee camps.

After carefully studying all the incoming news and information about the possible consequences of the conflict for the environment and human settlements, the BTF decided to concentrate on the consequences of the conflict on industrial sites, on the Danube River, on biodiversity in protected areas, and on human settlements. It also conducted a desk study on the possible use of depleted uranium (DU) weapons in Kosovo.

The first technical mission visited Pančevo, Novi Sad, Kragujevac, Bor, Priština, Niš, Novi Beograd, Obrenovac, Kraljevo, and Prahovo. It included 16 experts and two mobile laboratories from Denmark and Germany specialising in environmental contamination. Samples were taken from the soil, air, and groundwater and analysed either on-the-spot using the mobile laboratories or sent to laboratories in Denmark and Germany. Investigations were also made at bombed industrial sites and the areas adjoining them. Special attention was given to the possible contamination of agricultural land close to targeted facilities.

Nine experts took part in the Danube field mission. The scientific work focused mainly on sampling river water, bottom and bank sediments, mussels, and other invertebrates. The samples were analysed at a specialised laboratory in Hungary.

The biodiversity mission, composed of five scientists, visited the Fruška Gora National Park, the Kopaonik National Park, Zlatibor in Serbia, and Lake Skadar in Montenegro. During the field missions, the BTF organised stakeholder meetings in Belgrade, Pančevo, Novi Sad, and Niš with representatives of local NGOs, environmental experts, and local authorities (often in political opposition to Belgrade).

UNEP's 1999 Desk Assessment study of the possible effects of depleted uranium use in Kosovo was limited by lack of information on the actual use of DU. In July 2000, however, NATO provided UN Environment with the information it required, enabling a field mission to be planned and conducted. The information included a map indicating the location of 112 separate strikes by DU ammunition, and a table showing the number of DU rounds used and the coordinates of the targeted areas.

During the field mission to Kosovo in November 2000, soil, water and other samples were collected from eleven sites where DU had reportedly been used during the conflict. Five separate laboratories then analysed these samples.

UNEP's work in assessing the consequences of the Kosovo conflict was a major contribution to environmental assessment of modern warfare. Its findings indicated that the Kosovo conflict has not caused an environmental catastrophe affecting the Balkans region as a whole. Nevertheless, pollution detected at some sites was serious and posed a threat to human health.

The BTF was able to identify environmental 'hot spots', namely in Pančevo, Kragujevac, Novi Sad, and Bor, where immediate action and further monitoring and analyses was necessary. At all these sites, environmental contamination due to the consequences of the Kosovo conflict was identified. Part of the contamination identified at some sites clearly pre-dated the Kosovo conflict, and there was evidence of long-term deficiencies in the treatment and storage of hazardous waste.

The mission made several important new findings and acquired a variety of experience that will be of value in planning and implementing further work. Measurements taken during the August 1999 field mission – which had no information on the exact sites where DU had been used – did not detect any elevated levels of radiation. During the November 2000 field mission, no evidence was found of DU presence outside of the NATO-listed sites. Experience obtained in the field suggested that the site coordinates provided by NATO were accurate. UNEP field experience also supported the information provided by NATO on the type of DU ammunition used. There were no indications of the use of any other type of DU ammunition in Kosovo.

Nevertheless, even after one and a half years had elapsed since the conflict, the UNEP team found slightly radioactive material at many sites, including the penetrator and jacket parts of DU ammunition. On tarmac roads and areas covered with concrete that had been struck by DU ammunition, radioactivity was measurable in the immediate vicinity of the impact holes. The samples collected around the sites where DU ordnance had been used showed that DU dust was also measurable near the targeted sites. Even if alarming environmental risks did not exist at the time at these sites, UNEP recommended several precautionary measures, such as marking the DU sites and decontaminating them when possible. In the areas most at risk of groundwater contamination, UNEP recommended that water quality be monitored.

The observations made at the sampling sites also provided the basis for extrapolation to other areas in Kosovo targeted by DU ordnance. Based on the findings of the report, several recommendations were made both for the areas where sampling occurred and for all sites in Kosovo where DU had been used.

UNEP recommended that all sites where DU was used be visited and samples taken for analyses of contamination by uranium of well water used for drinking. It was recommended that wells within the attacked areas and in the direction of the groundwater transport be monitored. The local situation determined how far from the attacked area the wells may be contaminated by DU. As the DU contamination is likely to increase with time, the monitoring may have to be repeated. UNEP also suggested that analysis looking for pH, Eh, and total alkalinity, as well as major elements such as calcium, iron, and alkalinity be used to cast light on whether the uranium was in reduced form or oxidized (and mobile), and on the uranium transport capacity of the waters.



Smoke cloud over Pancevo, April 1999, @Pancevac



Meeting with the management of the oil refinery in Novi Sad, @BTF

2000: FYR OF MACEDONIA, Managing the environmental consequences of the Kosovo conflict

In 1991 and 1992, in the Republic of Macedonia, the basic, highly polluting industrial processes did not alter measurably, and even fewer resources were available for investment in environmental controls. At the same time, growing urbanization reduced air quality, increased pressure on water supplies and further exacerbated waste treatment and disposal problems. In 1999, the sudden influx of new refugees posed a formidable relief challenge to the nation and the international community.

From 1990 to 2000, South-eastern Europe experienced upheaval and instability. The region's rich natural environment, already under pressure from decades of urban and industrial pollution, became increasingly degraded.

Refugees began arriving in FYR of Macedonia in March 1998 to escape conflicts occurring within the province of Kosovo, in the Federal Republic of Yugoslavia (FRY). On 24 March 1999, commenced air strikes against the FRY. Virtually overnight, hundreds of thousands of refugees fled to FYR of Macedonia and neighbouring countries. The sudden influx of new refugees posed a formidable relief challenge to FYR of Macedonia and the international community.

UNEP's environmental assessment of FYR of Macedonia was made with the close cooperation and support of the Ministry of Environmental Protection and Physical Planning (MEPP). The assessment process began with a systematic review of the available literature and data concerning FYR of Macedonia's environment.

A preliminary UNEP field mission met with environmental leaders from the Government of FYR of Macedonia (the Government), the non-governmental community and academia. Based on this research, UNEP identified three core areas of concern:

- Industrial "hot spots" of urgent environmental concern;
- Environmental impacts of the refugee influx; and
- Measures needed to strengthen institutional capacities for environmental protection.

In September 2000, a UN Environment-led mission, hosted by MEPP, investigated environmental conditions in FYR of Macedonia. The team divided into three subgroups that focused on industrial 'hot spots', refugee impacts and institutional capacity, respectively. The teams held dozens of meetings with key stakeholders from government, non-governmental organizations, donors, international organizations, academia, and the media.

The "hot spot" team visited ten sites, which were considered most likely to pose immediate risks to the environment and human health, and to include examples of the principal industries found in FYR of Macedonia. At each site (with the exception of Lojane), the UNEP team met with plant officials, conducted visual inspections of the facilities, and, when appropriate, took samples of soil, water or air. Experts from the team also met with Government and municipal officials, as well as representatives of non-governmental organizations.

The team specializing in the potential environmental impacts of refugees met with a total of 14 agencies and organizations that were directly or indirectly involved with the refugee influx. It inspected the refugee camps of Blace, Bojane, Cegrane, Radusa, Stenkovec I, and Stenkovec II; the collective centres of Suto Orizari, Pretor, and Radusa; and the waste water treatment plants of Struga and Radusa.

During the UNEP mission, a subgroup was specifically charged with assessing institutional capacities for environmental management. The subgroup interviewed numerous representatives of key Government ministries and agencies, industries and non-governmental organizations, and reviewed relevant legislation, regulations, reports and other documentation.

At several of the locations and institutions, the available technical information was limited or outdated. UNEP followed-up by obtaining and reviewing additional data after the mission and by analysing the results of samples taken in the field by mission experts.

During its field mission, UNEP identified environmental "hot spot" conditions in five sites requiring urgent attention to halt serious risks to public health and the natural environment. The remaining five industrial sites visited by the "hot spot" team presented serious environmental problems requiring further investigation, the implementation of remediation measures, and long-term monitoring to avoid further risks to human health and the environment.

Prior to the UNEP's mission, serious concerns had been raised about the potential impacts of the refugee crisis on Rasce Spring, one of the nation's major sources of drinking water. However, UN Environment identified only minor instances of refugee-related environmental degradation that might have been avoided with a greater degree of environmental planning, management and integration with other sectors and government agencies.

The post-conflict assessment team also found that the Government's environmental responsibilities needed to be better coordinated and the MEPP's funding base greatly improved. Environmental monitoring was insufficient and not adequately linked to public health. Enforcement of regulations was weak and could be strengthened through the creation of a permitting system.

Shortcomings in the handling and disposal of chemicals, contaminated sludge and other hazardous wastes reflected the general lack of appropriate facilities within FYR of Macedonia. It was clear that major investments were required to address these issues and that most, if not all, of the companies visited lacked access to the technical and financial resources required.

Regarding UNEP's "hot spot" conclusions, two key areas of improvement emerged:

- The implementation of environmentally acceptable industrial processes, including measures for adequately controlling the use of chemicals; and
- Adequate handling, storage, treatment, and disposal of waste, whether solid or liquid, hazardous or non-hazardous, municipal, or industrial.

The report formulated recommendations for industrial "hot spots" and other industrial sites visited during the mission. It also provided recommendations to improve the management of the refugee crisis' environmental consequences and to improve the institutional capacities for environmental management.

It was apparent that FYR of Macedonia was seeking to make progress in the field of environmental protection and that some key steps were taken in the late 1990s with the adoption of new environmental legislation and the creation of new institutional structures. However, many challenges remained, particularly in terms of investment, implementation and enforcement. The international community can provide crucial technical and financial assistance for FYR of Macedonia's priority environmental initiatives. Demonstration of concerted action and commitment to the provision of resources at the national level will be a major stimulus to external donors.



Improperly stored hexavalent chromium compounds at HEK Jugochrom, FYR Macedonia, 2000, UNEP.

Quote:

"During a field mission to FYR of Macedonia, the team visited refugee camps and environmental 'hot spots', including neglected industrial sites."

Klaus Toepfer, Former Under-Secretary General of the United Nations, Former Executive Director, UNEP

2002: ALBANIA, Managing the environmental consequences of the Kosovo Conflict

Albania is home to some of Europe's most diverse and treasured natural resources. These resources suffered, however, from decades of unregulated industrial activity under the leadership of the Albanian Party of Labor between 1944 and 1991. These problems required investigation, the implementation of remediation measures and long-term monitoring in order to avoid further risks to nature and human health.

At the turn of the century, the country began undergoing a transformation of its democratic institutions. Environmental protection at the time was evolving alongside economic development. In fact, Albania had begun to develop a framework for addressing the environmental problems that had arisen during decades of neglect. In 1998, the Government created the National Environment Agency, bringing environmental issues to a new level of national prominence.

By the year 2000, Albania had the opportunity to stop environmental destruction and, at the same time, create a strong economy and prosperity for its citizens.

In mid-September 2000, UNEP conducted an assessment aimed at identifying the most urgent environmental needs of Albania in order to prioritize rehabilitation funding. The assessment entailed extensive analyses of relevant environmental issues, meetings with key shareholders, field missions, the publication of reports, and efforts to catalyze concrete environmental remediation action.

With the close cooperation and support of Albania's National Environment Agency (NEA), UN Environment began the assessment process with a systematic review of the available literature and data concerning Albania's environment. A preliminary UNEP field mission met with environmental leaders from government, the non-governmental community and academia. Based on this research, UNEP decided to focus this assessment on three core areas of concern: Sites of urgent environmental concern, also known as "hot spot" sites; refugee impacts on Albania's environment; and Albania's institutional capacity for environmental protection.

Following the preliminary field mission, a UNEP mission hosted by the NEA investigated conditions in Albania. The mission team included a wide range of experts, from those with a background in chemical and technological processes, to those with an expertise in land use planning and law. National experts from Albania accompanied the team and provided valuable information. The mission team divided into three subgroups that focused on "hot spots", refugee impacts and institutional capacity, respectively.

The "hot spot" team visited nine sites, all of which were selected in advance of the mission through in-country consultations with national experts. At each of the sites, the team met with plant representatives or local officials, conducted visual inspections of the facilities, and, when appropriate, took samples of soil, water or air. Experts from the team also met with several representatives of non-governmental organizations and research institutes.

The team specializing in the potential environmental impacts of refugees met with seven agencies and organizations that were directly or indirectly involved with the refugee influx. Based on pre-mission research and on the content of the aforementioned interviews, the team inspected twelve refugee-affected areas. Meanwhile, the institutional capacity team met with representatives of the NEA, as well as a number of local and international organizations.

After decades of environmental neglect, economic factors have slowed Albania's industrial sector. As a result, less smoke, less effluent, and less solid waste is flowing from the nation's factories and mines. In the wake of years of industrial activity, however, remain a number of severely contaminated sites that are threatening human health and the environment.

Based on the field mission's assessments, UNEP published 27 recommendations – many of them included sub-recommendations – in the three areas of "hot spot" sites; refugee impacts on Albania's environment; and Albania's institutional capacity for environmental protection.

In general, UNEP recommended a two-track approach to addressing industrial contamination in Albania. First, risk reduction strategies needed to be quickly developed and implemented in order to remediate the problems identified in the "hot spot" sites. UNEP had identified "hot spot" environmental conditions in five of the nine sites it investigated during its field mission:

- the chemical plant in Durrës
- the fertilizer plant in Vlorë
- the oil refinery in Ballsh
- the oil fields in Patos
- the solid waste dumpsite in Sharra

At the time, some of these plants were closed, others remained operational and important to Albania's economy. All required urgent attention and UNEP called for the international community to provide emergency assistance to these priority areas. The remaining four sites investigated by UNEP were found to have serious, but less urgent environmental problems.

Second, the pressing need to clean up Albania's polluted industrial facilities called attention to a host of the country's more structural environmental management issues. Hazardous waste management. Solid waste disposal. Wastewater treatment. Soil and groundwater protection. Monitoring. Enforcement. These problems required investigation, the implementation of remediation measures, and long-term monitoring in order to avoid further risks to nature and human health.

UNEP found the long-term environmental impacts of refugee influxes into Albania to be minimal. UNEP, however, observed areas of minor environmental degradation that might have been avoided with a greater degree of environmental planning, management and agency cooperation. In addition, the majority of the camps were not adequately rehabilitated.

During the process of campsite selection, flat and well-drained locations are generally preferred for construction. Unfortunately, agricultural lands often allow camps to be established quickly and at the lowest cost. Some of these areas have been cleaned by UNHCR. On the majority of sites, however, gravel remains, inhibiting future agricultural production. As of the time of the UNEP mission, 80 % of the agricultural land used required rehabilitation. The lost productivity from these lands is expected to have significant economic impacts on families that had farmed them.

Based on the assessment, the government of Albania was found to be making significant strides toward developing its environmental protection capacities. Environmental legislation and programs had improved in recent years. Environmental responsibilities within the Government, however, were widely dispersed and often overlapping. As a result, policies at the time were not coordinated, implementation was found to be slow, and enforcement weak. The monitoring of environmental and health conditions was also inadequate. UNEP concluded that the creation of a strong, adequately financed Ministry of the Environment would help clarify environmental responsibilities, strengthen policy and enforcement efforts, and increase environmental awareness in Albania.



Illegal removal of contaminated sand for use in home construction, UNEP.



UNEP site inspection at Vlorë complex, Albania, 2002.

Quote:

"[This report] extends the body of knowledge about the environmental impacts of the conflict, and about the urgent environmental challenges facing Albania. [...] It also underscores the importance of environmental management during humanitarian assistance efforts."

Klaus Toepfer, Former Under-Secretary General of the United Nations, Former Executive Director of UNEP

2002: SERBIA AND MONTENEGRO, Post-conflict assessment and clean-up

The Federal Republic of Yugoslavia was officially dissolved on 4 February 2003 when the Federal Parliament adopted a new Constitutional Charter and proclaimed the establishment of the State Union of Serbia and Montenegro. Within weeks of the suspension of NATO air strikes, UNEP had assembled a representative and independent team of international scientific experts and initiated a programme of field missions.

The FRY was officially dissolved on 4 February 2003 when the Federal Parliament adopted a new Constitutional Charter and proclaimed the establishment of the State Union of Serbia and Montenegro. The new State Union was designed to increase cooperation between the two republics, to create a single market and to ensure a more equitable balance of power and responsibility. Since the change of government in October 2000, the key priorities for Serbia and Montenegro have been to work for membership of the European Union and of NATO and to rebuild political, social and economic cooperation within the wider south-east European region.

Within weeks of the suspension of NATO air strikes, UNEP had assembled a representative and independent team of international scientific experts and initiated a programme of field missions.

UNEP's first expert field mission visited mainly industrial sites in the following areas: Pancevo, Novi Sad, Kragujevac, Bor, Pristina, Nis, Novi Beograd, Obrenovac, Kraljevo and Prahovo. Soil, air and groundwater samples were taken and analysed either on-the-spot, using mobile laboratory facilities, or sent to laboratories in Denmark and Germany.

A second mission to examine environmental impacts along the Danube River was organized in close cooperation with the International Commission for the Protection of the Danube River (ICPDR). The principal sites visited were Novi Sad, Pancevo, the 'Iron Gate' Reservoir, and the Lepenica and Morava rivers, tributaries of the Danube close to Kragujevac. The scientific work focused mainly on sampling river water, bank and bottom sediments, and freshwater mussels and other invertebrate fauna.

A third UNEP team investigated the consequences of the conflict for biodiversity, especially in protected areas, and visited Fruska Gora National Park, Kopaonik National Park, Zlatibor in Serbia and Lake Skadar in Montenegro.

In autumn 2000, UNEP was also invited by Yugoslavian authorities to carry out depleted uranium (DU) studies at targeted sites in Serbia and Montenegro. This study investigated five of the eleven sites that were struck with DU ordnance in Serbia, the single site that was hit in Montenegro and one targeted military vehicle. The mission considered safety issues regarding the storage of DU at the Vinca Institute of Nuclear Sciences in Belgrade. A scientific report made by the IAEA regarding the condition of this facility was included in this report.

The assessment team consisted of 14 international experts and the mission was conducted from 27 October to 5 November 2001. During the mission, a total of 161 samples were collected, including 69 vegetation, 54 soil, 17 air, 11 water, and 4 smear samples. Three penetrators and three penetrator fragments were also collected. Sample analyses were conducted by the Spiez laboratory in Switzerland and the ANPA laboratory in Italy.

In terms of improving our understanding of the environmental behaviour of DU, UNEP's report contained five new and significant findings.

First, detailed laboratory analyses of soil samples revealed low levels of widespread DU contamination at five of the six study sites. This indicates that during the conflict, DU dust was widely dispersed into the environment following the explosion of DU rounds. No DU was detected at the sixth sample site in Bukurevac.

Second, the penetrators recovered by the UNEP team had decreased in mass by 10-15% due to corrosion. This had important implications for decontamination approaches as well as for future risks of groundwater contamination and monitoring needs.

Third, the military vehicle investigated during the mission was targeted by DU, but only low levels of contamination were detected. In this specific case, decontamination could be conducted by removing the remaining DU fragments and wet cleaning the interior and exterior using appropriate safety, storage, and disposal measures.

Fourth, the mission paid special attention to the quality of groundwater and drinking water in DU targeted areas. Laboratory results showed that DU was not present in any of the water samples. In the short term, this was a positive result. However, in the long term, uncertainty existed regarding DU mobility and future study was needed to measure long-term infiltration rates and to assess potential risks. Annual water quality monitoring was also needed to ensure that sources of drinking water remain risk free.

Finally, the analytical toolbox available to the UNEP team was extended using air sampling equipment. Airborne DU particles were detected at two of the six sites measured. While these particles may have become airborne from on-site digging operations, the finding highlighted

important risks associated with soil disturbance at DU sites. As a result, necessary precautions should be taken during decontamination or construction works at DU sites.

In conclusion, the findings of this study in Serbia and Montenegro were consistent with the findings of UNEP's DU study in Kosovo (2001). No alarming levels of DU contamination were detected, but uncertainty exists regarding future potential groundwater contamination from penetrator corrosion. Based on UNEP's findings, general and site-specific recommendations were provided to the responsible authorities for prompt implementation.

UNEP's Clean-up Programme also had been a notable success, especially when considering the available funding and limited timeframe. The conflict-related impacts at the four hot spots were significantly reduced. Environmental management institutions were strengthened, and the Cleanup Programme contributed towards the resumption and strengthening of international and regional environmental cooperation.

At most locations, the conflict-related impacts represented only a part of the environmental and health challenges present. This meant that considerable environmental problems remained at several sites. Efforts were required to further strengthen national and local environmental management capacities, to integrate environment into the national development agenda, and to promote preventive and precautionary approaches to environmental management. There were real opportunities for accomplishing these goals, given that Serbia and Montenegro benefits from a rich natural-resource base and a skilled workforce.

The role of partnership with donors, with the wider international community, within the UN system, and with local counterparts and experts, was fundamental to the programme's success.

In responding to a post-conflict situation, the time factor is crucial. A faster start to the programme, enabled by more immediate availability of financial resources, would have seen even greater environmental benefits.



Vinca storage. Five barrels containing radioactive waste from sites targeted by depleted uranium in Serbia and Montenegro are being stored at Vinca, 2002, UNEP.

2002: BOSNIA AND HERZEGOVINA, Measuring environmental impacts from depleted uranium contamination

NATO warplanes dropped 10,000 rounds of depleted uranium (DU) ammunition in the mid-1990s in Bosnia and Herzegovina. In the summer of 2002, UNEP was ready to initiate action when the Council of Ministers of Bosnia and Herzegovina requested an assessment related to the use of DU ordnance in 1994 and 1995.

It was difficult to come to any significant conclusions regarding the potential harm of DU in those post-conflict regions since there had been very little scientific fieldwork with proper measurements as well as laboratory work outside of the military community. There was a growing concern about the possible effects of DU in Bosnia and Herzegovina both on peacekeepers and on the local population.

In the summer of 2002, when the Council of Ministers of Bosnia and Herzegovina requested UN Environment to conduct such an assessment in BiH related to the use of DU ordnance in 1994 and 1995, UNEP was ready to initiate action.

In 2000, UNEP carried out the first-ever international assessment on the environmental behaviour of DU following its use in a real conflict situation in Kosovo. To reduce the uncertainties about DU's environmental impacts, a second phase was followed-up in Serbia and Montenegro with a field mission in October 2001. Both the Kosovo and the Serbia and Montenegro reports were well received by local stakeholders, as well as by the international scientific community. These reports helped alleviate some of the public concerns with respect to DU by scientifically demonstrating the low contamination levels and providing recommendations to reduce future risks at affected sites. Since then, UNEP has become a reference in the scientific community regarding the impacts of DU when used in a conflict situation.

This was UNEP's third DU assessment focusing on the use of depleted uranium air attacks against armoured vehicles, tanks, and artillery positions in 1994 and 1995. The main objective of the assessment was to examine the possible risks from any remaining DU contamination of ground, water, air, and biota, as well as from solid pieces of DU still in the environment, and on that basis, recommend any justified countermeasures. The assessment also aims to gain an overview on the storage of radioactive waste and sources, as well as radioactive waste management within BiH.

15 international experts comprised the UNEP mission to BiH, which took place from 12 to 24 October 2002. UNEP had selected 15 sites to be visited during the mission. One of the sites was unfortunately inaccessible due to the heavy presence of mines. The possible health risks and questions for safe storage of radioactive waste were integrated into the tasks of this mission. Therefore, experts from the relevant UN agencies – the World Health Organization (WHO) and the International Atomic Energy Agency (IAEA) – participated to this mission.

In total, 132 samples were collected: 4 penetrators, 46 surface soil, 3 soil profiles of 60 cm, 5 smear, 2 scratch, 19 water, 24 air, and 29 vegetation samples. Both the Swiss Spiez Laboratory and the Italian APAT Laboratory conducted sample analyses. Of the 14 sites investigated, three clearly showed DU contamination, confirming the earlier use of DU ordnance. These sites correspond to the information on DU targets provided by NATO.

This study was UNEP's third contribution to the scientific debate on the environmental risks and the behaviour of DU. UN Environment is committed to working with other UN organisations to extend DU studies to other post-conflict regions where the long-term effects of DU contamination should be

studied. As part of this commitment, UNEP was invited in Spring 2002 by the IAEA to participate in a DU mission to Kuwait.

In this BiH study, UNEP has found that even more than seven years after the end of the conflict, it is still possible to detect DU in soil and sensitive bio-indicators at sites where DU had been used. A large number of contamination points (holes where DU penetrators hit the ground), as well as loose contamination, including DU penetrators, fragments and jackets/casings were found. UNEP could confirm local DU contamination around impact points, although the levels were low and no significant level of radioactivity could be measured. Overall, the findings of this study were consistent with the findings of UNEP's earlier DU studies. The levels of DU contamination were not a cause for alarm, but some uncertainty remained with respect to future potential groundwater contamination from penetrator corrosion products. Four new and significant findings were contained within the report entitled *Depleted Uranium in Bosnia and Herzegovina: Post-Conflict Environmental Assessment*:

- First, detailed laboratory analyses of surface soil samples revealed low levels of localized ground contamination;
- Secondly, penetrators buried near the ground surface and recovered by UNEP had decreased in mass by approximately 25% over 7 years. Based on this finding, correlated with those penetrators studied in UN Environment's earlier studies, a DU penetrator can be fully oxidized to corrosion products (e.g. uranium oxides and carbonates) in 25 to 35 years after impact;
- Thirdly, for the first time, DU contamination of drinking water could be found at one site. DU could be clearly identified in one drinking water sample. A second drinking water sample from a well also showed traces of DU, but was detectable only through the use of mass spectrometric measurements;
- Finally, the presence of DU in air was found at two sites, including air and certain surface contamination inside two buildings at two different sites. Resuspension of DU particles due to wind and/or human activities from sources such as contamination points, corroded penetrators or fragments laying on the surface are the most likely cause.

In addition to these key findings, some important remarks and recommendations were also provided in the report. Throughout the mission, the UNEP team observed that workers and civilians, as well as military and mine clearance personnel with access to sites where DU presence was confirmed, were unaware of or misunderstood the risks and issues surrounding DU ammunition. Awareness raising activities should be considered, including information about DU in general, associated risks, handling and storage and contact information for relevant authorities. A flyer or leaflet, like the ones used to advocate mine safety, could be produced and distributed.

UNEP team also concluded that the importance of having correct locations and coordinates for DU-affected sites and of obtaining access to these sites for the purpose of conducting surveys and measurements is essential. The longer the elapsed time since the date of the attack, the more difficult it is to implement countermeasures, including decontamination, if necessary.



Beta radiation is measured from a penetrator fragment found in the concrete at Hadzici, 2002, UNEP.



Beta radiation measurements during the pre-mission helped identify contamination spots, 2002, UNEP.



Line surveys with field instruments were undertaken at all sites during the mission, 2002, UNEP.

2003: AFGHANISTAN, Laying the foundations for sustainable development

Decades of internecine conflicts and foreign occupation have devastated Afghanistan's natural resource base, degraded the land, and shattered the country's environmental governance traditions and institutions. In 2003, the government of Afghanistan requested UNEP's assistance to ensure environmental and natural resource considerations were integrated into the country's development and governance frameworks.

In 2002, the Karzai interim government and its international partners notably put in place approaches to slow the pace of degradation of the natural resource base, including nascent environmental governance structure and appropriate policies, laws, and other tools to better manage the country's natural resources.

In 2003, the government of Afghanistan requested the assistance of UNEP to ensure environmental and natural resource considerations were integrated into the country's development and governance frameworks.

UNEP began implementing a program to promote institutional and capacity development for environmental management, with community-based natural resource management (CBNRM) at its core. The goal was to help restore the natural resource base, improve rural livelihoods, reduce the number of disputes and conflicts over natural resources, and contribute to peacebuilding. Even as the Taliban insurgency continued, CBNRM projects were successfully implemented in the central highlands and in north-eastern and western Afghanistan.

Since 2002, UNEP has supported Afghanistan's environment sector and institutions, including on governance, laws, policies, scientific research, and multilateral environmental agreements (MEAs). UNEP partners with line ministries in the Agriculture and Rural Development (ARD) cluster for developing environmental policies and plans, piloting community-based ecological approaches to building resilience, and upscaling impacts for landscape- and ecosystem-level planning to build

resilience to natural hazards and climate change. As a small agency, UNEP focuses on technical science-based work, giving technical and environmental guidance to partners in government, academia, international organizations, and UN agencies.

At present, UNEP's Afghanistan programme involves training and mentoring government counterparts and providing technical assistance and advice in the fields of environmental coordination, environmental law and policy, environmental impact assessment and pollution control, environmental education and awareness, community-based natural resource management, protected areas, and multilateral environmental agreements.

Focus Areas

- **Climate Change**

UNEP implemented projects to increase the resilience of vulnerable rural communities and build the capacity of national and local institutions to address climate change risks. In addition, UNEP provided technical support to the Government of Afghanistan to fulfil its reporting obligations to the UNFCCC through the development of greenhouse gas inventories and the submission of National Communications and Biennial Update Reports.

- **Ecosystem Management**

UNEP promoted sustainable management and conservation of ecosystems through policy support, training, advocacy, research, and practical implementation of community-based natural resource management projects.

- **Chemicals and Waste**

UNEP provided support to the Government of Afghanistan on policy- and decision-making as well as formulation of strategies, action plans and technical reports on chemicals and waste including ozone-depleting substances and persistent organic pollutants.

- **Resilience and Disasters**

UNEP promoted the implementation of ecosystem-based solutions for climate change adaptation and disaster risk reduction through technical support to the Afghanistan Resilience Consortium.

- **Multilateral Environmental Agreement**

UNEP continues to build the capacity and guide the Government of Afghanistan to access, implement and report on multilateral environmental agreements.



Air sampling along Kandahar's main street, 2002, @Denis Bruhn



UNEP team with Afghan guides investigating pistachio forests near Farkhar village, 2002, @David Jensen, UNEP

Quote:

"When I arrived to Afghanistan, the physical destruction of both the infrastructure and the natural landscape was staggering. We knew it would require a massive effort by the international community to support the nascent Government of Afghanistan as it simultaneously confronted immense challenges on a number of fronts – democratization, reconstruction, development and state-building." Dr. Asif Zaidi, Former Afghanistan Country Programme Manager

2003: IRAQ, Cleaning-up and reconstructing after Second Gulf War

UNEP was active in Iraq even before the 2003 conflict, but attention was particularly focused on the environmental situation during the conflict and ensuing reconstruction period, and the establishment of the Ministry of Environment (MoEn) provided UNEP with a key counterpart institution in its capacity-building efforts.

The intense coalition bombardment targeted industrial sites that were potential sources of air, soil, and water pollution, with possible attendant risks for human health. Baghdad, Basra, and other cities experienced extended power cuts, with serious impacts on the already inadequate water distribution and sanitation systems that were subject to further degradation during the conflict.

Furthermore, the movement of thousands of military vehicles, intensive fighting, and air bombardments caused widespread and locally severe degradation of fragile desert ecosystems which could take many decades to recover.

UNEP was active in Iraq even before the 2003 conflict, but attention was particularly focused on the environmental situation during the conflict and ensuing reconstruction period, and the establishment of the Ministry of Environment (MoEn) provided UNEP with a key counterpart institution in its capacity-building efforts.

In 2003, UNEP set up a team of experts and initiated a project to collect and synthesize information on the chronic environmental problems and environmental impact of conflict in Iraq. The resultant Desk Study on the Environment in Iraq concluded that damage from the Iran-Iraq war during the 1980's, the 1991 Gulf War, environmental mismanagement by the former Iraqi regime, the economic impact of sanctions, and underlying environmental stresses had resulted in severe damage.

The desk study also identified the Mesopotamian Marshlands as having been almost completely destroyed by 2002 as a consequence of drainage work and upstream damming. UNEP designed and coordinated the implementation of the Iraqi Marshlands Observation System and the systematic reflooding of the wetlands.

Due to a poor economic situation and UN sanctions, a large number of qualified professionals in the Environmental Protection and Improvement Department (which became the Ministry of Environment) had not been able to keep up-to-date with developments in the field. The Environmental Site Assessment (ESA) project was scoped to include both policy and site-specific activities and its efforts were concentrated on capacity-building at the government level for the management of such sites.

At the same time, site-specific work was conducted in areas with urgent short-term problems to ensure that the project delivered immediate practical benefits. UNEP experts initially provided intensive training and equipment to the MoEn teams, and thereafter worked closely with the same staff for the duration of the project. For the priority site assessment, significant work (such as laboratory analysis, map and report compilation) was completed outside Iraq by UNEP experts, consultants, and contractors, with UNEP providing oversight and quality control.

UNEP also helped with the clean-up of contaminated sites and environmental mainstreaming within the UN Programme for Iraq. It also supported the environmental management of the Iraqi marshlands and activities related to depleted uranium. The activities in each of these areas ranged from training to the provision equipment and assistance to information management. Activities were planned and implemented with a view to helping Iraq recover from the damage its environment incurred through conflict, as well as to setting a basis for sustainable development.

Even during a period of great security constraints and political changes, UN Environment has managed to complete major project activities in Iraq, which is an achievement in itself.

A series of individual reports outlining the key chronic environmental problems faced by the country and the environmental threats posed by the various military conflicts were prepared during the course of the project: a Desk Study on the Environment in Iraq (2003); an Environment in Iraq, Progress Report (2003); an Assessment of Environmental Hot-Spots in Iraq (2005); a Capacity-Building for Assessment of Depleted Uranium (2008); and 12 reports on the Iraqi marshlands (2004-2006).

UNEP's training programmes reached approximately 800 representatives from different ministries, governorates, and local communities on a range of environmental topics. Consequently, the Iraqi Ministry of Environment established cooperation and coordination on a range of topics with external peer groups and other relevant national ministries, governorates, and local institutions.

Immediate relief has been provided to vulnerable populations living in environmentally sensitive areas: Up to 22,000 people in the Iraqi marshlands now have access to safe drinking water, using environmentally sound technologies, and suitable approaches for sanitation and marshland management options have been demonstrated. A fully functional system to monitor marshland re-flooding was notably developed, providing a synoptic spatial and temporal overview of changes in the marshland environment on a near real-time basis, supplemented with semi-detailed seasonal thematic analysis.

Community groups have been empowered and recognized as legitimate stakeholders in environmental management. Community-level initiatives for marshland management have been conceptualized, developed, and implemented with UNEP support.

A modern environmental information centre has been set up and staff trained on gathering, classifying, and distributing environmental information. Similarly, the Marshland Information Network has been established among the Iraqi ministries, governorates, local groups, academia, and international organizations – enabling the exchange of data and analysis and facilitating communication to move towards the development of a marshland management plan.

UNEP also helped develop a new Framework Environmental Law, one of the best in the region. With equipment, protocols and training provided by UNEP, officials of the MoEn and other institutions in Iraq were able to undertake field assessments at several contaminated sites. This has provided specific information on contamination of those sites as well as experience to the staff in continuing with such investigation at many more such sites in Iraq.

Based on the results obtained on site assessment, two site clean-up projects were initiated. The clean-up project minimized the immediate danger to public health from the two locations and provided training to local employees on undertaking environmental clean-up.

UNEP initiatives, particularly on the Iraqi marshlands, generated significant press coverage, raising international awareness on the Iraqi environment and efforts to promote sustainable development initiatives even under difficult conditions.

Lastly, local communities have officially commended UNEP as one of the only international organizations that have made a difference on the ground and improved the lives of the people. The Ministry of Environment has also recognized the Iraqi marshlands project as a model case of technical cooperation.



Garbage dump in a street of Baghdad, 2003, UNEP.



Heavy metals waste at Al Qadissiya. This demolished site represents a severe risk to human health, due to the cyanide contained in hazardous waste, 2003, UNEP.



The Al Qadissiya site is unsecured, contains quantities of highly toxic chemicals and has been demolished in an uncontrolled manner, resulting in severe human and environmental hazards, 2003, UNEP.

2003: LIBERIA, Mapping environmental vulnerabilities after the civil war

Liberia is known for a long-running and brutal conflict that ran for most of the 1989-2003 period. The upsurge of rebel factions in the civil war was not only due to ideological differences, but also for control over Liberia's rich natural resources. The control of timber and mineral wealth both linked to and sustained the civil war, bringing the conflict wide international attention.

UNEP established an implementation office in Monrovia, representing the organization's first post-conflict country-level presence in Africa.

The effects of the war in Liberia were catastrophic. It left a quarter of a million people dead and over half a million people displaced, living in temporary housing or camps. By the end of the conflict, just over half of all Liberians were under 18 and many of them orphans. It left the country overrun with weapons, and in economic ruin, with an 80% unemployment rate. Basic infrastructure and services were non-existent, and parts of Monrovia had not had electricity since 1989. Almost doubling the capitals population, the mass influx of displaced persons to Monrovia overwhelmed the only functioning sewage system in Liberia.

UNEP established an implementation office in Monrovia, representing the organization's first post-conflict country-level presence in Africa.

UNEP coordinated a response from UNCT members (FAO, UNDP, UNMIL and UNOPS) on the "Environmental Sustainability" chapter of the Country Common Assessment report, and as a direct consequence "Environment" was placed in the document as a stand-alone area of focus.

Training included eleven days of lectures and six full-day site assessments for over thirty participants from government agencies, humanitarian and environmental NGO's and United Nations. UNEP's guide contained best practice, an overview of the tools, and approaches to assess and manage environmental impacts, Liberia specific case studies, and information from stakeholder meetings and workshops.

UNEP developed a methodology to map the vulnerability of the environment to the potential threats posed by the establishment and operation of camps for displaced people. Areas were mapped according to their ecological value and environmental vulnerability.

Awareness raised on this issue resulted in the IDP Consultative Forum, the policy-making body on IDP repatriation and reintegration activities, for the first time incorporating environmental considerations, including a series of recommendations, into the assessment process of closed camps.

UNEP organised and implemented environmental awareness raising events at a county level – bringing the EPA and information on environmental considerations to a county level for the first time. Four environmental awareness events were successfully completed in central, south, and west Liberia, attended by over 1000 people representing government, civil society, and NGOs from the targeted counties.

UNEP's work in the Needs Assessment process, and the publication of a desk study on the environment in Liberia, was instrumental in ensuring that environmental issues were placed on the reconstruction and development agenda. The desk study represented the first and most comprehensive account of environmental concerns in Liberia. Having a county-level office and resident staff meant that UN Environment was able to fully participate in country-level planning and processes. UNEP was invited to sit on the UNCT and actively participate in strategic decision-making and review processes. UNEP coordinated a response from UNCT members (FAO, UNDP, UNMIL and UNOPS) on the "Environmental Sustainability" chapter of the Country Common Assessment report, and as a direct consequence "environment" was placed in the document as a stand-alone area of focus. The CCA provides important indicators for donor investments and priority responses.

UNEP's work on environmental considerations of human displacement led to an invitation to sit on and participate in IDP Planning Unit Task Force Committee, created to address camp closure and consolidation issues in Liberia. Awareness raised on this issue resulted in the IDP Consultative Forum, the policy-making body on IDP repatriation, and reintegration activities, for the first time incorporating environmental considerations, including a series of recommendations, into the assessment process of closed camps. It did not end with recommendations, the INGO 'Environmental Foundation of Africa' was contracted by UNHCR as the implementing partner to execute the recommendations for closed camps. Over 30 staff from a broad range of government and non-government agencies received training to limit environmental impacts in refugee/IDP operations and resettlement operations. This training was also highly relevant for the development and management of any settlement and helped support organisations and agencies in Liberia to incorporate environmental considerations into village and town planning and expansion.

UNEP's awareness raising events brought environmental issues to the county-level for the first time. Due to a lack of resources the EPA was very much Monrovia-based at the time, but as a direct consequence of these events, the EPA was able to inform a broad range of stakeholders about their mandate, and with UNEP provide information on environmental challenges and considerations across Liberia.

Providing support and resources to build capacity, laying the foundations for the appropriate use of Liberia's rich natural resources to aid Liberia's economic and social development, determined the success of the UNEP. UNEP's in-country presence and activities increased awareness and technical capacity cross-sectorally to a range of government and non-government partners, putting environmental considerations on post-conflict and reconstruction agendas.

UNEP's legacy was recognized in October 2013 with an invitation by the EPA to participate in the forum "Building Partnerships for a sustainable environment for now and tomorrow's Liberia". The invitation was issued with the statement "it will be an honour to have you here, you helped to plant some of the (human) seeds that are now germinating. You have been a part of history making the Liberian environment".



UNEP staff on a solid waste management assessment mission, 2007, UNEP.



Environmental Site Assessment Workshop participants and UNEP staff, 2007, UNEP.

Quote:

"The success of UNEP's work in Liberia was of course due to a great team! It was also due to the inclusion and active participation of a broad range of partners. Environmental considerations are a concern for all agencies and the cross-sectoral approach we adopted for building capacity in Liberia helped sow the seeds for better understanding this. Given the long history of civil conflict in Liberia,

it was not surprising that technical and organisational capacity was a challenge, but most importantly, interest and enthusiasm was abundant.”

Dr Kay H. Farmer, Liberia Programme Manager

2004: INDIAN OCEAN, Assessing the impact of the 2004 tsunami

On 26 December 2004, a series of earthquakes occurred in the area of the west coast of northern Sumatra, which triggered powerful tsunamis reaching 10 meters in height and affected the coastal area of many countries neighboring the Indian Ocean. The tsunami killed more than 226,000 people in 13 countries.

The strongest earthquake had the magnitude of 8.9 on the Richter scale and was followed by aftershocks ranging from 6 to 7.3. The earthquakes triggered powerful tsunamis reaching ten meters in height, and these moved through neighboring parts of the Indian Ocean at over 500 kilometers an hour wrecking coastal areas in India, Indonesia, Sri Lanka, Thailand, and Maldives, as well as in Myanmar, Seychelles, and Somalia.

As of January 2005, an estimated 139,000 people lost their lives and some 18,000 were missing. Moreover, the tsunamis flooded coastal areas and wiped away homes and buildings, roads and bridges, water and electricity supplies, crops, irrigation and fishery infrastructure, food and fuel network.

In response to requests from tsunami-impacted governments, the United Nations system, under the leadership of former Secretary-General Kofi Annan and the former Under-Secretary-General for Humanitarian Affairs, Jan Egeland, has swiftly mobilized emergency humanitarian assistance. Housing, health care, education, transportation, water and sanitation services have all been rapidly deployed to the region. In all of these efforts, the UN has worked side by side with scores of public and private international relief agencies to address the urgent daily needs of the tsunami victims.

In the aftermath of the tsunami disaster, the JEU mobilized and supported the environmental experts in United Nations Disaster Assessment and Coordination (UNDAC) teams in Sri Lanka, Maldives, and Indonesia. The experts carried out rapid environmental assessments to identify acute environmental issues with immediate impacts on human welfare and response efforts. The major environmental and human health concerns included waste management, sanitation and sewage issues. The enormous amounts of waste and debris resulting from the tsunami needed to be managed in an environmental and sustainable manner. As a result, the identification of proper landfills, the clearing, sorting and recycling of the debris were identified as priority activities. In Sri Lanka and Indonesia, UNDAC environmental experts enabled the rapid implementation of waste management pilot projects to reduce the waste and debris through recycling.

The rapid environmental assessments also found that sanitation and sewage systems were severely damaged, causing health risks, in particular in resettlements camps where people were provided emergency shelter. As a result, the JEU, along with other partners, developed guidance material to reduce environmental risks in settlements for displaced people in Sri Lanka.

JEU [Mission report](#) available on the EECentre.



ILO, ©ILO/Marcel Crozet, 2004, Thailand.



OCHA/UNDAC, 2005

2004: RWANDA, Moving from conflict to environmentally sustainable development

About 800,000 people lost their lives during the 1994 genocide in Rwanda. Massive population movements within both Rwanda and the wider Great Lakes region, population encroachment on national parks and forest reserves, and the whole collapse of natural resource governance and administration caused significant environmental consequences. From 1994 onwards, the country's focus shifted to post-conflict recovery and reconstruction.

What happened to Rwanda's environment during the 1990-1994 conflict is still affecting the country's recovery efforts, despite its impressive strides on economic growth. Nearly a decade after the end

of the conflict, the Government of Rwanda requested UNEP to conduct a comprehensive countrywide Post-Conflict Environmental Assessment.

Rwanda's extensively altered environment is under multiple, severe and mutually reinforcing pressures driven by high population growth, declining resources, and poverty. Conserving natural ecosystems and rehabilitating degraded landscapes is one of the key challenges facing Rwanda. The transformation from recovery-based growth to broad-based development coupled with Rwanda's high vulnerability to climate change and disasters also created a new set of environmental stressors, including exacerbating competition and tensions over scarce natural resources.

Nearly a decade after the end of the conflict, the Government of Rwanda requested UNEP to conduct a comprehensive countrywide Post-Conflict Environmental Assessment (PCEA). Given that a long time had elapsed since the 1994 genocide, it was a challenging task for UNEP to discern the direct physical impacts of the conflict on the environment. Yet, UNEP responded favorably to the request from the Government of Rwanda to assess and analyse the long-term indirect environmental consequences of the conflict.

This was not a typical UNEP PCEA focusing on the conflict's direct environmental impacts. Rather, the aim was to evaluate Rwanda's current state of the environment from a post-conflict perspective, and to provide a forward-looking analysis with practical recommendations to assist Rwanda chart an environmentally sustainable path to its Vision 2020 initiative. Between March 2008 and April 2009, a team of UNEP experts – in close consultation with Rwanda's Environmental Management Authority and the Ministry of Natural Resources – carried out the assessment.

UNEP's assessment started with an initial scoping study identifying priority themes before the completion of a comprehensive desk study in June 2008. Fieldwork was primarily conducted in August 2008 over a two-week period. A multi-disciplinary UNEP team of eleven experts undertook site inspections, collected soil and water samples, interviewed local authorities, and conducted rapid household surveys and focus group discussions with local communities.

Apart from fieldwork, the assessment also involved laboratory analysis and extensive consultation with the Government of Rwanda, academic and research institutions, UN and international agencies, donors, civil society organizations, and private sector representatives. It covered 11 themes, including agriculture and land degradation, forestry, water resources, energy, wildlife and protected areas, urban environment, and industry. UNEP also designated experts from different fields to examine cross-cutting issues such as environmental governance, linkages between environment, conflict and peacebuilding, the growing risks of climate change and disasters, and gender-related issues.

The PCEA shed light on the long-lasting environmental consequences caused by conflict-induced population displacement and resettlement of returnees to Rwanda. In the final report of the assessment 'Rwanda: From Post-Conflict to Environmentally Sustainable Development' and its summary report targeted at policy makers, UNEP provided a critical analysis of the most pressing environmental issues facing the country. The reporting outputs from the assessment directly contributed to the preparation of Rwanda's first national State of the Environment Report.

This multi-thematic assessment recommended an integrated package of more than 90 projects and practical interventions that would help the country accelerate its sustainable development agenda by 2020. Technical recommendations were identified to help decision makers pursue an environmentally sustainable course towards Vision 2020 under three priority areas:

- Ecosystem conservation and rehabilitation to combat poverty: Achieving the targets of Vision 2020 and improving the quality of life of Rwandans depend on the continuous supply of goods and services by the country's ecosystems. Natural forests and wetlands provide the major source of renewable freshwater and energy generation, improve erosion control, as well as regulate regional climate and natural hazards. Fully conserving the existing natural forest and wetlands resource base, as well as rehabilitating degraded forest, wetlands, and rangeland ecosystems can greatly contribute to Rwanda's fight against poverty through job creation, income generation, and provision of alternative livelihoods. Targeted environmental rehabilitation interventions could help improve the quality of growth by delivering immediate benefits to the poorest segments of society. Restoring ecosystem integrity would also help build the coping capacity of the very poor in view of Rwanda's high vulnerability to climate change and disasters.
- Capacity-building to strengthen environmental governance: Rwanda has made substantial progress in establishing the policy, legal and institutional frameworks to address environmental issues in the country. However, considerable investment in capacity-building efforts is still required to ensure adequate compliance and enforcement, support the ongoing decentralisation process, and bolster environmental governance within key economic sectors. Recent endorsement of an Environment and Natural Resources strategy should contribute towards a coherent and long-term environmental vision and consolidation of the current project approach to environmental management. Support for the development of the environment Sector Working Group is critical for effective prioritisation and planning in the sector and alignment of donor funding.
- Enhance and promote regional environmental cooperation: This assessment underscored the importance of regional environmental cooperation in sustainably managing the resource demands of Rwanda's rapidly growing population across core development sectors. Key areas included promoting joint investments in the energy and water sectors, sustainable trade in forest resources, transboundary management of protected areas and regional level initiatives in responding to the challenges posed by disasters, climate change, and food security. Drawing on the experiences and successes of neighbouring countries in the sustainable management of natural resources through regional knowledge networks that act as conduits for technical cooperation, information exchange, and technology transfer would help save precious time and resources. Cumulatively, the confluence of transboundary and regional environmental activities could substantially advance interstate dialogue and confidence-building, as well as reinforce regional integration and long-term peace.

The report's recommendations also provided catalytic support to the partnership between UNEP Rwanda on the 'Green Economy' and the launch of the Forest Landscape Restoration Initiative. The Initiative has led to significant intensification of Rwanda's tree planting programme with the aim of raising forest cover to at least 30 percent of its land area by 2020.



UNEP expert with Ministry of Natural Resources and Forestry Management Support Project officials inspecting rehabilitation of the Gishwati Forest with indigenous species.



Lacking a buffer or transitional zone, the Volcanoes National Park lies in striking contrast with the densely populated surrounding farmland.

2005: SUDAN, Developing a solid technical basis for sustainable development

In January 2005, after more than two decades of devastating civil war, the Sudanese central government in Khartoum and the Sudan People's Liberation Army in the south signed a historic Comprehensive Peace Agreement. As it focused on recovery and development, however, the country faced a number of key challenges. Chief among them were several critical environmental issues – such as land degradation, deforestation and the impacts of the climate crisis – that threatened Sudan's prospects for long-term peace, food security and sustainable development.

The Government of National Unity and Government of Southern Sudan requested UNEP to conduct a post-conflict environmental assessment of Sudan.

As it focuses on recovery and development, however, the country faces a number of key challenges. Chief among them are several critical environmental issues – such as land degradation, deforestation, and the impacts of climate change – that threaten Sudan's prospects for long-term peace, food security and sustainable development. In addition, complex but clear linkages exist between environmental problems and ongoing conflict in Darfur, where violence and insecurity continue to prevail despite the signing of a peace agreement in May 2006.

With a view to gaining a comprehensive understanding of the current state of the environment in Sudan and catalysing action to address the country's key environmental problems, the Government of National Unity (GONU) and Government of Southern Sudan (GOSS) requested UNEP to conduct a post-conflict environmental assessment of Sudan. The goal of the UNEP assessment was accordingly to develop a solid technical basis for medium-term corrective action in the field of environmental protection and sustainable development.

The post-conflict environmental assessment process for Sudan began in late 2005. Following an initial appraisal and scoping study, fieldwork was carried out between January and August 2006. Different teams of experts spent a total of approximately 150 days in the field, on ten separate field missions, each lasting one to four weeks. Consultation with local and international stakeholders formed a large and continuous part of UNEP's assessment work, with the total number of interviewees estimated to be over two thousand. Parties consulted include representatives of federal, state and local governments, NGOs, academic and research institutions, international agencies, community leaders, farmers, pastoralists, foresters and businesspeople.

The assessment team was comprised of a core UNEP's team and a large number of national and international partners who collaborated in a range of roles. These partnerships were crucial to the project's success, as they enabled the fieldwork, ensured that the study matched local issues and needs, and contributed to national endorsement of the assessment's outcomes. UNEP also worked closely with the Government of National Unity and the Government of Southern Sudan, and specific efforts were made to align UNEP activities with a government initiative known as the National Plan for Environmental Management.

In order to maximize local engagement in the assessment process and its outcomes, UNEP worked closely with the Government of National Unity (GONU) and the Government of Southern Sudan (GOSS) throughout 2006. Specific efforts were made to align UNEP activities with a government initiative known as the National Plan for Environmental Management (NPEM).

In practical terms, UNEP provided technical and financial support for two major environmental workshops in 2006, one held in Khartoum in July and the other in Juba in November. At these events, technical papers were presented and national delegates discussed and debated regional and national environmental issues. The draft report consultation process also allowed for UNEP material to be integrated into NPEM documents as they were being developed.

UNEP engaged the Government of National Unity and the Government of Southern Sudan in a formal process of draft document review. While it incorporates the agreed solutions and wording from that process, this final report is, however, first and foremost an independent UNEP report, with endorsement from the GONU and GOSS.

The UNEP post-conflict environmental assessment of Sudan identified a number of critical environmental issues that are closely linked to the country's social and political challenges with conflict, food insecurity and displacement. In addition to a summary of the findings, the report includes 85 detailed recommendations and a discussion of the general way forward.

The detailed recommendations have been distilled into four general recommendations:

- Invest in environmental management to support lasting peace in Darfur, and to avoid local conflict over natural resources elsewhere in Sudan. Because environmental degradation and resource scarcity are among the root causes of the current conflict in Darfur, practical measures to alleviate such problems should be considered vital tools for conflict prevention and peacebuilding. Climate change adaptation measures and ecologically sustainable rural development are needed in Darfur and elsewhere to cope with changing environmental conditions and to avoid clashes over declining natural resources.
- Build capacity at all levels of government and improve legislation to ensure that reconstruction and economic development do not intensify environmental pressures and threaten the livelihoods of present and future generations. The new governance context provides a rare opportunity to truly embed the principles of sustainable development and best practices in environmental management into the governance architecture in Sudan.
- National and regional government should assume increasing responsibility for investment in the environment and sustainable development. The injection of oil revenue has greatly improved the financial resources of both the Government of National Unity and the Government of Southern Sudan, enabling them to translate reform into action.
- All UN relief and development projects in Sudan should integrate environmental considerations in order to improve the effectiveness of the UN country programme. Better coordination and environmental mainstreaming are necessary to ensure that international assistance 'does no harm' to Sudan's environment.

UNEP developed a Sudan country programme and established permanent project offices in Khartoum and Juba. The latter was subsequently relocated to Nairobi, Kenya for security reasons. UN Environment also developed a range of assessment products to assist with the funding and political support required to implement its recommendations.



Fuelwood vendors in Red Sea state. Deforestation is a major cause of land degradation in desert environments, 2005, UNEP.



Consultation with local stakeholders formed a large and continuous part of UN Environment's assessment work, as here in the small village of Mireir, Southern Darfur, 2005, UNEP.

2005: GAZA STRIP, Assessing the environmental impact of Israeli settlements and armed conflict

Since 1970, Israel has established several settlements in the Gaza Strip, from its southern border with Egypt to the northern border with Israel. On 12 September 2005, the Israeli cabinet formally declared an end to Israeli military occupation of the Gaza Strip. UNEP's Crisis Management Branch conducted an environment-related assessment after two of the region's historical events – the Israeli disengagement in 2005 and the Gaza War in 2008.

The Gaza Strip had been a theatre of conflict for decades. Each of these conflicts has left its mark, and over time, a significant environmental footprint has developed in the Gaza Strip. During the three-week armed conflict between Palestine and Israel that began on 27 December 2008 and ended on 18 January 2009, the Israeli Defence Forces (IDF) conducted a major combined military operation in the Gaza Strip. The operation comprised bombardment by land, sea, and air, and incursions into the Gaza Strip by Israeli troops.

The fighting resulted in extensive casualties and the destruction of homes, livelihoods, and infrastructure. With fighting taking place in densely populated areas, and with hospitals and UN facilities being hit by shells, there was almost no safe space in the Gaza Strip. As the borders were sealed, civilians had no place to flee, and bore the brunt of the fighting.

UNEP's Crisis Management Branch conducted an environment-related assessment after two of the region's historical events – the Israeli disengagement in 2005 and the Gaza war in 2008. As part of its response to the Israeli disengagement plan and the proposed transfer of the settlements, the Palestinian Environment Quality Authority (EQA) requested UNEP to assist with a systematic environmental assessment of the settlements after the disengagement. UNEP developed a comprehensive assessment plan, conducted background research, and initiated remote sensing analyses in June 2005. The field work was carried out in Gaza in December 2005 by a UNEP team of

eight experts with expertise in the fields of hazardous waste, including asbestos, marine and coastal issues, soil contamination, and water quality. The UNEP team was able to cover all 21 disengaged settlements, as well as the Erez industrial site.

About three years after the disengagement assessment, when the escalation of hostilities began in the Gaza Strip, UNEP immediately started to track developments and to study their implication for the environment. Information was first gathered during a four-day mission by UNEP to the area in late January 2009, to identify environmental issues that might pose an immediate threat to human life. In February 2009, following the UNEP Governing Council's decision, a team of international environmental experts coordinated by UNEP's Crisis Management Branch was deployed to the Gaza Strip to assess the environmental damage of the escalation of violence and carry out an economic evaluation of the rehabilitation and restoration of the environment in the region.

In May 2009, the UNEP technical mission, consisting of eight international experts, travelled to the Gaza Strip with equipment and sampling kits. The United Nations Development Programme/Programme of Assistance to the Palestinian People (UNDP/PAPP) in Jerusalem and the Gaza Strip provided logistical support for the mission. The UNEP team spent the first three days conducting meetings with UN colleagues and other local stakeholders, as well as conducting reconnaissance visits to all the clusters of impacted sites, which had been identified from satellite image analysis. This was followed by a comprehensive field visit, using sampling, and measuring equipment. During this detailed visit, the team visited 35 individual locations or clusters of impacted areas, ranging from bombed-out houses to industrial units destroyed by ground action.

The basis for UNEP's environmental cooperation in the Gaza Strip was laid in 2002 when UNEP started its work with the Palestinian Authority and Israel, which culminated in the publication of the *Desk Study on the Environment in the Occupied Palestinian Territories*. The Desk Study, which included 136 recommendations for specific follow-up activities in the environmental sector was unanimously welcomed at the 22nd UNEP Governing Council in Nairobi in February 2003. Since then, UNEP has organised a series of capacity-building training seminars for the EQA, and hosted trilateral technical meetings attended by Israeli and Palestinian environmental delegations.

There was no real precedent for *Environmental Assessment of the Areas Disengaged by Israel in the Gaza Strip* of this nature. UNEP developed its own methods, focusing on four objectives: First, to gather a baseline data set of the environment in the disengaged settlements. Second, to identify areas posing immediate risk to people. Third, to create an information base, including satellite images and maps, for future planning. Fourth, to provide training on environmental assessments to Palestinian experts. Using satellite imagery, reports, and comments from Israeli, Palestinian, and international sources, UNEP scientists – prior to commencement of the field work – identified approximately 100 areas of interest, including industrial buildings, waste disposal sites, agricultural plants, and storage tanks.

This assessment found that the overall environmental impact of the former Israeli settlements in the Gaza strip was limited. Other than some localized pollution, the former Israeli settlements did not cause contamination of water, land, or buildings posing a significant risk to the environment or to public health. Pollution at the former Erez Industrial Estate was also localized and could be mitigated by targeted clean-up action.

On the basis of the findings of the assessment, UNEP assisted UNDP/PAPP to carry out the task of clearing and recycling the rubble produced by the destruction of the settlements in the Gaza Strip. The removal of the rubble, the safer disposal of asbestos, and the cleaning up of contamination in some identified specific areas eliminated the environmental constraints to human settlement in these areas.

The findings of the post-conflict environmental assessment were written into the report *Environmental Assessment of the Gaza Strip: United Nations Environment Programme following the escalation of hostilities in December 2008 – January 2009*. The assessment identified the most urgent and challenging finding about the state of the underground water supplies, upon which both Israeli and Palestinian people rely for drinking and agricultural irrigation. Based on the findings of the assessment, two sets of recommendations were listed in the report. The first set of recommendations were recommendations for the restoration of environmental damages that were directly caused by the escalation of violence in December 2008 and January 2009. The second set proposed measures to remediate pre-existing environmental degradation that was exacerbated by the recent events, which UNEP considered essential for improving the overall environmental situation in the Gaza Strip.

This report, which was later submitted to then-UN Secretary-General Ban Ki-Moon, was the latest post-conflict environmental assessment undertaken by UNEP at the time. This report outlined a range of economically costed options for managing the current situation and leading the Gaza Strip onto a sustainable path, in a hope that the facts and economic analysis presented could assist and guide the relevant national and local authorities and the international community to design forward-looking recovery strategies and transformative investment decisions.



UNEP conducted an environmental assessment of the disengaged settlements: Several locations with localized contamination were identified, 2008, UNEP.



UNEP expert in the Gaza Strip during the UN Early Recovery Assessment mission in January 2009.

2006: LEBANON, Crisis, oil spill, and establishing a path towards sustainable development

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 over 1,100 Lebanese killed, more than 4,000 wounded, and considerable damage to Lebanese industrial installations and infrastructure. The conflict had immediate and longer-term environmental impacts.

Concerned by the extent of environmental damage caused by the oil spill and potential contamination of land, air, and water as well as harm to humans and biodiversity as a result of the conflict, on 5 August 2006, the Lebanese Minister of Environment requested UNEP to conduct a post-conflict environmental assessment of the country. This activity was included in the Government of Lebanon's National Early Recovery Plan.

In the assessment process, UNEP investigated concerns relating to land contamination, ground and surface water, as well as solid and hazardous waste, including asbestos. The main findings and recommendations for follow-up actions were presented in the Post-Conflict Environmental Assessment of Lebanon report. To distribute the findings of this report widely, a comprehensive executive summary has been produced as a stand-alone publication in French and Arabic.

The assessment also obtained baseline data on the environment following the conflict, which could form the basis for further monitoring work and assist the government in formulating environmental management policies, as well as remediation priorities. The data collected also added to the global body of knowledge on the environmental impacts of conflict, and into a central information system for the Lebanese Ministry of Environment.

The report also raised warnings where urgent measures were needed, provided practical recommendations to avert future damage to the environment, and strengthened the common

resource base essential to the well-being of Lebanese people. Through the assessment during the reconstruction period, UNEP assisted in developing appropriate environmental plans and to enhance the country's capacity towards sustainable use of its natural resources, in terms of both the environmental impacts of the conflict and pre-existing concerns. It also urged the Ministry of Environment to play a central role in the implementation of the recommendations with the support and cooperation of other ministries and government departments.

UNEP's recommendations can be divided into two sections. Sectoral recommendations were made to address the problems identified in specific areas of concern, including solid and hazardous waste, industrial contamination, soil and freshwater resources, weapons used, air pollution, and marine and coastal environment. Institutional recommendations focused on strengthening environmental management were provided to the Ministry of Environment as follows:

- **Coordination mechanism for environmental emergency response:** In the recent conflict, the absence of an effective coordination mechanism led to a fragmented response and an inability to coordinate the internal response and external assistance. It was therefore recommended that the Ministry of Environment take the lead in establishing a National Emergency Preparedness and Response Infrastructure and Coordination Mechanism for environmental emergency response, with the assistance of the international community, to ensure an effective response to environmental emergencies, whether related to conflicts, man-made, or natural disasters.
- **Institutional strengthening:** The Ministry of Environment should be strengthened as an institution, especially in terms of its enforcement capacity. Key areas that need to be reinforced are water quality guidelines, waste management, environmental monitoring, and environmental inspections.
- **Environmental information:** It is recommended that Lebanon establish national monitoring plans in key environmental sectors such as air, water, forestry, and marine resources to inform policy-making. The information gathered could be made available to interested parties, including non-governmental organizations and the general public, at an environmental resource centre accessible to the public and through appropriate websites.

The environmental impact of the conflict was exacerbated by the bombing of fuel storage tanks at the Jiyeh thermal power plant on 13 and 15 July, which resulted in the spillage of 10,000 to 15,000 tonnes of heavy fuel oil into the Mediterranean Sea, affecting approximately 150 km of Lebanese coastline. The urgent need to dispose of large quantities of oil-contaminated waste was a continuing challenge for those involved in the clean-up efforts. At the same time, the large numbers of cluster bombs, which lie unexploded throughout much of southern Lebanon, also constituted a severe impediment to post-conflict recovery.

The Joint UNEP/OCHA 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 focused 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;
- 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 continued to pose a major challenge for long-term reconstruction efforts. There was an obvious need for further assessment and follow-up work. Efforts to integrate environmental concerns into the recovery and reconstruction phases were being continued by the Ministry of Environment, in close cooperation with UNDP-Lebanon and UNEP, in particular the UNEP Post-Conflict Branch (PCoB).

[Mission report](#) available on the EECentre.



The Khiam dump site illustrates the high levels of dust generation at most rubble disposal sites, 2006, UNEP.



UNEP team with Ministry of Environment counterparts inspect glass factory for radiation, 2006, UNEP.



2006: INDONESIA, Yogyakarta earthquake and volcanic activity

On 27 May 2006, a 5.9 magnitude earthquake and two volcanic eruptions struck Yogyakarta Province on the Indonesian island of Java. The devastating event reportedly caused the death of over 5,100 people, injured between 8,500 and 20,000, and destroyed or damaged an estimated 60,000 houses, leaving close to 200,000 people homeless.

In July-August 2007, the Former Yugoslav Republic (FYR) of Macedonia was severely affected by extended forest fires and fires occurring in other vegetation. The fires were consequences of human activities, e.g., agricultural burnings, careless use of fire, and in some cases suspected arson. Extremely dry, hot and often windy weather conditions prevailing during the whole fire season created extreme fire situations and often made firefighting impossible. The situation was aggravated by the consequences of rural exodus. The widespread abandonment of land cultivation resulted in increasing loads of unused combustible materials in forests and former agricultural and pasture fallow lands. With a reduced presence of the young generation of rural population and average over-aging of the rural communities, the human resources available for fire prevention and fire suppression activities were dramatically dwindling.

The Joint UNEP/OCHA Environment Unit, in cooperation with UNDP, UNEP and the Global Fire Monitoring Center, responded to a request of the Government of the FYR Macedonia, by developing a joint mission to the country to assess the damages of the wildfires and to recommend action for future fire disaster risk reduction. The assessments were carried out from 27 August to 7 September by a team of international experts who cooperated closely with experts from national agencies.

Based on needs identified, the recommendations made included the launch of programmes aimed at strengthening fire management capabilities at national and regional levels, and the adequate training and equipment of voluntary rural fire brigades. Given the fact that fires are a recurrent problem in the Balkans region, the development of a regional strategy on cooperation in fire management and the establishment of a regional fire monitoring centre were recommended. In this

context, the FYR Macedonia hosted the preparatory regional meeting and participated in the above mentioned Regional Seminar.

[Report](#) available through GFMC.



Airport, Earthquake Yogyakarta.

2006: NIGERIA, Assessing the extent of environmental contamination from the oil spill in Ogoniland

Ogoniland has experienced recurrent social unrest during the past several decades due to tensions between the local communities and international oil companies over operations, petroleum-related environmental contamination and allocation of revenue generated.

As a direct consequence, oil industry operations were suspended in Ogoniland in 1993. However, the facilities themselves have never been decommissioned and have gradually deteriorated through exposure to natural processes, but also as a result of criminal damage, causing further pollution, and exacerbating the environmental footprint. Thus, widespread environmental contamination and public health challenges remains today, some twenty years after the cessation of oil production within Ogoniland.

Upon a request from the Federal Government of Nigeria, UNEP undertook an independent study to determine the extent of the environmental impacts arising from oil industry operations in Ogoniland.

UNEP's environmental assessment of Ogoniland is one of the most comprehensive studies of its kind ever undertaken. It resulted in tens of thousands of environmental samples and laboratory analysis - all illustrative of the environmental situation in Ogoniland. Ultimately UNEP's report provided a "road-map" for the future with overarching recommendations to address the multi-faceted environmental challenges facing the Ogoni people.

UNEP's team undertook robust scientific investigation of the impact of oil pollution on all aspects of the Ogoniland environment including surface and ground water, soil, sediment, fish and vegetation.

Further, the impact of pollutants on public health was assessed in three ways: by taking air quality measurements in communities around spill sites, by measuring drinking water quality around spill sites and by a review of public health data obtained from medical centres in Ogoniland. In addition, the institutional and legal structures, plus the associated policies and procedures related to the petroleum industry were assessed by the UNEP experts.

The assessment has been unprecedented and public consultation was the key. Over a 14-month period, the UNEP team examined more than 200 locations, surveyed 122 kilometres of pipeline rights of way, reviewed more than 5,000 medical records and engaged over 23,000 people through over 260 formal community meetings.

At the completion of the project a comprehensive environmental assessment of Ogoniland was published and made available globally via UNEP's website.

The report drew on the extensive field work undertaken including:

- 200+ spill sites inspected;
- Detailed land and groundwater investigations at 69 priority sites;
- Water samples from 142 groundwater monitoring wells;
- Soil samples obtained from 780 boreholes;
- Sediment samples collected at 37 locations; and
- Air quality testing at 29 villages.

For the first time, UNEP's report quantified, in a scientific way, the consequences of the oil related conflict on both the environment and public health. It concluded that there was an extremely worrying degree of pollution within Ogoniland, of particular concern being contamination of ground-water – specifically by highly toxic substances such as benzene. Some areas, which appear unaffected at the surface, were in reality severely contaminated underground and it was recommended that actions to protect human health and reduce the risks to affected communities be undertaken without delay.

The report provided the scientific basis on which a long overdue and concerted environmental restoration of Ogoniland, a kingdom in Nigeria's Niger Delta region, could begin. It provided a "road-map" of key activities which needed to be undertaken to restore the environment and public health of Ogoniland.

A number of emergency measures were recommended to address the issue of contaminated drinking water. Longer term, it concluded that some aspects of the required clean-up activities, such as restoration of the mangroves, could take up to 30 years to achieve. It articulated the facts that the situation was extremely serious and that time was of the essence. Delays in implementation of the numerous recommendations would likely extend the foot-print of the contamination and endanger public health.

The report recommended establishing three new institutions in Nigeria to support a comprehensive environmental restoration exercise. A proposed Ogoniland Environmental Restoration Authority would oversee implementation of the study's recommendations and should be set up during a Transition Phase which UNEP suggested should begin as soon as possible. The Authority's activities should be funded by an Environmental Restoration Fund for Ogoniland, to be set up with an initial

capital injection of US\$1 billion contributed by the oil industry and the government, to cover the first five years of the clean-up project.

The report recommended that an Integrated Contaminated Soil Management Centre be built in Ogoniland, supported by potentially hundreds of mini treatment centres, which would treat contaminated soil and provide hundreds of job opportunities. It also recommended creating a Centre of Excellence in Environmental Restoration in Ogoniland to promote learning and benefit other communities impacted by oil contamination in the Niger Delta and elsewhere in the world.

Reforms of environmental government regulation, monitoring and enforcement, and improved practices by the oil industry were also recommended in the report.

UNEP continues to dialogue with key stakeholders, including the Government of Nigeria, to encourage progress and to reiterate the organisation's willingness to continue to be engaged in the process of the restoration of Ogoniland.

In summary, the greatest success of this UNEP initiative was to successfully undertake an extremely complex and extensive environmental assessment under very challenging and hostile conditions. Despite this, the final report received broad praise from both the local and international audience. But, arguably, the greatest success of the UNEP team was to win the trust and support of the majority of the Ogoni community – in an environment where such commodities have become rare in the extreme.



Visible hydrocarbon pollution on surface water in Ogoniland, UNEP.



A multidisciplinary team of international and Nigerian experts conducted fieldwork for the UN Environment assessment over a 14-month period, UNEP.

Quote:

"In every post-disaster situation, there are many environmental issues that must be addressed. These range from dealing with hazardous healthcare waste to safeguarding drinking water sources. We focused our efforts in the early days on raising awareness among the international players on this important link." Michael J. Cowing, Senior Expert

2006: CÔTE D'IVOIRE, Managing hazardous waste dumped by the Probo Koala

In August 2006, a European shipping vessel, the Probo Koala, dumped hazardous waste at various sites throughout Abidjan, including in residential areas. The health impacts on people living near the dump sites caused an international outcry and highlighted the need to enhance African countries' capacity to detect and manage hazardous waste, including the trans-boundary movement of dangerous chemicals. UNEP and the Secretariat for the Basel Convention jointly developed the Technical Cooperation Trust Fund for Côte d'Ivoire, a capacity-building project to strengthen hazardous waste management systems.

In 2010, after a decade of negotiations, an election was held in which all the major political formations took part. The independent election commission of Côte d'Ivoire declared Alassane Ouattara the winner, but the incumbent president, Laurent Gbagbo, did not concede defeat. As a consequence, violence broke out yet again. In April 2011, forces loyal to Alassane Ouattara captured Laurent Gbagbo and in May 2011, Ouattara took up the role of president.

The new government of Côte d'Ivoire, which came into power after the 2010 elections, made a formal request to UNEP for a Post-Conflict Environmental Assessment (PCEA). In responding to the request, UNEP deployed a multidisciplinary team of experts to Côte d'Ivoire with the intention of building an understanding both of the country's key needs and the expectations of the various stakeholders – from the national government through UN agencies and bilateral donors to the private sector and civil society – regarding the PCEA.

The UNEP mission also served as reconnaissance for the security concerns and logistical challenges that would be encountered when undertaking a country-wide PCEA. Based on the scoping visit, the first step in determining whether an assessment is feasible, UNEP agreed to initiate a PCEA. A plan for the scope of the work involved in the PCEA was prepared and submitted to the government, and the government provided inputs to the scope of work after extensive national consultations. The methodology employed to gather the data combined a review of the literature with satellite image analysis, aerial surveillance by helicopter, and discussions with experts who are familiar with forest management. Field visits were conducted primarily to verify the information obtained from remote sensing and discussions.

UNEP experts and a team of national counterparts visited key protected areas identified by remote sensing image, local consultations, and aerial reconnaissance. In parts of the country that were not accessible due to security constraints, field visits were supplemented by an aerial survey by helicopter.

Fieldwork for the PCEA was conducted in June and August 2013. A number of national experts joined the field work. Chemical analyses of the samples and further remote-sensing studies were conducted between August and October 2013. During 2014, the draft report was prepared and submitted to the government and external peer reviewers.

The PCEA studied environmental issues which had direct or indirect linkages with the conflict, including forests, environmental degradation of Ébrié Lagoon, environmental issues related to unplanned urban expansion, industrial and artisanal mining and their environmental footprint, and the risk of oil spill along the Côte d'Ivoire coastline. In addition, the study also looked at how the institutions overseeing natural resource management and environmental governance were impacted by the conflict.

UNEP analysed the state and evolution of the classified forests using data provided by SODEFOR's regional management centres for 2010 and 2012. From the data, the team was able to ascertain the area occupied by illegal plantations, the numbers of family units, and a rough estimate of the degradation of the classified forests.

The report produced seven key findings:

1. There was significant and ongoing deforestation, primarily caused by conversion of classified forests into agricultural lands.
2. National parks in the country were affected by the conflict, some more severely than others.
3. The city of Abidjan has doubled its population during the conflict period while urban service provisions have stagnated or deteriorated. This has resulted in range of environmental issues including water pollution, inappropriate disposal of hazardous and municipal waste and severe land degradation.
4. The Ébrié Lagoon, which was already severely polluted even before the conflict, has been further degraded due to disposal of solid and liquid waste and unplanned land reclamation.
5. The mining sector in Côte d'Ivoire has not gone at a pace similar to its neighbours primarily due to the insecurity caused by the conflicts.
6. The risk of an oil spill affecting Côte d'Ivoire increased significantly during the conflict period due to expanding oil exploration in the Gulf of Guinea, including in Côte d'Ivoire waters. However, the capacity to deal with an oil spill has in fact deteriorated, making the country doubly vulnerable.
7. There are number of Ministries and institutions in Côte d'Ivoire who have overlapping responsibility for environmental management. Not all of these departments co-ordinate their activities effectively adding to the environmental challenges facing the country.

The study has made a number of technical recommendations to deal with the various environmental challenges facing the country. It is clear from all the evidence and analysis presented in this report that Côte d'Ivoire has many environmental challenges. The causes of the environmental degradation of Côte d'Ivoire are complex. Remedial action will have to go far beyond the technical solutions to individual environmental problems that were specified in this report. There are broader actions that need to be taken in order to get the country back on a path of sustainable growth and once again make the country a model for the whole of Africa.

While there are a number of very serious challenges to the country's environmental sustainability, there is also some cause for hope. The following recommendations were presented with the anticipation that they would receive attention from individuals and institutions far beyond those within the environmental community:

- Urgently halt continued deforestation; reforest at a grand scale, adequately protect and manage areas of conservation value;
- Reverse the unsustainable growth of Abidjan; and
- Establish Ébrié Lagoon as an engine for economic revival in Abidjan.



Waste from the Probo Koala are reported to have been dumped from two tanker trucks down the side of the vegetated embankment on the side of the main road linking Abobo and Alépé.



UN Environment expert team undertook sampling of soil, water, air, sediment, mollusks, fruit and vegetables at 18 sites considered to have been affected by the dumping of toxic wastes, as well as at three control sites.

2007: FYR Macedonia, Wildfires

Between July and August 2007, the Former Yugoslav Republic of Macedonia experienced extended wildfires affecting forests and other vegetation on an area exceeding 50,000 hectares that caused 200 people to be evacuated. Direct impact on residential areas and damage to infrastructure remained limited.

In July-August 2007, the Former Yugoslav Republic (FYR) of Macedonia was severely affected by extended forest fires and fires occurring in other vegetation. The fires were consequences of human activities, e.g., agricultural burnings, careless use of fire, and in some cases suspected arson. Extremely dry, hot and often windy weather conditions prevailing during the whole fire season created extreme fire situations and often made firefighting impossible. The situation was aggravated by the consequences of rural exodus. The widespread abandonment of land cultivation resulted in increasing loads of unused combustible materials in forests and former agricultural and pasture fallow lands. With a reduced presence of the young generation of rural population and average over-aging of the rural communities, the human resources available for fire prevention and fire suppression activities were dramatically dwindling.

The Joint UNEP/OCHA Environment Unit, in cooperation with UNDP, UNEP and the Global Fire Monitoring Center, responded to a request of the Government of the FYR Macedonia, by developing a joint mission to the country to assess the damages of the wildfires and to recommend action for future fire disaster risk reduction. The assessments were carried out from 27 August to 7 September by a team of international experts who cooperated closely with experts from national agencies.

Based on needs identified, the recommendations made included the launch of programmes aimed at strengthening fire management capabilities at national and regional levels, and the adequate training and equipment of voluntary rural fire brigades. Given the fact that fires are a recurrent problem in the Balkans region, the development of a regional strategy on cooperation in fire management and the establishment of a regional fire monitoring centre were recommended. In this context, the FYR Macedonia hosted the preparatory regional meeting and participated in the above mentioned Regional Seminar.

[Report](#) available through GFMC.



Fire-affected informal settlement of Roma, at the outskirts of Bitola, @Jelena Beronja, UNEP, 2007.

2007: UKRAINE, Assessing the environmental impacts of the Kerch Strait oil spill

On 11 November 2007, a strong storm in the Kerch Strait (which connects the Sea of Azov with the Black Sea and separates Ukraine from the Russian Federation) blew winds of up to 35 m/s and waves of up to five metres. The storm caused environmental harm and loss of life and property, including 13 vessels being sunk, stranded, or damaged.

Treacherous weather conditions at sea hampered any clean-up efforts in the sea during the initial 24 hours, resulting in oil being transported to the shorelines on both sides of the Kerch Strait. According to the data provided by Ukraine's Ministry of Transport, as of 20 November 2007, the total amount of the immediate spillage was 1,300 tonnes of heavy fuel oil, 2.3 tonnes of oil lubricants, 25 tonnes of marine diesel fuel oil, and 5.5 tonnes of heating oil.

Following a request for assistance from Ukrainian authorities to the European Community, the Monitoring and Information Centre of the European Commission (EC-MIC) invited the UNEP/OCHA Joint Environment Unit to participate in an EC-led assessment mission from 18 to 24 November. A staff member from the Joint Environment Unit was deployed as liaison officer with the team.

Main conclusions resulting from the assessments included that clean-up measures were well underway and that there was no immediate need for emergency relief assistance. It was recommended that a medium and long-term environmental assessment of the spill impacts be carried out. For this purpose, the Joint Environment Unit ensured a smooth handover to UNEP PCDMB.

Following the MIC report, the EC invited UNEP to coordinate a joint EC-UN Environment comprehensive multi-sectoral Post-Disaster Needs Assessment (PDNA). In addition to the scientific assessment of the damages caused to the coastal and marine environment, the EC was keen to understand the institutional and economic mid to long-term needs of Ukraine related to the oil spill incident, as well as to review existing data on coastal sensitivity mapping for the region. Thus, the

Ukraine PDNA was divided into the following four assessment categories: scientific, coastal sensitivity mapping, economic and institutional.

Thereafter, UNEP assembled a broad multi-disciplinary international team of experts to undertake the scientific, technical, and institutional assessments for the Ukraine PDNA. To assess the economic valuation of the environmental impacts of the oil spill, UNEP initiated a partnership with a local Ukrainian university, Kyiv-Mohyla Academy.

In April 2008, UNEP conducted a scoping mission to Ukraine to meet the Ukrainian Government and the EC delegation in Kiev, in order to discuss and agree on the thematic and geographic scopes of the PDNA.

All four assessment teams were in Ukraine and Kerch for several weeks in July 2008 where they formed independent teams in the field for each assessment component. After the completion of the fieldwork phase, all four assessment teams participated in a two-day meeting in Kerch to share mission findings and discuss reporting strategies. During this period, the institutional and economic assessment teams conducted meetings with local stakeholders and affected populations, while the coastal and marine assessment team and the coastal sensitivity mapping team visited the oil spill-impacted sites on land and at sea.

In November 2007, during the emergency response phase, the European Commission (EC) Monitoring and Information Centre (MIC) and UNEP were engaged in a range of monitoring activities to examine the course of the response to the oil spill. Monitoring activities were accompanied by satellite data collection to monitor the impact of the oil spill following the accident. The impacts were reported in numerous governmental statements and press sources.

At the request of the Ukrainian Government, the MIC organized a preliminary rapid environmental assessment mission in November 2007 in which the JEU also participated. The findings from the MIC mission were later used as a basis for the preparation of the EC-UNEP PDNA mission.

The EC-UNEP PDNA, conducted with the support of the Government of Ukraine, covered the following four main areas with separate assessments for each:

- *Coastal and marine assessment:* The coastal and marine component of the PDNA obtained data on the impacts of the oil spill contamination on the coastal and marine environment of the Ukrainian side of the Kerch Strait. This helped establish an accurate assessment of needs for an adequate environmental recovery programme and provided the basis for further monitoring work. It also assisted the government of Ukraine in formulating sound environmental management policies and improving its capacity for disaster risk preparedness and emergency response coordination.
- *Coastal sensitivity mapping assessment:* The objective of the coastal sensitivity mapping component of the PDNA was to assess the quality of existing coastal sensitivity maps and to gather information on the vulnerability of the environment. Through the information obtained, a set of measures and recommendations were proposed to improve coastal sensitivity maps and information management in emergency situations related to the particularly high-risk Kerch Strait, and more generally to the entire Ukrainian Black and Azov Seas' coastline.
- *Institutional assessment:* The objective of the institutional component of the PDNA was to review the existing legal framework and institutional mechanisms involved in responding to environmental emergencies, taking the oil spill of November 2007 as a demonstration of the ability of the current Ukrainian system to manage such emergencies. It mapped out the institutional infrastructure for disasters from oil spills. It examined the command and control structures that were in place in national and sub-national authorities, with the view to

strengthen planning and response for environmental emergencies related to oil spills. It also reviewed regional and international agreements that assisted Ukrainian authorities in contingency planning and response for environmental emergencies related to oil spills.

- *Economic assessment:* The economic component of the PDNA sought to evaluate the incurred costs of the Kerch oil spill incident, primarily derived from the expenditure costs for the clean-up operations. The team also attempted to project the cost of opportunities missed (in terms of lost tourist and fisheries revenues). It examined the impact of the oil spill to the local and national economies, by evaluating the direct and indirect costs related to the oil spill response and its medium-term impacts on local businesses.

UNEP compiled a report of the findings from each of the four components undertaken in Ukraine for the EC-UNEP environmental PDNA. It provided a comprehensive review of Ukraine's recovery needs following the Kerch Strait oil spill. It also identified concrete recommendations to strengthen Ukraine's preparedness and response capacity to address environmental causes and consequences of disasters.

JEU Mission [Report](#) available on GFMC.



Volgoneft-139 and the broken boom, from which oil still leaks, 2007.



UNEP experts collecting samples from contaminated materials found on the shoreline, 2007, UNEP.

2008: PHILIPPINES, MV Princess of the Stars pesticide spill

Typhoon Fengshen struck the Philippines on 21 June 2008, causing the MV Princess of the Stars ferry to capsize off the shore of Sibuyan Island in the central Philippines. Fewer than 60 of over 850 passengers survived the disaster. The ferry was carrying large quantities of highly toxic pesticides in addition to an estimated 100,000 litres of engine fuel.

During rescue and recovery operations, it was discovered that the ferry carried a substantial amount of highly toxic pesticides in its cargo. It appears that these and many other chemicals were packed in a 40-foot container and a 10-foot container. The capsized ship also contained 100,000 liters of fuel for the engines.

The Philippines Government requested assistance from the United Nations, and the request was answered by the Joint UNEP/OCHA Environment Unit and the European Commission's Monitoring and Information Centre, who jointly offered to assess and address issues related to the pesticides aboard the ship. The Joint EU/UN Assessment Team deployed to the Philippines from 9 to 20 July 2008. Its primary objective was to gather, consolidate and analyze available data regarding the secondary impacts of the chemicals contained in the capsized ferry, and, on the basis of this information, evaluate on-going and planned response activities (national and international). The assessment also focused on identifying gaps in response activities, and making recommendations on further possible international assistance. The team undertook on-site assessments on land and at sea, and surveyed the wreck by plane. Team members had extensive interaction with relevant national agencies, including the Department of Transportation and Communications, the 'Princess of the Stars' Task Force, the Department of Health, the Fertilizer and Pesticide Authority, the Department of Agriculture, the Coast Guard, the Environmental Management Bureau of the Department of Environment and Natural Resources, the National Disaster Coordinating Council, the Bureau of Fisheries and Aquatic Resources, the National Pesticide Analytical Laboratory, the University of the Philippines, the National Epidemiology Centre and the National Tuberculosis Centre.

The assessment noted the successful efforts made by national agencies to monitor the situation with regard to possible contamination of sea water by chemicals and oil. It also provided recommendations in a number of areas where improvements can be made concerning crisis organisation (such as contingency planning, and the establishment of a command post), sampling

and monitoring (such as sampling procedures, analytical protocols, and bio-monitoring), and the next steps for the salvage operations (especially contingency planning in the event of further damage to the vessel).

[Mission report](#) available on the EECentre.



UNEP/OCHA Report, 2008

2007: DEMOCRATIC REPUBLIC OF THE CONGO, Assessing environmental damage from Africa's World War

The conflict in the Democratic Republic of Congo (DRC) has been termed 'Africa's World War' due to the involvement of a large number of countries both directly and by proxy – and the high cost in human lives estimated at over 5 million people. Natural resources are widely acknowledged to have played a key role in sustaining and perpetuating the DRC's complex cycle of conflict. In 2007, UNEP became involved following an official request from the DRC government for a comprehensive Post-Conflict Environmental Assessment.

While most of the country is peaceful, eastern DRC remains gripped in a major humanitarian crisis and a violent cycle of conflict with over 20 foreign and local armed groups continuing to be active. Natural resources – particularly lucrative minerals (tin, tungsten, tantalum and gold) – are widely acknowledged to have played a key role in sustaining and perpetuating the DRC's complex cycle of conflict. Access to land especially when connected to ethnic identities is a major driver of local conflicts.

UNEP became involved following an official request from the DRC Government for a comprehensive post-conflict environmental assessment. Images of massacred mountain gorillas in the Virunga National Park in 2007 broadcast on news media worldwide created an international outcry, which prompted UNEP to send a mission to investigate the incident.

Several reasons prompted UNEP to get involved including: i) the global and regional importance of the DRC's immense natural capital; ii) the fact that natural resources are a key driver of the conflict and also a central part of the solution; iii) collapse of natural resource administration and low

capacity has seriously worsened threats to the environment; and iv) the DRC is host to one of the largest peace keeping and humanitarian missions in the world with a significant environmental footprint.

UNEP conducted a broad-scope multi-disciplinary study that examined 17 thematic areas and covered the whole country. It focussed on prioritising key environmental problems and threats in order to propose practical recommendations.

A core UNEP team planned and carried out the assessment including preparation of desk studies, reconnaissance field visits, environmental sampling, filming, mapping and report write-up. The fieldwork was carried out by UNEP in close collaboration with its main national counterpart, the Ministry of the Environment, Nature Conservation and Tourism (MECNT).

Following the preparation of detailed scoping and desk studies, 14 separate reconnaissance field visits covering all provinces and eco-regions of the DRC were carried out by a joint UNEP-government team. The significant investment in fieldwork over an 18-month period is one of the defining features of this assessment, which comprised extensive interviews and focus group discussions, site visits, photographic and video documentation, remote sensing and mapping. Measurement of pollution levels from large-scale mining in Katanga was carried out, including for heavy metals and radioactive substances. Despite security constraints and the physical isolation of whole regions, the assessment team still managed to cover the entire country.

A project office was set-up in Kinshasa to organize all aspects of the fieldwork – security, transport, finance and procurement - as well as to liaise with UN and national partners. Logistical support – particularly crucial given the difficulties of moving around the country – was provided by a range of partners, including the UN peacekeeping mission (MONUSCO), UN agencies and international and national NGOs. A series of consultation workshops were jointly organised by UNEP and the Environment Ministry to solicit inputs and views from a wide range of national and international stakeholders.

In addition to a full in-depth post-conflict environmental assessment of the DRC, a detailed 'Synthesis for Policy-Makers' was also published. Several technical studies on specific themes (e.g. water resources, transboundary environmental cooperation, renewable energy) were also prepared, and separately released.

A documentary (entitled 'Conservation from Chaos') based on the key findings of UNEP's assessment was also produced, which was broadcast on DRC national and international television (BBC). In addition, a series of short films on selected topics (e.g. protected areas, Kinshasa urban environment, agriculture, forestry) were made. All of the aforementioned outputs are available on-line via UNEP's website.

The launch of the report by UNEP's Executive Director and the DRC Environment Minister at a high-level forum in Kinshasa capped the post-conflict assessment process. Based on the study's findings and recommendations, a post-conflict environmental recovery programme was initiated. This has comprised of capacity building activities and natural resource management demonstration initiatives at local level.

A key achievement of UNEP's assessment is that it set out a coherent narrative of the complex challenges facing the DRC's immense natural capital and the critical environmental interventions needed to help the country's transition to peace and development. This narrative was largely taken-up by Government, the UN system and other partners. Indeed, the DRC's Environment Minister remarked that he usually hand carries a copy of UN Environment's report to various international forums to help make the environmental case for his country.

UNEP's assessment project provided the entry point for follow-up interventions in the DRC. Building on the report's recommendations, UNEP has implemented several projects and activities in the DRC, including:

- the DRC's first integrated watershed management and ecosystem-based disaster risk reduction pilot projects to improve livelihoods and food security and reduce flood risks in the Lukaya catchment near Kinshasa. The pioneering demonstration projects are recognized by government as a successful showcase, which needs to be boosted with greater resources to promote scale-up and raise impact.
- development of a practical drinking water quality monitoring system for the national 'Healthy Villages' programme supported by UNICEF which has so far reached 6.7 million people in rural Congo since 2008.
- technical assistance on reducing and eliminating toxic mercury emissions from the first artisanal gold mining project to export legal and conflict-free gold from eastern DRC implemented by the Canadian NGO IMPACT
- supporting the drafting of environmental regulations and policies including endorsement of a 'road map' to develop a National Policy on Sustainable Water Resources Management.

Following the defeat of the main rebellion in Eastern DRC in the end of 2013 and as part of the UN's renewed efforts to stabilize the region, UNEP was actively engaged with various UN and national partners in examining opportunities to produce tangible 'peace dividends'. Specifically, UNEP elaborated proposals with various partners on increasing sustainable energy access, clean-up of the provincial capital of Goma, supporting rural economic recovery through watershed rehabilitation, and promoting sustainable mining.

In 2015, UNEP also prepared a background report on the role of environmental crime and illegal natural resources exploitation in fuelling the conflict cycle in eastern DRC, and developed appropriate recommendations to address this predicament, in consultation with the United Nations Organization Stabilization Mission in the Democratic Republic of the Congo (MONUSCO) and other entities. The study's findings were highlighted by the Special Representative of the Secretary General to the DR Congo at the Security Council.



Artisanal mining is impacting landscapes in the eastern Democratic Republic of the Congo, UNEP.



Mercury inventory using an electronic balance to measure ratio of mercury loss to gold produced, UNEP.

2008: CHINA, Building back better after the Wenchuan Earthquake

On 12 May 2008, Sichuan Province was struck by a devastating 8.0 magnitude earthquake. Its impact was felt as far as Beijing and Shanghai, some 1,500 km and 1,700 km away. As the UN system's designated entity for addressing environmental issues at the global level, the Government of the People's Republic of China requested UNEP's assistance in the aftermath of the disaster.

UNEP immediately engaged in the post-disaster recovery effort, including by coordinating the environmental response to the earthquake through its office in Beijing, which was supported by international experts and technical staff from across the organization.

In the immediate aftermath of the earthquake, UNEP established a task force to monitor the situation from the onset and provide emergency response advice. This task force worked in close cooperation to ensure that environmental issues were seen as an integral part of the response process.

In late May 2008, UNEP established an internal working team comprised of experts from across the organization, to assess the impact of the earthquake, identify potential secondary environmental risks and provide technical support to the Chinese Government and the UN system on environmental matters. UNEP was one of the first UN agencies to deploy specialized experts to China after the earthquake, and immediately became the primary international environmental actor of the ground.

In July 2008, as part of a select group of UN agencies, diplomatic missions and donors, UNEP was invited by the national Government to survey the earthquake-affected region first hand. The UN mission to the earthquake-affected region revealed that entire villages had been buried and several cities had become uninhabitable. The mission also revealed the level of the environmental challenges that needed to be addressed. UNEP noted a number of potential secondary environmental risks stemming from the earthquake, including issues related to waste, landslides, and chemical spills. Additional missions by UNEP staff to the earthquake-affected area followed in September and December 2008.

UNEP's engagement in the country from 2008 to 2010 focused primarily on providing high-level expertise and capacity development for the management of the environmental impacts of the disaster.

As the primary environmental actor on the ground, UNEP was able to raise awareness of environmental and ecological considerations within the overall state planning processes for post-earthquake recovery and reconstruction, and to ensure that these considerations were duly included. Upon the request of the national Government, UNEP focused its efforts on capacity development and provision of technical support and coordination.

Three international workshops were held in cooperation with the MEP in 2008 to share experiences on best practices in post-earthquake situations, and several practical training sessions were held on the ground, for example to assist with the development of field-level plans for the handling and processing of rubble that was potentially contaminated by asbestos, or on contaminated sites management.

With regard to technical support, UNEP immediately strengthened its office in Beijing by hosting international experts and technical staff from across the organization, to be able to assist the MEP in addressing the environmental challenges of the post-earthquake period. In addition to lending support for the drafting of inputs to national recovery plans and appeals, as well as numerous reports and project proposals, UNEP worked closely with the MEP and local governments to help "green" the reconstruction, while addressing environmental improvements across sectors such as industry, education and agriculture. UNEP deployed experts on the ground to assess the situation and advise national and provincial authorities engaged in reconstruction, providing specific guidance on the approaches that should be adopted for rehabilitation and restoration.

A unique feature of UNEP's post-earthquake intervention in China was that not only were UNEP experts able to provide Chinese authorities with international best practice on environmental considerations, but that they were also able to learn from Chinese best practices. This knowledge is invaluable and can be applied to other post-disaster situations.

From an environmental point of view, three specific areas are worth highlighting:

- *Centralized camp management*: Impacted communities ranging from 5,000 to 20,000 people were moved to large camps in which adequate provisions were made by the State for key facilities and social infrastructure, such as schools, hospitals, and play areas. From an environmental point of view, this ensured that issues of water supply, sewage, and solid wastes could be professionally managed in a centralized fashion.
- *Planning guidelines for reconstruction*: Clear guidance was issued to communities and cities on what areas could be used for rebuilding and what areas should remain untouched. Most importantly, environmental and disaster reduction considerations were built into this assessment, which enabled local communities to rapidly deploy their resources, rebuild their homes where possible, and return to normalcy. From an environmental and disaster risk reduction point of view, this ensured that rebuilding was not undertaken in environmentally sensitive or disaster-prone areas, which greatly helped to minimize the impact of further risk.
- *Pace of reconstruction*: Thanks to an innovative financial model developed by the Government, reconstruction occurred at a very rapid pace. As a result, a significant amount of the local population was able to return to permanent accommodation. Such a model is an example of best practice and can be replicated in other parts of the world. In disaster-prone areas, reconstruction plans often take up to a decade, and due to the longevity of the process, transitional camps become virtual slums, undermining the population's quality of life and causing environmental damage.



The UN mission to the earthquake-affected region revealed that entire villages had been buried and several cities had become uninhabitable, 2008.

2009: KENYA, Guiding the expansion of the support bases in Mombasa

The Mombasa logistics base acted as a hub in United Nations Support Office for UNSOA's operation. It supplied AMISOM with the supplies and equipment necessary to its operation. Goods from different suppliers are tested for functionality and temporarily stored before being repackaged and shipped by sea to Somalia.

There were also plans for hazardous waste to be brought back from Somalia to Kenya – via the Mombasa Support Base – for final treatment and disposal as such facilities were not available in either Mogadishu or Mombasa. In response to increases in troop numbers stationed in Somalia, the logistics base was required to expand in 2009.

The Environmental Policy for UN Field Missions, which applies to both the Department of Peacekeeping Operations (DPKO) and the Department of Field Support (DFS), came into effect on 1 June 2009. This policy, developed in cooperation with UNEP, provides a set of environmental standards and objectives for UN Field Missions. These standards have been developed to minimize the environmental footprint of peacekeeping operations while maximizing the efficient use of natural resources.

Given its environmental mandate, UNEP was requested by the DPKO and the DFS to provide technical assistance in the implementation of this policy in the field. In June 2009, as an initial pilot operation, UNEP undertook a preliminary assessment of the resources demand and operating practices of two AMISOM camps: the Headquarters Camp in Mogadishu, Somalia and the Support Base in Mombasa, Kenya.

Each camp had been designed for 200-person occupation over a period lasting 10 years. The assessment compared the existing design parameters and operational specifications for each site

and screened 132 potential resource efficiency measures that could be applied to achieve a reduction in energy and water consumption as well as waste production and disposal. Each option was ranked using a traffic light system of green (considered as feasible), yellow (further study required), and red (not feasible) according to practicality, technical robustness, and financial implications. This ranking of potential resource efficiency measures was designed as an initial input to the DFS/UNSOA engineering team for further consideration.

As an initial pilot operation, a team of UNEP experts worked with the UNSOA team and assessed the design parameters and operational specifications relating to the construction and operation of two proposed AMISOM camps in Mogadishu and Mombasa. On request from the DFS, a reduced scope environmental impact assessment was conducted to assess key environmental concerns related to the two alternatives.

Two major reports were produced based on the assessment. The Environmental Impact Assessment – produced by UNEP and the Swedish Defense Research Agency (FOI) – looked at potential impacts on the human, physical, and ecological environment. It assessed and compared two alternative sites for the expansion of the Support Base in Mombasa. The technical report, titled *Assessment of Energy, Water and Waste Reduction Options for the Proposed AMISOM HQ Camp in Mogadishu, Somalia and the Support Base in Mombasa, Kenya*, summarized the outcomes of this assessment and provided a set of immediate, medium, and long-term recommendations to DPKO and DFS for reducing energy, water, and waste footprints at the two sites considered as well as in the design of future camps in other countries.

This technical assessment provided a series of immediate, medium, and long-term recommendations which could contribute to the successful implementation of the DPKO-DFS Environmental Policy for UN Field Missions and to reduce the resource consumption, waste production, and greenhouse gas emissions of peacekeeping operations. In addition to conducting environmental impact assessments in both Mombasa and Mogadishu, the other four most important recommendations were:

- **Immediate review and adoption of green-ranked measures:** Green-ranked measures had been assessed as being feasible on the basis of their cost (both capital and operational), robustness for use in the field, and ease of use. In this respect, they are considered to be suitable for immediate deployment into the design of new camps and the operation of existing camps. The DFS/UNSOA engineering team should conduct a technical review of the green ranked resource efficiency measures listed in this report in order to identify the measures that can be immediately adopted in the design of the Headquarters Camp and Support Base.
- **Further study and pilot testing of yellow-ranked measures:** The DFS engineering team was recommended to further assess the yellow-ranked measures identified in this report, including a detailed cost-benefit analysis as well as operational feasibility studies. The report also recommended to collect and review the lessons learned from the adoption of these technologies in other peacekeeping operations for best practice. Ideally, a selection of yellow-ranked options including large solar panel arrays, wind turbines, composting toilets, grey water recycling, rain water harvesting, and solar distillation were recommended for pilot testing at the Support Base given its lower security profile.
- **Feasibility study on closed loop bioenergy production:** The report recommended that a feasibility study be undertaken to evaluate optimum processes and technologies that could be integrated to produce a “closed loop” bioenergy system to better manage energy, water, and waste in peacekeeping missions. Such a study should consider solid and liquid waste volumes, calorific value, storage, and treatment, as well as potential energy yields from anaerobic digestion processes in the form of biogas. Further, it would evaluate conversion

of biogas to electrical and heat energy using conventional engines and alternative technologies such as fuel cells.

- **Development of a Sustainability Appraisal Camp Toolkit (SACT):** A dedicated “how to” toolkit is needed for UN peacekeeping activities that would help deliver sustainability objectives in a practical manner on the ground. It is important that a holistic approach is formulated covering the five main phases of a camp lifecycle: identification of sites, planning, set up, management, and decommissioning/liquidation. Such a tool kit should be aligned with existing UN policies, procedures, and tools while also including case studies showcasing best practices.



An Environmental Baseline Study was conducted in Mombasa, Kenya on the potential site of the UNSOA logistics base, UNEP.

2010: HAITI: Increasing resilience to disasters

UNEP conducted an environmental impact assessment (EIA) to assess key environmental concerns related to the development of military bases in Mogadishu. The EIA, requested by the UN Department of Field Support, analysed how the development of new bases impacts the environment and local population.

Haiti is situated in the middle of the hurricane belt and often suffers from severe windstorms during the Atlantic hurricane season from June to October. Flooding and landslides are also common. Haiti also lies on a strong tectonic fault line and is therefore earthquake-prone. However, there have been no earthquakes of this size on Haiti since 7 May 1842. Approximately 3 million people were affected by the earthquake and subsequent aftershocks hitting Haiti in January 2010, and an estimated 316,000 people died.

The JEU participated in OCHA's Operational Task Force and provided information to UNEP colleagues involved in the humanitarian response on the ground. The JEU prepared a Hazard Identification Tool (HIT) indicating the “big and obvious” facilities and objects that could pose a risk in the aftermath of the earthquake. Subsequently an environmental expert was deployed with the UNDAC team, while the JEU helped broker the deployment of two disaster waste management specialists funded by the Swedish Civil Contingencies Agency (MSB). Their assessment indicated no major acute environmental emergencies; however the issue of disaster waste management was identified as a priority in the recovery phase, and the experts liaised with World Health Organization regarding the identification and proper handling of asbestos and other potentially hazardous materials.

UNEP supported the overall UN response with building inspections and seismic risk assessments. UNEP also conducted a Rapid Environmental Assessments (REA). A senior UNEP expert was deployed from Geneva, Switzerland, during the second half of January. UNEP coordinated and supported the environmental aspects of the relief, recovery, and reconstruction efforts. Four concurrent general approaches were applied: awareness raising, coordination, technical assistance, and practical action. Chaos was gradually replaced by order, and activities shifted from emergency search and rescue and medical treatment to more established relief activities.

Since the 2010 earthquake, the Government of Haiti has attempted to balance short and medium-term imperatives with longer-term needs. In this context, UNEP recommenced the development of its long-term programme, in the framework of sustainable recovery allied to sustainable development. One of UNEP's priorities in the first half of 2010 was to complete two existing technical assessment projects: a study of lessons learned in relation to Haiti's environment, and the Global Environment Outlook (GEO) Haiti, a report assessing the state of the country's natural resources and the problems encountered in its sustainable management.

The 2010 GEO Haiti Report was a dynamic, inter-disciplinary, and participatory process aimed at evaluating the status of the environment. It was carried out by Haiti's Ministry of the Environment, with sustained support and close guidance from UNEP and the University of Quisqueya (UniQ). Through the contribution of experts, researchers, and resource-persons from all sectors of society, the GEO Haiti 2010 report was launched in June 2010.

Prior to the 2010 earthquake, UNEP had been working with the Government of Haiti for several years. In October 2008, UNEP participated in the hurricane Post-Disaster Needs Assessment and mobilised a small resident team. The UNEP country-based programme in Haiti started operating as a coherent unit in the first quarter of 2009. At the heart of the programme are the rehabilitation of badly degraded ecosystems and the promotion of sustainable development.

JEU [Mission report](#) available on the EECentre.



USAR team at Hotel Christopher, the former UN Headquarters in Port-au-Prince. Photo: Pablo O'Farrill, 2010.

Quote:

"The United Nations Environmental Programme's work in Haiti was broad and included post-disaster recovery support to forestry, marine environmental management, sustainable energy access, and environmental governance. The flagship programme was a multi-thematic initiative focused on the mountain range and coasts of the South Department. The Cote Sud initiative focused on integrated practical action in an impoverished and unstable – but nonetheless promising region – restoring ecosystems and developing sustainable livelihoods in agriculture, fisheries and eco-tourism."

-Andrew Morton, Haiti Project Manager

2010: SOMALIA, Mitigating environmental impacts of military bases in Mogadishu

UNEP conducted an environmental impact assessment (EIA) to assess key environmental concerns related to the development of military bases in Mogadishu. The EIA, requested by the UN Department of Field Support, analysed how the development of new bases impacts the environment and local population.

The chief reason for the volatile security situation in Mogadishu was the war between the Transitional Federal Government of Somalia (TFG), supported by the African Union Mission to Somalia (AMISOM) troops, as well as the Al-Shabaab and the Hizbul Islam militant groups. The fighting began when the TFG came into power in 2009. AMISOM was mandated to support the transitional government, implement a national security plan, train the Somali security forces, and assist in creating a secure environment for the delivery of humanitarian aid.

In Somalia, land degradation is a key environmental issue, closely linked to desertification, drought, and unsustainable livestock and agricultural practices. Over the past 25 years, Somalia has also experienced a cycle of protracted droughts, culminating in the most recent one in 2016 and 2017, when rains failed for three seasons in a row. Food insecurity and livelihoods, possible hazardous waste, lack of marine and coastal management, and the mitigation and management of natural disasters are other environmental concerns.

To accommodate planned increases in troop numbers within AMISOM, two new bases in Mogadishu were planned to be developed. One of the bases was located at a military academy, and the other at the Mogadishu University, with additional infrastructure to be able to facilitate the planned expansion. The two bases were intended for force protection as well as acting as resupply points for the AMISOM troops to accommodate 1,000 troops each. The bases were intended to be self-reliant, considering the majority of aspects necessary for sustaining the force including on-site water supply, sanitation and waste management, power supply, service areas with workshops, storage of equipment, fuel, and medical facilities.

As part of the planning process, the United Nations Department of Field Support (DFS) requested that an environmental impact assessment be performed to analyse how the development of the new bases impacted the environment and the local population. Following the request, UNEP conducted an environmental impact assessment (EIA) to assess key environmental concerns related to the development of these bases. The assessment is also regarded as a 'reduced scope EIA', specifically developed for conflict and crises situations. UNEP supported other agencies and assisted them in

identifying cross-cutting environmental issues relevant to other sectors. The assessment was conducted as a desk study due to the challenging security situation in Mogadishu at the time of assessment.

The environmental assessment has been performed by a team of professionals from UNEP and the Swedish Defense Research Agency (FOI). The preliminary assessment was limited to environmental and socio-economic concerns associated with the development of the aforementioned AMISOM bases. This included activities located in and around the two compounds. In addition to this, the increase in AMISOM presence in Mogadishu resulted in the development of a third base for logistical support near the airport. An assessment of selected impacts related to the Airport Base was included within this assessment supported by UNEP.

As a part of a Joint Needs Assessment (JNA) for Somalia, co-led by the World Bank and the United Nations Development Group, UNEP was the lead agency responsible for identifying and reporting on environmental issues in Somalia. Due to the protracted civil war, on-site field studies were not possible and up-to-date environmental data was scarce. The JNA was a first step towards gathering current environmental information to form the basis of a Somali environmental information centre.

This EIA report provided an assessment of potential positive and negative impacts of the construction and operation of proposed bases on the human, physical, and ecological environment. This included socioeconomics; community infrastructure and services; health, safety and security issues; natural resources; pollution of air, soil and water resources; and impacts on biodiversity and on endangered species of flora and fauna.

The report concluded that both proposed sites were located in and near environmentally-sensitive areas. Contained in this report were the results of the preliminary assessment process, intended to identify and assess key environmental concerns. The main issues of environmental concern relating to the establishment of the new AMISOM bases in Mogadishu included: hazardous materials (HAZMAT) management; increased ground water abstraction; sanitary waste disposal; site drainage; and import of materials. Due to the local security situation in Mogadishu, the results from this assessment were therefore based on a desk study only. Recommendations were further proposed to mitigate the environmental impacts of the establishment of the two bases:

- An alternative disposal site for the waste should be sourced, even if improved routines for waste stream management were introduced.
- Serious measures should also be taken to reduce consumption – all communal areas should be fitted with low-flow mechanisms, water efficient equipment should be used, and efforts made to recycle grey water and harvest rainwater.
- Efforts should be made to adapt the design of latrines and soakaways, so that possible pathogenic contamination of local water supplies be limited. Pit latrines and sludge disposal sites should be located downhill and as far away as possible from any local water sources to allow for pathogen die off.
- Drainage of the site should be done in a way that prevents the ponding of water. All the effluents generated should be identified and quantified. Designated areas should be appointed for vehicle washing and maintenance. Processes such as slow sand-filtration percolation should be implemented where applicable.
- The use of charcoal should be prohibited for use by the troops. Adequate provisions are provided for troops in the form of temporary cooking arrangement as well as messing facilities. There is no excuse for troops to procure charcoal to support an industry that encourages local deforestation in an area vulnerable to exploitation.
- The excavation of sand from beaches should be prohibited and instead be sourced from less sensitive sites. Restrictions in vehicular movements on beaches should be introduced and information about the possible presence of endangered species spread. If used for

recreational purposes, the beach should be accessed by foot only as this would not harm nest sites to the same extent.



AMISOM, @Tobin Jones

2010: CÔTE D'IVOIRE, Post-Conflict Environmental Assessment after a decade of conflict

Côte d'Ivoire gained independence from France in August 1960 and in the two decades that followed, made huge economic progress through growth in the export of various agricultural products, primarily cocoa. When the price of cocoa began to fall in the 1980s, the country fell first into economic decline and then, in the 1990s, into political turmoil. There was a military coup in 1999, and in 2000 conflict became open and widespread. Despite reconciliation efforts on the part of the key political actors, in 2002 a mutiny of disaffected soldiers in Abidjan grew into a full-scale rebellion. The rebels of the Ivory Coast Patriotic Movement seized control of the north of the country from the national government and from then on Côte d'Ivoire was in practice governed as two administrative units, with a buffer zone (termed the Zone of Confidence) in the middle.

In 2010, after a decade of negotiations, an election was held in which all the major political formations took part. The independent election commission of Côte d'Ivoire declared Alassane Ouattara the winner, but the incumbent president, Laurent Gbagbo, did not concede defeat. As a consequence, violence broke out yet again. In April 2011, forces loyal to Alassane Ouattara captured Laurent Gbagbo and in May 2011, Ouattara took up the role of president.

The new government of Côte d'Ivoire, which came into power after the 2010 elections, made a formal request to UNEP for a Post-Conflict Environmental Assessment (PCEA). In responding to the request, UNEP deployed a multidisciplinary team of experts to Côte d'Ivoire with the intention of building an understanding both of the country's key needs and the expectations of the various stakeholders – from the national government through UN agencies and bilateral donors to the private sector and civil society – regarding the PCEA.

UNEP's mission also served as reconnaissance for the security concerns and logistical challenges that would be encountered when undertaking a country-wide PCEA. Based on the scoping visit, the first step in determining whether an assessment is feasible, UNEP agreed to initiate a PCEA. A plan for the scope of the work involved in the PCEA was prepared and submitted to the government, and

the government provided inputs to the scope of work after extensive national consultations. The methodology employed to gather the data combined a review of the literature with satellite image analysis, aerial surveillance by helicopter, and discussions with experts who are familiar with forest management. Field visits were conducted primarily to verify the information obtained from remote sensing and discussions.

UNEP experts and a team of national counterparts visited key protected areas identified by remote sensing image, local consultations, and aerial reconnaissance. In parts of the country that were not accessible due to security constraints, field visits were supplemented by an aerial survey by helicopter.

Fieldwork for the PCEA was conducted in June and August 2013. A number of national experts joined the field work. Chemical analyses of the samples and further remote-sensing studies were conducted between August and October 2013. During 2014, the draft report was prepared and submitted to the government and external peer reviewers.

The PCEA studied environmental issues which had direct or indirect linkages with the conflict, including forests, environmental degradation of Ébrié Lagoon, environmental issues related to unplanned urban expansion, industrial and artisanal mining and their environmental footprint, and the risk of oil spill along the Côte d'Ivoire coastline. In addition, the study also looked at how the institutions overseeing natural resource management and environmental governance were impacted by the conflict.

UNEP analysed the state and evolution of the classified forests using data provided by SODEFOR's regional management centres for 2010 and 2012. From the data, the team was able to ascertain the area occupied by illegal plantations, the numbers of family units, and a rough estimate of the degradation of the classified forests.

The report produced seven key findings:

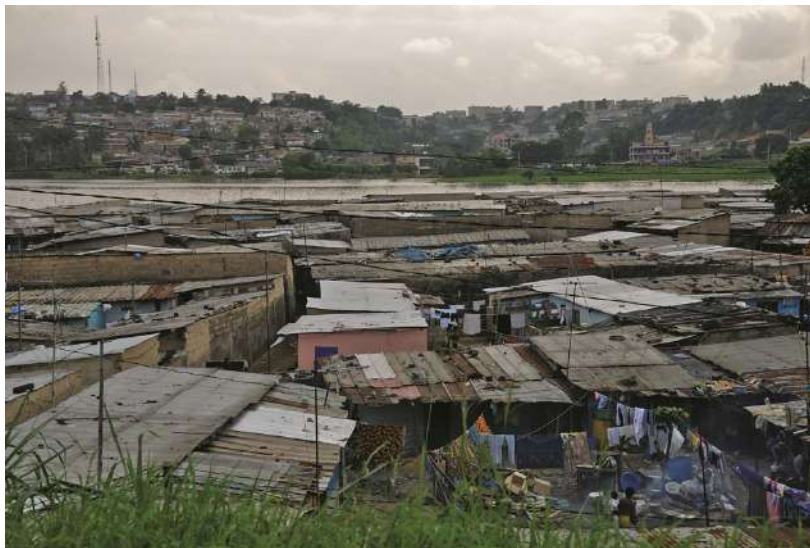
8. There was significant and ongoing deforestation, primarily caused by conversion of classified forests into agricultural lands.
9. National parks in the country were affected by the conflict, some more severely than others.
10. The city of Abidjan has doubled its population during the conflict period while urban service provisions have stagnated or deteriorated. This has resulted in range of environmental issues including water pollution, inappropriate disposal of hazardous and municipal waste and severe land degradation.
11. The Ébrié Lagoon, which was already severely polluted even before the conflict, has been further degraded due to disposal of solid and liquid waste and unplanned land reclamation.
12. The mining sector in Côte d'Ivoire has not gone at a pace similar to its neighbours primarily due to the insecurity caused by the conflicts.
13. The risk of an oil spill affecting Côte d'Ivoire increased significantly during the conflict period due to expanding oil exploration in the Gulf of Guinea, including in Côte d'Ivoire waters. However, the capacity to deal with an oil spill has in fact deteriorated, making the country doubly vulnerable.
14. There are number of Ministries and institutions in Côte d'Ivoire who have overlapping responsibility for environmental management. Not all of these departments co-ordinate their activities effectively adding to the environmental challenges facing the country.

The study has made a number of technical recommendations to deal with the various environmental challenges facing the country. It is clear from all the evidence and analysis presented in this report that Côte d'Ivoire has many environmental challenges. The causes of the environmental degradation of Côte d'Ivoire are complex. Remedial action will have to go far beyond the technical solutions to individual environmental problems that were specified in this report. There are broader actions that

need to be taken in order to get the country back on a path of sustainable growth and once again make the country a model for the whole of Africa.

While there are a number of very serious challenges to the country's environmental sustainability, there is also some cause for hope. The following recommendations were presented with the anticipation that they would receive attention from individuals and institutions far beyond those within the environmental community:

- Urgently halt continued deforestation; reforest at a grand scale, adequately protect and manage areas of conservation value;
- Reverse the unsustainable growth of Abidjan; and
- Establish Ébrié Lagoon as an engine for economic revival in Abidjan.



Rapid urbanization of Abidjan has been one of the most significant consequences of the conflict.



Water sampling in Ébrié Lagoon

Quote:

"Côte d'Ivoire has the potential to reverse environmental degradation and emerge as a leader on green economy solutions."

-Achim Steiner, Former Under-Secretary-General of the United Nations, Former Executive Director, UNEP

2011: JAPAN, The Great eastern Japan earthquake

On 11 Mar 2011, a 9.0 magnitude earthquake in northeast Japan triggered a massive tsunami, causing widespread destruction. The tsunami was up to 30 meters high and inundated 433,000 square kilometers of land. 492,000 people were evacuated, 11,600 were killed and 16,450 were reported missing. 17,000 homes and buildings were destroyed and 138,000 damaged.

The scale of destruction to housing, infrastructure, industry and agriculture was extreme in Fukushima, Iwate, and Miyagi prefectures. In addition to the hundreds of thousands who lost their homes, the earthquake and tsunami contributed to an accident at the Fukushima Daiichi Nuclear Power Plant, emitting an enormous amount of radioactive material into the environment and requiring additional mass evacuations. The impacts not only shook Japan's society and economy as a whole, but also had ripple effects in global supply chains.

The UNEP/OCHA Joint Environment Unit led an observer mission.

UNEP is very well positioned to respond to disasters. Its Crisis Management Branch, based in Geneva, has extensive experience in post-crisis environmental assessment and clean-up efforts. Its International Environmental Technology Centre, based in Japan, has expertise in waste management. For that reason, the Ministry of Foreign Affairs of Japan invited UNEP to facilitate a disaster debris management experience-sharing mission. The Government of Japan also requested that UNEP prepare a documentary on the visit for information, dissemination and training purposes. It also requested UNEP to participate to various events on post-disaster recovery to present the expert mission's findings.

UNEP's international expert mission was conducted in two phases. During the preparatory phase, the team of experts collected all relevant background information about the Great East Japan Earthquake and tsunami, including satellite images and government documents. In May 2011, UNEP officials undertook a preliminary visit to some of the selected municipalities to scope the main mission and examine logistics.

Then, in March 2012, UNEP initiated the second phase of its mission, which involved detailed coordination with government authorities at all levels. Five municipalities were chosen to provide sufficient geographic diversity and to expose the experts to the different scale and nature of disaster debris problems faced by the municipalities, as well as the range of solutions being tested. The impacted cities visited during the expert mission were Sendai City, Miyako City, Ofunato City, Ishinomaki City and Soma City. A recycling facility in Tokyo where the disaster debris were being received was also visited.

At each site, the mission team met with the city officials dealing with debris management. The team also visited storage areas as well as any treatment, recycling, reuse and disposal facilities, making observations and notes, and exchanging ideas with technicians on the ground. It also met with experts and city officials to exchange experiences in a structured manner. It was not part of the scope of UNEP's mission to visit the Daiichi power plant or its exclusion zone, nor to examine the Japanese Government's plans to dispose of radiation-contaminated debris.

The approaches to managing the post-disaster debris in Japan hold many lessons for similar situations elsewhere in the world, which could be employed in other countries on a case-by-case basis. The expert team concluded that the support from the central government to fully underwrite

the costs associated with the disaster debris management has been the core success factor behind Japan's disaster debris management operation. Further lessons from the Japan experience which can help inform disaster preparedness and post-disaster response efforts for the management of debris are as follows:

- The importance of being prepared: Japan has decades of experience in planning for, and responding to, disasters. The major municipalities have documented plans for disaster debris. This is extremely beneficial as allows the government authorities to move swiftly into "emergency mode" after a disaster. Vulnerable countries should prepare a disaster debris management plan as an essential part of their national or regional contingency planning.
- Swiftness of response: Japan's Ministry of the Environment came with a clear guideline for the local municipalities on how to deal with the disaster debris. This included a guidance note on segregation, storage and treatment. This enabled the municipalities to have a consistent framework to deal with the debris. Individual municipalities trying to figure out a sorting strategy would have created different waste streams in different municipalities making any final consolidation difficult.
- Technical backstopping: Dealing with disaster debris is a specialized technical task, something which local municipalities, at least the smaller ones, generally lack the technical capability to implement. Thus providing them only with a guidance note would have been inadequate. The decision by the Ministry of the Environment to deploy staff from the national government to the prefecture and local level was a welcome initiative which provided technical backstopping to the local experts.
- Central financial support: The disaster produced such vast quantities of debris that the local municipalities would never have been able to handle the clean-up burden on their own, even during a normal period. However, the disaster debris had to be handled at a time when their revenue dropped sharply due to the destruction of economic activity and the relocation of local populations. The national government's decision to fully underwrite the costs associated with the disaster debris management has been the core factor behind the success of the disaster debris management operation in Japan.
- Collective contracting: The scope and scale of contracts needed for disaster debris management was also far beyond the capability of the local municipalities. The prefecture governments assisted the local municipalities by entering into area-based contracting with major Japanese contractors which brought in the required scale of resources and equipment relatively quickly. Local interests were taken care of by joint venture arrangements.
- Health and safety practices: No concessions were permitted when dealing with health and safety considerations on-site in the affected areas, even during the emergency phase. Good health and safety practices were being followed at the sites, which should ensure that there are minimal or no secondary impacts on the staff involved in disaster debris management.
- Use of local resources: Efforts to maximize the use of local companies to deal with disaster debris was done when appropriate. This ensures that more resources are pumped into the local economy while also promoting local ownership and aiding the emotional recovery of survivors who get to contribute and feel part of the clean-up effort. This is yet another practice which should be integrated into disaster debris management contingency plans.



UNEP hopes to use data from the mission to develop an international protocol for estimating the volume of debris in post-disaster settings, UNEP.



Stack of two-wheel vehicles in Sendai City awaiting identification by their owners, UNEP.

"The ongoing disaster debris management in Japan is the world's single largest waste management operation, surpassing Hurricane Katrina. It is therefore appropriate that such a process is informed by the international experiences and that we document lessons from this operation for use elsewhere."
Muralee Thummarukudy, Operations Manager, Crisis Management Branch Mission leader

2012: ITALY, Costa Concordia cruise ship accident

On 13 January 2012, the cruise ship Concordia, operated by Costa, ran aground near the Giglio Island coast after hitting a reef. Of the 4,229 passengers and crew members on board, 30 lost their lives. The accident triggered potential environmental risks, which needed to be assessed and addressed. The UNEP/OCHA Joint Environment Unit, in collaboration with the European Community Humanitarian Office (ECHO), participated in a mission to observe the rescue and marine pollution

operations, and to draft a report on the main findings in order to share lessons learned with participating States of the EU Civil Protection Mechanism.

[Emergency Response Management report](#) available through the Italian Civil Protection.



Costa Concordia ship accident, 2012.

2012: SOUTH SUDAN, Assessing solid waste dumping in Juba and water harvesting structures in Eastern Equatoria, Western Equatoria, and Lakes States

After a short period of calm soon after the signing of the Comprehensive Peace Agreement in 2005, resource-based conflicts over access to traditional grazing lands and water rights escalated in all states of South Sudan, forming a fundamental challenge to peace and stability in the country. Disputes over political boundaries that delimit pasture, water and migration routes have exacerbated the situation.

Situated on the White Nile, Juba is the capital and largest city of the Republic of South Sudan. Since the Peace Agreement between the Sudan and South Sudan, Juba has developed very rapidly and is now considered one of the fastest-growing cities in the region. This rapid growth in population put significant pressure on already inadequate waste management services, and there are now critical issues relating to waste management practices in Juba. It is estimated that around 50% of the waste is collected on a daily basis before it is transported to the city's only official dumping site, about 13 kilometres away from the city centre.

In fast-growing urban areas, waste management has become increasingly important as the strain on infrastructure and treatment facilities can directly impact the environment and subsequently human health. UNEP has therefore undertaken a waste characterization exercise to support Juba City Council and other municipal entities in improving their waste management systems.

For UNEP's Preliminary Environmental Assessment, four field visits were conducted in October 2012. UNEP analysed soil and water samples, and conducted field visits, which also included interviews with waste-pickers and a nearby small scale farmer.

The first detailed analysis of Juba's municipal solid waste was undertaken by UNEP in December 2012 during the dry season. To capture any seasonal variations in waste trends, UNEP also undertook waste analysis and characterization exercises of Juba's municipal waste during December 2012 and again in September 2013, during the wet season.

In 2015, in order to understand water harvesting interventions in the context of livelihoods improvement, conflict resolution and policy discourse in South Sudan, UNEP and the Food and Agriculture Organization of the United Nations (FAO) embarked on a joint project to assess water harvesting structures for sustainable livelihoods and peace building in South Sudan.

Prior to the detailed assessment and field mission, a mapping/inventory survey and characterization of the existing water harvesting structures was carried out in three states in order to determine which structures would be sampled in the detailed assessment. Checklists and tools were also developed for gender analysis, natural resources management and technical, environmental and socio-economic issues pertinent to water harvesting structures.

The assessment of water harvesting in South Sudan was aimed at generating lessons needed to support a long-term, cost-effective and environmentally sound programme for livestock water development in South Sudan.

In 2017, given the pace of environmental change in South Sudan, the Ministry of the Environment and Forestry (MoEF) of the Republic of South Sudan requested that UN Environment facilitate a study on the state of the environment in the country. UNEP and MoEF supported Environmental Pulse Institute in developing the State of Environment and Outlook report (SEOR), including organising an inception workshop to launch the SEOR process and validation workshops to peer review the draft chapters. Field visits were an integral part of the development of the report.

UN Environment's Preliminary Environmental Assessment identified several major deficiencies in the management and operation of the dump site that required the immediate implementation of remedial administrative action and monitoring. The report also provided recommendations for mitigation measures and monitoring.

The latest UNEP waste characterization exercise for Juba city was conducted during the last week of September 2013, during the latter part of the rainy season. The results from the December 2012 and the September 2013 waste characterization exercises for Juba city provided a comprehensive understanding of the city's waste composition and capture any seasonal variations in waste composition. The September 2013 exercise also provided important data for aiding future planning and implementation of appropriate and sustainable practices for solid waste management in Juba.

One thing that was extremely concerning was how many waste consignments were found to be contaminated with biomedical waste (hazardous health care waste) that contained items such as needles, syringes, soiled swabs, and bandages. Although accounting, on average, for only 1% of the total waste stream, some consignments had as much as 4% by weight of this extremely hazardous material. This arguably represented the greatest risk to the health and safety of the site's waste pickers and staff. It became clear that existing practices were not working and that some hospitals and clinics were abusing the system by recklessly disposing of hazardous materials.

As a result of the UNEP-FAO collaboration and building on experience and techniques from across the Sub-Saharan region, UNEP published an Environment and Socioeconomic Impact Assessment Report in 2015.

Tools for the gender analysis were developed with reference to the Socio-economic and Gender Analysis (SEAGA) Field Level Handbook. Guide questions were designed to enable learning about community dynamics, including the linkages among social, economic and environmental patterns, priorities for development, division of labour within communities (including gender and other social characteristics). Questions were also designed to better understand the use and control of resources and participation in community institutions. This enabled cross-checking of the information collected for accuracy and also participatory data collection by listening to different views of women, men, youth, community leaders and other stakeholders.

A natural resources management assessment tool was developed to provide guidelines for collecting information on natural resource management issues around the water harvesting structures, conflicts associated with livestock use of the water harvesting structures, and supplementary natural resource use like pasture. The tool also assisted in gathering the views of the communities on how to mitigate conflicts with the use of the water harvesting structure and other related natural resources. The tool further helped in comprehending the institutional arrangements and challenges associated with the management of the water harvesting structures.

The assessment further outlined that emphasis on hardware and physical water development comes at the expense of water governance, improving operations, maintaining skills, installing financial management, and providing technical backstopping. This leads to the unsustainable management of water services.

Finally, the State of Environment and Outlook report, published in May 2018, was the first report of its kind to ever be published in South Sudan. It will be used as a benchmark for natural resource assessments and will inform decisions regarding environmental protection and natural resources management in South Sudan.



Collecting a leachate sample from a logged pool, UNEP.



Abandoned Parikworn Pond at Nyigir Payam, Parikworo Boma due to siltation and design problems in Fashoda County, Upper Nile State, UNEP.

Quote:

"Supporting the people and government of South Sudan to adequately manage and protect its natural resources and environment is one of the important steps in improving community security, local resource governance, alternative livelihoods options, and subsequently contribute to the sustainable development of the new nation". Martin Dramani, Programme Management Specialist

2013: PHILIPPINES, Typhoon Haiyan/Yolanda

Typhoon Haiyan (known locally as Yolanda) made first landfall in the early morning of 8 November 2013 in Guiuan, Eastern Samar province, with maximum sustained winds of 235 km/h and gusts of 275 km/h, leaving a wide path of damage, destruction and casualties.

A significant spill of heavy oil (bunker C type) occurred when Power Barge No. 103 – operated by the Philippine's National Power Corporation (NAPOCOR) – ran aground at the shores of Estancia during the height of typhoon Haiyan, contaminating approximately a one kilometer stretch of Estancia's coastline. As the barge continued to leak, the size of the spill grew, with final estimations of between 500 to 900,000 liters spilt, affecting approximately 10km of coastline. Authorities evacuated 492 residential families in the immediate vicinity, due to health and safety concerns related to light volatile compounds evaporating from the oil. Following air monitoring and assessments, authorities allowed relocated families to return to their homes as of 19 December.

NAPOCOR initially contracted a salvage operator (Kuan Yu Global Technologies Inc. Technologies Inc.) for the unloading of the barge and the clean-up. Slow progress on containing the leaking oil and fears of weather changes leading to potential impacts on human health and the environment led the Environmental Management Bureau (EMB) to request international assistance on 22 November 2013 to expedite the clean- up. Following the request, a senior marine oil pollution expert, Ms. Florence Poncet from the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (CEDRE) was deployed through the Joint UNEP/OCHA Environment Unit (JEU) and EU Civil Protection Mechanism from 27 November to 23 December 2013. The objective of her mission was

to support EMB of Region 6 in the management of the oil spill clean-up, with the aim to reduce the impact on the affected population and the environment.

EMB together with a joint UNEP/OCHA/WHO team undertook an initial assessment of the spill noting recommendations to protect residents and workers from oil hazards. From 7 to 15 December, oil that remained in the damaged tanks of the power barge was pumped to a small tanker vessel (MT OBAMA). As of 16 December, EMB reported that a total of 809,000 liters of oil were recovered from the barge.

[Mission report](#) is available on the EECentre.



REUTERS/Erik De Castro



Oil spill in Estancia town, Iloilo province, Philippines, picture taken on 21 November 2013 by Corporal Ariane Montambeault

2014: BANGLADESH, Sundarbans oil spill

On 9 December 2014, an oil tanker collided with a cargo ship on the Shela River in the Sundarbans, a UNESCO World Heritage Site and federally protected mangrove forest in Bangladesh. The tanker

released around 350,000 litres of heavy fuel oil into the river. The oil has spread over a stretch of more than 35 miles.

A tanker carrying a reported 357,664 liters of heavy fuel oil collided on 9 December, 2014, at around 5:00 am local time, with another vessel and partly sank in the Shela River situated within the Sundarbans mangrove region in Bangladesh. A major breach was made in the hull causing oil to spill into the river and adjacent side channels and creeks. By the afternoon of the next day the oil had spread at least 20 km upstream to Mongla and at least 20 km downstream to Horintana. The accident caused widespread concern for the Sundarbans ecosystem, which is the world's largest mangrove forest and has been a Ramsar site since 1992 and part of which is a UNESCO World Heritage site since 1997. Due to its richness of biological diversity the entire Sundarbans (6,017 square kilometers) is under some form of state protection. Furthermore, millions of Bangladeshis depend upon the Sundarbans for food, livelihoods and shelter. The oil spill took place within the Chandpai Wildlife Sanctuary, which was recently established to protect important dolphin habitat. Concern about the potential impacts of the oil to the ecosystem and the communities that depend on it for their livelihoods, led the Government of Bangladesh on 15 December 2014 to request the United Nations Development Programme (UNDP) provide technical assistance in assessing the impacts and supporting the response.

On 15 December, the Economic Relations Division (ERD) of the Ministry of Finance of the Government of Bangladesh (GoB) submitted a request to the United Nations Development Programme (UNDP) to provide technical assistance in response to the Sundarbans oil spill to: 1) assess the oil spill containment and clean-up needs, and 2) conduct an assessment and draft an action plan for recommended mitigation measures. The Joint UN/Government mission consisted of 25 experts and officials from Bangladesh Government agencies and universities, the United Nations Disaster Assessment and Coordination (UNDAC) team, UNDP, USAID, the European Union Civil Protection Mechanism, France and the Wildlife Conservation Society; and was led by an UNDAC Team Leader. The mission took place from 17 to 31 December 2014.

This team composition provided an excellent knowledge-sharing opportunity to strengthen national oil spill preparedness and response capacity. The short-term environmental impacts of the oil spill seemed to be limited, but further monitoring has been recommended. Furthermore, the oil spill incident presented a serious wake-up call, and the response team discouraged traffic through the unique and biodiverse Sundarbans from an environmental perspective.

The findings of the mission were presented to the Ministry of Environment and Forests and the media on 31 December 2014, becoming front-page news in all major national newspapers. The Government of Bangladesh was keen to take the recommendations forward, and was developing an action plan with UNDP support, based on the recommendations from the mission. UNDP supported the oil waste disposal with support from the UK Department for International Development (DFID) and International Tanker Owners Pollution Federation Ltd (ITOPF).

[Mission report](#) is available on the EECentre.



@Syed Zakir Hossain/Greenpeace



International experts checking oil on a Nypa leaf, Zia Islam. Photo: OCHA/UNDAC, 2004.

2015: PARAGUAY, Electric depot PCB fire

On 14 October 2014, a fire in a transformer depot at the National Electrical Administration covered two hectares of Paraguay's Laurety San Lorenzo municipality. Providing electricity to the country, the facility is located in a densely populated metropolitan area 11 kilometers from the capital.

The fire began in a transformer depot at the National Electrical Administration (ANDE) in the Laurety –San Lorenzo municipality of Paraguay. The facility provides electricity to the country and is located in a densely populated metropolitan area 11 km from the capital Asuncion. The site covered approximately 27 hectares (has), and the fire affected approximately 2 has. Equipment including stored transformers, capacitors, and other materials that may contain polychlorinated biphenyls (PCBs), which can generate a large amount of dioxins and furans, were affected by the blaze.

On 23 October 2015 the Minister / Executive Secretary of the Paraguay Ministry of Environment officially requested the United Nations Environment Programme (UNEP) Secretariat of the Basel, Rotterdam and Stockholm (BRS) Conventions Secretariat for technical assistance and guidance to assess the impact of the event and to appropriately deal with the resulting waste. The Secretariat of the Basel, Rotterdam and Stockholm Conventions and the Joint UNEP/OCHA Environment Unit have been collaborating in the area of emergency assistance for more than 10 years, to support

developing countries or countries with economies in transition that are party to the Basel Convention, in particular in cases of incidents occurring during a transboundary movement of hazardous wastes and other wastes covered by the Convention.

A team was assembled, and the mission took place 9 - 22 November 2015. The objective of the mission was to evaluate the extent of the environmental risk to the fire-affected sites, including the associated runoff, leaks, spills and waste, and provide recommendations for the management of the waste resulting from the incident. The objectives also included assessing the extent of human health risks at the fire-affected sites and provide guidance for reducing future risks. The evaluations and assessments by the team included interviews, aerial photography, and other assessment techniques used to evaluate the situation and develop recommendations.

[Mission report](#) is available on the EECentre.



UNEP/OCHA Publication on eecentre.org.

2016: HAITI, Hurricane Matthew

Hurricane Matthew struck southwestern Haiti on 3 October 2016, causing casualties and widespread damages in the nation. This hurricane – reportedly the strongest to hit the nation since 1964 – had disastrous environmental impacts, wrecking numerous infrastructure facilities all over the Tiburon peninsula.

An associate environmental expert deployed as part of the UN Disaster Assessment and Coordination (UNDAC) team, mobilized at the request of the Joint UNEP/OCHA Environment Unit through the (European) Union Civil Protection Mechanism (UCPM). The associate environmental expert was deployed from 15 to 24 October and worked in close collaboration with the UNEP office in Port Salut, mainly with a waste and water expert. Together the two experts conducted environmental emergency assessment with a focus on water contamination. All activities were undertaken in close coordination with the UNDAC team and the WASH cluster. The two experts were based in Port-Salut and visited several locations affected by the hurricane, including Roche-a-Bateau, Carrefour-Joute, Chardonniere, Les Coteaux, and Saint Jean du Syd. All documents and findings were shared with the UNDAC team, UNEP and the National Directorate of Drinking Water and Sanitation (Direction Nationale de l'Eau Potable et de l'Assainissement – DINEPA) during and at the end of the

mission. Documents and findings were also handed over to the European Union Civil Protection (EUCP) team in Port au Prince.

[Mission report](#) is available on the EECentre.



Nathan, Haiti, by Eva Andersson, EUCP/UNDAC.

2016: IRAQ, Dam Failure in Mosul response

The Mosul Dam, built to hold up to 11.1 billion cubic meters of water (at maximum water level of 330 meters above sea level), is at increasing risk of failure. Ongoing erosion and gaps in the required maintenance of the dam have led to a worrisome situation. A failure would lead to catastrophic downstream impacts.

For some time, the risk of the potential failure of Mosul Dam has been acknowledged by national as well as international stakeholders. The Government of Iraq, the UN agencies, national and international humanitarian actors acknowledge the urgent need to put in place elements of an international response strategy against the unprecedented impact brought by a possible dam failure, affecting millions of Iraqis across large parts of the country. The dam failure risk is set within the context of on-going volatile all-out armed conflict, extreme restrictions on humanitarian access, political divisions and uncertainty, criminality, large-scale presence of IDPs and refugees, and related needs for humanitarian assistance to highly vulnerable families.

The Mosul Dam, built to hold up to 11.1 billion cubic meters of water (at maximum water level of 330 meters above sea level), is at increasing risk of failure. Ongoing erosion and gaps in the required maintenance of the dam have led to a worrisome situation. A failure would lead to catastrophic downstream impacts jeopardizing the provinces of Ninewa, Kirkuk and Salah al-Din, possibly causing 7 damages from the plains of the Euphrates to Baghdad, 350 kilometers south and where up to hundreds of thousands of people could be killed.

Upon request of the OCHA Country Office in Iraq, a UN Environment/OCHA Joint Unit Senior Humanitarian Affairs Officer deployed to Iraq for four weeks in March and April 2016 to support preparedness for a potential failure of the Mosul Dam. The mission identified priority preparedness actions focusing on a first tier of activities. As a follow-up to the mission, a United Nations Disaster Assessment and Coordination (UNDAC) mission was mobilized. The UNDAC team worked with national and international actors to facilitate the development of protocols for the reception of international humanitarian assistance in the case of a potential dam failure. The UNDAC team, in

collaboration with UNDP, also supported the Government to ensure the establishment of an emergency alert system in areas deemed at high risk of flooding. Concurrently, the WHO Emergency Medical Teams' manager deployed with the UNDAC team to develop joint response protocols. The JEU contributed to this analysis by providing an overview of industrial installations of concern, as identified through the Flash Environmental Assessment Tool (FEAT), in the flood zones.

[Mission report](#) is available on the EECentre.

Web story available [here](#).



The Mosul dam on 11 April 2016, by OCHA/Rene Nijenhuis

2016: IRAQ, Chemical Hazards in Mosul Response

The Iraqi Security Forces' efforts to retake the city of Mosul, Iraq, from the Islamic State of Iraq and the Levant (ISIL) began in October 2016 and have seen an escalation of the emergency situation in the Mosul area. The environmental consequences associated with the ongoing conflict have led to the request for deployment of an expert to Iraq.

Two EFAs were subsequently deployed, back-to-back, through the UN Office for the Coordination of Humanitarian Affairs (OCHA) Stand-By Partnership Programme, to OCHA's Humanitarian Operations Centre in Iraq. The advisors were provided at no cost by the Danish Emergency Management Agency (DEMA) which also provided back-office support, and worked closely with the UN Environment/OCHA Joint Unit (JEU) in Geneva throughout the mission. The advisors' main task was to assess health and environmental hazards in Iraq, especially those posing immediate life-threatening risks to local communities and humanitarian responders.

Oil well fires have emerged as a prominent threat to both human health and the environment in Iraq. Since May 2016, approximately 20 oil wells were set ablaze in armed conflict with the number and volume of oil well fires increasing dramatically in July 2016. These fires were reportedly caused by ISIL and generally occurred in or near Al-Qayyarah governorate, Iraq. The mapping of the locations of the oil fires proved to be a challenge throughout the mission, and was mostly done with support of UNITAR-UNOSAT through remote assessments. Additionally, notifications by the Ministry of Oil on its website were tracked. After efforts to extinguish the fire towards the end of March, the government officially reported that the last fire had been extinguished on 4 April 2017. In Iraq, the oil wells burned for approximately nine months - a similar timeframe to the around 650 oil wells set on fire in Kuwait during the Gulf War with some burning for approximately ten months.

A field mission to Al-Qayyarah was conducted by the EFA on 7 January 2017 to better understand the effects of an oil spill to the north of Al-Qayyarah. At the time of the assessment, this spill did not pose an acute threat to the nearby Tigris River. However, a more detailed environmental assessment should be carried out to determine the impact of the pollution to soil and plants in the area. Whilst contamination was visible, it was confined to a limited area which generally lacked vegetation. Should the area experience heavy rainfall, runoff may lead to high levels of polycyclic aromatic hydrocarbons (PAHs) in the Tigris river, which is the source of drinking water for millions of people downstream. The mission found that the area and associated spill in its present state does not pose an acute threat to humans or animals located in the vicinity.

Then, Stockpiles of sulfur stored at the Al-Mishraq sulfur mining and processing facility were set on fire around 19-20 October 2016, supposedly by retreating ISIL forces. This caused the dispersion of sulfur dioxide and sulfur trioxide throughout the region. Sulfur oxides pose respiratory health risks for humans and are also precursors for acid rain. WHO reportedly treated over 1,500 people for suffocation symptoms in nearby villages. By 27 October, this fire had largely been extinguished. Iraqi environment authorities have undertaken preliminary investigations of the immediate impacts of the fire on human health.

During their mission, the EFAs conducted three field visits to assess the status of the treatment of healthcare waste. These missions showed that proper healthcare waste management has not been prioritized in the Mosul region, likely because up to 800-900 patients per day (numbers in February 2017) were being treated. The field visits also confirmed healthcare waste to apparently have been a challenge already before the Mosul crisis, and to not be confined to the Mosul area alone. Inadequate management of healthcare waste can pose a risk to human health and the environment, as it exposes health care workers, waste handlers and the community to toxic and hazardous substances and pharmaceuticals, infection risk and injuries. Uncontrolled disposal of healthcare waste can release these chemical and biological hazards into the environment, placing the general public at risk.

It was found that several incinerators previously operating in the region had been phased out, in anticipation of their replacement by shredder autoclaves. However, due to the cost of upgrades, shredder autoclaves have not been systematically installed in connection with medical facilities. Currently, only two shredder autoclaves are operational in Erbil Governorate. At the Nanankali Hospital in Erbil, there is a large facility with the capacity to handle hazardous healthcare waste, but it charges other hospitals and clinics for the use of its treatment facilities. This apparently has led hospitals and clinics to instead deposit their waste at a landfill located about 10 kilometers from the center of Erbil.

Hazardous installations (those potentially storing hazardous chemicals) located in and around Mosul have been mapped using the Flash Environmental Assessment Tool (FEAT). While most of the installations are not operational, stored substances and legacy pollution present at these sites may still pose a risk to surrounding communities and the environment. The FEAT analysis gives an estimate of the health and environmental risks from a potential chemical releases from these facilities. For example, cement factories and oil storage facilities contain materials that could harm both agricultural land and the local water supply. This analysis was conducted in close collaboration with UN-Habitat, who have mapped and shared these hazards through their Mosul data portal. An overview of the mapped hazards is shown in the annex.

Environmental threats in (former) ISIL controlled areas around Mosul remain from the widespread use of makeshift oil refineries. These refineries often use unrefined oil or waste products from earlier refining, leading to oil pollution. ISIL's use of these refineries was highly publicized by PAX, a non-

governmental organization based in the Netherlands that published satellite images showing four of these sites in Tal Afar, west of Mosul. These makeshift refineries became strategically important for ISIL's access to oil and revenue through smuggling. Once ISIL left the hills of Khafasah, south of Mosul, about 600 makeshift refineries were discovered in the region. To date, experts have not been able to conduct an environmental assessment of these locations.

Web story available [here](#).



Burning oil wells at Al-Qayyarah, by OCHA/Sorensen, 2016.

2017: IRAQ, Picking up the pieces: rebuilding after ISIL

The extent of wanton environmental destruction by ISIL is gradually emerging as more areas are cleared from explosives and become accessible. Stirred by its traumatic experience, Iraq successfully tabled the first ever resolution on mitigating pollution from conflict and terrorism that the UN Environment Assembly adopted in December 2017.

ISIL's scorched earth tactics targeting particularly the oil industry was a hallmark of its terror campaign. Burning for 9 months, the 18 oil wells set alight by ISIL in Qayarrah created such thick black smoke it blanketed out the sun for months in what locals refer to as the 'Daesh winter'. Oil was flowing like rivers on city streets and the inside of people's homes covered in toxic black soot.

River barrages and regulators – particularly on the upper Euphrates in western Iraq – were also weaponized to drown areas, impede government troop movement, or cut off water supplies and wreak havoc on the livelihoods of farmers and the Mesopotamian marshlands downstream.

The extent of wanton environmental destruction by ISIL is gradually emerging as more areas are cleared from explosives and become accessible. Stirred by its traumatic experience, Iraq successfully tabled the first ever resolution on mitigating pollution from conflict and terrorism that was adopted by the UNEP Assembly in December 2017.

Two weeks after the Iraqi Government declared the liberation of Mosul on 9 July 2017, UNEP deployed staff to Iraq to conduct a rapid environmental assessment of the city and surrounding areas with the Environment Ministry. Fact-finding visits and spot samples were collected to obtain a general understanding of the scale and gravity of environmental contamination in areas retaken from ISIL. This included field visits to the priority oil and mining sites of Qayarrah and Mishraq, both torched by ISIL, damaged industrial facilities in Mosul city, and abandoned nuclear dump sites. Visits to the ravaged city of Ramadi and Fallujah in western Iraq were also made. A brief technical report providing an overview of the main findings was published by UNEP in September 2017.

UNEP conducted a series of training workshops to strengthen the capacity of experts from the ministries of environment and oil to conduct contaminated site assessments. A package comprising of portable hydrocarbon analysers, sampling tools, and personnel protective equipment was handed over to the Environment Ministry to support a mapping campaign of oil contaminated sites. An institutional capacity needs assessment of the Environment Ministry's ability to oversee environmental performance of the oil and gas sector was also conducted.

A debris assessment study of Mosul city was prepared, including operational debris management scenarios to aid decision-making. The assessment was carried out in collaboration with Mosul Municipality, UN-Habitat, and a specialized debris organisation called Disaster Waste Management. A consultation workshop was subsequently organized in Mosul University, which provided a forum for a wide range of stakeholders to come together for the first time to discuss debris management challenges and opportunities. The workshop concluded with a decision by Mosul Municipality to set-up a debris management committee to develop a city-wide debris recovery plan.

A regional debris management workshop was also organized in Al-Anbar University, in collaboration with Anbar Governorate and the Environment Ministry involving the municipalities of five heavily damaged cities in western Iraq. Following the workshop, local authorities in Ramadi are working on identifying potential sites for piloting a debris recycling centre.

An Advisory Mission of the Ramsar Convention on Wetlands involving representatives from Iran and Iraq to the shared Mesopotamian marshes took place in December 2017 to explore cooperation opportunities for their conservation and sustainable management. In collaboration with the Ramsar Secretariat, UNEP helped facilitate the transboundary mission, which included site visits and workshops in both Iran and Iraq. As a first step in advancing cross-border cooperation, a joint mid-winter waterfowl census was conducted in the shared Hawizeh-Azim marshes by experts from both countries in early 2018. UNEP also conducted satellite-based monitoring of large scale fire outbreaks in the Hawizeh marshes bordering Iran between June and August 2018 prompting the Government of Iraq to request water releases from upstream riparian countries to help suppress the fires.

With technical guidance from UNEP, a field campaign to map oil-contaminated sites was conducted by a joint team of experts from the ministries of environment and oil in the former provinces occupied by ISIL, including Ninewa, Salah El-Din, Kirkuk, and Diyala. Around 20 heavily polluted sites were identified. The survey findings were reviewed with a view to conducting detailed analysis of priority sites and developing clean-up plans.

The recommendations from the environment ministry's capacity assessment study to oversee the oil industry are informing the design of the bilateral Iraq-Norway Oil for Development (OFD) programme. As a result, Iraq's Environment Ministry was included – for the first time – as an equal partner with the Ministry of Oil in the second phase of the Iraq OFD Programme (2019-2022).

In a pioneering initiative, two debris recycling centres are being set-up in Mosul by UNDP's Stabilization Programme and the International Organization for Migration with technical advice from UN Environment. In addition, technical guidelines were developed for environmental management of debris recycling centres with the Environment Ministry and Mosul Municipality. In view of growing interest to scale-up rubble recycling in other destroyed cities from the ISIL conflict, UNEP is building on the Mosul experience to support local authorities in Anbar, Salah El-Din, and Kirkuk governorates identify cost-effective options for managing their debris challenges.

In the wake of a massive fish kill event in the Euphrates River in Babel Governorate – 85 km south of Baghdad – in October/November 2018 resulting in the death of around 8 million farmed carp fish

equivalent to 10,000 to 15,000 tonnes, the Ministry of Health and Environment requested urgent assistance from UNEP to identify the cause of their demise. Comprehensive laboratory analysis of fish, sediment, water, and fish feed for both microbiological and chemical parameters was rapidly organized by UN Environment in collaboration with the University of Geneva. Consultations on the test results with leading fish pathologists established the root cause of the mass fish kill event to be a lethally infectious viral disease known as the koi herpesvirus disease. Based on the findings, UNEP advised the government on the need to better control the number of fish farms and fish movement as well as improving laboratory diagnostic capacity to prevent similar outbreaks in the future.



Example of easily accessible rubble on the streets, and 'unreleased' rubble from damaged buildings requiring complex demolition, 2017, UNEP.



Environmental devastation by ISIS in Qayarah, 2017, UNEP.

Quote:

"Entering Mosul two weeks after its liberation, I was struck by how quickly life had sprung back: shops and restaurants opening their doors, municipal workers sweeping the streets, students and professors cleaning up their ransacked university, and displaced families streaming back across the Tigris River to salvage belongings in the devastated Old City – defiant hope in the horrors of war." Hassan Partow, Iraq Programme Manager

2017: UKRAINE, Chemical contamination in conflict

On 24 February 2017, the Voda Donbassa's Donetsk Filter Station was hit by shelling that just nearly missed the chlorine storage. The incident served as a reminder of the risk of conflict in areas with industrial hazards.

Entered in its fourth year, the conflict in eastern Ukraine takes place in a region rich in natural resources, but missing proper water resources. Entered in its fourth year, the conflict in eastern Ukraine takes place in a region rich in natural resources, but missing proper water resources. Coal mining started in the area in the middle of the XIXth century as the railways network developed as well as heavy industries. Around coal mines, the metallurgical works, the coal transformation and chemical plants developed, attracting the needed working population and the development of the subsequent agriculture. The presence of a military conflict in such a context, already rich in hazards and historical pollution, is significantly increasing the probability of an incident involving industrial products.

On February 24th, 2017, the Voda Donbassa's Donetsk Filter Station (DFS) was hit by shelling and the chlorine storage was nearly missed. The incident serves as a reminder of the risk of industrial hazards, conflict and population in the same area at the same time. In addition to the WASH Cluster and UN Environment / OCHA Joint Unit (JEU) advices, OCHA was called upon to facilitate the deployment of an environmental advisory mission.

The aim of the mission took its shape during the first weeks of the context assessment. It has been mainly oriented towards collection of evidences, mapping out environmental potential hazards and challenges, assessing the likelihood of selected risks and providing some recommendations that the humanitarian community could introduce to be better prepared for an environmental emergency within the conflict affected area.



Illitch metallurgical plant, Mariupol, July 2017, by L. Nicole/SDC.

2017: BANGLADESH, Refugee Influx

Violence in Rakhine State, Myanmar, which began on 25 August 2017, has driven an estimated 621,000 Rohingya across the border into Cox's Bazar, Bangladesh. The speed and scale of the influx has resulted in a critical humanitarian emergency, with potential direct and indirect environmental

impacts. The people who have arrived in Bangladesh since 25th August 2017 are now reliant on humanitarian assistance for food, shelter, and other life-saving needs. Basic services that were available prior to the influx are under severe strain due to the massive increase in the number of people in the area. In some of the sites that have spontaneously emerged, water and sanitation facilities are limited or of poor quality, and extremely high population density raises the risks of an outbreak of disease. The Rohingya population in Cox's Bazar is highly vulnerable, living in extremely difficult conditions after having fled conflict.

A Rapid Environmental Assessment Study was initiated by the Ministry of Environment and Forest (MoEF) of Bangladesh and by the United Nations Development Programme (UNDP) and UN Women to assess the environmental impacts of the Rohingya influx into Bangladesh and propose a series of actions to address the main environmental risks. The UN Environment/OCHA Joint Unit deployed one expert through the Swiss Agency for Development and Cooperation to support the assessment.

Eleven environmental impacts were identified that have been or could potentially be exacerbated by the Rohingya influx. Six of these were physical environmental impacts on: ground water; surface water; acoustic levels; indoor air quality; solid waste management; and soils and terrain; and the remaining five were impacts on ecosystems: natural forests; protected areas and critical habitats; vegetation; wildlife; and marine and freshwater ecosystems. Key risks were pinpointed and assessed based on the rating of their impact. The following risks associated with the physical environmental impacts were assessed as high: ground water depletion; ground water contamination; poor indoor air quality; poor management of sewer sludge; removal of soils and terrain; and changes in terrain. Impacts on ecosystems with high associated risks were: deforestation and forest degradation; encroachment onto and resource extraction from protected areas; changes in land cover; rapid biomass reduction; loss of species; loss of wildlife habitat and shrinkage of wildlife corridor; and mortality risks for wildlife.

Most of the physical environmental impacts appear to be reversible, although those on soils and terrain may require considerable time to return to their baseline levels. The denuded landscape will have reduced water retention capacity which may impact ground and surface water in the area. Paramount to any reversal will be the implementation of closure of the Rohingya camps and the initiation of land reclamation plans.

The study outlines a number of recommendations to implement mitigation measures and offset programmes.

[Mission report](#) is available on the EECentre.



UNDP Bangladesh/Arif Faisal

2018: COLOMBIA, Ituango Dam

On 5 May 2018, a collapse inside the third tunnel of the Ituango Dam project (Antioquia Department) increased the levels of the Cauca river in the area. On 12 May, a natural unblocking in the second tunnel produced a flash flood affecting the Puerto Valdivia and Taraza municipalities. Following these events, 544 people were evacuated and 60 houses destroyed.

Hidroituango has been the largest hydroelectric dam project in Colombia, with a capacity of 2,400 MW. It is located on the Cauca River in the department of Antioquia, about 170 km north of Medellín. The project was under construction, and at the end of April 2018 the dam had reached a height of 185 m (corresponding to an elevation of 385 m above sea level).

On April 28, 2018, the Auxiliary Diversion Gallery (GAD) was blocked, which triggered a series of events that have put the stability and integrity of the dam, and the lives of the communities that live downstream, at risk. After the initial blockage of the GAD and the temporary opening of the right diversion tunnel, it was blocked by a new landslide, and then suddenly unblocked, causing damage downstream. The loss of control of the water level in the reservoir jeopardized the safety of the dam, whose construction is made of rock with an impermeable core of clay. Due to its state of construction at that time, the imminent flooding of the reservoir presented a risk that the water would exceed the crown of the dam, weakening its physical integrity and causing accelerated erosion capable of completely breaking the dam and causing a flash flood of large proportions. in downstream communities.

On 5 May, a collapse inside the third tunnel of the Hidroituango Dam project increased the levels of the Cauca river in the area. On 12 May, a natural unblocking in the second tunnel produced a flash flood affecting Puerto Valdivia and Taraza municipalities. Following these events, 544 people were evacuated (250 in official shelters) and 60 houses destroyed. Further events in the dam, which is in risk of collapse, have led to the evacuation of more than 9 000 people. According to the authorities, there are around 180 000 people at high risk.

On May 17, the UN Environment Programme received a letter from the Ministry of Environment and Sustainable Development (MADS), requesting an expert mission to provide recommendations in real time to support the evaluation of the stability and integrity of the dam, and support the process of decision-making on solution option. In response to this request and thanks to the support of the European Union Civil Protection Mechanism (UCPM), the Swiss Agency for Development and Cooperation (SDC), between May 22 and 31, a team of three civil engineers specialized in dams, a geological engineer with work and research experience in the affected area, and a specialist in environmental emergencies. On June 1, the official closing of the mission was made, through the presentation of the preliminary findings and recommendations of the mission to MADS, in the framework of a meeting of the Inter-institutional Environmental Committee for the contingency of Hidroituango.



@Colombian National police, 2 June 2018

2019: MOZAMBIQUE, Cyclones Idai and Kenneth

Tropical Cyclone Idai made landfall during the night of 14 to 15 March 2019 near Beira City, Sofala Province, in central Mozambique. The cyclone brought torrential rains and winds to the Sofala, Zambezia, Manica, Inhambane and Tete provinces. Outside of Beira, a dam collapsed on 17 March and other dams have been reportedly identified as at risk.

On 18th March 2019, the President of Mozambique issued a statement welcoming international assistance. At the request of the UN Resident Coordinator a.i. in Mozambique and in coordination with the OCHA Regional Office for Eastern and Southern Africa and the United Nations Disaster Assessment and Coordination (UNDAC) mechanism, the UN Environment/OCHA Joint Unit deployed a dam expert, with expertise in flood risk management, in Mozambique as part of the UNDAC team dispatched to the affected areas.

Between March 24th and April 13th 2019 a dam assessment is done to assess the effects of the Cyclone on the dams by Gerhard W. Winters, supported by the governmental specialists and a support team as back office in the Netherlands. An Extension of the mission was issued on the 9th of April through the European Civil protection Mechanism. From 14 to 29 April an assessment was done by Jeroen Helder, with support of his predecessor Gerhard Winters and the back office team. During this second mission tropical cyclone Kenneth made landfall on Thursday 25th of April in the province Cabo Delgado in the North of Mozambique. This category 4 cyclone brought extensive damage on the coastal area near the city of Pemba and caused torrential rainfall in the days after the cyclone while being more or less stationary over the coastal area.

The assessment of dams is done by combining field true information, with local knowledge of the regional water managers and dam operators. It showed the discrepancy between different data sources, news items and field true information, thus showing the need for verified baseline dataset. The reservoirs visited show no structural damage on the dams but erosion and clogging caused problems and have a negative impact on the strength and safety levels of the dams. This need to be restored before the next rain season.

Both at local (Beira), regional (ARA's) and national level plans for water management are developed. There is a clear need for restoration and improvement of the river basin management to provide protection against flooding to the people of Mozambique. However the country has a long history of floods and recovery plans developed, a long term solution for water safety (and water availability) requires a long term approach in the development of water related policies in Mozambique and a capacity building program that not only covers the technical needs to design and implement infrastructure but also builds on the governance to include flood risk management awareness in all spatial planning in the country.

[Report](#) is available on Relief Web.



Mavuzi Dam, Manica Province, 9 April 2019 by UNEP/OCHA Joint Environment Unit.

2019: BAHAMAS, Hurricane Dorian

On 1 September 2019, Hurricane Dorian made landfall as a Category 5 hurricane on Abaco Islands, the Bahamas, before moving over Grand Bahama Island. By 29 October, the official death toll stood at 67, and over 200 people were still missing. The hurricane destroyed infrastructure and disrupted public services.

Key environmental concerns in the aftermath of Dorian included: i) the management of large quantities of disaster waste generated by the hurricane; ii) the confirmed inland spill of crude oil and any potential spills at sea from Equinor's oil storage facility on Grand Bahama Island; and iii) any potential secondary and cascading impacts resulting from damages to the numerous hazardous operation facilities located on Abaco and Grand Bahama Islands.

To support the government-led response to Hurricane Dorian, a United Nations Disaster Assessment and Coordination (UNDAC) team was deployed to The Bahamas from 8 to 28 September. The team embedded an environmental expert from the UNEP/OCHA Joint Environment Unit (JEU). The expert moved across New Providence, Abaco and Grand Bahama Islands to equally support efforts in Nassau, Marsh Harbour and Freeport. In Grand Bahama, the expert was joined by one representative of the Ministry of the Environment, two oil spill experts mobilized by the JEU through the European Union Civil Protection Mechanism (UCPM) and a UCPM liaison officer to specifically address oil spill concerns, in liaison with the United States Coast Guard.

The main objective of the overall mission was to provide technical advice to national and local authorities to rapidly identify, assess and mitigate any negative environmental impacts following the event, with an emphasis on those that posed immediate life-threatening risks to humans (both local communities and responders); advise on required follow-up actions; promote the early integration of environmental considerations in assessments and overall response efforts; facilitate knowledge sharing and information exchange among national and international counterparts on environmental matters; and deliver recommendations accordingly.

[Mission report](#) is available on the EECentre.

Web story available [here](#).



Drone view of Marsch Harbour, Abaco Islands, The Bahamas after Hurricane Dorian, by Samaritan's Purse.

2020: BEIRUT, Port explosion

On 4 August 2020, an explosion of 2,750 tons of ammonium nitrate occurred at the port of Beirut. By 21 August, the official death toll stood at 180, with over 6,500 people injured and more than 300,000 displaced. The explosion left a trail of devastation, with massive damage to infrastructure and disruption to basic services.

Key environmental concerns in the aftermath of the explosion included: i) air pollution resulting from the smoke plume and toxic dust, with potential for resuspension in air with movements (clean-up, traffic, etc.) and runoff into the water supply system in the event of rains; ii) any potential secondary and cascading impacts resulting from damages to the port warehouses which were known to store chemical substances, some of which highly toxic; iii) the management of the large quantities of disaster waste generated by the explosion, including the possible presence of asbestos and other hazardous waste. All of these have implications for soil and water contamination, both at the port and elsewhere.

At the request of the United Nations Resident/Humanitarian Coordinator and OCHA Country Office in Lebanon, a United Nations Disaster Assessment and Coordination (UNDAC) team was deployed to Beirut from 5 to 27 August. The UNDAC team embedded a staff member from the UNEP/OCHA Joint Environment Unit (JEU). An Emergency Operations Cell was established to coordinate international response, in support of national efforts. As part of the international coordination structure, an Environment Cell, led by the JEU staff member, was created to ensure environmental coordination.

The main objective of the mission was to coordinate all international environmental response, leveraging from expertise dispatched across different teams of responders, in support of national efforts; provide technical advice to rapidly identify, assess and mitigate any acute environmental risks following the event, with an emphasis on those that posed immediate life-threatening risks to humans (both local communities and responders); advise on required follow-up actions in the short-, medium- and long-term; promote the early integration of environmental considerations in humanitarian assessments and overall response efforts; facilitate knowledge sharing and information exchange among national and international counterparts on environmental matters; and deliver recommendations accordingly.

As a result of the mission, the hazardous materials found at the port during the immediate response phase have been mapped and advice on rapid mitigation of related acute environmental risks was provided in real-time and actioned, to prevent cascading negative humanitarian and environmental impacts. Training on dealing with asbestos and other hazardous waste during ongoing clean-up

operations was provided to environmental NGOs to raise awareness. Further assessments are required, including on soil and water contamination, to make sure that all threats are identified, to understand any actual or potential cascading risks and to restore safety.

Preliminary findings from the immediate response phase have informed the development of a comprehensive disaster waste management strategy, for which funding has been secured by the European Union. The mission outcomes showed that special considerations on hazardous waste, including asbestos, toxic dust and any other residual chemical substances, should be incorporated into this strategy and any ongoing clean-up efforts should be linked to it. The strategy will aim at minimizing the generation of waste, promoting reusing and recycling of non-hazardous waste to the extent possible, while ensuring adequate removal of contaminated products. Coordination has been facilitated across relevant national and international stakeholders to ensure that port clearance as well as recovery/reconstruction efforts across the city take into proper account the substantial residual risk linked to the presence of hazardous materials, only some of which have been found to date, and ensure adequate treatment and disposal.

The incident further highlighted the opportunity to enhance readiness for any similar events in the future and provides lessons learnt for safety at commercial ports globally.

[Report](#) available on Relief Web.



Beirut Port fire, 10 September 2020, by OCHA/Farid Assaf.

2021: EQUATORIAL GUINEA, Ammunition explosion

On 7 March 2021, a series of explosions occurred at the armory of the Nkuantoma gendarmerie and military barracks in the city of Bata, the economic capital of Equatorial Guinea. The explosions appear to have resulted from the detonation of ammonium nitrate stored in a civilian storage of explosives for mining purposes, which led to the collapse of military barracks near the site, resulting in further explosions of grenades and ammunition and leading to the spreading of unexploded ordnances across the city. The official death toll stands at 107 people, with more than 700 people injured. Out of a total population of about 310,000, it is estimated that 130,000 people were exposed to the explosions, with 19,000 affected and 8,000 in need of humanitarian assistance. The site where the explosions occurred was totally destroyed as well as houses and vegetation up to 800m from the blast epicenter.

Key environmental concerns in the aftermath of the blasts included: i) detonation risk of unexploded ordnance (UXO) and consecutive contamination; ii) possible water and soil contamination through the outwash of ammunition left overs; iii) the risk of collapsing houses; iv) visible contaminants like the orange powder of the dangerous explosive RDX (also called cyc ionite), barrels with petroleum products and burned cars.

In response to a request for international assistance from the UN Resident Coordinator (RC/RC Office) in-country and the government, a United Nations Disaster Assessment and Coordination (UNDAC) team of 16 was deployed to support on coordination, assessments, environmental information management and humanitarian financing. The mission lasted three weeks, from 12 March to 2 April, and was led by the UNEP/OCHA Joint Environment Unit.

The main objective of the overall mission was to assess the overall situation, with a focus on urgent humanitarian needs; to conduct rapid environmental assessments to identify direct and possible secondary environmental impacts and advise on mitigation measures, with a focus on acute, life-threatening risks; to provide coordination support to the government; to identify key elements that should be addressed in the immediate humanitarian response phase to ensure smooth transition into recovery; to coordinate needs assessments and ensure continued communication with RC/RCO, national authorities and other actors to minimize duplication of efforts; to support on information management and reporting; to ensure continuous information sharing and communication of outputs of the response, under the leadership of the RC/RCO; to provide the government and the RC/UN Country Team with short-term, medium-term and long-term recommendations in the above-identified areas.

[Report](#) available on Relief Web.



Experts deployed on-site to conduct environmental assessments after ammunition explosions, by UNDAC team member.

2021: ST. VINCENT AND THE GRENADINES & BARBADOS: Volcano eruption

After a heightened period of activity, explosive eruption of La Soufrière volcano began, on 9th April 2021. Ash plumes of up to 20,000 feet were observed heading east, leading to a request, on the same day, from the Government of Saint Vincent and the Grenadines for international support to address environmental consequences of the volcano eruption.

On 8th April 2021, seismic activity at La Soufrière volcano changed significantly when the seismic station closest to the summit began recording low-level seismic tremors. La Soufrière entered a heightened period of activity indicative of a fresh batch of magma either near or approaching the surface. Consequently, Prime Minister Dr Ralph Gonsalves issued an immediate evacuation order for those people living in the most exposed areas and raised the alert level to red, indicating that an eruption was in progress or likely without warning. On 9th April, explosive eruption began and ash

plumes of up to 20,000 feet were observed heading east, leading to a request, on the same day, from the Government of Saint Vincent and the Grenadines for international support to address environmental consequences of the volcano eruption.

Major environmental concerns in the aftermath of La Soufrière eruption included: i) the evaluation of lahar risk posed by volumes of ash deposited; ii) the toxicology and chemical composition of the ash and its impact on marine and terrestrial ecosystems; iii) the management of the ash, in terms of cleanup, storage, utilisation, and disposal, considering its physical and chemical properties; iv) the management of other waste streams arising from the event, for example damage to houses, white goods, electronics and waste arising out of the humanitarian response to people's needs; v) other environmental dimensions of the response and recovery process.

In coordination with the UN Resident Coordinator, the UNEP/OCHA Joint Environment Unit dispatched a team of 12 experts to Kingstown. In response to a request for international assistance from Barbados, two additional experts were deployed to Bridgetown as an antenna of the larger team dispatched to Saint Vincent and the Grenadines, to support on environmental pollution (air and water) and overall environmental response. The team members arrived between 21st and 24th April, for a duration of three weeks.

The main objective of the overall mission was to provide technical advice to local and national authorities to identify, assess and mitigate negative environmental impacts induced by the volcanic eruption. This was done through environmental analysis and sharing best practice to the emergency response and short- to long-term recovery. Technical advice was provided on volcanology, lahars, impact on nature and ecosystems, environmental toxicology, ash management, disaster waste management and environment in humanitarian action.

[Report](#) available on Relief Web.



The landscape of St. Vincent and the Grenadines is shrouded in the ash blanket from the eruptions of the La Soufrière volcano, by Stv Online, April 2021.

2021: SRI LANKA, MV X-Press Pearl

On 20 May 2021, the MV X-Press Pearl container ship caught fire and started sinking in early June, releasing fuel oil, dangerous chemicals and plastic pellets – among other materials – in the Laccadive sea. It was anchored around 9 nautical miles (17 km) northwest of the Port of Colombo, in Sri Lanka's national waters.

Key environmental concerns in the aftermath of the incident included: i) a large black smoke plume created by the fire extending inland; ii) potential spill of 15 products classified as Dangerous Goods aboard the ship into the sea, including 25 metric tonnes of nitric acid; iii) large quantities of plastic pellets, cargo and other debris from the vessel washing ashore along the west coast of Sri Lanka,

affecting most notably the Negombo beaches and lagoon - a prime fishing and tourist sector north of Colombo; and iv) a long but limited oil slick continuously leaking from the ship raising concern over a major sudden spill of the 348 tonnes of bunker fuel aboard the ship.

In response to a request for technical support from the Ministry of Foreign Affairs through the UN Resident Coordinator (RC) in Sri Lanka and the UN Environment Programme, the UNEP/OCHA Joint Environment Unit mobilised a team of four experts. It included two oil/chemical and marine litter experts from the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (CEDRE) in France and a marine environment expert from the Italian National Institute for Environmental Protection and Research (ISPRA). The experts were mobilised through the European Commission's Directorate General for European Civil Protection and Humanitarian Aid Operations/Emergency Response Coordination Centre (DG ECHO/ERCC). Lead by an environmental assessment specialist from the UNEP Resilience to Disasters and Conflicts Global Support Branch, the mission lasted from 16 to 30 June.

The main objective of the overall mission was to the design and implementation of an environmental assessment over the short and longer terms; advise on the measures to be taken to prevent, respond and mitigate risks from the incident including from bunker fuel oil spill containment and clean-up, shoreline clean-up of plastic pellets and other debris, and salvage of the ship wreck and lost containers; provide longer-term recommendations on strengthening national preparedness and incident management capacity to deal with future maritime disasters; identify additional expertise needed to address the impacts of the incident and link national counterparts with relevant networks and partners including accredited international laboratories; and brief the government and international partners on the evolving situation and needs for immediate emergency response and longer-term recovery.

The mission outcomes showed that the limited but continuous release of oil from the wreck represents an evolving threat to the marine environment and necessary control measures should be put in place for a 'worst case scenario' of a sudden release of a large volume of bunker oil. A plan should be developed and implemented to setup a monitoring to detect the release of chemical pollutants from the wreck and lost containers. The wrecked MV X-Press Pearl and the lost containers at sea pose the most immediate risks of this gradually unfolding incident. A plan to eliminate these risks by the removal of the wreck and containers, and their eventual decommissioning. Plastic pollution being another major consequence and concern issued from the incident, there's a need to put in place clean-up actions. A great emphasize should be placed on conducting further environmental assessments and monitoring, including of marine pollution, fisheries, marine wildlife, and air pollution, to ensure a safe recovery. Finally, with regard to the latest and other past environmental emergencies that struck Sri Lanka, there's a need and opportunity to strengthen maritime disaster management capacity. Therefore, the country should consider developing and implementing a maritime disaster plan and undertake a capacity building programme.

[Report](#) available on UNEP website.

Web stories available [here](#) and [here](#).



Flotation in seawater. Sarakkuwa beach, Gampaha district, UNEP.

2021: HAITI, Earthquake

On 14 August 2021, a devastating 7.2 magnitude earthquake, followed by tropical storm Grace, struck Haiti, particularly in and around Jérémie and Les Cayes, on the northern coast of the country's southern peninsula. The earthquake damaged or destroyed infrastructure, disrupted public services, and killed and injured thousands.

Key environmental concerns in the aftermath of the earthquake included: i) the management of large quantities of debris and disaster waste and ii) addressing hazardous materials-related risks issuing from damaged stores and warehousing.

To support the government-led response to the multi-faceted disaster, a United Nations Disaster Assessment and Coordination (UNDAC) thirty-three-members team was deployed to Haiti from 15 August to 29 September, in coordination with OCHA and UNEP country offices. The team supported on coordination, rapid environmental assessments, humanitarian needs assessments, information management, humanitarian access, civil-military coordination.

The main objective of the overall mission was to support local and national authorities through field coordination; needs and environmental assessments, through rapid assessments and assessments and analysis (A&A), to ensure the environment is mainstreamed at all phases of the humanitarian response; and information management.

The overlapping crises (COVID, security, political and economic) and political situation created a compounding impact on the country and the response. Tensions on the ground, constraints and insecurity were a key challenge for humanitarian and environmental actors, especially when conveying assistance and relief supplies to hard-hit and hard-to-reach areas.

The mission delivered preliminary findings that ensured environment was anchored to the immediate emergency response phase and informed the development of a Post-Disaster Needs Assessment (PDNA) to transition into early recovery.

Video from OCHA: <https://www.youtube.com/watch?v=96J0WqvBnN8>

[Report](#) available on OCHA website.



Haiti earthquake response 2021, by UNOCHA.

2022: TONGA, Volcanic eruption and tsunami

On 15 January 2022, an unprecedented disaster hit Tonga as a result of the Hunga-Tonga-Ha'apai volcanic eruption, which was followed by a tsunami with waves of up to 15 meters. These hit the west coasts of Tongatapu, 'Eua and Ha'apai Islands. A tsunami warning had been issued, triggering a mass evacuation.

Communication lines were down and remain limited, with no communication with the outer islands until Monday 17 January after the deployment of Armed Forces patrol boats. Search and rescue operations began on Sunday 16 January. Initial damage assessments are underway.

In consultation with OCHA field offices and national authorities, the UNEP/OCHA Joint Environment Unit is looking at deploying a team of environmental experts to provide technical advice in the following domains: volcanology, ash management (cleanup and disposal), environmental pollution/contamination (air, water, soil), ecology (with a focus on marine ecosystems) and green response. Remote support is also welcome.

[Updates](#) available on Relief Web.



Photo by Reuters

2022: PERU, Oil spill

On 15 January 2022, at least 11,900 barrels of oil were spilled into the sea in front of the La Pampilla Refinery, in Callao, during operations to unload crude oil from an oil tanker at one of the fuel terminals. The response operations have been led by the company Repsol, owner of the refinery, and the Peruvian government.

The volcanic eruption in Tonga generated tsunami waves that reached the coasts of South America, causing two fatalities on the northern coast of Peru and flooding several coastal areas. An oil spill of at least 11,900 barrels occurred during operations to unload crude oil from an oil tanker at one of the fuel terminals of the La Pampilla Refinery, in Callao, Peru. The refinery is owned by the Spanish oil giant Repsol.

This environmental emergency has been described as the worst ecological disaster to affect Peru in its recent history, causing "serious damage to hundreds of fishing families" and "endangering the flora and fauna", according to the country's Ministry of Foreign Affairs. The situation was evolving negatively, and the spill was spreading rapidly, driven by ocean currents to the north.

On January 20, the Peruvian government requested technical support from the United Nations (UN) in three main areas: incident management and response coordination, rapid socio-environmental impact assessments, and technical advice to reduce the risk of future disasters due to oil spills in the ocean, including methodological and regulatory recommendations. The UNEP/OCHA Joint Environment Unit deployed a team of 12 experts on coordination of disasters and fuel spills at sea, which began to arrive in Lima as of January 22 for a three-week mission. On the same day, January 22, the Ministry of the Environment of Peru declared an environmental emergency for 90 days in the coastal area affected by the oil spill, recognizing the impact on the marine and coastal ecosystem of high biological diversity, livelihoods and a high public health risk.

Between January 23 and February 11, the mission carried out field visits and overflights to the affected area, held meetings with State authorities and specialists, civil society actors, people affected in the disaster area, and representatives and teams. After what, the main findings and recommendations related to the environmental impacts of the oil spill were presented to the Prime Minister of Peru on 11 February.

[Report](#) is available on ONU Peru.



Image of the oil spill in Peru, Municipality of Ventanilla. Photo by IAEA.