Environmental Emergency Response to the South Asia Earthquake

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

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Cover photo: IRIN News

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Foreword

The devastating earthquake of October 8, 2005 created an overwhelming disaster that affected millions of people in Pakistan.

One vital component of effective humanitarian response in such a disaster - or indeed any humanitarian catastrophe – is ensuring that serious environmental risks to human life and welfare are promptly identified, and steps taken to reduce them.

The Joint UNEP/OCHA Environment Unit (Joint Environment Unit) is the United Nations' mechanism to mobilize and coordinate the international response to environmental emergencies and natural disasters with major environmental impacts. On behalf of OCHA and UNEP, the Joint Environment Unit supported the emergency response in Pakistan by ensuring that rapid environmental assessments were completed quickly and that experts were mobilized to act upon the assessment findings. The experts provided practical advice, solutions, and technical support that responded effectively to the issues identified during the initial assessment. The Joint Environment Unit has also taken steps to ensure an effective link between these response phase efforts and subsequent recovery and rehabilitation activities.

These actions – initial assessment, action and follow-up - provide a useful model for effectively integrating environmental considerations into humanitarian response. This report describes these activities, and in doing so, contributes to future efforts for comprehensive and integrated humanitarian response.

The Joint Environment Unit's activities in Pakistan could not have been accomplished without the generous support of the Swiss and Swedish governments. We are grateful for their assistance.

Jan Egeland

United Nations Under-Secretary-General for Humanitarian Affairs and Emergency Relief Coordinator

Summary

On Saturday, October 8, 2005, at 8:50 local time, a massive earthquake measuring 7.6 on the Richter scale occurred in northern Pakistan. Tremors were felt over a vast area, with the epicentre situated close to Muzaffarabad, 95 km northeast of the Pakistani capital of Islamabad.

The Office for the Coordination of Humanitarian Affairs (OCHA) mobilized a first eight-member United Nations Disaster Assessment and Coordination (UNDAC) team to support assessment and coordination work, in response to a request made by the Government of Pakistan. The team arrived in Islamabad on the morning of October 9th, 2005. More UNDAC members were deployed in the days following the disaster.

The Joint UNEP/OCHA Environment Unit (Joint Environment Unit) ensured that the team included two UNDAC-trained environmental experts. They were tasked with conducting a rapid environmental assessment (REA) to assess any life-threatening environmental issues in the disaster area.

The REA identified a number of acute environmental issues, including waste management, slope instability, and threats to the natural resource base. To address these issues, the Joint Environment Unit deployed four experts to Pakistan to provide practical advice, solutions and technical support.

REA findings and the advice of the four experts were disseminated to national and international partners as they became available during the disaster response.

This report provides an overview of environmental aspects of the disaster response from the Joint Environment Unit's perspective. It focuses on the actions taken by the environmental experts who were deployed to respond to the issues identified in the REA, consolidates the advice and tools they developed, and provides initial lessons learned from the response activities. The objective of the report is to contribute to improving future environmental emergency response, by sharing in one document the experience, knowledge, and tools gained by the Joint Environment Unit.

I. Introduction

Background

Major disasters have acute, negative environmental impacts that can threaten human life and welfare. These impacts may include damage to industrial facilities such as chemical plants, acute waste management problems, and erosion and landslide risks. Major disasters may also result in environmental issues that are not life-threatening and therefore less urgent, but which are nonetheless important and require attention in the early recovery process – for example, damage to ecosystems. Diagram 1 illustrates a hierarchy of environmental issues in disaster situations.

The Joint UNEP/OCHA Environment Unit (Joint Environment Unit) is the United Nations mechanism to mobilize and coordinate the international response to environmental emergencies, including natural disasters with major environmental impacts. In situations such as the Pakistan disaster, the Joint Environment Unit has the primary functions of identifying any acute issues, mobilizing assistance to ensure that they are addressed, and helping to ensure appropriate transition and follow-up so that less urgent, longer-term issues can be addressed during the recovery and rehabilitation phases.

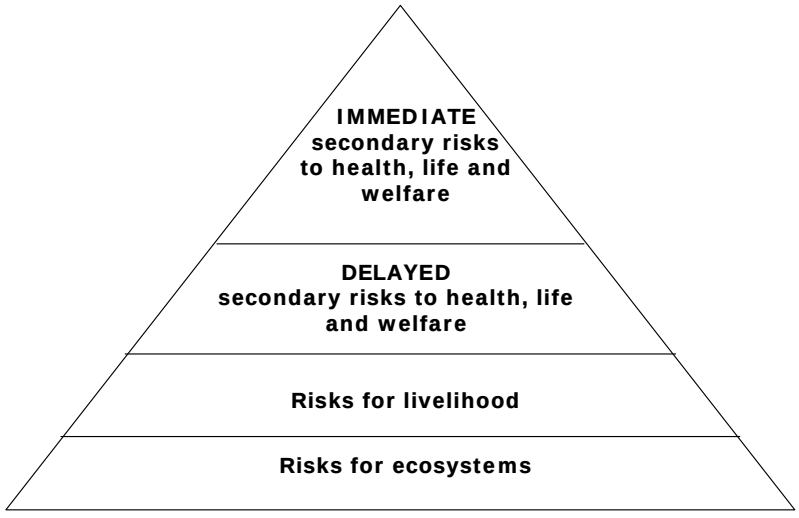


Diagram 1. A response hierarchy. The Joint Environment Unit addresses urgent, life-threatening issues at the top of the pyramid. Development agencies and UNEP are generally responsible for the medium-longer term risks depicted at the bottom of the pyramid *(Based on: Emergency response and environmental issues during the Indian Ocean tsunami-earthquake: initial lessons to learn (OCHA 2005).*

Context

South Asia Earthquake

On Saturday, October 8, 2005, at 8:50 local time, an earthquake measuring 7.6 on the Richter scale occurred in northern Pakistan. Its tremors were felt over a vast area, with the epicentre situated close to Muzaffarabad, 95 km northeast of the Pakistani capital of Islamabad.

The initial earthquake and subsequent aftershocks caused thousands of deaths and destruction of infrastructure, including medical facilities, government buildings and schools. Casualty numbers from February 2006 reported 73,338 people killed, 69,412 injured and 3.3 million homeless[1].

More than 70% cities and villages in the six northern provinces of Pakistan were destroyed and 30% were damaged by the earthquake and its aftershocks[2]. The cities of Muzaffarabad, Balakot and Bagh were particularly affected. Many roads and bridges were destroyed or severely damaged. The largest earthquake intensity was observed in the Kaghan, Neelum and Jhelum valleys, where landslides, rock-slides, rockfalls and debris flows were triggered. These blocked roads, and in some cases temporarily dammed rivers.

The Balakot area north of Muzaffarabad was clearly the worst hit region, with over 20,000 casualties, 90% of buildings destroyed and 100% of the population left homeless in the immediate aftermath[3]. In India, official reports confirmed the deaths of 1,307 persons in Indian-administered Kashmir, while 37,607 buildings collapsed[4]. Tremors were also felt in Afghanistan's Nangarhar and Jalabad provinces where some buildings collapsed[5].

Map 1: Pakistan. Source: National Geographic Society

Overview of the Joint Environment Unit response

The Office for the Coordination of Humanitarian Affairs (OCHA) mobilised an eight-member United Nations Disaster Assessment and Coordination (UNDAC) team[6] to support assessment and coordination work in response to a request made by the Government of Pakistan. The team arrived in Islamabad on the morning of October 9th, 2005. More UNDAC members were deployed in the days following the disaster.

The Joint Environment Unit ensured that the UNDAC team included two UNDAC-trained environmental experts. These experts were tasked with conducting a rapid environmental assessment (REA) to identify any life-threatening environmental issues and to recommend areas where additional support was required to mitigate risks and impacts.

The experts identified a number of acute environmental issues, prompting a decision by the Joint Environment Unit to deploy an additional four experts to respond to the concerns identified.

One of the major challenges during the relief phase was obtaining access to the worst affected areas in Pakistan's north: thousands of people were cut off in remote valleys as landslides destroyed roads or continue to block them. The combination of the enormous number of injured, the high altitude of the affected areas, the mountainous terrain, the almost complete destruction of infrastructure in an area covering 28,000 square kilometres and the rapidly deteriorating weather conditions as the Himalayan winter begins, made this situation "the toughest logistical challenge the aid community has faced to date", according to Jan Egeland, the United Nations Under-Secretary-General for Humanitarian Affairs[7].

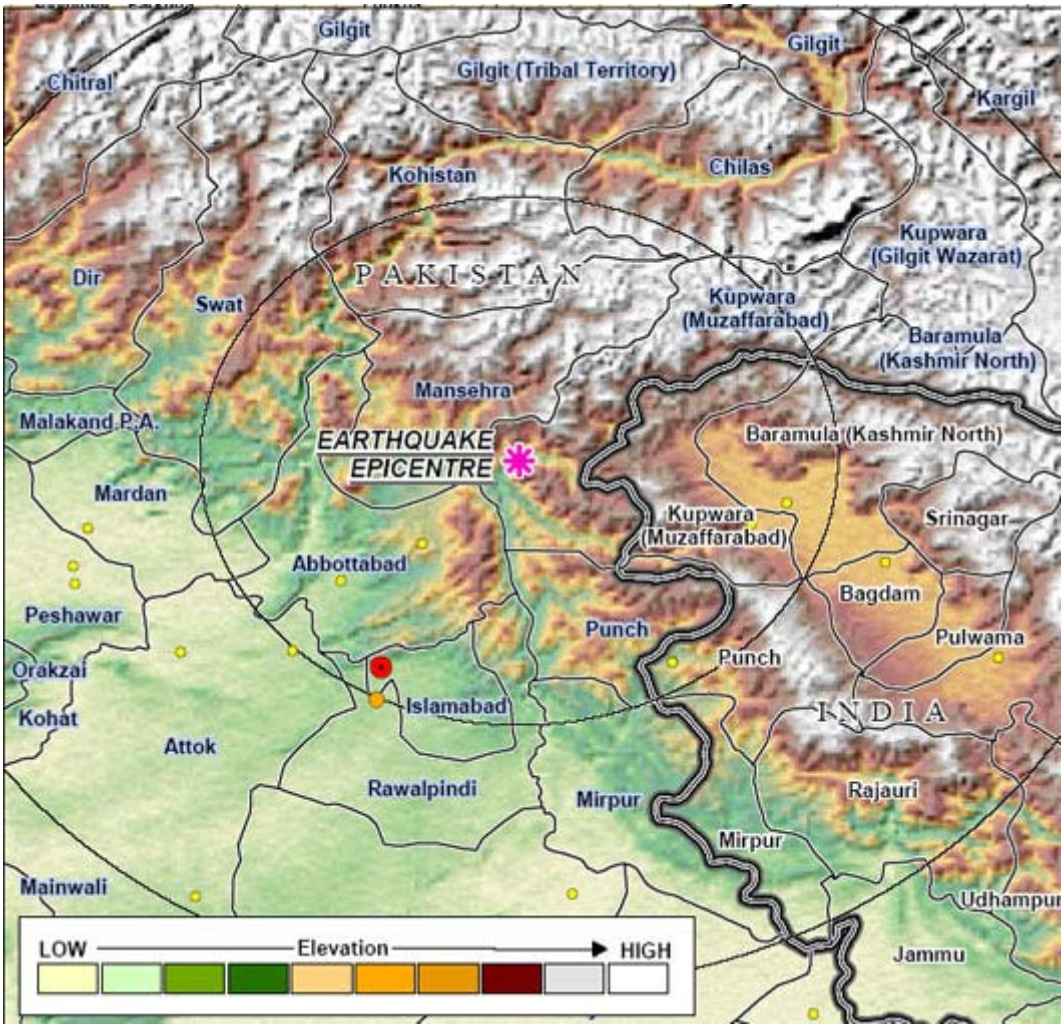
Consolidated report: objectives and scope

This report provides an overview of environmental aspects of the disaster response from the Joint Environment Unit's perspective. It focuses on the actions taken by the environmental experts who were deployed to respond to the issues identified in the REA, consolidates the advice and tools they developed, and provides initial lessons learned from the response activities. The objective of the report is to contribute to improving future environmental emergency response, by sharing in one document the experience, knowledge, and tools gained by the Joint Environment Unit. The information contained in this report – in particular the results of the REA and the technical advice, tools and guidelines developed by the environmental experts – was shared with international partners and in the field as it became available during the course of the response. The report does not provide comprehensive information on the activities of other organizations that were engaged in related activities, for example, CARE International and the World Wildlife Fund (WWF).

Pakistan: General Country Information

The Islamic Republic of Pakistan has a population of 161.1 million and covers a total land area of 796,095 sq km[8]. The country borders on Iran to the west, India to the southeast, Afghanistan to the northwest, and China to the north. Pakistan's northern highlands, the region particularly affected by the recent earthquake, is mountainous, rendering access difficult even under normal conditions. The region is also characterised by extreme variations in temperature.

Pakistan is highly prone to disasters, including floods, earthquakes, windstorms, fires and industrial accidents. According to the 2003 World Disasters Report, 6,037 people were killed and 8,989,631 directly affected by natural disasters in the decade between 1993 and 2002[9]. The 2005 earthquake is amongst the most devastating natural disasters in Pakistan's history[10].



Map 2. The earthquake epicenter in Pakistan. (source: World Food Programme)

II. The Environmental Emergency Response

Overview of the response

The environmental emergency response activities in Pakistan were undertaken in three phases, as illustrated in Diagram 2.

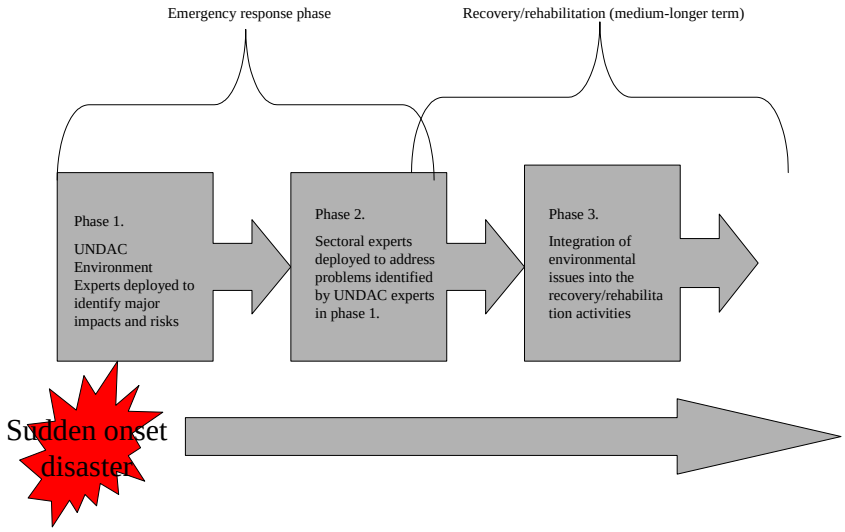


Diagram 2. Joint Environment Unit activities in Pakistan: phases of the response to an environmental emergency.

In Phase 1, the UNDAC team environmental experts were deployed to undertake an REA, to identify any acute environmental issues resulting from the earthquake. The findings from the REA were shared with international partners through OCHA situation reports and an update that was distributed by the Joint Environment Unit on November 8, 2005. The key findings of these experts are summarized in the section below.

In Phase 2, experts were deployed by the Joint Environment Unit to address the major problems identified in the REA. These activities are described below in *Section III: Activities to Address REA findings.*

Phase 3 involves medium to longer-term activities. The Joint Environment Unit undertakes wherever possible activities to ensure an effective transition to these. During the response to the South Asia Earthquake, the Joint Environment Unit:

- Supported the development of the Early Needs Recovery Assessment[11] by providing all information from the REA to the United Nations Environment Programme staff developing the environmental

aspects of the report, and ensuring that the environmental experts met with the these staff members following their missions;

- Supported the return of the slope instability expert to Pakistan in January 2006 to conduct additional activities to ensure an effective transition between response and recovery stages; and,

- Through the development of this report, aims to ensure more effective future efforts by consolidating and sharing the expert's findings.

Summary of key issues identified by the UNDAC team environmental experts in the REA

The following were identified as key issues during the rapid environmental assessment:

Waste Management and Debris

- *Healthcare Waste:* Emergency health treatment of many victims led to an overload of the already poor health care system. The UNDAC team environmental experts indicated that advice was needed to assist local authorities and international organizations to ensure proper disposal of healthcare items and prevent disease, for example through contamination of water and dermal contact or puncture from used syringes and sharps.

- *Shelters/Camps:* With thousands of earthquake survivors crowding into camps, the UNDAC team environmental experts believed that a lack of proper sanitation facilities posed a serious health risk and challenge. They recommended that guidance on improved waste management be provided on an urgent basis in both spontaneous and organized settlements. They also recommended wastewater treatment to avoid waterborne epidemics.

- *Debris:* The earthquake generated a vast amount of debris that required urgent temporary storage. Site selection and separation of wastes were issues that the environmental experts believed needed to be addressed at the earliest possible stage.

Potential Secondary Risks from Industrial Facilities/Sources

- The UNDAC team experts investigated a number of industrial issues to determine whether there were any serious risks, including the gas pipeline from Islamabad to Mansehra; oil and gas fields; water storage dams; small industrial installations; pesticide/fertilizer storage facilities; sites containing asbestos; and, transformer stations. None of these were found to present serious life-threatening risks. The experts recommended follow up assessment of fuel storage tanks at petrol stations and possible contamination from PCBs (polychlorinated biphenyls) in transformers, both of which were also subsequently found not to present life-threatening risks.

Natural Hazards and Threats to Natural Resources

- *Landslides:* Slides had blocked roads, cutting off settlements and creating dangerous travelling conditions. They also blocked and dammed many rivers and possibly tributaries, which the UNDAC team experts believed could lead to flooding. Assessment was required to determine the location and possible stabilization of landslide areas.

- *Deforestation, Erosion and Reduced Soil Fertility:* Immediate needs for timber for reconstruction will soon lead to serious deforestation, increasing the risk of soil erosion and potential landslides if measures are not taken. As well, energy efficient stoves and other alternative energy resources should be distributed to people in the region to reduce the pressure on forest resources.

Debris being dumped in the earthquake aftermath (photo: L. Jönsson)

III. Activities to address REA findings

Overview

The Joint Environment Unit deployed experts to Pakistan in late October and early November 2005 to address the findings and recommendations from the REA. The experts were requested to work through the cluster approach (see Box 1) to undertake activities and provide technical support to reduce risks identified in the REA.

Two experts were deployed to address waste management issues, one to address issues related to slope instability and landslide risks, and a fourth for issues related to natural resources.

Activity 1: Waste management

The REA identified serious concerns regarding a general lack of proper waste management in the affected region, particularly in the growing number of temporary settlements. The fact that solid waste management was either poor or absent and health care waste was not being safely disposed of, created a threat to human health and welfare in these settlements.

Mr. Jürg Zaugg was seconded by the Swiss Agency for Development & Cooperation (SDC), and Mr. Leif Jönsson was seconded by Swedish Rescue Services Agency (SRSA), and deployed through the Joint Environment Unit to address these issues.

The experts' field work involved the provision of assistance to improve waste management practices in densely populated zones (urban areas and relief camps), proper disposal of healthcare waste, and the removal and clearing of debris (e.g. concrete, bricks, steel, glass and plastic) from collapsed structures, as described below.

Box 1. The Cluster Approach

The Cluster approach was a key recommendation of the July 2005 Humanitarian Response Review (HRR).

The clusters create a single framework for coordination in bringing together a variety of different actors, including international governmental organizations, national and international non-governmental organizations, government and the military, for regular coordination meetings.

It was implemented during the response to the South Asia Earthquake in Pakistan for the first time. The UNDAC team, together with the Humanitarian Coordinator and the UN Country Team established a set of ten Clusters, covering the main relief work, in Islamabad. Clusters of particular relevance to the environmental experts included health, water/sanitation, and early recovery and reconstruction.

Subsequently, field cluster sites were established in each of the main UN field presences, i.e. Muzaffarabad, Bagh, Batagram and Mansehra, and were called *Humanitarian Hubs*.

During their mission, the waste management experts made field visits to four Humanitarian Hubs in the affected area: Muzaffarabad, Mansehra, Balakot and Bagh. Generally, they provided advice in Water and Sanitation cluster meetings and collaborated closely with governmental and military authorities,

and conducted additional assessments of the waste management situation where needed. They met with NGOs and other foreign relief agencies to assist and support the local governments in the affected area in solid waste management issues. Finally, the experts concluded their mission with debriefings conducted at the Ministry of Environment and at the UNDAC Emergency Response Centre in Islamabad. They also briefed UNEP and provided input for the Early Recovery Needs Assessment as noted above.

Solid Waste Management

The experts' field visits to relief camps in the four Hub areas revealed solid waste management practices ranging from no management at all to established collection and transport. Final disposal of waste remained a widespread problem.

There are numerous options for disposal, the minimum requirements being disposal without open burning and at safe distances from residential areas and water bodies. However, access to suitable land areas for disposal sites is often difficult in disasters. Other issues that required attention in Pakistan were the lack of:

● An appropriate physical disposal system (e.g., bins and containers)
● Transport vehicles and machinery for excavation and waste compacting
● Good access roads to disposal sites
● Education among camp residents in proper hygiene and waste disposal practices.

To address this situation the experts undertook activities in the following areas:

- **Creation of waste management guidelines.** The experts developed both waste management guidelines, and "Do's and Don'ts" waste management documents. These targeted waste management in relief camps with a separate appendix for sanitary (controlled) landfill operations. The experts also drafted a power point presentation for debris handling considerations. These guidelines are provided in the annex to this report.

- **Improvement of solid waste collection and disposal.** The experts provided information on this issue in discussions with UNICEF, WHO and local authorities. These meetings led to improved waste collection and disposal in both Muzaffarabad and Mansehra, two major centres in the affected region.

Health Care Waste

Visits to emergency health care facilities at the four Hub areas revealed that health care waste management ranged from almost none, to levels fully in line with the recommendations and guidelines issued by the World Health Organization (WHO). The Federal Government of Pakistan had issued regulations on health care waste management but these were not followed at District Hospitals in the affected areas that were visited by the waste management experts.

Children exposed to health care waste on the street in Mansehra (photo: R. Nijenhuis)

This situation posed serious health risks to staff and patients at these facilities due to both non-segregation of infectious and non-infectious waste, and a lack of adequate internal collection, transport and storage of solid waste inside the health care facilities.

The waste management experts also observed that there was no adequate external collection, transport and disposal of health care waste. This posed health risks to the public and waste management staff, and created risks of environmental impacts. Dangers include re-use of infectious sharps and needles, accidental exposure to infectious materials and contamination of surface groundwater.

To address this situation the experts undertook activities in the following areas:

- **Creation of health care waste guidelines.** The experts, in consultation with the WHO in Muzaffarabad and the Joint Environment Unit, developed guidelines for minimum requirements for the management of health care waste. Guidelines were distributed to health care facilities through visits, emails and on-line at the Humanitarian Information Centre (Islamabad) website. They were supplemented by a paper, “Do’s and Don’ts for Health Care Waste”[12]. These documents are provided in the annex to this report.

- **Specific interventions.** The waste management experts noted the absence of adequate health care waste management at several health care facilities in the region and brought the issue to the attention of the Water and Sanitation cluster group as well as WHO, UNICEF and local

government authorities. In Muzaffarabad, the Municipal Authority received support from UNICEF and WHO to strengthen waste management, including health care waste. In Mansehra, an MOU was developed, stating that Municipal Authority would take on responsibilities for health care waste following the guidelines developed by the waste management experts.

- **Debris Handling**. The handling of huge amounts of debris involves issues ranging from estimates of debris volumes, to legal issues around property rights and building codes. The waste management experts provided some guidance in this area, but did not undertake a comprehensive debris management assessment or activities.

- **Polychlorinated Biphenyls (PCBs) in Transformers.** Following some research, the experts concluded that most transformers in the affected areas are free of PCB oils and that there is no immediate risk from this source.

Table 1: Summary of recommendations made by the waste management experts.

Recommendation	Details
Implementation of Waste Management Guidelines	This would raise and standardize the level of waste management in the affected region, protect public health and environment in the relief phase and could lead to further improvements in during the reconstruction phase.
Clear Responsibility Needed for Waste Management in Camps	Camp managers should be trained and advised on how to organize waste management. Responsibility for collection, transport and disposal of solid waste from the camps should be made very clear, and, where possible, delegated to the local or regional government. The capacity of the local government should be assessed and supplemented where required to ensure a sufficient level of service.
Health Care Waste Management	Financial support for upgrading collection, transport and disposal of health care waste must be supplemented by staff training, and designation of responsibilities for each step in the chain from generation of waste to final disposal.
Health Care Waste Incinerators	The total number of incinerators should be increased.

Provide Guidelines for Restoring Infrastructure in Early Relief Phase	Future UN Relief operations should establish procedures, or guidelines, on how to restore infrastructure capacity earlier in the relief phase. Effective solid waste management relies on infrastructure and logistics to ensure that waste can be collected, transported and disposed in a way that safeguards human health and the external environment.

Activity 2: Slope instability and landslide risks

The REA identified risks from slope instability and landslides. As a result, Dr. Jean F. Schneider, an expert in geology, was deployed to Pakistan by the Swiss Agency for Development through the Joint Environment Unit to provide technical advice and support to reduce risks to communities and humanitarian workers in the region.

During this mission, the expert visited Muzaffarabad, and the three valleys most affected by the earthquake, Neelum, Kaghan and Jhelum. He was accompanied by two geologists from the Pakistan Geological Survey, two engineers of the Muzaffarabad Highway Department and several officers of the Pakistan Military Corps of Engineers. Generally, the expert provided technical advice and briefings to a wide range of local, regional and national authorities as well as to international organizations and NGOs operating in the region.

More specifically, the expert undertook activities in the following areas to reduce risks:

- **Emergency road clearing.** Technical advice and assistance was provided to the Pakistani Military on conducting emergency road clearing and excavations and reinforcing unstable slopes and damaged bridges. This advice proved essential in reducing the number of accidents affecting road-clearing crews, convoys and relief workers.

- **Advice on earthquake effects and reconstruction.** Presentations were made to UN, ICRC, and Pakistani military audiences in Muzaffarabad and Balakot to explain the cause of the earthquake and its effects. The expert provided advice on sites to rebuild settlements and his perspective on the likelihood and locations of future earthquakes. The expert advised that many slopes remain unstable and may pose ongoing threats to the population and infrastructure, especially as aftershocks still occur. He noted that the infiltration of rainfall and snowmelt in spring could lead to further risk of slides. It was also noted that related degradation of agricultural land and pastures may contribute to long-term vulnerability of rural communities, as the subsistence farmers living in the region will suffer the loss of grazing pastures for their goats and sheep.

- **Advice on housing.** Advice was provided on the likelihood of another earthquake occurring somewhere southeast of the epicenter within the next century. The expert recommended a safer and sustainable housing style with a light roof for reconstruction. He noted an abundance of clay in the region that could be processed to create a lighter housing insulation. He emphasized that another reason for the collapse of buildings and infrastructure during earthquakes is the undercutting and over-steepening of slopes without reinforcement.

- **Development of maps.** Assistance was provided to the Pakistani military in the creation of a map of known landslides in affected areas, noting sites where measures to mitigate future slides could be undertaken.

- **Advice regarding dams and floods from landslide***.* The expert identified the natural dam created by the "Dana Slide" near the village of Hattian (the "Hattian dam") as a particular concern. The Dana Slide completely buried the small village of Dandbeh, covering an area of nearly two square kilometres. The expert expressed concern that the spring snow-melt may cause this natural dam to burst and lead to a flood wave downstream that could endanger settlements on the riverbanks. Accordingly, the following were initiated:

    - Topographical survey of slide and catchments area, as well as downstream to Hattian Village in the Jhelum Valley, including possible access road to dam,
    - Detailed geological survey of the area, scale 1:10’000, with special emphasis on cracks and mass movements, as well as loose soil downstream to Hattian,
    - Surface sampling and coring in deep drill-holes for geotechnical properties of slide mass, laboratory analysis and experiments of samples,
    - Hydrological, hydrogeological and meteorological survey in catchments area, as well as the observation of possible seepage through the dam,
    - Observation and measurement of possible movements on cracks and sliding planes, observation of dam instabilities,
    - Modeling of possible flood waves induced by slides into the lakes; and,
    - Modeling of possible debris flows downstream to assist in the development of evacuation plans.

Table 2: Summary of recommendations made by the slope instability and landslide expert.

Recommendation	Details
State of Road Clearance and Reconstruction Needs to be Regularly Assessed	The progress of road clearance reports does not indicate how unsafe these road are, only that they are passable by some vehicles. In the Neelum and Kaghan Valleys, road clearance needs to be assessed regularly, since the conditions of the roads change daily, especially during the rainy season. The fractures in the hill slopes caused by the earthquake have yet to react to the first rains, which are likely to cause substantial landslides.
Hattian Dam: Measures Must Be Taken to Reduce Risk of Flooding	The following mitigation measures were planned or discussed to lower the risk of a flood at the Hattian Dam: ● As a first measure, an access road to the natural dam needs to be built during the winter, ● Preliminary evacuation plans of vulnerable areas, dwellings and infrastructure downstream as well as the flooding area upstream need to be determined, and appropriate measures taken, ● Observation and measurement of possible movements on cracks and sliding planes, observation of dam instabilities should be continued, ● Seepage or piping needs to be closely observed and should be avoided, if possible to avoid the hazard of inner erosion (suffusion), ● Overflow at the natural spillway of the large lake at the foot of the slope needs to be avoided, if necessary by pumping and/or siphoning. ● An artificial spillway over the central dam apart from (East of) the foot of the slope, reinforced by gabions is necessary for the mid-term stability of the dam These mitigation measures need to be in place during the first quarter of 2006 before a large snowmelt.

Activity 3: Natural resources issues

The harsh conditions of the Himalayan winter required a rapid supply of shelter and basic needs for isolated victims at high altitudes. Firewood for heating and cooking and poles and timber for shelter and house reconstruction were required for millions of people affected by the earthquake.

The REA found that rapid deforestation, coupled with overgrazing, which is also a problem in the region, could increase risks of soil erosion and thus the potential for landslides. Moreover, rapid resource depletion could create longer-term livelihood and sustainability problems. In response, Dr. Urs Bloesch, a natural resources expert, was seconded by the Swiss Government and deployed through the Joint Environment Unit to Pakistan.

The expert assessed the state of the natural resources in the disaster area in collaboration with Pakistan's Ministry of Environment (MoE). Rapid natural resource assessments were carried out in the disaster area of North West Frontier Province (NWFP) and of Pakistan-administered Kashmir. As natural resources are a crosscutting issue, the expert took part in the meetings of three different cluster groups: Emergency Shelter, Early Recovery & Reconstruction and Camp Management. He held meetings in the field and in Islamabad with representatives of MOE, local authorities, UN organisations, donors and international and national NGOs. Informal interviews with affected people were also conducted in the field.

The expert visited most of the main affected districts of NWFP, namely Shangla, Batagram and Mansehra and of Pakistan-administered Kashmir, namely Muzzafarabad and Bagh. The districts of Kohistan (NWFP) and Poonch (Pakistan-administered Kashmir) could not be visited due to time constraints.

From assessments made on these field visits, the mission produced immediate mitigation measures that will be integrated in the ongoing relief operation to promote the sustainable use of the scarce natural resources. The expert concluded that there are key environmental problems resulting from direct and indirect impacts of the earthquake on the natural resources. Preliminary findings of the mission were included in the Early Recovery Needs Assessment, presented at the international donor conference in Islamabad on 19 November 2005.

The findings and recommendations of this expert mission (see Table 3) were discussed with representatives of MoE, the Emergency Shelter and Camp Management Clusters, the Forest Service, and other organisations. The expert participated in an in-depth discussion and analysis of the mission's conclusions as part of an exhaustive technical debriefing held for MoE with the participation of other UN organisations, as well as international and national NGOs.

Table 3: Summary of recommendations made by the natural resources expert.

Recommendation	Details
Shelter Kits should include fuel-efficient stoves	The emergency shelter cluster was advised to include fuel-efficient stoves (for firewood) in the ongoing distribution of shelter kits. This will help to reduce the energy demand on forest resources.
Site Selection for Relief Camps	Site selection (e.g. to avoid risk of flash floods, steep slopes) and camp management (e.g. latrines, waste management, protection of vegetation cover) should follow UNHCR environmental guidelines.
Energy Needs in Relief Camps: Focus on Local Solutions	Local solutions should be identified to supply people in relief camps with the appropriate energy (e.g. LPG, kerosene, or electricity) and stove type. Local solutions would consider site characteristics and the availability of energy. As an example, where feasible and culturally acceptable, multi-family cooking should constantly be encouraged.
Housing Design Must be Safer and Sustainable	*Sustainable Timber Management:* An emphasis should be placed on the reuse of wood from demolished buildings. The local administration should conduct assessments of the intact beams before issuing permits to harvest new timber. A possible lift of the ban on cutting green trees only for the affected areas and the respective consequences should be analysed carefully by the MOE in order to avoid large uncontrolled cutting.
	Safer and Sustainable Construction: The Early Recovery and Reconstruction cluster should promote a house type that is earthquake-resistant. It should have light roofs (e.g. galvanised iron sheets plus an additional insulation layer) and light walls (e.g. aerated bricks). This type uses less wood than the traditional *Kacha* house and should have a high thermal efficiency.

Infrastructure Rehabilitation & Improved Land Use Planning	*Satellite Data Required:* Satellite data must be gathered to facilitate infrastructure rehabilitation and future land-use planning. This activity was recommended by the expert as part of the Early Recovery Needs Assessment. He suggested that the World Wildlife Fund may have a well equipped GIS lab and the experience to carry out this activity.
	*Damage to Ecosystems Must Be Assessed**:*** This is particularly important regarding the impact of the earthquake on ecosystems of high conservation value like the Ayubia National Park and Palas Valley (both NWFP) and Machiara National Park (Pakistan-Administered Kashmir).
Take Steps to Prevent Further Erosion and Landslides	Loose soil from landslides and earth slips should be further stabilised with different mechanical soil conservation works (drainage channels, check dams, retaining walls, plugging gullies, gabion spurs, etc.) and by re-vegetation of the bare soil. Natural regeneration should be used as far as possible. Plantation and direct sowing of trees, shrubs and pasture herbs and grasses will further enhance the re-vegetation process of the bare soil. A community-based approach should be followed such as the one currently applied by the Tarbela Watershed Management Project in NWFP.

IV. Initial lessons from the relief effort

The following is a summary of issues that should be considered to improve future responses to natural disasters with major environmental impacts. It is based on debriefing discussions held in Geneva between the Joint Environment Unit, the UNDAC team environmental experts, and the four experts deployed to address REA findings.

Overall response timing and sequencing was effective. In the response to this disaster, the Joint Environment Unit ensured that environmental experts were almost immediately 'on the ground' to conduct a REA. Moreover, within days of issues being identified through the REA, additional experts were deployed, not merely to conduct additional assessments, but to provide practical advice and solutions. This sequencing should certainly be an objective wherever applicable.

An initial orientation in the capital is essential. It is important to make good contact with national authorities and key officials at the start of a mission. The waste management and natural resources experts in particular found the contact through the Ministry of Environment and the Environmental Protection Agency helpful in the initial orientation in Islamabad. **T**he Joint Environment Unit should continue to ensure that an initial stay in the capital city is scheduled, and that good contacts are established in relevant Ministries in the affected country before experts arrive.

Local cooperation and participation is needed. Cooperation with local authorities and locally employed relief workers is important to ensure understanding and ownership of environmental issues and facilitate a more effective transition from relief response to reconstruction. In future missions, the Joint Environment Unit should continue to ensure local involvement and maintain communication lines with local experts following the end of the relief phase.

Staffing capacity on missions. The environmental experts on the UNDAC team found it difficult to undertake their activities alongside normal humanitarian duties due to the large workload. There is no simple solution to this issue. However, the Joint Environment Unit in collaboration with the Dutch Institute for Health and the Environment (RIVM) is developing a new rapid environmental assessment methodology that should streamline assessment activities to reduce the burden on environmental experts.

Create and distribute guidelines in initial stages of deployment. UNDAC team members and environmental experts should receive additional guidelines for conducting environmental assessments and interventions, before their deployment. The Joint Environment Unit should therefore consolidate guidelines to correspond to key field areas such as waste disposal, health care waste, natural resources use, animal carcass disposal, and ensure that these are distributed at the start of each mission, as required.

The waste management guidelines and “do’s and don’ts” documents developed by the waste management experts were very well received. They should be further developed and made available on the Joint Environment Unit’s website to ensure wide distribution. In future disaster situations they should be distributed at the UNDAC team deployment stage.

Improved Integration of Environmental Issues into the cluster structure
The experts observed that environmental issues, due to their cross-cutting nature, do not always fit readily in the cluster structure. It can be difficult, therefore, to ensure that environmental issues are efficiently addressed. As an example, the natural resource expert had difficulties identifying which cluster should address fuel usage. One step could be to ensure that an environmental expert is present at all cluster meetings to make sure that environmental issues are addressed. The Joint Environment Unit should also clarify which cluster should address fuel usage (please see Box 1, page 13 for more information on the cluster approach).

Provide Standard Pre-Deployment Briefing Material and Checklist
Standardized briefing packages for experts should be developed. This material should clearly emphasize the distinction and links between response and recovery activities and include an overview of country level hazards (e.g. industrial facilities.) The Joint Unit should increase pre-mission data mining and provide concise background information to experts before and during deployment.

Create a standard assessment methodology. The experts emphasized the importance of an initial assessment of life-threatening, acute issues following a disaster. A stronger methodology to facilitate this is required. As noted above, the Joint Environment Unit is collaborating with RIVM to create this.

Continuity between response and recovery phases is crucial. The experts expressed concern over what happens to the recommendations of the environmental experts after their missions. The Joint Environment Unit should continue to coordinate with governments and stakeholders to ensure that issues are addressed. To facilitate this, recommendations by experts should be written as precisely as possible, and where possible, in the form of activity or project proposals. Experts should also describe the specific nature, location or severity of specific problems in their reports. The experts’ support for and inputs into the Early Recovery Needs Assessment was identified as a positive action that should be replicated where applicable.

Post-disaster debriefing should be a regular step. The experts found the post-disaster debriefing process with the Joint Environment Unit to be useful. It was suggested that this type of debriefing be extended to include an annual meeting of environmental experts to share ideas and discuss further improvements and future directions in environmental emergency response. The Joint Unit should consider arranging regular debriefing sessions with environmental experts and discuss with partners options for organizing an annual meeting of environmental experts.

ANNEX 1

Note: The following guidelines were developed by the waste management experts and shared in the field.

Guidelines I

Minimum Requirements for Health Care Waste Management in affected area, South Asia – Earthquake, Pakistan

Prepared by
Jürg Zaugg & Leif Jonsson, deployed by the Joint UNEP/OCHA Environment Unit (Joint Unit)
in liaison with Dr. Shibib and Dr. Imran Mukhtar, WHO office at Muzaffarabad Humanitarian Hub
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Introduction

Infectious and Hazardous Health Care Waste constitute severe risks for both patients; health care staff and the general public if not handled with precautions and with separate treatment to disinfect and seal off the waste.

Minimum requirements have been developed for the safe collection, transport and disposal of Health Care Waste adapted to the limited resources available for the affected area during the relief period. Preferably, where more resources are available, Health Care Waste should be managed in accordance with the principles and methods described in the following publications:

WHO – Management of solid health-care waste at primary health-care centres: A decision-making guide. Available on:
http://www.who.int/water_sanitation_health/medicalwaste/hcwdmguide/en/index.html

The Secretariat of the Basel Convention - Technical Guidelines on the Environmentally Sound Management of Biomedical and Healthcare Wastes Available on:
http://www.healthcarewaste.org/en/documents.html?id=196

WHO - Assessment of small-scale incinerators for healthcare waste. Available on:
http://www.who.int/water_sanitation_health/medicalwaste/smallincinerators/en/index.html
WHO - Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies. Available on:

http://www.who.int/water_sanitation_health/medicalwaste/pharmaceuticals/en/index.html

WHO - The Healthcare waste management rapid assessment tool
http://www.who.int/water_sanitation_health/medicalwaste/hcwmtool/en/index.html

The WHO Healthcare Waste Website provides other general information on handling of healthcare waste. Available on:
http://www.healthcarewaste.com

Acronyms, Definitions and Explanations

Health care Facility	Hospital, Primary Health Care Centre, Clinic etc. that provides Health Care
Medical Waste or Health Care Waste (HCW)	Total waste stream from a health care facility that includes both potential infectious waste and non-infectious waste materials.
HCW	Health Care Waste
Infectious waste	*Infectious sharps:* syringe or other needles, blades, infusion sets, broken glass or other items that can cause direct injury *Infectious non-sharps* include materials that have been in contact with human blood, or its derivatives,bandages, swabs or items soaked with blood, isolation wastes from highly infectious patients (including food residues), used and obsolete vaccine vials, bedding and other contaminated materials infected with human pathogens. Human excreta from patients are also included in this category.
Non-Infectious waste	Include materials that have not been in contact with patients such as paper and plastic packaging, metal, glass or other wastes which are similar to household wastes.
Surface water	Any open water body like streams, rivers, lakes, ponds etc.

ANNEX 2

Health Care Waste Management Matrix

Relief Objective: Safeguard the public for Infectious diseases and epidemic outbreaks

Problem: Waste from Health Care Facilities not handled in a safe way

Immediate Objective: Implement minimum requirements for a safe Health Care Waste Disposal

Healthcare Waste Intervention Logic	Action	Field requirements	Equipment	Personnel	Risks (Environment/ health)	Budget require-ments
1. Source						
1.1.Inventory on the waste situation at the Health Care Unit	Carry out an inventory on types, amounts and handling of HCW		Transport vehicle	Officer with knowledge on environmental health/ hygiene	Exposure to: infectious waste; sharp and abrasive waste; environmentally hazardous waste	
1.2.Information on Medical Waste	Oral and written info on the need of waste segregation at source, how the segregation is organized and the occupational health risks involved		PC + printer paper for prints	1 designated waste management/ hygiene officer		

Healthcare Waste Intervention Logic	Action	Field requirements	Equipment	Personnel	Risks (Environment/ health)	Budget require-ments
1.3.Internal Collection	Organize waste segregation at every department that produces healthcare waste. Organize collection points with waste containers for non-hazardous HCW waste and a central, confined collection point for infectious/ hazardous HCW.	Fenced-off or confined area for central collection point for infectious/ hazardous Waste. Other collection points centrally located and accessible for collection vehicle.	Plastic bags in different colours. Puncture-proof containers for sharps and needles (preferable). Waste containers (closed) for infectious waste (min.1) and non-hazardous waste	Same as 1.2 .	Exposure to: Infectious waste, sharp & abrasive waste, environmentally hazardous waste	
2. Collection and Transport						
2.1 Training	Training of staff involved in collection and transport.		Printed set of instructions.	1 designated waste management/ hygiene officer.		
2.2. External collection and transport	Regular schedule for collection of infectious/ hazardous HCW.	Free access for the collection vehicle.	Transport vehicle with sheltered upload (net for covering the plastic bags). Protecting devices for the workers (gloves, masks, shoes, goggles).	Driver and 1 staff member.	Exposure to: Infectious waste, sharp & abrasive waste, environmentally hazardous waste.	

Healthxare Waste Intervention Logic	Action	Field requirements	Equipment	Personnel	Risks (Environment/ health)	Budget require-ments
3. Treatment & Disposal						
3.1. Site preparation	Fence off the area. Open up a pit by dozer (1.2 x 2.0 m, min. 1.5 m deep).	Fenced estate, plain ground on dry land. Accessible by truck. No habitants and no settlements adjacent to the site or close by in main wind direction. Ground Water Table min 5 m below ground surface. Distance to surface water min 50m.	Bulldozer or front-end loader for excavation. Fence and gate. Open steel drum cut off at the middle.	Operator for dozer/front-end loader. Fencing personnel.	Contamination of ground water and surface water. Air pollution	
3.2 Training	Training of staff responsible for treatment and disposal.		Printed set of instructions.	1 designated waste management/ hygiene officer		
3.3 Treatment	Batch-wise disinfection and reduction of size of infectious HCW by drum incineration in pit.		Container or shed for tools and diesel cans Diesel or Kerosene.	Operator of treatment/ closure	Contamination of ground water and surface water. Air pollution	
3.4. Closure	Cover and final closure of incinerated HCW. Site clearly identified on physical map distributed to governmental physical planning office.	Inert filling material/ top soil. Maps.	Bulldozer/Front-end Loader	Operator of treatment/ closure	Contamination of ground water and surface water.	

ANNEX 3

Minimum Requirements for Camp Waste Management in affected area, South Asia – Earthquake, Pakistan

Prepared by
Jürg Zaugg and Leif Jonsson, deployed by the Joint UNEP/OCHA Environment Unit

Introduction

Household Waste inside camps (partially mixed up with medical waste) constitute severe risks for all - families inside camps, surrounding residential areas, camp management staff and the general public - if not handled with precautions and with a separate disposal outside camps and densely populated areas.

Minimum requirements for the handling of Solid Waste from Relief Camps have therefore been developed.

The preferred final destination for the waste is either recycling and reuse, controlled incineration or a controlled (sanitary) landfill. In a relief situation, where resources are limited and constrained, other solutions also might have to apply.

Useful links:

http://w3.whosea.org/LinkFiles/List_of_Guidelines_for_Health_Emergency_Solid_waste_management_in_emergencies.pdf

Acronyms, definitions & explanations

Domestic Waste or Household Waste	Normal solid waste from activities in daily life - packaging, food, used paper, plastic etc. This waste may contain smaller quantities of hazardous waste and waste similar to health care waste.
Medical Waste or Health Care Waste (HCW)	Total waste stream from a health care facility that includes both potential infectious waste and non-infectious waste materials.
Hazardous waste	Waste that can have a hazardous impact on environment and health like oil, solvents, acids, heavy metals, non-biodegradable substances etc.
Sanitary or controlled landfill	
Ground Water Table	Water freely available underground. Roughly the level of the water in a well.
Surface water	Any open water body like streams, rivers, lakes, ponds etc.

ANNEX 4

Waste Management Matrix

Relief Objective: Safeguard the public for unhealthy living conditions, infectious diseases and epidemic outbreaks

Problem: Waste from Relief Camps not handled in a safe way

Immediate Objective: Implement minimum requirements for an acceptable waste management at Relief Camps

Waste Intervention Logic	Action	Field requirements	Equipment	Personnel	Risks (Environment/ health)	Budget require-ments
1. Source						
1.1.Training/ Education of camp people	Training/ awareness on health and waste management	-	-	1 trainer	-	
1.2. Families /tents	Collect waste from bins to collection point	Internal organisation for cleaning and transport of (waste) bins to waste collection point	Bins (approxiamtely 1-2 for 6 tents)	Approximately 1-2 for 20 tents	Exposure to foul smells, flies, rodents, unhealthy conditions, infectious diseases and epidemic outbreaks.	
1.3. Collection point(s) for the waste	Manage the collection point and keep it in good order	Separated place (at the perimeter of the camp) accessible for collection vehicle	Fence or wall – alternatively a container – where waste is stored. Minimum tools: shovel, broom, cart. Best option: transport skip	1 responsible person (pretrained), auxiliary personnel	Exposure to foul smells, flies, rodents, unhealthy conditions, infectious diseases and epidemic outbreaks.	

Waste Intervention Logic	Action	Field requirements	Equipment	Personnel	Risks (Environment/ health)	Budget require-ments
2. Collection & Transport						
2.1 Training	Training of staff involved in collection and transport.		Printed set of instructions	1 designated waste management/ hygiene officer		
2.2. External collection & transport	Regular schedule for collection of waste.	Free access for the collection vehicle.	Transport vehicle with covered transport compartment. (net for covering the plastic bags). Best option: Vehicle for skips. Personal protection: devices for the workers (gloves, masks, shoes, goggles).	Driver + 1 staff per vehicle	Exposure to: normal waste containing infectious waste, sharp and abrasive waste, environmentally hazardous waste.	
2.3. Access road to disposal site	Preplanning of number of expected transports.	If necessary, road improvement.		Waste manager	Traffic jam, breakdown of collection system.	
	If necessary: construction work, foundation engineering works.	Given by landscape	Engineering team	-	-	

HCW Intervention Logic	Action	Field requirements	Equipment	Personnel	Risks (Environment/ health/others)	Budget require-ments
3. Treatment & Disposal						
3.1. Site preparation	Prepare the site for disposal. If possible: fence off the area	Plain ground on dry land. Inclination < 10 %. Accessible by truck. No habitants and no settlements adjacent to the site or close by in main wind direction. Ground Water Table min 5 m below ground surface. Distance to surface water min 100 m.	Bulldozer or front-end loader for excavation and disposal in layers. Clay layer for barrier at the bottom of the landfill. Layer height 0.50 m; pipes for leachate collection (armored pipes). Option: Vent pipes for collection of landfill gas from decomposition of waste. Fence and gate. Office and restroom for staff.	Operator for dozer/front-end loader. Auxiliary personnel, fencing personnel.	Contamination of ground water and surface water. Air pollution	
3.2 Training	Training of staff responsible for treatment and disposal.	Training room, classroom, office equipment.	Printed set of instructions. Practical course (if possible licensed driver for dozer and compactor).	1 designated - waste management officer. Operator for dozer/front-end loader. Auxiliary personnel		
HCW	**Action**	**Field requirements**	**Equipment**	**Personnel**	**Risks**	**Budget**

Intervention Logic					(Environment/ health/others)	require-ments
3.3 Disposal	Bring in the collected waste and build up layers. Compact the layers by dozer. If possible: use with special compactor. During holidays, weekend etc. the landfill has to be covered by a thin layer of gravel or soil (recycled gravel from debris, or topsoil, or other reused sand).		Bulldozer or front-end loader. Option: landfill compactor, container or shed for tools and diesel cans.	Operator of dozer responsible of sanitary landfill closure. If possible, access to water net (if not, water tank).	Contamination of ground water and surface water. Air pollution by spontaneous fire, air poll. In the neighborhoods by “wind shipping”.	
3.4. Closure	Cover and final closure of the layers of waste.	Inert filling material/ clay layer and then topsoil.	Bulldozer/front-end. Loader/compactor.	Operator of treatment/ closure.	Contamination of ground water and surface water.	

ANNEX 5

"Do's and Don'ts" for Waste in Camps / Tented Villages

„DO"	„DO NOT"	Remarks
Collect the solid waste / put the waste in bins.	Throw it on ground or in water.	Normal waste is also named domestic waste or household waste
Separate / segregate **plastic bottles** if there is a market for recycling.	Mix all kinds of solid waste together.	Health care waste such as syringes, needles, blades, infusion sets or dirty dressings also has to be segregated.
Empty the bins on a regular schedule.	Let the waste bins be flooded with waste.	
Inform, train and communicate with your staff at all levels about waste procedures.	Let anyone work without proper training for their task.	
Put the waste in a container/drum/bin at designated areas where the waste can be collected with access for transport vehicle.	Let the waste stay inside the camp.	
Request assistance from the municipality or organize your own collection, transport and disposal system.	Wait for better times… Or treat your waste on site with open burning.	Your own initiative is crucial – you cannot take for granted that a normal waste management will work in a relief situation. **Open burning of waste generate harmful & toxic gasses and residuals!**
Inform, train and communicate with your staff at all levels about waste procedures.	Let anyone work without proper training for their task.	
Do your own assessment of the external collection/management of solid waste.	Hand over responsibility to other organisation without further feedback and follow-up.	
Control and upgrade your waste management as more resources become available.	Stay too long with disposal methods that were appropriate for the relief phase.	After the relief phase, sanitary landfills for domestic waste and incinerators for infectious health care waste would be the appropriate disposal methods.

More Information

What is Domestic Waste?

Domestic waste – or household Waste is any solid waste that is the result from everyday life, i.e. discarded food, packaging, worn out clothes, newspapers, diapers, etc.

Where do I find more information on the management of Solid Waste?

Here are some useful links:

http://w3.whosea.org/LinkFiles/List_of_Guidelines_for_Health_Emergency_Solid_waste_management_in_emergencies.pdf

Infectious sharps: syringe or other needles, blades, infusion sets, broken glass or other items that can cause direct injury.
Infectious non-sharps include materials that have been in contact with human blood, or its derivatives, bandages, swabs or items soaked with blood, isolation wastes from highly infectious patients (including food residues), used and obsolete vaccine vials, bedding and other contaminated materials infected with human pathogens. Human excreta from patients are also included in this category.

What is not Infectious Health Care Waste?

Materials that have not been in contact with patients such as paper and plastic packaging, metal, glass or other wastes, which are similar to household wastes.

Where do I find more information on the management of Health Care Waste?

Here are some useful links:

WHO – Management of solid health-care waste at primary health-care centres: A decision-making guide. Available on:
http://www.who.int/water_sanitation_health/medicalwaste/hcwdmguide/en/index.html

The Secretariat of the Basel Convention - Technical Guidelines on the Environmentally Sound Management of Biomedical and Healthcare Wastes. Available on:
http://www.healthcarewaste.org/en/documents.html?id=196

WHO - Assessment of small-scale incinerators for healthcare waste. Available on:
http://www.who.int/water_sanitation_health/medicalwaste/smallincinerators/en/index.html

WHO - Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies. Available on:
http://www.who.int/water_sanitation_health/medicalwaste/pharmaceuticals/en/index.html

WHO - The Healthcare waste management rapid assessment tool
http://www.who.int/water_sanitation_health/medicalwaste/hcwmtool/en/index.html

The WHO Healthcare Waste Website provides other general information on handling of healthcare waste. Available on:
http://www.healthcarewaste.com

ANNEX 6

The “Do’s and Don’ts” for Health Care Waste

„DO”	„DO NOT“	Remarks
Separate / Segregate Infectious Health Care Waste (HCW) like syringes, needles, blades, infusion sets, dirty dressings etc.	Mix it with normal solid waste (domestic waste, household waste).	
Put infectious waste in a separate box (sharps) or in separate plastic bags.	Put infectious waste direct on the ground or in a normal, open bin.	
Collect the infectious waste in a closed container at a confined (fenced off) area but with access for transport vehicle.	Put the collection point for infectious waste at an open place.	
Request assistance from the municipality or organize your own collection, transport and disposal system.	Wait for better times…	Your own initiative is crucial – you cannot take for granted that a normal waste management will work in a relief situation.
Inform, train and communicate with your staff at all levels about HCW procedures.	Let anyone work without proper training for their task.	
Inform community/ municipality about minimum requirements for HCW and what your needs are.	Hand over responsibility to other organization without further feedback and follow-up.	
Control the collection of infectious HCW.	Expect that others will inform you automatically.	A “remixing” with normal wastes is a threat to human health.
Check the minimum requirements at the treatment and disposal site.	Accept a site and site operations on hearsay.	Infectious HCW needs to be disinfected through incineration (but not normal waste!).
Control and upgrade your HCW management as more resources become available.	Stay too long with disposal methods that were appropriate for the relief phase.	After the relief phase WHO and national standards should apply (special HCW incinerators etc.).

End Notes

[1] Numbers according to OCHA South Asia Earthquake Fact Sheet February 2006, available on http://earthquake05.un.org.pk/uploaddocuments/1465SouthAsiaEQ_FactSheetFeb2006.pdf

[2] OCHA Situation Report No. 19 South Asia Earthquake, 1.11.2005, available on www.reliefweb.int

[3] OCHA Situation Report No. 11 South Asia Earthquake, 16.10.2005, available on www.reliefweb.int

[4] OCHA Situation Report No. 14 South Asia Earthquake 19.10.2005, available on http://www.reliefweb.int

[5] OCHA Situation Report No. 2 South Asia Earthquake 8.10.2005, available on http://www.reliefweb.int

[6] See UNDAC team website at for more information.

[7] Jan Egeland. *Quake Victims Need Our Immediate Help.* OpEd, 3.11.2005, available on http://ochaonline.un.org/webpage.asp?MenuID=9853&Page=2035

[8] Population data according to *Country Profile: Pakistan* on http://news.bbc.co.uk/go/pr/fr/-/1/hi/world/south_asia/country_profiles/1157960.stm

[9] International Federation of Red Cross and Red Crescent Societies, 2003. *World Disasters Report 2003. Focus on ethics in aid*, available on http://www.ifrc.org/publicat/wdr2003/

[10] Asian Development Bank – World Bank 2005. *Pakistan Earthquake 2005. Preliminary Damage and Needs Assessment,* http://www.adb.org/Documents/Reports/pakistan-damage-needs-assessment.pdf

[11] http://earthquake05.un.org.pk/uploaddocuments/635UN-Sector-Reports-Early-Recovery.pdf

[12] The website of the Humanitarian Information Centre (HIC) in Islamabad provides detailed information on the United Nations Emergency Response in Pakistan on http://earthquake05.un.org.pk/index.php