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Impact of the earthquake and the subsequent relief operation on the natural resources in north-eastern Pakistan

Environmental Assessment Report

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EXECUTIVE SUMMARY

1. On 8 October 2005, an earthquake of the magnitude 7.6 occurred in Pakistan, its epicentre situated just 95 km northeast of the capital Islamabad. The earthquake and its numerous aftershocks caused massive destruction in the area. More than 80'000 people were killed, about 80'000 people injured and the homestead of about 500'000 families damaged, some of them even completely destroyed.

2. In addition to the preliminary environmental assessment carried out by the UNDAC team (9 – 30/10/05), this joint mission (31/10 – 16/11/05) involving OCHA/UNEP and the Ministry of Environment (MOE) focussed on the impact of the earthquake and the subsequent relief operation on the natural resources (especially wood) of the earthquake-affected area. The mission came out with immediate mitigation measures which will be integrated in the ongoing relief operation.

3. The imminent onset of very harsh conditions of the Himalayan winter urgently requires rapid supply of shelter and basic needs for isolated victims at high altitudes. Firewood, poles and timber required for shelter and house reconstruction for millions of people affected by the earthquake pose a threat to the scarce forest resources. Unsustainable exploitation of the limited forest resources will increase the risk of additional landslides, erosion and floods.

4. The mission visited most of the main affected Districts of North West Frontier Province (NWFP), i.e. Shangla, Batagram and Mansehra and of Azad Jammu Kashmir (AJK), i.e. Muzzafarabad and Bagh.

5. Natural resources are a cross-cutting issue and part of the three clusters Emergency Shelter (lead by IOM), Early Recovery & Reconstruction (lead by UNDP) and Camp Management (lead by UNHCR). Numerous discussions were held in the field and in Islamabad with representatives of MOE, local authorities, UN organisations, donors and international and national NGOs mainly engaged in one of these three clusters. In addition, informal interviews with affected people were conducted in the field.

6. Not only kind and intensity of damages vary greatly from one location to the other, but also the respective eco-climatic, socio-cultural and economic conditions are very diverse. This asks for a site-specific approach of the relief operation.

7. The natural resources were already put under severe stress in NWFP and AJK prior to the earthquake. Wood resources became scarce in many areas and overgrazing of forests and subalpine pastures was widespread.

8. Most of the affected mountain dwellers are tenants whereas the landowners are mostly living in villages and towns down in the valley. At least some members of the family will remain during winter at their homesteads to guard their property. The mission strongly encouraged the actors of the emergency shelter cluster to include in the ongoing distribution of shelter kits also fuel-efficient stoves (for firewood) which will help to reduce the energy demand.

9. An expected 500'000 displaced people will stay during winter in the tented villages/camps mainly in the valley bottoms at lower altitude. The exact number of displaced people coming to the tented villages/camps depends on many factors including the nature of their tenure in the affected area and the comfort of the shelter and aid items delivered.

10. Fuel is one of the major environmental issues in this operation. The supply of energy and appropriate stoves for heating the tents at higher altitude is of high priority in order to avoid severe health problems for the displaced people and to prevent deforestation around the camps what risks to lead to severe tensions between local population and displaced people.

11. UNDP is currently elaborating a Project (8'000'000 US$) to cover mainly the energy needs of the displaced people. It is foreseen to supply the displaced people with flameless LPG gas stoves for heating the tents as well as for cooking purposes. Due to time constraints and logistical reasons, but also on the final amount received at the flash appeal, only parts of the total needs will be covered by this Project. Many NGOs are planning (some have already stared) to use either LPG or kerosene for heating (cooking) purposes in the tented villages/camps.

12. According to our field discussions, multi-family cooking in tented villages/camps might be acceptable for some tribes (e.g. Gujar and Swati). Other tribes (e.g. Chaudhry) might accept it only if it is organised amongst people of the same clan. Multi-family cooking could considerably reduce the energy consumption up to 50% according to the experiences of UNHCR.

13. OCHA should discuss with UNHCR as lead agency of the Camp Management cluster the necessity to provide an expert having the task of advising and training the NGOs in charge of the camp management in the selection of appropriate energy and stove type for a specific site and in the proper handling of stoves and energy**.**

14. About 500'000 houses have been damaged by the earthquake and out of them only a smaller part can be rebuilt before the coming winter. The Early Recovery & Reconstruction cluster should promote a house type which is earthquake-resistant, i.e. having light roofs (e.g. galvanised iron sheet) and light walls (e.g. aerated bricks) which at the same time uses less wood than the traditional *Kacha* house and has a high thermal efficiency. The supply of timber for the reconstruction should be done in a sustainable way**.** A possible lift of the ban of cutting green trees only for the affected areas and the respective consequences should be analysed carefully by MOE in order to avoid large uncontrolled cutting.

15. If not handled properly, the collection of firewood and cutting of timber for the reconstruction of the houses will lead to further deforestation and might also greatly affect some unique biodiversity hotspots in NWFP, like the Ayubia National Park and Palas Valley containing the most pristine tract of Western Himalayan Moist Temperate Forests, representing one of the Global 2000 sites identified by WWF and the Machiara National Park in AJK.

16. The earthquake caused large landslides and earth slips having a direct impact on the natural resources. Due to the high intensity of the earthquake along the fault line, landslides and earth slips occurred over various slope angles, soil types and vegetation covers. Beyond the fault line, it seems that landslides mainly occurred on foot slopes (often steeper) and on sites which have a scarce vegetation cover (mainly due to deforestation and overgrazing).

17. Nearby the road Chakar – Bagh (about 5 km southeast of Chakar) a huge landslide ("mountain-slide") has built up a dam about 200m heigh and 500 to 1000m wide in a steep valley (see Fig. 3). At least six villages were buried under this enormous earth mass. This new natural dam is backing up the water of a small creek forming a steadily growing lake with an inherent high flood risk at latest in springtime when the snow will melt.

18. Further landslides and earth-slips will occur until the soil gets stabilised especially where the soil is composed of loose material. Snow and ice melt in springtime and the subsequent monsoon

rain will cause additional landslides and mudslides. Once the loose soil is better stabilised, soil conservation measures should be undertaken.

19. The earthquake also modified the hydrology at many places thereby greatly affecting large parts of the watersheds of the Indus basin: new lakes and springs arose, many riverbeds changed due to landslides and sediment yields of many water courses highly increased.

20. The earthquake has greatly affected the natural resources and the future land-use of large parts of the Western Himalayan Mountains. Many landowners and tenants who lost their arable land and parts of their pastures need to be compensated in order to ensure their livelihood. On the other hand, forests outside of landslide and earth-slip areas are apparently not or only slightly affected by the earthquake. Trees seem to withstand even major soil movements.

21. A satellite remote sensing (high resolution images) of the whole earthquake-affected area for detecting physical damages has to be carried out for facilitating the planning of the infrastructure rehabilitation and of the future land-use of the affected area.

22. The earthquake caused many casualties amongst the forest staff within the areas and numerous forest buildings were destroyed.

1. INTRODUCTION

1. On 8 October 2005, an earthquake of the magnitude 7.6 (Richter Scale) occurred in north-eastern Pakistan, its epicentre situated just 95 km northeast of the capital Islamabad. The earthquake was triggered by the rising of the Eurasian plate over the Asian plate. The earthquake and its numerous aftershocks caused massive destruction in the area, especially in the vicinity of the epicentre and along the southeast-northwest oriented fault line. More than 80'000 people were killed, about 80'000 people injured and the homestead of about 500'000 families damaged, some of them even completely destroyed. Rescue and reconstruction efforts have been seriously hampered by the quake's destruction of communication networks and roads.

2. In addition to the preliminary environmental assessment carried out by the UNDAC team (9 – 30/10/05), this joint mission (31/10 – 16/11/05) involving OCHA/UNEP (consultant seconded from SHA) and the Ministry of Environment (MOE) focussed on the impact of the earthquake and the subsequent relief operation on the natural resources (especially wood) of the earthquake-affected area (note another mission dealt with). The mission came out with immediate mitigation measures which will be integrated in the ongoing relief operation in view of a sustainable use of the scarce natural resources in this remote mountainous area. In addition, preliminary findings of the mission were included in the Early Recovery Needs Assessment from UNEP presented at the international donor conference in Islamabad on 19 November 2005.

3. The imminent onset of very harsh conditions of the Himalayan winter urgently requires rapid supply of shelter and basic needs for isolated victims at high altitudes. Firewood, poles and timber required for shelter and house reconstruction for millions of people affected by the earthquake pose a threat to the scarce forest resources. Unsustainable exploitation of the limited forest resources will increase the risk of additional landslides, erosion and floods.

4. The mission visited most of the main affected Districts of North West Frontier Province (NWFP), namely Shangla, Batagram and Mansehra and of Azad Jammu Kashmir (AJK), namely Muzzafarabad and Bagh. Only the Districts of Kohistan (NWFP) and Poonch (AJK) having also major damages could not be visited due to time constraints.

5. The relief operation has been organised following a cluster approach jointly coordinated by the Federal Relief Commission of the Pakistani Government and by OCHA. The following ten clusters have been identified: Nutrition (lead agency WFP), Water / Sanitation (UNICEF), Emergency Shelter (IOM), Early Recovery & Reconstruction (UNDP), IT/Communication (WFP), Logistics (WFP), Camp Management (UNHCR), Protection (UNICEF) and Education (UNICEF).

6. Natural resources are a cross-cutting issue and at least part of the three clusters, i.e., Emergency Shelter, Early Recovery & Reconstruction and Camp Management. Numerous discussions were held in the field and in Islamabad with representatives of MOE, local authorities, UN organisations, donors and international and national NGOs mainly engaged in one of these three clusters. In addition, informal interviews with affected people were conducted in the field.

7. A map of the region is given in Annex B. The mission timetable and list of people met is included in Annex C.

2. BRIEF BIOGEOGRAPHIC DESCRIPTION OF THE EARTHQUAKE -AFFECTED AREA

8. The earthquake-affected area of Western Himalayan Mountains is formed of Paleozoic-Mesozoic metamorphic and igneous rocks. The rainfall is bimodal with a mean annual rainfall for the earthquake-affected area ranging approximately between 1000 and 1500 mm. A major peak occurs during the monsoon from June to September and a second peak in winter from December to March. The climatic conditions are very harsh having often extremely cold winters and high snowfall. The population density is high in most of the area with more than 300 persons/km^2.

9. The eco-climatic and socio-cultural conditions in the earthquake-affected area are very diverse and mainly the following vegetation zones may be distinguished (modified from van Dijk & Hussein, 1994):

- Subtropical pine forest approximately between 500 and 1200 m a.s.l.; dominant species: Chir pine (*Pinus roxburghii*); mainly rainfed agriculture, some irrigated areas in the valley bottoms; main agricultural crop is wheat (wheat, rice, groundnut, sorghum and millet) and increasingly vegetables; mainly intensively grazed forest-pasture;
- Himalayan Moist Temperate forest approximately between 1200 and 2000 m a.s.l.; dominant species: Blue pine (*Pinus wallichiana*), Silver fir (*Abies pindrow*), Himalayan spruce (*Picea smithiana*), Himalayan cedar (*Cedrus deodara*), oak (*Quercus* spp.), *Biara* (*Salix denticulata*), *Bankhor* (*Aesculus indica*); main agricultural crop is wheat, maize, potatoes and beans; mainly intensively grazed forest-pasture;
- Himalayan Dry Temperate forest approximately between 2000 and 3000 m a.s.l.; dominant species: Blue pine (*Pinus wallichiana*), Chilghoza pine (*Pinus gerardiana*), Himalayan cedar (*Cedrus deodara*) and oak (*Quercus* spp.); main agricultural crop is maize (potato); mainly intensively grazed forest-pasture;

- Subalpine forest approximately between 3000 and 4000 m mixed with subalpine pastures; dominant species: Silver fir (*Abies pindrow*), *Juniperus communis*, *Rosa webbiana*, *Berberis lycium* and White Willow (*Salix alba*); no agricultural crops, only pastures;
- Alpine pastures above 4000 m; Tree species usually occur only in small groups of stunted growth mostly composed of Birch (*Betula utilis*); some shrubby vegetation of *Juniperus communis, Rhododendron companulatum* and *Salix alba*. It is intensively grazed by the herds of the Gujars.

10. Legally forests in Pakistan can be divided into two major tenure categories: state owned or controlled (Reserved, Protected and Guzara Forests) and privately owned. Around 66 % of the total forests are under state control while 34 % of the forests are privately owned (Country Guideline Paper, 2002). For more details see Annex D. Pakistan is a forest deficient country with an extremely poor natural forest cover of approximately 5.2% (Jan, 1993). The forest cover in the Himalayan Mountains of NWFP and AJK is slightly higher with 13.9 and 11.0% respectively including most of the natural coniferous forest.

11. Land tenure determines the relationships between the resource (land) and the user (the farmer). Land tenure arrangements are particularly important for the sustainability of agriculture and the productivity of the land. Long-term investments in tree planting, land improvement and water management require long-term interests in the land holdings. Most tenants in NWFP and AJK are share croppers. The owner can terminate the lease arrangement at any moment. In a share-crop arrangement, the production of a field is divided over the tenant and the landowner. A common division in the rainfed agriculture is an equal share for owner and tenant (van Dijk & Hussein, 1994).

12. 5,500 – 6,000 species of vascular plants have been recorded in Pakistan (van Dijk & Hussein, 1994). Around 300 species are endemic to Pakistan, 90% of which occur in the western and northern mountains at altitudes over 1200 m a.s.l. The vegetation of the Western Himalayan Mountains has a high biodiversity. Ayubia National Park and Palas Valley containing the most pristine tract of Western Himalayan Moist Temperate Forests rich in biodiversity and one of the sites of Global 2000 identified by WWF (both NWFP) and Machiara National Park (AJK). The Himalayan moist and semi-moist temperate forests have perhaps the richest mammalian communities of any ecosystem in Pakistan, with species including Kashmir grey langur, rhesus macaque, grey wolf, Kashmir red fox, Himalayan black bear, stone marten, yellow-throated marten, leopard, leopard cat, musk deer, grey goral, Royle's pika, Indian giant flying squirrel, small Kashmir flying squirrel and Indian crested porcupine (van Dijk & Hussein, 1994). Breeding populations of Western Harn Tragopan are found in the dense forests of Kaghan Valley and in parts of AJK.

13. The earthquake-affected area is part of the watersheds of the Indus and Jhelum basin. The condition of this watershed and in particular of the forest is crucial to the economy of the whole of Pakistan because of its heavy reliance on irrigation of the vast and fertile Indus plain and the two major hydropower plants of Tarbela and Mangla.

3. DIRECT IMPACT ON THE NATURAL RESOURCES

14. The natural resources were already put under severe stress in NWFP and AJK prior to the earthquake due to rapid population growth and demands for increased standards of living. Most of the forests are highly depleted having a sparse forest cover. Only about 8% of the Western Himalayan Forests in NWFP and AJK are dense forests (more than 60% canopy closure, see FSMP, 1993). Deforestation is mainly caused by heavy uncontrolled grazing, commercial logging, local use of trees for firewood, clearance for cultivation, and defective road construction. Of special interest is the rate of decline under various tenure classes. Guzara forests under the forest co-operatives show a distinct lower rate of decline than Guzara forests managed by the Forest Department. On the other hand, there is a 100% increase in number of trees in the farmland of NWFP from 1992 to 2003 (Swati & Khan, 2004).

15. According to the Watershed Management Projects in Tarbela in NWFP 51% of the households use wood as fuel at the domestic level. The survey further reveals that about 75% of the rural households collect the firewood themselves from natural forests, wastelands and farmlands. Only 16% of the landless people meet a portion of their firewood requirements by purchasing, otherwise they satisfy their requirements from the same sources as the other villagers do (Swati & Khan, 2004). On average per capita firewood consumption for an average household of eight individuals in Galiat (Mansehra District) is 684 kg per annum (Khurshid, 2001). Whereas at higher altitudes the annual per capita firewood consumption is 0.71 m^3 (Fisher, 1998).

16. In addition, some ranges support livestock at three times their carrying capacity (van Dijk & Hussein, 1994). Overgrazing of subalpine meadows and forests in general as well as intensive cultivation without adequate soil conservation measures in particular further reduced the diversity of fauna and flora and left the soil vulnerable to wind and especially to water erosion on steep slopes. Consequently the topsoil is washed away into the river system leading to siltation of dams and irrigation channels downstream. Landslides occur frequently and the sparse vegetation cover was also one of the main reasons of the 1992 floods. Moreover, the ecosystems of the Western Himalayan Mountains have been negatively affected by water pollution due to the discharge of untreated sewage and by widespread poaching.

17. The earthquake devastated an area of about 30’000 km^2 of the Western Himalayan Mountains. The earthquake and subsequent aftershocks triggered massive landslides which destroyed a large number of buildings and killed or injured their occupants, blocked or damaged many roads thereby isolating many local communities and wiped out terraces and other agricultural lands. Not only kind and intensity of damages vary greatly from one location to the other, but also the respective eco-climatic, socio-cultural and economic conditions are very diverse. This asks for a site-specific approach of the relief operation.

18. The numerous large landslides and earth-slips have a direct and long-lasting impact on the natural resources. Along the clearly visible fault line, independently of slope angles, soil types and vegetation covers, mainly huge landslides occurred exposing large areas of bare rocks (see Fig. 1). Beyond the fault line, it seems that landslides mainly occurred on foot slopes (often steeper) and on sites with a scarce vegetation cover (mainly due to deforestation and overgrazing, see Fig. 2). At higher, mainly afforested elevation, few landslides occurred beyond the fault line.

Fig. 1. Huge landslide along Neelum Valley (Muzzafarabad District) exposing large areas of bare rock.

Fig. 2. New landslide in Kaghan Valley down to the Kunhar River having loose surface soil.

19. Nearby the road Chakar – Bagh (about 5 km southeast of Chakar) a huge landslide ("mountain-slide") has built up a dam about 200m heigh and 500 to 1000m wide in a steep valley (see Fig. 3). At least six villages were buried under this enormous earth mass. This new natural dam is backing up the water of a small creek forming a steadily growing lake with an inherent high flood risk at latest in springtime when the snow will melt.

Fig. 3. New natural dam and lake nearby Chakar (Bagh District)

20. Further landslides and earth-slips will occur until the soil gets stabilised especially where the soil is composed of loose material. Snow and ice melt in springtime and the subsequent monsoon rain will cause additional landslides and mudslides. Once the loose soil is better stabilised, soil conservation measures should be undertaken.

21. The earthquake also modified the hydrology at many places thereby greatly affecting large parts of the watersheds of the Indus basin: new lakes and springs arose, many riverbeds changed due to landslides and sediment yields of many water courses highly increased.

22. The earthquake has greatly affected the natural resources and the future land-use of large parts of the Western Himalayan Mountains. Many landowners and tenants who lost their arable land and parts of their pastures need to be compensated in order to ensure their livelihood. Land-use planning is complex. One has to consider agricultural and livestock husbandry practices, an effective participation of the local communities and the complex and varying local land tenures.

23. The forests outside of landslide and earth-slip areas are apparently not or only slightly affected by the earthquake. Trees seem to withstand even major soil movements (see Fig. 4).

Fig. 4. This village in the Neelum Valley (Muzzafarabad District) is completely destroyed. The trees, however, seem to be intact.

24. In addition, the earthquake had also an important economic impact on tourism in particular in the scenic Kaghan Valley, which is an important tourist resort. Most hotels in this valley have been destroyed which will also affect the job opportunities of the local communities. The earthquake also caused many casualties amongst the forest staff and destroyed numerous forest buildings.

25. According to the information received during the mission no organisation is currently using satellite remote sensing for detecting all physical damages (mainly landslides, roads, surface water, if possible buildings…) of the whole earthquake-affected area. A good overview of the whole extent of all damages as well as detailed information for specific sites, however, is essential for the proper planning of the rehabilitation of the infrastructure and of the future land-use of the area. WWF would have a well equipped GIS lab and the experience to carry out this activity. A budget of about 80,000 US$ is required and is included in a UNEP project brief (Early Recovery Needs Assessment) presented at the international donor conference in Islamabad on 19 November 2005.

4. INDIRECT IMPACT ON THE NATURAL RESOURCES

26. About 500'000 houses have been damaged by the earthquake. Most of the affected mountain dwellers are tenants whereas the landowners are mostly living in villages and towns down in the valleys. At least some members of the family will remain during winter in their homesteads to guard their property.

27. The relief operation is challenged a) immediately by a high energy demand for heating and cooking by the displaced people leaving in tented villages/camps and b) next spring by the high

demand of building material for reconstruction of the damaged houses. The immediate onset of the winter renders this task enormously difficult both in organisational and logistic terms. It addition, measures have to be taken to ensure a sustainable management of the forests and to provide alternatives that will protect them from deforestation.

ENERGY SUPPLY

28. An expected 500'000 displaced people will stay during winter in the tented villages[1]/camps mainly in the valley bottoms at lower altitude. The exact number of displaced people coming to the tented villages/camps depends on many factors including the nature of their tenure in the affected area and the comfort of the shelter and aid items delivered. Most of the camps have been selected by the army. UNHCR has provided four site-planners to ensure a proper site selection.

29. Fuel is one of the major environmental issues in this operation. The supply of energy and appropriate stoves for heating the tents at higher altitude (above 800 m a.s.l.) is of high priority in order to avoid severe health problems of the displaced people and to prevent deforestation around the camps. No open fire will be allowed in the tents according to the policy of the Government of Pakistan.

30. Table 1 shows the estimated costs of different energy types considering their calorific values, assumed conversion efficiencies (depending on the appliances) and cost-effectiveness (modified from Bloesch, 2001).

Table 1. Comparison of price and calorific value of different energy types

Energy source	Price (Rs./kg)	Calorific value (MJ/kg or kWh)	Total heat MJ/Rs.	Conversion Efficiency (%)	Useful heat MJ/Rs.
Firewood	1.0 – 2.0	16 – 24	10.7 – 16.0	9 – 16	1.7
Kerosene	13	35 – 44	2.7 – 3.4	40 – 70	1.7
LPG	4.4	44 – 46	10.0 – 10.5	50 – 65	5.9
Electricity	-	3.6	-	45 – 50	-

Source: Adapted from Crabtree & Khan (1991); Anonymous (1995); Siddiqui et al. (1997) UNHCR (1998);
1 US $ ≈ 60.5 Rs. (December 2001)

31. It is important to notice that the prices in Table 1 are from 2001 and do not include transportation costs. Depending on the transportation distances the total cost might be considerably higher, especially for bulky materials like firewood. Furthermore, the above comparison does not consider the cost and depreciation of the stoves or other appliances. These parameters strongly influence the overall cost-effectiveness of both fuels and stoves/heating devices.

32. At first sight, firewood seems to be the cheapest energy source, but it view of cost effectiveness (MJ/Rupee) LPG would be the best choice (5.9MJ/Rupee) contrary to firewood and kerosene (1.7 MJ/rupee). In this comparison no price for electricity is given since the Government of Pakistan announced that electricity will be free of charge for the affected people in the coming three months.

33. UNDP is currently elaborating a Project (8'000'000 US$) to cover mainly the energy needs of the displaced people. It is foreseen to supply the displaced people with flameless LPG stoves for

[1] Sites having less than 50 tents.

heating the tents as well as for cooking purposes. Due to time constraints and logistical reasons, but also based on the final amount received by the flash appeal, only parts of the total needs will be covered by this Project. Many NGOs are planning (some have already stared) to use either LPG or kerosene for heating (cooking) purposes in the tented villages/camps.

34. According to our field discussions, multi-family cooking in tented villages/camps might be acceptable for some tribes (e.g. Gujar and Swati). Other tribes (e.g. Chaudhry) might accept it only if it is organised amongst people of the same clan. Multi-family cooking could considerably reduce the energy consumption up to 50% according to the experiences of UNHCR. UNHCR as lead agency of the Camp Management cluster should also advise and train the NGOs in charge of the camp management in the selection of the appropriate energy and stove type for a specific site and in their proper use (e.g. considering safety and health concern).

35. The current demand of firewood in the homestead of the earthquake-affected people in the mountains is nowadays less than before the earthquake since many people left for the valleys. The mission strongly encouraged the actors of the emergency shelter cluster to include in the ongoing distribution of shelter kits also fuel-efficient stoves (for firewood) which will help to reduce the energy demand also in future. Some NGOs like SHA have started to do so (see Fig. 5).

Fig. 5. Fuel-efficient stoves distributed by SHA in Mansehra area.

36. If not handled properly, the collection of firewood and cutting of timber for the reconstruction of the houses will lead to further deforestation and might also greatly affect some unique biodiversity hotspots in NWFP, like the Ayubia National Park and Palas Valley containing the most

pristine tract of Western Himalayan Moist Temperate Forests, representing one of the Global 2000 sites identified by WWF and the Machiara National Park in AJK.

37. If the displaced people in the camps are not supplied with fuel, the collection of firewood in the surroundings risks to lead to severe tensions between local population and displaced people. The situation should be monitored carefully since it could change rapidly.

SUPPLY OF BUILDING MATERIAL FOR SHELTER AND RECONSTRUCTION

38. Roughly the following three house types can be distinguished in the Western Himalayan Mountains:

1) *Kacha* house: thick stone walls with a heavy roof built with large beams and covered with a earth layer; traditional house type in the rural area; their occupants use mainly firewood for heating and cooking; most of such houses were destroyed causing a lot of casualties.

2) *Pakka* house: concrete walls and reinforces concrete roofs; typical house type of wealthier people mainly in small towns and larger village in the valley bottom; their occupants use mainly LPG and electricity for heating and cooking; most such houses were destroyed causing a lot of casualties.

3) Intermediate house type with a light roof consisting of light galvanised iron sheets; their occupants use either firewood, LPG or kerosene for heating and cooking; the number of casualties were less in these houses compared to the other two types.

39. Most reconstruction will be done next spring, since only a small part of the damaged houses can be rebuilt before winter. Without targeted interventions, rural mountain communities will have little choice but to exploit nearby forest resources. In view of the great number of affected rural households, such exploitation risks to have a bigger impact on forests than the earthquake by itself.

40. A earthquake-resistant house type should be promoted, which requires less wood than the traditional *Kacha* house type, has a high thermal efficiency (for fuel-saving purposes) and would be culturally harmonious. The timber demand should be further reduced by reusing the old beams whenever possible.

41. According to Intercooperation (Village Development Plan of Timri) about 15 m^3 of sawn timber is needed for the construction of a *Kacha* House. Assuming conversion wastage of 50% in sawing trees into scants, about 30 m3 of standing trees are required for the construction.

42. It is essential for future generations that the supply of timber for the reconstruction is done in a sustainable way**.** A possible lift of the ban of cutting green trees from 1992 (as a consequence of the 1992 floods), only for the affected areas, and the respective consequences should be analysed carefully in order to avoid large uncontrolled cutting**.** A prerequisite is the proper control of the forest exploitation by the forest service. A permit for cutting trees should only be given based on the effective need for additional beams for the reconstruction attested by the local administration. According to the growing stock Guzara forests (using the right of owners) and Reserved and Protected forests could be used. As far as possible a local solution should be identified since the import of timber from foreign countries is very costly and environmentally not friendly.

Fig. 6. Heavy-built *Kacha* House completely destroyed, Kahgan Valley.

5. RECOMMENDATIONS

Immediate term

1. In addition to the UNDP Project aiming at supplying LPG to the affected people, local solutions should be identified to supply the displaced people in the tented villages with the appropriate energy (LPG, kerosene, electricity) and stove type.

2. OCHA should discuss with UNHCR as lead agency of the Camp Management cluster the necessity to provide an expert having the role of advising and training the NGOs in charge of the camp management in the appropriate energy and stove selection for a specific site and the proper handling of stoves and fuel**.** Multi-family cooking in tented villages/camps and energy-saving practices in general should be promoted wherever possible (see UNHCR 1998).

3. The site selection (e.g. avoid risk of flash floods, steep slopes) and the camp management (e.g. establishment of latrines, waste management, protection of vegetation cover) should follow the environmental guidelines of UNHCR (1996). UNHCR should ensure the training of the organisations in charge of the management.

4. Improved fuel-efficient stoves should be disseminated and energy-saving practices promoted by the organisation of the Emergency Shelter cluster in the homestead of the affected people for energy-saving purposes.

5. The Early Recovery & Reconstruction cluster should promote a house type which is earthquake-resistant, i.e. having light roofs (e.g. galvanised iron sheets plus an additional insulation layer) and

light walls (e.g. aerated bricks) which at the same time uses less wood than the traditional *Kacha* house and has a high thermal efficiency. This house type will require less wood than the traditional *Katcha* house. In many cases the wood in demolished buildings was not damaged and an assessment should be made by local administration before issuing permits to harvest new timber for reconstruction.

6. The supply of timber for the reconstruction should be done in a sustainable way**.** A possible lift of the ban of cutting green trees only for the affected areas and the respective consequences should be analysed carefully by MOE in order to avoid large uncontrolled cutting.

7. A proper assessment has to be carried out for the huge new natural dam at Chakar in order to define the flood risk and to identify possible mitigation measures.

8. A satellite remote sensing (high resolution images) of the whole earthquake-affected for detecting physical damages has to be carried out for facilitating the planning of the infrastructure rehabilitation and of the future land-use of the affected area. This activity is part of a UNEP project brief (Early Recovery Needs Assessment) presented at the international donor conference in Islamabad on 19 November 2005. WWF would have a well equipped GIS lab and the experience to carry out this activity.

9. The local forest service which has very good field knowledge and knows the homesteads of most of the affected people living in the mountains should be involved in the relief operation.

10. The infrastructure of the forest service should be repaired and sufficient staff should be deployed in the affected area.

11. 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 (AJK) has to be assessed.

Mid term

12. The loose soil of the 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.) complemented by revegetation 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 revegetation process of the bare soil. A community-based approach as it is currently applied by the Tarbela Watershed Management Project in NWFP should be followed.

13. Community-based forest projects should be elaborated in order to favour a sustainable use of forest products. Additional income generation activities (e.g. use of Non-Timber-Forest Products, tea plantation) shall be initiated to support the affected people in terms of livelihood opportunities.

14. The Ministry of Petroleum and Natural Resources shall be approached for supply of Natural Gas (Sui Gas) to all the major towns in the Pakhal plain (Shinkiarai, Baffa, Khaki, Ichrian etc.), Balakot Valley and Battal so as to reduce pressure on the surrounding coniferous forests for firewood.

15. The large impact of the earthquake requires the elaboration of a new land-use policy at the local level.

6. CONCLUSION

43. The Mission assessed some key environmental problems as a result from the direct and indirect impacts of the earthquake on the natural resources. Preliminary findings of the mission were included in the Early Recovery Needs Assessment from UNEP presented at the international donor conference in Islamabad on 19 November 2005. The findings and recommendations of the mission were discussed with Representatives of MOE, actors from the Emergency Shelter and Camp Management Cluster, the Forest Service as well as other interested organisations. In addition, an exhaustive technical debriefing was held at MOE with the participation of many UN-organisations, as well as international and national NGOs what allowed an in depth discussion and analysis of the mission's work.

44. The Mission clearly identified the need of an immediate supply of LPG, kerosene and electricity and stoves/heating devices in order to avoid deforestation of the scarce forest resources in the vicinity of the tented villages/camps and thereby also conflicts between the local communities and the displaced people. The appropriate energy type has to be identified considering the eco-climatic and socio-cultural conditions at the specific site as well as the locally available energy type and the stoves/heating devices. In this context, the mission stressed the need at UNHCR level to fully consider the timely and appropriate distribution of energy for cooking and heating for the displaced people.

45. The mission strongly encouraged the actors of the emergency shelter cluster to include in the ongoing distribution of shelter kits also fuel-efficient stoves (for firewood). The house reconstruction has to be well organised and necessary measures have to be taken in order to avoid an overexploitation of the forests due to timber cutting.

46. OCHA has to ensure the transition from the emergency phase to the rehabilitation phase where UNDP / UNEP have to play a more active role.

47. The future land-use in the affected area has to be controlled by the local authorities in order to ensure an equitable distribution of land and to favour a sustainable use of the natural resources. Income generation activities (e.g. community-based forest projects, use of Non-Timber-Forest Products, tea plantations) shall be initiated to support the affected people in terms of livelihood opportunities.

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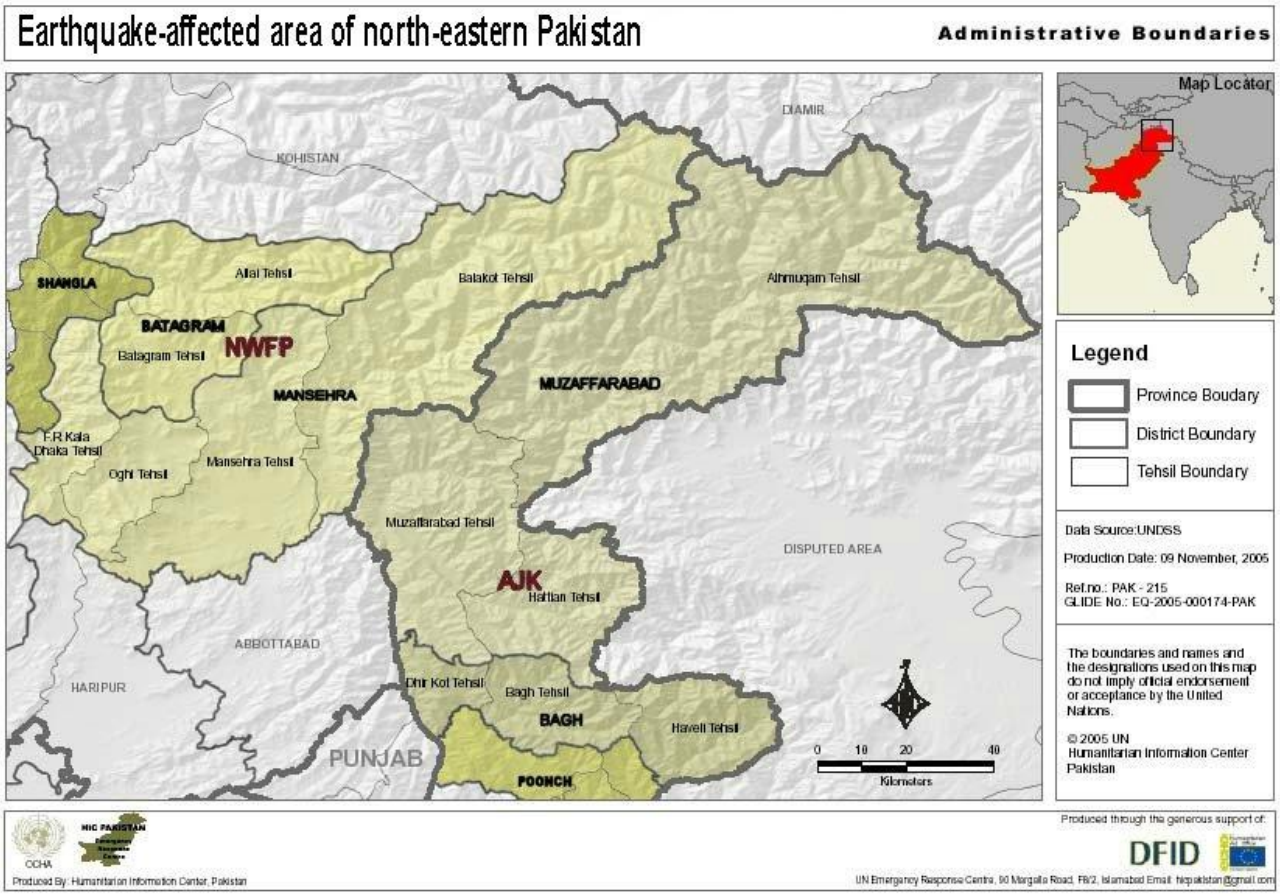
ANNEX A: ACRONYMS & ABBREVIATIONS

AJK	Azad Jammu and Kashmir
BACIP	Building and Construction Innovation Project
CBRM	Community Based Sustainable Resource Management Project
FSMP	Forestry Sector Master Plan
FSCO	Field Security Coordination Office
IOM	International Organization for Migration
IUCN	The World Conservation Union
LPG	Liquefied Petroleum Gas
MOE	Ministry of Environment
NWFP	North West Frontier Province
OCHA	Office for the Coordination of Humanitarian Affairs
SDC	Swiss Agency for Development and Cooperation
SHA	Swiss Humanitarian Aid Unit
UNDAC	United Nations Disaster Assessment
UNEP	United Nations Environmental Programme
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WB	The World Bank
WFP	United Nations World Food Programme
WWF	World Wide Fund for Nature

ANNEX B: MAP OF THE REGION



ANNEX C: MISSION ITINERARY AND PEOPLE MET

ITINERARY

SUN 30 October 2005	14:00-24:00	Travelling Biel-Geneva-London
MON 31 October 2005	10:00	-Islamabad
	10:00-19:00	Briefings at OCHA and UNEP; security briefing FSCO; report reading
TUE 1 November	8:00-21:00	Coordination meeting at the UN Emergency Response Centre; presentation of the National Plan of Action at the Prime Minister Secretariat; discussions with UNICEF and IUCN; briefing with R. Nijenhuis (together with waste management experts)
WED 2 November	8:00-20:00	Discussion with MOE, WWF; reporting
THU 3 November	8:00-20:30	Briefing SDC, discussion with UNHCR; emergency shelter cluster meeting
FRI 4 November	8:00-20:30	Helicopter flight Islamabad-Mansehra, briefing OCHA Mansehra; discussion with SHA; preparation field visit with MOE
SAT 5 November	8:00-21:30	Field visit Kaghan Valley (Mansehra District)
SUN 6 November	8:00-20:00	Briefing OCHA Batagram; field visit Batagram District and Meira camp (Shangla District)
MON 7 November	8:00-20:30	Discussion forest service; field visit of tented villages / camps in Mansehra District; demonstration by Habib Hard Ware Store (Abbottabad) of LPG and kerosene stoves at SHA compound; reporting
TUE 8 November	8:00-20:30	Discussion with CBRM; briefing OCHA Muzzafarabad; field visit of Neelum Valley (Muzzafarabad District)
WED 9 November	8:00-20:30	Field visit Jhelum Valley (Muzzafarabad and Bagh District)
THU 10 November	8:00-20:30	Briefing OCHA; discussion with UNHCR, IOM; forest service; field visit Havely Valley (Bagh District)
FRI 11 November	8:00-20:30	Helicopter flight Mansehra-Islamabad; reporting
SAT 12 November	8:00-20:30	Participation needs assessment (UNEP) and UNDP Fuel Project at MOE; discussion BACIP; preparation debriefings
SUN 13 November	8:00-20:30	Preparation debriefings; reporting
MON 14 November	8:00-20:30	Debriefing OCHA; report reading

TUE 15 November	8:00-20:30	Debriefing MOE (including UNEP, WB, WWF, IUCN, BACIP)
WED 16 November	8:00-24:00	Travelling Islamabad-London-Geneva-Biel

PEOPLE MET

Aga Khan Planning and Building Service	Mr. Khizer Farooq Omer, Planning, Monitoring and Evaluation
Care International	Mr. Charles Kelly
CBRM	Mr. Irshad Khan Abbasi, Project Coordinator
	Mr. Munawar Khan, Regional Coordinator
Forest service	Mr. Mohammad Iqbal Swati, Conservator of Forests
IOM	Mr. James Barron, Leader Emergency Shelter Cluster
	Mr. Stephen Lennon, Team Leader
IUCN	Mr. Karl Schuler, Technical Advisor
MOE, Islamaba	Major (Rtd,) Tahir Iqbal, Minister for Environment
	Dr. Bashir Ahmed Wani, Inspector General Forests
	Mr. Mahbob Elahi, Director General Environment
OCHA	Mr. Andrew Mcleod, Chief Operations
	Ms. Pat Duggan, Head of Office, Muzzafarabad
	Mr. Rene Nijenhuis, UNDAC
	Mr. Jean-Marc Cordaro, Team Leader Bagh
	Mr. Hans Christian Poulsen, Team Leader Batagram
	Mr. Markus Werne, Team Leader Mansehra
	Mr. Kulmiye Mohamed, Humanitarian Affairs Officer
Save the Children	Mr. Zabardast Khan Gangash, Team Leader
SDC	Mr. Richard Kohli, Deputy Country Director
SHA	Mr. Karl-Friedrich Glombitza, Team Leader
UNDP	Mr. Abdul Qadir Rafiq, Programme Officer, Environment Unit
UNEP	Mr. John Anstey, Technical Advisor
	Mr. David Meadows, Operations Manager
	Mr. Christian Lambrechts
UNICEF	Mr. Bill Fellows, Leader Water / Sanitation Cluster
UNHCR	Mr. Michael, J. Zwack, Leader Camp Management Cluster
	Ms. Vivian Tan, Senior Regional Public Information Officer
	Mr. Beat Schuler, Senior Protection Officer
	Mr. Ismail Abdelgabbar Mohamed, Associate Repatriation Officer

ANNEX D: LEGAL CLASSIFICATION AND LAND TENURE OF FORESTS

Legally forests in Pakistan can be divided into three major tenure categories: state owned, state controlled and privately owned. Around 66 % of the total forests are under state control while 34 % of the forests are privately owned.

1. State owned forests

Reserved forest (RF): Legally these forests are usually free from rights and concessions and all acts are prohibited unless permitted, specifically by the Central Government through notifications. In Hazara and Muree, Cantonment and Municipal authorities manage some Reserved Forests.

Protected Forests: These forests, unlike the RF, carry rights and concessions of local people, to varying degrees. In legal terms all acts are permitted unless prohibited by a notification of the Government.

Resumed Lands: these are the lands surrendered by big landlords when the ceiling on land ownership was fixed under the Land Reforms Act of 1959.

Un-classed Forests: These include those few patches, which are owned by the Government but have not been notified as reserved or protected forests under the Forest Act, 1927.

2. State controlled forests

Guzara Forests: Guzara literally means "subsistence". Although managed by the Government, or since 1981, by forest-cooperatives, these are sizeable patches of wooded lands close to habitations, which meet the domestic needs of local communities. The ownership is vested in local people, either as individual property or as joint property.

3. Communal or private forests

Communal Forests: The entire village or part of it owns the forest.

Private forests and waste lands: This is an exclusively owned forest land of a family or an individual having all the rights of ownership over it.

Chos Act Area: These are privately-owned lands which are subject to erosion hazard, or which endanger vital public installations or structures, can be taken over by the Government under the Chos Act, 1900. These areas may be returned to the original owners after their treatment.

Section 38 Areas: Private owners can offer their land to forest departments for afforestation and management for an agreed period, ranging form 10 to 20 years, under Section 38 of the Forest Act, 1927. The Forest Officer then manages such land on the owner's behalf as a Reserved or Protected Forest, on such terms as may be mutually agreed.

Farm Forest Areas: These are linear or compact plantings of trees on private farm lands, owned individually or jointly by locals and are not subject to forest department authority.