

# Earthquake in Pakistan

## **An Assessment of Environmental Risks and Needs**

**Based on IUCN Field Missions to NWFP and AJK**  
November 19–26 and December 4–7, 2005



January 16, 2006

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## Abbreviations

|       |  |
|-------|--|
| ADB   | Asian Development Bank                         |
| AJK   | Azad Jammu and Kashmir                         |
| AKPBS | Aga Khan Planning and Building Services        |
| CGI   | Corrugated Galvanised Iron                     |
| CNG   | Compressed Natural Gas                         |
| EPA   | Environmental Protection Agency                |
| EQ    | Earthquake                                     |
| ERRA  | Reconstruction and Rehabilitation Authority    |
| FAO   | Food and Agriculture Organisation              |
| GoP   | Government of Pakistan                         |
| GSM   | Global System for Mobile Communication         |
| HVCA  | Hazards, Vulnerability and Capacity Assessment |
| IAP   | Institute of Architects Pakistan               |
| ICRC  | International Committee of the Red Cross       |
| LPG   | Liquefied Petroleum Gas                        |
| NGO   | Non-Government Organisation                    |
| NRSP  | National Rural Support Programme               |
| NWFP  | North West Frontier Province                   |
| PEA   | Preliminary Environmental Assessment           |
| SCO   | Special Communications Organization            |
| SHA   | Swiss Humanitarian Aid                         |
| SRSP  | Sarhad Rural Support Programme                 |
| TB    | Tuberculosis                                   |
| TVO   | Trust for Voluntary Organisations              |
| WFP   | World Food Programme                           |
| WWF   | World-Wide Fund for Nature                     |

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## Executive Summary

After its preliminary environmental assessment of the affected areas - through a field mission - immediately following the October 8 earthquake, the World Conservation Union (IUCN) undertook two missions to select districts of NWFP and AJK, in the affected areas, to have a more detailed assessment of environmental risks and needs. The report that follows is based on these field missions: November 19-26 to NWFP and December 4-7, 2005 to AJK. The methodology for carrying out the assessment was based on visits to the affected areas and communities; observation of the environmental damages; meetings and consultations with affected communities as well administrators and aid agencies; and finally, a review and analysis of the findings, including the compilation of a pre-quake environmental overview of the visited areas.

In both NWFP and AJK, apart from the huge losses in life and property, badly disrupting the socio-economic activities, there has been considerable damage to the biophysical environment. This includes the destruction caused by the land and mudslides that continued after the main earthquake due to the frequent aftershocks; siltation of rivers and streams; damage to both natural and man-made water channels rendering them unusable for irrigation purposes; damage to the forest resources, essentially due to landslides and rock-falls; damage to agriculture land - especially that on the slopes - roads, water mills and fish farms; and finally, the huge amount of debris, the safe disposal of which poses a major environmental challenge.

Among the most serious risks is the danger of flash floods and more landslides; the pressure on dwindling natural resources, especially forests for fuel and shelter needs; health hazards due to poor sanitation and inadequate solid waste management practices in the relief camps; the dangers of heavy siltation in rivers feeding into the Mangla Dam and those of haphazard reconstruction. An important psycho-social risk, with far reaching socio-economic implications, is the danger of affected people becoming dependent on relief aid and lose their motivation for work.

The final section of the report assesses the environmental needs and suggests the way ahead. This includes interventions at the planning stage calling for proper land use and zoning plans; enforcement of updated building codes and guidelines (extended to the mountain hamlets); mainstreaming of multiple hazards and environmental risks into all development sectors, policies and procedures, especially to develop a comprehensive natural disaster risk management framework for mountain areas. There was also a need for collaboration between the government, civil society, private sector and the academia to design and implement such a framework.

Among the sector-wise interventions is the need for a coordinated effort for information and knowledge dissemination; technical assistance in camp management; optimal and environment-friendly ways and means for catering to the energy and construction requirements; restoration of livelihoods; rehabilitation of rural community infrastructure; sustainable forest management and environmental rehabilitation. Finally, the lessons learnt from the earthquake should inform the approaches to rehabilitation and reconstruction. The earthquake, though devastating, has created unique opportunities for rebuilding and re-engineering of the social, economic, environmental and cultural fabrics and institutional arrangements for research, planning and service delivery in the affected areas. The overarching principles on which it should be based are detailed in the Section 4.3 of the report.

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## 1. Introduction

### 1.1 The Report

The World Conservation Union (IUCN) undertook two missions to selected districts of the North West Frontier Province (NWFP) and Azad Jammu and Kashmir (AJK), which were badly affected by the earthquake (EQ) of October 8, 2005. The mission to NWFP was fielded between November 19 and 26, while the mission to AJK took place between December 4 and 7. These areas are indicated upon Map 1, attached with this report.

This report provides an overview of environmental conditions prevalent in the visited areas prior to the devastation caused by the earthquake of October 8, general observations made during the two missions and a qualitative analysis of post-EQ environmental risks. Based on these observations and analyses, the report elaborates on the potential environmental risks, and highlights the needs that exist in the areas with respect to environment and livelihoods.

### 1.2 Objective

The Primary objective was *to obtain an overview of environmental conditions in the EQ affected areas, and determine the risks faced by the latent threats to the environment; based on the findings regarding environmental damages and risks of future serious environmental impacts, to determine the environmental needs in the subsequent phase of reconstruction and rehabilitation.*

In the long-term perspective, the mission was to guide on what opportunities existed, assisting communities with livelihood restoration and better ecosystem management of the affected areas. A supplementary aim in this respect was to determine methods for mainstreaming disaster prevention in the planning and reconstruction process in the disaster-prone areas in the mountainous regions.

The mission also aimed to assist the Government of Pakistan (GoP) in its reconstruction and rehabilitation efforts and in assessing future disaster management needs in Pakistan.

### 1.3 Background

On October 8, 2005, parts of the Northern reaches of Pakistan were struck by the most devastating earthquake in recent history of the region. The earthquake measuring 7.6 on the Richter scale had its epicentre in district *Muzaffarabad*, AJK. It was strongly felt over a vast area, but the most significantly affected areas were in NWFP and AJK. The districts of *Mansehra*, *Abbottabad*, and *Battagram* in NWFP, and the districts *Muzaffarabad* and *Bagh* in AJK were the worst hit areas. The colossal damage caused by the EQ was exacerbated by aftershocks - which continued till the end of November - and heavy landslides which carried parts of roads and dwellings built on the picturesque slopes.

### 1.4 IUCN Response

IUCN has been one of the first organizations to bring attention towards this environmental aspect of the earthquake. Immediately following the earthquake, it conducted a Preliminary Environmental Assessment (PEA) through a field mission to the EQ affected areas of AJK and NWFP between October 16-18. While a report of this mission, **PEA Report** was released and widely disseminated, an **Alert Bulletin**, jointly prepared with WWF and Care International was also released before the report to highlight the most severe environmental – including public health - hazards in the wake of the EQ. Issued both in English and Urdu, it aimed to sensitize both the

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general public as well as the relief administrators to the emerging environmental risks from the secondary impacts of the EQ.

Again as a result of strong advocacy by IUCN environment was effectively incorporated in the **Damage and Need Assessment Report** prepared jointly by GoP, the Asian Development Bank (ADB) and the World Bank (WB) for presentation to the Donors' Conference on November 19 -20

After this initial spadework, IUCN decided to undertake more field missions in order to assess damages to the environment, and to conduct a more focused appraisal for the needs and opportunities for mainstreaming environmental issues in the relief, recovery, rehabilitation and reconstruction processes.

The second mission was fielded to NWFP between November 19–26, 2005. The third such mission was fielded to AJK between December 4–6, 2005.

## 1.5 Methodology

The methodology adopted for carrying out the assessment – compiled in this report - is based on the following steps:

**Visit to Earthquake Affected Areas and Communities:** The mission covered the areas in NWFP and AJK which are indicated on Map 1. The areas visited in NWFP are: the settlements of *Bana*, *Gangwal* and *Gantar* in *Allai* valley, district *Battagram*; *Dalola* and *Kokmang* in district *Abbottabad*; and the *Siran* valley in district *Mansehra*. While the second mission was fielded to the affected areas of AJK *Muzaffarabad* and *Bagh*, the areas visited during the 3rd mission to AJK were: *Muzaffarabad* city, *Khori*, *Pattika*, *Khamsar*, *Thuri*, *Chella Bandi*, *Tandali*, *Ghari Dupatta*, *Chikaar*, *Sudhan Gali*, *Bir Pani*, *Dhal Qazian*, *Muzaffarabad* city, *Hari Ghel* and *Rawalakot* city.

**Meetings and Consultations with Affected Communities:** The Field Mission attempted to gather as much information as possible through meetings with local residents, community elders, officials of the government, and secondary information assimilated through agencies working in the EQ hit areas. The team visited far flung villages in forests, and settlements inaccessible by road, to meet with affected people to assess damage and ascertain their needs and requirements.

Impressions were taken through site visits, visual inspection, observations, photography, and discussions with affected people, officials and field staff of aid agencies. Information gathered was corroborated through maintaining a photographic record of the areas. Data gathered with respect to the situation of natural resources in the EQ affected areas was however, mostly qualitative in nature.

**Additional Meetings with Administrators and Aid Agencies:** In NWFP, meetings were also held with army officers at *Allai*, *Siran Valley* and in *Mansehra* to know the current state of affairs and the government's priorities for the winter. In addition to that, meetings were held with the field teams of CARE, ICRC, SUNGI, Swiss Humanitarian Aid (SHA), Austrian Aid Agency and HAASHAR, besides encounters with field staff of UN-OCHA, Omar Asghar Khan Foundation, and SRSP. The team also attended two coordination meetings, one each in *Allai* and *Mansehra*.

In AJK meetings were held with various government officials, including the Conservator Forests, the Minister for Power Generation and Distribution, and the AJK EPA. Meetings were also held with other organizations such as TVO, NRSP, WFP and Islamic Relief.

**Review and Analysis of Findings:** All information collected was carefully reviewed and analyzed. In addition to the direct effects of the EQ on the environment there are many other latent threats that still exist to the environment and the risk of their occurrence varies between *high*, *moderate* and *low*. This assessment of risk has also

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been made as part of this study. Risk assessment has been carried out based on the principles of qualitative risk assessment, i.e., based assumptions, professional judgment and technical expertise of the EQ team.

## 2. General Situation: Post Earthquake

As mentioned in the previous section two missions were fielded to the EQ affected areas following the preliminary visit immediately following the EQ. The general situation of the environment as observed during both missions is summarized in the following sections.

The environment of an area has three major components: **physical, biological and socio-economic**. Each has been reviewed, and a synopsis of the situation has been presented.

### 2.1 Overview of NWFP

Huge losses in life and property were reported in the areas of NWFP which were visited. Landslides have occurred at many locations in the hilly areas. Most of these slides had not stabilized at the time the mission was fielded, as was especially observed in *Allai*, where the soil was still unsettled due to continued tremors.



Water resources have also been adversely affected. Water supply schemes servicing communities both in the rural and urban areas

have been destroyed, and irrigation systems have been severely damaged, and rendered useless. The silt load in the rivers and other surface water bodies has increased due to the number and volume of landslides in their proximity.

Forest resources have also suffered losses, mainly due to landslides in the area. Biodiversity assessments were not made at this stage. An ecological assessment should be conducted over the coming months to determine the extent of these impacts.

In NWFP, a large number of people were employed in other cities of Pakistan. They have returned home following the EQ, and may have no jobs to return to. When this mission was fielded, relief was still underway. Though in most areas people have started separating timber, stone and gravel from the rubble, especially in traditional wood-and-stone houses, not many have started reconstruction. In some cases one temporary room was reconstructed near the destroyed house.

There was little reconstruction work in progress due to many reasons mentioned by the people, including:

- i) continuing aftershocks, which hampered reconstruction work;
- ii) waiting for the compensation money announced by the government so that people could purchase non-indigenous materials such as corrugated iron sheets;
- iii) fear that if houses were constructed before compensation assessment, the government may not pay them the compensation;
- iv) looking for advice on how to rebuild earthquake-resistant safer houses;

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- v) approaching winter and difficulties for construction work; and
  - vi) lack of skilled and unskilled human resources in the villages due to the sheer scale of the destruction.

Majority of the men were seen around the relief distribution points set up by the army and NGOs at the *tehsil* headquarters. In some places long queues of people were seen waiting for relief items and to get compensation cheques. Most of the relief items that were being distributed included tents, beddings, kitchen utensils, flour, blankets, cooking oil etc.

As compared to the initial weeks, the general humanitarian and emergency situation in these affected areas visited by the team was seen to be improving. Some valleys in the areas visited now had rudimentary access to critical requirements of food and tents and items of immediate need. Medical support was being provided through camps set up by NGOs and other relief agencies. The logistical and coordination support mechanism provided by the army at the district and *tehsil* headquarters level was providing support in *Allai* and *Siran*. The main link roads, serving as lifeline for these mountainous valleys were at that time open to supplies. Helicopters were plying the valleys with medical teams, supplies and tents, trying to reach those still inaccessible.

The immediate priority of the government as described by the army team in *Allai* and *Siran* was the distribution of compensation cheques (of Rs.25,000) to affectees whose houses were completely damaged, and provision of winterized shelter to maximum number of households before the onset of the winter. This was indeed a gigantic and challenging task, as there was a high probability that the first shower would disrupt the highly vulnerable road network in the valleys, making road transportation difficult. The army and some relief agencies were seen actively providing corrugated iron sheet shelters to affectees in high altitude areas.

The government was making firm appeals to people living at high altitude areas to evacuate, and temporarily migrate to the tent villages established at low altitudes, before the snowfall which generally starts in the first or second week of December. However, the local residents did not seem to be convinced, and many people remained at their homesteads. The main reasons for staying back as reported by people in the higher valleys themselves were concerns for the safety and dignity of their women, care for their children and livestock in these camps, besides insecurities about the protection of their assets buried in the rubble of the destroyed houses and the maize crops in their fields. Local residents interviewed in *Gangwal* and *Gantar* in *Allai* reported that only those people who had either lost everything in the village or were poor tenants and had little asset base in the village, left for the camps. Those comparatively well-off had already left for the cities and those with middle incomes, some land and assets, such as livestock, grains, building material in the rubble, were reluctant to evacuate. Family feuds, tribal rivalries, protecting the arms and dignity norms of attachments with ancestral lands and graves etc. were compelling the more traditional among the population to stay back.

## 2.2 Overview of AJK

The situation in AJK was at a more advanced stage of relief, and had entered into the rehabilitation and reconstruction phase when the mission visited the area.

The basic damage to the physical environment in AJK was due to the massive landslides, throughout the affected areas. Their occurrence was the highest in and around the area of epicentre, *Muzaffarabad* and its environs. The slides have caused huge damages to the infrastructure of the area, such as to roads, bridges, houses, public structures, and even heritage sites, such as the *Muzaffarabad* Fort. In most areas these slides have not yet stabilized.



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The water resources of AJK have received huge loads of gravel and sand falling down from the mountain faces, increasing the sediment load of the surface water bodies in the area. Irrigation systems have also been severely damaged, and generally, rendered useless.

Forest resources have also suffered losses, again mainly due to landslides in the area.

Biodiversity assessments were not made at this stage. An ecological assessment should be conducted over the next months to determine the extent of these impacts. However, there are concerns among the local experts that the forest biodiversity has been adversely affected, and the AJK government has



requested IUCN to provide assistance in performing an assessment of these impacts.

The EQ affected areas of AJK are dependent on the income from remittances, particularly in *Bagh* and *Rawalakot* areas, remittances from overseas are a major source. The remittances from abroad in *Muzaffarabad* and *Rawalakot*, and better socio-economic conditions, may have been major factors in a comparatively quicker start of rehabilitation and reconstruction work in these areas. In addition, most of the rural households in AJK have already received Rs.25,000 compensation money and corrugated sheets for reconstruction. A large number of people from these areas working in different parts of Pakistan returned to their villages immediately following the EQ to help their families, and to claim compensation.

The EQ affected areas in AJK also have better access through roads except for the areas in the *Neelum* and *Leepa* Valleys.

The EQ affected areas of AJK are generally more developed than the EQ affected areas of NWFP. The following may be the underlying reasons for this difference:

- greater exposure of AJK community to the outside world;
- higher literacy rate;
- greater women empowerment; and
- better socio-economic conditions.

Most of the effected households now have tents or some type of shelter, but there is a shortage of winterized tents. As the severity of winter increases over the coming weeks, life in ordinary tents would be extremely difficult.

The policy of the Government of AJK and other relief organizations working in the area is to keep the people in their villages and provide them relief *in-situ*. This has been done primarily to prevent social issues. However, some tent villages have been established by the Government of AJK and relief organizations.

While there was a high rate of unemployment in AJK, prior to the EQ, it is believed, however, due to relief, rehabilitation and reconstruction activities, specific work and employment opportunities will rise. ***(It was observed by the mission, and also highlighted by different people that current indiscriminate supply of relief goods is acting as a disincentive for the people to work. This may also trigger social issues such as dependency and loss of self-respect and initiative.***

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***Currently, there is severe shortage of labour in the EQ affected areas of AJK. There were some complaints that influential people were usurping most of the relief supplies that were coming in.)***

The pressure on forests has increased tremendously to cater to the fuel-wood and timber demand. The regulatory capacity of the Forest Department of the Government of AJK has been badly affected due to loss of human resource (staff), office buildings and vehicles. More than 75% of the staff of the Forest Department of the Government of AJK was working in the EQ affected area and all of them have been in one way or another affected by the EQ.

Government infrastructure, including buildings and equipment, has been crippled, and most government officials are themselves affectees. In buildings which are still standing, cracks have appeared and many might be unsafe for occupation.

### **3. Environmental Risks**

While the previous section provided an overview of the conditions observed in the EQ affected areas, this section, based on the observation made during the two missions, looks at the environmental effects of the EQ. Other than the obvious direct damages to the environment there are also latent risks that threaten further damage to the already fragile situation of the environment of these EQ hit areas.

The EQ on October 8, 2005, has caused huge damages to all segments of the environment, adversely affecting the entire environmental profile of the area. In this section an attempt has been made to qualitatively assess and rank the risks faced by the environment of the EQ affected areas.

#### **3.1 Risk Assessment**

It is very difficult to judge levels of risk, and there is no common framework for evaluating risks, neither is there any universally recognized level of risk which is considered to be tolerable/acceptable. A **Qualitative Risk Assessment** is being performed to identify hazards, and to some degree, rank them in categories of severity. This methodology is fairly effective in identifying, categorizing and evaluating risks, in order to devise means and mechanisms to minimize these risks - to the minimum tolerable level. However, such a qualitative method relies heavily on professional judgment, technical expertise and experience of the assessor.

In order to systematically ascertain risks that existed after the immediate devastation caused by the EQ, all segments of the environment have been examined. These include the **physical, biological** and **socio-economic** environments of the affected areas. The risks have been divided into three categories, **high, moderate** and **low**, based on their probability of occurrence and proportion of the exposed population to these risks.

For the purpose of this report, the analysis has been based on the information obtained from visits to the area, and the limited data available. In cases where insufficient information was available, but based on professional judgment, where it was felt that there was an imminent threat to the environment, the risk has been flagged, but has not been ranked.

#### **3.2 Physical Environment**

As mentioned above, the physical environment is composed of soil, topography, water resources, climate, and air quality. Of these features, the EQ has largely affected the topography of the affected areas, the soil has loosened and landslides have occurred changing the outlook of the terrain. Water resources also face some threats. Both of these will be discussed in the following sections.

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### 3.2.1 Soil

Landslides were observed at many locations such as *Allai Valley*, *Balakot*, *Muzaffarabad* and along the route to *Bagh* from *Muzaffarabad*. Furthermore, these slides have not stabilized and were still active when the area was visited. These pose a threat to lives and livelihoods of the populations residing on these very slopes, or immediately beneath them. Crevices have formed in mountain faces in *Allai*, *Battagram*, *Monsehra* and *Galliat*, which may create further land and mud slides under any external, additional force.

#### **Risk: Secondary land slides**

Due to the loosened state of the soil and slopes, there exists a **high** risk that secondary slides may occur in the event of rain, snow melting, further jolts or any other sources of external stress. For specific locations, however, more detailed quantitative risk assessments would need to be carried out.

### 3.2.2 Water Resources

The risk of further damage to the surface water resources in the area as a result of the secondary damage caused by the EQ will be examined in this section.

**Water sources and water supply schemes:** Immediately after the earthquake, the flow of water in many of the natural springs was altered. Some had considerably reduced flow, while in some areas, new springs were observed. In certain areas, e.g., in the *Allai Valley*, the people reported that the colour of the spring water changed to milky. However, in the meantime, many of the water related irregularities have again normalized.

The water supply schemes, irrespective of their source, in nearly all areas, have been severely affected by the EQ. Where the water supply systems have not been restored, there is a **high** risk that people use unsafe water from streams, or other sources of water,

**Flash Floods:** Landslides caused by the earthquake have temporarily blocked several rivers. This kind of river blockage risks causing flash floods once the dam breaches. As more landslides are expected, the risk of flash floods is not over. Therefore people should avoid to camp or stay close to the river beds.



In the *Muzaffarabad* district, en-route to *Bagh*, in the *Hattian Bala/Chakaar* area, a massive landslide

has blocked the river of a side valley of the *Jehlum* River. The dam created by the landslide may be as high as 150 to 250 meters. Behind this dam a lake is slowly being formed, inundating the communities residing there. It will take months or even years to fill this lake. However, once the lake is full, there is a risk that the dam, created out of non-consolidated landslide rubble, may breach. A landslide into the lake could create a big wave that can destabilize the dam. If the dam gives in, it could cause a catastrophic flash flood, which would sweep away communities and cities downstream, along the *Jehlum* Valley down to the plains of Punjab.

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The risk of this dam is such that it has to be assessed by most qualified experts. Large scale engineering works to reduce the maximum level of the lake, as much as possible, will probably have to be undertaken.

**Silt Load in rivers:** The rivers in the affected areas have received large volumes of sand, soil and stones from the landslides that occurred as an immediate consequence of the EQ. This has significantly raised the silt load in these water bodies, which will be transported downstream. This may not be apparent at the moment, and the material deposited in the water bodies may appear to have settled at present, mainly due to the low flow in the rivers.



However, as the volume of water in the rivers increases after rains, this silt may dislodge and be carried downstream. This will increase the rate of siltation of the *Mangla* reservoir, located near the town of *Jhelum* in Punjab further downstream on the River *Jhelum*.

### 3.3 Biological Environment

A biodiversity assessment post-EQ may not be very conclusive, essentially due to limited previous baseline biodiversity data from the earthquake affected areas. However WWF is working on a natural resource damage assessment in AJK.

The people in *Alai* Valley of NWFP reported that two black bears had died in the valley due to a rock fall, while another bear was seen moving down the valley. There is a risk that the threat to wildlife will increase as people may hunt to sustain livelihoods.

#### 3.3.1 Forests

**Damages to Trees and Forests:** In the core area of the earthquake, standing forests on steep slopes were destroyed by landslides. Furthermore, many trees were damaged by rock falls. The earth shaking during the EQ was such that some trees simply truncated about two meters above the ground. The inner structure of many trees may have been damaged which would affect their use in future.



**Timber:** Due to excessive loss of property in the rural areas of AJK and NWFP, there is an imminent threat that

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standing forests may be felled for fuel wood and timber needs. There is a risk that if alternate energy sources are not identified, or alternate (less timber intensive) construction methods are not introduced, people will resort to cutting trees to rebuild their houses. At places it was noticed that people have started to remove timber and other construction material from debris to start reconstruction of their houses. However, in some places the timber from destroyed houses is damaged and no longer good for construction. It was observed in many locations in AJK, where people had already received compensation money, that timber intensive reconstruction had begun. In the face of these factors the risk that people will cut forests is **high**. Deforestation poses an urgent and long term threat to the environment.



Another observation was made which also adds to the above, already high, risk. The timber stored in the affected areas is being transported out at an alarming rate for sale in high price markets in the lowlands. The Coordinating Officer in *Allai*, Col. Zakeer has placed a ban on the movement of timber out of the valley to reduce the need for cutting of trees for construction and other purposes.



### 3.4 Socio-economic Environment

The residents of the EQ affected areas have had their lives completely changed by the EQ. Their livelihoods have been lost, in addition to the huge losses, in lives of family and loved ones that they have faced. The economy of the area has been severely affected with people having lost their source of income. However, the EQ has created many opportunities for the people of the area. New sources of income may be generated, now that the economy of the area has received significant funding from the government for reconstruction purposes. Additionally, there will be many job opportunities for labour, both for people in the area and those from other parts of the country to be employed in the reconstruction activity.

**Management Capacity of Civil Administration:** Apart from the damages caused by the EQ to the environment and natural resources, it is important to mention that the human and physical capacity to manage them has also been affected. Several staff of the Forest Department or members of their families have been killed, their houses have been destroyed, and some offices are no longer functional. Link roads have destroyed and many Forest Department buildings have collapsed. A comprehensive report from the *Hazara* Forest Division has been prepared and shared. There is a

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need that the Forest Department be provided assistance from other provinces or from GoP in order to overcome this institutional hurdle.

**Migration:** Poor communities have mostly lost whatever sources of livelihoods they had. The earthquake has further marginalized them. In the event that their income generation mechanisms are not restored, they may need to migrate out and move to other areas in search of livelihood. There is a risk that in the post-relief phase there will be increased out-migration, which will increase the load on weak urban economies and also add to poverty in



the EQ affected areas. However, at the same time, the economy of the area will get a boost due to reconstruction efforts, as large sums of money from public and private sectors have started to pour in after the earthquake. Immediately after the earthquake, many men working as labourers in other parts of the country, returned home to look after the family affairs. Most of them are still at home, and many of them, may have lost their jobs. Once the reconstruction is in full swing, there would be plenty of jobs for them. However they may not have the required skills, and the remuneration may be less than what they used to earn in the cities.

**Agriculture land, terraces:** Many farmers lost an important part of their agricultural land on terraces and steep slopes. As long as this land is not rehabilitated, it will result in less agricultural production, and consequently, less food security and less income.

**Livestock:** Collapsing sheds, landslides and rock-falls killed a huge number of livestock, mainly buffaloes and cows. After the earthquake many farmers had to sell their livestock at a very low price because of lack of shelter and food for them. A reduced number of livestock at the rural household level implies a reduced income and less manure for the next cropping season.

**Irrigation schemes:** Most of the irrigation schemes in the core area of the earthquake have been severely damaged. Many concrete channels are broken and their repair is a difficult task, as land movement has often changed the gradient of the channels... The lack of irrigation resources will adversely affect the agriculture production in the following season if the systems are not rehabilitated.

**Fish farming:** Many concrete ponds that served as fish farms and the water supply to them have been destroyed by the earthquake. The large fish hatchery in *Chakkar*, which produces fingerlings for the whole region, was also destroyed. The fry from these hatcheries were supplied to private fish farmers whose livelihoods depended on them. Many fish farmers will be deprived of their livelihoods as long as the infrastructure of the fish farms is not renewed.

**Water mills (NWFP):** For grinding their maize and wheat, people rely on traditional water mills, situated along the rivers and streams. Many of them were destroyed by the EQ. This increases the dependency of the people on the flour being brought in by the relief agencies. Additionally, this will increase the burden for people who have to traverse great distances for grinding their flour.

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**Roads:** Due to the devastating EQ, many roads have been destroyed in the mountain areas of AJK and NWFP. The army did a great job in quickly repairing the main roads. Still, there are many link roads which have not been repaired, and it is difficult for the people living there to get the necessary relief items and material for reconstruction of their shelters and houses. The winter, with snow and rain and more landslides and mudslides, will again close many of these roads.



**Debris removal:** A major environmental challenge, mainly in the affected urban areas, is that of proper removal of the debris of collapsed buildings. Part of the debris need to be separated and used for reconstruction. The rest has to be removed to proper dumping sites. If the rubble is dumped anywhere without considering the topography, hydrology and drainage patterns of the area, it is likely that this would have adverse effects on the overall hydrology of the area.



**Camp Management:** The relief operations and the struggle for survival after the earthquake have created new environmental problems with possible consequences affecting the health and the well being of the people. Issues pertaining to camp management, as were observed in camps visited in the NWFP areas, and their risks are detailed in the following sections. It may however be noted that these camps were visited in the early days after the EQ, when the pressure of providing relief was high.

- **Location of tent villages:** In general, experienced relief organizations have established tent villages in safe places. However, there are many spontaneous temporary settlements and small groups of tents placed in extremely dangerous places such as along river beds and on steep slopes. As such, these camps may be at risk from land and mud slides, flash floods or avalanches. Most of the camps are located in agricultural areas which will get very slushy and damp after rain and snow. No adequate preparations have been made to face this situation.
- **Water Supply and Sanitation:** Many water supply schemes have been destroyed by the landslides and people have resorted to using river water for drinking purposes at relief camps in most areas. Most of the smaller tent villages have no adequate toilets and sanitation. Often the people use riverbeds and ravines for toilet purposes. This situation represents a health risk for the people in

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these camps.

- **Waste management:** Solid and liquid waste management, was, most of the time, not adequate, even before the earthquake. The rudimentary waste management systems, where they existed, have collapsed. The relief operations have added to the amount of waste accumulated in the areas. There are three types of wastes being generated in the relief camps 1) **aid waste**, which was seen scattered all over during the first mission but had almost disappeared by the time of the second mission, 2) **domestic waste**, generated by camp operations such as kitchen waste and other related waste, and 3) **medical waste**, from field hospitals which at some camps is being managed adequately, but mostly being just mixed with domestic waste creating potential serious health hazards.



The most serious problem is the management of medical care waste. Waste management was not a priority during the first weeks of relief operations. Except in some well managed larger camp sites, waste mismanagement is rampant; if this issue is not addressed effectively, it will cause more problems and lead to diseases, even epidemics.

**Unplanned and hazardous reconstruction:** In some areas, reconstruction at a small scale has already started, mainly by better off people. Such premature reconstruction creates several problems. New constructions will hamper a proper planning and zoning of the villages and towns with adequate infrastructure like road network, water and energy supply and sewerage systems. Without support and training the new buildings will again not be earthquake resistant and they will need excessive timber and energy. There is a dire need for proper EQ-proof, and environmentally sound, local architectural techniques, guidelines and norms.

## 4. Needs and Potential Interventions

Based on the information gathered by the two missions to the affected areas, an analysis was undertaken to identify the needs to be addressed.

The needs that have been identified can be broadly divided into interventions that should be initiated at the planning stage, and interventions that need to be introduced on the ground where the damage has occurred, or where there is a risk to the environment.

### 4.1 Planning Stage Interventions

Based on observations made during the visit to the areas, one thing that was very obvious was that more lives could have been saved, less damage encountered, and a lower overall cost of reconstruction would have resulted, had the following been in place:

- Proper land-use policies and land zoning plans.



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- Enforcement of updated building codes and guidelines, extended and contextualized to the rural mountain hamlets.
  - Construction of earthquake resistant buildings through the application of indigenous materials and low-cost designs suitable for EQ-prone and harsh mountain environments.
  - Transparent building verification systems and a regular schedule for the inspection of public and private sector buildings for hazard risks and possible provision of retrofitting.
  - Mainstreaming of multiple hazards and environmental risks into all development sectors, policies and procedures.

Although the EQ was very intense, nevertheless, it was man-made vulnerabilities such as lack of planning or other neglect that contributed significantly to the human and material losses. Based on these observations, the following three conclusions may be drawn:

- Despite the fact that currently science is unable to accurately predict the occurrence of earthquakes, the hazards are well known. These hazards can be identified, studied, managed and mitigated through proper hazard mapping, vulnerability and risk assessment, community based preparedness initiatives and through structural and non-structural mitigation measures before that hazard becomes disastrous.
- It is the human factor in disasters, like lack of proper land-use planning; land zoning; urban and rural planning; unsustainable use of natural resources like forests and water resources; lack of integration of disaster risks into broader development plans, policies and processes; lack of awareness and local capacities; social and political marginalization; poverty and a poor standard of living that creates a devastating impact with the onset of a natural disaster, like the earthquake.
- Disasters, especially earthquakes, have no political borders. Therefore, a regional approach to disaster risk management is required. Disaster response and mitigation efforts would also require a regional perspective.

It is therefore imperative to develop a comprehensive natural disasters risk management framework for mountain areas, based on the above lessons learned and conclusions, at the federal, provincial and district levels.

The framework entails; i) a comprehensive hazards, vulnerability and capacity assessment (HVCA) at the village level; ii) risk analysis and risk modelling, based on the HVCA to understand the nature and intensity of multiple hazards; iii) development of maps that guide the development of land-use plans and land-zoning based on ecological, geographic, vulnerability and risk scenarios. With land-use, zoning plans and maps in place, this framework provides a very effective and efficient tool for planners and decision-makers to develop principles, policies, strategies, procedures and standards for hazard risk mitigation, preparedness and response.

There is a need to engage academia, civil society, the government and the private sector to develop mechanisms to design and implement such a framework. There are many organizations promoting this approach in many parts of the world. Some civil society organizations in Pakistan are engaged in small-scale research projects to validate such a framework in the Northern Areas of Pakistan. Based on the lessons learned, this framework could be scaled up and replicated in other regions.

In order to address the risks that may arise in the reconstruction phase, there is a need to:

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- Develop rehabilitation plans and strategies.
  - Develop guidelines and norms for reconstruction in an EQ resistant and timber and energy saving manner.
  - Adjust policies and legislation e.g. access rights of local earthquake victims to forest products (from sustainable management).
  - Rural land use planning.
  - Urban planning (zoning).

## 4.2 Sector Wise Interventions

There is an immediate need to start interventions for environmental protection/rehabilitation and sustainable use and conservation of natural resources in all areas affected by the EQ. Interventions are required in various time frames: **short**, **medium** and **long** term interventions. These interventions may be divided into the following broad categories.

### 4.2.1 Information Dissemination and Coordination

The feedback from the field should be communicated to the relevant institutions and the knowledge should be made available to institutions working in the field and at the community level. This requires close collaboration of the relevant government institutions, civil society organizations and the private sector. This tragedy has been educational for the government and the civil society in highlighting their dependence on each other. The government realized that the civil society has a very key role to play in such situations and can assist the government in responding to such disasters. The civil society also realized that it can be more effective when it works in close collaboration with the government and the army. In all the areas visited by the Mission, it was noticed that the government institutions, army and the civil society are all working together towards a common goal – providing relief to the affected people.

It is now important to take this momentum into institutionalizing this relationship further in disaster management and beyond. Knowledge exchange forums could be established to discuss environmental issues and to find appropriate solutions. Different relevant organizations could participate in roundtables on important environmental issues e.g. timber saving construction material and techniques, fuel wood saving energy options, etc. Lessons learned and best practices could be put on the Internet. Positive examples could be shown and shared to bring life back to normal. Information about environmental work being done by different organizations should be made available. In the beginning, pilot projects can be undertaken to develop technologies and to train the local residents. While communicating with the communities and disseminating the information it should be ensured that appropriate communication channels e.g. language are used.

Some activities which should be initiated are:

- Coordinate information about environmental work and expertise of various relief and reconstruction agencies.
- Improve access to existing environmental guidelines and knowledge.
- Disseminate existing guidelines widely on the Internet and distribute hard copies.
- Create new environmental guidelines and/or improve existing guidelines.
- Demonstrate how to use guidelines in the field by placing expertise in the field and providing field-based support to agencies.

Some studies are required to be undertaken immediately to finalize the response. The most important of these would be:

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- Detailed risk assessment of potential secondary hazards viz. landslides, slope instability, soil and riverbed erosions etc., that have been activated by the earthquake and are potential threats to the natural resources like forest ecosystems, biodiversity, freshwater resources and settlements.
  - Technical risk assessment of the lake formed at *Hattian Bala* and *Chakkar*, created due to a massive landslide.
  - Impact of earthquake on natural resource management and livelihoods.
  - Changes in the quality and quantity of water resources in the EQ affected areas.
  - Contamination and siltation of streams, rivers and dams.
  - Relationship/linkages between deforestation and landslides in EQ affected areas.
  - Vulnerability study of women and children (ongoing, jointly by IUCN and *Khwendo Kor*).

#### 4.2.2 Assistance to Camp Management

Different organization involved in managing camps/tent villages and the organizations responsible for planning and undertaking reconstruction could be assisted in the following areas from the environment and safety perspective:

- Suitability/safety of camp sites.
- Waste management in camps.
- Disposal of medical care/hospital waste.
- Sanitation and hygiene.
- Access to clean drinking water.
- Land use planning.

#### 4.2.3 Energy Requirements and Construction

This would be an important area to reduce the burden on forests for timber and fuel wood. There is a good potential of reuse and recycling of wood and other construction material present in destroyed buildings.

There is a need to improve traditional housing structures by making them safer and environment friendly. Timber intensive construction should be replaced by more appropriate designs with



utilization of timber alternates. Insulation in the houses needs to be improved. More use of CGI sheets may be a viable option.

Alternate fuel sources like LPG, solar, mini-hydel power, solar and biogas should be introduced. Introduction of fuel-efficient stoves is another good intervention.

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There is an urgent need for rehabilitation and restoration of damaged community infrastructure including water supplies, link roads, paths/tracks, water mills etc.

Some other steps that may be taken include:

- Involve universities like the Institute of Architects Pakistan (IAP) in developing and promoting seismic-resistant, insulated and low-cost designs for rural and urban housing in earthquake-prone areas in the mountains and create an illustrated manual in local languages. Coordinate and facilitate volunteer architects and students of architectural schools directly or through partners like the AKPBS, NRSP, SUNGI and HAASHAR, to visit selected settlements and demo-sites to train local masons and carpenters and help in implementing the prescribed designs.
- Provide support to the provincial and AJK governments to develop land use and zoning plans and digitized maps using modern techniques.
- Assist the government in developing policy guidelines, operating standards, codes and norms for reconstruction purposes.

#### 4.2.4 Restoration of Livelihoods

As majority of the population in the EQ affected areas depends on farming for livelihoods, there is a need to make interventions in agriculture and livestock farming sectors for restoration of sustainable livelihoods. Immediate restoration of crop and animal husbandry is required to improve the nutrition status of the people in the EQ affected area besides providing means of livelihoods. Some of the necessary interventions in this area are:



- Rehabilitation of agricultural fields and terraces.
- Supply of agricultural inputs (seed, fertilizer).
- Support to poor farmers in the purchase of small and large animals.
- Supply of agricultural machinery, tools and implements.
- Rehabilitation of fish hatcheries and fish ponds.

#### 4.2.5 Rehabilitation of Rural Community Infrastructure

The basic community infrastructure in the rural localities in the EQ affected areas has suffered heavy losses. The areas where assistance in the form of interventions is required are:

- Drinking water supply schemes.
- Rehabilitation of destroyed irrigation systems.
- Construction and rehabilitation of damaged or destroyed link roads.

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- Construction or repair of water mills.

#### 4.2.6 Sustainable Forest Management

In AJK about 90% of the forests are owned by the state. In the EQ-affected areas of NWFP, the majority is *guzara* forest. In both cases the local communities have only very limited rights and benefits from the management of the forests. The government has not demonstrated the capacity – which it may not have at all - to manage the forests in a sustainable way. Therefore, most of the forests are in very bad shape and over-exploitation and destruction of forests is going on at large scale.

After the earthquake, the need for construction material and fuel-wood puts additional pressure on the already scarce forests. The earthquake, on the other hand, could be used as an opportunity to give more secure long term rights and benefits from sustainable management of forests to the local communities. Such a move is possible under the new forest legislation and would be necessary to have the support of the local communities for rehabilitation of the forests and sustainable management in future.

The following measures should help to protect the forests from indiscriminate destruction:

- Professional support for sustainable management of the forests, to cover, as far as possible, the needs of the earthquake victims on fuel wood and timber.
- Large scale introduction of **Joint Forest Management** schemes with secure and far reaching rights and benefits for the local communities.
- Rehabilitation of forests under Joint Forest Management schemes
- Protection of natural regeneration in existing and potential new forest areas.

As the traditional ownership and management systems have proven not to be sustainable, they should not be replicated under the earthquake environmental rehabilitation programs.

#### 4.2.7 Environmental Rehabilitation

Long-term interventions should be designed for environmental rehabilitation in the EQ affected areas. These may include rehabilitation of ecology, wildlife, biodiversity including forests, as well as different aspects of livelihoods. Water resource and watershed management at micro and macro levels is an environmental priority for sustainable livelihoods, agriculture and development in the mountain areas, as well as downstream. Integrated watershed management interventions may be initiated. Pasture land management should be integral part of the environmental rehabilitation.

### 4.3 Approach to Rehabilitation and Reconstruction

There is an old Chinese saying that crisis brings two elements: danger and opportunity. And wise people mitigate dangers by building on the opportunities the crisis brings and manage future risks in an anticipatory and pre-emptive manner.

The earthquake, though devastating, has created unique opportunities for rebuilding and re-engineering of the social, economic, environmental and cultural fabrics and institutional arrangements for research, planning and service delivery in the affected areas.

In order to design any strategy or plan for rehabilitation and reconstruction, the following overarching principles and approaches need to be taken into account so as to revitalize the economy, rebuild the critical lifeline infrastructures and revive the

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social, cultural and environmental assets of the affected communities in these hazard-prone remote mountainous regions:

- The government and multi-lateral and bilateral donors should immediately formulate and publicly disseminate a transparent, clear, coordinated and synergized policy and plan of action for rehabilitation and reconstruction.
- In the short run, some kind of a cash-for-work programme needs to be initiated to engage the local population in the reconstruction work. This is necessary not only for their ownership of the initiative and providing source of livelihood, but also to ensure that the disincentive for work engendered by the relief aid – creating an unhealthy dependence on it – is removed forthwith.
- The rehabilitation and reconstruction work should be planned and executed in a decentralized manner by mainstreaming it in the regular development planning cycles and channelling funds through i) provincial and local governments ii) civil society organizations and iii) by giving maximum incentives to the private sector to thrive and to revitalize the economy and hence providing sustainable employment opportunities in the affected areas;
- A strong sense of public-private partnership should be created by making ERRA more transparent, and representative; and giving the civil society organizations and the private sector due representation in planning, decision-making and execution in order to ensure accountability, efficiency and effectiveness; and to improve coordination in policy development and in judicious use of available resources.
- Investments need to be geared towards fostering local self-reliance and local initiatives of the people by promoting the optimal use of local knowledge, local institutional mechanisms, traditional skills and local construction materials and technologies in the mountain areas.
- All reconstruction and rehabilitation policies, strategies and plans should mainstream disaster and environmental risks to mitigate the negative impacts of the earthquake on the fragile ecosystems and to ensure that the reconstruction efforts themselves do not create further vulnerabilities in the future. Therefore all mega projects should include a proper EIA and mitigation measures, and medium and small-scale projects follow proper environmental guidelines and checklists.
- Promote sustainable use of the natural, cultural and social resources of the affected areas. Necessary laws and regulations should be formulated which give ownership rights to the communities living in the vicinity of forests, watershed areas and rangelands, promoting joint and participatory management of resources.
- Proper mechanisms should be put into place through enacting legislation to make the downstream beneficiaries adequately pay for using the natural resources.
- Use the winters as an opportunity and Invest in vocational skill development to prepare local people to be involved in reconstruction work in spring and promote local employment.
- Provide opportunities to the youth and women for formal and informal education, sport, culture and other entertainment facilities.
- Provide incentives, training and support to local people to be involved in preparations for reconstruction materials in the villages.
- Develop and implement disaster prevention, preparedness, mitigation and risk management plans involving the provincial government, district and union councils ensuring maximum participation by the private and civil society organizations.
- All disaster risk management strategies should keep in view a multi-hazard scenario in these fragile mountain ecosystems, rather than focusing only on a

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single hazard like the earthquake.

Various non-government actors are supporting the communities in relief. There is very little technical advice or assistance being provided to people in the affected rural and urban areas. In some areas people have started rebuilding their houses on the same foundations and mostly re-cycling the waste from the rubble. There are many guidelines and construction design illustrations available from various sources, however, they need to be customized to the needs of local agencies and local contexts.

# Annex: Pre-Quake Environmental Overview

## 1. Introduction

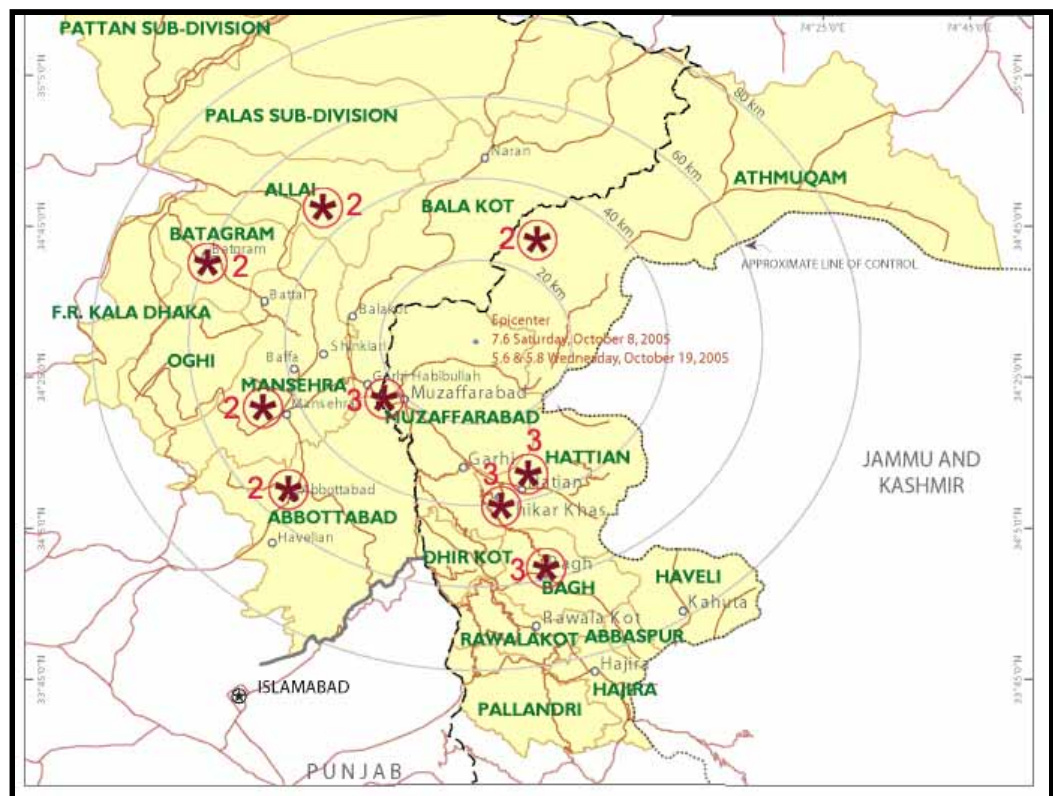
This section provides an overview of environmental conditions prevalent in the districts visited, prior to the EQ.

### 1.1 Districts Visited in AJK

#### 1.1.1 Physical Environment

##### a) Location

District *Muzaffarabad* encompasses the area surrounding *Muzaffarabad* city, extending eastward along the *Jhelum* Valley towards the Line of Control, ending at Chakhoti. It also takes in part of the *Neelum* Valley. It borders on the East with Indian-controlled Kashmir, to the South with District *Bagh*, to the West with District *Abbotabad*, to the North-West by District *Mansehra*, and to the North with the Northern Areas. District *Bagh*, encompasses the area South of *Muzaffarabad* District and is situated along the *Mohi* River. It is bounded by District *Abbotabad* to the West, District *Poonch* to the South, and Indian-controlled Kashmir to the East. Please refer to the accompanying map for more details.



##### b) Topography and Soils

The topography of Districts *Bagh* and *Muzaffarabad* in AJK is mainly hilly and mountainous, with three major valleys and featuring some alluvial plain areas. Much of the area is highly eroded and is characterized by deeply cut ravines and undulating hill terrain. The highest point is located in *Athmuqam* at an altitude of 6,300 meters.

Soils in AJK are grouped into three categories: hilly plateau soils; hill slope soils, and; inter-mountainous valley soils. The valley soils are fertile and alluvial, and are



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therefore able to support productive agriculture. However, the hilly soils are shallow and prone to erosion.

**c) Water Resources**

District *Muzaffarabad* is in the catchment area for the *Jhelum* and *Neelum* Rivers, whilst District *Bagh* forms the catchment of the *Mohl* River. All of these water courses are part of the greater Indus basin catchment area. The *Jhelum* River is the main waterway of Kashmir. The *Jhelum* and *Neelum* rivers are relatively rapid-flowing, and they are responsible for moving vast quantities of alluvial matter downstream.

**d) Climate**

Most of northern AJK, including *Bagh* and *Muzaffarabad* districts, is classified as having a moist temperate climate. The average annual rainfall is between 1000mm and 2000mm. There is winter snow and frost cover at altitudes above 1500 metres. In *Muzaffarabad* and *Bagh* districts, 30% of winter precipitation occurs in the form of snow. Accumulated snowfall at higher altitudes can reach as much as 25 feet over the season.

The average temperature in *Bagh* District ranges from 21°C to 40°C in summer and between -3°C and 15°C in winter. In *Muzaffarabad* District, the average temperature ranges from 25°C to 42°C in summer and between -3°C and 15°C in winter.

**e) Air Quality**

The two districts lack a heavy industrial base and therefore, ambient air in the area is believed to be largely uncontaminated. However, air pollution does occur as a result of the burning of fossil fuels such as coal, as well as via diesel and petrol emissions, although these have not been measured to ascertain precise levels.

**1.1.2 Biological Environment**

**a) Forests**

Both districts have over 50% of their total areas under forest cover – 59% for *Muzaffarabad* and 53% for *Bagh*. The predominant species of tree found in *Muzaffarabad* District are deodar, blue pine, spruce, chir, walnut, ash, maple, poplar, willow and oak.

The predominant species of tree found in *Bagh* District are the same as *Muzaffarabad* District and additionally include horse chestnut, quercus, *olea cafidata* and *acacia modesta*. Blue pine and chir are the two species that provide the most significant forest coverage.

Forestry and forest products form an important component of local livelihood and also income for the AJK government. These forests are a major source for construction timber that is used locally and shipped out of AJK to Pakistan. The overall situation for forests in AJK, however, is grim as it is fast losing its forest cover. The forest coverage was estimated at 20% of total area by the FAO in 1997 and at just 12% by the United Nations in 2003.

**b) Protected Areas**

AJK is home to 11 protected areas, comprising of seven game reserves and four national parks namely: *Machiara*, *Toli Pir*, *Pir Lasurra* and *Gamote*. From the national parks, *Machiara* is in district *Muzaffarabad*. All protected areas are managed by the AJK Forest Department.

**1.1.3 Socio-economic Environment**

**a) Population**

The total population in the two areas is 1,139,170. The population density for *Muzaffarabad* and *Bagh* is unavailable, but AJK's overall population density is roughly 258 persons per square kilometre.

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Both districts are predominantly rural. *Muzaffarabad* is less rural than *Bagh*, with a rural population of about 86%. About 95% of *Bagh's* population is rural.

#### **b) Education**

At present, 27% of the total recurring budget is spent on education. As a result of the high priority of the Government of AJK on education, the literacy rate for AJK rose to 60% after the 1998 census. This means that the area enjoys education levels higher than the Pakistani average.

Interestingly, *Muzaffarabad's* literacy rate is lower than that of *Bagh*. *Muzaffarabad's* overall literacy level is 46.95%, while *Bagh's* is 56.89%.

There is considerable discrepancy in the education received by men and women in these districts, in favour of men, and also between rural and urban areas, in favour of urban areas.

#### **c) Health**

*Muzaffarabad*, being the larger of the two districts, does not have significantly more health units than *Bagh*. The total number of health units in *Muzaffarabad* is 150, including 6 rural health centres, 52 basic health units, 25 mother child health centres, 24 dispensaries, 13 TB and leprosy centres and 20 food centres. *Bagh* has a total of 148 health units, only 2 less than *Muzaffarabad*, including five rural health centres, 18 basic health units, 22 civil dispensaries, five *unani* dispensaries, 22 mother child health centres, 23 first aid posts, eight WF Scheme centres, 28 EPI centres and 10 TB and Leprosy centres.

#### **d) Irrigation**

Both districts have no major irrigation systems or irrigated areas as most agriculture is rain-fed or *barani*. Some irrigation is present but forms a very small portion of overall agricultural land use and is based on utilisation of natural springs and small streams or *nullahs*. Figures for *Muzaffarabad* are not available but *Bagh* has close to 1,680 hectares of irrigated land.

#### **e) Livelihoods and Economy**

##### Agriculture

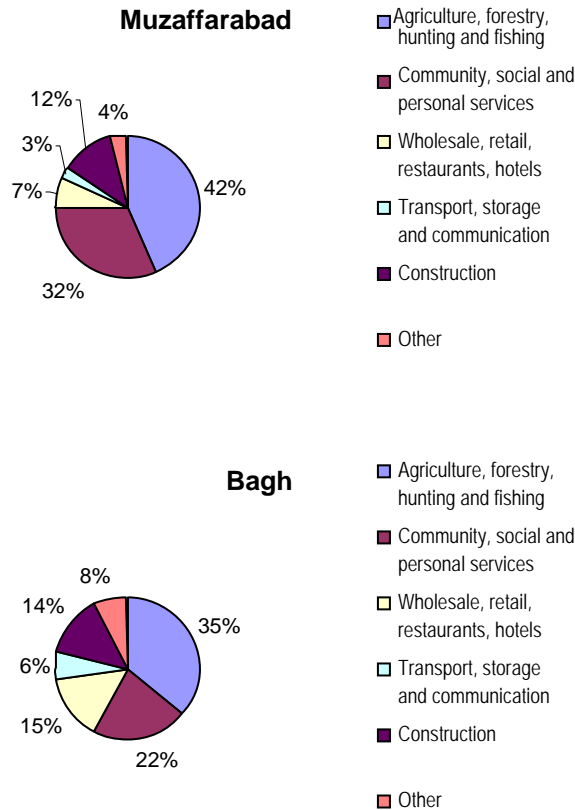
The use of land and natural resources plays a vital role in the lives and livelihoods of the people of the area concerned. 91% of AJK's population live in rural areas and are dependent upon forest and agricultural land for their livelihood (World Bank, 2000). Subsistence agriculture prevails, usually meaning grazing, terraced agriculture, and small-scale forestry. However, pressures of increasing population as well as exploitative use of resources, are leading to degradation which threatens the livelihoods of the local populations. 13% of land or 172,721 square kilometres of land is under cultivation. About 92% of cultivable land in AJK is rain-fed. Less than 10% of agricultural land in AJK as a whole is irrigated but over 25% of land in the agro-economic zone comprising the lower portion of District *Muzaffarabad* and Districts *Bagh* and *Poonch* is irrigated.

Principal crops cultivated are maize in summer (*khariif*) and wheat in winter (*rabi*). In addition, rice, and oilseeds are cultivated at lower altitudes where irrigation is available. About 40% of households own small orchards producing pears, walnuts, cherries, plums, and apricots. Both pastoral and sedentary grazing of sheep, goats and cattle occurs. Buffaloes are an extremely important income source due to the high price of their milk and meat. In addition poultry are extensively farmed. Both districts have a considerably large number of poultry farms and poultry. Livestock varieties in both districts include buffalo, sheep, goat, horse, mule, ass and domestic poultry.

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### Employment

The people of both *Muzaffarabad* and *Bagh* are engaged predominantly in agriculture, forestry, hunting and fishing, while community, social and personal services are the other major activity. The breakdown of major streams of employment in the two districts is given in the charts below.



### **f) Infrastructure**

#### Telecommunication

Urban centres and larger villages are connected to the telephone network. In urban and less remote areas, such as *Muzaffarabad*, mobile telecommunication is available. However, due to the context of the ongoing conflict in the area, the telecommunications infrastructure in much of AJK is provided by an army organization, Special Communications Organization (SCO). Until 1999 very little telecommunication infrastructure had been invested in. However, since then there has been significant development. Current and future telecommunications projects include the laying of fibre optic cable from *Mansehra* to *Muzaffarabad*, the provision of GSM services, and giving coverage to more remote areas.

#### Roads

A good mountain road network provides access to most parts of the two districts. *Muzaffarabad* has a total metalled road network of 813 km and an un-metalled network of 758 km. *Bagh* has a total of 3,187 km of roads both metalled and un-metalled.

#### Electricity

Electricity is available in both districts. Of the two districts *Muzaffarabad* has the higher degree of electrification with electricity reaching 75.55% of all households; while in *Bagh* 68.27% of all households are electrified. Both districts see a higher degree of electrification in their urban areas.

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### Water Supply

The percentage of households receiving piped water is quite low in both districts, with most households using wells and other sources and not having water available inside. Only 31.38% of all households in *Muzaffarabad* receive piped water, while in *Bagh*, only 30.16% of all households receive piped water.

## 1.2 Districts Visited in NWFP

The districts of *Battagram*, *Mansehra* and *Abbottabad* were visited by the EQ team. An overview of the environmental conditions, as they existed in these areas prior to the EQ are stated here.

### 1.2.1 Physical Environment

#### a) Location

The three EQ affected districts visited by the EQ team are located within the *Hazara* Region of the North West Frontier Province (NWFP). *Hazara* lies in the east of NWFP and borders Azad Jammu and Kashmir. *Abbottabad* District is bounded by *Mansehra* to the North, *Muzaffarabad* to the east, Rawalpindi to the South and *Haripur* to the West. *Battagram* District is bounded to the North by *Kohistan*, *Mansehra* to the East, *Kala Dhaka* tribal area the South and *Shangla* to the West. Finally, *Mansehra*, the largest of the three districts, is bounded to the North by the *Diamir* and *Kohistan* districts, to the East by *Muzaffarabad*, to the South by *Abbottabad* and by *Battagram*, *Shangla* and *Buner* districts to the West. Please refer to the attached map for more details.

#### b) Topography and Soils

The affected districts are predominantly mountainous, with the lesser Himalayas being the main mountain range. Typical elevations in *Abbottabad* District range between 600m to as high as 2,700m in its northern region. *Battagram* has higher elevations, with the highest point being *Darwazai Sar* at 4689m high. *Mansehra* is also dominated by high mountains varying in height from 2000m to 4500m.

The soils of *Mansehra* District are composed of metamorphic rocks and silts of mica granite, as do the north-western parts of *Abbottabad*. Generally, the valley soils are fertile and alluvial, and are therefore able to support productive agriculture and the hilly soils are shallow, steep and infertile, unless converted to terraces and irrigated.

#### c) Water Resources

There are a number of large streams in the three affected districts. The *Nindhyar Khwar* and *Allai Khwar* are the two major streams in *Battagram* District.

The *Kunhar* River flanks the eastern boundary of the *Abbottabad* District and joins the *Jhelum*, which flanks the same boundary for another 50 kilometres.

*Mansehra* District has two major rivers flowing through it – the *Kunhar* and *Sirin* Rivers. The *Kunhar* passes through *Naran*, *Kaghan*, *Balakot* and *Ghari Habibullah* to drain the *Kaghan* valley, finally joining the river *Jhelum* five miles below the *Domel* (the confluence of the *Jhelum* and *Neelum*).

These streams are the major water sources for these areas. However it is also worth mentioning that a considerable number of mountain communities, especially the smaller villages and hamlets on the mountains, are supplied by smaller mountain springs. These mountain springs are the main source of drinking water for these communities.

#### d) Climate

The average annual rainfall in the three districts is between 1000mm and 2000mm, where the *Balakot Metrological Observatory* in *Mansehra* records the highest rainfall per annum at 1679 mm. The average temperature in *Abbottabad* District ranges from

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15°C to 32°C in summer, and between 2°C and 20°C in winter, while in *Mansehra* District, the average temperature ranges from 21°C to 35°C in summer, and between 2°C and 14°C in winter (*Battagram* has no formal climatic observations, however the conditions present in *Mansehra* can be assumed for it as *Balakot* is the nearest weather observatory). The coldest area in *Mansehra* is the *Kaghan Valley* located upstream of the river *Kunhar*.

The upper reaches of the *Battagram* district such as *Shamlai Hill* and *Bilandkot*, receive heavy snowfall during the winter months, while *Chaur* is snowbound and inaccessible for 8 months of the year. Parts of *Abbottabad* and the *Kaghan Valley* in *Mansehra* receive heavy snowfall in the winter months as well.

#### **e) Air Quality**

No major industries exist in any of the three districts and automotive transport is minimal and limited to the urban centres. Therefore, ambient air in the area is believed to be largely uncontaminated.

### **1.2.2 Biological Environment**

#### **a) Forests**

The affected areas have a significant amount of lower alpine forest cover (the primary species include pine, spruce, deodar, fir and blue pine) and support a lot of the local wildlife. The *Abbottabad* district has close to 39,395 hectares<sup>1</sup> of forested area, of which 28% is reserved. Most of the remaining forested land in *Abbottabad* is *guzara*<sup>2</sup> forest. *Battagram* has 70,850 hectares of land under forest cover, none of which is reserved or protected by the government and most of which is *guzara*. Part of the forested area in *Battagram* is resumed land, while 10,121 hectares of the overall 70,850 hectares are part of the tribal belt. *Mansehra* is one of the most forest-rich districts in the country and has a total of 109,931 hectares of forested area, of which 34,196 hectares is reserved, 61,198 hectares is *guzara*, 11,798 hectares is resumed and 2,739 hectares forms part of the *Kaladaka Protected Area*<sup>3</sup>. Tree varieties here include deodar, blue pine, chir, poluddar, walnut, cherry, poplar and kao.

Forests and forest resources also form a significant portion of the local socio-economic environment. These forests provide various goods and services that are essential to local wellbeing, including firewood and timber for construction. Most forests are used for grazing animals.

It must be noted that these forests are fast disappearing. This can be attributed to the lack of local ownership of forested areas. A *guzara* forest is, in theory, communal property and is to be administered for the benefit of the entire village group that owns it. However, these forests often end up being controlled by very exclusive user groups that tend to exploit them, leading to unsustainable forest use patterns. Under these conditions, local communities are also involved in their unsustainable use. Finally, the forestry department is unable to check the felling of trees in excess of quotas.

#### **b) Protected Areas**

The NWFP has 53 declared protected areas, the vast majority (39) of which are game reserves. Of the remaining 14, three are national parks, three are wildlife sanctuaries, three are wildlife parks, three are unclassified and two are refuges. All protected areas are managed by the NWFP government.

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1 State of Environment and Development, *Abbottabad Conservation Strategy*, from: <http://acs.iucnp.org/soed.htm>

2 *Guzara* literally means subsistence; such forests are owned individually or jointly by a village group and are designated to meet the domestic and grazing needs of the local population.

3 Data obtained from forest department officials in the *Mansehra* District of the NWFP.

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### 1.2.3 Socio-economic Environment

#### a) Population

The total population in the three districts is 2,340,000 and the population densities for *Abbottabad*, *Battagram* and *Mansehra* are 447.7, 236.2 and 251.8 per sq km respectively. All three are predominantly rural. 94.67% and 82.01% of *Mansehra* and *Abbottabad* respectively live in rural areas, while *Battagram* is entirely rural.

#### b) Education

The level of literacy in the affected districts is low (where the literacy of those of age 10 and above is being considered). *Abbottabad* has the highest level of literacy at 56.61% and *Mansehra* comes next with 36.3% literacy. *Battagram*, has the lowest level of literacy at 18.31%. It should be noted that female literacy is especially low across the three districts.

#### c) Health

Health facilities are rudimentary across these areas though hospitals exist in *Mansehra* and *Abbottabad*. However these districts are served primarily by basic health units and dispensaries. *Battagram* has the poorest health facilities from amongst the three districts.

#### d) Irrigation

Both *Battagram* and *Abbottabad* do not have much irrigated areas as most agriculture is rain-fed or *barani*. Some irrigation is practised (tapping spring water or rivers) but forms a very small portion of overall agricultural land use (e.g. in *Abbottabad* 11% of cultivated land is irrigated<sup>4</sup>).

On the other hand, *Mansehra* does have some level of irrigation-based agriculture. Of the total area that is cultivated (about 80,747 hectares), 8,315 hectares is irrigated during the *kharif* crop plantation and 4,169 hectares is irrigated during the *rabi* crop plantation.

#### e) Livelihoods and Economy

##### Agriculture

Agriculture is the predominant economic activity along with supplementary livestock management, though *Abbottabad* is an exception in this respect among the three districts as shown in the charts below. *Abbottabad* has a total cropped area of 24,856 hectares while *Battagram* has a total cultivated area of 24,834 hectares. Both districts rely mainly on rainfall (these areas are also known as *barani* areas). Also to note is the fact that there is variety of crops that are cultivated locally including wheat, maize, rice, *jawar*, *bajra* and barley.

*Mansehra* also has predominantly *barani* agriculture, although it does have a limited degree of irrigation. The total cultivated area is 80,747 hectares, of which 12,484 hectares is irrigated. The major *kharif* crops sown in *Mansehra* are maize, rice and sugarcane with total yields of 102,782, 6,281 and 125 tonnes respectively, while the major *rabi* crops sown are wheat, barley, onion and potato with yields 58,338, 656, 239 and 801 tonnes respectively. *Mansehra* is also favourable to horticulture and produces a significant quantity of fruit products.

All three districts have veterinary services provided by the government. *Battagram's* veterinary service is managed from *Mansehra*. The livestock of significance include buffalo, cattle, goat, sheep, poultry, ass, mule, horses and *Abbottabad* and *Mansehra* also include camels amongst their livestock. Domestic poultry is the largest category of livestock and *Abbottabad* has the largest livestock populations from amongst the three districts.

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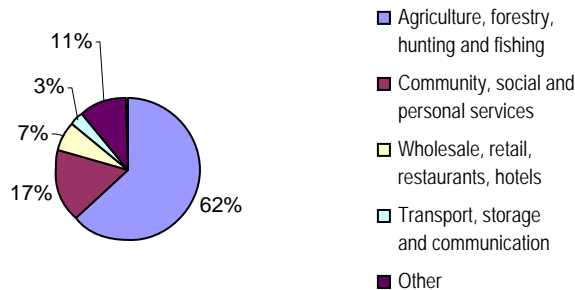
<sup>4</sup> State of Environment and Development, *Abbottabad* Conservation Strategy, from: <http://acs.iucnp.org/soed.htm>

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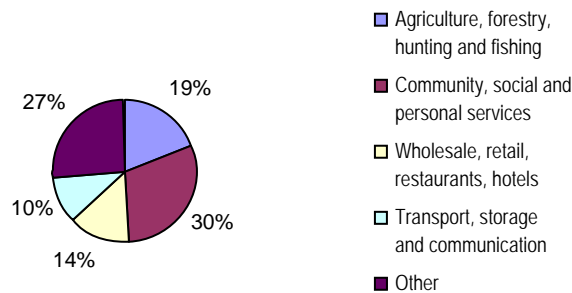
### Employment

*Mansehra* and *Battagram*'s populations are engaged predominantly in agriculture, forestry, hunting and fishing, while in *Abbottabad* the population is involved predominantly in community, social and personal services. The breakdown of major streams of employment in the three districts is as follows.

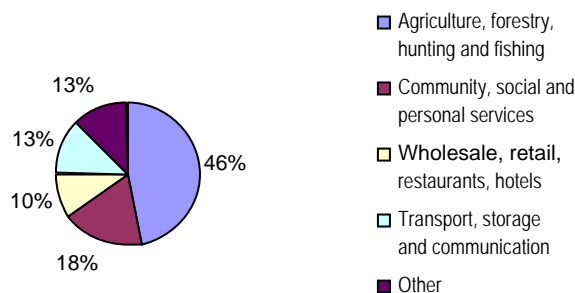
#### **Batagram**



#### **Abbottabad**



#### **Mansehra**



### **f) Infrastructure**

#### Telecommunication

Urban centres and larger villages are connected to the telephone network with the digital network extending to a number of towns across all three districts. Also, cellular telephone services are available in the main urban centres in these areas except *Battagram*.

#### Roads

Furthermore, a good mountain road network provides access to most parts of the three districts, although the more remote villages may be accessed via jeepable

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tracks. *Abbottabad* has a total road network with a length of 464 km<sup>5</sup>, *Mansehra* has a total metalled road network of 473 km and an un-metalled network of 277 km. *Battagram* district has a total metalled road length of 132 km while its un-metalled road length is 212 km.

#### Electricity

Electricity is available in all three districts, however, availability outside the larger population centres is limited. *Abbottabad* has the highest degree of electrification (almost 75% of all households), while *Mansehra* and *Battagram* have less access to electricity (49.10% and 42.35% respectively). All three districts rely exclusively on the *national grid*.

#### Water Supply

In *Abbottabad*, official figures claim that drinking water schemes now serve 85% of rural areas and 90% of the urban population. However, the distribution system is outdated, inefficient and unreliable. In addition, water losses are high, owing to both leakage and illegal connections, while the user charges currently in place are obsolete, leaving the authorities with a water-budget deficit as high as 80%. Water quality is also suspect, with contamination reported in many areas<sup>6</sup>.

In *Mansehra*, close to 55% of all houses are using piped water where the majority have this facility located outside. In *Battagram* only 24.36% of households have water available inside the houses.

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5 State of Environment and Development, *Abbottabad* Conservation Strategy, from: <http://acs.iucnp.org/soed.htm>

6 *ibid*.





## **The World Conservation Union (IUCN)**

Created in 1948, the World Conservation Union (IUCN) brings together 82 States, 112 government agencies, 850 plus NGOs, some 10,000 scientists and experts from over 180 countries in a unique worldwide partnership. IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

IUCN is the world's largest environmental knowledge network and has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. IUCN is a multi-cultural, multilingual organization with some 1000 staff located in 62 countries. Its headquarters are in Gland, Switzerland.

IUCN Pakistan has five programme offices in cities from the north to the south, multiple field offices and a large portfolio of projects. It is one of the 9 Country Programmes of IUCN's Asia Region, covering 23 countries with a workforce of nearly 500.

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