

# Traditional Knowledge and Local Institutions Support Adaptation to Water-Induced Hazards in Chitral, Pakistan



AGA KHAN RURAL SUPPORT PROGRAM  
(A Project of Aga Khan Foundation)

# Executive summary

The central objective of the research project 'Documenting and Assessing Adaptation Strategies to Too Much, Too Little Water' is to document adaptation strategies at local or community level to constraints and hazards related to water and induced by climate change in the Himalayan region, including how people are affected by water stress and hazards, their local short and long-term responses, and the extent to which these strategies reduce vulnerability to water stress and hazards. Five case studies were carried out in four countries. The results of each have been summarised in separate documents on a CD-ROM to accompany a single synthesis document.

The Pakistan case study presented here documents and assesses people's responses to flash floods and water stresses in two union councils respectively, Shishikoh and Mulkhow, in Chitral district, North West Frontier Province (NWFP). Flash floods happen frequently in Shishikoh, whereas in Mulkhow dry weather prevails for most of the year. Data collection methods included focus group discussions, key informant interviews and direct observations.

The livelihoods in both Mulkhow and Shishikoh depend heavily on natural resources. Due to remote location and limited development interventions, opportunities for diversifying livelihoods are almost negligible and this makes them extremely vulnerable to the impacts of water stresses and floods. Climate-induced hazards such as flash floods and water scarcity have had negative impacts on the livelihoods of the inhabitants. The agricultural sector has been severely affected with loss of productive land due to flash floods, poor productivity, and crop failure as the main impacts that lead to food insecurity in both study areas. Depletion of water resources, mainly springs, is a continued threat to the agricultural sector in Mulkhow. Other impacts of climate-induced hazards documented in the study areas include the loss of livestock and the high transportation costs and increased prices of consumer goods following flash flood events, health issues due to shortage of water for domestic use, and increased vulnerability of children and women.

In the absence of a modern early warning system, the communities rely on indigenous knowledge to predict floods and droughts through careful monitoring of local environmental signals (e.g., cloud density and movement over the mountains, the smell of clay and pines, unusual animal noises and behaviour). In Shishikoh, due to the increasing rate of flash floods, residents are leaving the plains and building houses on slopes. In Mulkhow, a key adaptation strategy is a traditional system of water management. This system is based on a traditional social network ('gram') which manages the water distribution and the maintenance and repair of irrigation infrastructures. Other strategies to deal with water stresses include the borrowing or swapping of water, small-scale diversification of crops, and contract farming. People also manage to minimise the negative impacts of climate related hazards on their livestock through the traditional system of lending or borrowing animals, internal arrangements for grazing pastures, and livestock diversification. Micro-credit and migration are common practices in both study areas. An ancient system of intra-rural migration was also recorded in Mulkhow where, due to the shortage of water, increasing temperatures, and availability of fodder in alpine pastures, residents move their families to higher elevations. Diversification of livelihoods (through pine-nut collection and employment in the education department and security agencies) also occurs, but on a very small scale.

The economic status of households, strong social networks, predefined resource user rights, interventions of NGOs, and indigenous knowledge and systems were identified as factors enabling successful adaptation. Alternatively, poverty, isolation, inaccessibility, the scale of hazards, limited livelihood diversification opportunities, resistance to assistance from NGOs, lack of knowledge, poor social networks, and lack of policies and governance were identified as critical constraining factors.

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Shahid Nadeem, Imran Elahi, Abdul Hadi, Ihsan Uddin, Aga Khan Rural Support Program, Chitral, Pakistan

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## Introduction

For the mountain communities of Asia, particularly the inhabitants of mountain catchments in the greater Himalayan region, climate change has brought about striking changes in their livelihoods. As a matter of course these communities, intentionally or unintentionally, adapt to these variations. Scenarios involving 'Too Much, Too Little Water' are the most prominent. In the latter scenario, water sources are drying up, and in the former large swathes of land are rendered uninhabitable and uncultivable by increasing frequency and intensity of flash floods.

The International Centre for Integrated Mountain Development (ICIMOD), as part of a project on 'Too Much, Too Little Water' funded by the Swedish International Development Agency (SIDA) carried out a study entitled 'Assessing Adaptation Strategies to Climate-Induced Water Stresses and Hazards'. This study is also contributing to a feasibility study funded by the Norwegian Ministry of Foreign Affairs for a Himalayan Climate Change Impact and Adaptation Assessment (HICIA). The Centre for International Climate and Environmental Research (CICERO), the United Nations Environment Programme (UNEP) and GRID ADRENAL are coordinating institutions. These activities are important components in ICIMOD's strategic programme on Integrated Water and Hazards Management.

The Aga Khan Rural Support Program (AKRSP), a project of the Aga Khan Foundation (AKF), has been working in poverty reduction through participatory social development of the mountain communities of northern Pakistan since 1982. Recently, AKRSP implemented projects for disaster preparedness and management with the Pakistan Poverty Alleviation Fund (PPAF) and is a partner with ICIMOD in this study.

This report aims to identify and assess adaptation strategies to climate-induced water stresses in Mulkhow and water hazards in Shishikoh Union Councils. Research methods and approaches, concepts and assumptions, and justification for selection of the study sites and their descriptions are presented in the second chapter.

The third chapter describes the general characteristics of the selected areas, patterns of change, and impacts of water stresses and hazards. The fourth chapter deals with people's responses to water stresses and hazards, and, in the fifth chapter, factors influencing the adaptive capacity of the people are discussed. In the sixth chapter, communities' adaptation strategies have been assessed and evaluated in the context of ideal situations and best practices globally.

The overall aim of the study is to understand how people in the HKH region respond to water stress and hazards in the face of climate variability and change. The objectives are as follows.

- (1) To assess the impacts of water stress and hazards on livelihoods
- (2) To assess local responses to water stresses and hazards
- (3) To provide recommendations for adaptation to future climate change.

The overarching question that the field teams are seeking to answer is how do people in the HKH region respond to water stress and related hazards in the context of climate variability and change? This question is approached in selected sites by examining the following.

- (1) How are people affected by water stress and hazards?
- (2) What are the local short and long-term responses?
- (3) To what extent can these strategies reduce vulnerability to water stress and hazards?

## Research approach and methods

### Team profile

The profile of the study team is shown in Table 1.

Table 1: Profile of the study team

S. No	Team Member	Academic Background	Professional Background	Ethnicity	Gender	Role in research team
1	Shahid Nadeem	MSc. in Sustainable Development (UK) MSc. Agriculture (Rural Development)	Monitoring & Evaluation	Local	Male	Team leader
2	Abdul Hadi	Masters in Public Administration	Monitoring & Evaluation	Local	Male	Team member
3	Ihsan Uddin	MA in Social Anthropology Diploma in Local Government	Monitoring & Evaluation Social Mobilisation	Local	Male	Team member
4	Imran Elahi	MSc. In Geography Diploma in GIS & Remote Sensing	Monitoring & Evaluation	Local	Male	Team member
5	Munira Sultana	B.A	Social Mobilisation Data collection	Local	Female	Part time team member

### Concepts

There is no local word for vulnerability; however, the closest phrase describing this concept in the Khowar language is 'khakavesik', and this term embraces a level of insecurity for people, their moveable and immovable assets, and their environment from water stress and hazards. By inference it also covers the inadequacy of options or abilities available for people to protect themselves against possible damage, or to recover from the consequences of natural phenomena with or without outside help. 'Shang' is the local word used for risk, defined by the community as the chance or probability of droughts and floods occurring and of suffering from adverse impacts from the effects of climate variability and /or change or any hazard to which people or their livelihoods are exposed. 'Gherik' is the closest word describing adaptation. The term adaptation was interpreted as adjustment to expected climate variability and /or change (water stress or excess) without damage to the society and livelihoods and the ability to exploit the beneficial opportunities of climate variability and /or change. In addition to these, in order to capture local perceptions of climate change and /or variability, the team used the following indicators.

- Changes in temperature
- Rain at unusual times or lack of rain when expected

- Frequency and intensity of snow and rain
- Change in existing vegetation patterns and wildlife behaviour
- Change in natural resources (land, water, forests, and so on)

### Main assumptions of the study

- The areas selected have been facing frequent variations in climate which affect the lives of mountain communities in Chitral.
- Communities whose livelihoods are based on natural resources are becoming increasingly vulnerable to climate variations.
- A poor socioeconomic situation exacerbates the impacts of climate change on vulnerable communities.
- Traditional and indigenous systems have a key role to play in facilitating community adaptation to climate variations.
- With the passage of time, communities are adjusting to climate variations.
- Socially mobilised and organised communities have better adaptive capacities than others.

### General step-by-step approach

Data collection commenced with site selection in July 2008. Objectives of the study were shared and feedback was gathered from AKRSP's local support organisations (LSOs) and key informants. Visits to the different sites selected also took place to witness the actual situation. After finalising the sites, based on feedback from AKRSP, the team developed a checklist, and a literature review began in late August 2008. Secondary data were collected from local organisations. When the local literature review was complete, literature held in Peshawar and Islamabad was reviewed. A further round of visits to the study sites then took place. The whole process ended in mid-September. Khow Local Support Organisation (KLSO) was consulted to help identify and select villages prone to water shortages and to organise focus group discussions. Similarly, the help of local activists was taken to select the most vulnerable villages and organise discussions. In early October 2008, data collection started in Mulkhow and lasted for a week. Data collection commenced in Shishikoh in early November 2008; and with support from local activists the team was able to complete this work in ten days. Data collections from the sites were categorised and refined. Report writing began in December 2008 and continued until submission of the first draft in mid-February 2009.

With feedback provided by ICIMOD and partner organisations, the report was then edited by the study team. In addition to the visits planned, regular visits to the study sites took place to carry out key informant interviews. During the second round of field work (March to June 2009), additional information was gathered from the study areas through different means (i.e., focus group discussions with women, a report-back workshop, key informant interviews, literature review, and observation); and this process was followed by data verification and analysis, after which the second draft was submitted.

### Selection of study sites

Initially a list of water-scarce and water-excess areas was prepared in consultation with the field staff of AKRSP, Union Council (UC) representatives, and the District Coordination Office (DCO). Mulkhow, Ovir, Mastuj, Shagarm, and Rech UCs were identified as the main areas suffering from water shortages, whereas Shishikoh, Drosh, Arandu, and Ashret UCs located in the southern part of Chitral were categorised as water-excess areas with regular incidences of flash floods. Two areas were selected from the list on the basis of their long histories of water hazards and the intensity and scale of impact or devastation caused by hazards. To ensure proper selection, field visits were carried out to observe and discuss the frequency and scale of devastation caused by water-induced hazards. Keeping in mind the criteria, verification from relevant UCs and personal observations, two UCs, Mulkhow and Shishikoh, were selected for the study. In July 2008, Shishikoh was hit by three major flash floods and the study team postponed their visit because of partial damage to Shishikoh's transport road. District government officials were contacted and they confirmed major losses of infrastructure, especially the road connecting Shishikoh to the main transport road.

## Field work and data collection

A range of data collection methods were used focusing on both secondary and primary data. The methodology used for data collection combined qualitative research methods such as focus group discussion, key respondent interviews, observations and review of secondary data and reports available with different organisations. A framework for data collection is given in Table 2. In the text references in the form '(AKRSP, October 2008)' refer to the date of data collection.

Table 2: **Data collection framework**

General context or approach used for data collection	Data and information collected (qualitative & quantitative)	Level of data collection (e.g., household, community, district, etc)	Methods used for data collection (e.g., transect walk, semi-structured interviews with ..., visual records, etc)
Environmental context	<ul style="list-style-type: none"> <li>Type, frequency and magnitude of natural hazards events occurring in selected sites for the last 50 years</li> <li>Impacts</li> <li>Adaptation strategies</li> </ul>	<ul style="list-style-type: none"> <li>Community/village level</li> <li>District level</li> </ul>	<ul style="list-style-type: none"> <li>Focus group discussions (FGD) (19: 11 men's and 8 women's)</li> <li>Key informant interviews (KII) (13)</li> <li>Visual records (photos)</li> <li>Observation</li> </ul>
Economic context	<ul style="list-style-type: none"> <li>Sources of livelihood</li> <li>Income diversification options</li> </ul>	<ul style="list-style-type: none"> <li>Community/village level</li> <li>Institutional level (Local Govt. KLSO)</li> </ul>	<ul style="list-style-type: none"> <li>FGD (11) men's</li> <li>KII (24)</li> </ul>
Socio-cultural context	<ul style="list-style-type: none"> <li>Beliefs related to natural hazards, especially floods and droughts</li> <li>Social network</li> <li>Gender roles</li> </ul>	<ul style="list-style-type: none"> <li>Individual level</li> <li>Community /village level</li> </ul>	<ul style="list-style-type: none"> <li>FGD (19) 11 men's &amp; 8 women's</li> <li>KII (13)</li> <li>Transect walk</li> <li>Visual documentation</li> </ul>
Demographic context	<ul style="list-style-type: none"> <li>Population</li> </ul>	<ul style="list-style-type: none"> <li>Community level / village</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>FGD ( 11)</li> </ul>
Livelihood contexts	<ul style="list-style-type: none"> <li>Water user rights</li> <li>Local irrigation system</li> <li>Sources of livelihood</li> <li>Natural resource management</li> <li>Water management</li> <li>Gender roles</li> <li>Diversification of livelihoods</li> </ul>	<ul style="list-style-type: none"> <li>Household</li> <li>Community/ village</li> <li>District</li> <li>Country</li> </ul>	<ul style="list-style-type: none"> <li>FGD (19) 11 men's&amp;8 women's</li> <li>KII (24)</li> <li>Literature review</li> </ul>

## Literature review

A review of literature on the topic and on the project area helped put the study into context. Visits were made to both government and non-government organisations as well as to different universities such as the NWFP University of Agriculture, Peshawar University, Qaid Azam University, and the national libraries to collect relevant documents. Online searches were other methods used. The International Union for Conservation of Nature (IUCN), the World Wide Fund (WWF), and the Institute of Social and Environmental Transition (ISET) Pakistan were visited and discussions were held with professionals there to collect secondary data. The lack of literature focusing on community adaptation to climate change in Chitral and the NWFP became a major issue during the literature review. Some literature is available on community adaptation to environmental stress at district, provincial, and national levels and this was used for the literature review.

## Focus groups

Focus Group Discussions (FGDs) were used to ensure that information from the grass roots' level was obtained, especially from the people who are directly affected by both scenarios (too much or too little water). A total of 19 (11 men's and eight women's) focus group discussions took place during the data collection process. Details of focus groups, numbers of participants, and names of villages are given in Table 3.

Table 3: Details of focus group discussions

Gender	Mulkhov			Shishikoh		
	# of focus groups	Participants	Villages selected for focus groups	# of focus groups	Participants	Villages selected for focus group discussions
Male	6	92	Saht, Gaht, Nogram, Warijun, Zani, Kushum	5	88	Birga, Kalas, Taar, Khashindel, Madaklasht
Female	5	54	Saht, Gaht, Nogram, Warijun, Kushum	3	28	Taar, Madaklasht, Birga
Total	11	146		8	116	

Each focus group consisted of 15 to 20 persons. As proper selection of participants for focus group discussions is crucial for generation of data, emphasis was placed upon selection of major stakeholders. Local support organisations (LSOs) played a crucial role in the selection of participants.

### Details of participants

- Male community members included farmers, shopkeepers, school teachers, political leaders, and village elders. A total of 180 men attended 11 focus group discussions. In addition, 16 key respondents were interviewed.
- Because of social restrictions, separate focus group discussions were held with women with the help of female facilitators. A total of eight focus groups (five in Mulkhov and three in Shishikoh) were held, attended by 82 women. In addition eight key respondents were interviewed also.
- Local government representatives and government officials: one forest official and four union council representatives took part in the focus group discussions.
- Representatives of local support organisations: in addition to the support of social mobilisers for organising data collection from communities, representatives from Khow Local Support Organisation (an umbrella organisation of village and women's organisations in Mulkhov) also participated in the discussions. Three Board members and three management officials participated actively in the discussions held in Mulkhov.

A detailed checklist (Annex) was prepared beforehand for the FGDs in accordance with the requirements of the study. Information and data on livelihood sources; history of water-induced hazards; vulnerability trends; major impacts on agriculture, water resources, livestock, horticulture, drinking water, and women; and major adaptation strategies; role of social institutions, traditional knowledge of management of resources; beliefs; and enabling or constraining factors were collected. The team ensured participation by encouraging FGD involvement. Similar questions were discussed in all groups to maintain a balance among ethnic groups, clans or families, and professions.

### Observation

Observation methods were to verify and document the information provided by the communities during focus group discussions. For this purpose, after each focus group discussion, the study team, along with members of the community, visited damaged areas, water resources, agricultural land, and livestock.

### Key informant interviews

Twenty-four key informants (18 men and 6 women) such as teachers, farmers, village elders, historians, and local public representatives were interviewed to derive in-depth information on the historical perspective of water trading, local irrigation systems, folklore, traditional water management systems, migration systems, and so on. These interviews took place usually after focus group discussions to verify some of the historical information provided by FGD participants. No formal questionnaire was used for these, but the above-mentioned topics were discussed in detail.

### Visual documentation

The impacts of water-induced hazards and community adaption measures were captured on camera also.

## Data verification and analysis

Verification of data was carried out through triangulation, through personal observation, and by using different sources for data collection. Similarly, verification was sought from the union council and district coordination offices for instances such as major flood events in Shishikoh. Moreover, community information about the use of pine nuts was verified by Chitral Innovative Development Organisation (CIDO) officials working in sustainable management and use of pine nut resources. Similarly, verification of facts about forest harvesting was procured from the forest department.

As the impacts of climate variations and adaptations have not been documented before, verification of data became a big issue. At village level, however, information provided by participants was cross-checked with other participants in the same focus group and other focus groups in the same area. In short, the information was recorded only after getting the consensus of all participants in the focus group discussions. In addition, key informant interviews were carried out to verify the data collected from focus group discussions. The responses of all the community members on a certain issue were almost the same. The study team did not come across any conflicting information. To analyse the data, it was sorted and irrelevant information removed. Secondly, data categorisation took place under each topic given in the reporting guidelines. Thirdly, the impact and adaptation strategies were documented and, finally, adaptation strategies of the local people to water stresses and hazards were analysed based on the ability of these adaptation measures to reduce vulnerability and enhance the resilience of the communities in a sustainable manner.

## Challenges and shortcomings

The unavailability of previous research and literature reviews from which to develop an understanding of the concepts of climate change was the biggest challenge. Although AKRSP has worked in natural resource management, previous experience in activities related to climate change is lacking; otherwise the task would have been easy. The lack of subject experts and organisations in the area was another problem faced by the study team. Despite the fact that environmental conservation organisations such as WWF, IUCN, and the Protected Area Management Project (PAMP), and disaster management organisations like FOCUS, operate in the area, no expert or relevant information was available. Access to information from government organisations remained the biggest issue throughout the reporting period. The officials in certain offices were reluctant to provide us with data. For instance, when approaching the 'Tehsil Nazim' (an elected local government representative) about water-related projects in the study areas carried out by the local government, he gave the responsibility to the official under him who was either unable or unwilling to help, and the data we needed had to be collected eventually from another branch of the local government. The reluctance of certain communities to cooperate with NGOs was another issue we faced during the data collection process. The communities in the study areas, especially in Shishikoh, are conservative about women's participation and put up a strong resistance to NGOs. To cope with this, strategies were devised for data collection such as use of social activists and elected representatives; and sometimes identities were hidden and researchers pretended to be university students. Collecting information directly from women was a challenge that we tackled with the support of a women's facilitator.

As AKRSP works in community development, the community always expects some kind of tangible development intervention and this gave certain expectations about the results of our work. Community expectations about development interventions after completion of the study were also recorded during the data collection process. As mentioned above, the study areas selected were quite conservative, therefore permission for photographic and audio recording of events was often not given by the participants.

## Impacts of water stress and hazards on livelihoods

### General characteristics of the study site

Chitral district is located in the extreme North West of the Northwest Frontier Province (NWFP) of Pakistan. It is the largest district in the province with an area of 14,850 sq.km.; and it accounts for 20% of the provincial landscape (Figure 1). The area is mostly populated by the 'Khowar', speakers (an Indo-Aryan language) (Bashir 1996), a group of people who look upon themselves as 'Chitrali'. The region was ruled by a local hereditary ruler under Pakistan until it became a district of the North West Frontier Province in 1969. Besides the majority (more than 99%) Muslim population (30% Ismaili and the rest Sunni), the area is also inhabited by small ethnic minority groups such as the semi-nomadic Muslim 'Wakhis'

and 'Gujars' and the non-Muslim 'Kalasha' people (IUCN 1998, 1999). Chitral shares boundaries with Afghanistan on the north and west, with the Northern Areas of Pakistan on the east, and with the districts of Dir and Swat towards the south. The main Chitral Valley is rugged and its 30 deep, narrow, and tortuous subsidiaries are drained by the Chitral River and its tributaries. Originating in the Chiantar Glacier, the river finally enters Afghanistan at Arandu. Its main valley is about 354 km long and varies in width from 180 to about 4,800 metres (Israr-ud-Din 1996). The majority of traditional settlements are situated in valley bottoms, often on old fluvio-glacial terraces or alluvial fans, and are often scattered in discrete clan quarters each having their own small mosque (Haserodt 1996).

The district is in the rain shadow of high mountains and does not receive the monsoons. The mean precipitation for the towns of Drosh and Chitral (Lower Chitral) is about 650 and 500 mm, respectively; and this is received mainly in spring and winter (IUCN 2004b). Summer and autumn are dry, barely receiving 10 to 25 mm of rainfall per month. In Upper Chitral, the annual precipitation is approximately 200 mm, received mostly as snow at higher elevations. Mean annual rainfall statistics are given in Table 4.

**Table 4: Mean annual rainfall of Chitral**

Month	Drosh			Chitral		
	Total (mm)	Share in annual rainfall (%)	Average/month (mm)	Total (mm)	Share in annual rainfall (%)	Average/month (mm)
Jan-Feb	162	25	81	91	18	47
Mar-Apr	245	37	123	278	54	139
May	61	9	61	41	8	41
June-Nov	150	23	25	62	12	10
December	40	6	40	44	8	44
Total	658			519		

Source: Chitral Conservation Strategy (IUCN 2004b)

The total forest area in Chitral is 53,550 ha, and it accounts for four per cent of the total area; i.e., 1.48 million ha (IUCN 2004a). The forest cover in Chitral is the result of annual precipitation (Haserodt 1996) which, in South Chitral, rises to 300 mm, giving the South a coverage of about 99%, 66% of which is in Drosh tehsil, 31% in Chitral tehsil, and 2% in Loikuh (IUCN 2004a). In South Chitral most of the forest area lies in the south-western valleys of Arandu, Beori, Ashiret, Shishikoh, Bamburet, Rambur Birir, Usun, and Dimel Nisar. These valleys are covered with coniferous forest at higher elevations (1,760-3,500 masl) and oak forests at lower elevations (1,400-1,680 masl) (IUCN 2004a), whereas in North Chitral, where land is mostly dry and denuded, one can come across scattered clumps of juniper. The forest types are dry temperate coniferous, dry zone fir forest, dry oak, arid temperate scrub, sub-alpine birch, moist deciduous alpine scrub, and moist alpine pastures of coniferous cover: the largest area of all types of forest in southern Chitral covers 39,000 ha, while oak forest covers 14,000 ha (Khan 1981). Until 1969 the Chitral State owned the forests and local people could only use them for grazing, collection of dry wood for firewood, and to lop oak trees for fodder (Israr-ud-Din 2008; IUCN 2004a). The land-cover map of Chitral is shown in Figure 1 and land-use classification in Figure 2.

Property, agricultural land, and irrigation channels are subject to damage because the arid, vertical landscape often limits settlement and cultivation to active alluvial fans. Few people die from flash floods, however, because they have learned from experience to identify and interpret environmental signs and signals associated with them: changes in cloud colour, water flow, intensity and frequency of rainfall, as well as unusual sounds and unusual presence and movements of wildlife (Dekens 2007). The district remains cut off from the rest of the world for at least five months of the year in winter owing to heavy snowfall at the two gateways to the region—Lawari Pass (3,200 masl) and Shandur Pass (3,720 masl)—in the south and north of the district respectively (IUCN 2004b). Construction of the long debated Lawari Rail Tunnel Project (LRTP) between Chitral and Dir districts is in progress and is expected to be completed by the end of 2011.

Chitral's inaccessibility casts its shadows on every facet of human life: external inaccessibility prevents easy movement of labour for off-farm work to urban centres; and it also hampers the export of fruit and vegetables and the import of grain and livestock feed and agricultural inputs. Moreover, inadequate internal communications combined with a short working season greatly reduce the reach and impair the quality of health and education services and generally hamper all development work. Chitral has very limited cultivable land, i.e., approximately two per cent. Figure 2 gives the land-use classification for Chitral district.

Figure 1: Land-cover map of Chitral (Source: IUCN 2004b)

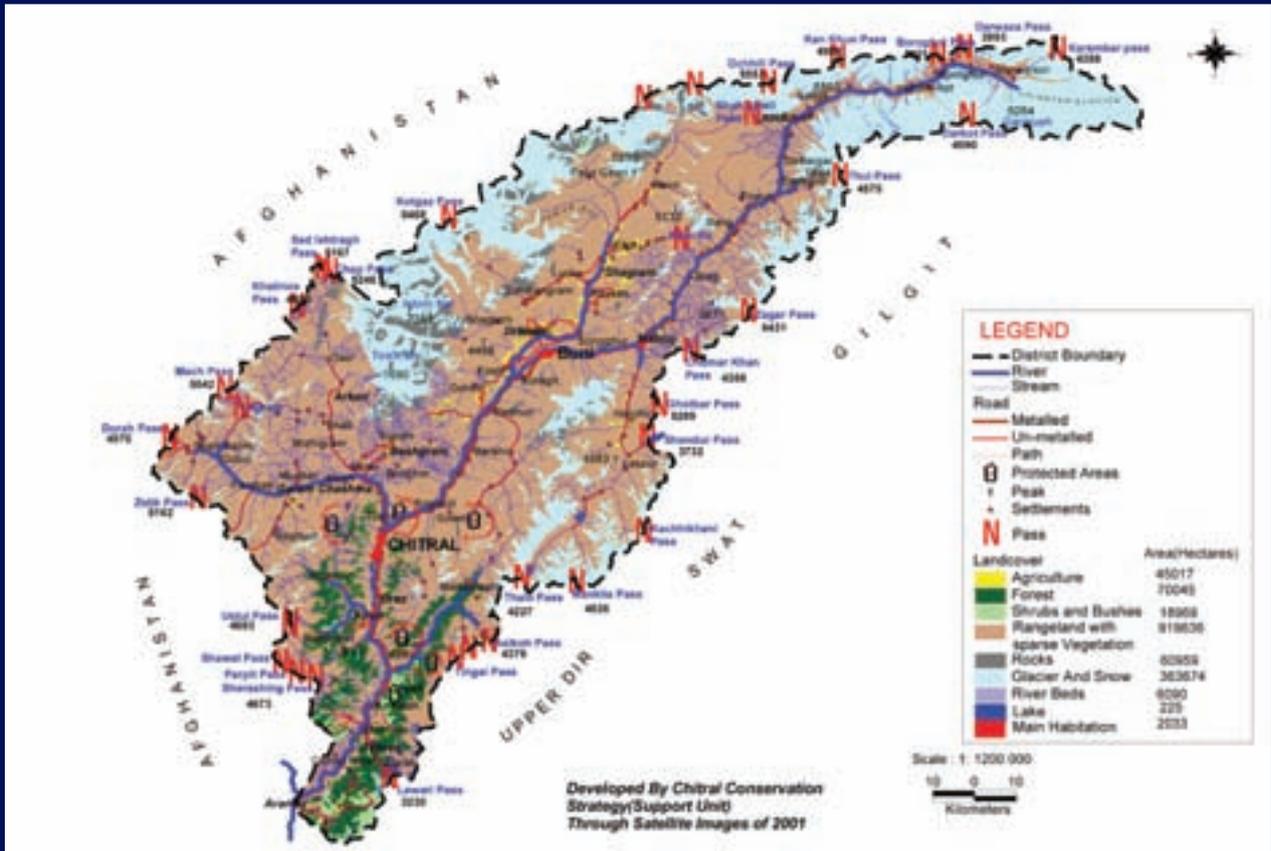
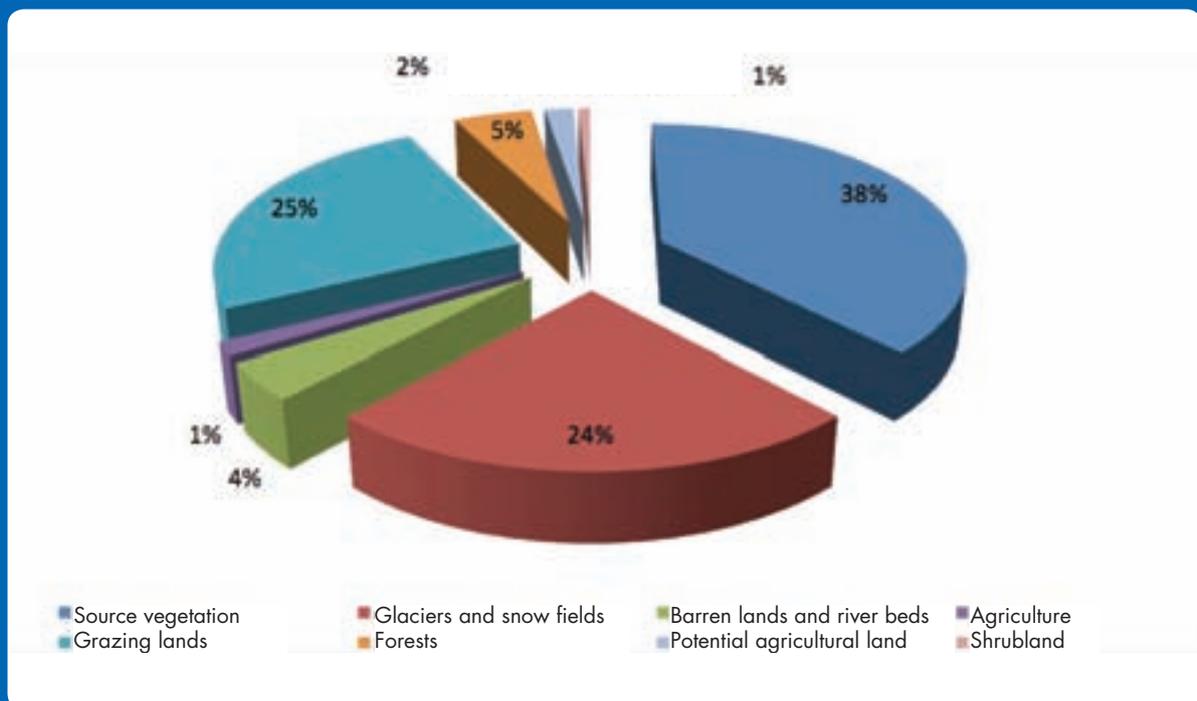


Figure 2: Land-use classification of Chitral (Source: IUCN 2004b)



The estimated population of Chitral District is around 385,000, with 48,000 households (household size is ca 7.9 persons). 162,082 (50.85%) are males and 156,607 (49.15%) are females. Urban inhabitants constitute 9.6% whereas 90.4% live in rural areas (Government of Pakistan 1998). The growth rate is 2.52% and the literacy rate 58.5%, out of which the literate male population is 77% and the female literacy rate is 40% only (AKRSP 2007). There is remarkable ethnic diversity with different traditions and customs because of migration from the outside in the past and up to the present. Currently still about 85% of the population are Khow, the Khowar-speaking majority, of which about two thirds are Sunni Muslims and one third Ismailis. There are also Kalash people, a non-Muslim tribe with a small decreasing population and with very different customs to the Khow.

In Chitral, a total of more than ten languages are spoken (Haserodt 1996). The main source of income is subsistence agriculture with average landholdings of less than one hectare, and 90% of the population are engaged in farming. Seventy-five per cent of household incomes are derived from off-farm sources, however. Increased population pressure and fragmentation of land are reasons for a decline in landholdings, thereby increasing cropping intensity (AKRSP 2007).

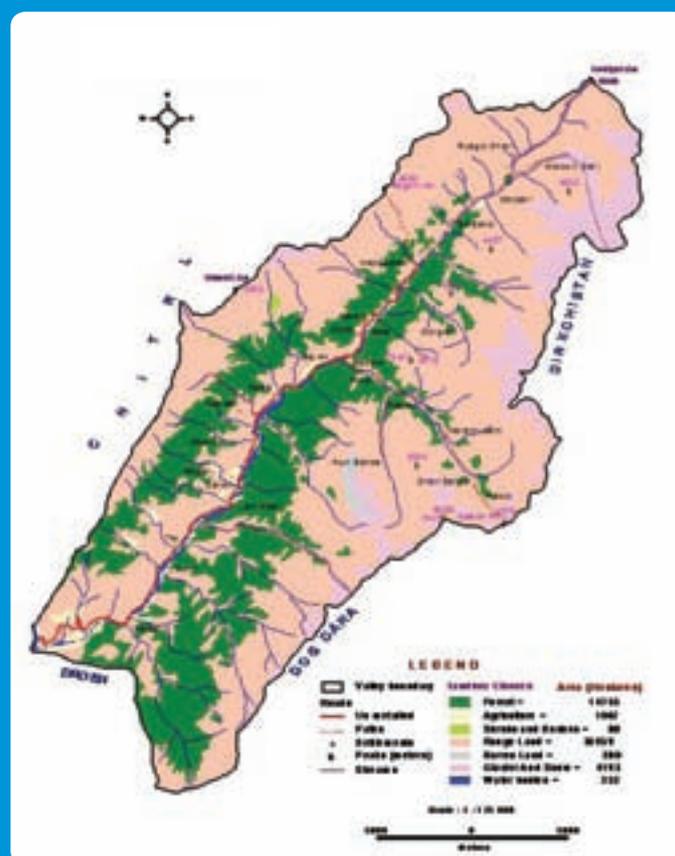
### Shishikoh

Shishikoh: is one of the sub valleys of Chitral, situated at a distance of approximately 80 km south of the district centre. The location of Shishikoh valley is 35.631990 degrees latitude and 71.889037degrees longitude. Figure 3 presents the land-cover situation in Shishikoh. The total area of the valley is 56,586 hectares, and it has a population of 12,412 (GoP1998).The land cover in Shishikoh is comprised of grazing lands 64%, forests 26%, agriculture 2%, and the remaining 8% consists of glaciers and permanent snow-covered mountains (IUCN 2005c). The valley is marked by different seasonal temperatures largely due to physiographic features. The weather in upper valleys like Madaklasht is quite harsh. The climate in general is dry temperate or sub-humid and the tract is positioned outside the monsoon range. Occasional summer rains occur in some parts of the valley. Summers are pleasant and winters are chilly. Winter rain and snowfall are confined to the months of October-April. The height of the valley varies from 1,433 to 3,900 masl (IUCN 2005a). The peaks receive snowfall during October and April and in the lower parts, where the settlements of the study area are situated, snow occurs in December and January. Density of snowfall varies from 0.6096 to 4.8768 m in depth, depending on the altitude. Annual rainfall is between 500 and 1,000 mm. Mean annual temperature ranges from minus 5 to 40°C.

The Shishikoh valley is a multi-racial and multilingual area. Three major Muslim ethnic tribes are found in the study villages: 1) Khow: the main tribe in the area speaking the Khowar (Chitrali) language and they lead a sedentary life; 2) Gujar: the nomadic and partly settled Gujar tribe who are mainly shepherds, woodcutters, and collectors of pine nuts who are mostly settled in sub-valleys; and 3) Pathans: a small portion of the population of Shishikoh valley belongs to the Pathans tribe who migrated there from adjacent Dir, Swat, and Kohistan.

The Khow tribe is the main ethnic group as it makes up 55% of the population, whereas the Gujars are the second largest tribe (27%) and the rest are Dangarik, Madaklashti, and Pathans (IUCN 2005a). In Shishikoh, there are two branches of Islam: Sunni and Ismailis. Sunnis constitute 90% of the total population whereas Ismailis constitute only 10% and inhabit Madaklasht village located at the upper end of the valley. Sunnis are regarded as the most rigid and conservative while Ismailis are considered to be a flexible, educated, and mobilised community. Overall literacy levels in

Figure 3: Land-cover map of Shishikoh (Source: IUCN 2001)



Shishikoh are estimated at 18.75%. While male literacy levels are estimated at 32%, female literacy rates are as low as 5.5% (CIDO 2006). Literacy levels among the Ismailis, however, are recorded to be 100% for both male and female. The annual income of an average household is estimated to be PKR 50,119 (\$603.84). The average income is made up of both on-farm and off-farm sources. Like any subsistence economy, food items account for over 76.87% of the household budget, followed by clothing which accounts for 10.70% of the budget. Health care appears third among household priorities using 7.79% only. Education is fourth, accounting for 2.83% of the budget (IUCN 2005b).

Shishikoh valley is a classic example of too much water in the shape of devastating flash floods. The fertile, irrigated land is in danger of being washed away by these floods. Rectification of the situation is beyond the resources and means of local communities. The inhabited and cultivated land in the valley has been shrinking for many decades due to these floods and many people have migrated or settle up in the hills because of land erosion. There are clear signs of land erosion and misery resulting from rapid and sustained deforestation as a consequence of floods (IUCN 2005b). Every year whenever a small flood occurs, elders in the village recount stories related to bigger floods that have happened in the past. Elders claim that the flood in 2006 was "greater than previous ones" (personal communication from Islamuddin, Aziz Urahman, Gul Muhammad Jan, Rashidullah, Khan Zarin, Ghulam Jafar, Gurin village, Shishikoh Valley, Lower Chitral, in Dekens 2007). The mountains once green with pines are denuded and the circumstances are ripe for floods. Flash floods are a common phenomenon in denuded mountains where there are streams which have played havoc by ruining homes, schools, health infrastructure, and mosques.

### Mulkhov

Mulkhov: is one of the oldest, inhabited valleys in Chitral. It is located to the north about 85 km away from the district centre at 36.193173 degrees latitude and 72.143999 degrees longitude. The valley is surrounded on all sides by mountains and the Torkhow River flows through it in a north-south direction. Towards the east lies the small plateau of Qaqasht (which translates as dry land) whereas the permanently snow-clad Terichmir peak nearby reaches a height of 7,696 m. The average height of the mountains (Hindu Kush range) in this region is 4,572 m. The valley is in a sub-tehsil of the Chitral District and is further divided into four Union Councils: Oveer, Kosht, Mulkhov, and Terich. Due to its undulating terrain it is divided into lower and upper parts in which the upper parts constitute a single cropping zone and the lower parts lie under double cropping zones. The soil of the low land (below 2,135m) is sandy gravel while that in the upper area above 2,135m is comprised of mostly clay soil. The total population of Mulkhov is 13,998 with more than 1,600 households (Government of Pakistan 1998). The area is inhabited by a single, ancient ethnic group called the Khov. The Khov consider themselves to be the original ancient inhabitants of Chitral. There are two main branches of Islam, i.e., Sunni and Ismailis. The Sunnis are in the majority whereas the Ismailis constitute about five per cent (KLSO 2008).

Agriculture is the main occupation, but people do keep livestock for household consumption and to supplement their cash incomes. The area doesn't have any forests and all the firewood is transported from Chitral town. People grow poplar and Robinia on the slopes and around their fields to supplement their firewood supplies. Agriculture is wholly dependent on surface irrigation, i.e., a network of small irrigation channels. The perennial streams from glacial melt and natural springs are the only source of irrigation and drinking water. The springs and perennial streams start to dry up in spring from about the middle of March and with the commencement of summer, in June, the area faces acute water shortages and water from the head or source hardly reaches the lower villages at the tail end. As a result, not all cultivable land is cropped during the summer season, which is the best season for agricultural production. Whatever crops and fruit trees exist suffer from water scarcity. The area has nutrient rich and fertile land and is suitable for production of cash crops (i.e., rice and potatoes) but due to shortage of water the farmers are not able to exploit this opportunity. Wheat is the main winter crop. Maize is cultivated for livestock and pulses are also grown on small patches of land during summer. It is worth mentioning that being in a low productive zone for wheat means that the majority of households purchase wheat from grain supply stores which are subsidised by the government.

The communication system in Mulkhov is very poor. The road passing through the whole region does not have a tarmac surface and is in very poor condition. Recently, a wireless telephone facility was installed in the area, but it is out of order most of the time. There is only one Basic Health Unit (BHU) with one male doctor to cater to the needs of the whole population. There is a police station, bank, and high school, but students have to go to Boone or Chitral to go to college. Lack of colleges is pointed out to be the main reason for an increase in dropouts after tenth grade, especially among girls. Construction of two private sector colleges began in early 2009, however.

Infrastructural facilities are poor in the region. Four-wheel jeeps are the only means of transportation, and these usually leave for Chitral early in the morning and return in the afternoon mostly loaded with household goods and construction items. Due to lack of proper transportation facilities, the people have to travel in fully-loaded jeeps at their own risk.

The houses in the region are mostly 'kacha', i.e., made of mud and wood. The soil of Mulkhow is considered to be the best for construction of houses. Due to its remoteness, the government has introduced only minimal interventions in the social sector. No major projects could be seen in the area. The community is also considered to be conservative and rigid and the majority of people had strong resistance to NGOs until early 1990. Gradually acceptance of NGOs increased and the communities organised themselves to seek development projects from NGOs such as AKRSP, SRSP, and IUCN. Between, 2005 and 2008, the area secured a considerable amount of funds for lining irrigation channels and constructing water storage reservoirs under the President's Water Management Initiative (PWIM) and World Bank water programme. With the support of the above-mentioned interventions, a reasonable number of traditional water storage structures were upgraded with concrete structures. The communities of Mulkhow have had acute water shortages for many decades as a result of a change in rainfall patterns and snowfall. This has resulted in the drying up of the springs which are the only source of water in the area because there is no glacial melt supplying the Mulkhow valley. Canal water often goes to waste during transit, before reaching the fields, and a very small quantity of water is left for the crops.

The dearth of water for irrigation plays havoc with land under cultivation. Two cropping areas in Warijun, known for a good yield of wheat, barley, and a variety of pulses have now become barren due to scarcity of water. Fruit orchards developed with the help of Chitral Area Development Programme in Gaht village have been destroyed (IUCN 1997). An increase in population has led to the water sources being defiled and contaminated. The existing irrigation infrastructure is so poor that almost three quarters of the water supply goes down the drain and does not benefit the standing crops (IUCN 1997). The shortage of drinking water in the area has assumed alarming conditions. Drinking water is collected and transported by women and, on an average, they have to cover one kilometre to bring water (KLSO 2007).

Table 5 gives a breakdown of the key characteristics of the study areas.

**Table 5: Key characteristics of the study areas**

	<b>Shishikoh</b>	<b>Mulkhow</b>
No of households	1800	2000
Age of the settlement		
Elevation (metres)	2000	1600
Socio-ethnic composition	Khow (indigenous community) 55%, Gujar 27%, Pathan & Persian 18%.	Khow
Transportation and market access	Unmetalled road, 15 km to the sub-divisional market and 75 km to the district market.	Partly metalled road, 20 km to the sub-divisional and 85 km to the district market
Major stress as perceived by the community	Flash floods, debris fall, land erosion, forest degradation, malnutrition	Droughts, mass movements, decreasing water sources, mal-nutrition,
Electricity (yes/no)	Yes	Yes
Nature of water stress and/or hazards	Too much water	Too little water
Irrigation channels (yes/no)	Yes, but traditional	Yes, but traditional
Access to rivers and streams	Easy access	Accessibility difficult
Climate	Dry temperate/sub humid with high intensity summer rains	Dry temperate, almost no summer rains
Perceived climate change/variability	More intense and frequent droughts due to less snowfall and less rain	More frequent and intense rain
Main livelihood activities	Forest ( timber, oak forests), NTFPs like Chilgoza pine and walnuts livestock Agriculture Limited employment Seasonal labour	Agriculture (mostly wheat, no vegetables, negligible fruit production) Livestock Employment in the public and private sector (mostly labour)

Source: Primary and secondary data

The following are the main similarities and differences between the study areas.

### Similarities

- Strong clan or family system exists in both study sites.
- Illiteracy is a common factor in both sites.
- In both study sites the infrastructure is very poor.
- Government and non-government development work is very limited.
- Market accessibility is a big problem for both study sites.
- Both areas have single and double cropping zones.

### Differences:

- There is ethnic diversification between the study sites. Mulkhov is a single ethnic (Khow) area, whereas Shishikoh has diverse ethnic groups (Khow, Gujar, Pathans, and Persians).
- The impacts of climate variation are different, i.e., Shishikoh has too much water and Mulkhov too little.
- There is a great difference in vegetation cover between the sites. Shishikoh has a forest cover of oak, pines, and Chilgoza pine whereas Mulkhov has huge pastures and rangelands.
- Variation in social mobilisation and awareness is also prominent in both study sites. Social and indigenous networks are strong in Mulkhov but Shishikoh lacks strong social ties.
- The topographies of the study sites differ.

## Current livelihood system and vulnerabilities

### Shishikoh

The average landholding in Shishikoh is as low as 0.45 ha per household and most of the ownership is disputed (IUCN 2005b). Mountain streams and springs provide irrigation and water channels have been erected to make agriculture possible. Almost half of the area is mono-cropped. The land is sloping and, due to conflicts over land and/or forest resources and frequent exposure to flash floods, farmers do not invest in the land. Job opportunities do not exist and income from the forests in the form of royalty and local labour stopped after imposition of a ban on commercial harvesting in 1993 (IUCN 2005b). Most of the farmers depend for off-farm income on opportunities in Chitral town and 'down country' to sustain their families during the long winters when the valleys are covered with snow and Chitral is isolated from everywhere else (IUCN 2005a).

The people of the valley have used the forests and forest resources as long as they can remember. They collect fuelwood, timber, and other forest products from them. As a customary right, local communities are entitled to collect fuelwood and timber from the forests around the villages. Forest produce, such as pine nuts, are collected for commercial purposes also (IUCN 2007). Moreover, the forest is used for grazing by nomadic herdsmen. According to the land-cover map of Shishikoh, the forest area extends over 14,755 hectares which is equivalent to 26% of the total area. Forests are divided into designated forests and non-designated forests. Designated forests are inventoried and managed by the government and non-designated forests are owned and managed by the community or individuals. The valley has 72% (10,575 ha) of designated forests while the remaining 28% (4,105 ha) are non-designated (IUCN 2005b). The communally-managed forests are located mostly around the settlements. Timber forests are found between altitudes of 1,707 and 3048 metres, and these are owned by individuals and communities who receive royalties for their shares (IUCN 2005b).

The cultivable land is mostly used for production of cereal crops, as they provide both food and fodder. According to the land-cover map, Shishikoh has a total area of 1,067 ha of arable land, which is only 1.8% of the total area (IUCN 2005c). Because agricultural production is insufficient and forest resources abundant, local inhabitants generally keep one or two animals to supplement their livelihoods. Gujars (nomadic herdsman) keep more livestock, especially goats, as their main means of sustenance. Shortage of animal fodder, especially during the late winter and early spring, is the biggest problem and cattle are fed with dry maize stalks. Oak is very important because it provides winter fodder: animals eat small oak branches and twigs during winter and spring when there is very little to eat (IUCN 2005b).

Social organisation is relatively weak, formal village organisations do not exist and interest groups have been formed in only ten target villages to carry out project interventions (IUCN 2007).

Settlements are located around the openings of different streams because of the availability of water. Within living memory, these settlements possessed large tracts of land and agricultural production was sufficient. Today, people have been left with very small strips, sufficient only for kitchen gardening. In some places, out of desperation, people are striving to reclaim lost land but with little success because of the regular recurrence of floods. Land erosion and deforestation go hand in hand in the Shishikoh valley (IUCN 2005b).

In terms of vulnerability, the survival of the communities of Shishikoh valley is at stake because of the flash floods which increase in frequency and intensity. To cope with the situation, most of the population is engaged in unplanned exploitation of the forests, thus contributing to the occurrence of flash floods. Furthermore, unplanned exploitation of forest resources is limiting livelihood options because of the unprecedented depletion of resources (IUCN 2005a).

### Mulkhov

The livelihood options of the inhabitants of Mulkhov are based on on-farm and off-farm economic resources. Subsistence agriculture, mostly cereals and livestock, are the main sources of sustenance. According to the baseline study IUCN carried out in five villages of Mulkhov, the average total landholding is around 2.4 acres, of which 1.6 acres (67%) are cultivated while 0.8 acres (33%) are barren due to shortage of water for irrigation. Out of 1.6 acres of cultivable land, 67% is used for cereal crops and the rest is used for vegetables, fruit, fodder, and agroforestry purposes: fodder accounts for around 17% (almost half of the land remaining after cereal production). It is therefore concluded that, currently, cereals and fodder are the most crucial agricultural products.

Shortage of water is the main reason behind the limited interest in production of vegetables, fruit, and agroforestry products (IUCN 2006). The study area has historically been water deficient resulting in low cropping intensity and single crop production, even though the project area falls in a double cropping zone. Also, farmers are reported to have managed to cultivate only around half of the total cultivable land as there is a shortage of water (IUCN 2006).

The dependence on agriculture does not mean that farming is the most profitable sector; rather it is an unwanted but necessary endeavour for those who do not have any other livelihood options. Employment in the public and private sectors both for men and women in most households in Mulkhov is negligible and this involves 28 (men) and 6% (women) of the households only. Only 13% of households have one man with access to private sector employment while no woman has a job in the private sector (IUCN 2005b).

Due to lack of education, coupled with limited opportunities for self-employment, the locals are unable to get regular employment in the public or private sector or to engage in self-employment. Hence, farming is the primary occupation. As in other parts of Chitral, the women of Mulkhov are responsible for crop thinning, livestock rearing, fodder and water collection, and sometimes watering fields in addition to their household chores. Educated women prefer to work in the educational sector and also have skills in stitching, embroidery, and tailoring. Their products are not being marketed however. The traditional craft of Shu (traditional woollen fabric) has almost vanished and these fabrics are produced in a handful of households for personal use only (KLSO 2007). Reduction in sheep, poor product quality, and lack of access to the market are the main reasons behind the decline of this traditional craft. The livestock of the area are often handed over to shepherds who graze them at an agreed cost.

Inhabitants of the Mulkhov valley are vulnerable to every danger posed by the impact of changing weather patterns and glacial melting on its water sources. Firstly, their agriculture is going to be badly affected by the constantly shrinking water sources. Moreover, especially in the disadvantaged sections of society, children and women are going to be affected by malnutrition as a result of decreasing agricultural output in the form of vegetables and fruits. The reason for this is that the men often move to the urban centres and can purchase fruit but women and children in the villages have no such access (AKRSP, October 2008). The increase in women's workloads as a result of water shortage has a negative impact on women's health. The possibility of complete absence of water looms large over certain parts of the valley: Nogram and Kushum for example, and this will compel the current inhabitants to migrate to other parts of the district and country.

## The pattern of change

### Shishikoh

The historical timeline for Shishikoh is shown in Table 6.

**Table 6: Historical timeline of Shishikoh**

	1960-1980	1980-1990	1990-Present
Major flood events	<ul style="list-style-type: none"> <li>1967,67,68,71,73,74,76,79</li> </ul>	<ul style="list-style-type: none"> <li>1980,81,86,87,88,90</li> </ul>	<ul style="list-style-type: none"> <li>{1990-92-93-96-99-01-02-04-07-08}</li> </ul>
Major developments (new roads, embankments, etc.)	<ul style="list-style-type: none"> <li>1970 Shishikoh road constructed</li> </ul>	<ul style="list-style-type: none"> <li>Chitral Area Development Programme intervened in the area</li> </ul>	<ul style="list-style-type: none"> <li>AKRSP established the first hydropower project in Shishikoh</li> <li>Pvt. schools established in Shishikoh</li> <li>Two hydropower plants established by the UC</li> <li>Work on Shishi hydropower plant started</li> <li>Small embankments constructed in different villages of Shishikoh by the government.</li> <li>Check dams (protective walls of 2ft) constructed in Taar village with the support of the Forest department</li> <li>Water management programme initiated</li> </ul>
Land-use change			
Change in resource use, management, availability, state of the resource	<ul style="list-style-type: none"> <li>Commercial harvesting of forests started</li> <li>Trade in fuelwood started on a large scale</li> </ul>	<ul style="list-style-type: none"> <li>Grazing of forests continued</li> </ul>	<ul style="list-style-type: none"> <li>Extensive grazing in process</li> <li>Harvesting of timber and oak forests in process</li> <li>Exploitation of pine nut resources for income generation started in Shishikoh.</li> <li>Premature harvesting and cutting of branches and pine nut trees started.</li> <li>High rate of land degradation and loss due to flash floods</li> </ul>
Political events – e.g., rules and legislation	<ul style="list-style-type: none"> <li>Part of independent state of Chitral until 1969,</li> <li>Basic democracies after 1969</li> </ul>		<ul style="list-style-type: none"> <li>Local govt. system established in 2001</li> <li>District government banned cutting of pine nut trees and allocated time for harvesting</li> </ul>
Major economic events/change			<ul style="list-style-type: none"> <li>Lawari Tunnel work started in 2005 and first phase completed in early 2009.</li> </ul>
Access to services, market opportunities, labour markets, institutional changes Etc	<ul style="list-style-type: none"> <li>Basic Health Unit established</li> <li>The road that links the study areas with the nearest town/market is still un-metalled.</li> </ul>	<ul style="list-style-type: none"> <li>The road that links both study areas with the nearest town/market is still un-metalled.</li> </ul>	<ul style="list-style-type: none"> <li>Condition of Shishikoh road further deteriorated.</li> <li>Wireless telephone system started working in both study areas</li> <li>Health centre established by communities with support of Aga Khna Health Services (AKHS) at Madaklasht</li> </ul>

Source: Primary and secondary data

Until 1969, Shishikoh was ruled by the Mehtar of Chitral and before 1970 the Shishikoh valley was densely populated with pine and oak trees and there was a narrow passage through which the Shishi River flowed (Key Informant Interview [KII] 2009). After 1970, however, due to commercial, illegal harvesting of designated forest and harvesting of non-designated oak forest for firewood, this valuable resource depleted. In addition to commercial harvesting, 50,000 cubic feet are cut down annually for consumption in upper Chitral (IUCN 2005b). An average of 39,358 tons of fuelwood is being harvested on an annual basis to fulfil the needs of the valley as well as the rest of the district (IUCN 2005b). Productive forest area decreased from 5,453ha to 3,878ha between 1981 and 2006, which indicates a loss of 1,575ha in 25 years at the rate of 63ha per year (IUCN 2005b). The yield has also come down. In 1964, the prescribed yield was 141,322 cubic feet while, in the revised working plan, the proposed annual yield is 97,661 cubic feet (IUCN 2005b). Besides timber, oak, and pine nuts, resources in the Shishi valley are under immense pressure. Mounting prices of pine nuts were the main reason behind exploitation of pine nut resources. In 2003 pine gained importance when traders from Bannu and Waziristan explored the hidden potential in Shishikoh and commercial marketing

of pine nuts started by purchasing pine nut cones. To get maximum benefit the local people involved in the trade started premature harvesting and cutting down of branches and trees.

The forest area is subjected to heavy grazing pressure also. In addition to the local livestock, hundreds of nomadic herds come to the alpine pastures each year and graze the forest twice, once in ascending and once when descending. Management by the forestry department is confined to protecting forests from illicit cutting of timber and regulating cutting for local use only. There were no initiatives to involve local communities in forest management and conservation until recently. The forest department carried out some plantation with communities in the study area. A road linking the small villages with the main transport road was constructed in the late 1960s also.

The limited interventions from both government and non-government organisations (NGOS) in the social and economic sectors did not result in anything, hence they failed to address the problems, but did not cause the poor development and livelihood opportunities that led to local dependency on the forests (IUCN 2005a; 2005b). Local resistance to non-government organisations is one of the factors limiting the interventions of NGOs, especially in the social sectors (key informant).

The impacts of all these factors are manifest in increased dependency on forests and reduction in vegetation in the study area, in turn leading to increased frequency and intensity of flash floods (AKRSP, November 2008). There is one basic health unit and, in 2006, a wireless phone facility was installed in the area, but it did not cover the whole area. A large-scale irrigation project is being installed in Lavi village, and this will help the livelihoods of communities downstream. The rate at which the forests are cut down, overgrazing, and denudation exacerbate the devastation caused by flash floods, resulting in land degradation. Four sub-villages have been badly affected by flash floods and debris fall. One of the key informants in Kalas village said he was paying annual alms (Zakat) before 1983 and was self sufficient in crop products. Now he is solely dependent on receiving alms (AKRSP, November 2008).

### Mulkhov

Land-use change in Mulkhov is seen to be concomitant with increasing water scarcity in the area. Farmers prefer to cultivate the lands close to the headwaters. Water shortages are leading to the drying up of forest plants and fruit. The diversity of flora and fauna is decreasing with the passage of time. Participants in focus group discussions at Kushum revealed that shrubs, herbs, and trees such as *Carum carvi* (hojoj), capers (kavir), *Prongos pubularia* (mushen), and *Artemisia* (thron) have decreased but that walnuts and juniper are on the verge of extinction. The populations of wild rabbits and local, migratory wild partridges and other birds (chakor, totiru (*Tetraogallus himalayensis*), chock (*Alectoris chukaris*), falcon (*Falco cherrung*), dove, and migratory ducks) have decreased gradually (AKRSP, October 2008).

The intervention of NGOs began in the 1980s when the Chitral Area Development Program (CADP) and ARKSP began operations in the area. Community organisations, consisting of both men and women, established by the AKRSP and CADP, have participated actively in development of the area through establishment of hydropower plants, health centres, and water supply infrastructures. In partnership with donor and development agencies, these local organisations are of immense help and contribute significantly to development of infrastructure, women's development, and institutional development and strengthening.

In order to uplift the socioeconomic status of the people, the government is taking steps to improve infrastructure by constructing checkdams, protective works, and water supply and sanitation schemes. In this respect, some major projects have been completed and some are under way; for example, the Atakh Canal, a 127 megawatt microhydel project, and the lining of irrigation channels by the water management department. The historical timeline of Mulkhov is shown in Table 7.

Because it is located in the north of Chitral beyond the effective zone of the summer monsoon, only a little rainfall and precipitation occur in winter in the form of snow. Because of the prevailing climatic conditions, the area only supports shrubs, ephemerals, grasses and some woody plants. *Artemisia maritima* (dron) is the dominant species, and it is mostly used as a substitute for fuelwood due to the scarcity of fuel and for fodder for the animals. Along with *Artemisia*, *Sophora griffithi*, *Haloxylon*, and *Capparis spinosa* occur as associate crops up to an elevation of 2,320m. *Junipera excelsa* (sarooz), *Betula utilis* (bhuli), *Prunus amaygdalus* (Kandu) and *Fraxinus* spp (thok) were once widespread in the area but only remnants of these woody species are seen today. The upper ridges above 2,500m are mostly covered with *Prangos pabularia*, *Ephedra gerardiana* (somani), and other grasses which provide grazing for summer flocks. Along rivers streams, and ponds, *Tamarix* (hinju), *Hippophae rhamnoides* (seabuckthorn) and *Berberis vulgaris* (choweng) are found. In places where there are irrigation facilities, the people have cultivated artificial forests of *Populus* spp, *Morus*, *Robinia pseudoacacia*, and *Ailanthus altissima* to cater to the rising demand for wood to use for fuel and construction.

Table 7: Historical timeline of Mulkhow

	1960-1980	1980-1990	1990-Present
Major drought events	(1964-67-71-76)	(1983-1989)	(1999-2003 and 2007-08)
Other major natural hazards			
Major developments (new roads, embankments, etc.)	<ul style="list-style-type: none"> <li>• 1960 - road constructed,</li> <li>• Basic Health Unit established</li> </ul>	<ul style="list-style-type: none"> <li>• Chitral Area Development Programme started operations in the area</li> <li>• AKRSP intervened in the area and developed two hydropower stations in Saht</li> </ul>	<ul style="list-style-type: none"> <li>• Pvt. schools established in Mulkhow</li> <li>• Construction of two colleges started in 2008</li> <li>• 7 km long irrigation channel constructed in Mulkhow jointly by AKRSP, SRSP, and the government.</li> <li>• Feasibility study for construction of a 127 megawatt hydel power station started in Mulkhow</li> <li>• Water management programme initiated</li> <li>• Construction of Atakh Canal started</li> <li>• Water supply schemes with stand post system initiated by the government, AKRSP, and SRSP</li> </ul>
Land-use change			
Change in resource use, management, availability, state of the resource	<ul style="list-style-type: none"> <li>• Shortage of water continues</li> </ul>	<ul style="list-style-type: none"> <li>• Shortage of water continues</li> </ul>	<ul style="list-style-type: none"> <li>• Shortage of water continues</li> </ul>
Political events – e.g., rules and legislation	<ul style="list-style-type: none"> <li>• Part of the independent State of Chitral until 1969,</li> <li>• Basic democracies after 1969</li> </ul>		<ul style="list-style-type: none"> <li>• Local govt. system established in 2001</li> </ul>
Major economic events/change	<ul style="list-style-type: none"> <li>• Construction of road</li> </ul>		<ul style="list-style-type: none"> <li>• Lawari Tunnel work started in 2005 and the first phase was completed in early 2009</li> </ul>
Access to services, market opportunities, labour markets, institutional changes Etc	<ul style="list-style-type: none"> <li>•</li> </ul>		<ul style="list-style-type: none"> <li>• Work on widening of road that links Mulkhow to the main metalled road is in progress.</li> <li>• Wireless telephone system started working</li> <li>• Access to drinking water improved after installation of pipelines.</li> <li>• Health centre established by communities with support of AKHS</li> <li>• Khow local support organisation (an umbrella organisation of all the village/women's organisations) formed with AKRSP support</li> </ul>

Source: Primary and secondary data

### Impact of water stress and hazards on livelihoods

Mountain streams and springs are the only source of water for domestic needs and agricultural production. Climate-induced variability in the water situation in the form of flash floods and water shortages have had a negative impact on the livelihoods of inhabitants in the study area. Drought and flash floods have eroded their assets, resulting in limited adaptive capacities and rendering them vulnerable to water-induced hazards in future.

#### Shishikoh

The situation in Shishikoh valley is drastic in terms of water-induced hazards. The impacts of flash floods are quite visible in the form of damaged households, destroyed communication or physical infrastructure, and eroded cultivable lands. Discussing the impacts of flash floods on livelihoods, loss of arable and productive land was identified as the biggest impact of flash floods in the study area. Participants in focus group discussions at Taar, Birga, and Khashindel (AKRSP, November 2008) stated that arable land has been almost washed away by the floods and very limited land is left; and this is not enough to make them self sufficient in cereal production. The data collected during the focus group discussions showed that between 1998 and 2008, flash floods ruined 18, 18, and 21 ha of productive land in Birga, Taar, and

Khashindel respectively, giving a total of 57 ha (AKRSP, November 2008). Moreover, the participants stated that debris falls had decreased the productivity of the land and reduced crop yields resulting in an increased dependency on the forests. The focus group discussions at Khashindel revealed that the main irrigation channel for the village is destroyed every year by flash floods, resulting in poor agricultural production. This issue was also pointed out by participants in Birga and Kalas (AKRSP, November 2008). The situation has rendered these communities in the valley extremely insecure in terms of food and has created dependency on subsidised wheat supplied by the government from 1972 onwards following a severe drought (AKRSP, October 2008).

Livestock play a crucial role in diversifying livelihood options and supplementing household income in Shishikoh as the limited landholdings make it impossible to rely on the agricultural sector alone for survival. The livestock sector is not protected from the negative impacts of flash floods either. Loss of animals was another impact directly or indirectly attributed to flash floods. Sharing their views, members of the Gujar community in Taar stated that each year at least ten animals, mainly goats and sheep, are lost in flash floods; but this is dependent on the frequency and intensity of the floods (AKRSP, November 2008). Destruction of crop land and natural vegetation was identified as a contributing factor to the loss of animals. Participants in Taar and Kalas pointed out that, after flash floods, fodder supplies were limited and animals become highly susceptible to various diseases, began to lose weight, and often died. Thus flash floods, both directly and indirectly, are ruining the livelihoods of Shishikoh communities. Similar responses were recorded in the other villages (AKRSP, November 2008). Box 1 summarises the impacts of flash floods in Shishikoh.

#### Box 1: Flash flood impacts in Shishikoh

- Loss of arable/productive land
- Low productivity
- Economic loss
- Increase in price of consumable items
- Loss of livestock
- Uprooting of drinking water infrastructure
- Damage to households
- Loss of lives

Destruction of the meagre communication infrastructure by frequent flash floods contributes towards an increase in the price of consumer goods in village shops, and this renders the communities vulnerable to potential hazards. The respondents in Taar and Madaklasht villages (AKRSP, November 2008) said that transporters charged more than usual during the flood season because, after flash floods, repair and maintenance of the main communication road through the valley is usually carried out by them as the Construction and Work Department (C&W) does not own the said road. The road was constructed by the Forest Department which has no incentive to maintain it unless there is an opportunity for commercial logging. Participants in Khashindel, Taar, Birga and Kalas villages also pointed out that increased intensity and frequency of flash floods have led to the uprooting of the drinking water supply infrastructure in Shishikoh (AKRSP, November 2008). The participants in all five selected villages revealed that the loss of land and livestock and the high cost of rehabilitation have brought extra economic burdens, making people even more vulnerable to flash floods than heretofore.

### Mulkhow

Variations in the frequency and duration of rainfall are the main reasons behind the prolonged droughts that affect socioeconomic conditions in Mulkhow. The severity and persistence of drought have led to a wide range of impacts across the region. The negative impacts of drought on the agricultural sector were apparent from the responses of participants in focus group discussions throughout the study area. Drying up of water resources, especially the springs, was indicated to be the main impact of drought in the study area. Table 8 shows the number of springs that have dried up between 1998 and 2008. This information was collected during focus group discussions held in the selected villages in October 2008, and it was verified in the report back workshop in May 2009.

**Table 8: Springs that dried up between 1998 and 2008**

#### Mulkhow

Saht	Gaht	Nogram	Warijun	Zani	Kushum
15	9	8	3	12	6

According to the data, a total of 53 natural springs had dried up over ten years. Saht village where 15 springs had dried up was the most severely affected whereas Warijun was the least affected as only three springs had depleted. Shortage of water in the study area has led to a reduction in the area under cultivation, hence limiting agricultural production. The region, despite falling into a double cropping zone, has become a single cropping zone and farmers have no option but to leave large areas of land uncultivated (AKRSP, October 2008). In addition to this it was also discovered that there has been a decrease in crop diversity and wheat is the main crop now: maize production has become negligible. Box 2 summarises the impacts of drought on Mulkhov.

During the focus group discussions in Saht, Nogram, and Kushum, almost all the participants stated that because of shortage of water almost 80% of their landholdings were uncultivated during summer (kharif) season (AKRSP October 2008/May 2009). Low crop yields were another impact of water stress on the agricultural sector in all five villages in the

#### Box 2: Impacts of drought in Mulkhov

- Drying up of water resources, mainly springs
- Limited area of land under cultivation
- Low crop yields (cereals, vegetables, fruits)
- Crop failure
- Loss of animals due to shortage of fodder
- Loss of trees (fruit/forest)
- Loss of human and financial resources
- Limited supply of water for domestic use

study area. The participants at the feedback workshop held in May 2009 said that the land in Mulkhov is very fertile and contains only negligible amounts of rock debris. Hence it was suitable for all kinds of crops but water shortages meant that average production per acre was far less than the standard. The participants also added that, when water is scarce, attacks from pests and disease become a common phenomenon and another determining factor in low productivity.

Water stress also increases the workloads of people whose primary source of livelihood is agriculture. With a decrease in water, farmers (mostly at the tail end of the water channel) have to put more physical effort into irrigation. The situation becomes worse when the turn for irrigation comes at night. Family members (both men and women) are assigned to different distribution points to ensure a supply of the quantity of water allocated and avoid loss through seepage or blockage

(AKRSP, October 2008). The inhabitants of Kushum, Nogram, and Gaht also have serious problems with crop failure. Participants in focus group discussions in these areas stated that frequently the wheat crops failed to mature because of water shortages. The participants from Kushum recounted that, between 1998 to 2002 and 2005 to 2006, a major proportion of the wheat crop did not mature and was prematurely harvested and fed to animals, incurring a huge loss in terms of time, labour, and money (AKRSP, October 2008).

The participants identified loss of trees (fruit trees and others) as a serious problem in the area. Plantation of a reasonable number of fruit and other trees around the houses and cultivable land is a common practice in the study area. This is usually done to meet nutritional needs and supplement the household's fuelwood requirements. The prevailing drought, however, has resulted in the loss of these trees. Discussing the loss of trees (fruit trees and others), participants in the focus group discussion in Warijun said that it takes five to 10 years for a tree to mature and loss of one tree results in the wastage of 10 years of input and effort (AKRSP, October 2008). A village elder from Gaht village said that walnut trees used to be a common source of cash income in Mulkhov, but now, due to the shortage of water, this plant could hardly be seen in the area. Another participant from the same village told us that the drought from 1998 to 2002 was so severe that they lost almost 70% of the fruit and other trees. Moreover, in Nogram, a walnut tree more than a 100 years' old dried up due to shortage of water. Participants in focus group discussions at Nogram in discussing the overall impacts of drought said that drought has discouraged farmers from investing their time, labour and money (AKRSP, October 2008). One is encouraged to put in maximum effort only if food security is attainable.

The impacts of water stress are not limited to the agricultural sector alone: the livestock sector has also been affected negatively by the shortage of fodder. The majority of participants in focus group discussions in Gaht and Zani revealed that the shortage of fodder and vegetation renders livestock physically weak and unproductive and they are compelled to sell stock at throw away prices or slaughter them. In addition, we learned that between 2001 and 2003, the livestock population decreased by about 50%. Sharing a personal experience of drought, a local farmer from Saht said that the drought in 2001 so affected the prices of animals so badly that people sold their animals at unbelievably low prices.

He added that, in March 2001, he sold his cow for PKR 8,000 (\$96), but a month later he purchased a cow for only PKR 1,500 (\$18) from the village of Nogram which is the most water stressed area in Mulkhow. Increases in animal diseases were seen as another key factor contributing to the decrease in livestock population (AKRSP, October 2008).

The negative impacts of water-induced hazards affect both genders separately: both men and women participants agreed that women have to bear enormous physical and mental burdens on a daily basis, especially during water stress or excess. Moreover, prevailing gender roles exacerbate these impacts and render women even more vulnerable (see Box 3). Depletion of water sources, such as springs and perennial streams, in Mulkhow has created a serious shortage of water for domestic use, resulting in poor health and hygiene, especially among children and women. An increase in women's workloads was identified as a negative impact of drought in the region. During drought, besides farming and looking after the animals, women have to travel long distances to fetch water. The participants at the women's focus group discussions in Nogram said that the springs were approximately one kilometre from the villages and half an hour was needed to fetch water: the main river is almost 600 metres below the uphill villages and 300 metres below the village centre in Mulkhow (AKRSP, April 2009). In both cases, one has to travel down and up to collect water twice a day on average. This exhausting journey has drastic impacts on the health of women and children. It was observed that washing clothes in the river was the most common practice in the study areas.

Voicing their thoughts about the negative impacts of drought on the health of women, women at the focus group discussions in Gaht pointed out that, although women have the responsibility of collecting and managing household water supplies, they do not have control over the use of water. Men have priority in its use. Moreover, due to limited water supplies, they could not take a bath as often as they would like (AKRSP, April 2009). Similarly, woman discussants in Kushum stated that they bathe cautiously to avoid wasting water: in a water shortage they would have to carry it in again. This situation leads to poor health and hygiene among women (AKRSP, April 2009). Similar responses were recorded in other villages in both study areas. Changes in the physical appearance or posture of women are another impact attributed to shortage of water. The women of Warijun said that constantly fetching of water from long distances has led to slight curvatures in their figures (AKRSP, April 2009). Women respondents in Taar were of the opinion that increased workloads had made them look much older than their age (AKRSP, May 2009).

The shortage of water has limited the social lives of women in the study area. Participants in Kushum and Nogram pointed out that sometimes, due to shortage of water, they could not wash their clothes and this restricted their participation in social events and confined them to their houses (AKRSP, April 2009). The women in Kushum also stated that sometimes the water shortage was so acute that they could not offer prayers (AKRSP, April 2009). Moreover, a couple of women participants from Kushum and Nogram revealed that the lives of women are so hard that most women prefer to marry outside the Mulkhow region and the women who were married there from outside preferred their relatives not to marry into the study area (AKRSP, April 2009). Heavy workloads and lack of social interaction have placed limitations on the lives of women in the study areas resulting in marginalisation and poor adaptive capacities.

## Conclusions

As the people in the area are heavily dependent on natural resources for their livelihoods, almost all the inhabitants are vulnerable to water-induced hazards and their responses to the question of 'who is vulnerable' were uniform throughout the study areas. The participants at all 11 focus group discussions agreed, however, that the degree of vulnerability could vary for different people. The responses of the participants regarding vulnerability are as follows.

- Poor people were identified as the most vulnerable to water stress and excess in the study areas. Defining 'poor' was not an easy task for the community members. Different people had different views about this. In Mulkhow, the majority of the participants were of the opinion that any person who receives credit is poor. Another view was that any person

### Box 3: Impacts of water-induced hazards on women

- Increase in workload of women
- Limited participation of women in social events
- Poor health and physical disorder
- Women prefer to marry outside the area
- Low participation of women in rituals

who completely depends on external sources of wheat grain for their food is poor. Some people were of the opinion that people with no land are poor, but there was disagreement and examples were cited of people who do not have land but have sources of income such as a job or business. Some people also considered households with no water user rights to be poor. The participants concluded that a poor person is one with no regular source of cash income. The poor are considered vulnerable as they have less capacity to recover from or cope with the impacts of water stress.

- The households with a single source of income, especially farming, were identified as being extremely vulnerable to water stress and excess.
- Individuals with physical and financial capital or from a big tribe were seen to be less vulnerable to drought or flash floods because such families can adjust more easily than individuals. In reference to big clans and families we were told that descendants of royal families and their associates are considered to be big tribes or clans. These families have the privileges of more land and water resources than ordinary communities.
- Similarly, households or clans and families with limited access to resources are considered to be vulnerable. Poor people who have been granted land by the elite class (mainly royal family and associates) come into this category as they have very limited access to water and land, which are mainly owned by the elite class.
- People with no water rights (mostly those who are migrants) are more vulnerable also. Twenty and 45 households of Kholbronzk and Seer sub-villages in Saht respectively were identified as households which have no water rights and which depend completely on borrowing water for their farming. Distribution of water among the children is based on the land received by each heir. Here it is important to note that water allocation or distribution is related to the amount of land one owns and as women are not given a share of the property, therefore, they don't get any water rights.

Women were also identified as highly vulnerable in both study areas because of socially constructed gender roles and behaviour, whereas households headed by women who are poor were seen to be more exposed to the impact of water-induced hazards. Women are vulnerable as they have limited or no access to basic services such as education, health, employment, finances, economic opportunities, and information; and they have no control of resources such as land, water, cash, and livestock. Moreover, this situation reduces their adaptive capacities.

- Households with more women than men are seen to be vulnerable as, in the traditional society of Chitral, women are considered to be weaker than men and in conservative societies having more women means having more liabilities.
  - Communities without unity and collective efforts were also seen to be vulnerable as they lack the ability for collective action and self help. Unity is recognised as a prerequisite for accessing external help.
  - Households with limited education were identified as vulnerable in Madaklasht. The focus group participants in Madaklasht believed that remoteness, ethnicity, and lack of livelihood options compelled them to focus on education and learning technical or marketable skills to diversify their incomes. Moreover, households with no or limited human capital such as education and technical skills are more exposed to shocks and have limited adaptive capacities.
- Households located at the tail end of the irrigation network were also seen to be more vulnerable to water stress. No doubt the nature of impacts is the same on these households but the intensity is greater as they are more prone to agricultural losses and have to bear more physical and mental stress when drought becomes intense.

### The broader context

Chitral is divided into two major climatic regions; namely, a temperate lowland type and a semi-arid highland type. Firstly, the temperate lowland type includes the lower areas of southern Chitral district below 1,333m. The summer monsoons are intense in lower Chitral which results in flash floods in the region. The Shishikoh valley in lower Chitral is supposed to be very moist. Shishikoh valley has a common boundary with the Dir and Swat districts of the NWFP. All these areas possess nearly the same physiographic and climatic conditions. Other districts of the NWFP, such as Buner, Shangla, Kohistan, Abbottabad, and Mansehra, have nearly the same climatic conditions. The lessons learned in Shishikoh valley can be applied, therefore, to other southern valleys in the district and other mountainous areas of the province. This is important because rapid deforestation is occurring in valleys such as the Kalash, Damer, and Bior valleys in Chitral and the adjoining districts of Dir and Swat. The situation in some of these places is almost the same as in the Shishikoh valley or it has the potential to be so if measures are not taken to prevent it.

Secondly, the semi-arid highland type (above 1,333m) includes the upper northern parts of Chitral and Northern areas of Gilgit Agency; and Mulkhow lies in this region. The summer monsoons do not reach this area and dry weather prevails. This area is representative of the socioeconomic and climatic conditions in the adjoining upper valleys of Gilgit Agency. In a broad sense similar drought conditions prevail in the south-western districts of the NWFP like Kohat, Dera Ismail Khan, Tank, and Lakki Marwat, although the physiography in the context of communication and availability of land is different.

The study area is important because the Indus basin heavily depends on the glaciers of the Hindu Kush, Karakoram, and Himalayas (HKH) which act as a reservoir, capturing snow and rain, holding the water, and releasing it into the rivers which feed the plains. The Chitral River, which becomes the Kabul River on passing through Afghanistan, enters Pakistan at Warsak in the NWFP. It is the main source of water for the eastern parts of the NWFP. The Kabul River itself is little more than a trickle for most of the year, but swells in summer due to melting snows. Its largest tributary is Kunar River that starts out as Mastuj River from the Chiantar glacier in Chitral and flows south into Afghanistan. As many studies have pointed out, glacial melt could have disastrous consequences on the communities and watersheds of the Himalayas, as well as on other nearby mountain ranges along the Tibetan Plateau, and melt and climate change could also have catastrophic consequences for Chitral valley as well as the country as a whole.

The physiographic condition of Mulkhow is the same as other water deprived places in Chitral and the NWFP. The water in these places is mostly collected from springs which drain into the rivers. The northern and eastern Districts of the NWFP have rugged mountainous terrains with steep slopes. Irrigation systems are mostly rain fed because the summer monsoon is quite intense. Due to the density of snowfall in winter and rainfall in summer these areas are rich in natural vegetation. There are many glaciers in the alpine meadows of these valleys. The glaciers provide melt water down country in summer. The climatic variability in temperature and intensity of condensation that is resulting in flash floods, avalanches, drought, and land erosion is also posing a threat to places like the Mulkhow and Shishikoh valleys.

Due to the isolated geographic setting, the District of Chitral has a unique cultural identity which is different from that of surrounding places. The Pathan culture dominant in the province has influenced the Chitrali culture. Secondly, the religion is the same in all the districts of NWFP and there is an almost common religious perception about the occurrence of droughts, flash floods, and other natural calamities. Therefore, material, cultural indicators such as the way of living, standard of living, construction, clothing, and so on are similar but a wide difference in non-material culture still exists.

## Responses to water stress and hazards

### Experiences of past water stress and hazards

#### Individual and community memories of past events

The participants at all the five focus group discussions in Shishikoh were of the opinion that the frequency of flash floods increased from 1970. Discussing the main flash flood events in the recent past, participants from Birga said that the 1997 flash flood was the most devastating one because, besides destroying large areas of productive land, physical infrastructure, and three to five houses, it also caused the loss of 40 livestock and took four human lives (AKRSP, November 2008). This same year, 1997, was also terrible for the people of Kalas, as the flash flood washed away 40 cows and goats and a considerable amount of land. Similarly, in 2002 in Madaklasht a flash flood caused the loss of 50 sheep and cows (AKRSP, November 2008). In Taar village, in 2002 and 2008, floods caused six and two human deaths respectively and in addition 70-80 animals were lost in these two floods. At the individual level, people reported events which had caused devastation of their belongings such as houses and lands. An individual from Khashindel, expressing his feelings, said that he is no longer afraid of flash floods as he has nothing more to lose. The land he had, which was his only source of income, was washed away by a flash flood leaving him with no option except seasonal migration to earn cash. Similarly, a couple of individuals in Birga and Kalas villages reported that they had watched helplessly as their lands and houses were washed away by the floods (AKRSP, November 2008).

Forest degradation was blamed by focus group participants for the occurrence of flash floods throughout the study area. A village elder from Taar said that the status of the forest was far better during the Mehtar's rule than now in the current system. During the rule of the Mehtar of Chitral, there was a complete ban on selling timber. Only Miras Khor (owners) and Dastur Khor (one who is granted user rights) had the right to cut timber and this was only for construction of houses. The

common people had the right to collect dry branches of oak trees as fuelwood and to use the forest for rotational grazing. Thus, until the 1970s, occurrence of flash floods was very rare but after the 1970s, when commercial and illicit harvesting of the forests started, the frequency and intensity of flash floods also increased. Responding to the learning about flash floods, participants from Kalas stated that to protect their belongings and avoid loss of human lives from flash floods they had moved from the plains to the mountain slopes, but there are people who have reconstructed their homes in the same places because their landholdings are limited, because of poverty, and because of their emotional affiliation to their area (AKRSP, November 2008). The participants from Madaklasht were of the opinion that dealing with flash floods is beyond the capacity of individuals and that, until and unless the community is united, nothing will change. Therefore, they had organised the whole community and decided to conserve a certain area where no grazing or harvesting is allowed, and the results of this have been positive (AKRSP, November 2008). Participants from Khashindel were of the opinion that the forest may sustain the mounting pressure for a decade or two but, with limited education and skills, they would have no option but to depend on harvesting the forest for timber or fuelwood.

The inhabitants of Shishikoh valley have been unable to stop the deforestation process. On the other hand, the community in Madaklasht has successfully stopped the marking of forests for commercial purposes by the Forest Development Corporation (AKRSP, November 2008).

Over the years of constantly facing droughts, the communities of Mulkhow have adjusted to the situations arising from water stress. During the focus group discussions at Warijun, Gaht, Saht, and Kushum villages (AKRSP, October 2008) the participants stated that the region has been historically water stressed, but water stress was not recognised until the 1970s. After this, changes in weather patterns commenced in the form of decreasing frequency of rain. The situation worsened with the increase in population and now the area is facing acute water shortages (AKRSP, October 2008). Droughts that lasted for four years (1998 to 2002) in Mulkhow were considered to have been the worst, and they ruined the livelihoods of the communities. During these four years, most of the agricultural land became barren and crop production decreased. Despite having productive land for fruit and pulses, the crops were totally destroyed during this period. One participant in focus group discussions at Kushum stated that incidences of drought pushed them back ten years (AKRSP, October 2008). The participants from Nogram said that, in 2000 and 2003, both winter and summer crops failed. In normal seasons, the winter crop (wheat) matures in July but during the drought period crops had to be harvested in May and fed to animals (AKRSP, October 2008). The drought situation also affected productivity and paucity of fodder resulted in loss of animals. Most of the cattle were lost and the remaining ones had to be sold. Sharing their experiences, participants from Saht said that the severity of that drought period was evident from the fact that only two bulls survived in the whole village. Participants reported that the loss of animals resulted in economic loss, on the one hand, while, on the other, it also contributed towards poor productivity of winter crops due to a shortage of manure (AKRSP, October 2008). Participants in Zani revealed that the poplar tree (a common construction material in the area) is best grown in some parts where there were natural springs and climatic conditions were suitable but, during the said drought, many standing poplar trees became useless (AKRSP, October 2008).

Regarding the learning, the opinions of participants in all six focus group discussions were almost similar. Revival and strengthening of indigenous water management systems was attributed to the persistence of droughts in the area. The participants from Kushum pointed out that they now know that they are in a vulnerable situation and drought events like those of 1998 and 2002 could occur again. Moreover, the persistent droughts in the area have compelled them to manage the available water resources efficiently and this was only possible by strengthening traditional user rights and distribution systems (AKRSP, October 2008). During focus group discussions in Gaht and Saht participants said that traditional institutional structures for management of the meagre water resources are so strong that even during severe droughts no conflicts or disturbances have ever occurred (AKRSP, October 2008). Participants from Nogram and Warijun revealed that the prolonged drought in the area had compelled them to organise themselves and take collective action. Lastly, one thing was common among all the focus groups in Mulkhow, that is that communities realised that climate variations had always occurred but they were unable to explain why (AKRSP, October 2008).

### Historical perceptions of vulnerability and risks at local level

As mentioned, the livelihoods of the residents of both study sites are based on natural resources, and this makes them vulnerable to water-induced hazards. The frequency of the incidence of extreme events has increased: however the extent of devastation is not the same for all events (AKRSP, November 2008). Almost all the participants in focus group discussions throughout Shishikoh were unanimous about the fact that, whenever there is a marking of the forests by the

Forest Department and subsequent harvesting of trees, they are sure that there will be floods in that particular area next season. Moreover, there is a common understanding that, with the passage of time, the frequency of flash floods has increased, resulting in the loss of assets such as land, crops, livestock, and, sometimes, human lives. Community members in the study area do understand the cause and effect relationship between cutting down forests and increased frequency of flash floods but are unable or unwilling to pre-empt the emerging situation. They also realise that their vulnerability is increasing day by day due to continuing deforestation.

The perceptions of locals and outsiders regarding vulnerability and risk are almost similar. Both locals and outsiders were of the opinion that, until and unless alternative income generation opportunities are generated, the vulnerability of the people of Shishikoh will not decrease. Moreover, locals and outsiders also perceive that the scale of devastation caused by flash floods is beyond the capacity of the local people to amend.

Keeping in mind the extreme vulnerability and limited capacities of the people, some non-government organisations have tried to intervene in the area but, due to the poor reception and conservative attitudes of the community, the interventions have not succeeded in the lower part of Shishikoh. In Madaklasht, however, the interventions have been very successful in terms of education, health care, crop diversification, hydropower development, water supply and sanitation, income generation, and flood protection.

Mulkhow has been a water scarce region for a long time and its residents have been conscious of their vulnerability and risks attached to water stress, which is increasing with the passage of time. According to the inhabitants of the study area, agriculture, which is the source of livelihood for the majority of people, is extremely prone to the effects of drought and perennial water scarcity (AKRSP, October 2008). Because of insufficient water, lands are left uncultivated and the productivity of cultivated lands is also impacted leading to risks of food insecurity, malnourishment, and poverty (AKRSP, October 2008). Moreover, skin diseases and mal-nourishment, especially among women and children, are very common risks attached to water scarcity (AKRSP, October 2008).

### **Community initiatives related to past floods or droughts**

In reference to community initiatives Shishikoh had two different instances based on geography and ethnic diversity. In the first instance, very limited community initiatives could be observed throughout the study area, except in Madaklasht. Although a number of small irrigation channels and protective embankments along the main stream could be seen, these initiatives related to flood events in Shishikoh are not enough to check the scale of hazard. Small protective walls of approximately two metres in height and five metres in width are erected on slopes over the settlements in Taar and Birga villages. These arrangements have been made to save the settlements from small-scale debris falls. Forest degradation was identified as the root cause of flash floods by all the respondents, but the communities of Shishikoh, apart from Madaklasht and Kalas, have not been able to organise themselves and influence the government to take solid measures to halt the cutting down of forests and introduce large-scale infrastructural projects to check floods.

No doubt the conservativeness, conflict over resources, ethnic diversity, and strong resistance against non-government organisations are among the reasons behind the low level of social capital within the communities. A key informant from Taar village, who faced strong resistance and was ostracised socially by the community for getting support from AKRSP to construct a hydropower plant, said that remoteness together with lack of education and exposure have resulted in disunity and resistance against NGOs. He added that long-drawn-out conflicts between different clans and families and ethnic groups over natural forests have made the situation worse (AKRSP, November 2008).

The case of Madaklasht is different from the rest of Shishikoh. After realising the importance of the forest in minimising the impact of flash floods, the local community has been successful in preventing both legal and illegal harvesting of forests over the last five years. In addition to this, despite being heavily dependent on forests, the community has also reserved a reasonable portion of their forests in which grazing and cutting is not allowed. The initiative was taken after facing a flash flood back in 2002 which destroyed a considerable amount of land. This contrasting situation within Shishikoh is mainly due to the fact that the people of Madaklasht have a single ethnicity, high literacy rate (100% male and female), and access to information through exposure and responsiveness to NGOs. The participants in the focus group discussion at Madaklasht (AKRSP, November 2008/May 2009) said that four families whose houses were washed away by flash floods were accommodated on communal lands after consultation with the community.

The level of mobilisation towards collective action (to combat the impacts of drought) in Mulkhow is greater than in Shishikoh. According to the participants in focus group discussions in Warijun, in 1976 attempts were made by the local communities at 'glacier grafting'; however, due to selection of low altitudes and lack of snowfall the initiative did not succeed.

These communities have a long history of struggle and have become involved in the construction of the famous Atakh Canal (a main channel, supposed to be drawn from the roots of Terichmir, which will cover the whole of Mulkhow). Construction started in 2007 and was initiated by the inhabitants of Mulkhow on a self-help basis. Later on the government was approached to construct this channel, but the approach was turned down because of the huge construction costs. After long deliberations and protests the project was approved and construction work has begun. Many people, however, believe that the project was started just to gain political support. In addition, village women's organisations (WOs), formed with the support of ARKSP and other NGOs, in the communities have been able to secure funds for lining the irrigation channels, upgrading traditional water-harvesting ponds to concrete structures, and building irrigation channels.

### Individual and community attitudes towards external help

The community members in Shishikoh seem to be more dependent upon external help, especially from the government, than the communities of Mulkhow. This can be witnessed by the fact that no local-level initiatives have been taken by the community to check forest degradation so far. Even though they know that forest degradation exacerbates the impacts of flash floods, the community has not taken any measures to save the forest. On the contrary for their short-term benefit, they have been facilitating the harvesting of forests. Their lack of unity, conservativeness, and limited education and exposure are the main reasons behind the majority of communities relying completely on external help.

In discussing this external help, the participants at focus group discussions in Taar and Birga said that their capacity to cope with the scale of the hazard and the enormity of extreme events was limited and compelled them to seek external help to handle the consequences of climate-induced flash floods (AKRSP, November 2008). In discussing forest degradation, the majority of participants agreed that until and unless alternative livelihood opportunities were made available by the government, this process will go on.

Participants in the focus group discussion at Khashindel stated that the communities alone could not carry out reforestation without financial and technical help from outside. This also applied to the construction of protective infrastructure for land and houses. To be able to do so is out of local reach, therefore, at the individual as well as community levels, the locals are dependent upon external help to adapt to the changing environment and circumstances (AKRSP, November 2008).

Participants from Taar said that controlling the timber mafia which exploits the forests in the area is not possible for the local communities alone. In this instance, the local community, even the whole of the district government, is unable to stop them because they have highly-placed sources and sympathisers in the government hierarchy (AKRSP, November 2008). They said that locals are even discouraged from doing menial labour by these timber contractors so that they cannot disrupt the regular supply of timber from the forests.

The communities of Mulkhow were not found to be very dependent on external help during drought. Coping or adaptation mechanisms developed by the communities are mostly based on indigenous knowledge and systems and there is little intervention by development actors in enhancing the coping strategies of local people. It was observed, however, that the communities do rely on external support to strengthen local adaptation mechanisms. Transformation of traditional water reservoirs into concrete structures, lining and construction of irrigation channels, and installation of infrastructure for drinking water supplies are the interventions for which people rely on different development actors such as the water management department, AKRSP, and Sarhad Rural Support Programme (SRSP). Even in the case of external help or intervention, however, the community contributes its due share.

The combination of scientific knowledge with traditional distribution practices has improved the efficiency of water supply systems, especially during drought. Discussing external help in relation to drought, the participants at the feedback workshop in Warijun were of the opinion that seeking external help depends on the scale of devastation caused by drought. Small-scale work is carried out by them at local level, but the scale of drought they sometimes have to face cannot be tackled by the communities alone without external help (AKRSP, May 2009). The participants at focus group discussions in Warijun said that they wanted external help only for large-scale interventions in physical infrastructure to help them to adapt to drought conditions. Installation of water tanks, pipelines, and lining of water courses could not be carried out by the community alone. Notwithstanding they are willing to contribute whatever the initiative is (AKRSP, October 2008).

## Monitoring change

### Early warning signals

No modern or sophisticated early warning system were found in the study areas; however, the long history of flash floods in Shishikoh has resulted in the development of indigenous skills and knowledge to predict flash floods. The vulnerable communities observe the rotation and density of clouds over their respective mountains and anticipate the floods, especially during summer (June to September). When the movements of clouds and wind stop this gives a signal that there could be a flood. Similarly, floods are thought to be preceded by a certain kind of smell. The participants in focus group discussions at Birga and Kalas said that, before the occurrence of flash floods, a particular smell of clay and pine spreads all over, and this is a signal to take necessary action. They added that they can sense the floods before their occurrence as animals and birds make odd noises and act in an unusual manner. For instance, cows and goats start lowing and moving restlessly and dogs bark. Upon recognising these signs, people prepare to escape from the vulnerable areas to safe places (AKRSP, November 2008). The participants in Taar also said that flash floods can easily be distinguished by the noises they generate. They explained that flash floods are so powerful that they uproot trees and carry huge stones along which create a special kind of noise like the rolling of rocks; and these sounds can be heard from far away (AKRSP, November 2008). Moreover, information about a coming flash flood is also transmitted downstream by whistling and calling from people upstream. If the flood occurs at night, the communities upstream rotate their lanterns and torches to inform the downstream population. When the call for prayers (Azan) comes at times other than usual, this is also considered to be an indication of an unusual event: the focus group participants in Khashindel (AKRSP, November 2008) informed us that calling for prayers during extreme events, especially earthquakes and flash floods, is a common practice as it recognises Allah's greatness and seeks help in minimising the extent of loss. Though the purpose of calling for prayers is not to communicate about flash floods to others, whenever the Azan is heard at an unusual time during high intensity rains, people become alert and prepare themselves to leave for safe places. It should be noted that the majority of indigenous methods of predicting flash floods are still in practice and considered to be valid.

Without scientific weather forecasting in Mulkhow, the community relies entirely on their own local knowledge to forecast upcoming seasonal trends, i.e., drought or rainfall. There is a local perception called 'kareezi' (meaning black and white patches), a term used when there is a little snowfall over the mountains in early autumn. According to the people of Mulkhow, if 'kareezi' are present, then there will be a drought the following year. Early spring snowfall is considered to be the determining factor for the shortage or abundance of water in streams. The reason for this, according to participants in Nogram and Kushum, is that in spring, especially in February and early March, snowfall on the hills helps to bring glaciers down to the streams in avalanches which melt into water. In case there is no snowfall in spring, a shortage of water occurs even if there is heavy snowfall in the mountains in winter (AKRSP, October 2008). During the feedback workshop it was stated that rain is expected when there are more ants than usual (AKRSP, May 2009). References about the validity of the indicators forecasting drought are not very strong. A reasonable number of participants, especially the younger ones, did not accept these indicators. They were of the opinion that predictions based on such indicators are not always valid.

### Time threshold and emergency measures

In Shishikoh, people upstream whistle and there are other indications of flash floods, people leave their houses for safe places. In the process, household members act jointly and they take their cattle, rations to last a few days, and their valuable assets.. The people in the Shishikoh valley have identified safe places already. They might go to another village or to higher places above their homes on hill slopes (within the same village). It is important to note that women are not allowed to go to safe places without a male relative. In the absence of men at the time of flash floods, relatives take the women to safe places along with their own families. The study team came across a number of cases in which women were left in their houses because there were no men around. This puts the life of women at risk. The coping mechanism is the same for all three ethnic groups.

### Safe places

High intensity flash floods bring along uprooted trees and huge rocks, and predicting flash flood routes, especially at night, is difficult. The flood route can change any time if the flow is blocked by rocks and trees. Therefore, no specific place is allotted for refuge from floods. Keeping in mind all possible directions a flash flood can take, several safe places have been identified within the villages and refuge is taken where appropriate.

In discussing the characteristics of safe places, participants from Khashindel stated that safe places are mostly located at high elevations and on hard rock as there are fewer chances of slippage even if the flash floods reach the spot (AKRSP, November 2008). Safe heights are usually on hill tops and ridges 100-200m above the village. Participants from Kalas said that higher elevations with curved rocks are safer as they provide some space to protect women and children from the heavy rain as well (AKRSP, November 2008). Participants in Taar said that access to safe places is dependent on the intensity of floods and the time threshold. Sharing his experience, one of the participants said that his neighbour was working in the fields when a flash flood occurred. He saw that the flood was approaching from both sides and, with no option for escape, the man climbed up a tree to save his life (AKRSP, November 2008).

Shifting of families to safe places was identified as a coping strategy in Shishikoh. The participants in Madaklasht said that, whenever there are high intensity rains over long durations, families living on the edges of streams move in with their relatives who are living at safe distances from the usual route the flash floods take (AKRSP, May 2009).

## Physical and structural adaptation strategies

### Houses

Houses and landscapes are critical for the protection of people from flash floods. In Shishikoh, the majority of the houses are 'kacha' (i.e., made of stones, mud, and wood). The increasing rate of flash floods has compelled people to leave the plains and construct their houses on slopes. Deciding where to construct a house is not easy. A couple of participants from Taar said that several factors are considered, and these include the nature of soil, vegetative cover, grazing routes, and the previous history of flash floods (AKRSP, November 2008).

It was also stated during a focus group discussion in Birga, that stones are preferable to mud for construction as they provide better protection against floods. Stone boundary walls could be seen around the houses. Figure 4 is representative of household construction practices in Shishikoh. It is clear that people have shifted on to the slopes (green circle) but a number of households (red circle) can still be seen on flash-flood passages. Options to construct houses in safe locations depend on factors such as landholdings, social capital, and financial resources. In many cases in Shishikoh, due to flash floods, landholdings have decreased considerably and people have no option except to reconstruct their houses in dangerous places which are exposed to flash floods.

### Water-harvesting strategies

Harvesting water by building micro-structures is one of the key strategies for adapting to water stress in the Mulkhow region. These harvesting structures are called 'chat' (water reservoir) and are built by individuals as well as by the village as a whole. Figure 5 shows the improved and traditional water-harvesting structures used in Mulkhow.

The water harvested is usually used for agriculture and drinking water. Water from perennial streams and springs is stored in the structures and used later on according to a predetermined distribution system. With the passage of time, these ponds have been transformed into concrete structures, especially those used for drinking water. The water management department, Aga Khan Rural support Programme (AKRSP), and Sarhad Rural Support Programme (SRSP) have provided support for this.

Figure 4: Shifting houses onto slopes in Shishikoh



Figure 5: Traditional water-harvesting structure in Mulkhow



Farmers in Warijun, Saht, and Nogram, who have quite sizeable landholdings, have their own water reservoirs for storing their quota of water (AKRSP, October 2008). These water reservoirs are very useful when the water supply comes at night as these structures allow farmers to store the water share that comes at night and use it in the day. Currently, there are about 11 main reservoirs and 40 micro-structures in the Mulkhow region providing water for irrigation and for drinking (AKRSP, October 2008). Micro-structures were also found in Saht, Gaht, and Warijun: these were built by women to store a regular supply of water for the livestock.

Water reservoirs were built because of the increasing shortage of water. Attempts are being made to construct large water reservoirs too, but lack of finances is the limiting factor. Generally the improved concrete structures were bigger than the traditional ones. With the increase in water stress the number of reservoirs has increased considerably. As far as the usefulness of this strategy is concerned, the reservoirs, especially those built of concrete, have helped the communities to minimise the impacts of water stress. In the absence of rains and drying of water sources, water harvesting is the only option for efficient use of limited water resources.

### Local irrigation systems

To cope with water shortages the people of Mulkhow have an ancient system of irrigation which, according to some participants in the study area, is five hundred years' old. According to an ex-district council member, however, the water distribution system was established during the rule of Mehtar Mohammad Shafi who ruled Chitral from 1701-1722. Another key informant and historian from Warijun claimed that this system began under Chinese rule in 56 BC (approximately 2100 years' ago).

Under the traditional distribution system, water is allotted according to the area of agricultural land owned by different clans or families: a person having more land gets more water, whereas a person with a smaller landholding gets less. (Data were unavailable on amounts of water allocated because water supplies are not constant and much depends upon what is available.) Use of water between villages is clear cut, i.e., some villages use water in the day time and others at night based on a system of rotation. For instance, the village of Drasun (one of the sub-villages of Warijun) receives water at night throughout the summer while the people of Saht use the water in the day. The reason behind this distribution system is because Saht is close to the water source whereas Drasun is close to the tail end. There is a greater chance of losing water through evaporation in the day time, therefore people finish working before evening prayers and divert the water to Drasun until morning prayers (AKRSP, November 2008). In spring, mostly in mid-March, water distribution begins and ends when wheat is sown in November. 'Sorogh' is the term used for this period and system and households can have one or more 'sorogh' of water in a week or more, depending on their user rights. Distribution of water is generally determined by a water distribution committee mostly comprised of 'gram' elders in consultation with member households and according to their water rights. After allocating the 'sorogh', a timetable is drawn up and distributed among the mosques and/or 'jamat khana's' from where each member household can check it. The term used for a unit of water distributed is 'gologh'.

Sometimes, during summer, evaporation and seepage in the distribution system mean that farmers close to the tail end do not receive their allotted quantity of water. Thus, to cope with this situation, two or more farmers pool their water and divide it equally for irrigation. This pooling of water is also called 'gologh'. As water distribution is based on the area of land owned, land segmentation as a result of population increases has little impact on it. When land is distributed among the heirs, the water is allocated automatically among them according to the area of land.

### Efficient management of water resources

Improving the efficiency of water use is another coping strategy used throughout Mulkhow. For this reason the communities have been maintaining irrigation networks by means of an indigenous system. In this system, a two-pronged strategy is used and in the first instance, maintenance is carried out through 'mirzhoi' (in which communities hire one or more persons to maintain the water channels and pay them in grain after each harvest). The people employed are responsible for routine maintenance, minor repairs, and ensuring that allocations are supplied from the main distribution point. Secondly, the communities pool their resources and practise collective re-excavation of water-harvesting structures and annual and/or emergency repair and maintenance of irrigation channels. Collective re-excavation or maintenance of channels is called 'mone' (services by turn). Explaining the indigenous system of 'mone', a key informant told us that, whenever an irrigation channel needs improvement or repair, every household contributes labour on a turn by turn basis. If a household does not provide labour, it contributes raw materials such as gravel, cement, or sand. Some households provide the cost of labour so that a substitute can be arranged. Similar arrangements also take place between villages when the scale of work is beyond



Figure 6: Nirwalu – an indigenous system of water distribution in Mulkhow

artificial pond. The ground surface of the pond is levelled and the 'nirwalu' installed on the two corners after levelling the water surface. The construction of the pond and installation of the 'nirwalu' are the responsibilities of a specialised water distribution committee. Once this system is installed and water starts to flow, none of the beneficiaries visits the place. The distribution system is so sensitive that putting a small stone in it could disrupt the distribution of water. Such actions are illegal and the committee fines culprits. The traditional management of the system has not changed much except in some areas where wooden structures have been used. The management of water through 'nirwalu' has almost disappeared, except in parts of Kushum village where they still use this method (AKRSP, October 2008).

#### Local flood control and erosion protection system

There is no organised flood or erosion control system in Shishikoh. Realising that forest harvesting is a major trigger leading to devastation by flash floods, the inhabitants of Kalas and Madaklasht conserved their forests by banning commercial and illegal cutting. They have established committees and rules under which no one is allowed to graze animals or cut trees in certain parts of the forest.

### Non-structural strategies

#### Borrowing and commercialisation of water

Borrowing water was recorded as a common adaptation strategy to overcome water shortages throughout Mulkhow, but it is particularly common in Gaht, Warijun, and Saht as clans and families with major water rights, such as the royal family and elite clans or families, reside in these villages. These communities have been practising a number of options. Borrowing water, for instance, begins typically with an increase in temperature at the end of the winter season (mid April), resulting in a heavy demand of water for crops. Some of the practices recorded under this strategy are given below (see also Box 4).

#### Box 4: Borrowing and commercialisation of water

Explaining the historical perspective of this strategy, key informants, Mukaram Shah (Warijun), Sher Ali (Nogram), and Murid Shah (Saht) stated that borrowing and swapping of water is an ancient practice used to overcome the shortage of water. Merchandising of water, however, is a recent development that started in the early 1990s. Before this, there was no concept of buying or selling of water and farmers with an immediate need for water used to ask their relatives and tribes with greater water rights for support. The increase in population and changing rainfall patterns have led to a shortage of water. To tackle this issue, in the first instance, the borrowing and swapping of water started, which later on led to trading of water for in-kind, services, and cash. Now a mixture of all these strategies is used by the farmers in Mulkhow.

the capacity of one village. Hence common resources are spread over a larger area and the social organisation is also on a larger scale than in the single stream villages in Shishikoh, for example. These arrangements are made when the main irrigation channel passing through two or three villages needs improvement. The repair work is carried out by the men from beneficiary villages on a turn by turn basis. Female-headed households, the poor, and households with no male workforce do not have to contribute.

Water is also managed through traditional water control structures. One technique is the 'nirwalu' (Figure 6) which is a hole in the middle of a pair of stones of equal dimension installed on two corners of a small

Seeking free water for irrigation from relatives and clans or families with major water shares, such as the royal family and associates, is a common practice in the area. This strategy is common among the poor and households where there are children, women, and older men only. The most widespread practices are swapping and borrowing water turns. These two strategies are very common among farmers located at the tail end of a water distribution system who receive little water as a result of leakages in the system. Trading water in kind (fodder, fuelwood, or poultry), services (weeding, harvesting, irrigating land, or household work), and cash is another adaptation strategy used especially by farmers who have limited amounts of water for irrigation (AKRSP, October 2008).

## Livestock management and diversification

Livestock play a crucial role in supplementing the livelihoods of local communities but, at the same time, the livestock sector is severely affected by climate variations in both study areas. Notwithstanding, the communities in both study areas have been able to adapt to the situation and limit the loss of livestock. Being the custodians of livestock, women play an equal part in adaptation to climate variations in the livestock sector. Lending or borrowing domestic cattle, mainly cows and calves, is a frequent strategy women use to avoid loss of livestock because of water shortages. In drought periods when fodder is in short supply, rearing animals becomes impossible for those with limited resources.



Figure 7: Sotsiri – a traditional practice of livestock management

There are two ways of lending animals in Mulkhov and Shishikoh. In the first instance animals, mainly cows, are loaned to relatives, neighbours, or any other household in the village for a certain period on the agreement that they are cared for while the recipient household uses the animal products. Thus, instead of selling or slaughtering animals, they are loaned to households which are well off. The agreement can be extended with mutual consent. The second method is called 'zhawk'<sup>1</sup>.

Borrowing fodder and weeding others' crops for fodder are common practices women use to deal with fodder shortages (AKRSP, October 2008; April 2009). The women collect wild shrubs also such as 'karizma', 'ishpar' (*Rheum emodi*), and 'mushain' (*Prangos pabularia*) to supplement fodder needs. Borrowing fodder is popular among poor households (AKRSP, April 2009).

In Mulkhov, the shortage of fodder is overcome by grazing animals on the high pastures. When there is a shortage of vegetative cover, households shift their male animals to high pastures to graze freely. They visit the pastures regularly to check on the animals. In addition to this, there is a traditional grazing system known as 'sotsiri'<sup>2</sup> (Figure 7) in the Mulkhov region. Kaghlasht and the pastures of Saht are used often for this purpose. The traditional system of 'pajal' (shepherd) is still intact and local men or boys are assigned to graze the animals on the high pastures and protect them from predators during the night. Local shepherds sometimes shift their families to the pastures to prepare milk products. They are paid in kind or cash per head of livestock per month. Currently, Rs. 25 per goat is paid for one month by the communities and people pay in commodities such as flour, wheat, salt, sugar, soap, clothes, and shoes. The shepherds also pay the owners an agreed amount of ghee and cheese depending on the number of animals kept (AKRSP, October 2008).

In the context of diversification of livestock, local breeds of cattle are kept, even though their milk production is low, for two reasons 1) they are small and do not need much fodder and 2) they are used to the local climate conditions. Shifting from goats to sheep was another strategy to minimise the loss of animals. The local breed of sheep is small and considered to be more resilient than goats. Moreover, the wool they produce has a high market value as it is used for 'shu' and for local carpet production. Thus, by keeping sheep, women can minimise the risk of losing animals, plus they can earn cash from selling wool and woollen products (AKRSP, October 2008; April 2009). Livestock management and diversification practices in Mulkhov have helped reduce losses considerably.

## Crop management and diversification

The inhabitants of Mulkhov have modified their management practices and cropping patterns to adjust to the increasing shortage of water. Crop management practices include the use of improved agricultural inputs; and by planting as early as possible and practising agroforestry. Focus group participants in Warijun, Nogram, and Saht informed us that they are using improved varieties of wheat such as Pir Sabaq and Maxi-Pak which give 100% more production (approximately 12 bags/acre) than the local variety 'zhakht'<sup>3</sup> (approximately six bags/acre). These varieties give good results only if sufficient water is available and in the case of acute water shortages cereals are sown (AKRSP, 2008). Using manure and chemical

<sup>1</sup> 'Zhawki' is the long term lending of a young animal with an agreement under which the recipient household rears it and makes use of the animal products but returns it once the animal gives birth to a calf. In the zhawki system, however, the recipient household keeps the calf.

<sup>2</sup> 'Sotsiri' is an internal arrangement by which a certain number of households graze livestock in a closed pasture. The animals are pooled and grazed by one or two members of each household on rotation for agreed periods, mostly on a daily basis.

<sup>3</sup> Zhakht is a local variety of wheat which has cultivated as long as anyone can remember. It can grow with limited amounts of water but gives very limited production. It is mostly grown as dry fodder for animals.

fertilizers is another strategy to overcome the problem of low yields. In this respect, the increasing price of chemical fertilizers, especially Diammonium phosphate(DAP), was pointed out as a factor limiting their use throughout the study area. Changing sowing times and re-cultivation in February and March were also seen to be strategies in practice in the upper areas of Saht and Kushum within Mulkhow (AKRSP, October 2008).

Farmers plant fruit and other trees on the borders of cultivable land for shade, to improve the productivity of the land, and to supplement household firewood supplies. Drought tolerant and early maturing *Robinia pseudoacacia* and *Ailanthus altissima* are the most common trees in the region (AKRSP, October 2008). Shortage of water, especially in summer, has compelled the inhabitants of Mulkhow to diversify cropping patterns. In addition to the main crop *Triticum indicum* (wheat), cultivation of *Hordeum vulgare* (barley) and *Trifolium repens* ('shaftal') in winter is a common practice throughout the study area. Participants in focus group discussions from Gaht, Zani, and Warijun divulged that, in summer, because of water shortages, it becomes impossible to grow maize and farmers prefer to grow pulses and legumes (split yellow lentils-'mongh'; split orange lentils-'masoor'; and millet 'bajra') (AKRSP, October 2008). Participants from Kushum and Nogram gave the reasons for growing pulses and legumes as that 1) the soil of Mulkhow is dry and sandy and thus suitable for legume production and 2) legumes require less water than maize (AKRSP, October 2008). Participants in focus group discussions in Gaht stated that legumes are a good source of nutrition and fetch good prices. Most farmers sell their legumes to supplement their household incomes (AKRSP, October 2008). It is important to note that crop diversification only takes place on 15-20% of the cultivated land and in summer.

The traditional system of 'somain' (contract farming) is another way of dealing with water stress. In this system, households with no or limited land acquire land on contract from big landlords on a 50/50 profit basis. Farmers with little water prefer to engage in contract farming with those having major water rights. This way they get enough water with the land acquired to use on their own land as well. Altering the topography through terracing of sloped land is also a common strategy used in both Mulkhow and Shishikoh to decrease runoff and erosion of topsoil and increase moisture retention and nutrient content (AKRSP, October 2008).

### Changes in food consumption patterns

Changes in food consumption patterns are important adaptation strategies during times when food is scarce, especially amongst the poor. Participants from Kalas, Birga, Taar, Kushum, and Nogram said that when they lost crops and market prices for food items were high, they could not buy the amount of food needed as frequently: thus, most of the time they have tea with bread at breakfast and lunch; and, sometimes, even at dinner. Maize bread is eaten during food shortages as it is cheaper and takes more time to digest, resulting in limited consumption (AKRSP, November 2008). Broken rice ('dubar', 'dagra', and IRRI 6) was found to be very common in both study areas as it is cheaper than whole grain rice. Discussing the use of broken rice, the participants from Kushum said that even though it is of poor quality and not nutritious, it has a rock bottom price compared to other varieties of rice ('sela' and 'Basmati'), which they cannot afford very often (AKRSP, October 2008). Consumption of meat and vegetables was rare in the study areas. Use of *Trifolium* for food is a common practice in Mulkhow, especially in Shat and Warijun. Eating less food than usual was also identified by women as a common strategy to cope with shortages. Women borrow grain and other food items often (AKRSP, October/November 2008).

### Micro-credit

Micro-credit is a prime, common strategy for adapting and minimising vulnerability to water-induced hazards in both study areas. Village shopkeepers are the lenders whereas banks fall into a secondary category. Throughout the study area participants agreed that more than 70% of the households purchase consumable items on credit from village shopkeepers and pay them after a month, after receiving their salary or wages, or after harvesting crops (AKRSP, October/November 2008). Providing credit for agricultural inputs, livestock fodder, and rehabilitation of land or housing, however, is beyond the capacity of the village shopkeepers and people have to go to banks for these services.

Discussing the types of loans taken, participants in Zani and Nogram said that micro-credit is taken by individuals involved in seasonal migration down country for work: loans range between PKR 15,000 (\$180) and 25,000(\$300) depending on the household size. The facility is used mostly to purchase rations, pay school fees, and for travel expenses of the migrant (AKRSP, October 2008). Micro-credit is also used to purchase agricultural inputs and livestock. Besides the above-mentioned uses, people in Shishikoh also take credit for rehabilitation of their physical assets such as houses and land. No doubt, bank priorities and criteria, high interest rates, remoteness, and lack of knowledge of financial services are the main factors hindering the adaptive capacities of mountain communities in the study area (AKRSP, October/November 2008).

## Migration

Migration was found to be a common adaptation strategy used by the active male workforce in the study areas, but it is hard to establish a direct link between water stress and migration. The incidence of water stress and hazards has reduced livelihood opportunities, and hence can be seen to compel the male workforce to migrate to other areas for work opportunities. Seasonal migration is a predominant and crucial way of achieving and sustaining livelihoods in the study areas. Permanent migration has also been recorded in some villages. In both study areas, migration depends on economic and social status. The clans or families that enjoy a strong social status within the society and have deep roots in the region normally do not migrate, whereas those who have money but do not have strong ties to the area are more likely to migrate. Households with limited resources are more willing to migrate, but they are constrained by financial resources (AKRSP, November 2008).

In Shishikoh, seasonal migration of young men is common practice. This migration mostly takes place in groups. Social networks play an important role in facilitating the smooth execution of the migration process. Participants in focus groups in Taar and Kalas stated that generally migrants are unskilled and are led by skilled persons (masons, brickmakers, or carpenters) who have previous working experience or linkages with down-country construction companies or contractors (AKRSP, November 2008).

Rawalpindi and the southern belt of Punjab province are the usual destinations of these migrants. Karachi in Sind province is the main destination of migrants from Madaklasht where migration takes place both individually and in groups. Here social networks play a different role than those in other parts of Shishikoh. Participants from Madaklasht informed us that the migrant community from Madaklasht in Karachi is well organised and, whenever anyone from their village reaches Karachi, the community pools money to make arrangements for his accommodation and to arrange a job. In addition, the group of migrants also helps and supports community members in case of any mishap. Focus group participants from Madaklasht informed us also that, recently, the organisation of local people in Karachi arranged to send back the body of a local person to Madaklasht: he had died in Karachi (AKRSP, November 2008). Similar informal social networks were also found in Mulkhow which helped new migrants from Mulkhow when they arrived in Peshawar, Rawalpindi, or Islamabad.

Seasonal trends in migration from Shishikoh are marked, i.e., on average 64% of the active labour force are involved in seasonal migration. Table 9 gives a village-wise breakdown in percentages of the active labour force involved in seasonal migration. These statistics were collected during focus group discussions.

**Table 9: Percentage of the active labour force involved in seasonal migration**

### Shishikoh

Type of migration	Kalas	Birga	Khashindel	Taar	Madaklahst
Outside region	40	40	60	80	100

Source: Focus group discussions

The Mulkhow communities have several migration strategies to help them adapt to climate variations. These include seasonal migration of the active labour force, mostly young men, down country in search of jobs or labour. On average 44% of the active labour force in Mulkhow region are involved in seasonal migration (Table 10) (AKRSP, October 2008).

**Table 10: Percentage of active labour force involved in seasonal migration**

### Mulkhow

Type of Migration	Saht	Gaht	Nogram	Warijun	Zani	Kushum
Outside region	50	40	50	30	25	70

Source: Focus group discussions

An ancient practice of short term intra-rural migration was also found to be very common in Mulkhow. Families build houses in two different localities, one on low-altitude lands below 2,135m for the winter while, during summer, people live in temporary houses mostly at high altitudes above 2,135m near the pastures. In some areas of Kushum, people have houses in three different places at three different altitudes; and the reasons given for this are the shortage of water, suitable temperatures (5-23 degrees Centigrade), and availability of pasture. As water shortages increase, people shift to villages

located at the higher elevations. With the commencement of summer, water resources begin to dry up, especially amongst the houses located at low altitudes. This is the time when these households start to move up close to water resources, as most of the springs are located at high altitudes. Moreover, land is available for grazing and cultivation after snow melt. In winter the energy costs at low altitude are low and this means the high pastures can remain fallow for six months. This kind of migration is an indigenous method of adaptation to water shortages (AKRSP, October 2008) (Table 11) (Figure 8).

**Table 11: Percentage of households involved in intra-rural migration**

**Mulkhov**

Type of Migration	Saht	Gaht	Nogram	Warijun	Zani	Kushum
Intra rural	80	50	50	20	10	80

Source: Focus group discussions

The practice is common and, according to the data collected during focus group discussions, on average 46% of households move up in June and come back to their permanent settlements in November (AKRSP, 2008). The low rate of intra-rural migration in Zani is due to the fact that it is already located at a higher elevation than the rest of the villages and only the lower part of the village migrates. Migration practices provide safe places for survival in this drought-hit region.

Issues related to intra-rural migration in Mulkhov include, firstly, an increased dropout rate among school children because of the increased distance between the houses at upper altitudes and schools. Secondly, health-care facilities are not available for high-altitude houses. Discussing the negative aspects of intra-rural migration, a post-graduate woman from Warijun said that shifting household belongings to other houses puts extra burdens on women as they have to carry the household baggage on their backs: this was previously done by donkeys or horses but now people hardly keep them because of shortage of fodder (AKRSP, April 2009).

In the Mulkhov region, permanent migration was recorded as a strategy to deal with the persistent drought. According to the data collected during focus group discussions in six selected villages, between 1998 and 2008, approximately 195 households migrated permanently to different villages in Chitral, mainly Bakarabad and Attani. Village-wise details of permanent migration are presented in Table 12.

**Table 12: Number of households permanently migrated from Mulkhov**

**Mulkhov**

Type of Migration	Saht	Gaht	Nogram	Warijun	Zani	Kushum
Permanent	30	15	30	20	15	85

Source: Focus group discussions

Here it is important to note that, although men make the decisions, women play a key role in mobilising and convincing their partners to migrate permanently from Mulkhov and to settle somewhere else. Positive outcomes of migration for economic reasons include much-needed cash income and increased options to move out of the area. At the same time, migration has led to an increase in the workload of women because of a change in gender roles, and especially in households with a

limited number of men. Responses to the question on the impacts of migration were similar in all the focus group discussions held with women in both study areas. It was pointed out that, in the absence of a male head of household, women take charge of all household affairs in addition to routine responsibilities; and this places additional burdens on women's shoulders. Almost 100% of women in Mulkhov identified irrigation as the most backbreaking task (AKRSP, 2008). They stated that, during irrigation of the fields, women have to carry out many associated tasks such as monitoring seepages or leakages and the consistency in supply of the water allocation. To carry out these tasks, women have to make continuous visits between the water source and the

**Figure 8: Seasonal migration in Mulkhov**



land, and this increases their physical as well as their mental stress. This situation also puts an extra burden on children as they are deployed at different water distribution spots to check water loss and ensure consistent supplies of water. Moreover, if a conflict arises during irrigation, women suffer more as, because of cultural constraints, women cannot argue with men to get their quota of water. The situation worsens when the turn comes at night, as women cannot carry out all the tasks in the dark, resulting in the risk of losing crops because of water shortage. In this difficult situation, the indigenous social network is the only hope and option for distressed households as it provides support to fulfil responsibilities wherever possible. The support may range from watering lands, harvesting, and processing crops (AKRSP, 2008).

Women participants in Kushum stated that, due to the absence of men, they are unable to get health treatment and services as it is impossible for them to visit a basic health unit alone because it is located in Warijun some 10 km away (AKRSP, 2008). Similarly, participants in focus group discussions in Taar, Kalas, and Birga also claimed that getting health treatment in the absence of their men is almost impossible. Limited participation in social events, such as marriages and funerals, was also identified as another negative impact of male outmigration as women are not allowed to attend these events alone (AKRSP, 2008). The women in the study areas, and especially in Mulkhov, are under so much mental and physical stress that local women prefer to get married outside the area, while women from other areas do not want to get married into this area. This statement was shared with male participants at the feedback workshop in Mulkhov and they verified it (AKRSP, 2009)

### Social networks

Chitrali society has indigenous social institutions within the community for collective action and management of village affairs. 'Gram' is the indigenous social network of communities within a village comprised of a certain number of households. In general, a 'gram' consists of households that depend on the same mosque for their religious obligations. Trust and mutual action are the binding elements of this system. The conventional and agreed upon rules of the 'gram' are binding on every member. A village may have one or more 'gram' depending on the size of the village.

In Mulkhov this informal social network is very strong and has resulted in the development of strong bonds, a sense of responsibility, and an element of cooperative action among the communities. Homogenous ethnic origins and a strong clan or family system are among the main reasons behind strong social networks. This informal social structure plays a key role in improving adaptive capacities and reducing the vulnerability of the community, especially the poor and marginalised segments. Distribution of water, collective irrigation, improving efficiency through management of water infrastructure and the 'Nirwalu' system are valid illustrations of strong social networks within the communities. Similarly granting of water to households with children, women, and old men; swapping and borrowing water; loaning animals and fodder; and the 'sotsiri' and 'pajal' systems show how social networks facilitate adaptation. Migration practices also demonstrate the importance of networks in improving the adaptive capacity of vulnerable people. These networks also help vulnerable households to irrigate their lands and harvest their crops.

On the other hand, although the system of 'gram' does exist in Shishikoh it is not as strong and effective as it is in Mulkhov. Ethnic and linguistic diversity and longstanding conflicts over forest resources are the major reasons behind erosion of this very important informal social network in Shishikoh (except in Madaklasht where a single ethnic group lives and speaks the same language). Although the residents of Shishikoh do not hesitate to help the victims of water-induced hazards in an emergency event; they lack the element of unity and cooperation that could help facilitate adaptation and reduce vulnerability. Individual cooperation and coordination is still there, but no community-level initiatives have been taken so far. Loaning out animals in cases of loss, helping each other during outmigration, providing shelter to victims, and provision of support for rehabilitation are some examples of communal cooperation and social relationships that render those involved more resilient to water hazards because they reduce the impacts on the inhabitants (AKRSP, November 2008). No doubt everyone in Mulkhov is being affected somehow, but the role of social networks in the area has resulted in efficient use of the meagre natural resources available and this has enabled them to cope with the impacts of drought.

The weak social network in Shishikoh was also seen in the fact that the community has not been able to influence the government to stop both legal and illicit cutting of forests which exacerbates the impacts of flash floods. Despite forming forest committees, the communities have not been able to check unplanned, extensive grazing and degradation of oak forests. On the contrary, however, the people of Madaklasht village in Shishikoh have developed a strong social network within and outside the village in Karachi. The network of Madaklashti people in Karachi actively facilitates migration by helping its villagers find accommodation and jobs. This community has also been able to stop both legal and illicit cutting of timber and conserve a reasonable portion of the forest.

Strong social networks have also helped the local communities to procure development projects from government and NGOs for microhydel plants, a community-based school, community health centre, link road, water supply system, and for building capacities in the natural resource management and enterprise sectors. All these development interventions, implemented through social networks, have helped to reduce vulnerability and improve adaptive capacities of remote communities.

### Diversification of livelihoods

Inhabitants of both study sites have very limited options for livelihood diversification. Remoteness, limited job openings, and lack of large-scale government projects are the main reasons behind limited livelihood diversification. Notwithstanding, the following trends were observed during field work.

Collection and marketing of pine nuts provides an additional source of cash income in the Shishikoh area. In addition to the raw marketing of nuts, oil is extracted and marketed by down-country traders. During the last few years, this trend has attracted more and more youths in the area because it is more rewarding in terms of cash and involves relatively less labour than working as a daily wage labourer or farming. Talking about the pine-nut trade, participants from Taar and Khashindel stated that pine nuts were collected on a small scale for household use but traders from Bannu and Waziristan had introduced mass-scale commercial trading in 2003. The sale price of one bag (weighing 60 to 80 kg) of pine nut cones rose from PKR 150 (\$2) to PKR 2,400 (\$29) within four years (2002 to 2006) (AKRSP, November 2008). Participants from Kalas informed us that, although it is a seasonal activity, a reasonable amount of cash is earned which is used to purchase household goods (AKRSP, 2008). According to the progress report of CIDO (a local organisation working for sustainable use of pine nut resources for livelihood improvement) the revenue from pine nuts in 2003 was less than one million PKR (\$12,000) whereas in 2006 it had reached five million PKR (\$60,240). In addition to this, the estimated production potential of pine nuts in Shishikoh is 1.52 million PKR (\$18,262) (CIDO 2006). Moreover, 62% of pine-nut collectors are poor (IUCN 2005b).

Another example of livelihood diversification was the shift from herding sheep and goats to other occupations (shopkeepers, transporters, and construction labourers) by a single ethnic community called the 'Gujar'. Discussing the shift, participants in focus group discussions in Taar revealed that rearing sheep and goats is very hard and, after getting an education and exposure, the youth, especially the literate youth, do want this kind of work (AKRSP, November 2008). With the increasing literacy and education of the new generation, the inhabitants of Mulkhov are also switching over to occupations which are more sustainable and do not depend as much upon natural resources. In the Mulkhov region, the major changes in occupation were associated with the education sector and the armed forces.

Discussing options, participants in Warijun and Nogram divulged that because of remoteness and lack of basic infrastructure, it is very difficult to start any kind of off-farm enterprise, therefore the youth, both men and women, prefer to get jobs in the education sector (AKRSP, October 2008). According to the baseline statistics of KLSO (2008), currently there are 161 men and 83 women teachers from the Mulkhov region working in the education department. Following the education sector, the army and paramilitary forces were identified as a source of livelihood diversification in the area. According to the participants from Saht and Warijun around 10 to 15 boys join the armed forces (such as the Police, Chitral Scouts, Frontier Corps, Bajor Scouts, and Pakistan army each year (AKRSP, October 2008). Moreover, in 1998 180 persons were employed in the military and the current strength of army men from Mulkhov is recorded to be 445, more than a 100% increase (KLSO 2008). According to the participants of focus group discussions in Zani, however, because of current threats to security agencies, the trend of joining the armed forces has decreased considerably (AKRSP, October 2008).

### Access to safety nets and government support systems

Safety nets play an important role in reducing the vulnerability of the poor to water-induced hazards. These safety nets include the Zakat Fund, Baitulmal, Benazir Income Support Program (BISP), and poverty reduction funds established by KLSO and others. The Zakat Fund provides amounts of between PKR 5,000-15,000 (ca 66-200 \$US) while, as per a recent initiative of the government, PKR 1,000 per month (ca 13 \$US) is being given to poor women by the BISP. Participants in focus group discussions in Taar informed us that, after being badly affected, poor households which have no other option apply for safety net funds established by the government (AKRSP, 2008). During 2008, a total of 34 people who had suffered because of water stress situations (16 men and 18 women) were given poverty reduction funds from KLSO. The limit of this fund is between 10,000 and 20,000 PKR (between 1,429 and 2,857 \$US) and most of the funds were used by women to purchase livestock and by men to migrate and look for work. These funds are given without interest for a period of one year (KLSO 2008). Commenting on the Zakat and Baitulmal Funds, the majority of participants in the study area appreciated the government's initiative to reduce the vulnerability of the poor, but they had reservations about the distribution of these funds

(AKRSP, October/November 2008). Participants at the report back workshop were of the opinion that qualifying for these funds is difficult and most distribution is politically influenced (AKRSP, May 2009). The communities were satisfied with the distribution of poverty reduction funds by KLSO, however, as they had been distributed through a poverty reduction committee consisting of village elders, 'gram' representatives, and representatives of the Zakat department (AKRSP, May 2009).

### Conflict management arrangements

In the Shishikoh valley when flash floods wash away cultivable or cultivated lands, the landholders and the neighbouring household heads come together and demarcate the boundaries of the land owners. Moreover, in conflict situations the village elders and local elected representatives settle the issue. This communal action reduces the chances of conflict among land owners over boundaries. In rare cases, conflicts arise when debris such as wood is left on the land after a flash flood. In such cases, the community again comes together to decide who will get the wood. In addition to this, the arbitration board of the Ismaili branch located in Madaklasht is another way of solving conflicts at local level. Village and women's organisations are also a mechanism for solving problems; and these organisations are very strong in Madaklasht. The role of village-based organisations comes into play when development interventions, such as construction of channels, roads, or water supplies, are undertaken. These interventions require additional land, clearing of trees, and sometimes removal of boundary walls of houses owned by the communities. Many cases have been solved by these village-based organisations when the development intervention has been halted by individuals whose physical assets were affected.

There are vertical and horizontal linkages between these village-based institutions. Keeping in mind the nature and scale of the issues, village and women's organisations come together and form cluster organisations. These village and women's organisations are members of local support organisations also. It is worth mentioning that formal institutions, such as Union Councils, have been providing financial support to village, women's, and local support organisations. Thus one way or another, these formal and informal institutions at village level support each other in solving conflicts.

In the Mulkhow region, despite the clear water user rights defined by the local irrigation system, the reason behind most conflicts is water, especially when the water shortage is severe and a farmer's turn comes at night. In case of conflict, it is handled usually by the 'mirzhoi', followed by the water distribution committee at 'gram' level. Should the conflict be between villages then the village elders resolve the issue. In short, the 'gram' and village elders try their best to solve the issue internally. In addition to the indigenous system of 'gram', community members have also formed village, women's, and cluster organisations and a local support organisation (an umbrella organisation of all the village, women's, and cluster organisations) which have been helpful in binding the communities together and resolving issues at local level (AKRSP, October 2008). The introduction of local government systems has also been beneficial for solving issues arising among the communities. Issues that are not solved within the villages are now being mediated by elected representatives before taking recourse to a court of law (AKRSP, May 2008).

### Communication strategies

#### Oral and written communication

In the study areas, there is no written communication strategy to transfer knowledge among themselves or to other generations. Knowledge regarding droughts and flash floods is being transferred to the next generation orally through discussions at home, in religious places, at meetings of social organisations, and during weddings or funerals where large numbers of people come together to participate in the event. In addition, knowledge about drought is also being transmitted through folk songs, poetry, proverbs, and stories (Box 5), while in areas affected by flash floods in the Shishikoh valley people only remember the drastic flood events which destroyed human lives, livestock, and other natural resources and infrastructure. In discussing climate variations, the communities are the main source of oral communication about natural disasters, and this is transferred to the next generation with the passage of time.

#### Box 5: Mulkhow drought in folklore

A folk song written by a famous poet, Ziyarat Khan Zerak (1880-1950) of Songhor, in the early 1940s portrays the drought situation of Mulkhow. This song was written when Ziyarat Khan Zerak refused to obey the order of the ruler of Chitral and was exiled to Mulkhow. During his banishment, he observed the drought situation in Mulkhow closely and wrote a song which reads as follows.

"Mulkhow ray watan zomto taiqa ei naqsha biray;  
Veogho zagha ghech asmani tamasha biray."

"A land named Mulkhow with great mountains and scenery;  
Drought stricken, waiting for God's blessings, it is a feast."

## Factors influencing local adaptation

### Enabling factors

#### Economic factors

The capacity to adapt to climate variations and extreme weather events depends on the economic condition of the communities in the study areas. Households that are economically strong with multiple sources of income are found to be more resilient to the adverse affects of climate variation. Migration from the area is the major adaptation strategy for the communities in both study areas and depends on the financial stability of the households. Families with a strong economic background succeed better than the poor households in avoiding maladaptation, i.e., selling off livestock, valuable assets, and land. Furthermore families with strong economic backgrounds have access to quality health services, educational institutions, and employment.

In the study areas, NGOs have been playing a key role in the socioeconomic development of the communities. NGOs provide technical and financial support through social organisations for social and physical infrastructure in the communities: the greater the involvement of NGOs in the study areas, the greater the adaptive capacities of the communities in response to the adverse effects of water stress or excess.

In some parts of Shishikoh (Madaklasht, Taar, and Birga villages), building of protective walls, strengthening river embankments, and facilitating afforestation have been facilitated by NGOs. It was observed that the communities of Mulkhov and the upstream population of Madaklasht who have benefited from the NGOs are more resilient to drought and flash floods compared to the rigid and conservative communities of Shishikoh and Mulkhov which are resistant to NGO involvement.

Keeping in mind the specific problem of water stress in Mulkhov, the NGOs have constructed water courses, water supply schemes, a siphon irrigation system, lift irrigation, and water reservoirs. The siphon irrigation system developed in Mulkhov has not only benefitted big landholders but also the poor and marginalised who previously had no or a limited share of water from the traditional water distribution method because they were living at the tail end of the system.

It is important to note here that educated youth play a key role in mobilising their communities and coordinating with the change agents or development organisations.

#### Sociocultural factors (social capital and local institutions)

Strong social networks and organisations play an important role in shaping adaptation strategies and reducing the vulnerability of local communities in the study area. The importance of social networks and organisations in facilitating adaptation could be observed in the upper regions of Shishikoh (i.e., Madaklasht and Kalas). The social networks and organisations of the people living upstream (Madaklasht) are quite effective in terms of service delivery and achievement of objectives. There are roads, two hydropower stations, irrigation channels, skill development centres, computer literacy centres, and a community-based school which were launched by the social organisations with the financial and technical support of NGOs. Moreover, to control land erosion and flash floods, the social organisations in Kalas and Madaklasht villages have been able to unite and organise the people to impose a ban on deforestation and grazing in the forests. These actions (forest conservation) of the social organisations have also encouraged the government forest department to cooperate with the local people by preventing forest harvesting and reducing the power of the timber mafia. In Madaklasht, the social organisations, in collaboration with NGOs and the government forest department, have also established plantations on barren land above the village.

The effectiveness of social networks is quite clear in the case of Mulkhov where these informal institutions have been able to facilitate adaptation through collective management of water resources, distributing water for irrigation, managing livestock, organising communal grazing, and securing external interventions to reinforce existing adaptation practices such as upgrading the traditional ponds to concrete structures and development and lining of irrigation channels, as well as establishing water reservoirs, water supply schemes, and siphon irrigation systems. Moreover, influencing the government to start work on the long awaited Atakh Canal at a cost of PKR 429 million (\$51,543) is also attributed to the lobbying of strong social networks and local institutions.

The long history of drought and flash floods in the area has equipped the local communities with the knowledge and skills to cope with the situation. These indigenous coping or adaptation mechanisms are mostly focused on reducing vulnerability

to drought through effective and efficient use of resources. Indigenous knowledge about constructing houses in areas prone to flash floods, water harvesting, local irrigation systems ('sorogh', 'gologh', 'mone', 'mirzhoi', and 'nirwalu', borrowing, and swapping of water), livestock management (borrowing of animals, 'zhawki', 'sotsiri', and 'pajal'), and migration to higher elevations within Mulkhow are among the examples of the indigenous knowledge and systems that are facilitating adaptation to drought. Moreover, predefined rights for use of water resources in Mulkhow are also a factor facilitating adaptation.

Adaptation to climate variability in the Mulkhow region is influenced by the clan or family system. The clans or families with more members and sound social and economic status are considered to be more resilient to the impacts of drought and have a greater adaptive capacity. Pooling and borrowing of water and livestock, facilitating migration, and helping each other to water fields are the common arrangements undertaken by clan members to minimise the impacts of water shortage.

Leaving one's native land is not a simple decision and selling one's land and house is considered to be a crime in the area. Thus migration is not an appropriate adaptation strategy. In addition, their hope that the Atakh Canal would be constructed was also among the factors that compelled the people to live and adapt with the drought situation in Mulkhow. The people have a long history of struggle over the construction of this channel and it is expected that with its completion there will be no shortage of water in the area, and the people can live prosperous lives.

### Constraining factors

**Poverty:** one of the main factors limiting the community's capacity to adapt to the adverse effects of water stress and excess. Extreme weather events would cause less damage to households if multiple livelihood options were available; e.g., agriculture, off-farm employment, and business. Extreme weather events often cause extensive damage and substantial losses among the poor. Poor households are particularly dependent on limited sources of income and are thus more vulnerable. The poor are generally not able to absorb the shocks generated by extreme events and may sell land, animals, or any other assets, and this will make them more vulnerable to future shocks.

**Isolation and poor geographical access:** geographic location and poor accessibility of Mulkhow in general and Shishikoh in particular are factors that hinder the adaptive capacities of the communities. The communication and irrigation infrastructure of Shishikoh is very vulnerable to flash floods, erosion, and avalanches, because the valley consists of narrow V-shaped terrain. Madaklasht village in Shishikoh and upper parts of Mulkhow lie at high altitudes where accessibility is difficult due to remoteness, flash floods, and heavy snowfall. Sometimes, however, isolation can give the impetus for change as, in Madaklasht, people have improved their lot because they have no alternatives and have to adapt.

**Scale of and frequency of hazards:** scale and frequency of flash floods and drought are also factors that limit the adaptive capacities of local people. This can be witnessed during the extreme drought period during which, despite having indigenous water distribution mechanisms, most farmers harvested their crops and fed them to animals. Moreover, the livestock sector suffers great losses. Sometimes the scale of devastation caused by flash floods is beyond rehabilitation due to heavy debris fall (heavy stones).

**Lack of livelihood diversification options:** the study areas are mainly dependent on natural resources. Due to limited economic activities, remoteness, and limited technical skills in the study areas options for diversifying livelihoods are minimal. Such situations weaken the adaptive capacities of the communities. At village level, there is no market for labour, business, and other sources of income generation. Therefore, the communities do not derive a benefit from their skills and other resources (land, forest, and mountains).

**Limited knowledge of services and products:** knowledge plays a key role in strengthening the adaptive capacities of the communities to hazards. Limited information as a result of remoteness is also among the factors that have limited the adaptive capacities of the poor and marginalised communities of Mulkhow and Shishikoh. For instance, microfinance is found to be a common coping and adaptation strategy among the residents in the study areas, but limited physical access, lack of information about products and services, and complex procedures are the main factors that prevent people from benefitting from this service. The residents of Mulkhow, for example, have no knowledge of improved agricultural inputs, especially drought resistant seeds. The community also lacks information about bank loans for agriculture which are insured by the federal government against drought and flash floods. The community is unaware also of the crop insurance programme offered by Khyber Bank.

Resistance against NGOs: NGOs play an active role in strengthening the adaptive capacities of the communities through different developments in infrastructure, power generation, livestock, agriculture, forestry, and capacity building for income generation—especially when the scale of intervention is beyond the coping capacities of the communities. Most of the communities in Shishikoh (Taar, Birga, Kashindel, and Kalas) and the communities of Nogram and Kushum in Mulkhow are resistant towards the NGOs working in the area. People think that NGO interventions will lead women away from religious orientation and have them working according to a foreign agenda. This resistance towards NGOs is a serious limitation to building adaptive capacities through social organisation, management resources, and diversification of livelihoods.

Poor social networks: poor social networks ('gram' and social organisations) may affect the adaptive capacities of communities if they fail to unite people for collective action. Communities in Madaklasht, through its strong social network, have reduced their vulnerabilities by diversifying their livelihoods, natural resource management, and conflict resolution through social networks. Communities with poor social networks, especially in Shishikoh, are most vulnerable to extreme events.

Conflict over natural resources: in Shishikoh, conflicts over the forest are common among different ethnic groups (the Khow, Gujar, Pathan, and Persian) and other owners of the forest. These conflicts have divided the communities of Shishikoh into rival groups and weakened social networks. The pending judicial trials of ownership conflicts have also added an economic burden on poor communities, adding to their vulnerability. The Gujar community have the advantage of living in the forests, have taken over the forests by force, and are being sued in many cases by the local communities. In Madaklasht, it was stated that some years back migrants from the neighbouring district of Dir, who had at that time recently settled in Shishikoh, occupied the local forest and the dispute has been in court for approximately ten years.

Policies and governance: failure to implement policies and poor governance in the study areas are other factors that limit the adaptive capacities of the people to extreme weather events. For instance, harvesting the forests on a large scale by the government through contractors in Shishikoh makes local residents more and more vulnerable to flash floods. According to the elected representatives of Shishikoh, allocation of the district's annual development budget to the union council is not based on need or severity of an issue but the total budget is rather distributed equally among twenty-four union councils. The distribution criterion allocates a small amount of the budget mostly 0.2 million PKR (\$1,800) for development interventions in the area, thus making it impossible to take concrete steps to check flash floods. Delay in the construction of Atakh Canal in Mulkhow and the Lavi Canal in Shishikoh; conflicts over forest ownership in Shishikoh; and extensive commercial harvesting are among the constraints related to policy and governance.

Sociocultural constraints: the traditional attitude of men towards women is another factor rendering women vulnerable to water-related hazards. Dependency on male relatives to get to safe places during flash floods in Shishikoh is one of the examples of how women suffer because of social customs. Limited education and lack of access to employment are other factors related to social customs which limit the adaptive capacities of women.

## Conclusion and way forward

### Analysis of the different adaptation (or maladaptation) strategies

#### Houses

Shifting houses from the plains to the slopes has helped reduce vulnerability to flash floods to a great extent. Nevertheless, this strategy may not be practical for everyone due to limited land holdings, high cost of construction, and emotional affiliation to the land. In addition, the sustainability of the practice of constructing more houses is dependent on land-use changes, especially in the light of extensive grazing and forest depletion. If the management of natural resources is not taken seriously by the communities of Shishikoh, the safe places may become vulnerable places in future.

#### Water-harvesting strategies

The water-harvesting structures in Mulkhow have been helpful for establishing efficient use of meagre water resources. These are innovative in the sense that they reduce the loss of water while helping to reduce the workload of farmers and their households. For instance, people with water turns at night store their shares and use them during the day. This reduces physical and mental stress. The strategy has been useful for female-headed households. In addition, the transformation

of these traditional structures into concrete water reservoirs has institutionalised the use of water in the area. As far as the effectiveness of the strategy is concerned, through this initiative the community has been able to make optimum use of scarce water resources for irrigation and develop a mechanism for equitable distribution of water among the community. Constructing these micro-structures, however, is not easy and requires financial and human resources. Through construction of such micro-structures on a large scale, the best use of scarce water resources can be ensured.

### Local irrigation systems

The traditional local irrigation system in Mulkhow has clearly-defined user rights and mechanisms to adapt to variations in water resources. No doubt this can be seen as the best system currently in use throughout Chitral. The system is very flexible to the changing climate and shortage of water. 'Sorogh' and 'gologh' are real examples of flexibility in the context of decreasing water resources; and people can pool their water and irrigate their lands. Moreover, under the system of allocating water as per the area of land, even land segmentation does not affect the traditional irrigation systems. These systems are also innovative in the sense that there are no written rules or byelaws, just a social code of conduct which each beneficiary follows from generation to generation. No doubt they are sustainable as witnessed by their long history. Sustainability depends, however, on strong social networks such as the 'gram' system.

### Efficient management of water resources

The indigenous system of 'mirzhoi' is an innovative mechanism for efficient management of water resources in Mulkhow. This system not only ensures the availability of water at the right time, but also improves the efficiency with which the meagre water resources are used through regular maintenance and repair by the person(s) designated at a minimal cost. In addition, the system also creates income generation for local people who work as 'mirzhoi' in different villages. The system of pooling resources for big maintenance and repair activities also creates a sense of participation, collective action, and ownership among the whole community; and this is a basis for sustainability of any initiative. Similarly, distribution of water through 'nirwalu' in some parts of Kushum ensures equitable distribution of water as per the water user rights.

### Local flood control and erosion protection system

Controlling floods through checking forest degradation is a recent initiative in Kalas, so it is too early to assess its impact on reducing vulnerabilities. In Madaklasht, however, the results have been very positive. The area protected from grazing and forest harvesting is regenerating with new trees and no flash floods have occurred since protective measures have been in place. The decision to protect this area was taken in consultation with the whole community of Madaklasht and the sustainability of the interventions heavily relies on the social organisation and ownership of this decision. So far the interventions have been very successful in reducing the vulnerability of communities to flash floods, and the community is planning to extend the forest area under protection.

### Borrowing water

Borrowing and swapping water for farming is a common strategy that has reduced the vulnerability of farming households. The strategy has worked well for all; especially for the poor and the farmers who are located at the end of the water distribution system. The system commenced with borrowing and swapping and has now transformed into a commercial practice because of acute water shortages in the region, especially in Nogram and Saht where farmers purchase water for in-kind exchange, services, or cash. This practice is increasing over time. The communities have accepted this new mechanism as they do not have any other option except to trade water. This strategy is dependent on personal relations, availability of water, and mutual trust.

### Livestock management and diversification

After agriculture, animal husbandry is the next important sector that faces devastation in extreme weather events. Lending or borrowing of animals is an internal arrangement made by the women during drought or flash floods in the study areas: temporary and long-term lending and borrowing are strategies that have been successful in reducing the vulnerability of the community. Similarly, borrowing, weeding others' crop lands, and drying fodder also help improve women's adaptive capacities in poor communities. 'Sotsiri', 'pajal', and livestock diversification in Mulkhow have also helped prevent the loss of livestock, and these systems are considered to be sustainable.

### Crop management and diversification

Community crop management and diversification practices are not yet satisfactory, but they have reduced vulnerability to some extent. The crop management and diversification techniques used by the farmers are mostly indigenous and based on trial and error, thus sustainability of these practices remains unknown. Farmers bring seeds from Chitral and, if these seeds are successful, they purchase more. Using fertilizers, planting fruit and other trees, cultivating pulses instead of maize, experimenting with different seeds, and the traditional method of 'somain' (contract farming on a 50/50 profit and loss basis) are among the practices used to diversify cropping patterns and reduce vulnerability. Not all local people have been able to get full benefit from crop management and diversification practices, however. This is mainly because of primitive agricultural practices and lack of information about improved agricultural inputs. The capacities of the communities need to be promoted in this sector, and this should be recommended to policy makers.

### Change in food consumption patterns

Although change in food consumption patterns is recognised as a strategy to cope with food scarcity, it cannot be seen to be sustainable as it could have negative effects on the health of the population. Likewise, buying food items of poor quality and women eating less could increase vulnerability in the long run. Therefore, food security issues need to be addressed by policy makers.

### Micro-credit

Micro-credit has a great role to play in decreasing the vulnerability of poor communities by providing them with alternative sources of cash income during and after extreme weather events. Micro-credit arrangements through village shopkeepers are helpful for minimising food security issues among poor households, especially in the absence of men in the household. Micro-finance arrangements through the banks help as people can invest in the agriculture and livestock sectors and also migrate if need be. Accessing and acquiring micro-credit from village shopkeepers is simple and mostly done on the basis of mutual trust and social collateral. The complexity of procedures and high interest rates (18 to 22% normally) of the banks, on the other hand, are factors that hinder the adaptive capacity of people with limited outreach. This very important strategy can be of great help in improving economic and non-economic assets; but policy measures are needed to reduce the interest rates and remove the complexity of procedures.

### Migration

Seasonal migration has helped considerably to supplement incomes and reduce the vulnerability of the communities in both study areas. The percentage of people migrating is as high as 64% in Shishikoh and 44% in the Mulkhow area. This shows that a large proportion of households are engaged in this adaptation strategy. This unique mechanism of coping with drought through intra-rural migration has helped the communities to secure their livelihood assets to a great extent. People find it easier to migrate to houses constructed at higher elevations. Until now this innovative way of dealing with drought is considered to be the best adaptation strategy. There are issues, however, such as dropping out of school, lack of health facilities, and increased workloads for women. Intra-rural migration in Mulkhow is an efficient way of dealing with the issues of drought and it needs to be supported by establishing education and health facilities at higher elevations.

### Social networks

Informal social structures within a society play a key role in improving the adaptive capacity and reducing the vulnerability of a community, especially for its poor and marginalised segments. Most of the local adaptation strategies, such as traditional irrigation systems, pooling of resources, livestock management, water borrowing and swapping, and migration are based on strong social networks. With the passage of time, these networks have evolved into formal structures in the form of village and women's organisations, and, most recently, local support organisations which have been very successful in securing finances from different development actors to strengthen adaptation strategies. No doubt, without strong social networks, the sustainability of interventions is always at stake. Commercialisation, migration, and political and ethnic affiliations are perceived to be threats to traditional social networks, as these factors can result in eroding them. For example, during local body elections, political affiliations have resulted in disputes among 'gram' members and affected the unity of the community. Such factors, however, facilitate the development of new social networks also. Networks need to be strengthened by improving their capacities and involving them in development interventions.

### Diversification of livelihoods

Diversification of livelihoods is an important strategy that can reduce the vulnerability of communities to extreme weather events. Seasonal migration to other areas does take place from the study areas, but to a limited extent only because of the lack of skills and limited opportunities for alternative employment. So far, education and the armed forces have been the main sectors providing alternative employment for the people of Mulkhow. Seasonal migration for work as labourers also takes place from both areas, but diversification may not be possible for most of the population.

Similarly, in Shishikoh, the trade in pine nuts is a diversification option which provides a limited source of income. Moreover, being a seasonal activity, it will not be sustainable unless a proper value chain is established and activities implemented accordingly. Diversification of livelihoods through development interventions in capacity building, facilitating off-farm income-generating activities, and creating job opportunities through big development interventions should be promoted by decision makers (both government and NGOs) to reduce the vulnerability of communities in the study areas.

### Access to safety nets and government support systems

The safety nets established by the government and KLSO have been successful in reducing the vulnerability of the communities. The outreach of these interventions, however, is limited by the paucity of financial resources. Access to the government support system developed for the poor is marred by favouritism and political affiliation. If government support systems are used in an impartial and transparent manner they could reduce vulnerability of the poor and marginalised people of the study areas to a considerable extent.

### Conflict management arrangements

Conflict management arrangements in the Mulkhow region are strong enough to reduce vulnerability because they are based on predefined user rights and strong social structures. Village, women's, and cluster organisations and the newly formed local support organisations have also been playing a role in solving conflicts at local level. Although in Shishikoh there are no village or women's organisations, the communities prefer to solve conflicts at local level through mutual consensus. Moreover, the establishment of union councils in 2002 has strengthened the conflict management arrangements in the study areas. The decisions taken with the consensus of community elders and /or 'gram' members are binding on all parties, thus only in rare cases do conflicts reach a court of law. (It should be mentioned, however, that judgement on some resource conflicts in decades due to reasons unknown.) Arrangements for Shishikoh have been pending in court for conflict management in the study areas, especially in Mulkhow, are sustainable as they ensure participation of the communities and are based on mutual consensus. There is a need to strengthen these local institutions and minimise external interference that could erode this very important social capital. Table 13 ranks the different adaptation options.

### Maladaptive practices

Besides adaptation strategies, maladaptations were also observed; they are presented below.

#### Construction of water-harvesting structures above houses

During the field visits to Mulkhow, it was observed that some of the traditional water-harvesting ponds had been transformed into concrete structures and built above the houses. This increases the vulnerability of households if the land is destabilised or if the structures burst. Several of the traditional water-harvesting ponds were found above settlements also. Responding to a query about this malpractice, a participant at the focus group discussion in Warijun said that firstly the communities try to install the facility close to their houses to reduce labour. Secondly, the fields are located near the settlements, and therefore the installation of structures near households limits loss of water from the distribution network. Thirdly, the land in Mulkhow is considered unstable and there is a problem of landslides in the area; and, finally, there is a scarcity of land suitable for construction of water-harvesting structures. Similar views were also recorded during focus group discussions in Saht, Gaht, and Nogram (AKRSP, October 2008).

#### Cutting down of forests

Due to limited development interventions and options for diversification of livelihoods, the communities are heavily reliant on the forests for both household fuelwood supplies and cash. The communities realise these are only short-term benefits and that in the long run they are making themselves vulnerable. They justify the practices nevertheless by stating: "What else should we do? We don't have any other options."

**Table 13: Identification of possible adaptation options and ranking**

Possible local adaptation/ options	Who benefits from this option?	What activities are necessary?	Investment required?	Potential adverse consequences?	Etc.
Strengthen of local irrigation and water harvesting structures	Smallholder farmers	Building lined channels and concrete water reservoirs. Participation of communities	Significant	Reduced vegetation along the channels, environmental impacts on ecosystem	
Crop management and diversification	Smallholder farmers	Capacity building in improved farming, introduction of improved/ drought- resistant varieties,	Cost of crop and pest reduction trials	Use of fertilizer may negatively impact the environment.	
Livelihood diversification	Men/women	Off-farm income generation Market access	Cost of basic services and skill training and education	Increased work burden on female population at home	
Micro-finance	Farmers Females Poor	Improve access to Micro-finance banks Reduction in interest rate	Self-financing	Indebtedness of the communities	
Conservation of natural resources	Whole community	Formulation and effective implementation of policies Ensuring participation of committees. Afforestation	Medium cost	Chances of conflict and litigation	
Protective works/ checkdams	Whole community	Construction of protective walls, checkdams and embankments	High cost	Water diversion	
Social networks	Whole community	Formation of community organisation at local level and ensuring coordination, especially in areas that are not covered.	Low cost	Conflicts of interest/ disunity	
Education	Whole community	Construction of schools at village level and colleges at 'tehsil' level	Medium cost	Nil	
Shifting to safe places	Whole community	Settlement planning,	Medium cost	Land disputes,	
Access to safety nets	Poor Women	Influencing policy makers to raise the amount of funds in the safety nets Ensure transparency Community involvement in identification and selection of the poor	Low cost	Exploitation/ political influence	
Migration	Vulnerable community	Government initiatives for immigration		Lack of active labour force, brain drain, weakening social bonds	

### Existing gaps and further knowledge needs

Data and research studies about the climatic variations in the study areas are almost non-existent, and this meant the study team had to rely on the observations of inhabitants from the areas. This situation implies that we are not sure whether the variations are part of a weather cycle or are results of changing climatic conditions as a whole.

Socioeconomic data of the specific study areas were also lacking; and these would have been an important contribution to this study. Through socioeconomic data, the team would have been able to make a better assessment of the vulnerability and resilience of the communities.

Even government departments do not have sufficient, reliable records of the hazards that have occurred and their implications for the local communities; and such information would have provided the study team with reliable data regarding the impacts of too much and too little water in the region.

Secondary data on 'adaptation to climate-induced water stresses and hazards' are also lacking, and the study team had to rely wholly on primary data: this situation meant that a reviewing of the literature was difficult.

Demographic data showing the migration trends are also lacking, and these could have helped the study team to assess the importance of this particular adaptation strategy: for this also, only primary data were used.

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## Acronyms and abbreviations

AKF	Aga Khan Foundation
AKRSP	Aga Khan Rural Support Program
BHU	Basic Health Unit
BISP	Benazir Income Support Program
CADP	Chitral Area Development Program
CCS	Chitral Conservation Strategy
CICERO	Centre for International Climate and Environmental Research
CIDO	Chitral Innovative Development Organisation
FGD	focus group discussion
HICIA	Himalayan Climate Change Impact and Adaptation Assessment
HKH	Hindu Kush Karakoram and Himalayas
ICIMOD	International Centre for Integrated Mountain Development
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
ISET	Institute of Social and Environmental Transition
IUCN	International Union for Conservation of Nature
KLSO	Khow Local Support Organisation
LSO	Local Support Organisation
NWFP	North West Frontier Province
PKR	Pakistani Rupee
PPAF	Pakistan Poverty Alleviation Fund
SESNAAC	Socioeconomic Survey of Northern Areas and Chitral
SIDA	Swedish International Development Agency
SRSP	Sarhad Rural Support Programme
UC	Union Council
UNEP	United Nations Environment Programme
WWF	World Wide Fund for Nature

## Local terms

Azan	call for prayers
Chilgoza	pine tree
Chat	water reservoir
Dangerik	Dardic language
Dastur khor	one who is granted the right of use by the mehtar
Eid gah	place where people offer Eid prayers
Gologh	prescribed quantity of water or pooling of water by farmers
Gram	indigenous social network or group of households dwelling in the same spot with the same interests
Gujar	non-local tribe mostly of nomadic herdsmen
Ismailis	sect of Muslims
Kacha	unmetalled
Kareezi	black and white patches (of snow over the hills)
Khow	local indigenous tribe
Khowar	language of the Khow people

Mehtar	former ruler of Chitral
Miras khor	owners of inherited property
Mirzhoi	a person who keeps a check on water distribution networks
Mone	service by random turn which is compulsory and cannot be skipped by any means
Nirwalu	traditional water distribution container with holes in the centre and made of wood or rock
Pajal	herder
Pathans	non-local, Pushtu-speaking tribe
Shu	traditional woollen fabric
Somain	contract farming on 50/50 profit and loss basis
Sorogh	water distribution turn
Sotsiri	term for herding common livestock by turn
Sunni	sect of Islam
Tehsil nazim	an elected local government representative
Tehsil	administrative division of a district
Zhawki	term for lending young animals on contract



**Annex**

## Annex: **Data collection checklist for focus group discussions**

### **Livelihoods**

**What are the main livelihood options available in the area? Please rank.**

Agriculture

Livestock

Forests

Jobs

Business

Labour

### **Water use pattern**

**How is water used?**

Domestic/Household (estimated percentage of total water consumption) ( )% to 100%)

Agricultural (estimated percentage of total water consumption) ( )% to 100%)

Industrial (Estimated percentage of total water consumption) ( )% to 100%

Energy (Estimated percentage of total water consumption) ( )% to 100%

Who is responsible for collecting water for household consumption?

Who is responsible for watering the fields?

What is the system of procurement of water for industrial and energy use?

### **Water availability**

**What is the situation of water availability in the area?**

Increasing

Decreasing

**What are the main reasons for increase or decrease of water availability?**

### **Vulnerability and Adaptive Capacity**

**Who is vulnerable and how?**

**Who has more adaptive capacity and how?**

Impact on household

### **Water Scarcity**

Availability or lack of water

Increased or decreased water consumption by humans

Labour involved in fetching water (especially women)

Quality of water

More health-related expenditure

### **Water Hazards**

Damage to buildings

Land erosion

Damage to standing crops

Damage to fodder

Damage to communication and water infrastructure

### **What Have Been the Major Impacts on Livelihoods?**

Limited options for income generation in the agricultural sector

Loss of cultivable land

Reduced crop productivity

Crop failure

Reduced crop quality

Increase in pests and diseases

Delay in field operations

Increased mortality of livestock

Less fodder for livestock

Migration within and outside the district for work

Food security

Food prices

Transportation and/or travel prices

### **Adaptation Strategies**

#### **Infrastructure related**

Planning while constructing houses

Location of settlements

Location of key institutions (schools, hospitals, mosques, and so on)

Planning while constructing roads

Planning while constructing other infrastructure (water supply, irrigation channels, and so on)

#### **Agriculture**

Enhanced water storage (water reservoirs, check dams, and others )

Local irrigation systems

Construction and lining of water courses and irrigation channels

Use of improved irrigation techniques (sprinkler, drip, and so on)

Construction of protective works to avoid flood damage

Restoration of vegetative cover (afforestation)

Crop diversification, crop rotation

Use of improved or drought-resistant seed varieties

Improved crop management practices (timely cultivation, timely supply of inputs, and so on)

Land-use planning

#### **Livestock**

Selling animals

Searching for or developing new pastures

Discovering alternative fodders

### **Economic Strategies**

Development and protection of roads to and from the market place

Development and protection of telecommunication infrastructure

Are there any community plans for livelihood diversification?

Are there any community plans to ensure food security in the short, medium, and long term?

### **Financial Strategies**

#### **What are the financial measures planned or expected to enhance resilience among the communities?**

House insurance

Crop insurance

Easy and inexpensive life insurance for droughts and hazards

Availability of loans for agricultural land development

### **Sociocultural Strategies**

Degree of social organisation or mobilisation? (Village, WOs, and LSOs )

Degree of awareness regarding climate-induced water stresses and hazards?

Are there any disputes or litigations over water distribution in water-stressed areas and after eroded land is rehabilitated after water erosion ( and boundaries are not clearly demarcated)?

Is there any discussion about climate-induced water stresses and hazards in the society?

If so, what platform is being used? \_\_\_\_\_

### **Institutional Strategies**

Institutions and organisations working in the area in the field of water stresses and hazards

Communities' own organisations (village, women's organisations [WOs], local support organisations [LSOs], and other organisations)

Government institutions

NGOs

International organisations (UN, ICIMOD, AKF, and so on)

### **Communication Strategies**

How is knowledge regarding climate-induced water stress and flash floods transferred to the next generation?

Traditional early warning systems

Modern early warning systems

### **Maladaptive Practices**

#### **Are there any water-related projects in the area which failed to meet their objectives?**

Construction of houses, schools, health-care institutions, and so on in vulnerable places

Storage (water reservoirs, check dams, and so on)

Construction and lining of water courses or irrigation channels

Construction of protective works to avoid flood damage

Restoration of vegetative cover (afforestation)



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## Production team

Mats Eriksson (Team leader)  
Julie Dekens (Project coordinator)  
Vijay Khadgi (Project assistant)  
Greta Pennington Rana (Consultant editor)  
A Beatrice Murray (Senior editor)  
Punam Pradhan (Layout and design)  
Asha Kaji Thaku (Editorial assistance)

**Photos:** Field team

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**International Centre for Integrated Mountain Development**

GPO Box 3226, Kathmandu, Khumaltar, Lalitpur, Nepal

**Tel** +977-1-5003222 **email** [info@icimod.org](mailto:info@icimod.org) [www.icimod.org](http://www.icimod.org)