Vulnerability and resilience in rural North-West Pakistan[1]

Karin Astrid Siegmann and Bernd Steimann[2]

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Abstract

Pakistan's northern-most province, the North-West Frontier Province (NWFP), has a very recent history of vulnerability to various types of disasters. The paper's objective is to explore factors of vulnerability and resilience for rural communities in NWFP. The analysis is based on the conceptual framework of the Sustainable Livelihoods Approach. The following questions are asked:

1. Which factors make households and individuals vulnerable or resilient to different types of crises?
2. Which gender differences characterise the communities' experience of crises as well as their resilience?
3. Which livelihood strategies are more robust to crises than others?

The paper is based on a survey that took place from May-August 2004. Data on the communities' livelihoods have been generated in three selected villages in highland, foothills, and lowland regions of NWFP.

The investigation shows that households are particularly prone to human and financial capital-related crises. Such vulnerability is most pronounced in the highland village. At the individual level, women's health status as a proxy for vulnerability is considerably poorer than men's. Here, the more conservative lowland village shows the largest gender gap in health status. Regarding factors of vulnerability, the results highlight the close association between households' poverty and vulnerability. Diversification appears to be a buffer against human capital-related crises. The investment in social capital seems to be an important coping strategy for various types of crises. As determinants of individual health, demographic factors appear to be more relevant than asset status. Overall, both on the household and on the individual level, no systematic links between the households' asset status and their vulnerability and resilience could be established. It is stressed that poverty alleviation means reduction of vulnerability of communities in rural NWFP. At the same time, the establishment of and access to organisations that address people's needs and interests appears to crucial to strengthen resilience. Taking loans emerged as an important coping strategy after a crisis has occurred. Thus, improving rural communities' access to loans in an environment where formal financial institutions are almost non-existent is another policy lesson to be learned. Finally, distinct gender dimensions are hidden in these findings. Women's experience of poverty is more severe, their access to community-based organisations (CBOs) and finance is restricted. Improving their access to such social and financial resources is thus a priority for strengthening resilience in rural NWFP.

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[2] Contact: Karin Astrid Siegmann, Sustainable Development Policy Institute (SDPI), PO Box 2342, Islamabad/Pakistan. E-mail: Karin@sdpi.org.

1. Introduction

Pakistan's northern-most province, the North-West Frontier Province (NWFP), has a very recent history of vulnerability to natural disasters. According to the provincial relief department, at least 390 people were killed in avalanches, landslides, and flooding, while scores more were injured after heavy rains and snow in January and February 2005. In addition, over 26,000 houses have reportedly collapsed and more than 76,000 been partially damaged in the province's 24 districts (UNOCHA – IRIN, 2005a). Most affected were rural areas of the province. The heavy snowfalls during winter combined with unprecedented high temperatures in June have caused high floods along the Kabul, Swat, and Chitral Rivers. According to a United Nations report, they have affected at least 114 villages with over 1,100 houses destroyed and more than 1,800 damaged (UNOCHA – IRIN, 2005b).

Crises are not only related to natural disasters. They may also be health-related, social, economic, and political. They have in common that they cause or intensify disruptions in society. NWFP has had its share of this bundle of crises, from the absorption of millions of Afghan refugees, earthquakes to very poor health indicators in national comparison.
The dominant perspective on such disasters addresses them as some kind of disturbance in the 'normal' path of development. They are viewed as isolated events that require emergency responses. An alternative perspective looks at disasters as unresolved problems of development. Relationships and structures in society determine why certain sectors are more vulnerable to crises than others. Therefore, once links between them and conditions in society during normal times are understood, there is greater room for intervention strategies to focus on mitigation (Fernando and Fernando, 1997).

Therefore, this paper's objective is to explore factors of vulnerability and resilience for rural communities in Pakistan's NWFP. More specifically, it is asked:

1. Which factors make households and individuals vulnerable or resilient to different types of crises?

Previous (Siegmann and Sadaf, 2004) and ongoing research (Sadaf, forthcoming) emphasise differential access to livelihood assets for women and men in the study area, with women commonly being disadvantaged regarding their access to financial and human assets. Amongst others, this paper investigates whether such gender gaps in access to livelihood assets influence their vulnerability and resilience to certain types of crises. The second question therefore is:

2. Which gender differences characterise the communities' experience of crises as well as their resilience?

A third question is:

3. Which livelihood strategies are more robust to crises than others?

Steimann (2005) identified several types of livelihood strategies, based on the spatial range in which a household generates its income. This paper investigates which of these strategy types appear more robust to particular crises than others.

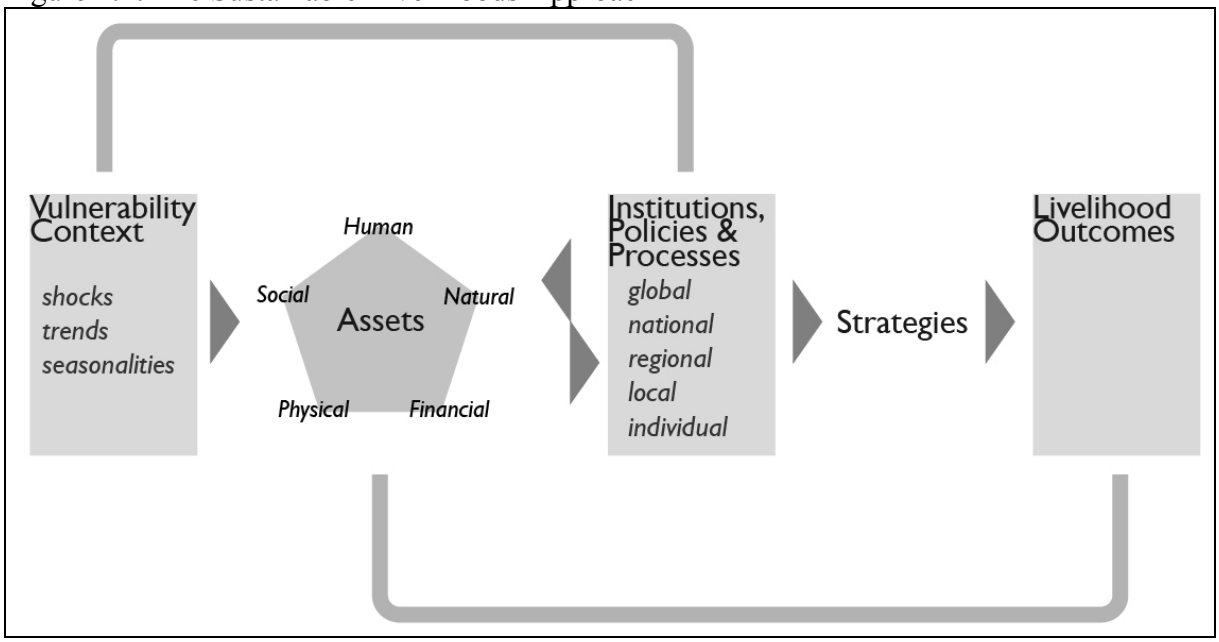
The article is structured as follows. The next section introduces the Sustainable Livelihoods Approach (SLA) as the conceptual framework of this analysis. The SLA considers vulnerability as an integral part of the environment in which livelihoods are shaped. The assets status of households and individuals are seen as crucial determinants of vulnerability and resilience. Section three reviews previous research regarding factors influencing households' and individuals' vulnerability. Poverty and livelihood diversification are identified as close associates of vulnerability and resilience, respectively. Gender differences in access to livelihood resources are emphasised as a reason for women's greater

vulnerability. The fourth section presents the methodological approach of this investigation. It introduces the three study locations in rural NWFP, the data generated there in 2004, as well as the tools for the data analysis. In section five, the results of the data analysis are presented. Whereas hypotheses about the role of diversification and – in particular - poverty are supported by the data analysis, no systematic links between the asset status and vulnerability could be established. However, at the household level, the role of social capital as a coping strategy became apparent. They are summarised and discussed in the last section, particularly in view of developing policy conclusions from the investigation. Poverty reduction and improving communities', and in particular women's, access to social and financial resources emerge as important strategies to strengthen their resilience.

2. Vulnerability in the Sustainable Livelihoods Approach

The Sustainable Livelihoods Approach (SLA) serves as analytical framework for this paper (DfID, 1999/2000; Chambers and Conway, 1991). It depicts stakeholders as operating in a context of vulnerability, within which they have access to certain assets. They include physical, financial, and natural assets alongside with human and social capital. These gain their meaning and value through the prevailing social, institutional, and organizational environment. This context - the 'transforming structures and processes' (Carney et al., 1999) - decisively influences the livelihood assets and strategies that are open to people in pursuit of their self-defined beneficial livelihood outcomes (Kollmair and Gamper, 2002).

Figure 2.1: The Sustainable Livelihoods Approach



Source: Steimann (2004)

The ability of a livelihood to be able to cope with and recover from stresses and shocks is central to the definition of sustainable livelihoods. Stress is understood as pressures which are continuous and cumulative, predictable and distressing, e.g. seasonal shortages, rising populations, declining resources. A shock has a sudden, unpredictable, and traumatic impact, e.g. fires, floods and epidemics (Chambers and Conway, 1991). Resilience refers to the ability of an ecological or livelihood system to 'bounce back' from stress or shocks. Those who are unable to cope or adapt are inevitably vulnerable and unlikely to achieve sustainable livelihoods (Scoones, 1998). Vulnerability has external and internal aspects. External are the

stresses and shocks to which human units are subject; internal is the capacity to cope (Chambers and Conway, 1991).
In addition, vulnerability can be interpreted both in a narrow and wider sense (Ellis, 2002). Its narrow interpretation refers to the micro-level of the household or individuals. At this level, for a given risk profile, it is the varying asset status of households or individuals, that determines how vulnerable they are to shocks. This is an assumption similar to the 'access model' outlined above. It is the basis for the working hypothesis of this exploration, namely that vulnerability is negatively associated with the household's or individual's asset status. Vulnerability potentially has a broader application. People's livelihood chances are not just determined by local level events, but also by the abovementioned 'transforming structures and processes' at national, regional, and sometimes even global levels. Whereas the data sources analysed allow in-depth analysis of the relation between livelihood assets and vulnerability, they provide less information about structural factors. Thus, although likely to be relevant, they mainly remain outside the focus of this investigation.

3. Determinants of vulnerability and resilience

Whereas the SLA hypothesises that access to livelihoods assets reduces vulnerability, no specific predictions are made regarding which entitlements are of special importance in particular crises. One obvious entry point in determining vulnerability is its relationship with poverty. Vulnerability is not identical with poverty but the poor tend to be the most vulnerable (Twigg, 2001). Poor people often live and work in environments that expose them to greater risk of illness and they have less access to health care. Their health risks are strongly connected to the availability of food, which is affected by almost all the risks the poor face. Similarly, market-related risks are commonly greater for the poor. It is well-known that general price rises usually hit poorer household harder than those well-off. In economic downturns, the first workers to be laid off are those with low skills disproportionately affecting women and young workers. But also, whereas nature-related uncertainties, plant diseases, and pests create harvest risk for all farmers, technologies for reducing such threats are less available for poorer farmers (World Bank, 2000).

To combine farm- and non-farm activities is commonly seen as a strategy to reduce vulnerability and increase resilience. Ellis (2002) observes for the South African context that the most successful households construct a non-farm component of their livelihood portfolio that comprises activities and enterprises that are not directly related to agriculture. This provides them with the resources to improve their farm productivity and strengthen their livelihood further. It also reduces vulnerability because it creates diverse income streams that are less prone to crisis than reliance on food crop agriculture in face of natural shocks.
However, there are also dangers involved in market-based livelihood strategies. For example, fluctuations in food prices can make those households producing for the market vulnerable. Those who meet their food needs through subsistence agriculture are less at risk than households that have to buy all their food (World Bank, 2000).

A related factor influencing vulnerability or resilience is the infrastructure available. For example, remote rural populations have fewer options to diversify their sources of livelihoods. They face high transport costs, and poor information is available to them (Ellis, 2002). Halvorson (2003) notes that one important factor affecting health outcomes in the Gilgit district of Pakistan has been that the subsistence economies of previously isolated households are being transformed and are being rapidly integrated into the global economy and international development networks.

Feminist scholarship draws particular attention to constructions of gender in the analysis of vulnerability (Halvorson, 2003; Fernando and Fernando, 1997). This can be illustrated by the factors of vulnerability to natural disasters or health emergencies listed by rural women in Gujarat/India. In addition to placing the causes of their vulnerability around the factors of resource base, and income, they further added that their situation was caused as well as compounded by – amongst others - their lack of education, lack of awareness of various relief schemes, rigidities of governmental relief schemes, incapability of raising and absorbing loans from the formal sector (Bhatt, 1997). In these human, social, and financial resources, access is highly gendered with women at disadvantage.

For the study area, it was effectively demonstrated that the distribution of livelihood assets is influenced by constructions of gender. Gender differences in access to human assets, such as health and education were found to be largest in areas where prevailing gender norms are most restrictive regarding female mobility (Siegmann and Sadaf, 2004). Halvorson (2003) equates such limited access to livelihood resources to greater female vulnerability. Her study on gendered causes of children's vulnerability in the district of Gilgit in Northern Pakistan stresses that the system of female seclusion, '*purdah*', defines the parameters of women's behaviour and access to geographical sites and spaces that are necessary for the achievement of many responsibilities related to child health (Halvorson, 2003).
She emphasises that just as livelihoods are highly gendered, so are the activities of women and men in the process of coping. Where female seclusion is central to the household division of labour, women's coping options are particularly constrained. For example, Sadaf (forthcoming) found that constrained female mobility is a reason for women's poorer access to health care facilities. More generally, Masika and Joekes (1996) identify a number of gender biases in social as well as legal norms affecting women's coping strategies. Restrictions to own land as well as other assets, to access formal loans as well as norms of female seclusion, women's lower bargaining power in the household, and their responsibility for the care for children are just some of the examples, that disadvantage women's coping options as compared to men's.

4. Methodology

4.1 The survey[3]

The data set analysed for this paper was compiled from the Sustainable Livelihoods Survey 2004 carried out in three villages in the Mansehra and Mardan Districts, NWFP. Amongst others, the survey was designed to enhance the understanding of similarities and differences between highlands and lowlands.

The main criterion for village selection therefore was the respective location in the highland-lowland context. The survey's first phase consisted of a household listing. Information collected from key informants included the number of household members by sex and age, first and secondary source of cash income, and access to land. Based on the so developed sampling frame, 80 individuals (age 15 years and above) were sampled randomly in each village. This sampling procedure allowed avoiding an approach focused on the respective household head, thus guaranteeing representativeness on the individual level, and unbiased representation of both women and men. 236 interviews were conducted during the second phase of the survey.

[3] This section is based on Steimann (2005).

The questionnaire was composed of eight sections. They include: (1) Household identification and family roster (demographic information), (2) physical assets (house type, water and energy supply, transports), (3) human assets (education, health status), (4) natural assets (access to and use of land and forests, livestock), (5) financial assets (cash income and expenditure, savings, loans), (6) social assets (participation in formal institutions, information through media, political participation), (7) vulnerability context (crises, shocks, long-term changes, main activities during last week), (8) institutions and processes (contact to institutions outside village, decision-making power within household). The focus on livelihood assets and vulnerability makes the dataset particularly well-suited for the present analysis.

4.2 The villages[4]

Village A is located at an average altitude of 2000 m above sea level (asl), around six kilometres off the next main road. A four-wheel drive takes one hour to the next *bazaar*, one way in a shared jeep costed Rs. 40 per head. Electricity is available to most households, yet power breaks are occurring frequently. There are three primary schools and one high school for boys, whereas co-education for boys and girls is practised by one primary school only. In addition, there are several mosque schools. The village's topography is rather steep, so that agriculture is very much limited. The climate is moderate with cold winters (November to February) and warm summers with a peak of precipitation in July and August. Most households are farming, mostly owning the land they cultivate. All farm households cultivate maize, and, in a few cases, winter wheat. Most fields are rain-fed (*barani*), while a few are irrigated from a nearby riverine. Fruit trees are available in abundance, such as walnut, apricot, pear, and apple.

Village B is located at an average altitude of 1000 m asl. The local *bazaar*, which offers various groceries, a bakery, a car repair shop, a pharmacy, and more, is crossed by a metalled road linking two regional *bazaars*, each at a distance of about 40 minutes by minibus. One way was Rs. 10 per head. Electricity is available to most households. There is each one primary school for boys and girls, and one high school for boys. In addition, a private English medium school for boys and girls and several mosque schools exist. The topography is hilly with moderate slopes. Due to a thin soil layer, land suitable for agriculture is very limited. The climate is moderate with cool winters and hot summers and maximum rainfalls in June/July. Land tenure is not clarified in many cases. Most farming households cultivate maize and wheat. As water supply is very scarce, most fields are *barani*.

Village C is located at an altitude of 350 m asl, just off a metalled main road leading to a regional centre at four kilometres distance. Frequent public transport takes fifteen minutes and was Rs. 10 per head and way in summer 2004. Apart from a few small shops, a local *bazaar* does not exist. Electricity is available to most households. There is one primary school practising joint education, plus one boys' high school and several mosque schools. The land is very fertile and fully irrigated. The climate is very hot and humid in summer, and moderate in winter. Precipitation is scarce, as monsoon results in extreme humidity rather than rainfalls. About 60% of all households are farming, mostly as pure tenants, as the land is distributed among a few absentee landlords. A majority cultivates three crops per year, mostly maize, wheat, and sugarcane, whereas the latter is often sold to a large, nearby sugarmill. Unlike villages A and B, located in the Hazara region, village C is a completely *Pukhtun*[5] village, which means more restrictions regarding women's movements (Siegmann and Sadaf, 2004).

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4 This section is based on Steimann (2005).

5 The *Pukhtuns* are the largest ethno-linguistic group of people living in Pakistan's NWFP Province.

4.3 The analysis

In order to answer the research questions, the following steps were undertaken in the data analysis. Firstly, univariate analysis was used to identify the types of crises most relevant to the study locations. They approximate revealed vulnerability at the household and individual level. Secondly, the crises experienced are associated with the households' and individuals' asset status in bivariate analysis, respectively. Proxies for different types of livelihood assets were identified from the given dataset in order to test the hypothesis that vulnerability and resilience are dependent on the household's and individual's asset status (Table A1 in the appendix). Bivariate correlations of the different types of crises and the respective asset endowment were checked as a first approximation of the link between asset endowment and vulnerability of households and individuals. In a third step, determinants of crises are identified in regression analysis. Logistic regression is applied to make out factors influencing the (dichotomous) occurrence of the most frequent types of crises at the household level as well as the incidence of illness at the level of the individual. Ordinary least squares (OLS) regression is applied additionally in order to single out determinants of the number of crises experienced. Finally, the so identified factors of vulnerability and resilience are correlated with different livelihood strategies pursued by households in the study locations to assess their robustness to crises.

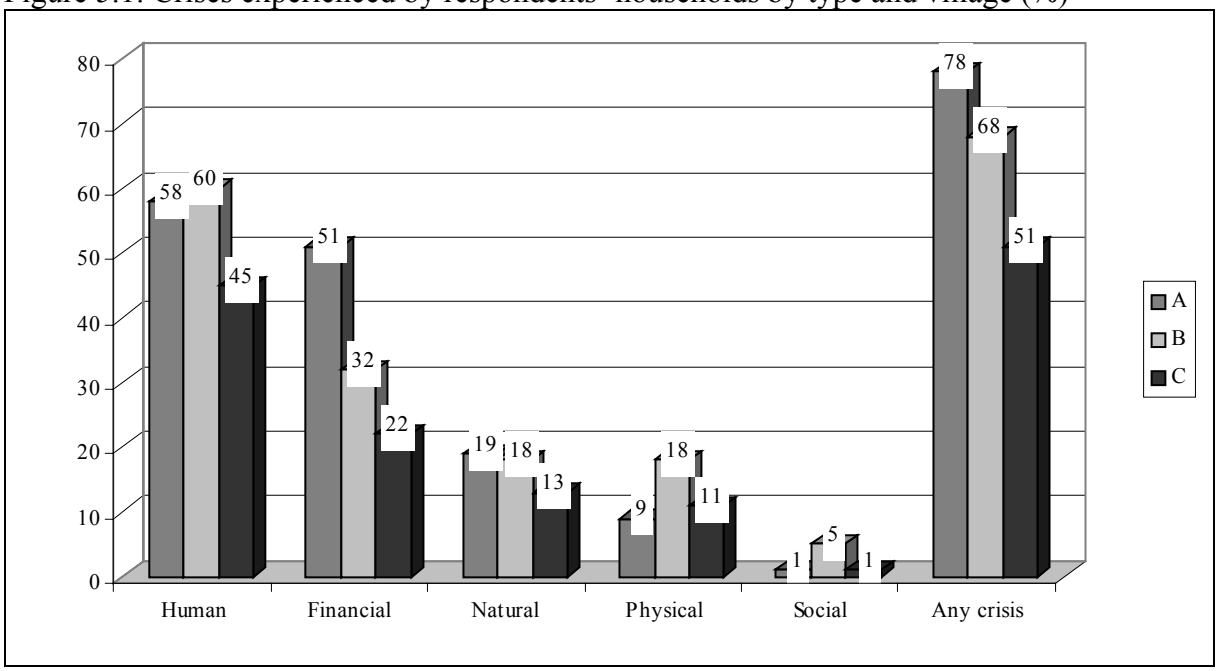
5. Vulnerability and resilience in the study locations

5.1 Crises experienced

In this paper, the vulnerability context of livelihoods in rural NWFP is operationalised through the occurrence of different crises, which households and/or individuals suffered during the six months prior to the survey. They were categorised based on the livelihood assets they are related to (Table A1 in the appendix)[6]. At the household level, human capital-related crises comprises of the occurrence of severe illnesses and accidents, arrests, and divorces within a household. Social capital-related crises include divorces, legal cases, and wedding costs. Poor production, food shortage, land loss, and legal cases are subsumed under natural capital-related crises, whereas physical capital-related crises include house and car damage experienced by the household. Finally, financial capital-related crises comprises of the occurrence of food shortage, job loss, remittance irregularities, market fluctuations, loss of livestock, high loan debts, and business losses within a household.

6 One specific crisis could be related to different types of livelihood assets.

Figure 5.1: Crises experienced by respondents' households by type and village (%)



As shown in Figure 5.1, crises are most prevalent in the highland village A, where 78% of all households suffered at least one crisis during the six months prior to the survey. In C, only every second household suffered one or more crises during the same time period.
Human capital-related crises are the most common crises in each of the three study villages. In most cases (96%), such crises are caused by severe illnesses or an accident of one or several household members. Other often-occurring crises are related to financial and natural assets. In A, more than half of all households experienced financial troubles, and every fifth household suffered two or more such crises. In B, still one third experienced financial difficulties (14% two or more such crises), and in C, one fifth reported the same (5%). Most crises are caused by market fluctuations and/or inflation. Especially for the highland village A, other frequent triggers of such crises the loss of livestock and/or poultry and irregular remittances. Regarding natural asset-related crises, one fifth of all households in A and B, respectively, were struck. 9% in A, and 13% in B reported more than one such crisis. Physical and social capital-related crises are less frequent, except in village B, where nearly one fifth of all households suffered at least one physical asset-related crisis. This was mainly caused by repeated earthquakes, which hit the area in early 2004.

At the individual level, vulnerability is proxied by the occurrence of an illness during the six months prior to the survey (Table 5.1).

Table 5.1: Occurrence of illness by sex, age, and village (%)

	Village A	Village B	Village C	All villages
Females				
15 to 29	31	35	42	36
30 to 49	73	47	83	65
50 to highest	83	88	71	81
All females	58	50	63	56
Males				
15 to 29	13	0	12	9
30 to 49	31	23	23	26
50 to highest	29	69	14	35
All males	27	36	16	25

Overall, more than twice as many female (56%) than male (25%) respondents stated that they were sick during the six months prior to the survey. This striking difference applies more or less both for each of the three study villages and for all age groups. Independent of the gender difference, health status appears to deteriorate with age.

5.2 Experience of crises and asset endowment

In order to link the occurrence of crises with the respective asset status, Tables 5.2 and 5.3 first give an overview about the households' and individuals' asset endowments (Table A1 in the appendix provides each variable's operationalisation). At the household level, human assets are approximated by the respondents' household's literacy rate. On average, it is highest in village A (57%) and lowest in village C (39%). The household's participation in formal institutions is assumed to reflect its social capital. Table 5.2 indicates that it is highest in village C. There, a number of community-based organisations (CBOs) are working on health and overall development-related issues. Financial assets are tabulated through total tropical livestock units (TLU) given the role of livestock as a popular type of savings in developing countries. While village B has the lowest mean TLU value, households in village A have 3.2 TLUs on average, which equals for example one bullock and two cows. As can be gauged from the lower medians, the distribution within the villages is skewed. Natural assets are tabulated through the size of arable land (in *kanal*[7]). Although overall, households in village A have access to more land as compared to the other villages, due to its steep terrain, this often includes rangeland not suitable for cultivation, whereas in village C, all accessible land can be used for cultivation. Thus, in terms of arable land, on average, village C has the largest average landholdings, about 10 *kanal*. The median indicates, however, a comparatively skewed distribution. Physical assets are tabulated through the availability of means of transport. While households in village A hardly own any means of transport, the situation in village B and C is much better.

[7] 1 kanal = 0.125 acre = 0.05 hectare.

Table 5.2: Households' average asset endowment by village

	Village A	Village B	Village C	All villages
Human assets				
Household literacy rate (%)	57.10	50.20	38.60	48.80
Social assets				
Household's participation in formal institutions	1	1	1.4	1.1
Financial assets				
Tropical Livestock Units	3.2	2.1	2.2	2.5
(median)	(2.4)	(1.9)	(2.4)	(2.4)
Natural assets				
Arable land in *kanal*	7.0	8.3	10.2	8.4
(median)	(5.0)	(5.0)	(4.0)	(5.0)
Physical assets				
Transport availability	0.3	1.2	1.6	1
Control variables				
No. of difficult months in terms of food supply	2.8	0.8	0.5	1.4
No. of cash income sources	1.6	1.7	2.5	1.9

Based on the discussion in section 3, additional control variables are included to proxy the household's poverty and its income diversification. The respective approximations are the number of difficult months in terms of adequate food supply and the total number of cash income sources. Households in village A experience far more severe poverty, namely on average about three months with difficult food supply than households in the other two study villages. Income sources are most diverse in the lowland village C. An average household in village A has 1.6 income sources, as compared to 2.5 income sources in village C.

At the individual level, human assets are estimated by the respondent's literacy (Table 5.3). The literacy in the study locations are close to the provincial average of 16% for women and 40%for men in rural NWFP (Federal Bureau of Statistics, 2004). This underlines that access to education, in particular for women and girls, is very much limited in rural areas of NWFP. Social assets are tabulated through an index approximating the respondent's participation in formal institutions. Overall, such involvement is low for both women and men. Also here, women appear to be far behind men. While the proxy considers both access to and the role within institutions, in this case it is above all the lack of access, which causes the low ratio for women. The respondent's monthly amount of pocket money reflects his or her access to financial assets[8]. The table shows that, on average, men have about twice the pocket money at their disposal than women. This is closely related to the respondent's intra-household bargaining strength, which includes decision-making power about the household budget and

[8] Due to the large number of missings, this variable could not be included in the regression analysis.

purchases, and which is about 2.5 times higher for men than for women. Regarding the overall weekly working time, women work twice as much as men do.

Table 5.3: Individuals' average asset endowment by sex

	Females	Males	All
Human assets			
Literacy (%)	14	62	39
Social assets			
Participation in formal institutions	0.1	0.5	0.3
Financial assets			
Monthly pocket money (median, in Rs.)	280 (68)	510 (300)	412 (135)
Control variables			
Working time (weekly hrs.)	46	22	33
Intra-household bargaining strength	1.7	4.2	3

Across the most common crises types, i.e. human, financial, and natural capital-related crises, Table A2 in the appendix emphasises the link between social assets and poverty and the occurrence of crises in respondents' households. Whereas the positive link between poverty in terms of difficult months regarding food supply is straightforward and in accordance with the literature discussed above, the positive association between social capital in the form of participation in formal institutions is surprising. Based on the SLA, a buffer function of social capital – as well as of other asset types – and thus a negative correlation between vulnerability and this type of capital would have been assumed.

Neither for women nor for men social assets are significantly linked to the experience of illnesses at the individual level (Table A3 in the appendix). For women, only education is associated with the experience of this type of crisis. As expected based on the discussion in section 3, the link is negative, i.e. literacy is associated with a lower probability of illness. For men, access to financial assets in the form of pocket money as well as his bargaining strength within the household has a statistically significant correlation with the experience of illness. In case of pocket money, this association is negative, in line with the SLA assumption of the asset status buffering crises. However, the result regarding men's intra-household bargaining power is amazing. Greater bargaining power is linked to greater vulnerability regarding health.

5.3 Factors of vulnerability and resilience

5.3.1 Households' vulnerability and resilience

The results of the logistic regression of the occurrence of a human capital-related crisis on various livelihood assets in Table 5.4 do partly reflect the results of the bivariate analysis (see Table A1 in the appendix for a list with the respective variable's operationalisation). Social assets, poverty, as well as income diversification[9] appear to be the strongest determinants of

[9] In a model not displayed in Table 5.4, for all three dependent variables, household size has been included to control for the fact that larger households might be able to access more cash income sources. The results were not changed significantly.

human capital-related crises, such as illnesses or accidents of HH members. As above, the sign of social capital coefficient is unexpected. Controlling for all other variables, each increase in the value of the participation index by one unit increases the probability[10] of the experience of a human capital-related crisis by 4%. This type of social capital also has a positive influence on the number of crises experienced by the respondents' households (Table A4 in the appendix). A unit increase in the index value increases the number of crises experienced by 0.04. Rather than interpreting this as participation in formal institutions as triggering crises caused e.g. by illness or accidents, one could assume a reverse causality. Household participation in formal institution may serve as a coping mechanism rather than as an ex ante buffer against vulnerability. A closer look into the different types of institutions included in the participation index reveals interesting distinctions. For the institution most frequently participated in, the village *jirga*[11], the interpretation given above may hold true. About one fifth of all respondent's households have one or more members in a local *jirga*. With a correlation coefficient of 0.38 (p=0.00), participation in the village *jirga* has a strong and statistically significant association with the experience of a human assets-related crisis. Interestingly, the relationship with participation in a CBO, of which slightly less than a fifth of all respondent's households are members, gives the opposite result. The statistically significant correlation here is -0.16. One possible reason may be that many CBOs are involved in preventive health care. As mentioned above, particularly in village C, this is the case. This way, health-related crises as the most prominent component of human capital-related crises may be averted.

[10] The probability changes are calculated as the difference between the original probability of the event occurrence and the new probability given the impact of a certain independent variable. For this, the original odds ratio is multiplied with the independent variable's odds ratio. The product equals the new probability of the event occurrence divided by one minus the event occurrence. This can be solved for the new probability and the probability change can be calculated.

[11] A *jirga* is an assembly of tribal men, which takes decisions by consensus.

Table 5.4: Determinants of occurrence of a crisis experienced by respondent's household (logit estimates)

	Human capital-related		Financial capital-related		Natural capital-related	
	Coeff. (Wald statistic)	Odds ratio	Coeff. (Wald statistic)	Odds ratio	Coeff. (Wald statistic)	Odds ratio
Household literacy rate	0.00 (0.04)	1.00	0.00 (0.04)	1.00	-0.01 (2.28)	0.99
Household's participation in formal institutions	0.16 (3.74)**	1.17	0.32 (13.53)**	1.38	0.40 (16.72)**	1.49
Tropical Livestock Units	0.05 (0.33)	1.05	0.20 (5.32)**	1.22	0.03 (0.07)	1.03
Nat. log arable land	0.00 (0.00)	1.00	-0.06 (1.16)	0.95	0.05 (0.55)	1.05
Transport availability	0.05 (0.42)	1.05	0.05 (0.44)	1.05	0.11 (1.34)	1.11
No. of difficult months in terms of food supply	0.22 (7.16)**	1.25	0.26 (11.19)**	1.29	0.27 (12.19)**	1.31
No. of cash income sources	0.39 (5.87)**	1.47	0.18 (1.07)	1.20	0.20 (0.77)	1.22
Village A dummy	0.42 (0.69)	1.52	1.10 (3.76)**	3.02	0.38 (0.26)	1.46
Village B dummy	1.10 (7.01)**	2.99	0.93 (3.66)*	2.53	0.90 (2.03)	2.47
Constant	-1.56 (6.91)**	0.21	-3.08 (19.44)**	0.05	-3.23 (13.83)**	0.04
Incl. observations	226		226		226	
Model chi-square	28.39		51.34		40.02	
Sig. model chi-square	0.00		0.00		0.00	

*Coefficient is significant at 90% level
**Coefficient is significant at 95% level

Regarding the impact of poverty, each additional month in which adequate food supply is difficult for the respondent's household increases the probability of the experience of a human capital-related crisis by 6%. The poverty proxy's role is similarly strong in the estimation of determinants of the number of human capital-related crises. For each additional difficult month in terms of food supply, the number of crises rises by 0.04. Of course, food security has a crucial impact on human health. Thus, particularly illnesses can be assumed to be the result of inadequate food supply.

An interpretation similar to the social assets proxy may apply in case of income diversification. Here, counter intuitively, each additional cash income source in the respondent's household increases the probability of the experience of a human capital-related crisis by 9%, if other model variables are controlled for. The impact is paralleled by its role in determining the number of human capital-related crises. One additional income source increases this number by 8%. Diversification may be a response to vulnerability rather than an ex ante buffer, as assumed by Ellis (2002). This implies, that a smaller amount of income sources is associated with more stable cash income, e.g. in the form of a regular salary.

The coefficient of the village B dummy reflects the comparatively high prevalence of human asset-related crises in this village (Table 5.1). Controlling for all other variables, living in village B increases the probability of the experience of a human capital-related crisis by 24% as compared to the lowland village C. The impact is paralleled in the variable's influence on the number of crises experienced (Table A4 in the appendix).
Other variables, e.g. related to the households educational status, financial assets in the form of livestock, available infrastructure, or arable land do not appear to influence the odds of the experience of a human capital-related crisis significantly. Particularly for education, this comes as a surprise. However, in some cases they impact on the number of crises the respondents' households' experience. For example, infrastructure in terms of transport availability has a significantly positive, moderate impact on the number of human capital-related crises. A unit increase in the index raises the number of human capital-related crises by 0.03. Again, a reverse causality may work here. A possible explanation is the relatively high number of road crash fatalities in Pakistan[12], the more so as the majority of human-related crises consists of household members' diseases and accidents (section 5.1). They may be related to the household's ownership of a motorbike or car, which score high in the transport index – and may cause accidents.

Similar to the results for the estimation of determinants of human capital-related crises, the existence of social assets increases the likelihood of the occurrence of a financial capital-related crisis, such as market fluctuation, loss of livestock, or remittance irregularity. Controlling for all other variables, each increase in the value of the participation index by one unit increases the probability of the experience of a financial capital-related crisis by 8%. The participation index is even more relevant for the number of financial capital-related crises experienced (Table A4 in the appendix). A unit increase in this social capital proxy raises the number of crises by 0.12. Again, the most straightforward interpretation for this surprising result is that investment in social capital is actually a strategy to cope with vulnerability. As in the case of illnesses and accidents and other human capital-related crises, participation in a village *jirga* has the strongest - positive - correlation with the occurrence of a financial crisis (Pearson correlation coefficient 0.48, p= 0.00). A possible explanation is that the social capital of village *jirgas* can be translated in financial capital, e.g. in the form of informal loans to cope with a crisis. The fact that in almost half of all cases where an illness or accident within the respondent's household was reported, taking a loan was mentioned as a coping mechanism, supports this interpretation. Although only 2% of the respondent's households are involved in women's organisations, they as well display a significant positive association with the experience of financial capital-related crises (Pearson correlation coefficient 0.14, p=0.03). One way to read this result is to assume that as a reaction to crisis, some women whose movement outside the homestead and social interaction are restricted otherwise are allowed to avail external support.
In case of financial crises, livestock plays a statistically significant role. However, it is not the buffering role one would assume based on the SLA. A unit increase in the value of the TLU index raises the probability of the experience of a financial capital-related crisis by 5%. As Table A4 shows, the number of financial capital-related crises do not appear be significantly influenced by savings in the form of livestock. Given the fact that the binary variable depicting the occurrence of a financial capital-related crisis includes livestock losses, one might of course assume a higher vulnerability to such crises: If a hen is lost due to illness, one would hardly call it a crisis. A dead bullock, however, might present a serious shock to a household's livelihood. This would also explain why the amount of livestock does not influence the number of financial crises experienced. Being one form of financial capital,

[12] In 1996, the number of road crash fatalities in Pakistan was at 17.4 fatalities per 10'000 motor vehicles (Addison Read International Properties, 2005).

livestock may actually allow a household to reduce such vulnerabilities by selling it to fund preventive and curative technologies as suggested in section 3.
Poverty has a similarly strong impact on the experience of a financial asset-related crisis as social assets or the amount of livestock. As in case of human capital-related crises, it increases the household's vulnerability. A financial capital-related crisis is 6% more likely for each additional month in which adequate food supply is difficult for the respondent's household. Obviously, poverty is closely linked to the dependent variable here, as the latter includes crises triggered by food shortage. But this is not the whole story. Food shortage also reduces the productivity of other market-related activities; it increases vulnerability to irregular income streams, e.g. from remittances. Also, the number of financial capital-related crises rises with poverty. In the OLS estimate, the poverty proxy has the strongest impact of all model variables as can be gauged from the standardised coefficients. One additional difficult month adds 0.12 to the number of crises experienced.
As compared to village C, controlling for all other variables, living in village A or B increases the probability of the experience of a financial capital-related crisis by 62% and 58%, respectively. This reflects the comparatively higher prevalence of financial asset-related crises in these two villages (Figure 5.1). Interestingly, this means that in the two villages that are to a lesser degree integrated in markets, market-related risks are higher. The main difference is the higher prevalence of crises caused by irregular remittances in the highland village. This gives a special spin to the view stated in section 3 that market-based livelihoods face the risk of market volatilities. One reason might be that there is a mismatch between the monetarisation of households' expenses, such as for health care, clothing, transport, electricity etc. in these highland villages and the lack of opportunities to be gainfully employed.
Other variables, e.g. related to the household's educational status, land access, available infrastructure, or diversification of cash income sources do not appear to influence the likelihood of the experience of a financial capital-related crisis significantly. The complete lack of impact of human capital on experience of financial crises is surprising. One could have assumed a complementary role of human and financial capital, i.e. in case of market volatility, the households' educational status may act as a buffer. This is apparently not the case.

Social assets are equally important as factors of vulnerability to natural capital-related crises. Increasing the probability of the experience of a natural capital-related crisis by 6% for every unit increase in the value of the participation index, this result mirrors the findings from the estimation of factors of the types of crises discussed above. This result is paralleled by the estimation of factors for the number of natural capital-related crises experienced. The proxy for social capital has a strong impact on the dependent variable. One extra unit in the social capital index adds 0.12 to the number of crises experienced. As in the discussion of human and financial capital-related crises, participation in the village *jirga* is most closely related to the experience of natural asset-related crises. In addition, the participation in a credit cooperative is positively associated with these types of disasters (Pearson correlation coefficient 0.15, $p=0.02$). The reading of the results developed above may hold true in this case as well. Membership may be used as an effort to get access to larger loans in an environment where access to formal credit e.g. through banks is virtually non- existent. However, as a qualifying note one has to highlight that for most natural capital-related crises respondents stated to cope through in kind rather than through cash loans.
Otherwise, only poverty influences vulnerability to natural assets-related hazards significantly. Each unit increase in the poverty proxy increases this vulnerability by 4%. Poverty also increases the number of natural capital-related crises households experience. One additional month without adequate food supply raises this number by 0.08.

Other variables, e.g. related to the households educational status, financial capital in the form of livestock, arable land, available infrastructure, or diversification of cash income sources do not appear to influence the likelihood of the experience of a natural capital-related crisis significantly. However, transport availability has a role to play in determining the number of crises experienced. A unit increase in the respective index increases their number by 0.05.

5.3.2 Factors of vulnerability to illness

Individually, good or poor health is an indicator of vulnerability. It was associated with the individuals access to livelihood assets in a logistic regression model (see Table A1 in the appendix for the variable list).

Despite the significant model fit, a glance at the logits in Table 5.5 gives the impression of model misspecification. In model 1, the only variables influencing the respondent's health status significantly are literacy, intra-household bargaining power, and the respondent's sex.

Table 5.5: Determinants of illness experienced by respondents (logit estimates)

	Model 1	
	Coeff. (Wald statistic)	Odds ratio
Literacy	-0.29 (2.72)*	0.75
Participation in formal institutions	0.15 (0.55)	1.16
House structure	-0.04 (0.01)	0.96
Transport availability	-0.08 (1.40)	0.93
No. of difficult months in terms of food supply	0.05 (0.58)	1.05
No. of hours worked last week	-0.01 (0.93)	0.99
Intra-household bargaining strength	0.16 (4.10)**	1.17
Sex dummy	-1.75 (14.21)**	0.17
Village A dummy	-0.123 (0.085)	0.88
Village B dummy	0.075 (0.04)	1.08
Constant	0.401 (0.782)	1.49
Included observations	234	
Model chi-square	36.8	
Sig. model chi-square	0.00	

*Coefficient is significant at 90% level
**Coefficient is significant at 95% level

In line with suggestions from previous research and the associations identified in section 5.2, literacy reduces the probability of the experience of an illness by 7%. This result would support the assumption that human assets reduce vulnerability to health problems. However, this is a rather straightforward finding.

Surprisingly, bargaining power increases such vulnerability. Controlling for all other variables, each unit of increase in the index proxying the respondent's bargaining power within his or her household increases the probability of the experience of an illness by 4%. This startling result that mirrors the correlations in section 5.2, can be explained with the results from model 2 (Table A5 in the appendix). Here, the bargaining power index is replaced by the respondent's age. This variable has a statistically significant effect on the health status. An additional year of age increases the likelihood of health deterioration by 1%. This mirrors the findings from Table 5.1, indicating a higher prevalence of illnesses among elder persons. It is therefore likely, that, in the absence of other factors controlling the influence of demographic variables on health status, the bargaining power index actually reflects the impact of age. Once both variables are included in the model, the bargaining

power proxy does not exert a statistically significant effect on the dependent variable. One can assume that the omission of other demographic factors from the model specification has led to an omitted variable bias.
Independent estimates for women and men were not possible due to a too small sample size. In the full sample, the included sex dummy has a strong and statistically significant effect in all model specifications (Table 5.5 and Table A5 in the appendix). In line with the findings presented in Tables 5.1 and A5, being male reduces the probability of the experience of an illness by 30%. Model 3 assesses dissimilar effect of the included independent variables on women and men. It does so by interacting the sex dummy with the other independent variables apart from the village dummies. No statistically significant interactions with other variables are apparent in the model.
Other variables, e.g. related to the respondent's social capital in the form of his or her participation in formal institutions, physical capital such as the condition of the house or infrastructure, poverty, the workload, or even regional characteristics do not appear to influence the health status in any statistical significant manner.

5.4 Vulnerability and resilience of livelihood strategies

In this sub-section, it is tried to link the factors associated with the occurrence of different types of crises with the livelihood strategies pursued by households. For a description of livelihood strategies, the typology developed by Steimann (2005) is applied. It groups the respondents' households according to the spatial ranges in which they generate their cash and non-cash income. Cash income can include the sale of farm products, farm or non-farm labour, self-employed business etc. Non-cash income means subsistence production by farm households. The spatial context of income generation is divided into four levels:

- Household practices subsistence farming (providing non-cash income) (Sub)
- Household generates at least one cash income source in the local context of the village (Loc)
- Household generates cash income in the regional context (outside village, not migration) (Reg)
- Household generates cash income in a national/international context (labour migration) (Rem)

The typology does not take the number and the importance of income sources into account. As many households often operate in more than one spatial context, possible livelihood strategies thus are, e.g., subsistence farming combined with one or several cash incomes generated on local level (SubLoc), or subsistence farming combined with one or several cash incomes generated on regional level, plus remittances (SubRegRem).

The analysis reveals striking differences between the highland and the lowland context. In village A and B, 91 resp. 89% of all households generate non-cash income through subsistence farming. 60 resp. 62% of all households are at least partly dependent on remittances from labour migration. 42 resp 56% of all households generate cash income in the local context, while only 19 resp. 16% can generate income in the regional context. Subsistence farming and remittances thus appear as the two main pillars of livelihoods in the highland and the foothills, complemented by local opportunities for income generation.
In the lowland village C, where the share of farming households is much smaller than in the other two study villages, 61% of all households generate non-cash income through subsistence farming. Labour migration is not as popular as in village A and B, with only 36% of all households having at least one household member living in migration. Instead, the regional economy appears to be of much more importance in village C, since 79% of all households can generate cash income in the regional context. The local context serves as an income source for 49% of all households. The figures thus reflect the study villages' location

and available infrastructure. While village C is in immediate vicinity of a large regional goods and labour market, village A is even far form the next metalled road. Thus, the below-mentioned local strategy types do not only map the respondents' households' income structures, but also their access to institutions in form of labour markets. However, in the case of village B, a well-equipped local *bazaar* exists, which might reduce the necessity to go to the next regional market in order to find an income (compare section 4.2).

Figure 5.2: Main livelihood strategies by village

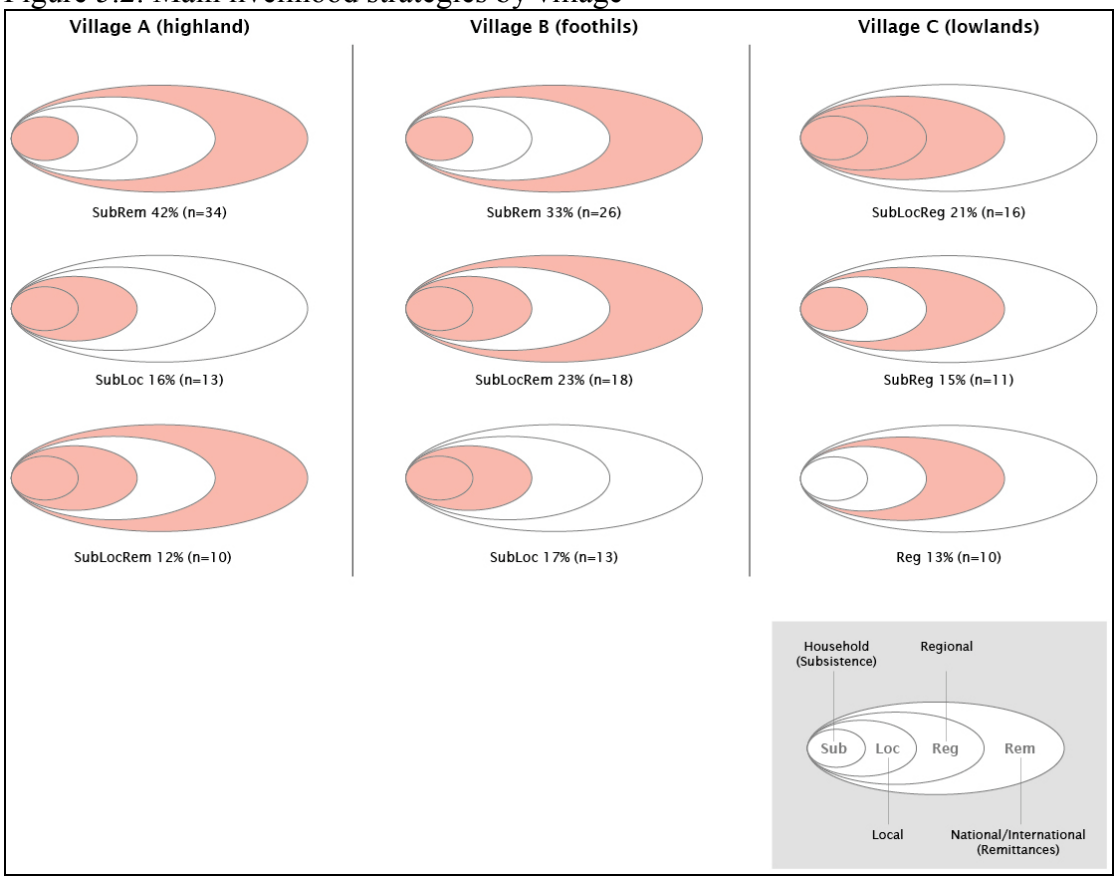


Figure 5.2 depicts the three most frequent livelihood strategies in each study village. It is obvious that combinations of subsistence farming with labour migration (in villages A and B) and with local and regionally earned cash income (in village C) are the most common combinations. In village A and B, large groups of 42 resp. 33% of all households embark on the same strategy, i.e. SubRem. Consequently, the diversity of strategies is less than in village C. This means that more different and somewhat equally represented strategy types coexist in village C, while in A and B, a few strategy types are predominant.

Table 5.6: Vulnerability and resilience of main livelihood strategies

	Pearson Correlation				
Strategy	Household's participation in formal institutions	Tropical Livestock Units	Arable land	No. of difficult months in terms of food supply	No. of cash income sources
SubRem		*0.12**			**-0.44****
SubLocRem					*0.17***
SubLoc				*0.13***	
SubLocReg			**0.16****		*0.29***
SubReg		*0.22***	**0.17****		
Reg	*0.12**	**-0.19****	*-0.18***		

Notes: *Italics*= positive association with crisis' occurrence/factor of vulnerability
Bold= negative association with crisis' occurrence/factor of resilience
Light shade/*=Correlation is significant at 90% level
Dark shade/**=Correlation is significant at 95% level
SubRem=Subsistence-remittances; SubLocRem=Subsistence-locally earned income-remittances; SubLoc=Subsistence-locally earned income; SubLocReg=Subsistence-locally and regionally earned income; SubReg=Subsistence-regionally earned income; Reg=Regionally earned income

Table 5.6 depicts statistically significant correlations between the most common livelihood strategies and factors of vulnerability or resilience, respectively. As stated above, the combination of subsistence agriculture and labour migration is the most common livelihood strategy, particularly in villages A and B. If a larger number of income sources is rightly interpreted as a coping mechanism, than the negative correlation between this strategy type and the number of income sources can rather be a perceived as a sign of vulnerability. Households get stuck in two avenues for survival, both of which are risky. Remittance might not be sent, subsistence farming is prone to weather risks and diseases as indicated in the correlation with the number of livestock.
For the strategy that combines subsistence agriculture with local and regional cash income generation prevalent in village C, access to arable land strengthens households' resilience. This reflects the fertility and multiple use options of land in village C as outlined in section 4. Similarly, the blend of income generation at the regional level and subsistence farming displays the same positive correlation with land as a factor of resilience. The like explanation related to the multiple functions of the fertile land in the Peshawar valley may apply here.
The combination of subsistence farming and local income sources is significantly associated with the strongest predictor of vulnerability to different types of crises, i.e. household's poverty. Spatially covariant financial and natural risks, e.g. in agriculture are probably reflected in this correlation. This strategy can therefore be called vulnerable. Based on the bivariate regression results displayed in Table A6, a second vulnerable strategy is based on the combination of subsistence agriculture and regionally earned income. Pursuing this strategy increases the probability of a financial asset-related crisis by 19%.
The positive association between the livelihood strategy based on regionally generated income alone and the households' participation in formal institutions reflects their stronger presence in village C as compared to the other two villages. If the reading of the role of this type of social capital as a coping mechanism with rather than trigger of crises is correct, than the probality to bounce back from crises is higher here, i.e. the strategy is comparatively resilient. This is supported by results from bivariate logits, regressing the occurrence of a

particular type of crisis with the livelihood strategy pursued by the respective respondent's household (Table A6 in the appendix). This strategy is the only one that has a significantly negative association with the occurrence of human assets-related crises or, put differently, the only strategy that is resilient to e.g. severe illnesses and accidents. Based on this, the reasons for that would lie in their greater accumulation of social capital for example in the form of participation in health-related CBOs. Additionally, those earning their income in the regional centre might face less difficulties accessing health care both in terms of infrastructure and financially. Many households pursuing this strategy actually have family members in a salaried job, which means relative income security and often health-related benefits. This supports the interpretation given to the role of diversification in human assets-related crises above.

6. Summary and conclusions

From the previous sections, the following results can be highlighted. Overall, human and financial capital-related crises such as severe illnesses and accidents are most relevant for the study area. More than half of all respondents' households experience such crises. Also, villagers in the remote highlands are more prone to crises than those in the relatively developed plains. Not surprisingly, poverty emerges as a strong predictor of all types of vulnerability. It raises both the probability of households being hit, for example, by illness and accident, market fluctuations and inflation as well as land losses or food shortage. This is in accordance with Semple's (2003) observations. He emphasises the structural dimension of vulnerability. According to him, the process whereby a given hazard translates into a disaster involving destruction of livelihoods is essentially a political one. The losers in disaster management are typically the weakest, poorest, and under-represented inhabitants of marginal areas. They are systematically lacking the means to articulate their interests and too often find that crisis management for the rich means increased vulnerability for the poor.

Besides, the household's social capital in the form of participation in institutions is closely associated with various types of crises. Amazingly, this association is negative, that is, the more households are involved, e.g. in *jirgas* or credit organisations, the more they experience various types of crises. A possible explanation reverses causality and interprets such networking as a coping mechanism after the experience of a crisis. A closer look also reveals that the impact is not uniform across institutions. For example, the participation in CBOs is actually negatively linked with the occurrence of a crisis. This type of social networks may thus be relevant in terms of strengthening resilience. Especially, taking loans emerged as an important coping strategy after a crisis has occurred. Thus, improving rural communities' access to loans in an environment where formal financial institutions are almost non-existent is one of the policy lessons to be learned.
These findings also imply that not all assets are factors in reducing vulnerability as assumed in the SLA. Specific entitlements may have a bearing on a particular type of crisis. For example, the impact of the geographical location, which in the context of this investigation maybe equated with market access, is particularly relevant for the experience of financial crisis. Financial vulnerability is found to be higher where villagers are less integrated in markets. A possible reason is a mismatch between the monetarisation of households' expenses and the lack of opportunities to generate cash income. Diversification, on the other hand, appears to be a buffer against human capital-related crises.

Regarding the second research question raised at the outset, the data reflected considerable gender differences in vulnerability, here approximated as good or poor health. Women are

more than twice as likely to fall ill than men. Here, the more conservative lowland village shows the largest gender gap in health status. Siegmann and Sadaf (2004) interpret this finding as a reflection of gender norms restricting women's movement and thus access to livelihood assets. For both sexes, this risk increases with age. However, the investigation did not come far in opening the black box of gender differences in vulnerability. Apart from literacy, no other livelihood asset appeared to strengthen resilience against health problems as predicted in the SLA.
However, there is a distinct gender dimension hidden in the household-centred results. Poverty in terms of access to food, finance, and other resources hits women harder then men (Siegmann and Sadaf, 2004; Table 5.3). Cultural norms prescribe women to have food last and least. Due to restrictions to their mobility, they can hardly earn cash income. Education for girls is often considered a spilled investment with the result being a huge gender gap in literacy in NWFP. Only one sixth of the female population of rural NWFP is literate as compared to 40 percent of all men. Similarly, participation in most types of institutions is considered a male issue. This means, women are effectively cut off from buffers against and tools to cope with crises as suggested by Bhatt (1997) and Masika and Joekes (1996). Therefore, women's access to livelihood assets, to education, employment, loans, and in particular to CBOs where they can organise around their specific needs and interests is a top priority when resilience of the rural population of NWFP shall be strengthened. Lack of women's access to formal institutions disadvantages them in coping.

Overall, few clear-cut findings emerged from the investigation into the vulnerability or resilience of particular livelihood strategies. A reliance on subsistence agriculture in combination with locally generated cash income clearly makes households more vulnerable. This is due to covariant natural and financial risks for both pillars of livelihood. That is, livelihood diversification is not a general means to strengthen household's resilience. This is supported by the fact that, in contrast, reliance on cash income generated in the regional context – often equated with salaried income – appears to be a robust strategy, particularly resistant against human asset-related crises. Reasons include the networks households pursuing this strategy type are involved in as well as their greater financial stability.

This exploration has obvious limitations. Structural factors are hardly included in the analysis given their negligible role in the utilised dataset. Highlighting the role of what Ellis (2002) termed the wider interpretation of vulnerability, O'Laughlin (2004) stresses the need to include a structural perspective in livelihoods analysis. For the study area, Matthew and Zaidi (2002) for example highlight the interdependencies of structural factors, such as the geopolitical environment of Northern Pakistan, population pressure, and *Pukhtun* cultural norms with the sustainability of livelihoods. Also, the cross-sectional data cannot capture dynamics of vulnerability and resilience. Similarly, as explained above e.g. in the case of the association between vulnerability and social capital, causality is hard to establish. Given their prominent role in individuals' vulnerability in rural NWFP, determinants of gender differences in health should be investigated beyond the limits of this study. Some of these gaps can and should be filled in qualitative approaches and institutional analyses.

References

Addison Read International Properties (2005): The Romania factbook. Available at: http://www.factbook.net/A&PStats.htm.

Bhatt, M. (1997): Maintaining families in drought India: The fodder security system. In: Fernando, P. and Fernando, V. (eds): South Asian Women: Facing Disasters, Securing Life. Colombo.

Bhatt, M.R. (1996): 'On Understanding Vulnerability'. Presentation to Duryog Nivaran Steering Committee Meeting, Colombo, November 1996. Colombo.

Blau, F. D., Ferber, M. A. and Winkler, A. E. (2001): The Economics of Women, Men and Work. 4th edition. Upper Saddle River.

Cardona, O. D. (2003): The need for rethinking the concepts of vulnerability and risk from a holistic perspective: a necessary review and criticism for effective risk management. In: G. Bankoff, G. Frerks, D. Hilhorst: Mapping Vulnerability: Disasters, Development and People.

Chambers, R. and Conway, G. R. (1991): Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. Cambridge. Available at: http://www.ids.ac.uk/ids/bookshop/dp/dp296.pdf.

Chambers, R. (1989): Vulnerability, coping and policy. In: IDS Bulletin 20 (2), 1-8.
De Haan. L. and Zoomers, A. (2005): Exploring the Frontier of Livelihoods Research. In: Development and Change 36 (1), 27-47.

Ellis, F. (2002): Human Vulnerability and Food Insecurity: Policy Implications. Forum for Food Security in Southern Africa. Overseas Development Institute. Available at: http://www.odi.org.uk/Food-Security-Forum/docs/Vulnerab_theme.pdf.

Federal Bureau of Statistics of the Government of Pakistan (2004): Labour Force Survey 2003-2004. Islamabad. Available at: http://www.statpak.gov.pk/depts/fbs/publications/lfs2003_04/lfs2003_2004.html.

Fernando, P. and Fernando, V. (eds) (1997): South Asian Women: Facing Disasters, Securing Life. Colombo.

Halvorson, S. (2003): A Geography of Children's Vulnerability: Gender, Household Resources and Water-related Disease Hazard in Northern Pakistan. In: The Professional Geographer, 55 (2), 120-133. Available at: http://publish.uwo.ca/~jbaxter6/Halvorson_2003_childrens_hazard_vulerability_geog237_only.pdf.

International Livestock Research Institute (ILRI) (1995): Livestock Policy Analysis. ILRI Training Manual 2. Nairobi. Available at: http://www.ilri.org/html/trainingMat/policy_X5547e/x5547e1j.htm.

Kottegoda, S. (1997): Gender and Disasters: Key Issues. In: Fernando, P. and Fernando, V. (eds): South Asian Women: Facing Disasters, Securing Life. Colombo.
World Bank (2000): Attacking Poverty. World Development Report 2000/2001. Washington DC.

LEAD Virtual Research and Development Centre (2005): Tropical Livestock Units. Available at:http://lead.virtualcenter.org/en/dec/toolbox/Mixed1/TLU.htm#Metabolic.

Masika, R. and Joekes, S. (1996): Employment and sustainable livelihoods: A gender perspective. BRIDGE. Available at: http;//www.ids.ac.uk/bridge.

Matthew, R. A. and Zaidi, A. A. (2002): People, Scarcity and Violence in Pakistan. International Institute for Sustainable Development. Available at: http://www.iisd.org/pdf/2002/envsec_conserving_1.pdf.

Sadaf, T. (forthcoming): Gendered livelihood strategies in two districts of rural NWFP of Pakistan: The role of gender norms. Master thesis to be submitted at the NWFP Agricultural University Peshawar. Peshawar.

Scoones, I. (1998): Sustainable Rural Livelihoods: A Framework for Analysis. IDS Working Paper 72. Brighton. Available at: http://www.ids.ac.uk/ids/bookshop/wp/wp72.pdf.

Semple, M. (2003), Political Dimensions of Vulnerability to Flooding, in: Bengali, K. (ed.), The Politics of Managing Water, SDPI, Oxford University Press, Karachi, pp. 141-149.

Sen, A. (1981): Poverty and Famines; An Essay on Entitlement and Deprivation. Oxford.

Siegmann, K. A. and Sadaf, T. (2004): Gendered livelihood assets and workloads in Pakistan's North-West Frontier Province (NWFP). Paper presented at the 7th Sustainable Development Conference, Islamabad, December 8-10, 2004. Available at: http://www.nccr-pakistan.org/publications_pdf/Gender/Siegmann_Sadaf_SDC04.pdf.

Steimann, B. (2005): Livelihood Strategies in North-West Pakistan. Results from the Sustainable Livelihoods Survey 2004, North-West Frontier Province (Pakistan). NCCR IP6 Working Paper Series, No. 5. Zurich. Available at: http://www.nccr-pakistan.org/publications_pdf/Gender/IP6_WP5.pdf.

Steimann, B. (2004): Rural livelihoods in a highland-lowland context and the role of forest resources (NWFP, Pakistan). Paper presented at the 7th Sustainable Development Conference, Islamabad, December 8-10, 2004. Available at: http://www.nccr-pakistan.org/publications_pdf/Forests/Steimann_SDC_Dec04.pdf.

Twigg, J. (2001): Sustainable Livelihoods and Vulnerability to Disasters. Benfield Hazard Research Centre Working Paper No. 2. London.

United Nations Office for the Coordination of Humanitarian Affairs - Integrated Regional Information Networks (UNOCHA – IRIN): Pakistan (2005b): Flooding kills 30, affects over 460,000. Release from July 19, 2005. Available at: http://www.reliefweb.int/rw/RWB.NSF/db900SID/VBOL-6EFEGD?OpenDocument&rc=3&cc=pak&emid=FL-2005-000108-PAK.

UNOCHA – IRIN (2005a): Pakistan: Northern flood and landslide victims await compensation. Release from April 11, 2005. Available at: http://www.reliefweb.int/rw/RWB.NSF/db900SID/ACIO-6BCM4N?OpenDocument&rc=3&emid=ST-2005-000018-PAK.

World Bank (2000): Attacking Poverty. World Development Report 2000/2001. Washington DC.

Zoomers, E. B. (1999): Livelihood Strategies and Development Interventions in the Southern Andes of Bolivia: Contrasting Views of Development. Cuadernos del Cedla no. 3. Available at: http://www.cedla.uva.nl/10_about/PDF_files_about/boliviacderno.pdf.

Appendix

Table A1: List of variables

Dependent variables				
Variable Name	Capital type	Variable	Operationalisation	Level
hum_dum	Human	Human capital-related crises experienced	Dummy (illness/accident of HH member or arrest or divorce) (1=crisis experienced, 0=not experienced)	Household
hum_cris	Human	Human capital-related crises experienced	No. of human capital-related crises experienced	Household
resp_ill	Human	Respondent's health	Dummy health status (1=respondent ill during past 6 months, 0=not ill)	Individual
fin_dum	Financial	Financial capital-related crises experienced	Dummy (food shortage or job loss or remittance irregularity or market fluctuation or loss of livestock or high debt or business loss) (1=crisis experienced, 0=not experienced)	Household
fin_cris	Financial	Financial capital-related crises experienced	No. of financial capital-related crises experienced	Household
nat_dum	Natural	Natural capital-related crises experienced	Dummy (poor production or food shortage or land loss or legal case or grass burns) (1=crisis experienced, 0=not experienced)	Household
nat_cris	Natural	Natural capital-related crises experienced	No. of natural capital-related crises experienced	Household

Table A1: List of variables (continued)

Independent variables				
Variable Name	Capital type	Variable	Operationalisation	Level
lit_hh	Human	Education	Household literacy rate (% of HH members≥10 years)	Household
res_lit	Human	Education	Respondent's literacy (2=can read and write, 1=can read, 0=neither read nor write)	Individual
tlu_tot	Financial	Savings	Tropical Livestock Units (TLU)[13], exchange rates as follows: sheep/goat = 0.15 TLU; donkey/mule = 0.7 TLU; cow = 1 TLU; horse = 1.14 TLU; buffalo/bullock = 1.2 TLU	Household
pocket	Financial	Cash income	Amount of pocket money (Rs.)	Individual
land_ara	Natural	Land arable	Arable land (kitchen garden + own agricultural land + land share crop in + land lease in + land mortgage in)	Household
larablan	Natural	Land cultivated	Nat. log arable land	Household
transpo	Physical	Transport	Transport availability, calculated as weighted sum of various means of transport: bicycle=1, rickshaw/donkey=2, motorbike/horsecart=3, car/tractor=4.	Household
kach_dum	Physical	House structure	Dummy house structure (1=mud house, 0=other)	Household
hh_part	Social	Participation in formal institutions	Sum of weighted participation in various institutions, with participation (yes=1/no=0)*role in institution (president=2/other=1)*regularity of participation (regular=2/irregualr=1)	Household
res_part	Social	Participation in formal institutions	Sum of weighted participation in various institutions, with participation (yes=1/no=0)*role in institution (president=2/other=1)*regularity of participation (regular=2/irregualr=1)	Individual
cinc_tot	Control variable	Cash income diversification	No. of cash income sources	Household
difmonth	Control variable	Poverty	No. of difficult months in terms of food supply	Household
villa_dum villb_dum	Control variables	Village	Village dummies (1=residing in village A/B, 0=not residing in village A/B)	Household /individual

[13] Tropical Livestock Units (TLUs) allow to quantify different livestock types and sizes in a standardised manner, by describing them in relation to a common unit (1 TLU) (LEAD, 2005; ILRI, 1995).

res_sex	Control variable	Sex	Sex dummy (female=0, male=1)	Individual
res_barg	Control variable	Intra-household bargaining strength	Intra-household bargaining strength, calculated as follows: Respondent is head of household (yes=3/no=0)+respondent is household's budget manager (single manager=2/co-manager=1/no=0)+respondent's decision-making power about purchases (none=0/small food items, groceries=1/large food items, household utensils, toiletries=2).	Individual
ager	Control variable	Age	Age of respondent (years)	Individual
worktime	Control variable	Workload	No. of hours worked last week	Individual

Table A2: Experience of crisis and household's asset endowment (Pearson's correlation coefficients)

	Household literacy rate	Household participa-tion in formal institutions	Tropical Livestock Units	Arable land	Transport availability	No. of difficult months in terms of food supply	No. of cash income sources
Dummy human capital-related crisis	-0.05	0.14**	0.07	0.11*	0.06	0.23**	0.07
N	234	236	235	229	236	236	236
Dummy financial capital-related crisis	0.01	0.24**	0.14**	0.07	0.02	0.35**	-0.02
N	234	236	235	229	236	236	236
Dummy natural capital-related crisis	-0.13*	0.29**	0.01	0.06	0.11*	0.31**	0.03
N	234	236	235	229	236	236	236

Light shade/*=Correlation is significant at 90% level
Dark shade/**=Correlation is significant at 95% level

Table A3: Experience of illness and individual's asset endowment (Pearson's correlation coefficients)

	Literacy	Participation in formal institutions	Monthly pocket money (Rs.)	No. of hours worked last week	Intra-household bargaining strength
Female	-0.16*	-0.05	-0.12	-0.08	0.04
N	113	114	78	114	114
Male	-0.13	0.01	-0.18*	-0.07	0.24**
N	122	122	104	122	121

Light shade/*=Correlation is significant at 90% level
Dark shade/**=Correlation is significant at 95% level

Table A4: Determinants of number of crises experienced by respondent's household (OLS estimates)

	No. of human capital-related crises		No. of financial capital-related crises		No. of natural capital-related crises		
	Coeff. (t-statistic)	Stand. coeff.	Coeff. (t-statistic)	Stand. coeff.	Coeff. (t-statistic)	Stand. coeff.	VIF
Constant	0.15 (1.12)		-0.17 (-0.92)		-0.05 (-0.28)		
Household literacy rate	0.00 (-0.53)	-0.04	0.00 (0.23)	0.02	0.00 (-1.01)	-0.07	1.19
Household's participation in formal institutions	0.04 (2.07)**	0.13	0.12 (4.93)**	0.29	0.12 (5.49)**	0.33	1.02
Tropical Livestock Units	0.01 (0.65)	0.05	0.04 (1.48)	0.10	0.00 (0.14)	0.01	1.34
Nat. log arable land	0.00 (-0.24)	-0.02	-0.01 (-0.66)	-0.05	0.01 (0.87)	0.06	1.47
Transport availability	0.03 (1.83)*	0.12	0.03 (1.36)	0.08	0.05 (3.11)**	0.19	1.11
No. of difficult months in terms of food supply	0.04 (2.87)**	0.21	0.12 (5.38)**	0.36	0.08 (4.16)**	0.28	1.33
No. of cash income sources	0.08 (2.37)**	0.17	0.02 (0.48)	0.03	0.00 (-0.08)	-0.01	1.26
Village A dummy	0.13 (1.14)	0.12	0.29 (1.84)*	0.17	0.05 (0.39)	0.04	2.59
Village B dummy	0.28 (2.97)**	0.25	0.29 (2.17)**	0.17	0.26 (2.2)**	0.17	1.76
Included observations	225		225		225		
Adj. R-square	0.10		0.26		0.22		
F-statistic	3.62		9.13		8.11		
Prob value F-statistic	0.00		0.00		0.00		

*Coefficient is significant at 90% level
**Coefficient is significant at 95% level

Table A5: Determinants of illness experienced by respondents – models 2 and 3 (logit estimates)

	Model 2		Model 3	
	Coeff. (Wald statistic)	Odds ratio	Coeff. (Wald statistic)	Odds ratio
Literacy	-0.09 (0.24)	0.91	-0.436 (2.35)	0.65
Participation in formal institutions	0.22 (1.25)	1.25	-0.43 (0.53)	0.65
House structure	-0.17 (0.22)	0.84	0.19 (0.21)	1.22
Transport availability	-0.09 (1.53)	0.92	-0.08 (1.18)	0.93
No. of difficult months in terms of food supply	0.06 (0.71)	1.06	0.08 (0.78)	1.08
No. of hours worked last week	0 (0.00)	1.00	-0.01 (0.56)	1.00
Intra-household bargaining strength	0.04 (0.23)	1.05	0.05 (0.10)	1.05
Sex dummy	-2.07 (16.43)**	0.13	-1.90 (4.68)**	0.15
Age	0.04 (13.27)**	1.05		
INTEREDU			0.25 (0.47)	1.29
INTERPAR			0.65 (1.08)	1.92
INTERKAC			-0.47 (0.56)	0.62
INTERTRA			-0.07 (0.15)	0.93
INTERPOV			-0.09 (0.53)	0.91
INTERWOR			-0.01 (0.28)	0.99
INTERBAR			0.19 (1.13)	1.20
Village A dummy	-0.106 (0.059)	0.90	-0.17 (0.15)	0.85
Village B dummy	-0.025 (0.004)	0.98	0.03 (0.01)	1.03
Constant	-1.119 (3.101)*	0.33	0.49 (0.87)	1.63
Included observations	227		234	
Model chi-square	50.04		40.9	
Sig. model chi-square	0		0	

*Coefficient is significant at 90% level
**Coefficient is significant at 95% level

Table A6: Livelihood strategy as determinant of crisis' occurrence in respondent's household (logit estimates)

	Human capital-related		Financial capital-related	
	Coeff. (Wald statistic)	Odds ratio	Coeff. (Wald statistic)	Odds ratio
Regional income generation	-1.45 (4.64)**	0.24		
Subsistence and regional income generation			1.05 (4.18)**	2.86
Constant	0.24 (3.25)**	1.28	-0.69 (23.38)**	0.5
Included observations	236.00		236	
Model chi-square	5.56		4.26	
Sig. model chi-square	0.02		0.04	

Note: The main types of crises have been regressed on all main livelihood strategies. Only those bivariate logits generating significant results are displayed in Table A6.