PROJECT: Enabling Integrated Climate Risk Assessment for CCD planning in Central Asia

Testing of Climate Risk Assessment Methodology in Kyrgyzstan

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Based on

During the preparation process, the project team used a baseline National Climate Risk Profile for Kyrgyzstan developed by UNDP CRM Project in Kyrgyzstan supported by a group of authors/experts: Zabenko O., Centre of Climate Change, Gaidamak N., National Statistic Committee of KR, Kirilenko A., NGO Biom, Myrsaliev N., Deputy Director of Ozone Center, Shevchenko V., Centre of Climate Change.

Contents

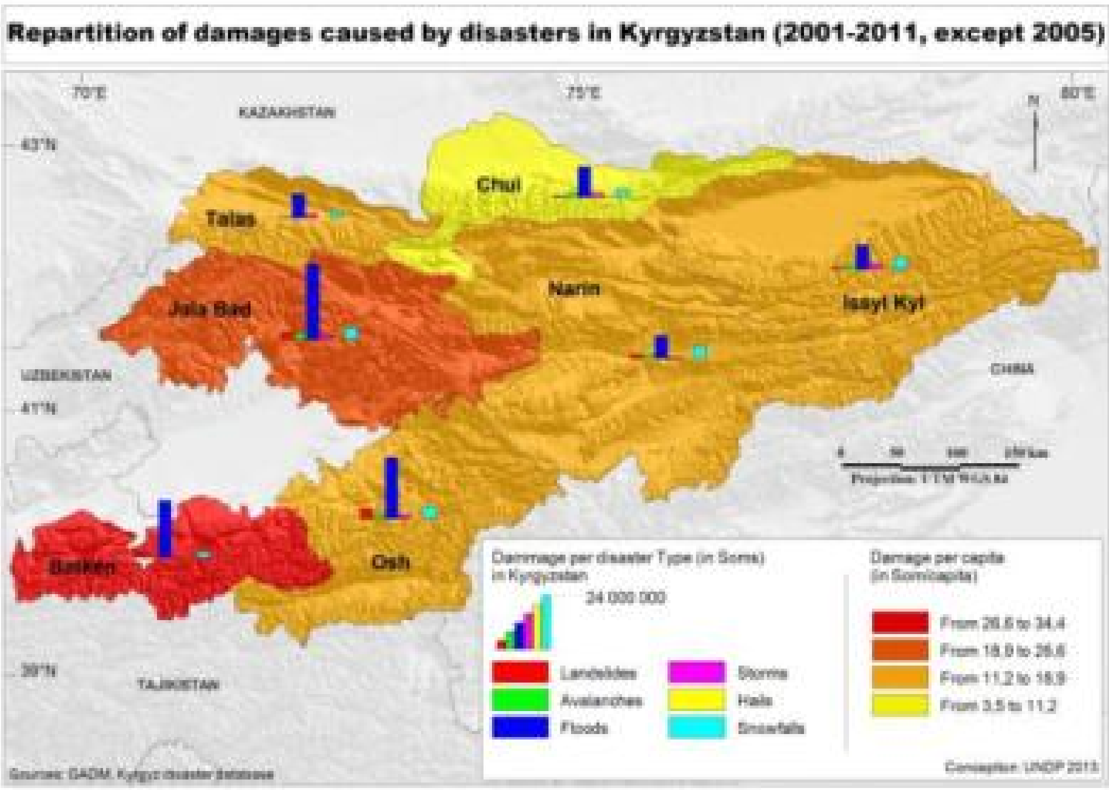
1. Summary

This **document** provides a preliminary profile of climate risks in Kyrgyzstan. The report was developed as part of a collaboration between CAMP Alatoo and UNDP's Central Asia Climate Risk Assessment Program (CA-CRM). Funding for the **Project** was provided to CAMP Alatoo by the Climate and Development Knowledge Network (CDKN) with other support from CA-CRM. The profile is based on procedures set out in the **Climate Risk Assessment Guide – Central Asia**, also developed by CAMP Alatoo and UNDP's Climate Risk Management Program with funding from the CDKN. Project documents and reports can be accessed at http://www.camp.kg and http://www.ca-crm.info.

The profile was developed by a team of 16 national and international experts. Work on the assessment on which the profile report is based took place in a series of technical meetings in Almaty, Kazakhstan and Bishkek and Issyk Kul, Kyrgyzstan, from May 2012 to March 2013.

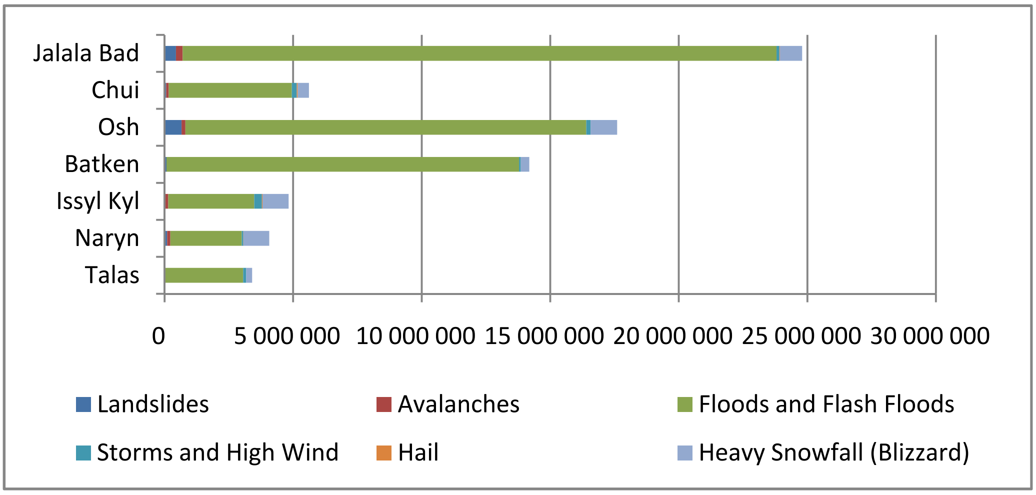
During the work on the profile the team used a baseline National Climate Risk Profile developed by the UNDP Climate Risk Management Project in Kyrgyzstan with support of a team of local experts.

The current report focuses on disaster-related climate risks and climate-related impacts on key crops and related livelihoods. Assessment results focus on the Oblast level to provide a clearer picture of where risks are critical within Kyrgyzstan, and to aid in directing assistance to manage these risks.

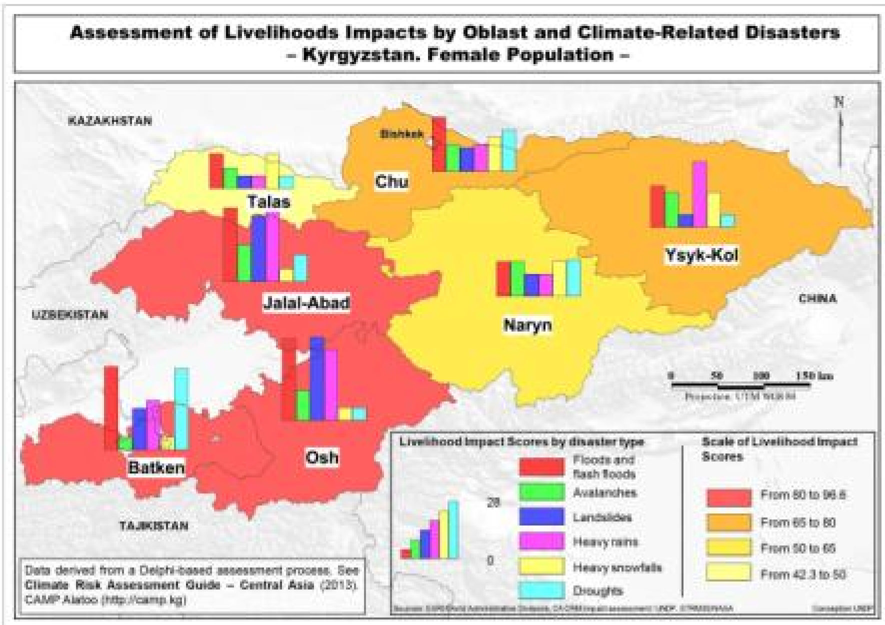


The assessment work did not identify any clear correlation between climate-related disasters and precipitation. Limited correlation between wheat production and SPI and prices and SPI was noted, while a more significant correlation between SPI and yield in Chui and Talas Oblasts was noted.

Total Damage by Oblast, US Dollars, 2000-2011



The **assessment** results indicate that floods and flash floods are the most significant climate related disaster in Kyrgyzstan, with an estimated US$ 66 million in damage from 2000 to 2011. The most affected Oblasts in total monetary terms are Jalal Abad and Osh, with an estimated damage of $ 23.1 million and US$16 million respectively. Batken has the greatest per capital damage, $US 3.02.



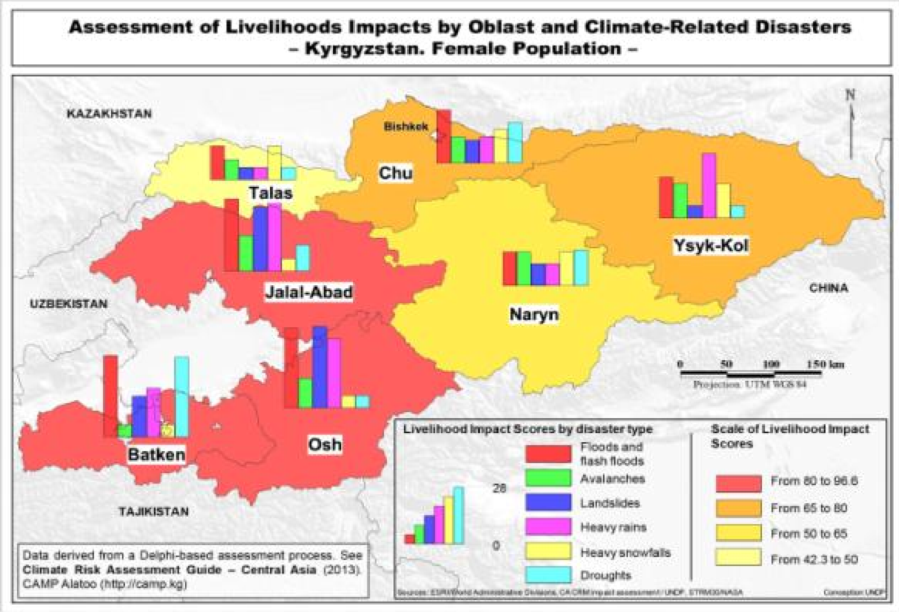
Batken also scores highest in terms of livelihoods impacts. With respect to livelihood impacts on females, Osh Oblast scores highest.

A number of scenarios were developed to project future climate risk damaged. For the all five disaster covered in the Profile, future damage is projected to total $US 153 million[1] by 2032 under a population-growth rate increase in damage. A 2% per year reduction in damage results in $US 109.5 million in damage by 2032.

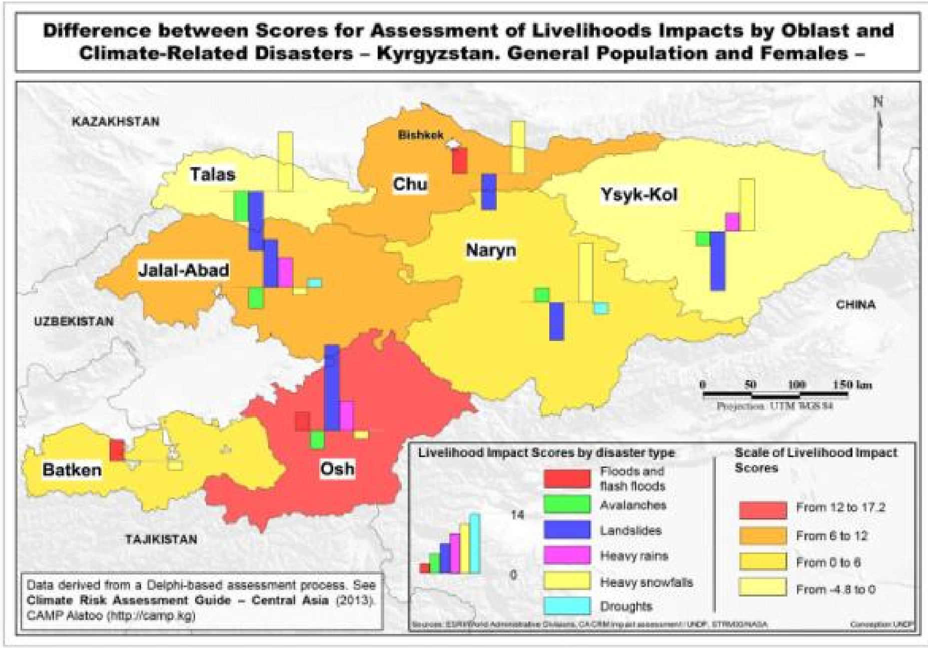
The **assessment** only identified limited possible correlations between Standard Precipitation Index (SPI) calculations and yield or prices for wheat at the level of each Oblast. A more detailed review of SPI and yield data in Chui and Talas Oblasts did indicate correlations for all cereals, as well as for

[1] Damage totals are not adjusted from inflation.

wheat, barley and maize for specific timeframes. This suggests that future changes in precipitation can be linked to possible changes in production and contribute to better climate risk management.



The **assessment** identified relative livelihood impacts for crops affected by climate risks. Batken scored as the most affected, followed by Jala Abad and Osh Oblasts. These results are useful in targeting climate risk management focusing on the agriculture sector.



Assessment results indicate that females experience some risks differently than the general population, and, in some cases, were identified to be at less risk than the general population. The gender-based assessment and results of the perception survey can be used to define more specific gender-focused risk management actions for specific Oblasts.

The **report** includes the results of a climate risk perception survey conducted in Suusamyr Valley, Kyrgyzstan. The survey indicated that (1) A gap exists between local and expert understanding of climate hazard and risks, (2) Climate-related risks do not have a uniformly high salience with local populations and (3) Climate impacts will likely be address through reliance on self, family, and local government. These and other findings should be incorporated into community-based climate risk management.

The **report** indicates that climate risk management strategies and activities be targeted to:

- Managing flooding and flash floods, particularly in southwest Kyrgyzstan, and specifically in Batken Oblast.
- Managing climate-crop impacts in Batken, Jalal Abad and Osh Oblasts.
- Bridging the gap between local resident and expert understanding of the nature and threat of climate-links hazards and impacts.
- Addressing the greater disaster impact on females in

- Osh Oblast, for all disasters,
- Jalal Abad, for landslides,
- Talas, Naryn and Issyk Kul Oblasts for snowfall
- Jalal Abad and Osh Oblast, due to higher impact scores for financial, social and natural capitals,
- Naryn, for higher social and natural capitals impacts, and,
- Batken, for higher social capital impact for for climate-crop impacts.

Further work on climate-related risks in Kyrgyzstan should:

- Significantly improve the data sets available on climate impacts at the national and sub-national levels.
- Consider detailed on site research into local climate-related impacts to develop better data and models on how climate and other factors contribute to negative impacts at the community and household level.
- Expand an econometric approach to analyzing hazards, impacts and management measures, particularly to bridge the analytical gap between short and long term impacts.
- Assess the impact of changes in livelihood impact indicators through a scenario approach.
- Expanding the livelihoods impact assessment to consider age and health status.
- Increase awareness about climate-related risks, both short and long term, and integrate climate-appropriate risk management measures into social and developmental processes.

2. Introduction

Climate-related risks pose a significant immediate threat to the lives and wellbeing of people in Kyrgyzstan and threaten the successful development of the country over the short and long term. Understanding the impacts and outcomes of these threats is critical in defining effective short and long term strategies and actions to minimize the negative impacts of a changing climate and from specific climate-related events.

This report is a preliminary presentation of the assessment of specific climate-related risks in Kyrgyzstan. The report focuses on defining the impacts of: Climate-related disasters on lives and livelihoods, and, Climate factors on crop production and livelihoods.

A separate commissioned report reviews the relation between projected future water availably and food supplies in Kyrgyzstan. These results presented in this report demonstrate the range of climate-society links that can be assessed using the process set out in the **Climate Risk Assessment Guide – Central Asia [2]**. The assessment results are presented in separate sections of the report, with a single conclusion and set of recommendations.

The **Climate Risk Assessment Guide – Central Asia** was developed by the Central Asia Climate Risk Assessment Project managed by Camp Alatoo, based in Bishkek, Kyrgyzstan, and UNDP's Central Asia Climate Risk Management Program, based in Almaty, Kazakhstan. The project was funded by Climate and Development Knowledge Network[2] through a grant to CAMP Alatoo.

The **Guide** is designed for use in Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan and should be applicable in countries with similar socio-economic characteristics. Further details on the project can be found at http://camp.kg and http://www.ca-crm.info.

The materials in this report are provided as input into a broader climate risk profiling effort for Kyrgyzstan under UNDP's Central Asia Climate Risk Management Program. Work on climate change impacts in Kyrgyzstan related to health has been done by the Kyrgyz Ministry of Health and the World Health Organization and available as **Assessment of the Impact of Climate Change on the Health of the Population of the Kyrgyz Republic** [5]. Given the detail of the Ministry of Health report, an assessment of health-climate issues is nor duplicated in this report.

The **report** draws on the **Second National Communication of the Kyrgyz Republic to the UN Framework Convention on Climate Change** [3](see **Section 5**, below). The results in this report build on the national level assessment provided on the **Risk Assessment for Central Asia and Caucasus: Desk Study Review [4]**, and deepens the understanding of climate risks and impacts at and below the national level. Specifically, where data is available, the **report attempt to** define climate related impacts and risk at the Oblast level.

The assessment was conducted by the Central Asia Climate Risk Assessment project team (see **0** for team members). Work on the assessment began in mid-2012 and was largely implemented through a series of technical team meetings in Issyk Kul and Bishkek, Kyrgyzstan and Almaty, Kazakhstan with the draft report issued at the end of March 2013, and a revision issued in August 2013.[3]

The baseline **Kyrgyzstan Climate Risk Profile** [1] report and other project documentation are available at the National CRM Project in Kyrgyzstan. The results provided in this report are expected to be revised as new information on climate and climate-related hazards and impacts and outcome are available.

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[2] The Climate and Development Knowledge Network ("CDKN") is a project funded by the UK Department for International Development and the Netherlands Directorate-General for International Cooperation (DGIS) and is led and administered by PricewaterhouseCoopers LLP. Management of the delivery of CDKN is undertaken by PricewaterhouseCoopers LLP, and an alliance of organisations including Fundación Futuro Latino americano, INTRAC, LEAD International, the Overseas Development Institute, and South-South-North.

[3] A preliminary presentation of the assessment process and was made at the Central Asia Regional Risk Assessment annual meeting in Almaty in October, 2012

3. Process

The assessment used the process set out in the **Climate Risk Assessment Guide – Central Asia [2]**. The process set out in the **Guide** considers both short term climate risks (e,g,, the impact of. droughts and flooding) and longer term risks related to a changing climate.

As permitted by the data and resources available, the process seeks to define the impacts of climate on human lives and livelihoods. This focus is based on the understanding that actions to address climate risks will take place when those who are at risk understand the risks they face in terms of impacts on their lives and livelihoods.

The risk assessment process used in this report involves:

1. **Defining the correlation between climate-related hazards and temperature or precipitation**. The results indicate whether specific climate hazards are tightly or loosely related to climate and trends.
2. **Defining impacts of climate events in terms of reported damage**. The results indicate the magnitude of climate-related disasters expressed as reported damage in US Dollars converted from Kyrgyz Som.
3. **Defining the impacts of climate events on livelihoods**. The results indicate the magnitude of livelihoods impacts of on human health, financial conditions, social interactions, access to natural resources and political support to address the impacts of climate events. As data on disaster impacts in these areas are difficult to access, this element of the assessment uses a Delphi approach, as described in the **Guide**.
4. **Defining the risk of climate events.** This risk calculation is based on the ratio between the cost of damage done by climate events and the scoring of livelihoods impacts.
5. **Defining possible future damage, livelihoods and risk outcomes**. These projections of outcomes are based on a set of scenarios with impacts projected over a specific period of time. For climate-related disasters, the time period is 21 years, while for the precipitation and crop production assessment, both 21 year and 80 decade (to 2100) have been used. These results provide a basis for considering strategies and actions to be taken to address climate impacts and outcomes.
6. **Defining the perceptions of those at risk to climate-hazard events and their willingness to address these risks.** The results indicate the:

    a. Degree of agreement between the expert-based assessment results (points 1 to 4 above) and local concerns, and

    b. Degree to which those at risk are willing to invest in the reduction of specific risks.

These results aid in understanding the differences between expert-based assessments and perceptions of climate that need to be bridged in addressing climate impacts. The results also help understand the degree to which affected populations are willing to address climate and other risks.

The report concludes with recommendations on risk management actions for each climate-related hazard assessed as well as a summary of limitations arising from the assessment process.

Note that the report does not assess the impact of climate-related risks on human life. While mortality data is available for disasters, the valuation of human life, and the lack of mortality data for other, longer term, climate risks, limits the utility of incorporating mortality into the assessment process at this stage.

4. Country-Level Climate Overview[4]

Kyrgyzstan is expected to experience considerable economic loss, humanitarian stresses and environmental degradation due to climate variability and climate change impacts. The expected impacts of a changing climate include:

a. An increase in mean annual temperature of 4.6°C by 2100[5].

b. Changes in rainfall patterns, with an average increase during winter by 13-27%, but a decrease during summer by 25-38%, by 2100[6].

c. An increase in the intensity and frequency of extreme weather events, including heat waves, extreme cold days and heavy rainfall.

d. An increase in climate-related disasters, including floods, mudflows, droughts and landslides.

Kyrgyzstan's economic development is susceptible to climate-related disasters. This situation is expected to worsen in the future. Disasters affecting Kyrgyzstan are a combination of rapid (e.g., landslides and mudslides) and slow onset (such as reduced glacial melt) events. Climate-related disasters cost the country an estimated $US 6.7 million per year from 2000 to 2011.[7] If disaster damage increases at the rate of population growth (1.1% per year), a conservative assumption, disaster damage from climate-related disasters could total on the order of $US 156 million by 2032.[8] Additional impacts are noted in **Table 1**, below.

Central Asia is said to suffer an "adaptation deficit" due to socio-economic factors and the Soviet legacy of environmental mismanagement.[9] According to the **Adapting to Climate Change in Europe and Central Asia**[10] report, Kyrgyzstan is ranked as the third most vulnerable country to climate change impacts in Central Asia, largely due to the country's high sensitivity sub-index within an overall index covering:

1. *Exposure:* measuring the strength of future climate change compared to today's natural variability,

2. *Sensitivity:* based on indicators likely to exacerbate the climate change impacts, such as renewable water resources per capita, the contribution of agriculture to the economy and share of electricity derived from hydropower[11], and,

3. *Adaptive capacity*: determined by combining social, economic and institutional measures.

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4 Based on documentation developed by UNDP's Central Asia Climate Risk Management Program for Kyrgyzstan.
5 Second National Communication to the UN Framework Convention on Climate Change (2009), Republic of Kyrgyzstan.
6 Second National Communication to the UN Framework Convention on Climate Change (2009), Republic of Kyrgyzstan.
7 See Section VII. C of this report.
8 See Section VII. I of this report.
9 Adapting to Climate Change in Europe and Central Asia (2009), World Bank.
10 See Footnote #14.
11 A measure of overall quality of national infrastructure and the % of the population over 65 were included in the sensitivity sub-index.

Table 1

Climate-Related Changes and Impacts

Increase in Temperature	Increase in glacial melting rates, resulting in increased river flow in summer causing floods and soil erosion; Increase in outbreaks of agricultural pests; Increase in land degradation; Decrease in agricultural productivity; Increase in the extent of arid and semi-arid areas; Expansion of infectious animal diseases and transfer of from sheep and cattle to poultry and pets; Decrease in biodiversity.
Changing Rainfall Patterns	Increase in frequency and duration of droughts; Increase in number of flood events; Changed seasonal river flow patters; Decrease in water volume in catchments and reservoirs; Decrease in agricultural productivity; Decrease in livestock productivity; Increase in extent of arid and semi-arid areas; Increase in infectious human diseases (exacerbated by the increase in temperature), such as enteric infections, tropical fevers, parasitic diseases and malaria[12].
Extreme Events Heat Waves Intense Rainfall	Increase in the frequency of heat waves Decrease in water supply and quality; Decrease in grassland vegetation; Decreasing livestock productivity, particularly sheep;[13] Increased incidence of human diseases, such as ischemic heart diseases in elderly people; b. Increase in intense rainfall events Increase in floods, avalanches, mudflows, glacial lake bursts; Increase in soil erosion & landslides;[14] Increase in river bank erosion; Damage to infrastructure, *i.e.* hydroelectric reservoirs; Pest outbreaks.

The **First** and **Second National Communications**[15]and the **National Capacity Self-Assessment for Global Environment Management** project[16] for Kyrgyzstan identified agriculture as being among the most vulnerable sectors to the impacts of climate change. Furthermore, the **National Communications** noted that climate change is likely to have a marked effect on the frequency and intensity of climate-related disasters (such as floods, mudflows and landslides).

The impact of climate variability and change on water resources is likely to affect other sectors of the economy, including the hydropower. Kyrgyzstan, with approximately 30% of the region's water resources, is one of the main suppliers of water in Central Asia. Rapid glacial melting is adversely affecting water supply and quality in Kyrgyzstan and Central Asia. Climate models predict a 64-95% reduction in Kyrgyzstan's total glacial area by 2100[3], and an increase in river flow by 10% in summer in certain parts of the country over the next 20 years. Glacier surface area in Kyrgyzstan has

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[12]The rate of such diseases is already 30% higher in the southern vs. northern parts of the country due to a much warmer climate (**First National Communication of The Kyrgyz Republic Under the Un Framework Convention on Climate Change** (2002), Ministry of Ecology and Emergencies of the Kyrgyz Republic).

[13] From 1990 to 2000, studies showed a decrease in the number of sheep and goats from 10 million to 3.8 million due to heat waves (**Climate Change Impacts – Central Asia** (2009), IFAD).

[14] In the last decade, 39 people have been killed by landslides in the Uzgen District alone in Kyrgyzstan according to UNDP.

[15] [3] and [7].

[16] See http://www.thegef.org/gef/sites/thegef.org/files/documents/document/ncsa-kyrgyzstan-cc-ap.pdf.

already decreased 19.8% from 1970-2000 and observations of the Tien-Shan Mountains[17] indicate a permanent shrinking of glacier areas [6].

Continued rapid glacial melting and increased evaporation due to increasing temperatures is likely to lead to a decline in water supply in certain parts of the country. This will also result in water shortages in the other Central Asian countries due to the regional interdependence of water resources. The sustainability of the hydropower sector is also of concern, as water supplies are likely to be compromised by climate impacts which will also aggravate pasture degradation and increase erosion.

Climate variability and change impacts effects in Kyrgyzstan are expected to further threaten human security and economic development, which are already threatened by:

- Impoverishment, given that one third of the population live below the absolute poverty line, with 37% below this line in rural areas (2009 estimates)[8], and
- Insufficient basic social services.

Kyrgyzstan is facing serious challenges in achieving Millennium Development Goals (MDGs), particularly MDG 6 (combating HIV/AIDS, malaria and other diseases) and MDG 7 (ensuring environmental sustainability). Addressing these MDGs is increasingly difficult as the climate changes.

Kyrgyzstan has a number of programs and projects targeting different climate impacts and risks, including the:

- Inter-Ministerial Commission to Prevent and Liquidate Emergency Situations, established in March 2006.
- UNDP-supported Disaster Risk Management Programme.
- Intergovernmental cooperation with the Swiss government on Awareness and Capacity Building of Integrated Local Risk Management in Kyrgyzstan; and
- National Committee on Climate Change Consequences, which has been developing a national climate change adaptation strategy for Kyrgyzstan.

[17] Glaciers of the Tien Shan Mountains are reported to have been shrinking over the past 50 years, and at an accelerated pace over the past two decades [9].

5. Second National Communication

The Second National Communication of the Kyrgyz Republic to the UN Framework Convention on Climate Change [3] provides a comprehensive assessment of the expected impact of projected changes to Kyrgyzstan's climate based on climate models. The Communication includes considerable background on climate features and conditions in Kyrgyzstan, a sector-by-sector review of current conditions and expected impacts under different scenarios and mitigation measures and options.

To a certain degree, the work contained in the **Communication** overlaps with work done for this **Report**. However, the **Report** attempts to consider climate risks at the sub-national level (i.e., for climate-related disasters) while also developing assessments in a way that the results can be compared despite different timeframes. In these ways, the **Report** deepens specific understandings of climate-related issues defined in the **Communication** as well as to frame-out mechanisms through which the expected impacts can be managed. Further, the **Report** contains information which is more current than in the **Communication**.

6. Cross-Cutting Issues[18]

As indicated in the **Guide**, cross-cutting issues (e.g. gender, age, health status) are important to understand climate impacts and risks and defining risk management options. A background report on gender issues was commissioned for the **Report** [10]. The report notes that some disasters (e.g., landslides) have disproportionally affected women in the past.

Several factors have contributed to greater levels of climate-related risks for females in Kyrgyzstan include, as elaborated below.

- Their presence in hazard prone areas, e.g., time spent in houses located in flood, mudflow or landslide hazard zones.
- The greater overall proportion of females than males in rural areas due to labor outmigration, increasing proportional exposure to disasters.
- Changes in work patterns, particularly increased involvement in gardening, field labor, and pasturing livestock. These changes have been triggered by male rural outmigration resulting labor shortages and led to an increased need for the remaining females to assure their own livelihoods support through expanded work patterns.

Changes in the type and location of tasks that women undertake, often as a result of male-migration, has increased the presence of women in hazardous locations where they would not commonly be in the past. For instance, an increased involvement of females in herding places them more often in locations subject to mud flows or avalanches than in the past.

In terms of disaster impacts, the **Report** assessed livelihoods impacts for the general population and for females for each Oblast and for each type of disaster. In terms of disaster-related climate events, the assessment indicated

- A higher level of livelihood impacts on females in Osh Oblast for all disasters when compared to the general population.
- A lesser impact for females for landslides in Talas, Chui, Naryn and Issyk Kul Oblasts.
- A greater impact for females from landslides in Osh and Jalal Abad, and for snowfall in Talas, Naryn and Issyk Kul Oblasts, when compared to the assessment for the whole populations in each Oblast.

See **Section 7.5**, **Livelihoods Impacts of Climate-Related Disasters**, for additional information.

Gender-disaggregated data in disaster impacts was not available, and a differential assessment of risk could not be performed. At the same time, the documented challenges faced by women in terms of access to a diversified livelihoods system, socially-defined roles (e.g., for child care and household tasks) and greater proportion of females in at risk populations, indicate that females could be disproportionally, affected by climate risk in the future. Further research into these issues is required.

When considering the livelihood impacts of climate conditions on crop production, the assessment results indicate that females experience greater impact in:

- Jalal Abad and Osh Oblast, due to higher impact scores for financial, social and natural capitals
- Naryn, for higher social and natural capitals impacts, and,
- Batken, for higher social capital impacts.

No cases were identified where females were less impacted than the general population.

[18] "Environment" is normally considered a cross-cutting issue. As climate is inherently an environmental issues a separate discussion of environment is not included in this report.

The assessment of perceptions of climate-related hazards disaggregated responses by gender (see Section 7.7.8 Local Climate Change Risk Perception in the Suusamyr Valley). In summary,

- Male and female respondents agree that winters have been longer, livestock deaths have increased, livestock disease has increased, water supply problems have increased. This agreement may be due to the cross-gender nature of these impacts, affecting family food security and reflecting common use, as in the case of water for agriculture and household uses (i.e., the uses are different but there is need for the same resource.
- Male and female respondents did not agree on perceived changes to avalanches, glacial melting, soil erosion, pasture degradation, agricultural pests. This result may be due to different exposures to these hazards.
- Females indicate a considerably greater change in respiratory diseases when compared to males. This result may be due to the greater attention which woman respondents pay to child health.
- 71% of women respondents and 61% of men respondents indicated an intent to spend funds on other than climate risk mitigation measures when asked how they would spend $US 500, indicating a lower priority given to these measures by females and males. This result may be largely due to the lower perceived threat posed by climate changes when compared to other threats to survival.

See the background report on gender issues was commissioned for the **Report** [10] for more details on the gender issues.

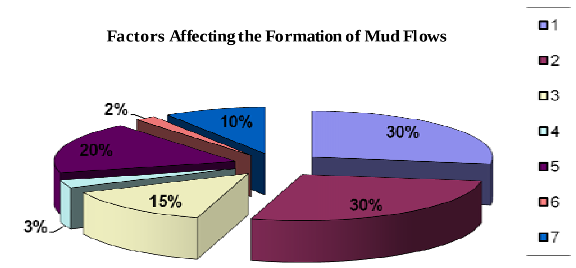
Specific data on climate-relate risks on health status and age was not available in disaster impact data. While generalizations can be made, a more useful approach over the long term is to investigate age and health status links to climate risks using indicative or deductive methods to define Kyrgyz-specific parameters and risk management options.

7. Results

7.1. Climate-Disaster Correlations

7.1.1. Overview

This section focuses on the degree of correlation between extreme climate events (disasters) and weather conditions. There is an expectation that climate factors, particularly precipitation, contribute to a significant degree to floods and flash flooding[19], avalanches, storms and hail and heavy snow sand to a lesser degree to landslides. Work by Sergey Erokhin, suggests that precipitation is a contributing but not determinant factor in triggering climate related hazards (see Factors Affecting the Formation of Mudflows, above) [11].



1 – Precipitation, 2 – Geology, 3 - Hydrogeology, 4 - Seismic Activity, 5 – Geomorphology, 6 - Human Factors, 7 - Mountain Lake Outbursts

Further to Erokin's analysis, land use, including the location of settlements, is often identified as a critical issue defining the impact of climate-related hazards. Defining the key factors that influence climate risk impacts is critical to defining strategies and measures to address these impacts.

To assess the possible link between precipitation and the five types of climate-related disasters noted above, a simple correlation between precipitation totals and number of events was developed for the seven Oblasts in Kyrgyzstan. The degree of correlation was determined by:

1. Establishing the average level of precipitation and disaster events for the 2000-2011 period.

2. Comparing the actual level of precipitation and disaster events against these averages, as percent of the average, for each year.[20]

3. Subtracting the percent of average disasters from the percent of average precipitation for each year.

The closer the difference between the two percentages, the closer the expected correlation between level of precipitation and number of disasters.

The period of analysis for:

- Floods and flash floods and landslides, was January to June each year, as this is the period when these events are understood to be most common.
- Avalanches and heavy snow was October of one year to March of the next as this is the period when these events are most common.
- Storms and hail was for both the total calendar year and for January to June of each year as these events can occur during any part of the year, but may be more likely in the first half of a year.

The results of this analysis are presented below.

[19] Given the physical processes involved, the hazard mud flow is included under Floods and Flash Floods in the report.
[20] The year 2005 was excluded due to the lack of data on disasters.

7.1.2. Batken Oblast

As indicated in the following **Table 2** and **Chart 1**, there is no clear correlation between recorded precipitation totals and disaster events for the timeframes analyzed. Further analysis, for shorter timeframes (e.g., one or two months) may indicate greater correlations for floods and flash floods, but the number of recorded events for other disasters (average annual events range from 0.4 to 1.1) are likely too small for any meaningful analysis.

Table 2

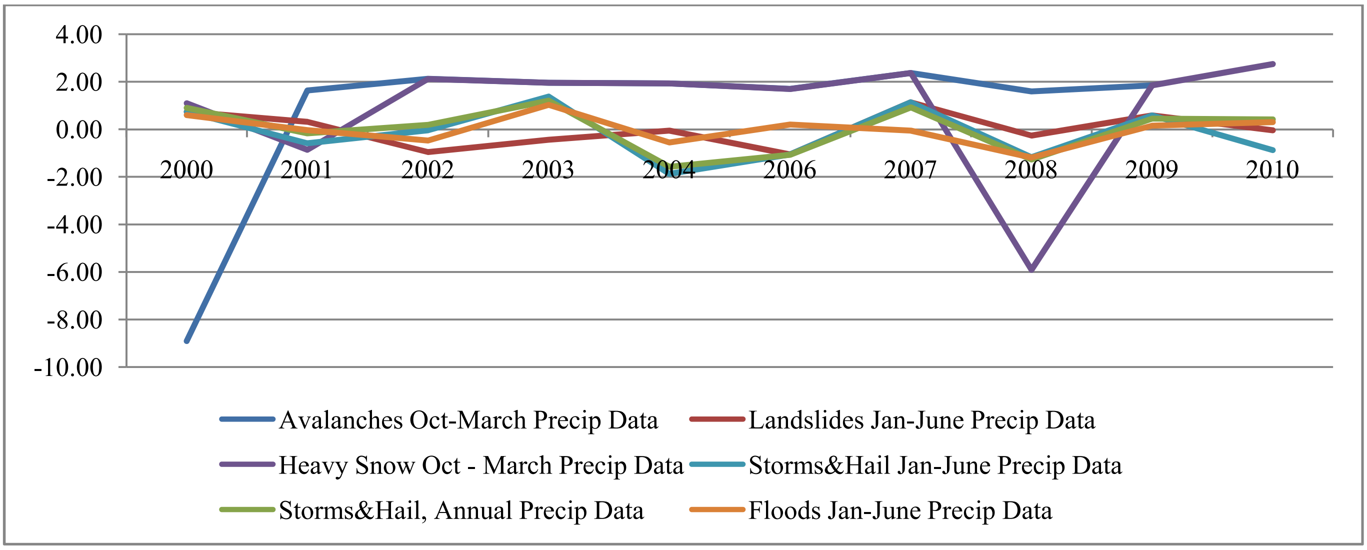
Degree of Correlation Between Precipitation and Disaster Events – Batken Oblast

Annual % of 10-year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	0.60	-0.03	-0.47	1.03	-0.55	0.20	-0.06	-1.18	0.16	0.30
Landslides, Jan-June Precipitation Data	0.74	0.32	-0.95	-0.44	-0.05	-1.05	1.14	-0.26	0.59	-0.04
Avalanches, Oct-March Precipitation Data	-8.72	1.91	2.48	2.29	2.26	1.99	2.77	1.86	2.17	2.75
Heavy Snow, Oct - March Precipitation Data	1.28	-0.59	2.48	2.29	2.26	1.99	2.77	-5.64	2.17	2.75
Storms&Hail, Jan-June Precipitation Data	0.74	-0.59	-0.04	1.38	-1.87	-1.05	1.14	-1.17	0.59	-0.87
Storms&Hail, Annual Precipitation Data	0.90	-0.17	0.19	1.20	-1.57	-1.07	0.92	-1.27	0.45	0.42

Chart 1

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 – Batken Oblast



7.1.3. Osh Oblast

Table 3 and **Chart 2** indicate that, with the available data and analysis, there is no clear correlation between recorded precipitation totals and disaster events for the time-frames analyzed. Further analysis for more focused time frames (e.g., two-three months) may indicate a correlation for floods and flash floods, landslides and avalanches, but the number of recorded events for heavy snow (average of 1 event per winter) or storms/hail (average of 2 events per year) are likely too small for further meaningful analysis.

Table 3

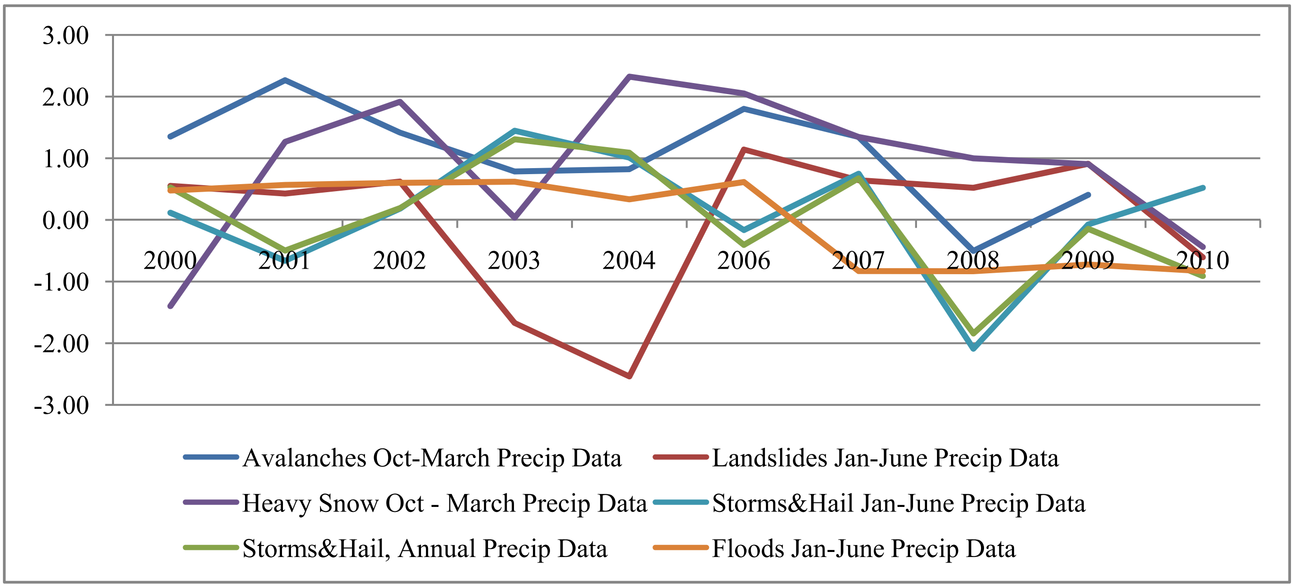
Degree of Similarity Between Precipitation and Disaster Events – Osh Oblast

Annual % of 10-year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	0.48	0.57	0.60	0.62	0.33	0.62	-0.83	-0.83	-0.72	-0.83
Landslides, Jan-June Precipitation Data	0.55	0.43	0.62	-1.67	-2.54	1.14	0.64	0.52	0.91	-0.61
Avalanches, Oct-March Precipitation Data	1.35	2.27	1.42	0.78	0.82	1.80	1.34	-0.50	0.41	-0.69
Heavy Snow, Oct - March Precipitation Data	-1.40	1.27	1.92	0.03	2.32	2.05	1.34	1.00	0.91	-0.44
Storms&Hail, Jan-June Precipitation Data	0.12	-0.66	0.18	1.45	1.01	-0.16	0.75	-2.09	-0.07	0.52
Storms&Hail, Annual Precipitation Data	0.53	-0.50	0.19	1.31	1.09	-0.41	0.68	-1.84	-0.14	-0.91

Chart 2

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 – Osh Oblast



7.1.4. Jalal Abad Oblast

Table 4 and **Chart 3**, below, indicate a possible occasional correlation between floods and flash floods in 2000, 2007 and 2009. No correlations beyond single years can be identified for other disasters. Further analysis of storms/hail and heavy snow does not appear useful as the average number of events per year is 1 and 1.7, respectively. Analysis of shorter periods of time (e.g., 2-3 months) may be fruitful for floods and flash floods, landslides and avalanches (average events per year 21.6, 6.1 and 9, respectively).

Table 4

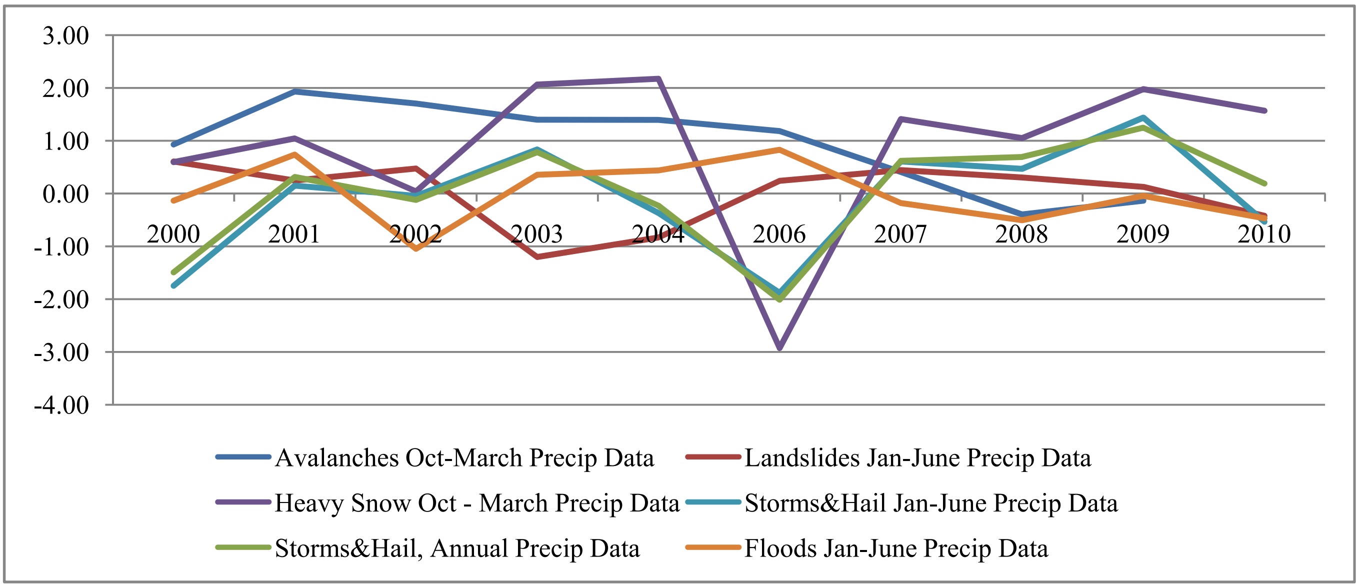
Degree of Similarity Between Precipitation and Disaster Events – Jalal Abad

Annual % of 10 year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	-0.13	0.74	-1.04	0.36	0.44	0.83	-0.18	-0.50	-0.04	-0.46
Landslides, Jan-June Precipitation Data	0.61	0.25	0.48	-1.20	-0.83	0.24	0.44	0.31	0.13	-0.42
Avalanches, Oct-March Precipitation Data	0.93	1.93	1.71	1.40	1.40	1.19	0.41	-0.39	-0.13	0.57
Heavy Snow, Oct - March Precipitation Data	0.60	1.04	0.04	2.07	2.17	-2.92	1.41	1.05	1.98	1.57
Storms&Hail, Jan-June Precipitation Data	-1.75	0.15	-0.04	0.84	-0.37	-1.88	0.61	0.47	1.44	-0.53
Storms&Hail, Annual Precipitation Data	-1.49	0.31	-0.12	0.78	-0.23	-2.01	0.62	0.69	1.25	0.19

Chart 3

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 –Jalal Abad Oblast



7.1.5. Naryn Oblast

As presented in **Table 5** and **Chart 4,** the analysis suggests a possible correlation for floods and flash floods for 2001, 2004 and 2009. Even single year correlations are not evident for other disasters except for landslides in 2009. Further analysis is not likely to yield better correlations as the number of average events per year as small, ranging from 0.8 to 2.2.

Table 5

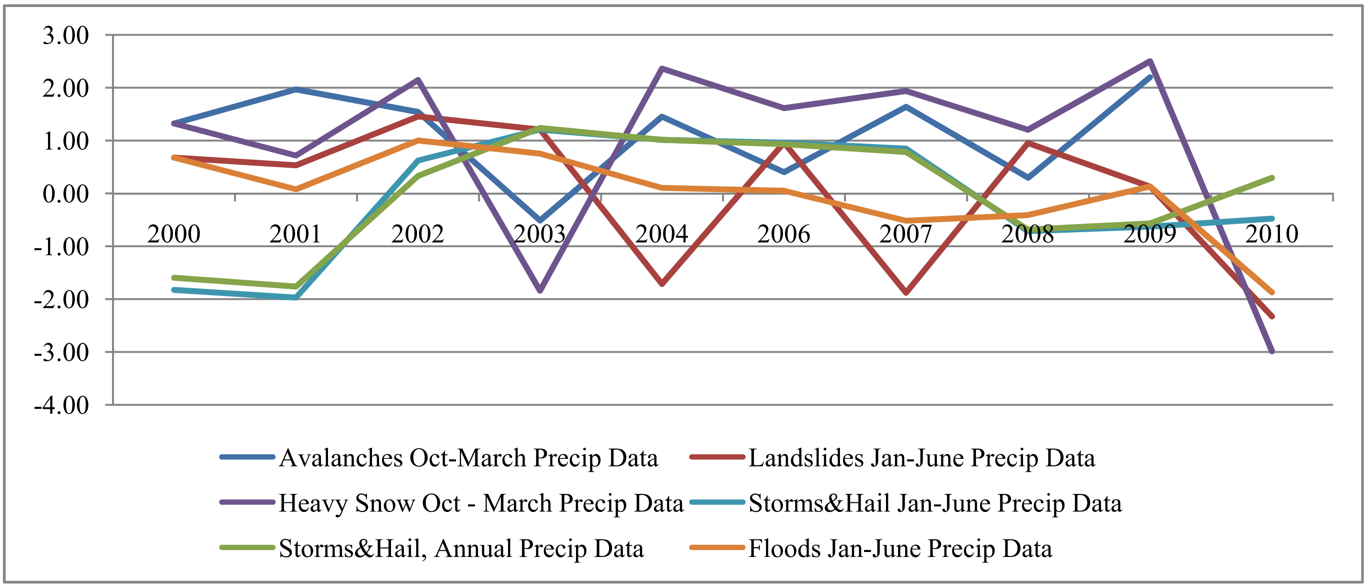
Degree of Similarity Between Precipitation and Disaster Events – Naryn Oblast

Annual % of 10 year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	0.68	0.08	1.00	0.75	0.10	0.05	-0.51	-0.41	0.13	-1.87
Landslides, Jan-June Precipitation Data	0.68	0.53	1.46	1.21	-1.71	0.96	-1.88	0.95	0.13	-2.33
Avalanches, Oct-March Precipitation Data	1.32	1.97	1.24	-1.72	1.00	-0.20	1.49	-0.16	2.05	-1.32
Heavy Snow, Oct - March Precipitation Data	1.32	0.72	2.15	-1.84	2.36	1.61	1.94	1.21	2.50	-2.98
Storms&Hail, Jan-June Precipitation Data	-1.82	-1.97	0.62	1.21	1.01	0.96	0.85	-0.71	-0.63	-0.48
Storms&Hail, Annual Precipitation Data	-1.60	-1.76	0.33	1.24	1.02	0.94	0.79	-0.68	-0.57	0.30

Chart 4

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 – Naryn Oblast



7.1.6. Issyl Kyl Oblast

As indicated in the **Table 6** and **Chart 5**, below, there are at best, only single year correlations floods and flash floods and landslides. In all cases, the average number of events per year is low (1.1 to 5.1), which likely reduces the value of further efforts at establishing correlations.

Table 6

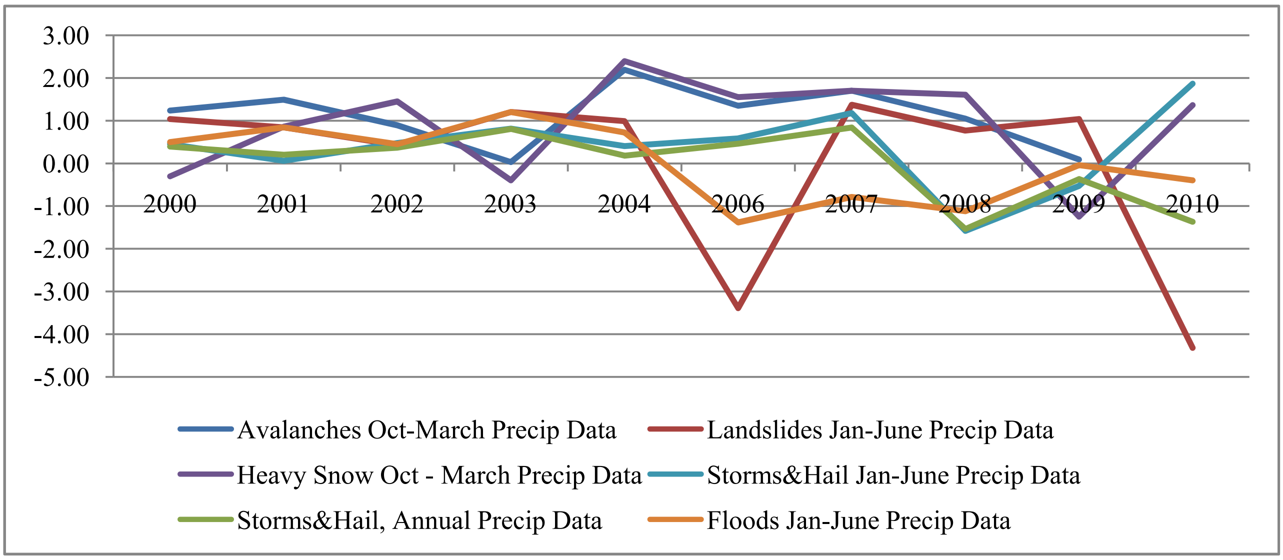
Degree of Similarity Between Precipitation and Disaster Events – Issyl Kyl Oblast

Annual % of 10-year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	0.50	0.85	0.45	1.20	0.72	-1.38	-0.79	-1.12	-0.04	-0.40
Landslides, Jan-June Precipitation Data	1.04	0.85	0.43	1.20	0.99	-3.39	1.37	0.77	1.04	-4.32
Avalanches, Oct-March Precipitation Data	1.24	1.49	0.90	0.03	2.19	1.35	1.70	1.05	0.09	-1.06
Heavy Snow, Oct - March Precipitation Data	-0.30	0.86	1.45	-0.40	2.40	1.55	1.70	1.61	-1.25	1.37
Storms&Hail, Jan-June Precipitation Data	0.45	0.06	0.48	0.81	0.41	0.58	1.18	-1.58	-0.53	1.87
Storms&Hail, Annual Precipitation Data	0.40	0.21	0.37	0.81	0.18	0.46	0.84	-1.53	-0.36	-1.37

Chart 5

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 – Issyl Kyl Oblast



7.1.7. Chui Oblast

As indicated in **Table 7** and **Chart 6**, below, there appears to be little correlation between disasters and precipitation in the timeframes covered by the analysis. The exception may be storms and hail at the annual scale, although the number of possible correlations is small. The limited number of average events per year (ranging from 0.6 to 3.9) indicates that further research into correlations mat not be productive.

Table 7

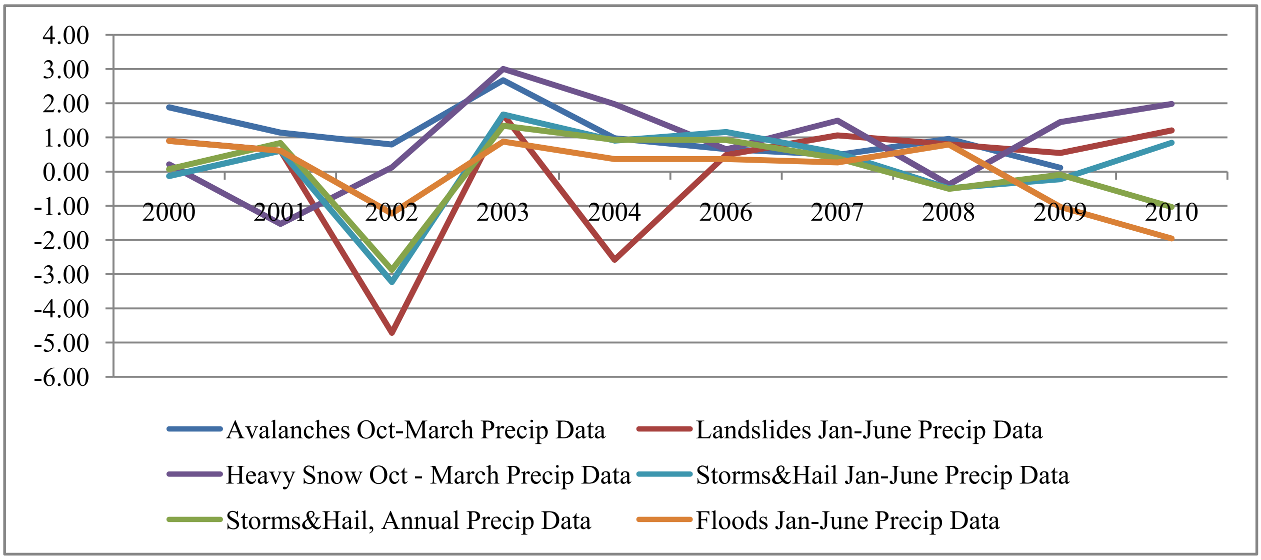
Degree of Similarity Between Precipitation and Disaster Events – Chui Oblast

Annual % of 10-year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	0.90	0.61	-1.22	0.88	0.37	0.37	0.27	0.80	-1.03	-1.95
Landslides, Jan-June Precipitation Data	0.90	0.61	-4.71	1.67	-2.58	0.49	1.06	0.80	0.55	1.20
Avalanches, Oct-March Precipitation Data	1.88	1.14	0.79	2.67	0.98	0.66	0.49	0.96	0.12	-0.69
Heavy Snow, Oct - March Precipitation Data	0.22	-1.53	0.13	3.01	1.98	0.66	1.49	-0.38	1.45	1.98
Storms&Hail, Jan-June Precipitation Data	-0.13	0.61	-3.23	1.67	0.91	1.16	0.55	-0.48	-0.22	0.85
Storms&Hail, Annual Precipitation Data	0.07	0.84	-2.87	1.34	0.93	0.92	0.39	-0.50	-0.09	-1.03

Chart 6

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 – Chui Oblast



7.1.8. Talas Oblast

Table 8 and **Chart 7**, below, indicate a weak likelihood of correlation between the climate-related disasters and precipitation for the timeframes analyzed. No landslides disasters were reported for the 2000-2010 period.

Possible correlation may have occurred for individual years, (e.g., floods and flash floods in 2007, storms and hail in 2000), but there are no clear trends for each disaster or timeframe for several disasters. Given the low number of annual events per year (ranging from 0.3 to 1.5) further analysis is not likely to yield different results.

Table 8

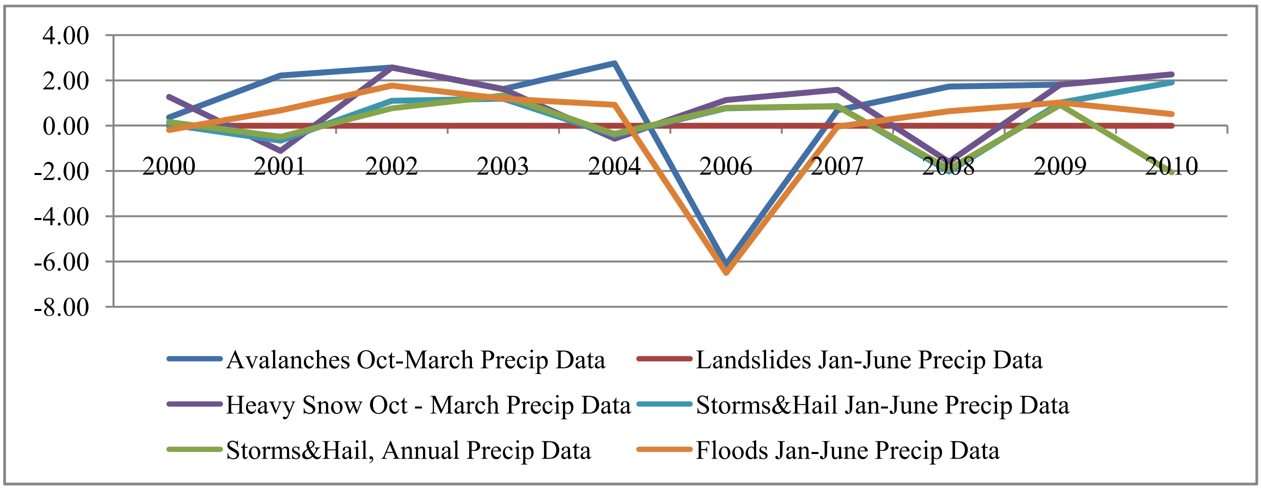
Degree of Similarity Between Precipitation and Disaster Events – Talas Oblast

Annual % of 10-year average disasters subtracted from annual % of 10 year precipitation average.

Disaster and Period of Data Used	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010
Floods and Flash Floods, Jan-June Precipitation Data	-0.19	0.67	1.77	1.19	0.92	-6.50	-0.04	0.64	1.02	0.51
Avalanches, Oct-March Precipitation Data	0.37	2.22	2.57	1.62	2.76	-6.14	0.69	1.74	1.82	1.36
Heavy Snow, Oct - March Precipitation Data	1.28	-1.11	2.57	1.62	-0.58	1.14	1.59	-1.60	1.82	2.27
Storms&Hail, Jan-June Precipitation Data	0.05	-0.66	1.10	1.19	-0.41	0.77	0.87	-2.03	1.02	1.92
Storms&Hail, Annual Precipitation Data	0.16	-0.49	0.77	1.34	-0.37	0.79	0.86	-1.92	0.92	- 2.06

Chart 7

Comparison of Percent Average Precipitation and Percent Average Disasters – 2000-2011 – Talas Oblast



7.2. Precipitation and Crop Production Correlation

This section of the **Profile** summarizes an assessment of the correlation between precipitation (expressed through a Standard Precipitation Index – SPI[21]) and crop production and prices. The use of SPI allows for a more nuanced assessment of precipitation impacts than simply comparing precipitation totals to production or prices.[22]

[21] For more information on SPI http://drought.unl.edu/portals/0/docs/spi-program-alternative-method.pdf.
[22] This section is based on [12] and [13]. Both reports are available from CAMP Alatoo.

For instance, production can be compared to cumulative precipitation over several different ranges of months (e.g., 6, 7, and 8) to identify the best match between production and precipitation. This allows for incorporation of the impact of precipitation that falls during the winter as snow as well as rainfall, providing a more complete assessment of climate conditions.

Two levels of analysis have been undertaken. The first looks at the correlation between SPI, production and prices for wheat for each Oblast in Kyrgyzstan using data from 1991 to 2011. **Table 9** summarizes the results of the analysis. Broadly speaking, there are no strong correlations between SPI and yield per hectare or between SPI and price per ton except for Talas Oblast for SPI-Yield, and Jalal Abad and Osh Oblasts for SPI-Prices.

Table 9

Correlation Between SPI, Yield and Prices

Assessment Period – 1991 to 2011.

Oblast	SPI-Yield Correlation	SPI- Price Correlation
Talas	0.36	-0.45
Chui	-.156	0.191
Issyk Kul	0.14	-0.61
Naryn	0.23	-0.32
Jalal Abad	0.05	0.36
Osh	0.24	0.411
Batken	0.01	0.12

A more detailed correlation assessment was made for wheat, barley, maize, oil crops, potatoes and vegetables produced in Chui and Talas Oblasts. These Oblast are the major production areas for these crops in Kyrgyzstan. Climate links to production are of greatest significance for these two areas, particularly in terms of assessing the future climate impacts.

Table 10, below, presents the results of the SPI and yield correlation analysis for a range of crops and for a range of periods of analysis. The period of analysis begins the stated months before the "End-Month" indicated at the top of each column. These analytical periods allow for considering precipitation (as snow or rain) over a growing season or longer and the outcome of the growing season, as indicated by yield. Blank cells indicate no analysis.

Cells in the table marked in grey indicate a strong correlation between SPI and yield. This correlation is most common for wheat and barley. Presented in another way, changes year-to-year and long term average precipitation are expected to have a direct impact on wheat, barley and other cereal yields in the Chui-Talas Oblasts.

Table 10

SPI- Agriculture Production Correlation – Chui and Talas Oblasts

Results presented as Correlation Coefficient Squared

Assessment Period – 1991 to 2011

Crop and Period of Analysis	End-Month of Analysis									
	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
All Cereals – 6 month period of analysis	0.106	0.166	0.18	0.193	0.165	0.150	0.261			
All Cereals - 7 month period of analysis	0.122	0.140	0.208	0.219	0.225	0.196	0.179			
All Cereals - 8 month period of analysis	0.178	0.137	0.157	0.221	0.234	0.239	0.209			
All Cereals - 9 month period of analysis	0.167	0.194	0.176	0.173	0.242	0.254	0.259			
All Cereals - 10 month period of analysis	0.075	0.128	0.212	0.263	0.260	0.332	0.341	0.343	0.290	0.274
Wheat - 6 month period of analysis	0.180	0.264	0.215	0.224	0.206	0.155	0.257			

Wheat - 7 month period of analysis	0.203	0.222	0.261	0.254	0.255	0.236	0.180			
Wheat -8 month period of analysis	0.283	0.242	0.263	0.295	0.289	0.288	0.266			
Wheat - 9 month period of analysis	0.244	0.324	0.300	0.287	0.323	0.316	0.314			
Wheat - 10 month period of analysis	0.050	0.082	0.219	0.290	0.312	0.348	0.337	0.336	0.300	0.242
Barley - 6 month period of analysis	0.285	0.317	0.402	0.410	0.377	0.348	0.408			
Barley - 7month period of analysis	0.222	0.284	0.380	0.414	0.413	0.378	0.345			
Barley - 8month period of analysis	0.172	0.224	0.299	0.390	0.423	0.424	0.388			
Barley - 9month period of analysis	0.074	0.181	0.274	0.316	0.412	0.444	0.446			
Barley - 10month period of analysis	0.012	0.022	0.122	0.269	0.360	0.460	0.488	0.496	0.428	0.392
Maiz - 6 month period of analysis	0.	0.017	0.027	0.033	0.018	0.027	0.065			
Maiz - 7 month period of analysis	0.	0.	0.020	0.032	0.038	0.023	0.032			
Maiz - 8 month period of analysis	0.015	0 .	0.	0.017	0.028	0.034	0.020			
Maiz - 9 month period of analysis	0.005	0.005	0.	0.	0.015	0.025	0.030			
Oil Crops – 7 month period of analysis	0.	0.002	0.020	0.021	0.026	0.017	0.022			
Potatos - 7 month period of analysis	0.001	0.005	0.	0.003	0.003	0.	0.003			
Vegetables - 7 month period of analysis	0.005	0.004	0.036	0.045	0.051	0.035	0.045			

7.3. Climate-Related Damage Impacts

Disaster damage data from the Kyrgyz Ministry of Emergency Situations (MoES) for 2000-2011[23] was used to define the level of damage experienced from five climate-related disasters: avalanches, floods and flash floods (including mudflows), storms and high winds, hail and heavy snowfall (blizzard). Note that damage data is not disaggregated by gender or age. No analysis by these characteristics was possible.

The eleven-year MoES data set included the number of events by Oblast for each year and the number of events and damage for some events for 2010 and 2011. To establish estimated damage levels for the other eight years, the damage data for 2010 and 2011 were:

- Totalled in Kyrgyz Som of damage per year.
- Converted to US Dollars at the mid-point exchange rate for 2010 and 2011, respectively.
- Averaged, to identify the cost of a single event for each type of disaster.
- Deflated by the annual rate of inflation for each year from 2000 to 2009 (with the exception of 2005, for which there was no event data). Actual damage costs from 2010 and 2011 were used for these years and the 2010 costs were not deflated.

[23] Data for 2005 was not available.

The resulting estimated damage cost per event type per year were then multiplied by the number of events each year for each Oblast to develop an estimate of the total damage caused per year. The results were tabulated per disaster type and per Oblast, as indicated in **Table 11** and **Chart 10**, below.[24]

Table 11

Total Estimated Damage, Climate Events

US Dollars, Adjusted for Inflation, 2000-2011[25]

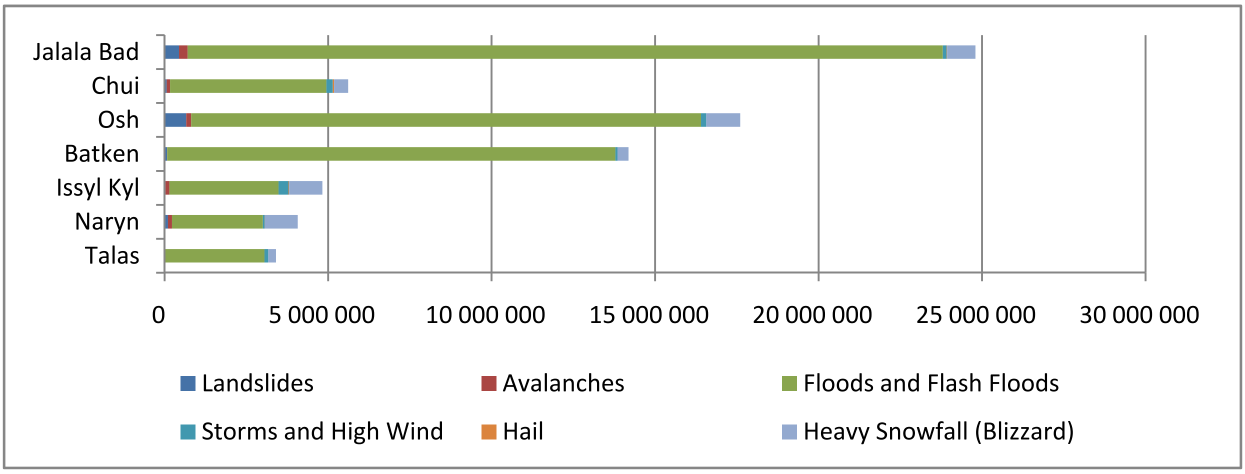
Oblast	**Landslides**	**Avalanches**	**Floods and Flash Floods**	**Storms and High Wind**	**Hail**	**Heavy Snowfall (Blizzard)**	**Total Estimated Damage**
Talas	0	22,164	3,030,756	119,253	0	232,851	3,405,024
Chui	64,045	100,456	4,782,898	194,751	39,190	433,908	5,615,248
Naryn	100,575	124,051	2,778,461	61,484	2,435	1,003,953	4,070,960
Issyk Kul	27,954	116,858	3,339,283	301,746	22,602	1,016,970	4,825,414
Jalal Abad	439,924	262,656	23,095,707	117,396	17,433	862,231	24,795,347
Batken	75,158	916	3,711,638	64,622	0	334,513	14,186,847
Osh	659,752	150,944	15,591,952	165,496	0	1,033,300	17,601,444

The analysis indicates that floods and flash floods are the single greatest cause of climate-related damage (estimated total damage of $US 66,330,696 for the period assessed), with the possible exception of drought, not assessed here.[26] Further, Jalal Abad Oblast appears to be the most affected in terms of damage overall and from floods and flash floods, followed by Osh and Batken. The scale of impacts from floods and flash floods is so significant to overshadow the estimated impacts of any other of the climate-related disasters in Kyrgyzstan, with the possible exception of drought (not assessed here).

[24] Note that this is damage data alone. No data was available on assistance provided, so these numbers likely overstate financial impacts.
[25]Excluding 2005.
[26] MoES data did not include drought, which is more clearly captured in the SPI analysis.

Chart 10

Total Damage by Oblast, US Dollars, 2000-2011



While absolute damage is an important indicator of climate-related outcomes, a more relevant for risk management indicator is the level of damage per capita, indicating how severely climate events are affecting individuals. A calculation of damage per year per capital is provided in **Table 12**, below. The damage data is the same as used in the previous table, with the population for each Oblast based on the annual average population for the period of 2000 to 2011 (excluding 2005). The results are presented in US Dollars per year per person of damage cost.

Table 12

Damage Per Year Per Capita

US Dollars, 2000-2011[27]

Oblast	**Landslides**	**Avalanches**	**Floods and Flash Floods**	**Storms and High Wind**	**Hail**	**Heavy Snowfall (Blizzard)**	**All disasters**
Talas	0.	0.009	1.27	0.050	0.	0.097	1.42
Chui	0.004	0.006	0.27	0.011	0.002	0.025	0.32
Naryn	0.036	0.044	0.99	0.022	0.001	0.356	1.44
IssylKy	0.006	0.025	0.71	0.064	0.005	0.215	1.02
Jalal Abad	0.042	0.025	2.19	0.011	0.002	0.082	2.35
Osh	0.046	0.011	1.09	0.012	0.	0.072	1.23
Batken	0.017	0.	3.02	0.014	0.	0.074	3.12

Based on the cost per person analysis, the level of damage from floods and flash floods is greatest per person in Batken Oblast, followed by Jalal Abad and Talas Oblasts. Thus, while the absolute damage levels are highest in Jalal Abad, the per person burden is greater in Batken. Jalal Abad has the second highest-level of per capita damage for the seven Oblasts. In terms of overall damage per capita, Naryn ranks slightly higher than Talas.

[27] Excluding 2005, for which no data was available.

7.4. Financial Costs of Impacts of Variations of Moisture Availability on Crops

Given the considerable turbulence in the Kyrgyz economy and agriculture sector since 1991, analysis of the financial costs of variations in crop production linked to changes in moisture availability for crops was not prepared for the **Report**. Such analysis, which needs to consider the expansion of cropped areas (including into marginal lands), changes in irrigation systems, prices, inflation, exchange rates and changes in the availability of agricultural inputs (e.g., seeds, fuel, fertilizer, labour) in addition to precipitation and SPI, was not possible within the scope of this assessment. Future work in this area should lead to a better understanding of the relative importance of climate factors in agricultural income beyond yield.

7.5. Livelihoods Impacts of Climate-Related Disasters

Based on the process set out in the **Guide**, a Delphi-based assessment was conducted on livelihood impacts from a range of climate-related disasters for each of the Oblasts in Kyrgyzstan. The assessment team consisted of two women and three men directly knowledgeable of conditions in Kyrgyzstan and with a mixture of social and physical science backgrounds, with another group of six persons (two female) serving as an external reference group, i.e, with more general knowledge of disasters and risks in Kyrgyzstan.

For each disaster and for each Oblast, the assessment considered the impacts on all residents and impacts on females alone. The overall result of the livelihoods assessment is presented in the table below and the following maps. Additional data is available in **Annex B**.

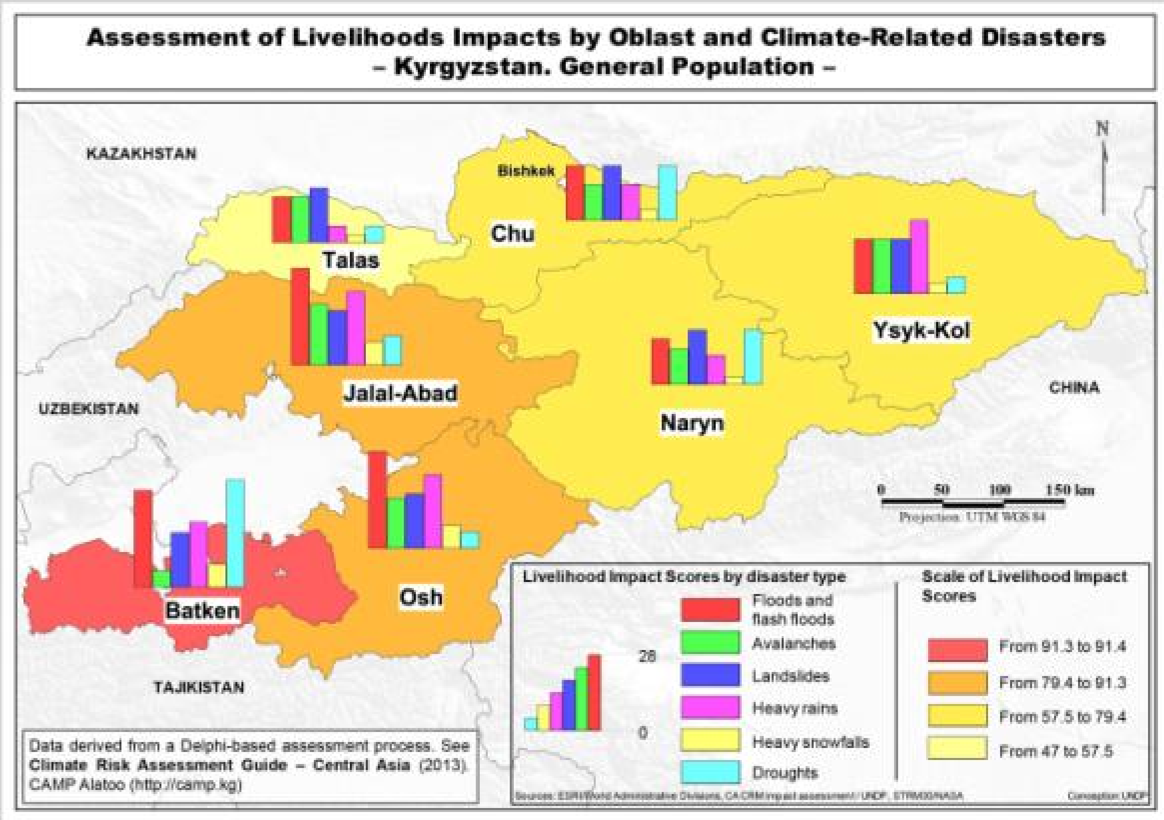
Table 13 Overall Impact of Climate-Related Disasters for Kyrgyzstan

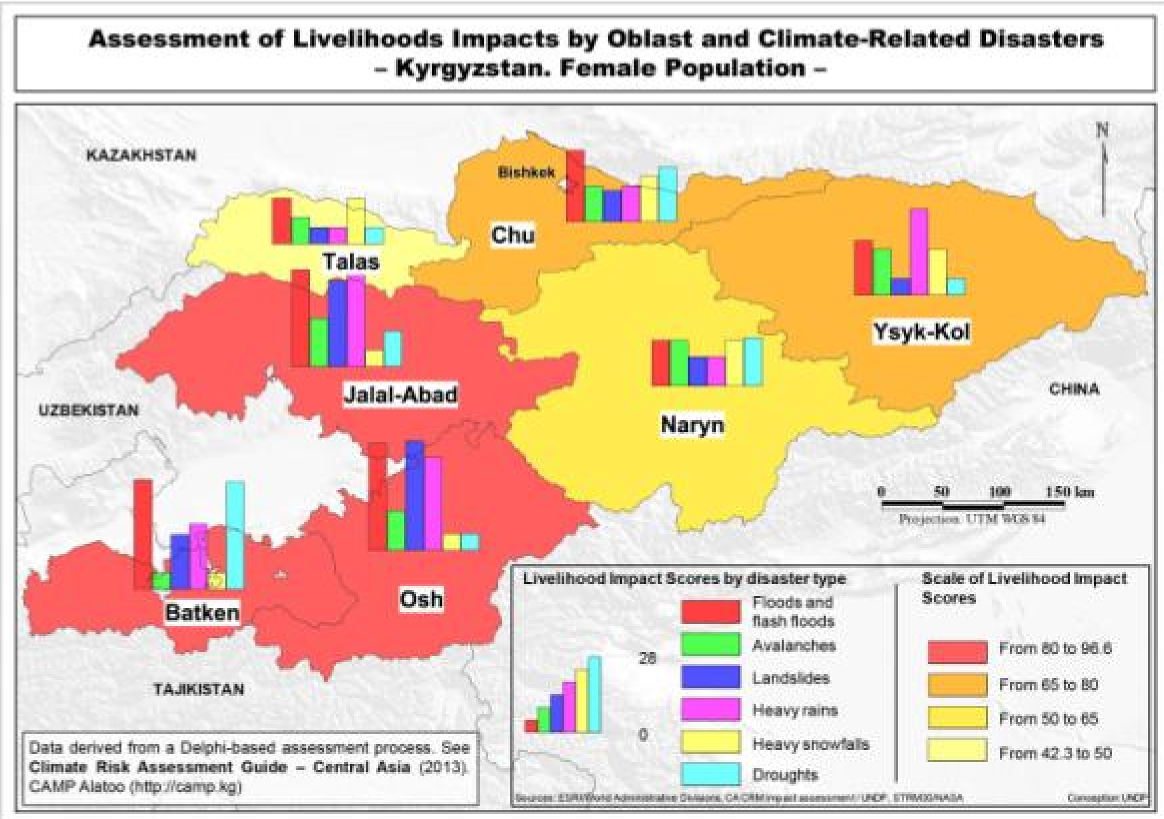
Climate-Related Disasters	Batken Oblast	Chui Oblast	IssykKyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Mudflow	24.25	13.79	13.79	24.25	11.41	24.25	11.41
Avalanche	4.28	9.04	13.79	15.22	9.04	12.84	11.41
Landslides	13.79	13.79	13.79	13.79	13.79	13.79	13.79
Heavy rains/hail	16.17	9.04	18.55	18.55	7.61	18.55	4.28
Snowfall	5.71	2.85	2.85	5.71	1.90	5.71	1.90
Drought	27.11	13.79	4.28	7.61	13.79	4.28	4.28
Total	**91.30**	**62.29**	**67.05**	**85.12**	**57.54**	**79.41**	**47.08**

The livelihoods impact assessment indicates that, for “mudflows” (technically the same as “floods and flash floods” in the damage assessment), the three south-western Oblasts of Jalal Abad, Osh and Batken are considered to have the greatest impact on livelihoods. When all livelihood impacts from the six different types of events are combined, Batken is identified as the most impacted Oblast in Kyrgyzstan.

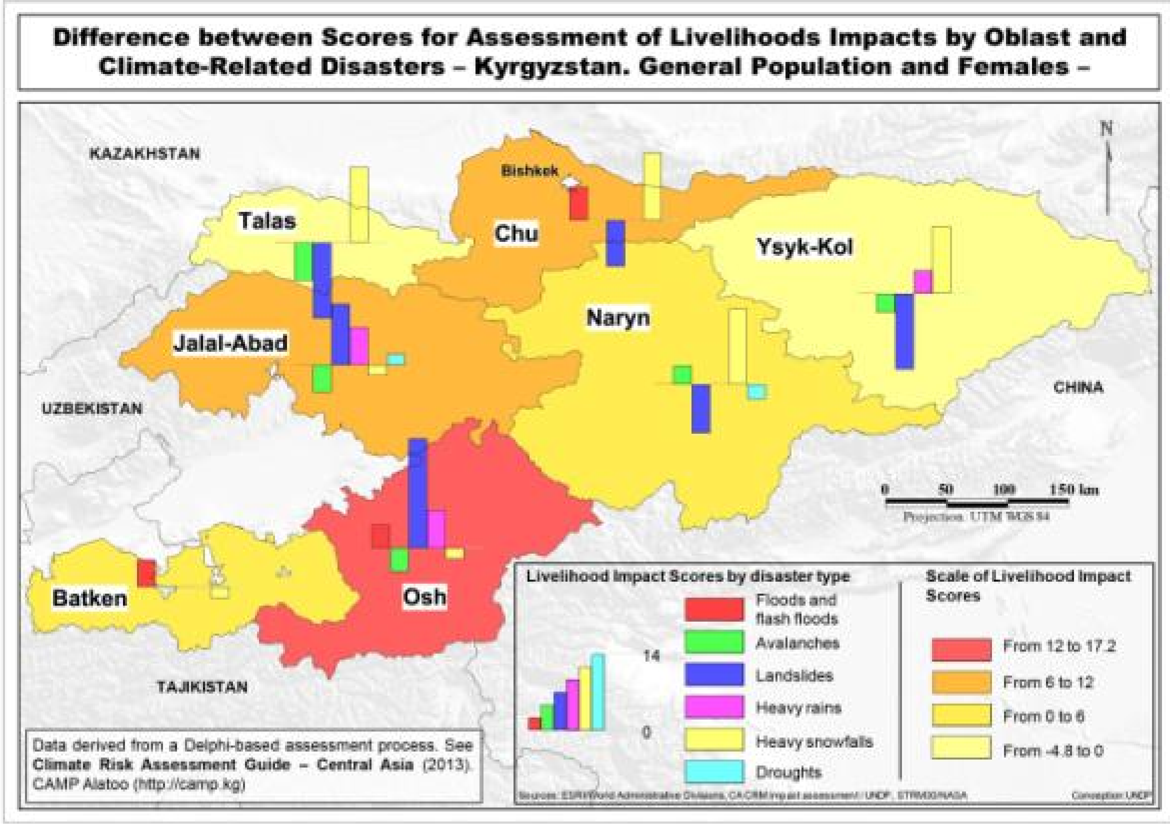
Note that the level of assessment is the Oblast. The level of impact at the District level within an Oblast may be greater or lesser than for the Oblast as a whole.

The following two maps present the level of assessed impact livelihoods for females (principally defined as women and older girls). The first map indicates that, in terms of combined impact of the six types of climate-related disasters, Osh Oblast has a relatively higher score than for Jalal Abad and Batken, principally related to higher scores related to landslides and heavy rains.


Assessment of Livelihoods Impacts by Oblast and Climate-Related Disasters
– Kyrgyzstan. General Population –
KAZAKHSTAN
Bishkek
Chu
Talas
Ysyk-Kol
Jalal-Abad
Naryn
CHINA
UZBEKISTAN
Batken
Osh
TAJIKISTAN
0 50 100 150 km
Projection: UTM WGS 84
Livelihood Impact Scores by disaster type
28
0
Floods and flash floods
Avalanches
Landslides
Heavy rains
Heavy snowfalls
Droughts
Scale of Livelihood Impact Scores
From 91.3 to 91.4
From 79.4 to 91.3
From 57.5 to 79.4
From 47 to 57.5
Data derived from a Delphi-based assessment process. See Climate Risk Assessment Guide – Central Asia (2013). CAMP Alatoo (http://camp.kg)


Assessment of Livelihoods Impacts by Oblast and Climate-Related Disasters
– Kyrgyzstan. Female Population –
KAZAKHSTAN
Bishkek
Chu
Talas
Ysyk-Kol
Jalal-Abad
Naryn
CHINA
UZBEKISTAN
Batken
Osh
TAJIKISTAN
0 50 100 150 km
Projection: UTM WGS 84
Livelihood Impact Scores by disaster type
28
0
Floods and flash floods
Avalanches
Landslides
Heavy rains
Heavy snowfalls
Droughts
Scale of Livelihood Impact Scores
From 80 to 96.6
From 65 to 80
From 50 to 65
From 42.3 to 50
Data derived from a Delphi-based assessment process. See Climate Risk Assessment Guide – Central Asia (2013). CAMP Alatoo (http://camp.kg)

The map immediately below presents the differences between the assessment scores for the whole population and females in each Oblast. Noteworthy are the positive (less impact) differences for females for landslides in Talas, Chui, Naryn and Issyk Kul Oblasts, and negative (greater impact) differences for landslides in Osh and Jalal Abad and for snowfall in Talas, Naryn and Issyk Kul.



7.6. Livelihood Impacts of Climate Factors Affecting Crops

Using the livelihoods impact assessment process set out in the **Guide**, a team of four persons (two male and two female) knowledgeable about crop production in Kyrgyzstan conducted a Delphi-based analysis of the impact of climate factors affecting crop production and livelihoods at Oblast level for the general population, and for females. The assessment process presumed that the most significant large-scale impacts on crop production have been a lack of precipitation (drought) or an excess of precipitation, which could lead to water logging or other impacts.[28]

Chart 10, below, presents the assessment results for the general population. (The left hand scale is the calculated livelihoods impact score as described in the **Guide**.) Similar to the disaster-livelihoods impact assessments, Batken Oblast is ranked highest, followed by Jalal Abad and Osh. However, in contrast to the disaster assessment, Talas ranks as more impacted than Chu or Issyk Kul, indicating possible local factors which influence climate-crop-impact links. Data used for the climate factors/impact assessment can be found in **Annex C**.

[2828] Hail and high winds cause damage to crops, but usually over very small areas relative to areas under cultivation.

Chart 10
Livelihood Impacts of Climate Factors Affecting Crops
(General Population)

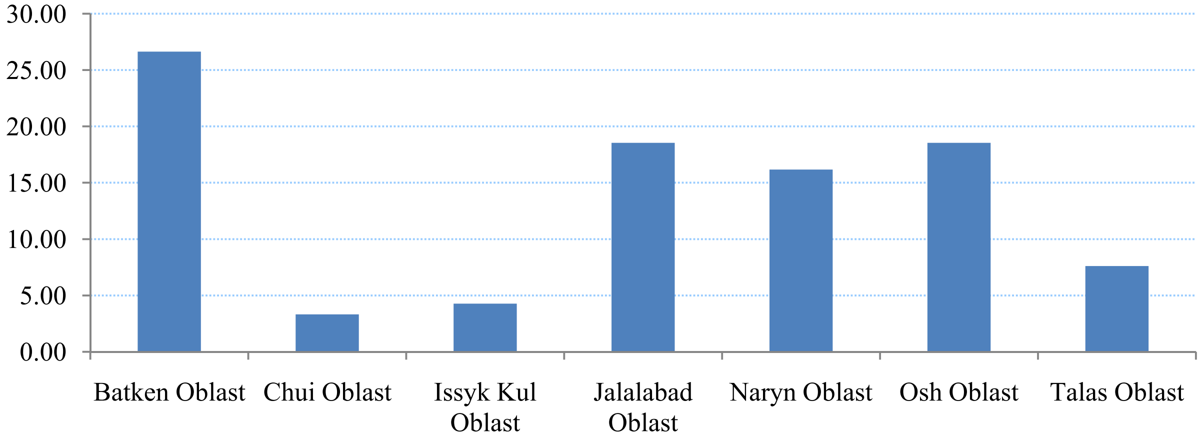


Table 14, below, summarizes the difference between the impact scoring for females and for the general population. The assessment indicates that impacts on females are worse in Jalal Abad and Osh (greatest difference), Naryn and Batken Oblasts. For Jalal Abad and Osh, the difference is attributed to higher impact scores for financial, social and natural capitals, for Naryn, for social and natural capitals and for Batken, for social capital. Unlike for disaster-impacted livelihoods, in no case were females less impacted than the general population.

Table 14

Comparison of Livelihood Impact Scores for General Population and Females for Climate Factors Affecting Crops – Seven Oblasts

	Batken	Chui	Issyk Kyl	Jalal Abad	Naryn	Osh	Talas
General Impact Total Score	26.63	3.33	4.28	18.55	16.17	18.55	7.61
Female Impact Total Score	30.43	3.33	4.28	27.58	21.87	27.58	7.61
Difference Female from General	+3.80	0.00	0.00	+9.04	+5.71	+9.04	0.00

7.7. Risk Calculations – Climate-Related Disasters

As set out in the **Guide**, the damage per year per person and the livelihoods score (damage-livelihood impact pair) are used to define relative risk for each climate-related type of event for each Oblast. As these numbers are not directly combinable, the results for each climate-related event are presented as scatter plots.

The greater distance a damage-livelihood impact pair is from the zero point, the greater the level of risk. The greater a pair is located towards the upper right side of the chart, the greater the overall level of risk. For generally analysis, the scatter diagrams are divided into four quadrants, defined by horizontal and vertical dividing lines based on the mid-point score[29] on each axis for each disaster.

[29]One half the maximum score.

The quadrants are defined as high overall risk (upper right), low overall risk (lower left), livelihood-based risk (upper left) and damage-based risk (lower right). The closer a damage/livelihood pair is to the upper right corner of each quadrant, the greater the level of risk. See the **Guide** for more details on this classification.

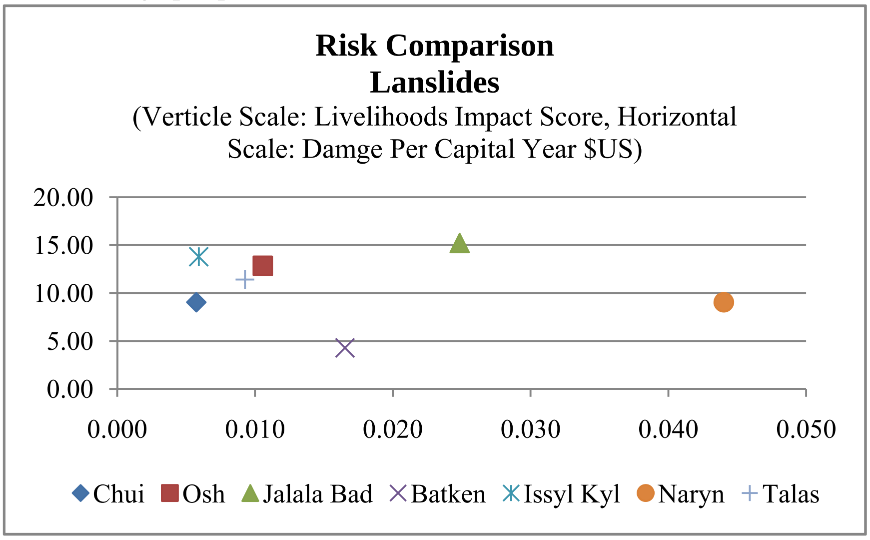
The scatter plots below present the level of risk for five climate-related disasters: Landslides, Avalanches, Floods and Flash Floods, Storms and Hail and Heavy Snowfall, and for all disasters, for each Oblast in Kyrgyzstan. (Damage data on storms and hail were combined to match livelihoods impact assessment results.) The livelihood scores are on the vertical axis and the damage per year per capita in US Dollars on the horizontal axis.

7.7.1. Landslides

The comparison of damage and livelihood impacts indicates that Osh, followed by Jalal Abad and Naryn rank highest for overall risks, while the other Oblasts rank high for livelihood-based risk, except Talas, which has no risk. As the livelihoods impact score is the same for all seven Oblasts, the level of risk depends heavily on the level of damage per person.

Table 15
Landslide Risk

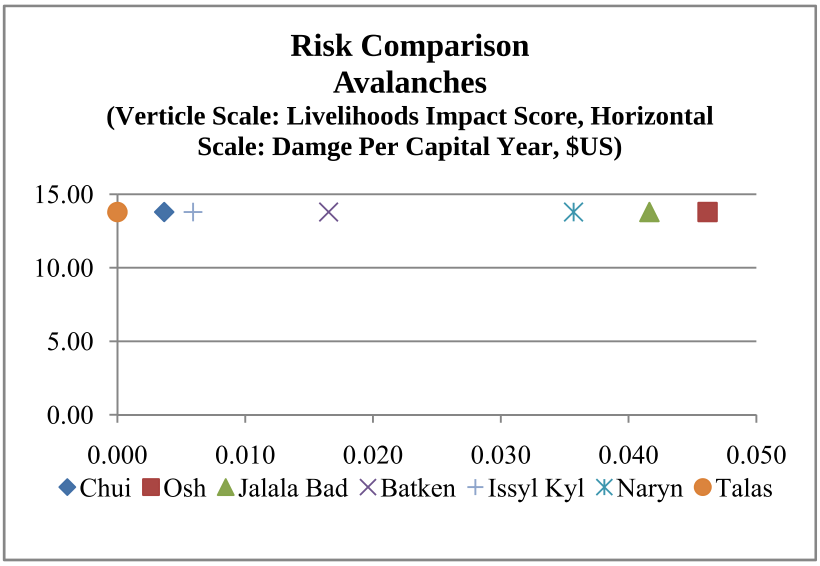
Oblast	Damage, per capita year, $US	Livelihood Score
Chui	0.004	13.79
Osh	0.046	13.79
Jalal Abad	0.042	13.79
Batken	0.017	13.79
Issyl Kyl	0.006	13.79
Naryn	0.036	13.79
Talas	0.000	13.79



7.7.2. Avalanches

The comparison of damage and livelihoods impacts indicates that Naryn Oblast followed by Jalal Abad are at highest overall risk, while all the other Oblasts have a livelihood-based risk except Batken, which is considered at low risk.

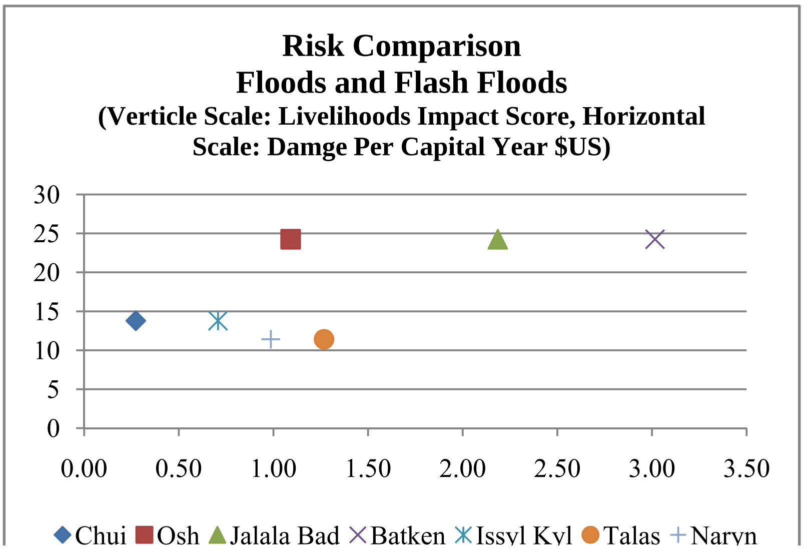
Table 16 Avalanche Risk		
Oblast	**Damage, per capita year, $US**	**Livelihood Score**
Chui	0.006	9.04
Osh	0.011	12.84
Jalal Abad	0.025	15.22
Batken	0.017	4.28
Issyl Kyl	0.006	13.79
Naryn	0.044	9.04
Talas	0.009	11.41



7.7.3. Floods and Flash Floods

The comparison of flood and flash flood damage and livelihood impacts indicates that Batken Oblast followed by Jalal Abad are at overall high risk. Osh, followed by Issyl Kyl and Chui, have a livelihood-based risk, while Talas and Naryn are at low risk.

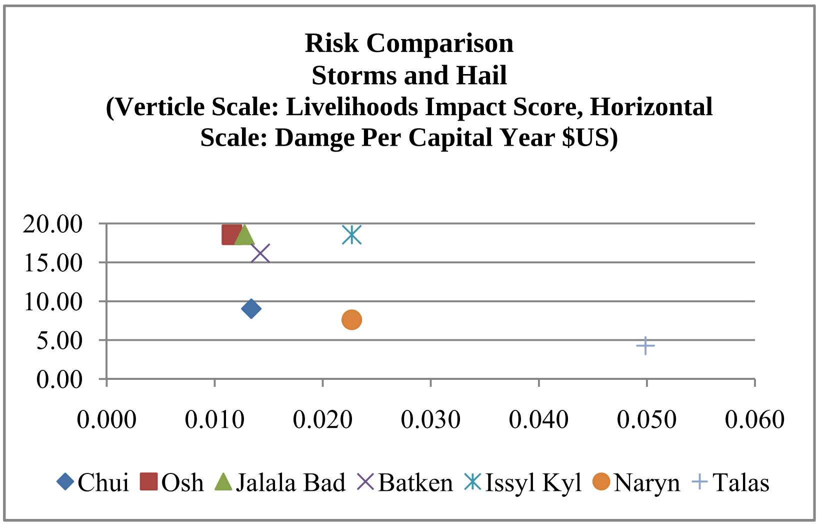
Table 17 Floods and Flash Floods		
Oblast	**Damage, per capita year, $US**	**Livelihood Score**
Chui	0.27	13.79
Osh	1.09	24.25
Jalal Abad	2.19	24.25
Batken	3.02	24.25
Issyl Kyl	0.71	13.79
Naryn	0.99	11.41
Talas	1.27	11.41



7.7.4. Storms and Hail

In terms of risk from storms and hail, no Oblast is defined at overall risk, while Talas is defined at damage-based risk, while Issyl Kyl, Jalal Abad, Osh, Batken are defined as at livelihood-based risk and Naryn and Chuie at low risk. The results are to a significant degree skewed by the high per capita damage level for Talas Oblast.

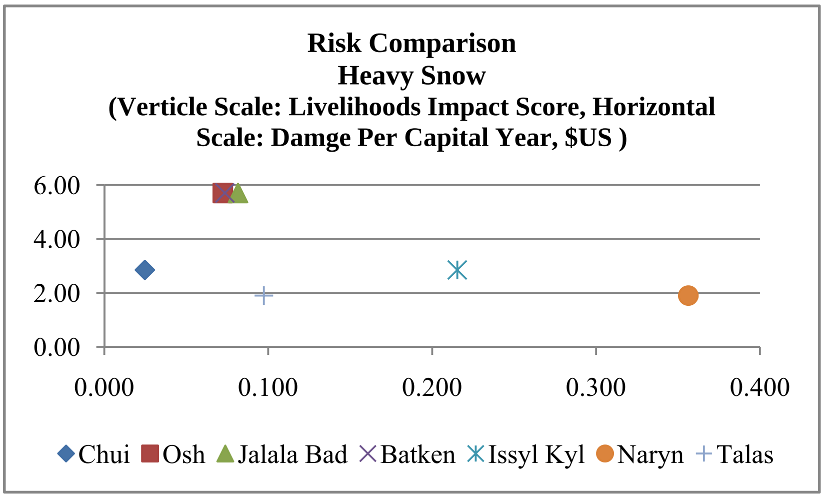
Table 18 Storms and Hail		
Oblast	**Damage, per capita year, $US**	**Livelihood Score**
Chui	0.013	9.04
Osh	0.012	18.55
Jalal Abad	0.013	18.55
Batken	0.014	16.17
Issyl Kyl	0.023	18.55
Naryn	0.023	7.61
Talas	0.050	4.28



7.7.5. Heavy Snow

In terms of risk from heavy snowfall, Issyk Kul Oblast is defined as greatest overall risk, Naryn Oblast is defined as at damage-based risk (largely based on relatively high per capita damage), Osh, Jalal Abad and Chui at livelihood-based risk and Talas at low risk.

Table 19 Heavy Snow		
Oblast	**Damage, per capita year, $US**	**Livelihood Score**
Chui	0.025	2.85
Osh	0.072	5.71
Jalal Abad	0.082	5.71
Batken	0.074	5.71
Issyl Kyl	0.215	2.85
Naryn	0.356	1.90
Talas	0.097	1.90

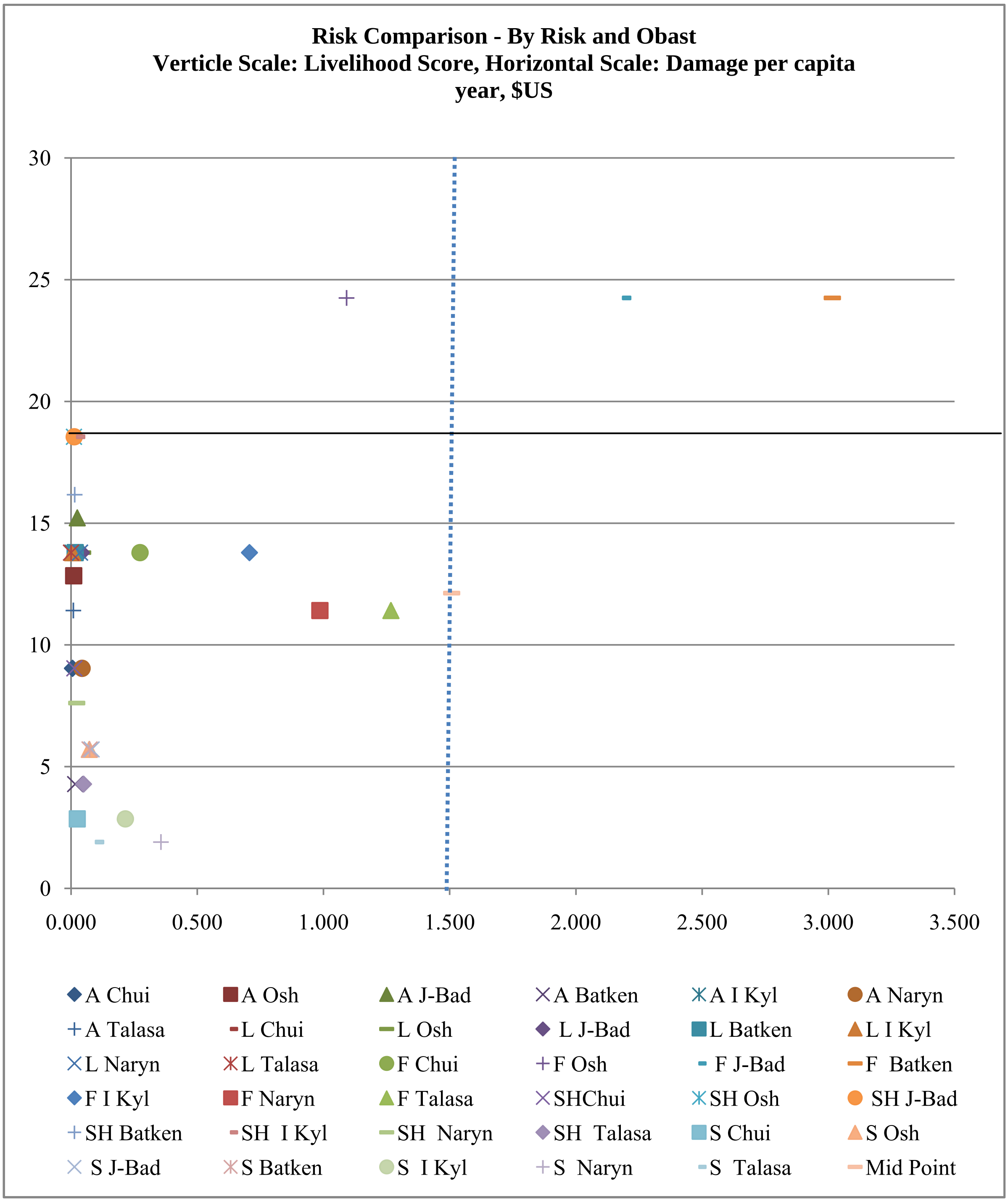


7.7.6. Overall Risk

The scatter plot below presents a comparison on damage and livelihood impact scores for each climate-related disaster type for each Oblast. (Vertical and horizontal lines indicating the damage and livelihoods impact mid points have been added.)

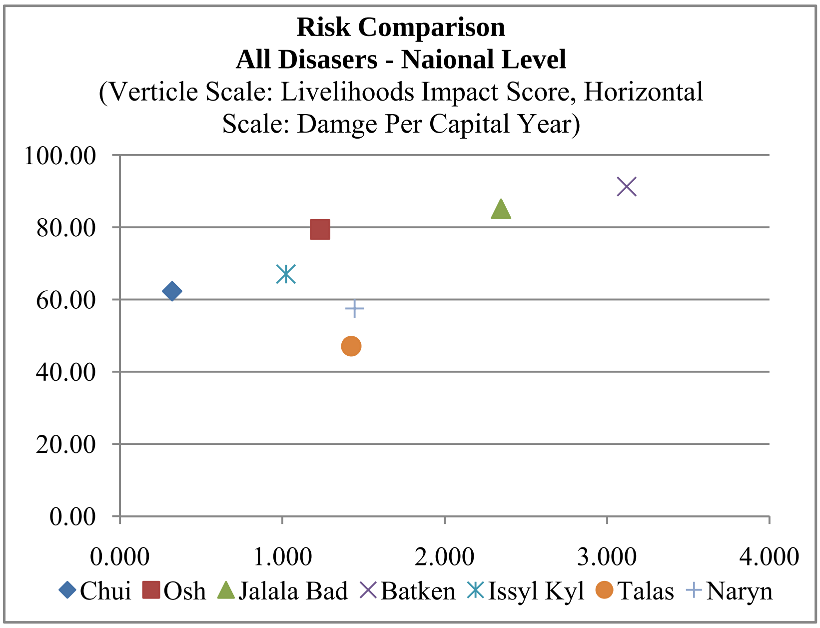
The data indicates that flooding in Batken, followed by flooding in Jalal Abad are at highest overall risk for all climate-related disasters, while flooding in Osh has a level of livelihoods impact which is significantly above other Oblasts for floods and other climate-related disasters. The disaster/Oblast specific data table can be found in **Annex D**.

(An “A” before a name indicates avalanche, “L” indicated landslide, “F” indicates floods and flash floods, “SH” indicate storms and hail and “S” indicates snow.)



The table and scatter plot immediately below compares all climate related disaster risks for the seven Oblast in Kyrgyzstan. This comparison indicates that in terms overall risk, Batken is at greatest overall risk, followed by Jalal Abad. All the other Oblasts are defined as having livelihood-based risk.

Table 20 All Disasters		
Oblast	**Damage, per capita year, $US**	**Livelihood Score**
Chui	0.025	2.85
Osh	0.072	5.71
Jalal Abad	0.082	5.71
Batken	0.074	5.71
Issyk Kul	0.215	2.85
Naryn	0.356	1.90
Talas	0.097	1.90



7.7.7. Damage Projections

This section of the **Report** provides scenario-based projections of climate impacts. These projections are intended to aid in understanding future climate risk impacts, comparing impacts from different risks and identifying possible cost savings from strategies and actions to reduce climate impacts.

Three sets of impact scenarios are presented below, dealing with (1) all common climate-related disasters to 2032, (2) flooding and flash flooding in Batken Oblast to 2032. Additional scenarios were considered to incorporate the impact of changes in precipitation on crop production but this work remained experimental and subject to further refinement.

7.7.7.1. All Climate Related Disasters

The following table presents changes over a 21 year period in disaster damage impacts under three scenarios:

- An increase in annual events and annual damage at the same rate as population growth (1.1%). This represents the baseline, "no change" scenario: no increase in risk management efforts and no change from recent historical average events or damage levels. (Future inflation is not included.)
- No increase in the number of disaster events year-to-year but a 1.1% increase in damage per year. This represents a stable natural environment (no increase or decrease in natural event triggers) but a rate of population increase-based increase in damage.
- An annual 2% reduction in average damage per event but no change in the number of events per year. This represents a stable natural environment (no increase or decrease in natural event triggers) together with effective efforts to reduce disaster damage.

Note that the results in the third scenario can also represent an average 2% per year reduction in climate-related events.

Table 21

Projected Impacts of Three Scenarios Reflecting Climate-Related Disasters in Kyrgyzstan

Impact Parameters	Scenarios		
	1.1 % growth in events and damage per event per year	No increase in# disasters year-to-year; 1.1% increase in damage per year	2% annual reduction in average damage per event but no change in # of events per year.
Total Number of Climate-Related Disasters	1,265	1,125	1,265
Total Damage ($US, 21 years)	153 million	135.6 million	109.6 million
Damage Per Capita @ Year 21	1.37	1.101	.735
Change in Damage per Event Year "0" to Year 20 (USD)	124%	124%	67%
Change in Number of Events per Year, Year "0" to Year 20	124%	0	124%
Change in Average Damage per Year "0" to Year 20	155%	124%	83%
Change in Cost per Person, Year "0" to year 20	124%	0	67%

The three scenarios should be viewed as alternative futures to assess different climate risk management options. No change from average event frequency for disaster events (second scenario) yields lower damage levels when compared to the 1/1% population growth baseline. A 2% reduction in damage scenario yields significant reductions in overall and per capita damage.

From a cost-benefit perspective, the issue is whether a $US 43.3 million investment in risk management (the difference between the baseline and 2% scenario damage levels) could result in the 2% deduction in damage. If this were the case, then this analysis indicates an investment of $US 2.1 million per year in risk reduction for the five climate-related disasters would be justified.

7.7.7.2. Flooding in Batken Oblast

The following table presents the results for flooding and flash floods in Batken Oblast based on the same three scenarios as described above.

Table 22

Projected Impacts of Flooding Scenarios in Batken Oblast

Impact Parameters	Scenarios		
	1.1 % growth in events and damage per event per year	No increase in # disasters year-to-year; 1.1% increase in damage per year	2% annual reduction in average damage per event but no change in # of events per year.
Total Number of Climate-Related Disasters	290	258	258
Total Damage (USD, 21 years)	31.6 million	28.0 million	20.3 million
Damage Per Capita @ Year 21	3.52	2.83	1.52
Change in Damage per Event Year "0" to Year 20 (USD)	152%	124%	67%
Change in Number of Events per Year, Year "0" to Year 20	123%	0	0
Change in Average Damage per Year "0" to Year 20	123%	124%	68%
Change in Cost per Person, Year "0" to year 20	123%	0	55%

As noted, the three scenarios are alternative futures for assessing different climate risk management options. As with the "all disaster" scenario, a 2% reduction in damage scenario would yield significant reductions in overall and per capita damage. If a $US 0.6 million investment per year over 20 years in Batken Oblast could result in 2% reduction in damage from floods and flash floods, then the investment could be justified on the basis of costs to benefits.

7.7.8. Local Climate Change Risk Perception in the Suusamyr Valley (Kyrgyzstan)

7.7.8.1. Overview

This section covers an assessment of climate risk perceptions among residents of the Suusamyr Valley of Kyrgyzstan. The assessment was undertaken by CAMP Alatoo to:

- Identify the most efficient actions and essential measures to mobilize the population Suusamyr Valley with regard to the climate change risk management, and
- Pilot the climate risk perception process presented in the **Guide**.

The assessment was conducted October 2012 as part of the UNDP Central Asia Climate Risk Management in Kyrgyzstan Project implemented by CAMP Alatoo. A full copy of the assessment report is available from CAMP Alatoo.

7.7.8.2. Method and Data Used

The basic method for identifying and assessing local perceptions was focus group discussions. The groups were formed out of the different strata of the local population (men, women, old people and youth). Selected households and specialists were also surveyed. Focus group discussions lasted 2 to 3 hours and were facilitated by a sociologist.

The questions used in the survey were taken from the **Guide** and adjusted for local conditions by the sociologist leading the assessment. Data and conclusions from experts on climate change trends were used for analysing findings of the survey.

A total of 70 person were contacted as part of the survey, through:

- House interviews with 54 persons, where at times other family members also took part in discussions, and,
- Two Focus Groups composed of eight persons each.

A total of 38 men and 32 women were covered by the survey.

7.7.8.3. Results

Reported Indications of Climate Change

The most important questions for the assessment were:

- “How does the local population understand the climate change?”and,
- “Which processes do they observe?”

The survey indicated that the local population hardly differentiated between the notion of climate change and climate variability. Respondents could recall and analyse natural phenomena over the last 30 years. At the same time, events during the last 10 years overlapped and distorted remembrance of earlier years.

Suusamyr residents perceive the last three years to have had severe winters. They linked this to fodder shortages and disease among the population, and as a strong indicator of the climate change. However, when considering a 30-year period, such winters have happened before, and were even more severe. Further village-specific responses are provided in **Table 23**, below.

Table 23

Reported Indications of Climate Change

Villages	Type of Climate Event	Reported Indicators	Comments
Suusamyr, Tunuk	Extreme decrease of air temperature (hard frost)	According to the local inhabitants, the winter became more severe since 2008. In the winter of 2011, the temperature dropped down to - 60 ^{o}C. In 1970-80s, the temperatures reached 0 to -55 ^{0}C, and in 1990-2010 to - 40 to -45 ^{0}C. Ice crusts were formed.	It was also mentioned that such phenomena can be linked with the climate change over the period of 10 to 15 years.;
	More frequent heavy snowfall	During recent years (since 2007) there were abnormalities in snowfall. At the beginning of November 2011 the height of the snow cover exceeded 1 meter	Before, the snow was falling gradually and reaching maximum height in January-February.
	Increase of duration of the snow cover.	Since 2008, the period of snow cover had increased by almost for two months, e.g., November to April.	Since the late 1990s, snow has covered the land from December until March. This has resulted in a shortage of the winter fodder.
First of May	Shift of the vegetation period	Ploughing since 2008 starts early when compared to 20 years ago.	Beginning of the spring field activities was in May 20 years ago, but now they start a bit earlier, in April.
	Extreme decrease of temperature (hard frost)	Indicated for the last few years (3-4 years). In 201, the temperature dropped to -57 to - 60 ^{o}C	

Villages	Type of Climate Event	Reported Indicators	Comments
	More frequent heavy snowfall	Since 2007, snowfall has been abnormal. At the beginning of November 2011, the height of the snow cover exceeded 1 meter.	
	More frequent gusty wind	During the last 3-4 years, wind has destroyed roofs of buildings and power lines.	Usually happens in autumn.
Kaisar	More frequent heavy snowfall	During the last few years (since 2007), snowfall has been abnormal. At the beginning of November 2011, the height of the snow cover exceeded 1 meter.	(Period of greater) Snowfall has shifted to the autumn.
	Extreme decrease of air temperature (hard frost)	Ice crust formation.	
	Increase of the snow moisture	In comparison with 1975 to 80, the snow is wet. Since 2005 to 2007, the snow moisture is very high.	The local population associates this phenomenon with putting into operation of the Toktogul water reservoir.
	More often drought	During the last 2 years (2010-2011), the yield of fodder and agricultural crops has dropped	Drought is aggravated by dry wind.
Kyzyl-Oi	More often drought	During the last 2 years (2010-2011), the yield of fodder and agricultural crops dropped.	Drought is aggravated by dry wind.
	Extreme decrease of air temperature (hard frost)		In the Kyzyl-Oi village the climatic conditions are favourable by comparison with other villages of the Suusamyr local self government.
	More often flood	Precipitation lasting 15 minutes leads to flooding. The last time it flooded was in 2008.	The flood is formed above the village in the gorge,
	Shift of vegetation period	Ploughing starts later during the past 2 to 3 years.	
KojomKyl	Extreme decrease of air temperature (hard frost)	Ice crust formation.	
	More often gusty winds	In spring and autumn, for the last 2 to 3 years, wind has destroys roofs of 15 buildings.	(winds Pass through certain areas (of the community.
	Increase of snow moisture	During the last 7 years the snow has been wet.	When it snows a crust is formed which, in spring, does not allow the melt water to penetrate into the soil.
	More frequent heavy snowfall	Ssince 2007 snowfall has been abnormal. In early November 2011, the height of the snow exceeded 1 meter.	
Karakol	Increase of the river bank erosion	Change of the river course, washout of the right bank during the last 3-4 years.	After 1992, the river course changed.
	More frequent heavy snowfall	During the last years (since 2007), snowfall has been abnormal. In early November 2011, the height of the snow cover exceeded 1 meter.	
	Extreme decrease of air temperature (hard frost)	Indications for the last 3 to 4 years are that the air temperature dropped to -57 to - 60 ^{o}C.	Since 2008, fodder shortages and “murrain” have occur.

Perception of Changes in Climate-Related Hazard Frequency

Table 23 below, provides the results of questions to assess the awareness of survey participants about changes in climate and environmental hazards. The respondents were asked whether each of the hazards were considered to be occurring more or less often than in the past. (Gender aspects of the responses are discussed in **Section 6**, above).

The respondents indicated that several climate-related hazards, including avalanches, strong wind, and respiratory disease, are occurring less often than in the past. At the same time, a significant number of respondents indicated that prolonged winter, livestock disease and (for females) cardiovascular and respiratory diseases are increasing. The perception survey provides an interesting insight into current views of a range of hazards, but a repeat survey in the future will provide deeper understanding on how view may change by season or other factors.

Table 24

Perception of Changes in Climate-Related Hazards Frequency

Hazards	Male			Female		
	Yes, occur more often	No, occur less often	I do not know	Yes, occur more often	No, occur less often	I do not know
Avalanche	18%	65%	17%	2%	75%	23%
Heat and Drought	66%	23%	11%	71%	14%	15%
Frost	53%	34%	13%	30%	55%	15%
Strong Wind	19%	78%	3%	9%	79%	12%
Prolonged Winter	97%	2%	1%	90%	5%	5%
Glacier Melting, Outbreak of Glacial Lakes	22%	28%	50%	4%	29%	67%
Soil Erosion	63%	24%	13%	3%	30%	67%
Pasture Degradation	57%	37%	6%	3%	51%	46%
Agricultural Pests	38%	37%	25%	4%	45%	51%
Agricultural Productivity (yield)	26%	57%	17%	10%	54%	36%
Increase of Livestock Production (meat, milk, wool)	38%	46%	16%	23%	62%	15%
Livestock Deaths	78%	19%	3%	56%	27%	17%
Livestock Disease	89%	8%	3%	77%	15%	8%
Water Supply Problems	90%	4%	6%	93%	4%	3%
Incidence of Cardiovascular Diseases	67%	22%	11%	80%	13%	7%
Incidence of Respiratory Diseases (influenza, bronchitis, pneumonia, etc.)	16%	73%	11%	96%	0%	4%
Incidence of the infectious diseases (intestinal, poisoning, etc.)	55%	34%	11%	42%	54%	4%

Comparison of Expert and Population Views on Climate Impacts

A comparative analysis of the climate change trends identified by climate experts and the population indicates that the population considered past conditions to be colder than as assessed by experts(see **Table 24**, below). One explanation provide by the experts is that a dry frost is not perceived as cold as the wet one.

The views of the local population with regard to the quantity of precipitation largely coincide with the experts' opinions. This could be due to extent of dry-land farming in the valley, which heavily depends on precipitations, leading the population to have more experience in assessing this climate feature.

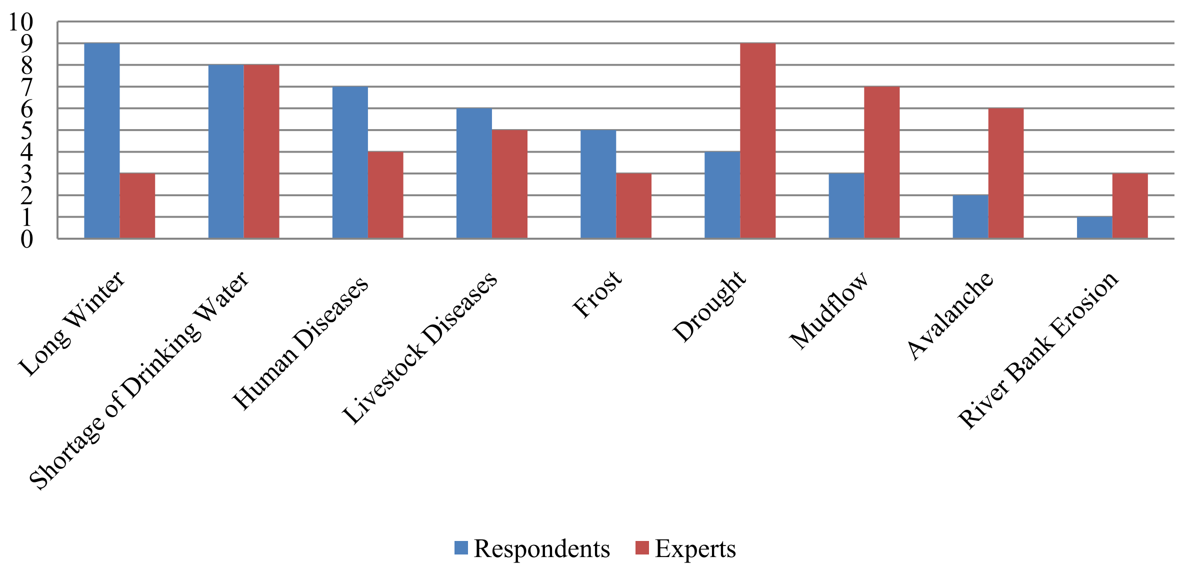
Table 25

Comparative Analysis of the Climate Impacts by Experts and the Population

Climate Change Indicator	Summer		Winter	
	Experts	Population	Experts	Population
Temperature, Mean Value	Decrease	Summer is hotter.	Increase	Winter is colder.
Extreme Temperatures	Decrease	Hotter	Warmer	Cold winter (to -60 C).
Frosts (Freezing Weather)			Reduced frequency and impact.	Severe winter.frost. Severe frost in October.
Precipitation, Mean Value	Precipitation decrease, especially in spring-summer.	Less rain, short and dry spring,	Without change or minimum increase.	Often and heavy snowfall.
Growing Season	Increase	Increase		

The following chart presents a ranking the importance of climate-linked hazards, comparing experts and local respondents. As noted above, experts and respondents differ in many cases, reflecting different experiences and priorities. These divergences need to be harmonized to create a common platform for climate risk management.

Chart 11
Comparative Analysis - Importance of Climate-Linked Hazards by Respondents and Experts
(Verticle Scale Indicates Relative Importance)



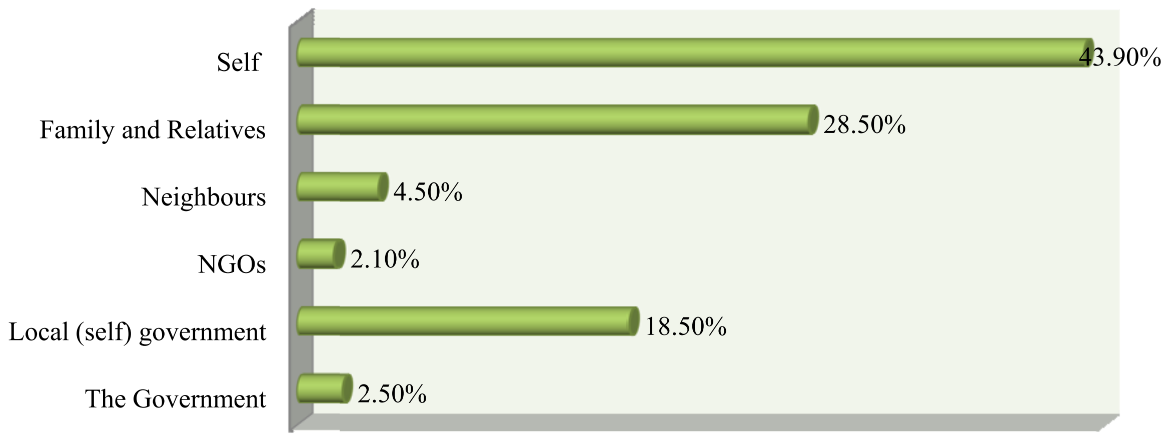
Based on the survey, it can be noted that:

- Local respondents are more tolerant towards frequent, time-spaced small phenomena in comparison with the incidents causing large damages, even if the total losses in the first case are much larger.

- Respondents were more aware of recent events and very often exaggerated their meaning and importance.
- Expert advice is important to understanding hazards and defining the divergence between physical conditions and local perceptions.
- Respondents cannot always differentiate between human-induced and climate-induced impacts.

In terms of respondent reliance on support for managing climate-related hazards, **Chart 12**, below, indicates that the most reported action is self-reliance followed by reliance on family and other relatives. Interesting, local (self) government structures are expected to provide support in managing climate-related issues.

Chart 12
What Respondents Reported Relying On



Actions to Mitigate Hazard Consequences

Table 24, below, presents actions suggested by respondents to respond to climate impacts and other hazards identified in the survey. The percentages indicate the number of respondents who mentioned the hazard or management actions.

Table 26

Actions to Mitigate Consequences of the Hazards Identified

Hazard	% of Respondents Mentioning Hazard and Action	Management Actions Mentioned
Duration of the season (winter/summer, etc.) (too long or short)	93.5%	Assure supplies of food, fodder; take care of own health and treat the livestock; insulation of buildings; mini-hydro-electrical stations in each village.
Water supply (inadequate)	91.5%	Keep rivers and ecology clean; rehabilitate artesian wells; clean watering places.
Respiratory diseases in humans (influenza, bronchitis, pneumonia, etc.)	84.5%	Carry out preventive measures; insulation; assure supply of coal, wood, dry dung and medicine. Get more information on these issues.

Hazard	% of Respondents Mentioning Hazard and Action	Management Actions Mentioned
Rate of the cardiovascular diseases among humans	73.5%	Timely preventive examinations; consult with the specialists; buy and take medicine.
Animal deaths	67%	Treat livestock in a timely manner; use quality veterinary drugs; get more information on different diseases and bury the animals carcasses only in certain locations..
Rate of infectious diseases (intestinal, poisoning, etc.)	38%	Follow sanitary and hygiene rules; train children; not to eat meat of sick livestock. Do not dispose of carcasses anywhere. Find out information about new infectious diseases, for example from ticks. etc.
Frost	32%	Cover the fruit trees; insulation for houses, sheds and sheep yards.
(Loss of) Animal Production (meat, milk, wool)	30.5%	Take good care of the livestock and maintain them appropriately.
Outbreak of agricultural pests	21%	Carry out preventive measures.
Pasture degradation	20%	Do not use pastures near the village for a certain time to prevent overuse.
Heat, Drought	18.5%	Take measures to adapt.

Willingness to Pay Assessment

The "willingness to pay" approach was used to assess interest in the survey participants in risk management activities (see the **Guide**). The results, summarized in **Table 24,** below, show that the climate change-related problems are not among the priorities of the local population. Rather, significant economic and social needs appear to be more important: 61% of men and 71% of women indicated an intent to spend funds other than on direct risk mitigation. This may be explained by a weak awareness of the social or economic impacts of a changing climate (a focus of further awareness raising) and other, more pressing problems.

Table 27

Willingness to Pay Survey Results

Replies to the question

“How would you spend the local currency equal to 500 USD (if you would have it), to reduce the above enumerated hazard consequences?”

Reply	% Responses from Men and Details of Proposed Use of Funds	% Responses from Women and Details of Proposed Use of Funds
Keep money for myself and not spend it on risk reduction.	43 % : Increase the number of livestock for later use.	32%: Educate children in Bishkek. 14 %: Buy (children) clothes or buy necessary house wares; buy medicine or start a business 12 %: Open a food kiosk
Allocate all the money to a risk mitigation option.	27%: Insulation of the sheds and vaccination of livestock.	19%: Purchase of coal, firewood, foodstuff or fodder.
Not spend the money at all to avoid headaches. Keep money as savings and use it for an “evil” day.	4%	9 %
Share the money among several measures – insulation of the sheep sheds, vaccination, fodder conservation, insemination, etc.	8 %	0%
Pay off debts	7%	4%
Invest for interest	7%	6%
No response	4%	4%

7.7.9. Limitations

There are several limitations that affect the results presented in this **Profile**. One significant limitation is the lack of data on climate-related impacts, particularly in terms of damage, both from rapid on-set events and from slower changed to the climate.

The assessment process addressed this limitation. But, for instance, an expectation that average damage for two years is representative of a longer period is weak, The resulting estimations of damage are correspondingly weak and need to be used with understanding of their limitations.

Also in relation to damage data, only data on monetary damage, and not assistance provided, was available for the assessment. As a result, the projections of damage likely overstate the actual damage experience in financial terms.

The climate risk perception assessment conducted in the Suusamyr Valley was sufficient as a proof-of-concept test of the perception assessment process set out in the **Guide**. However, the results cannot be applied to Kyrgyzstan as a whole. Similar assessments are needed in other parts of the country to generate a representative database of perceptions of climate impacts as an input into climate risk management strategies and projects.

7.7.10. Conclusions

The assessment of the relation between floods and flash floods, landslides, avalanches, storms and hail and heavy snow disasters and precipitation for all Oblasts did not identify any significant correlations during the timeframes for which data is available. The exceptions may be for floods and flash floods in Jalal Abad and Naryn Oblasts, and for floods and flash floods in Batken, for which further analysis at shorter timeframes (e.g., 2, 3 months) may be justified. However, there also needs to be further research to confirm that climate parameters are significant contributors to disaster impacts.

The assessment of disaster damage indicates that floods and flash floods, totaling an estimated $US 66 million in damage, are by far the most damaging events for the 11 years for which data is available. The most Oblast with the greatest estimated damage is Jalal Abad (US$ 23.1 million), followed by Osh (US$16 million).

In terms of per year per capital damage, a better measure of the human impact of disasters, Batken Oblast had the highest leve damagel, for floods and flash floods ($US 3.02 per capita), followed by Jalal Abad ($US 2.19 per capita) and Osh ($US 1.09 per capita). Batken also ranked first in terms of overall damage per year per person ($US 3.12), followed by Jalal Abad ($US 2.35) and Talas (US$ 1.42).

In terms of livelihoods impact from the five types of disasters assessed, Batken scored highest, followed by Jalal Abad and Osh Oblasts. When considering the livelihood impacts on females, the Osh Oblast scores highest, followed by Batken and Jalal Abad.

In terms of risk (damage and livelihoods impacts together), Batken Oblast was rated highest, for flood and flash floods, followed by Jalal Abad for the same type of disaster. While Osh Oblast had a relatively high level of livelihoods-based risk, all other disasters for all other Oblast had significant lower risk when compared to the floods and flash floods that have affected Batken, Jalal Abad and Osh. In terms of overall risk levels (all five disasters combined), Batken ranked first, followed by Jalal Abad.

Three scenarios were used to project damage levels from 2012 to 2023: (1) Population-growth rate (1.1%) increase in damage and events, (2) No increase in the number of disasters year-to-year; 1.1% increase in damage per year and (3) a 2% annual reduction in average damage per event but no change in number of events per year. The first scenario projected damages from all five disaster totaling $US 153 million[30] by 2023. Under the third scenario, projected damages are projected to total $US 109.6 million. Per year per person damage is projected be $US 1.37 in 2023 in the first case, and $US 0.735 in 2032 in the latter case.

Using the same scenarios, for flooding and flash flooding in Batken Oblast (the most at risk Oblast) the projections are for $US 31.6 million (population-growth rate scenario) and $US 20.3 million (2% reduction scenario). The projections indicate that a $US 0.6 million per year investment in risk reduction for floods and flash floods in Batken Oblast could justified on a cost-benefit basis is it reduced damage by an average of 2% per year by 2023. Note that this investment would be in damage reduction, in reducing the livelihoods impacts of floods and flash floods, or a combination of the two.

In terms of crop-climate impact linkages, the assessment only identified a few cases of correlation between SPI and yield or prices for wheat at the level of each Oblast. The exceptions were Talas for SPI/yield and Jalal Abad and Osh for SPI/prices.

At the same time, a more extensive investigation of possible correlations between SPI and yield in Chui and Talas Oblasts indicated correlations for all cereals, as well as wheat, barley and maize for specific time frames. This finding is significant as it suggests that future changes in precipitation can

[30] Damage totals are not adjusted from inflation.

be linked to expected changes in production, and by extension to food supplies. The assessment attempted to model such outcomes using a simple scenario approach but the process needs further refinement before inclusion in the **Report**.

The assessment identified relative livelihood impacts for crops affected by climate factors. Batken Oblast scored as the most affected, followed by Jala Abad and Osh Oblasts. These results are useful in targeting risk management focusing on the agriculture sector.

The assessment was able to define livelihood impacts related to disasters and climate-affected crops using a Delphi process. The results indicate that females experience some risks differently than the general population, but in some cases were identified to be at less risk than the general population. The gender-based assessment and results of the perception survey (see below) can be used to define more specific gender-focused risk management actions for specific Oblasts.

A climate risk perception survey was done in Suusamyr Valley and highlighted three points:

1. There is gap between local and expert understanding with respect to some aspects of climate hazards and risks which needs to be bridged,
2. Climate-related risks do not have a uniformly high salience with local populations.
3. Climate impacts will likely be address through reliance on self, family, and local government.

These and other findings should be incorporated into community-based climate risk management.

The climate-disaster and climate-crop components of the assessment indicate that climate risk management assistance should be targeted to:

- Managing flooding and flash floods, particularly in southwest Kyrgyzstan and specifically in Batken Oblast.
- Managing climate-crop impacts in Batken Oblast as well as Jalal Abad and Osh Oblasts.
- Bridging the gap between local residents and experts as to the nature and threat of climate-links hazards and impacts.
- Addressing the greater impact identified for females in:
    - Osh Oblast for all disasters,
    - Jalal Abad for landslides,
    - snowfall in Talas, Naryn and Issyk Kul Oblasts,
    - Jalal Abad and Osh Oblast, due to higher impact scores for financial, social and natural capitals,
    - Naryn, for higher social and natural capitals impacts, and,
    - Batken, for higher social capital impact for climate-crop impacts.

Further work on climate-related risks in Kyrgyzstan should:

- Significantly improve the data sets available on climate impacts at the national and sub-national levels.
- Consider focused field research on local climate-related impacts to develop better data and models for understanding how climate and other factors contribute to negative impacts at the community and household level.
- Expand an econometric approach to analyzing hazards, impacts and management measures, particularly to bridge the analytical gap between short and long-term impacts.
- Assess the impact of changes in livelihood impact indicators through a scenario approach.
- Expand the livelihoods impact assessment to consider age and health status.
- Increase public awareness about climate-related risks, both short and long-term, and integrate climate-appropriate risk management measures into social and developmental processes.

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Annex B. Livelihoods Impact Assessment Data

MUDFLOW

Overall Population

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	4	3	3	4	2	4	2
Financial	3	2	2	3	2	3	2
Social	3	2	2	3	2	3	2
Natural	3	2	2	3	2	3	2
Political	3	3	3	3	3	3	3
	21	**12**	**12**	**16**	**11**	**16**	**11**
Diagram	**Total Area**						
HF	5.71	2.85	2.85	5.71	1.90	5.71	1.90
FS	4.28	1.90	1.90	4.28	1.90	4.28	1.90
SN	4.28	1.90	1.90	4.28	1.90	4.28	1.90
NP	4.28	2.85	2.85	4.28	2.85	4.28	2.85
PH	5.71	4.28	4.28	5.71	2.85	5.71	2.85
Tot. area	**24.25**	**13.79**	**13.79**	**24.25**	**11.41**	**24.25**	**11.41**
Rank	**1**	**4**	**4**	**1**	**6**	**1**	**6**

MUDFLOW **Women**

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	4	3	3	4	2	4	2
Financial	4	2	2	3	2	3	2
Social	3	3	2	3	2	4	2
Natural	3	2	2	3	2	3	2
Political	3	4	3	3	3	3	3
	17	**14**	**12**	**16**	**11**	**17**	**11**
Diagram	**Total Area**						
HF	7.61	2.85	2.85	5.71	1.90	5.71	1.90
FS	5.71	2.85	1.90	4.28	1.90	5.71	1.90
SN	4.28	2.85	1.90	4.28	1.90	5.71	1.90
NP	4.28	3.80	2.85	4.28	2.85	4.28	2.85
PH	5.71	5.71	4.28	5.71	2.85	5.71	2.85
Tot. area	27.58	18.07	13.79	24.25	11.41	27.11	11.41
Rank	1	4	5	3	6	2	6

Outcome on Capital	**Difference Total Population vs Women**						
Human	0	0	0	0	0	0	0
Financial	-1	0	0	0	0	0	0
Social	0	-1	0	0	0	-1	0
Natural	0	0	0	0	0	0	0
Political	0	-1	0	0	0	0	0

AVALANCHE

Overall Population

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	1	2	3	4	3	3	3
Financial	1	2	2	2	1	2	2
Social	1	2	2	3	2	3	2
Natural	1	1	2	1	1	1	1
Political	3	3	3	3	3	3	3
	12	**10**	**12**	**13**	**10**	**12**	**11**
Diagram	**Total Area**						
HF	0.48	1.90	2.85	3.80	1.43	2.85	2.85
FS	0.48	1.90	1.90	2.85	0.95	2.85	1.90
SN	0.48	0.95	1.90	1.43	0.95	1.43	0.95
NP	1.43	1.43	2.85	1.43	1.43	1.43	1.43
PH	1.43	2.85	4.28	5.71	4.28	4.28	4.28
Tot. area	**4.28**	**9.04**	**13.79**	**15.22**	**9.04**	**12.84**	**11.41**
Rank	**7**	**5**	**2**	**1**	**5**	**3**	**4**

AVALANCHE Women

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	1	2	3	4	3	3	1
Financial	1	2	2	1	2	1	2
Social	1	2	2	3	2	3	2
Natural	1	1	1	1	1	1	1
Political	3	3	3	3	3	3	3
	12	**10**	**11**	**12**	**11**	**11**	**9**
Diagram	**Total Area**						
HF	0.48	1.90	2.85	1.90	2.85	1.43	0.95
FS	0.48	1.90	1.90	1.43	1.90	1.43	1.90
SN	0.48	0.95	0.95	1.43	0.95	1.43	0.95
NP	1.43	1.43	1.43	1.43	1.43	1.43	1.43
PH	1.43	2.85	4.28	5.71	4.28	4.28	1.43
Tot. area	**4.28**	**9.04**	**11.41**	**11.89**	**11.41**	**9.99**	**6.66**
Rank	**7**	**5**	**2**	**1**	**2**	**4**	**6**
Outcome on Capital	**Difference Total Population vs Women**						
Human	0	0	0	0	0	0	2
Financial	0	0	0	1	-1	1	0
Social	0	0	0	0	0	0	0
Natural	0	0	1	0	0	0	0
Political	0	0	0	0	0	0	0

LANDSLIDES

Overall population

Outcome on Capital	BatkenOblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	3	2	1	3	2	4	1
Financial	2	2	1	4	2	4	1
Social	2	2	1	3	1	3	1
Natural	2	2	1	3	1	3	1
Political	3	3	3	2	3	2	3
	17	**11**	**7**	**15**	**9**	**16**	**7**
Diagram	**Total Area**						
HF	2.85	1.90	0.48	5.71	1.90	7.61	0.48
FS	1.90	1.90	0.48	5.71	0.95	5.71	0.48
SN	1.90	1.90	0.48	4.28	0.48	4.28	0.48
NP	2.85	2.85	1.43	2.85	1.43	2.85	1.43
PH	4.28	2.85	1.43	2.85	2.85	3.80	1.43
Tot. area	**13.79**	**11.41**	**4.28**	**21.40**	**7.61**	**24.25**	**4.28**
Rank	**3**	**4**	**6**	**2**	**5**	**1**	**6**

LANDSLIDESWomen

Outcome on Capital	BatkenOblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	3	2	1	3	2	4	1
Financial	2	1	1	4	2	4	1
Social	2	1	1	3	1	3	1
Natural	2	2	1	3	1	3	1
Political	3	3	3	2	3	3	3
	17	**9**	**7**	**15**	**9**	**17**	**7**
Diagram	**Total Area**						
HF	2.85	0.95	0.48	5.71	1.90	7.61	0.48
FS	1.90	0.48	0.48	5.71	0.95	5.71	0.48
SN	1.90	0.95	0.48	4.28	0.48	4.28	0.48
NP	2.85	2.85	1.43	2.85	1.43	4.28	1.43
PH	4.28	2.85	1.43	2.85	2.85	5.71	1.43
Tot. area	**13.79**	**8.08**	**4.28**	**21.40**	**7.61**	**27.58**	**4.28**
Rank	**3**	**4**	**6**	**2**	**5**	**1**	**6**

Outcome on Capital	Difference Total Population vs Women						
Human	0	0	0	0	0	0	0
Financial	0	1	0	0	0	0	0
Social	0	1	0	0	0	0	0
Natural	0	0	0	0	0	0	0
Political	0	0	0	0	0	-1	0

HEAVY RAINS/HAIL

Overall population

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	3	2	3	3	2	3	1
Financial	2	2	3	2	2	2	1
Social	2	2	3	3	1	3	1
Natural	3	1	2	3	1	3	1
Political	3	3	3	3	3	3	3
	18	**10**	**14**	**14**	**9**	**14**	**7**
Diagram	**Total Area**						
HF	2.85	1.90	4.28	2.85	1.90	2.85	0.48
FS	1.90	1.90	4.28	2.85	0.95	2.85	0.48
SN	2.85	0.95	2.85	4.28	0.48	4.28	0.48
NP	4.28	1.43	2.85	4.28	1.43	4.28	1.43
PH	4.28	2.85	4.28	4.28	2.85	4.28	1.43
Tot. area	**16.17**	**9.04**	**18.55**	**18.55**	**7.61**	**18.55**	**4.28**
Rank	**4**	**5**	**1**	**1**	**6**	**1**	**7**

HEAVY RAINS/HAIL Women

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	3	2	3	4	2	4	1
Financial	2	2	4	2	2	2	1
Social	2	2	3	4	1	4	1
Natural	3	1	2	3	1	3	1
Political	3	3	3	3	3	3	3
	18	10	15	16	9	16	7
Diagram	**Total Area**						
HF	2.85	1.90	5.71	3.80	1.90	3.80	0.48
FS	1.90	1.90	5.71	3.80	0.95	3.80	0.48
SN	2.85	0.95	2.85	5.71	0.48	5.71	0.48
NP	4.28	1.43	2.85	4.28	1.43	4.28	1.43
PH	4.28	2.85	4.28	5.71	2.85	5.71	1.43
Tot. area	**16.17**	**9.04**	**21.40**	**23.30**	**7.61**	**23.30**	**4.28**
Rank	**4**	**5**	**3**	**1**	**6**	**1**	**7**

Outcome on Capital	Difference Total Population vs Women						
Human	0	0	0	-1	0	-1	0
Financial	0	0	-1	0	0	0	0
Social	0	0	0	-1	0	-1	0
Natural	0	0	0	0	0	0	0
Political	0	0	0	0	0	0	0

SNOWFALL

Overall population

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	1	2	2	1	2	1	2
Financial	1	2	2	1	2	1	2
Social	1	2	2	1	2	1	2
Natural	1	2	2	1	2	1	2
Political	3	3	3	3	3	3	3
	12	11	11	7	11	7	11
Diagram	**Total Area**						
HF	0.48	1.90	1.90	0.48	1.90	0.48	1.90
FS	0.48	1.90	1.90	0.48	1.90	0.48	1.90
SN	0.48	1.90	1.90	0.48	1.90	0.48	1.90
NP	1.43	2.85	2.85	1.43	2.85	1.43	2.85
PH	1.43	2.85	2.85	1.43	2.85	1.43	2.85
Tot. area	**4.28**	**11.41**	**11.41**	**4.28**	**11.41**	**4.28**	**11.41**
Rank	**5**	**1**	**1**	**5**	**1**	**5**	**1**

SNOWFALLWomen

Outcome on Capital	Batkent Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	1	2	2	1	2	1	2
Financial	1	2	2	1	2	1	2
Social	1	2	2	1	2	1	2
Natural	1	2	2	1	2	1	2
Political	3	3	3	3	3	3	3
	12	**11**	**11**	**7**	**11**	**7**	**11**
Diagram	**Total Area**						
HF	0.48	1.90	1.90	0.48	1.90	0.48	1.90
FS	0.48	1.90	1.90	0.48	1.90	0.48	1.90
SN	0.48	1.90	1.90	0.48	1.90	0.48	1.90
NP	1.43	2.85	2.85	1.43	2.85	1.43	2.85
PH	1.43	2.85	2.85	1.43	2.85	1.43	2.85
Tot. area	**4.28**	**11.41**	**11.41**	**4.28**	**11.41**	**4.28**	**11.41**
Rank	**5**	**1**	**1**	**5**	**1**	**5**	**1**

Outcome on Capital	Difference Total Population vs Women						
Human	0	0	0	0	0	0	0
Financial	0	0	0	0	0	0	0
Social	0	0	0	0	0	0	0
Natural	0	0	0	0	0	0	0
Political	0	0	0	0	0	0	0

DROUGHT

Overall population

Outcome on Capital	**Batken Oblast**	**Chui Oblast**	**Issyk Kyl Oblast**	**Jalal Abad Oblast**	**Naryn Oblast**	**Osh Oblast**	**Talas Oblast**
Human	3	2	1	2	3	1	1
Financial	3	2	1	2	3	1	1
Social	4	1	1	1	2	1	1
Natural	3	3	1	1	1	1	1
Political	4	4	3	3	3	3	3
	22	12	7	9	12	7	7
Diagram	**Total Area**						
HF	4.28	1.90	0.48	1.90	4.28	0.48	0.48
FS	5.71	0.95	0.48	0.95	2.85	0.48	0.48
SN	5.71	1.43	0.48	0.48	0.95	0.48	0.48
NP	5.71	5.71	1.43	1.43	1.43	1.43	1.43
PH	5.71	3.80	1.43	2.85	4.28	1.43	1.43
Tot. area	**27.11**	**13.79**	**4.28**	**7.61**	**13.79**	**4.28**	**4.28**
Rank	**1**	**2**	**5**	**4**	**3**	**5**	**5**

DROUGHT Women

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	3	2	1	2	3	1	1
Financial	3	2	1	2	3	1	1
Social	4	1	1	2	2	1	1
Natural	3	3	1	1	1	1	1
Political	4	4	3	3	2	3	3
	22	**12**	**7**	**10**	**11**	**7**	**7**
Diagram	**Total Area**						
HF	4.28	1.90	0.48	1.90	4.28	0.48	0.48
FS	5.71	0.95	0.48	1.90	2.85	0.48	0.48
SN	5.71	1.43	0.48	0.95	0.95	0.48	0.48
NP	5.71	5.71	1.43	1.43	0.95	1.43	1.43
PH	5.71	3.80	1.43	2.85	2.85	1.43	1.43
Tot. area	**27.11**	**13.79**	**4.28**	**9.04**	**11.89**	**4.28**	**4.28**
Rank	**1**	**2**	**5**	**4**	**3**	**5**	**5**

Outcome on Capital	Difference Total Population vs Women						
Human	0	0	0	0	0	0	0
Financial	0	0	0	0	0	0	0
Social	0	0	0	-1	0	0	0
Natural	0	0	0	0	0	0	0
Political	0	0	0	0	1	0	0

Annex C. Livelihood Impacts of Climate Factors Affecting Crops

Overall population

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalalabad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	2	1	1	2	2	2	1
Financial	4	1	1	3	2	3	2
Social	3	1	2	3	3	3	2
Natural	4	1	1	3	3	3	2
Political	4	2	2	3	3	3	2
	22	**6**	**7**	**14**	**13**	**14**	**9**
Diagram	**Total Area**						
HF	3.80	0.48	0.48	2.85	1.90	2.85	0.95
FS	5.71	0.48	0.95	4.28	2.85	4.28	1.90
SN	5.71	0.48	0.95	4.28	4.28	4.28	1.90
NP	7.61	0.95	0.95	4.28	4.28	4.28	1.90
PH	3.80	0.95	0.95	2.85	2.85	2.85	0.95
Tot. area	**26.63**	**3.33**	**4.28**	**18.55**	**16.17**	**18.55**	**7.61**
Rank	**1**	**7**	**6**	**2**	**4**	**2**	**5**

Women

Outcome on Capital	Batken Oblast	Chui Oblast	Issyk Kyl Oblast	Jalal Abad Oblast	Naryn Oblast	Osh Oblast	Talas Oblast
Human	2	1	1	2	2	2	1
Financial	4	1	1	4	2	4	2
Social	4	1	2	4	4	4	2
Natural	4	1	1	4	4	4	2
Political	4	2	2	3	3	3	2
	18	**6**	**7**	**17**	**15**	**17**	**9**
Diagram	**Total Area**						
HF	3.80	0.48	0.48	3.80	1.90	3.80	0.95
FS	7.61	0.48	0.95	7.61	3.80	7.61	1.90
SN	7.61	0.48	0.95	7.61	7.61	7.61	1.90
NP	7.61	0.95	0.95	5.71	5.71	5.71	1.90
PH	3.80	0.95	0.95	2.85	2.85	2.85	0.95
Tot. area	**30.43**	**3.33**	**4.28**	**27.58**	**21.87**	**27.58**	**7.61**
Rank	**1**	**7**	**6**	**2**	**4**	**2**	**5**

Outcome on Capital	**Difference Total Population vs Women**						
Human	0	0	0	0	0	0	0
Financial	0	0	0	-1	0	-1	0
Social	-1	0	0	-1	-1	-1	0
Natural	0	0	0	-1	-1	-1	0
Political	0	0	0	0	0	0	0

Annex D. All Climate-Related Disaster – Damage and Livelihood Scores[31]

Note: An "A" before a name indicates avalanche, "L" indicated landslide, "F" indicates floods and flash floods, "SH" indicate storms and hail and "S" indicates snow.

All Climate-Related Disasters		
Disaster Oblast	**Damage**	**Livelihoods Score**
A Chui	0.006	9.035
A Osh	0.011	12.839
A J-Bad	0.025	15.217
A Batken	0.017	4.280
A I	0.006	13.790
A Naryn	0.044	9.035
A Talas	0.009	11.413
L Chui	0.004	13.790
L Osh	0.046	13.790
L J-Bad	0.042	13.790
L Batken	0.017	13.790
L I	0.006	13.790
L Naryn	0.036	13.790
L Talas	0.000	13.790
F Chui	0.27	13.79

[31]by Oblast and Disaster

All Climate-Related Disasters		
Disaster Oblast	**Damage**	**Livelihoods Score**
F J-Bad	2.19	24.25
F Batken	3.02	24.25
F I	0.71	13.79
F Naryn	0.99	11.41
F Talas	1.27	11.41
SHChui	0.013	9.035
SH Osh	0.012	18.546
SH J-Bad	0.013	18.546
SH Batken	0.014	16.168
SH I	0.023	18.546
SH Naryn	0.023	7.608
SH Talas	0.050	4.280
S Chui	0.025	2.853
S Osh	0.072	5.706
S J-Bad	0.082	5.706
S Batken	0.074	5.706
S I	0.215	2.853
S Naryn	0.356	1.902
S Talas	0.097	1.902
Mid Point	**1.508**	**12.125**