

Climate Vulnerability & Resilience Assessment:

Synthesis Report

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Central Highlands Programme (CHP) is common initiative implemented by a consortium of three French NGOs (GERES, MADERA and SOLIDARITES INTERNATIONAL) funded by the Agency for French Development (AFD). The general objective of the programme is to increase the living standards and quality of life of rural mountainous populations by promoting balanced rural development and preservation of natural resources. The 3.5 years programme was launched in March 2014 in two provinces of the Central Afghanistan: Bamyan and Maydan-Wardak.



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Preamble

This study is a complementary work to the Community Based Climate Vulnerability and Resilience Assessment conducted by Simon Biney and Olivier Munos in 2014 for the inception phase of the Central Highlands Program. This analysis gave the following relevant results:

- Accurate description of the local context & the socio-economic situation within the districts of intervention of the CHP;
- Determination of six livelihoods that give a framing to further analysis (Agriculture, Animal husbandry, Water, Housing conditions, External livelihood, Network & State facilities);
- Analysis of local perception of climate change effects and impacts;
- Determination of adaptation & mitigation strategies;
- Recommendations for livelihoods' improvements.

For this specific study, the applied methodology relies on data collected through community-based tools and scientific knowledge analysis. It targets to give the most precise analysis possible of current and future vulnerabilities of the population within the districts of intervention regarding climate change current effects and future impacts.

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Acronyms

AFD	French Development Agency
CC	Climate Change
CFC	Civil-Military Fusion Center
CHP	Central Highlands Program
CORDEX	Coordinated Regional Climate Downscaling Experiment
CVRA	Climate Vulnerability and Resilience Assessment
DRR	Disaster Risk Reduction
GDP	Gross Domestic Product
GERES	Group for the Environment, Renewable Energy and Solidarity
MAIL	Ministry of Agriculture Irrigation and Livestock
ND-GAIN	Notre Dame – Global Adaptation Initiative
NEPA	National Environmental Protection Agency
ODI	Overseas Development Institute
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USGS	United States Geological Studies
WFP	World Food Program

1 Executive summary

Climate change does not respect border; it does not respect who you are - rich and poor, small and big. Therefore, this is what we call 'global challenges,' which require global solidarity.

Ban Ki-moon, Former 1st Secretary of the United Nations

Afghanistan is the 11th most vulnerable country in the world towards climate change current and future effects and impacts.

The Central Highlands, highly mountainous region with deep valleys and very cold winters, is one of the region of intervention of GERES – Group for the Environment Renewable Energy and Solidarity, in the country for several years. The Central Highlands Program, led by GERES and implemented in consortium with MADERA & Solidarités International is a three years program that notably aims to link field activities with the development of climate change-related activities.

This study is taking place in six districts of intervention of the consortium in the region: *Yakawlang 1 & 2, Hisa-e-Awal-e-Behsud, Marzak-e-Behsud, Saighan and Kahmard*. It aims to give the most complete analysis of current and future vulnerabilities towards climate change effects and impacts for the local communities regarding their livelihoods. To do so, the analysis relies on the most accurate climatic data available coupled with the use of local communities' perceptions and testimonies.

Scientific observations and local perceptions agree on several climate-related trends over the past years:

- i. Temperatures are warming in during winters and summers;
- ii. Snowfalls and spring rainfalls are substantially decreasing;
- iii. Floods and droughts are getting more frequent and intense within the entire area.

The main results of the study is that each district is having its own level of vulnerability towards climate change current effects and future impacts:

- *Yakawlang 1 & 2* – Vulnerable districts facing important heterogeneity
- *Behsud 1 & 2* – Poor opportunities of external livelihoods, strong and accelerating tendency to land degradation
- *Saighan* - An isolated “in-between” district
- *Kahmard* - Wealthier livelihoods and good access to resources

According to the scientific models, climate evolution is going to keep following the same path than the one that is already observed and faced by local communities of the Central Highlands. It consists in warmer winters and summers and rarefaction of water resource due to a steady reduction of snowfalls and spring rainfalls.

This will have severe impacts on people's livelihoods such as Agriculture, Animal husbandry, Housing conditions and Non-agricultural livelihoods. These potential effects might have severe impacts due to the very low level of adaptive capacities of the population within the entire area. Indeed, for now one of the most frequently used adaptation option is migrations to Kabul of other big cities of the country to find better economic opportunities. This could

constitute a serious issue for Afghanistan in the years to come if no actions are implemented to face climate change future impacts.

To do so, different type of actions can be implemented such as:

- Improve water management for irrigation purposes;
- Improve agricultural practices;
- Develop and improve animal healthcare services;
- Improve access to qualitative drinking water;
- Reinforce people's awareness towards climate change incoming effects and impacts;
- Improve natural resources management by developing energy saving solutions;
- Develop and implement disaster risk reduction solutions.

2 Part I – Context and Methodology

2.1 The Central Highlands Program - CHP

2.1.1 The CHP at a glance

Three French NGOs operating in Afghanistan, GERES, Solidarités International, and MADERA in 2014 came together to form a consortium funded by the French Development Agency (AFD) to undertake a 3½-year rural development and natural resource management program. Implemented in the mountainous provinces of Bamyan and (northern districts of) Wardak of Afghanistan.

The overall objective of this program is to increase living standards and quality of life of rural mountainous populations by promoting balanced rural development and the preservation of natural resources, through four components:

- *Component I*: Support sustainable agricultural management;
- *Component II*: Improve energy resilience of households and their living conditions in winter while limiting the depletion of natural capital;
- *Component III*: Improve access to and management of rare natural resources (pastures and water) for the sustainability of the production systems;
- *Component IV*: Produce knowledge and capitalize on the knowledge acquired within this program in order to initiate a political dialogue with the local authorities and development actors.

The CHP is implemented in 7 districts within 2 provinces of Afghanistan:

- *Saighan, Kahmard, Yakawlang (1&2) and Bamyan* of Bamyan Province
- *Hisa-e-Awal-e-Behsud and Marzak-e-Behsud* of Wardak Province

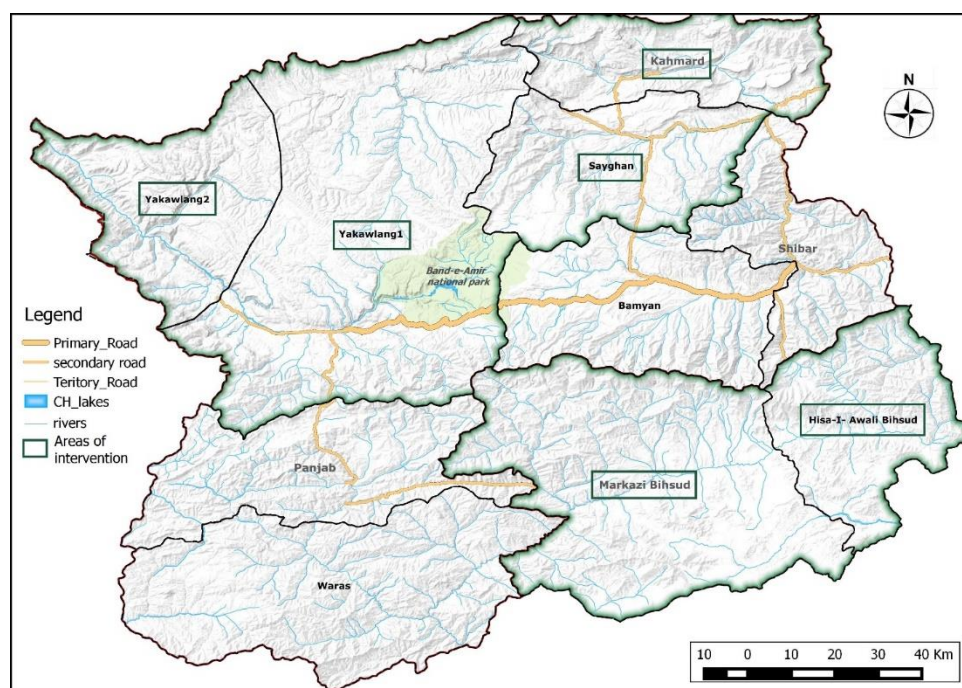


Figure 1: Areas of intervention of the CHP

2.1.2 Short description of the area of intervention

Located in the middle of Afghanistan, the Central Highlands are characterized by a mountainous geography, dominated by the *Koh-e-Baba* that reaches 4,951 m.

In 2016, Bamyan Province was made up of 454,633 people and Wardak Province 606,077 people which give a total population for the area of 1,060,710¹ for 28,377 km². Among these people, more than 72% live above 2,500 meters. The remaining population lives predominantly in Yakawlang districts where the level of altitude reaches 2400 for the *Chaman plain* to 3200 meters.

In the Central Highlands, the population is mainly rural and depend on agricultural activities. The districts of intervention are characterized by a short amount of arable land and a huge number of small villages, as shown in the two maps below:

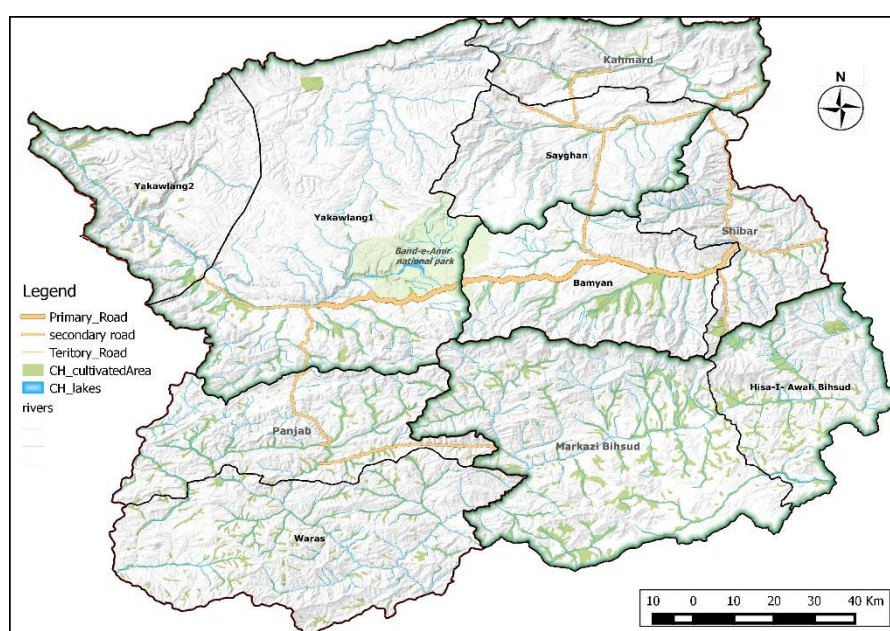


Figure 2: Repartition of the cultivated areas

¹ Source: <https://www.populationdata.net/pays/afghanistan/divisions>

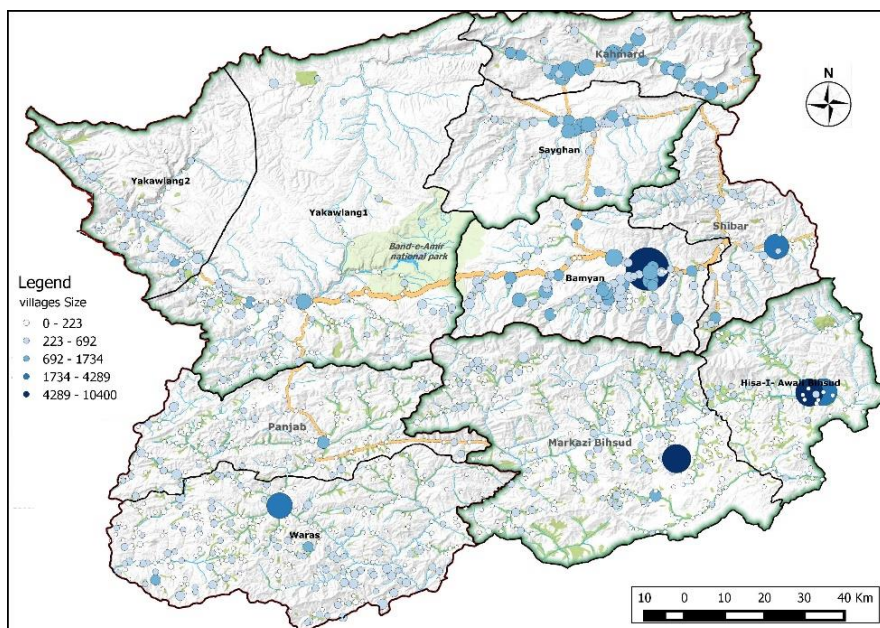


Figure 3: Villages repartition and density

2.2 Methodology

2.2.1 The CVRA

The applied methodology is an adaptation of the Climate Vulnerability and Resilience Assessment (CVRA)² developed by GERES. It relies on a participative diagnosis with local communities and specific stakeholders such as International Organizations, National Entities or Local Universities. It gives knowledges on the territory covered by this study in terms of climate, economic, social or environmental characteristics.

This methodology can be summed-up through the following steps:

Steps	Axes of assessment	Means
1. Characterization of the area		1. Literature review 2. Interviews 3. Focus group discussions: resource map livelihood matrix and livelihood resources 4. Household surveys
2. Climate context and hazard exposure		1. Literature review 2. Interviews 3. Focus group discussions: matrix of vulnerability analysis
3. Evaluation of the underlying vulnerability (sensibility)		1. Retrospective climatological study or, failing available and reliable weather time series data, literature review 2. Focus group discussions: calendar of events, climate risk matrix
4. Climate projections and impacts on vulnerabilities		1. Prospective climatological study (projections) 2. Interviews 3. Focus group discussions: scenarios
5. Adaptation options		1. Literature review (including NAPA / NAP) 2. Interviews and meetings with all stakeholders 3. Scoring grid for practices and potential actions (including carbon sobriety)

Figure 4: The five main steps of the CVRA

² Example of a CVRA applied on Tajikistan: http://www.geres.eu/images/publications/Brosh_A4_page_4_EN.pdf

Characterization of the area – This step consists in getting a first understanding of the area of implementation of the study or the project. To do so, it requires to collect data and review the existing literature in order to determine the main livelihoods of the population. Livelihoods can be defined as *stocks and proper income flows and food products to cover basic needs of a household*. A livelihood is characterized by three different components which are:

- *Physical and natural resources*: All internal or external resources of the territory that allow the household and the community to generate such stocks and flows of income and food.
- *Stocks*: Set of products (processed or not) available on the territory.
- *Recourses or external resources*: Recourses are practices classified as “non-productive” involving access to market, mutual aid, credit, positioning in local associations, etc. They provide indirect assistance for the reproduction of local life and production system.

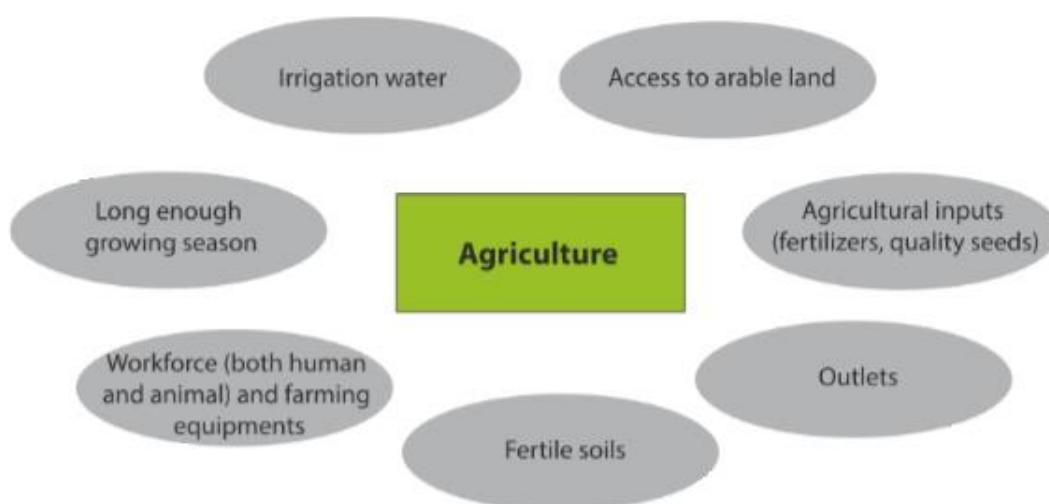


Figure 5: Example of a livelihood and its components - Agriculture

Climate context and hazard exposure – This step aims to collect and analyze the past and current climate trends that affect the area of intervention. It mainly consists in gathering information about temperatures, rainfall/snowfall patterns and extreme weather events frequency and intensity. To attain these type of data it can be helpful to use climatic data from existing climate reports or local weather stations. But, it can also be relevant to get information from the communities through household surveys or focus groups.

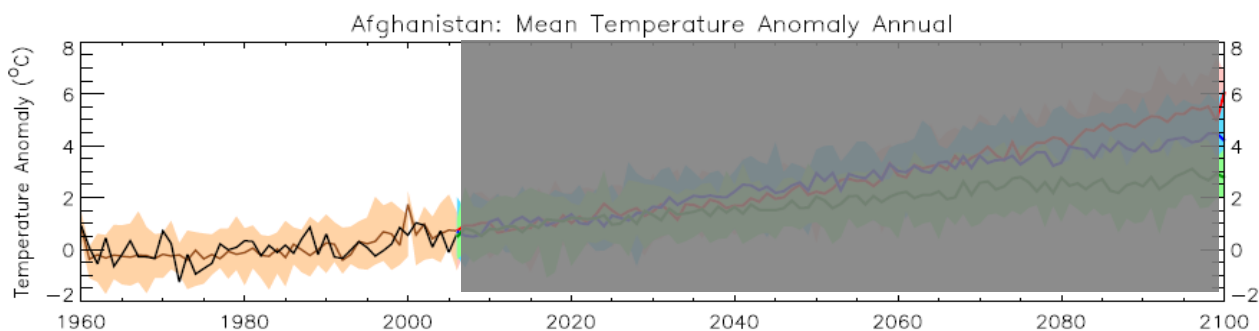


Figure 6: Past climate trend for mean annual temperature in Afghanistan³

Evaluation of the underlying vulnerability – In this step, the work consists of:

- i. Analyzing the risks associated with climate change effects in terms of livelihoods as far as resources, stocks and recourses are concerned. For this step it can be useful to rely on a risk matrix that allows to characterize these specific regarding a climate hazard or climate trends risks following several items such as:
 - a. Impacted component of the livelihood;
 - b. Impact on the this component;
 - c. Existing adaptation strategy;
 - d. Potential aggravating factors;
 - e. Impact on the livelihood linked with this component.
- ii. Classify the main vulnerable components of the livelihood to climate hazard or climate trend through a vulnerability matrix.

LIVELIHOOD:					
Hazards (Specify the duration)	Components of the livelihood	Impact on the resource	Adaptation strategy	Aggravating factors	Impact on livelihood
	Natural and material resources				
	Stocks				
	Recourses				

Figure 7: Example of a risk matrix

³ Source: <http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/>

LIVELIHOOD: AGRICULTURE					
Risks					
Resource/Stock /Recourse	Drought	Flash floods	Landslide	Pests/Diseases	Etc.
Irrigation water	3				
Access to arable land	3				
Fertile soils	3				
Workforce and equipments	1				
Etc.					

Low impact: 0; Medium impact: 1; High impact: 3

Figure 8: Example of a vulnerability matrix

Both tools presented in Figures 7 and 8 have been used to analyze each component of the livelihoods towards its level of vulnerability to climate change but they will not appear as such in the study. Indeed, these tools are useful for the reasoning and the analysis but this study will provide the finale result of the work of analysis and will not got through all its steps in details.

Climate projections and impacts on vulnerabilities – Following the same logic than for the characterization of the climate context, this step consists in finding climate projections for the area of implementation and analyze the potential effects and impacts on people’s livelihoods.

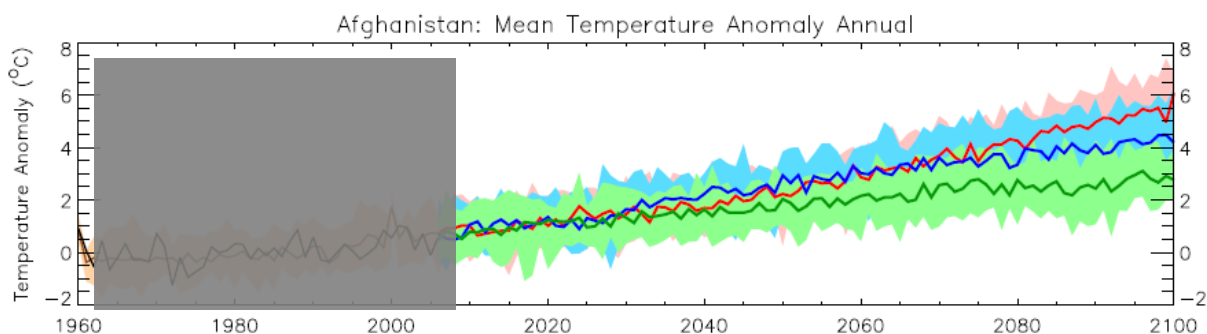


Figure 9: Climate projections for mean annual temperature in Afghanistan⁴

Adaptation options – This step aims:

- i. To analyze potential existing adaptation options that were implemented by the communities and to propose ameliorations by taking into account climate projections;
- ii. To propose new adaptation options based on the results of the analysis.

A multi-criteria-analysis can also be implemented in order to prioritize the order of implementation of the selected options regarding several criteria.

⁴ Source: <http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/>

Option	Impact on identified vulnerabilities	Urgency of action implementation	Community autonomy in the implementation	Social acceptance	Estimated cost	Impact on other livelihoods	Co-benefits of the action (mitigation, biodiversity, etc.)	Total (rank)
	Weight: 0,25	Weight: 0,25	Weight: 0,1	Weight: 0,1	Weight: 0,1	Weight: 0,1	Weight: 0,1	

Figure 10: Example of multi-criteria matrix

2.2.2 Data collection

For this specific study, a large amount of the data come from the previous assessment study conducted by S. Biney & O. Munos in 2014 for the implementation of the CHP inception phase – *Community-based Climate Vulnerability and Resilience Assessment for CHP, 2014*. This assessment relied mainly on data coming from household surveys – 1966 household surveys and 11 focus groups – and bio indicators analysis.

According to the 2014 study, the household survey permits to collect quantitative information:

- *General data* (Name, village, nb of family members, GPS coordinates, and altitude, etc.);
- *Economic data* (Income value and means, expenses types, debts level, investment capacity, seasonal income/expenses/debt, etc.);
- *Agriculture/livestock data* (type of livestock, nb of head, land ownership, size of land, type of land, type of crops, crop rotation, use of fertilizer, horticulture, water access, evolution of agricultural practices, etc.);
- *Natural Resources Management data* (type of NR collected, NR collection practices, NR gathering sites, existence of local NRM system, eventual inter-community conflict analysis, eventual disappearance of NR consequences such as increase in floods frequency or force, etc.);
- *Energy data* (type of fuel used, quantity consumed, type of equipment used, typical day summer/winter, energy practices, energy expenses-fuel and equipment- gathering practices, typology of houses, etc.).

This 2014 study can be seen as a baseline for this current study which has a deeper focused on climate-related issues by incorporating ne climatic data.

In fact, to complete the analysis of 2014, new focus groups were conducted in June 2017 in order to collect climate specific information: 2 in villages of Behsud district, 2 in villages of Yakawlang district and 4 in villages of Panjab & Waraz districts which are not current targeted districts of the program but might be targeted in potential future programs. Each focus group was only composed of male or female participants. People were selected to represent several age categories of the population in order to get information from the young and from the elders. In addition, some landscape observation regarding geographical and climate aspects were realized with the participation of elders and local authorities in almost all the visited villages.

Moreover, a bibliographical work, doubled with several meeting with relevant stakeholders in Bamyan province – NEPA, DAIL, IOM, Bamyan University – allowed the collection of scientific data regarding climate-related trends and futures within the Central Highlands region.

2.2.3 Purpose, expected results and limits of this climate study

As said above, a climate change and socio –economic study was conducted under the framework of two other GERES’ projects in Afghanistan in 2014.

This analysis gave the following relevant results:

- Accurate description of the local context & the socio-economic situation within the districts of intervention of the CHP;
- Determination of six livelihoods that give a framing to further analysis (Agriculture, Animal husbandry, Water, Housing conditions, External livelihood, Network & State facilities);
- Analysis of local perception of climate change effects and impacts;
- Determination of adaptation & mitigation strategies;
- Recommendations for livelihoods’ improvements.

The main purpose of this complementary climate study is to integrate these primary results within a deeper climate-focused analysis.

The study aims to give the most complete analysis of current and future vulnerabilities towards climate change effects and impacts for the local communities regarding their livelihoods. To do so, the analysis relies on the most accurate climatic data available coupled with the use of local communities’ perceptions and testimonies.

However, limits still persist in the analysis itself. There are uncertainties in some climatic models, notably as far as precipitation patterns are concerned. It is due to a greater spatial variability and the complexity of processes that lead to precipitation. This is exacerbated by the geographical context associated with the Central Highlands which are characterized by high mountains and deep valleys. Moreover, there is only one weather station for a region that is quite wide and has a huge diversity of landscapes.

This can lead to persistent uncertainty regarding conclusions and recommendations towards climate change adaptive strategies and options. For instance, even with an annual analysis of snowfalls it is difficult to get information on the distribution of the precipitation along the year. Moreover, regarding projections and climate futures, it is also more difficult for climate models to get a totally accurate projection of the future, once again because of climate natural variability. It implies to elaborate different scenarios that can lead to different answers in terms of strategies and actions.

Secondly, the study is focused on the districts of intervention of the Central Highlands Program. In consequence, it does not intend to stand for an exhaustive vulnerability analysis of the whole region. Moreover, it relies on a limited amount of means that did not allow to cover all villages and communities in order to gather the most precise climatic information as possible.

Finally, the use of people testimonies and perceptions constitute a limit itself because of the potential biases that come with it regarding memories and possible confusions between what is due to climate change and what is not.

3 Part II – Underlying vulnerabilities and current sensitivity to climate-related events

3.1 Determination of the livelihoods

The 2014 Assessment realized by S. Biney and O. Munos determined six livelihoods and their respective constitutive components:

- *Agriculture*: Source of food-consumption products (pulse, potatoes, wheat, fruits), source of income through cash crop and sold products (potatoes, fruits), source of intermediate products (fodder for livestock);
- *Animal husbandry*: Fodder, pasture, initial investment (cash), animal production & healthcare, facilities in winter, outlet;
- *Water*: Sufficient quantity of water, permanent access to drinking water, permanent access to irrigation water, sufficient quality of water;
- *Housing conditions*: Comfort items, fuel, construction materials, heating & cooking devices, construction land;
- *External livelihood*: Self-employment opportunities, employment opportunities , job (short term) opportunities, remittance opportunities;
- *Network & State facilities*: Healthcare facilities, communication facilities, road & means of transportation, security, cooperation between and among communities, skills and craftsmen.

For the current analysis, only four of them will be kept:

- **Agriculture**
This livelihood is notably composed of the following resources, stocks and recourses: Irrigations water, access to arable land, agricultural inputs (fertilizers, quality seeds, etc.), outlets, fertile soils, workforce (human and animal – farmers’ capacity and knowledge) & farming equipment, long enough growing season.
- **Animal husbandry**
This livelihood is notably composed of the following resources, stocks and recourses: Palatable and abundant fodder available, access to pastureland, animal healthcare, outlets.
- **Housing conditions**
This livelihood is notably composed of the following resources, stocks and recourses: Comfort items of assets, access to sufficient drinking water, accessible and affordable fuels for heating and cooking, access to raw building materials to maintain the house in good state.
- **Non-agricultural livelihoods**
This livelihood is notably composed of the following resources, stocks and recourses: Access to health, school & communication facilities, relatives living abroad or in big cities, level of physical security, existence & access to employment opportunities.

This classification is justified by the fact that irrigation water can be considered as a component of the “*Agriculture*” livelihood, and drinking water as a component of “*Housing conditions*”. To facilitate this analysis, the choice was made to gather “External livelihood” and

“Network & State facilities” under only one livelihood called ‘*Non-agricultural livelihoods*’. Moreover, the components for each livelihood were selected because they allow the comparison between the different districts.

These four selected livelihoods can be described as follow:

Agriculture – Most of the farmers are small scale tenants with limited irrigated land rent/lease. The production mainly consists in food, notably wheat and potatoes, and relies on covering household flour needs, covering winter fodder needs for livestock, covering incomes from potatoes surplus and limiting loss on production thanks to crop rotation. The production is mostly self-consumed. However, agriculture is often not productive enough and leads to a non-negligible risk for the food security of the entire area and its communities. In terms of irrigation, agricultural activities are highly dependent on water availability which mainly comes from runoff water from snow melting.

Animal husbandry – Almost all the families own animals such as sheep, goats, cows, oxen, donkeys and horses. The animals are fed with cultivated fodder that require 45% of the irrigated land. In economic terms, animals stand for a large part of the capital for households and provide a non-negligible amount of incomes each year, notably through co-products and direct selling of parts of the herds.

Housing conditions – Fuel and habitat mostly rely on an overuse of natural resources. Fuel consumption specifically depends on local biomass such as bushes, animal dung and wood. For almost all the rural communities, habitat consists in traditional mud houses.

Non-agricultural livelihoods- This category consists in the small amount of remaining activities that rely on other sources than agricultural. It is mainly composed of daily and permanent work done by the households to gather complementary sources of income but also composed of access to communication network and social facilities (schools, hospitals, roads, phone service, etc.).

3.2 Climate change effects & vulnerabilities in Afghanistan

3.2.1 Past and present climate Trends in Afghanistan

According to the UNEP data used for the 2017 CORDEX report⁵, Afghanistan is already facing a strong and global compilation of climate change direct effects in terms of temperatures and seasonal rainfall patterns.

⁵ Climate Change in Afghanistan deduced from reanalysis and coordinated regional climate downscaling experiment (CORDEX)—South Asia simulations; Valentin Aich, Noor Ahmad Akhundzadah, Alec Knuerr, Ahmad Jamshed Khoshbeen, Fred Hattermann, Heiko Paeth, Andrew Scanlon and Eva Nora Paton, 2017

This can be sum up within the following figure:

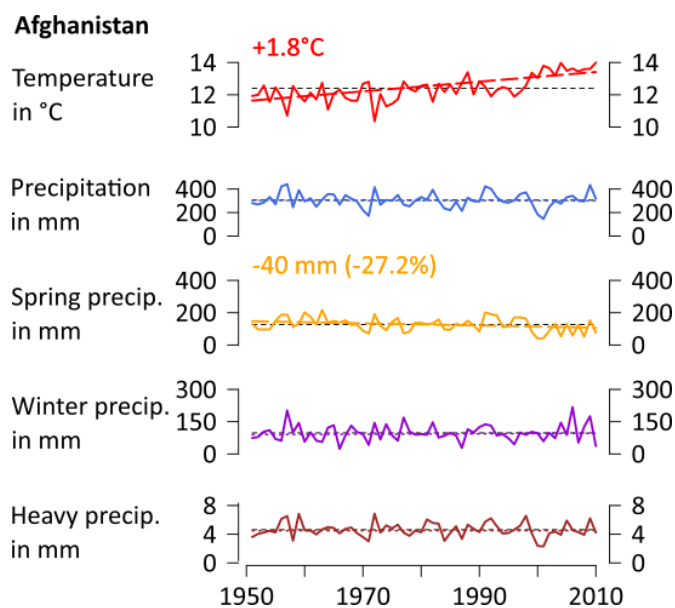


Figure 11: Climate trends for Afghanistan – CORDEX, UNEP, 2017

The figure above shows that Afghanistan is currently facing the first measurable direct effects of climate change. The results of the research lead by UNEP show that, since 1950, the mean annual temperature for the whole country has increased by +1.8°C and the phenomenon seems to accelerate and get more intense.

In terms of precipitation patterns, no clear trends seem to emerge except for the spring precipitation that are less and less abundant over the past years.

These figures are providing very useful information. Afghanistan relies a lot on agricultural and livestock activities which represent 22% of its annual GDP in 2016⁶ and its population is 73% rural⁷. In consequence, current effects of climate change already have impacts on people livelihoods notably through primary activities. These activities are deeply dependent on ecosystem services and climatic conditions in terms, for instance, of access to irrigation water, length of the growing season, etc.

Therefore, climate change is a potential additional threat to the level of vulnerability of the Afghan people.

⁶

Worldbank

database:

http://databank.worldbank.org/data/views/reports/ReportWidgetCustom.aspx?Report_Name=CountryProfile&Id=b450fd57

⁷ UNESCO Country profile: <http://uis.unesco.org/country/af>

3.2.2 Estimation of the level of vulnerabilities in Afghanistan

In terms of vulnerabilities, Afghanistan is already facing lots of difficulties.

To quantify it, the Notre Dame - Global Adaptation Initiative (ND-GAIN)⁸ developed an assessment methodology based on several components:

- Food – *Projected change of cereal yields, food import dependency, agricultural capacity, projected population change, rural population and child malnutrition.*
- Water – *Projected change in annual groundwater runoff, fresh water withdrawal rate, access to reliable drinking water, projected change of annual groundwater recharge, water dependency ratio and dam capacity.*
- Health – *Projected change in vector-borne diseases, slum population, medical staff, projected change in deaths from climate change induced diseases, dependency on external resources for health services and access to improved sanitation facilities.*
- Ecosystem service – *Projected change of biome distribution, dependency on natural capital, protected biomes, protected change in marine biodiversity, ecological footprint and engagement in international environmental conventions.*
- Human habitat - *Projected change of warm periods, urban concentration, quality of trade and transport-related infrastructure, projected change of flood hazard, age dependency ratio and paved roads.*
- Infrastructure - *Projected change of hydropower generation capacity, dependency on imported energy, electricity access, projection of sea level rise impacts, population living under 5m above sea level and disaster preparedness.*

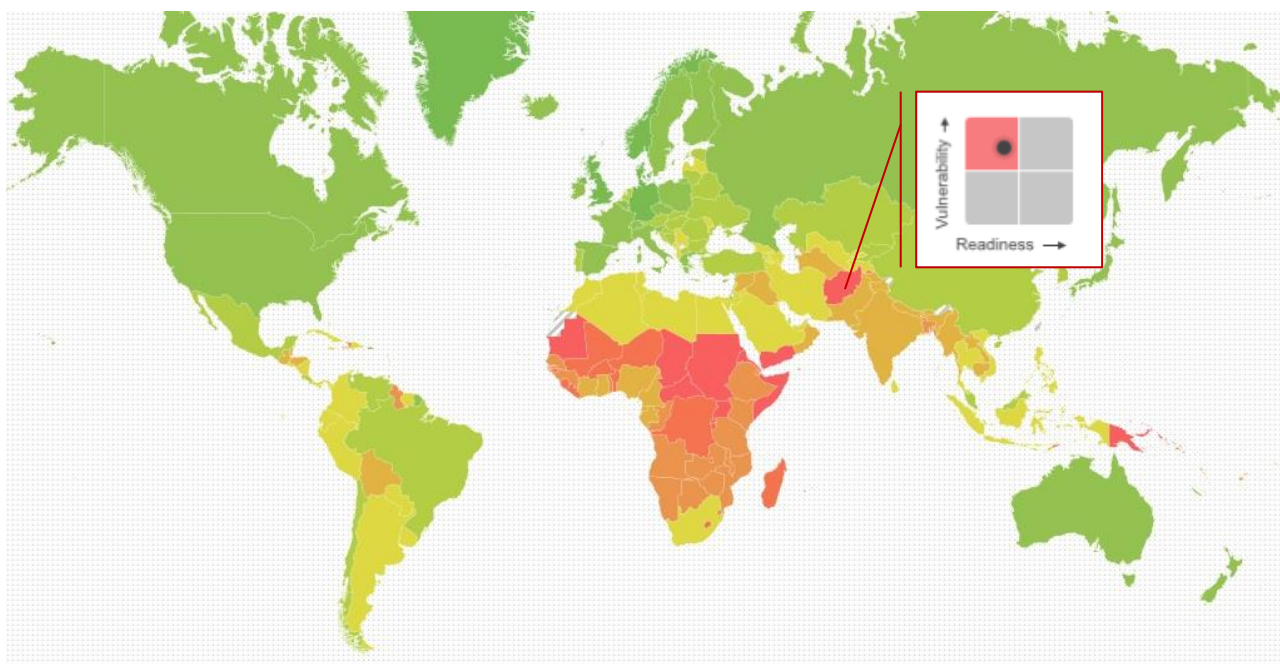


Figure 12: Map of the vulnerabilities according to the ND-GAIN Index

According to this index, Afghanistan is the 11th most vulnerable country of the world in terms of climate change potential effects and impacts on people's livelihoods. Afghanistan is also

⁸ Source: <http://index.gain.org/>

the 13th least ready country which means that regarding its intrinsic capacities (economic, environmental, political, etc.), it is estimated that the country will have difficulties to implement the necessary measures and actions to handle oncoming effects of climate change.

In a sense, climate change is not only an additional vulnerability, it enhances all the existing vulnerabilities. The conclusion of the ND-GAIN Index is that Afghanistan “*has both a great need for investment and innovations to improve readiness and a great urgency for action*”.

3.3 Climate change effects in Central Highlands

3.3.1 General overview

According to the UNEP data used for the 2017 CORDEX report, Central Highlands is one of the most severely impacted region of Afghanistan. Due to its specific geographical context and climatic conditions (mountainous region, dry and cold climate, etc.), the Central Highlands are particularly sensitive to climate variability.

This can be sum up within the following figure:

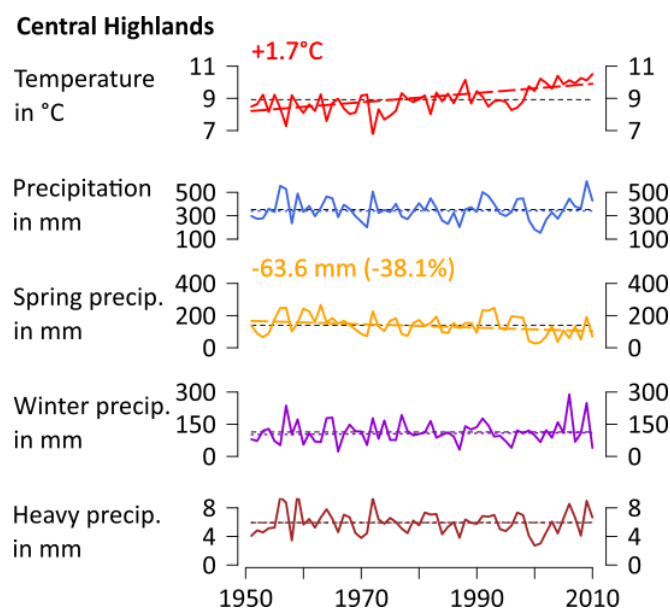


Figure 13: Climate trends for Central Highlands – CORDEX, UNEP, 2017

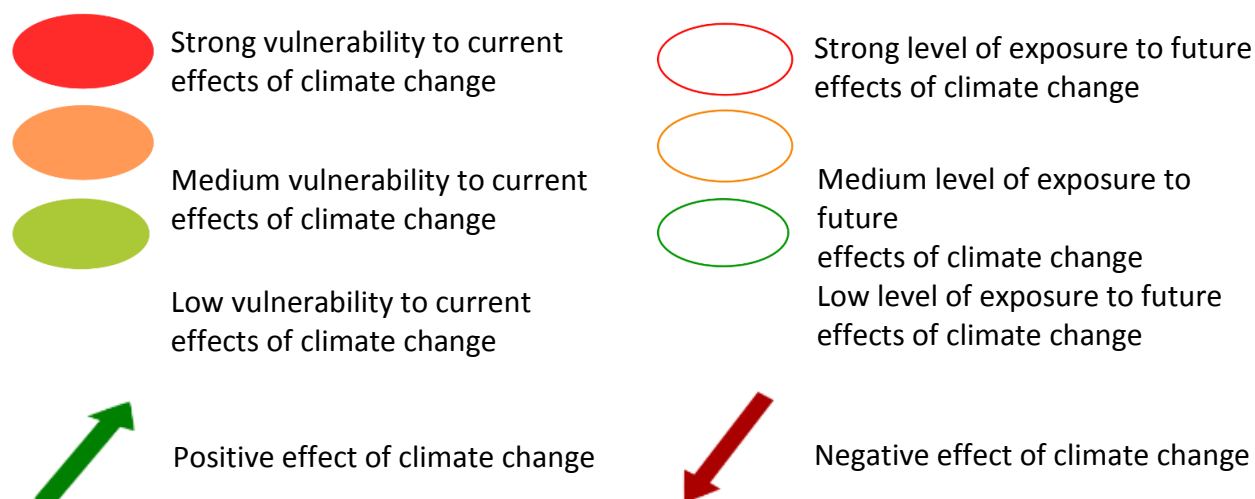
The figure above shows that the Central Highlands are deeply impacted by the first effects of climate change. In terms of temperatures, data show that, since 1950, the mean annual level increased by 1.7°C.

The Central Highlands are facing the strongest decrease of the whole country in terms of precipitation levels. For instance, during the spring season, the precipitations are nowadays 38.1% less significant than they were in 1950. Contrary to the rest of the country, the Central Highlands are also facing a severe decrease in terms of snowfalls during winter but the models do not allow to get a clear figure about the evolution of the situation. The conjunction of both these phenomenon represents a severe risk for agricultural activities. Indeed, if spring precipitations do not compensate the lack of winter snows, it can quickly leads to water shortages after the start of the growing season.

3.3.2 Methodology and potential biases of the analysis

3.3.2.1 Methodological details

In order to do a livelihood analysis of present and future vulnerabilities and level of exposure to climate change for Part II and IV of this study, the following typology will be applied:



All the figures shown in the following parts come from the 2014 study by S. Biney and O. Munos.

3.3.2.2 Climate change temporary positive effects and solidarity actions: two potential biases of the analysis

By discussing with some farmers in villages of Behsud, it looks like their perception of climate change impacts is following an inversed U-curve. This means that for now their perception is quite positive because of the prevalence of the positive sides of climate change. But in the coming years, climate change may have much more severe impacts on their livelihoods and lead to a negative perception of the phenomenon among communities. For lots of the encountered farmers, climate change is currently having positive effects and impacts: warmer temperatures, longer growing season, new available crops, etc. but they do not seem to perceive the temporary part of it. In very cold regions such as the Central Highlands can be seen as positive due to the new opportunities it creates. However, after a while, the effects of climate change will be too severe and the negative sides of it will overwhelm the positive ones.

Moreover, it is also important to notice that in some places where interviews or focus groups were conducted, NGOs and/or other international Organizations implemented several actions. These actions were not always directly targeting climate-related negative effects but they might have act as indirect coping mechanisms towards first negative impacts of climate change. It could be the case for water shortages, improved seeds, vaccination campaigns, etc. This may delay or hide the negative side of climate change to people and communities who, for now, only take benefits from climate-related variations. But, in the years to come, these actions might be overwhelmed by the potential acceleration of the global warming and the consequences that come with it.

3.3.3 Climate change in Yakawlang 1 & 2 † Vulnerable districts facing important heterogeneity

3.3.3.1 Geographical overview of the situation in Yakawlang



Figure 14: Climatic landscape evolution, Mountains & permanent snow cover, Yakawlang, 2017



Figure 15: Climatic landscape evolution, Rivers, Yakawlang, 2017

According to elders met in *Sia Dara* and *Kalta Top Olia* villages in Yakawlang, there is much less snow on the top of the mountains at the same period nowadays than 20/30 years ago. As shown in Figure 14, the top of the mountains is now almost completely devoid of permanent snow cover compared to the previous decades (white-crossed areas). In their opinions, it is linked to the conjunction of two phenomenon: the reduction of the amount of snowfalls and warmer temperatures. This seems to get worst every year for 20/30 years.

For the rivers, the situation is a little bit more difficult to analyze, and the link with climate change less easy to make. According to the same elders, there was much more water 20/30 years ago than today (blue-crossed area). But compared to this previous time, new infrastructures were built such as canals and ditches which could have had impacts on the local geography. In addition, agricultural uses of the water can also reduce the amount of water available within the rivers.

3.3.3.2 Livelihood analysis

CLIMATE CHANGE PERCEPTION

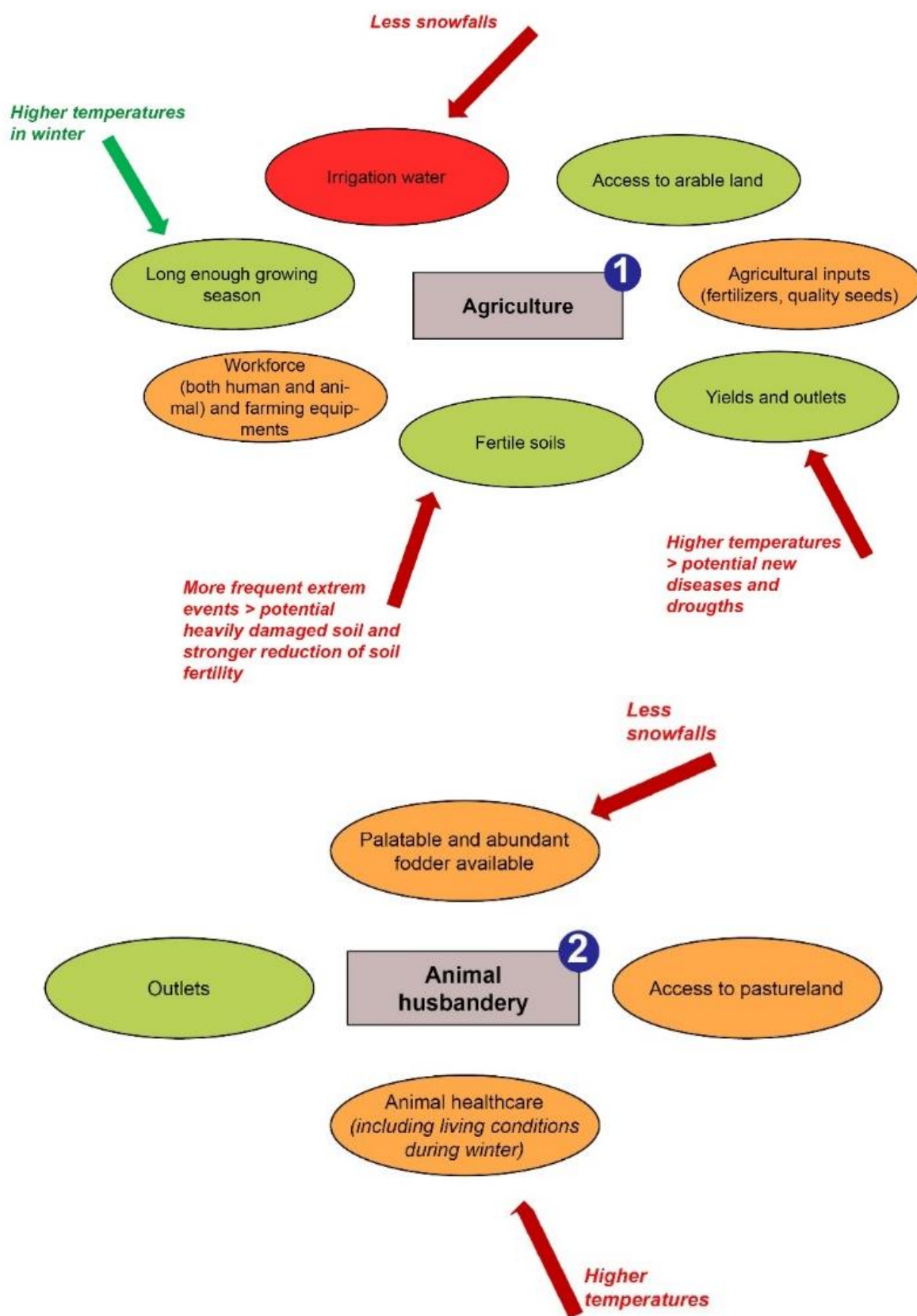
Nikbakht 68 years old resident of Kalta Top Olia said:

During the elder people were saying that a very heavy snow and storm occurred. There was a stone around 25 kg on the roof of a house but the storm took it from the roof and sent it to the deep valley. The snow storm last for 4 days and people were unable to go out to bring drinking water for themselves and their animals.

In Yakawlang, 97% of the 2014 CVRA study underline the fact that there is less snow today than 20 years ago. Over the last decades, 70% declare that the temperatures are getting warmer in winter and 91% perceive it during summers. According to some of the people met during focus groups in villages of Yakawlang, the time for snowfalls has also changed in comparison with 30 years ago with a start in late December now compared to beginning of October in the past.

In terms of climate hazards, 52% declare experiencing flood “sometimes” and 24% declare that it happens every year but droughts are the main cause of worries among the respondents.

SYNTHETIC ANALYSIS OF CURRENT VULNERABILITIES IN YAKAWLANG⁹



⁹ For a detailed analysis, see [Annex I](#)

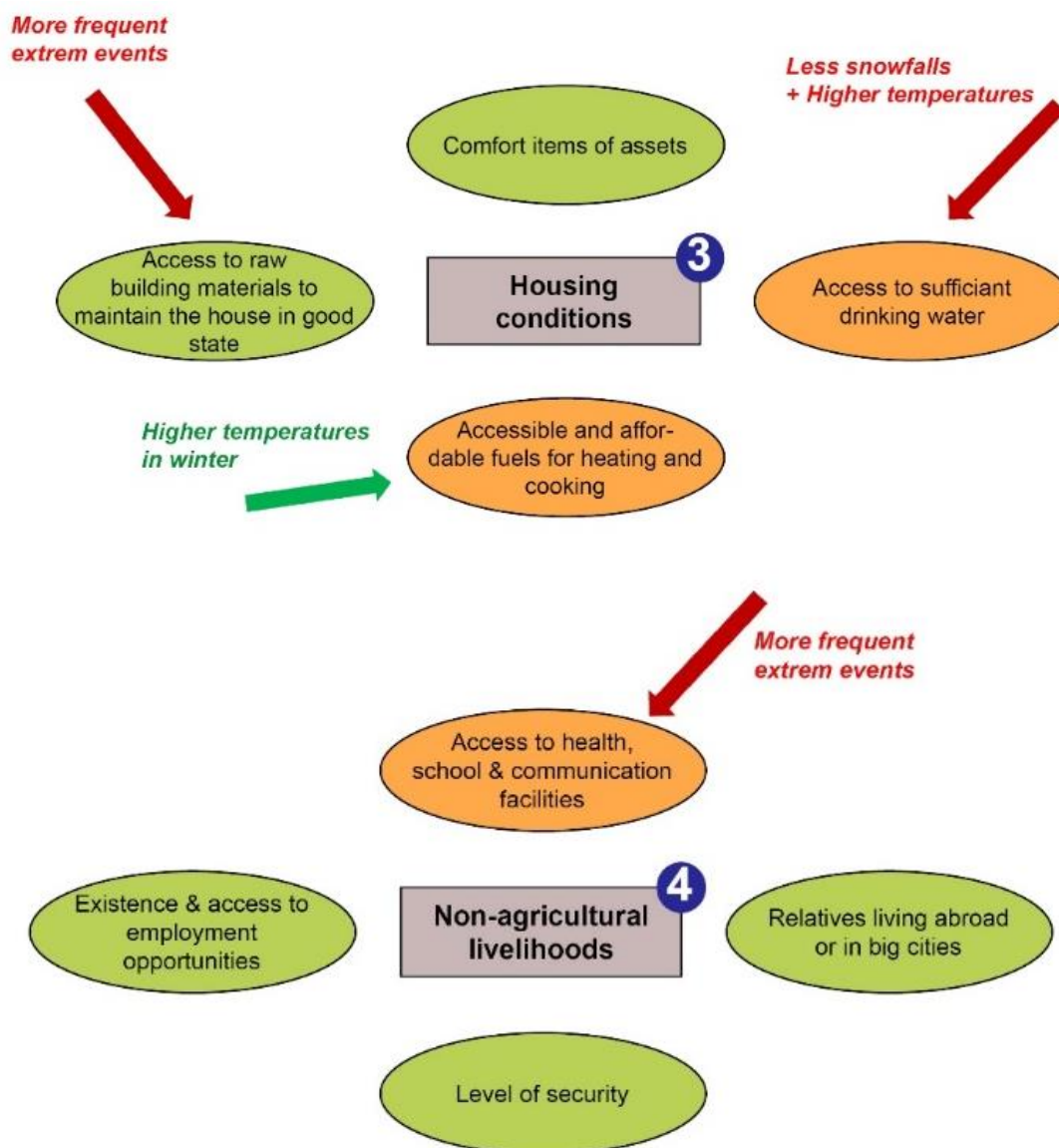


Figure 16: Current vulnerabilities to climate change, Yakawlang

Before starting the analysis, it is relevant to note that lots of NGOs interventions are concentrated in Yakawlangs districts. This can lead to a steady reduction of the current vulnerabilities expressed by the communities in these districts in comparison to the three other ones.

Agriculture – A highly vulnerable livelihood mainly due to limited access to irrigation water

70% of the interviewed people declare having no permanent access to irrigation water and being forced to practice water turns in order to limit and/or avoid shortages. With climate change, it looks like snowfalls are reducing and temperatures are getting warmer which add to the vulnerability of this component by making irrigation water scarcer. Regarding access to arable land, the level of vulnerability does not seem to be severe for now even if a few people of both districts declare losing some land due to water shortages. Seeds are mainly coming from self-production, and the use of chemical fertilizers is still limited. However, it seems that farmers are indicating having not enough access to improved seeds which can explain their level of exposure to new pests and diseases potentially due to warming temperatures. With climate change effects, it looks like farmers are able to grow new type of crops such as fruit

trees and vegetables. However, it also appears that their level of exposure to pests and diseases has increase over the years. In Yakawlang, farmers report facing red and black disease in barley and wheat that they were not facing in the past years. For now, soil fertility does not seem to be impacted by climate change effects even if droughts are getting more frequent and could lead to land-losses in the end. In terms of agricultural equipment, the mechanization is still scarce among the population of Yakawlang districts which can be seen as a vulnerability factor for low adaptive capacity.

Animal husbandry – A quite exposed livelihood but still rather preserved

A majority of the irrigated land is dedicated to fodder which means that the same vulnerability to irrigation water access is to be taken into account here. Needs for fodder are not well covered within the districts mainly because of the lack of water that dries the soil. This is mainly linked with snowfalls decrease and water availability reduction. In terms of access to pastureland, it looks like a degradation of the quality of these lands is raised by a majority of the shepherds, who are imputed it to more frequent and intense extreme climate events. Regarding animal healthcare, shepherds are having access to vaccines thanks to several vaccination campaigns. However, despite these campaigns, lots of them are declaring that diseases and pests spread among the cattle such as FMD – Food & Mouth Disease and Sheep Pox. This represents an important vulnerability, notably because of the effects of temperatures warming on the spread of diseases.

Housing conditions – Useful natural resources already threaten by people’s practices

For now, this livelihood is not quite vulnerable to climate change effects. The most sensitive component in this part is “access to drinking water”. Indeed, as it was said previously regarding irrigation water, this resource is particularly exposed and vulnerable towards climate change effects and impacts. The main sources of both districts are streams and hand pumps which rely almost entirely on runoff waters that come from mountains when the snow is melting. It explains that with the decrease in the amount of snowfalls annually, it raises a strong vulnerability in terms of people livelihood, even if it still concerns a limited number of people within both districts. Moreover, the quality of the water seems to be decreasing because more and more people are facing diseases while drinking it. Another fact to be noticed is the progressive rarefaction of bushes linked to fuel practices for winter notably because people in Yakawlang are over-using it, coupled with dung. This leads to soil degradation and soil erosion that reduce the capacity of the ecosystem to face climate-related extreme events such as floods and droughts.

Non-agricultural livelihoods – A rather preserved livelihood with a potential vulnerability in addressing climate-related extreme events

Yakawlang districts are quite preserved regarding this livelihood. Indeed, families often have relatives living abroad or in big cities within the region and that can help facing unpredictable climate events. People are often working as daily workers in order to provide alternative sources of income and help to fulfil the needs of their families. Regarding the level of physical security, Yakawlang is quite preserved from conflicts with *Kuchis* (pastoral/nomad shepherds that engage fights with sedentary breeders for access to pastureland). However, it is relevant to note that there is a lack of access to social facilities such as schools and hospitals for remote villages of both districts. In addition, it looks like communication network are not well-covering the entire area. This raises a vulnerability for the population towards the increasing number of extreme climate-related events in the region.

3.3.4 Climate change in Behsud 1 & 2 † Poor opportunities of external livelihoods, strong and accelerating tendency to land degradation

3.3.4.1 Geographical overview of the situation in Behsud



Figure 17: Climatic landscape evolution, Mountains & permanent snow cover, Behsud, 2017



Figure 18: Climatic landscape evolution, Diseases in trees, Behsud, 2017

According to elders met in *Sabz Darakht* and *Zarkharid* villages in Behsud, snow is getting scarcer on mountains' tops nowadays in comparison with 20/30 years ago. For a few years

now, the snowfalls are less abundant, except for one or two specific years, and the snow coverage is not as important as it used to be. 30 to 20 years ago, having two meters of snow everywhere was common and regular, but now one meter is the exception.

Figure 21 shows a disease reported as new, or at least more frequent, by the elders. It severely damages the trees and causes troubles for wood supplying for fuel purposes during winter.

3.3.4.2 Livelihood analysis

CLIMATE CHANGE PERCEPTION

An elder participant to a focus group organized in Zarkharid village:

“20 years ago when we put water inside corridor during winter, it froze because of the cold weather but currently when we put water inside corridor the water is no longer freezing anymore”.

An elder participant to a focus group organized near Shiraz:

ت در دروازه ها را باز می کردند و در دروازه ها را می بستند

t open the door as it was

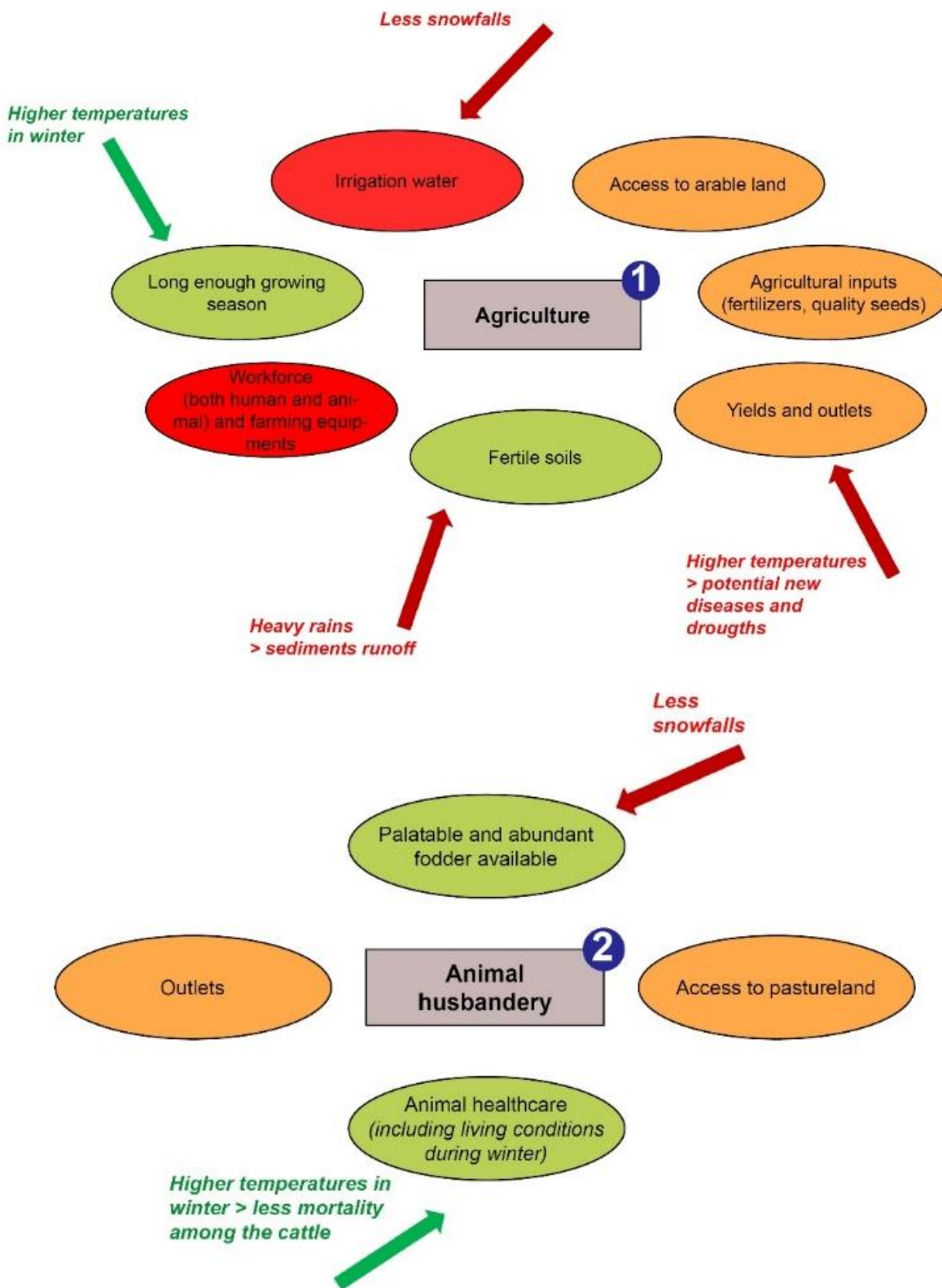
According to the 2014 CVRA report, more than 90% of the respondents in both districts of Behsud are saying that there is less snow than 20 years ago, which, for Markhazi Beshud, results in yearly water shortages for 82% of the respondents. In consequence, 88% of the respondents are more and more worrying about access to irrigation water for the years to come.

On the contrary to the situation in Yakawlang, 50% of the respondents in Hisa-e-Awali Behsud report that winters are getting colder and summers are not really changing. The situation is different in Markhazi Beshud where people are mainly responding that winters and summers are getting warmer. This difference might be due to an age gap with an underrepresentation of elders in Hisa-e-Awali Beshud, or an overrepresentation of returnees. Moreover, some of the people interviewed during focus groups declare that winters are shorter than 20/30 years ago.

70% of the respondents in both Behsud districts report that floods happen “sometimes” but almost the majority of them are worrying about it. As what is happening in Yakawlang, people are mostly worrying about droughts and their impacts on agricultural activities.

SYNTHETIC ANALYSIS OF CURRENT VULNERABILITIES IN BEHSUD¹⁰

¹⁰ For a detailed analysis, see [Annex II](#)



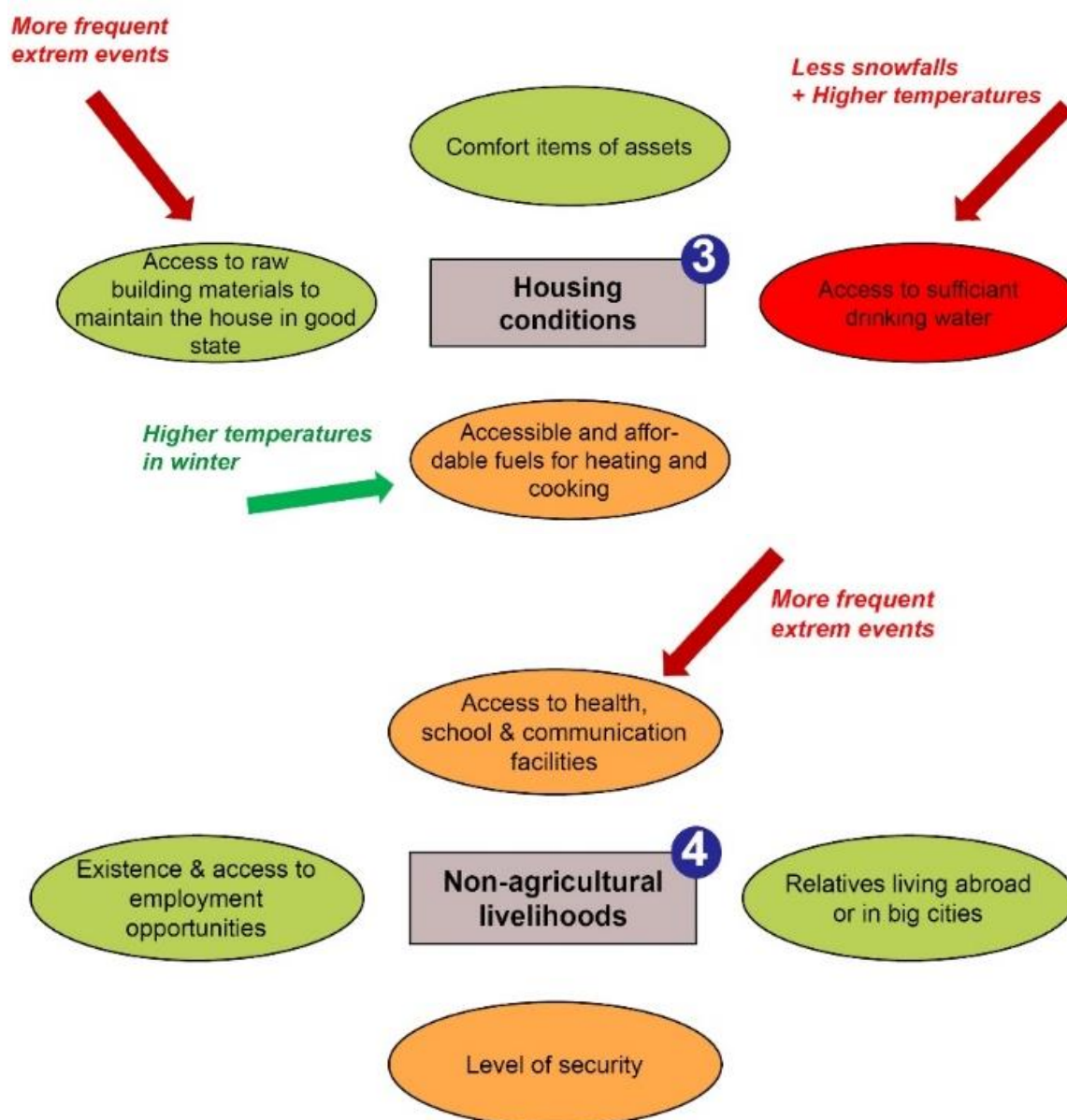


Figure 19: Current vulnerabilities to climate change, Behsud

Agriculture – A highly vulnerable livelihoods notably regarding human workforce and access to irrigation water

Agriculture is the most vulnerable livelihood of both Behsud districts. This is mainly explained by the access to irrigation water that is already decreasing a lot due to temperatures warming and the steady reduction of snowfalls annually. In consequence, people are already facing lots of water shortages, despite the water turns already put in place among communities. Some villages are experiencing the opposite situation, with more easily accessible water for irrigation during spring season. This is mainly due to the melt of eternal snows that were not melting until now but which are providing water thanks to temperatures warming. The other most vulnerable component of this livelihood is the human and material workforce availability. In fact, lots of people are already emigrating from both Behsud districts which reduce the amount of farmers available to cultivate the land which is not compensate by mechanical equipment. This migration phenomenon seems to be stuck within a unvirtuous circle because, according to people, migrations are mainly linked with the lack of economic

opportunities in villages and leads to a reduction of workforce available to cultivate lands which reduce the quantity of food available and leads to new waves of departures. As far as other components are concerned, agriculture is quite vulnerable too. Farmers are reporting losses of lands mainly because of water shortages (72% of the interviewed people within the districts). In terms of agricultural inputs, it mainly relies on human workforce and natural fertilizers which are mostly used as fuel during winter. Pests and diseases are also severely impacting the area through diseases on wheat and potatoes. This is reported to be an increasing phenomenon that farmers are not able to stop for now. However, it looks like thanks to temperatures warming, farmers are taking benefits from longer growing season and new crops availability. It mainly consists in fruit trees and vegetables.

Animal husbandry – A rather preserved livelihood except for access to pastureland

In Behsud, fodder availability and needs covering are not yet an issue among communities. Regarding animal healthcare, it looks like vaccination rates are quite high in both districts but not efficient enough to prevent diseases from happening within the herds. It is also explained by the lack of use of winter exit by the shepherds who choose to let their animals in the stables during all the winter season which is favorable to the spread of diseases. However, despite these practices, it looks like the situation is not yet too severe in Behsud. However, shepherds do not have a strong diversity of livestock in comparison with other district which can be seen as a vulnerability because of the lack of possibility to use it as a coping mechanism facing climate-related extreme events. Finally, the most vulnerable component of this livelihood in Behsud is the access to pastureland. It looks like over the past years, conflicts with *Kuchis* are increasing due to the lack of available qualitative land for nomads. The majority of Behsud shepherds declare noticing a degradation in pastureland quality due to climate extreme events.

Housing conditions – A severe vulnerability linked with the quality and quantity of drinking water available

The most severe vulnerability regarding this livelihood is linked with drinking water access. Almost all the population is getting water from a unique source of water which is mostly the rivers. As said above this source mainly rely on runoff waters that come from snow melting. This shows a strong vulnerability of this component towards current climate change effects which tend to reduce the amount of available water within the entire region. In consequence, people are already facing water shortages along the year in both districts of Behsud. However, it is important to notice that for now the quality of the water seems to be quite good with the majority of the people saying that they did not face any diseases linked with water quality over the past years. As for other districts of the area, bushes and dungs are the most used fuels for heating and cooking. This raises the same type of problem than in the rest of the region regarding natural resources rarefaction and all the consequences that come with it (soil erosion, landslides, etc.). Nevertheless, in terms of access to comfort items and raw building materials, it looks like both Behsud districts are quite preserved and not yet vulnerable to climate change effects.

Non-agricultural livelihoods – Potential conflicts with *Kuchis* that pull the level of vulnerability upwards

The most worrying issue, according to people, is the increasing rate of conflicts with *Kuchis* that threatens the level of security of the entire area. Conflicts usually happen from May to August because of the rarefaction of the available pastureland. This situation seems to

deteriorating over the past years. Moreover, people living in remote areas are facing the same type of vulnerability than the ones in Yakawlang regarding access to social facilities and communication networks. This is an issue to be taken into account facing climate-related extreme events.

3.3.5 Saighan -

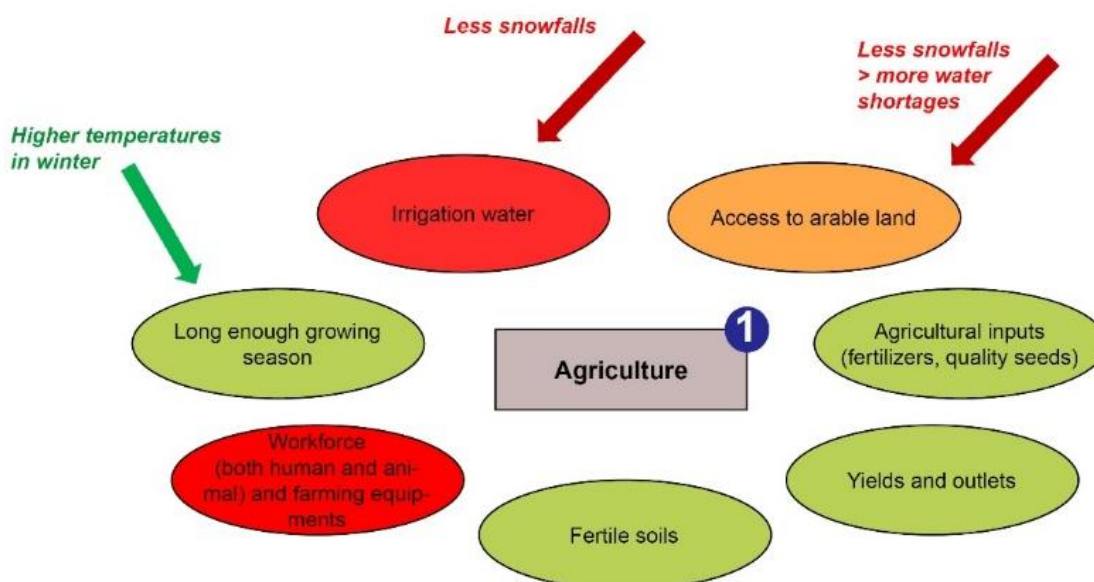
CLIMATE CHANGE PERCEPTION

In Saighan, 96% of the respondents to the 2014 study declare that there is less snow now than 20 years ago. In terms of water scarcity, the situation is close to what is happening in Yakawlang, with a majority of people that declare facing water shortages “sometimes” but not every year. However, 72% of the respondents are more worrying about water scarcity now than before which tends to show a steady degradation of the situation. Contrary to Behsud districts where people did not agree on their perceptions of temperature changes during winters and summers, more than 90% of the respondents notice a global warming in Saighan, no matter the season.

Almost a third of the respondents declare being affected by flood yearly within the district and 73% are getting more and more worried about it. This means that flood are already a major concern in Saighan that needs to be taken into account for this analysis. However, in Saighan, like in almost all the other districts, the most impactful climate hazards raised by the respondents are droughts and severe water shortages.

All of this underlines the fact that climate change is already impacting Saighan, notably in terms of water access and availability.

SYNTHETIC ANALYSIS OF CURRENT VULNERABILITIES IN SAIGHAN¹¹



¹¹ For a detailed analysis, see [Annex III](#)

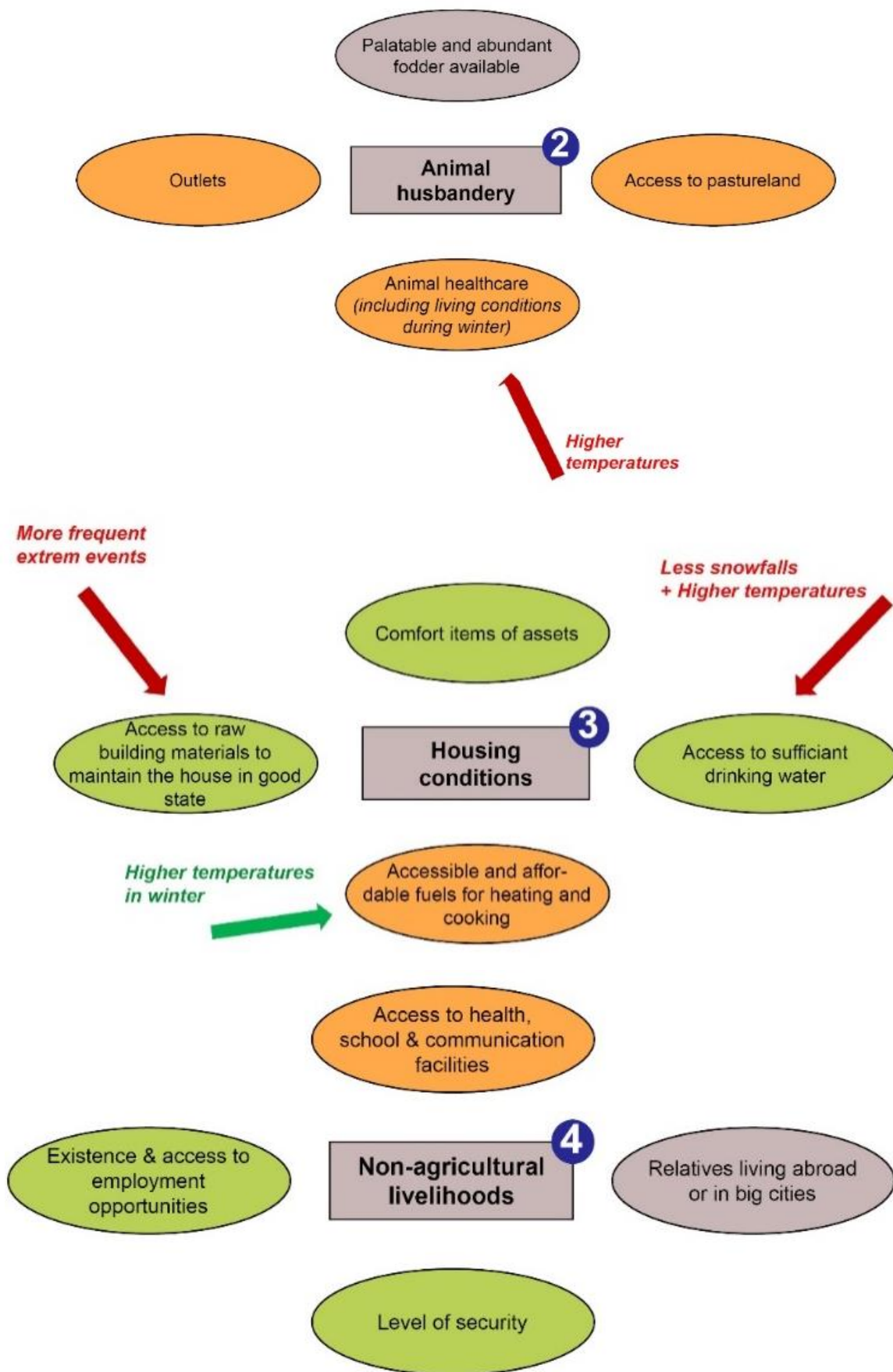


Figure 20: Current vulnerabilities to climate change, Saighan

Agriculture – A highly vulnerable livelihood towards water access and mechanical equipment, but rather preserved for its other components

As for the other districts of the region, Saighan is highly vulnerable to irrigation water access. People are already facing lots of water shortages despite the implementation of solutions such as water turns. The majority of them also notice the need for maintenance of the infrastructures that are frequently damaged. However, the situation looks quite better than in Behsud or Yakawlang with almost a third of the population having a permanent access to irrigation water. Saighan is particularly facing a lack of mechanical equipment for agricultural activities with almost 90% of the interviewed people that declare using none of it. This raises a strong vulnerability regarding the potential lack of adaptive capacity it leads to for communities facing climate change effects. For this other components, it looks like the situation is not yet an issue in Saighan, except for access to arable land. Indeed, almost half of the population in Saighan declare losing lands because of water shortages which constitute a vulnerability that needs to be taken into account.

Animal husbandry – A difficult situation for shepherds regarding prevalence of diseases and limited access to pastureland

For animal husbandry, due to a too high level of non-response it is not possible to analyze the “available fodder” component. However, for the other components, it looks like shepherds in Saighan are facing huge rates of prevalence of diseases among the cattle over the past years. This seems to be linked with the apparition of new diseases and a low level of efficiency of vaccines distributed during vaccination campaigns. Moreover, shepherds are frequently using stables during winters which are favorable to the spread of diseases among the herds. As far as access to pastureland is concerned, it looks like lots of shepherds do not have any access to it within the district. Nevertheless, it appears that the quality of these lands remains good or is improving thanks to temperatures warming.

Housing conditions – A quite preserved livelihood except for natural resources management for fuel purposes

On the contrary to Behsud or Yakawlang districts, access to drinking water is not yet an issue in Saighan. It looks like only a minority of the people are facing water shortages within the districts and gets access to a relatively good quality water with low rates of prevalence of diseases in it. Regarding comfort items and access to raw building materials for houses maintenance, the situation is quite positive too and the level of vulnerability towards climate change is still low. However, in terms of natural resources management for fuel purposes, the situation and communities’ practices raise a potential vulnerability of this component to climate change effects. In fact, the most used couple of resources for cooking and heating is bushes and coals. As said before, bushes are getting scarcer within the whole region and leads to negative consequences regarding ecosystem capacities to face climate-related events. Finally, houses are mainly built in mud which is a highly flood-sensitive material and people in Saighan are more and more worried about floods frequency and intensity. Even if for now it does not seem to be a relevant component of people’s vulnerability towards climate change, it could constitute a factor for low adaptive capacity in the future.

Non-agricultural livelihoods – A potential source of adaptive capacities for the communities

Even if Saighan population is also facing difficulties towards its access to health and school facilities or communication networks, it appears that all the components of this livelihood are rather preserved from climate change effects.

3.3.6 Kahmard - Wealthier livelihoods and good access to resources

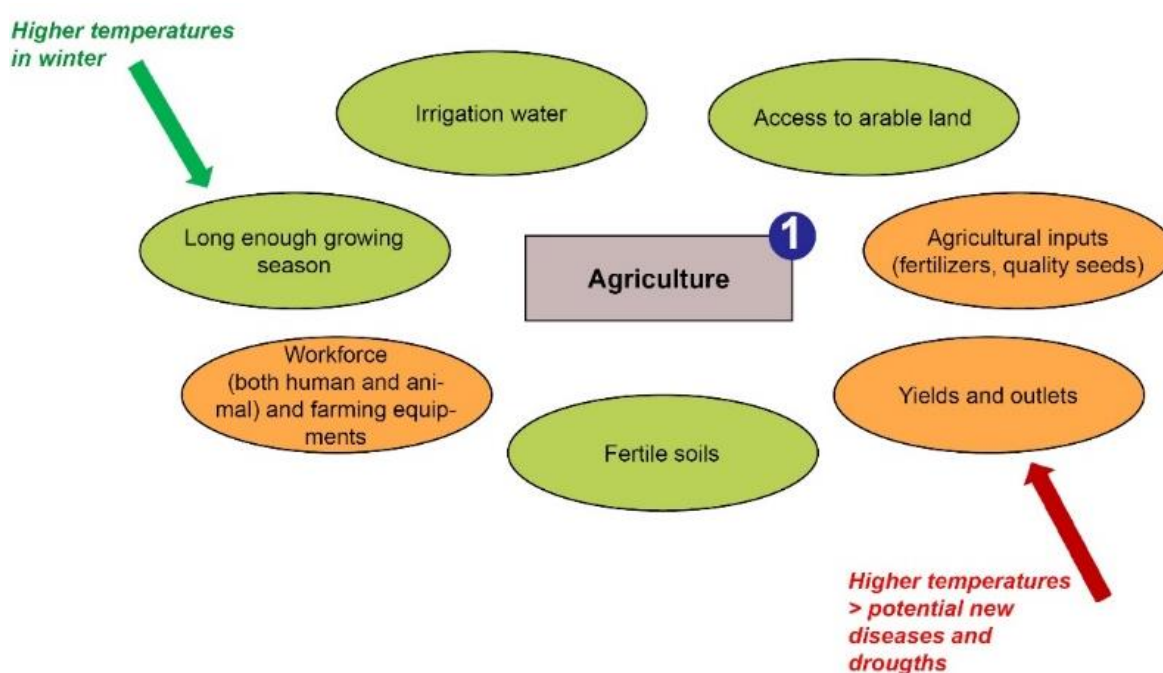
CLIMATE CHANGE PERCEPTION

Even if, as for all the other districts of the Central Highlands, a huge majority of the respondents to the 2014 study affirm that there is less snow today than 20 years ago (80%), it is the only district where more than 10% of the households affirm the opposite. Regarding water shortages, the situation is, once again, quite different from the other districts. Indeed, 67% of the respondents declare they never faced any in the past years and 61% are less and less worrying about it.

In terms of temperatures changes perception, people from Kahmard are on the same trend than other districts with a perception of winters getting hotter for 64% of them and summers are getting hotter for 93% of them.

On the contrary to other districts, people from Kahmard seem to be quite affected by floods. 46% of the respondents describe it as a yearly phenomenon and 18% notice several occurrences per year. Logically, it stands for 71% of the people in Kahmard in the first position in terms of most impactful climate-related hazards and 69% of them are more and more worrying about it.

SYNTHETIC ANALYSIS OF CURRENT VULNERABILITIES IN KAHMARD¹²



¹² For a detailed analysis, see [Annex IV](#)

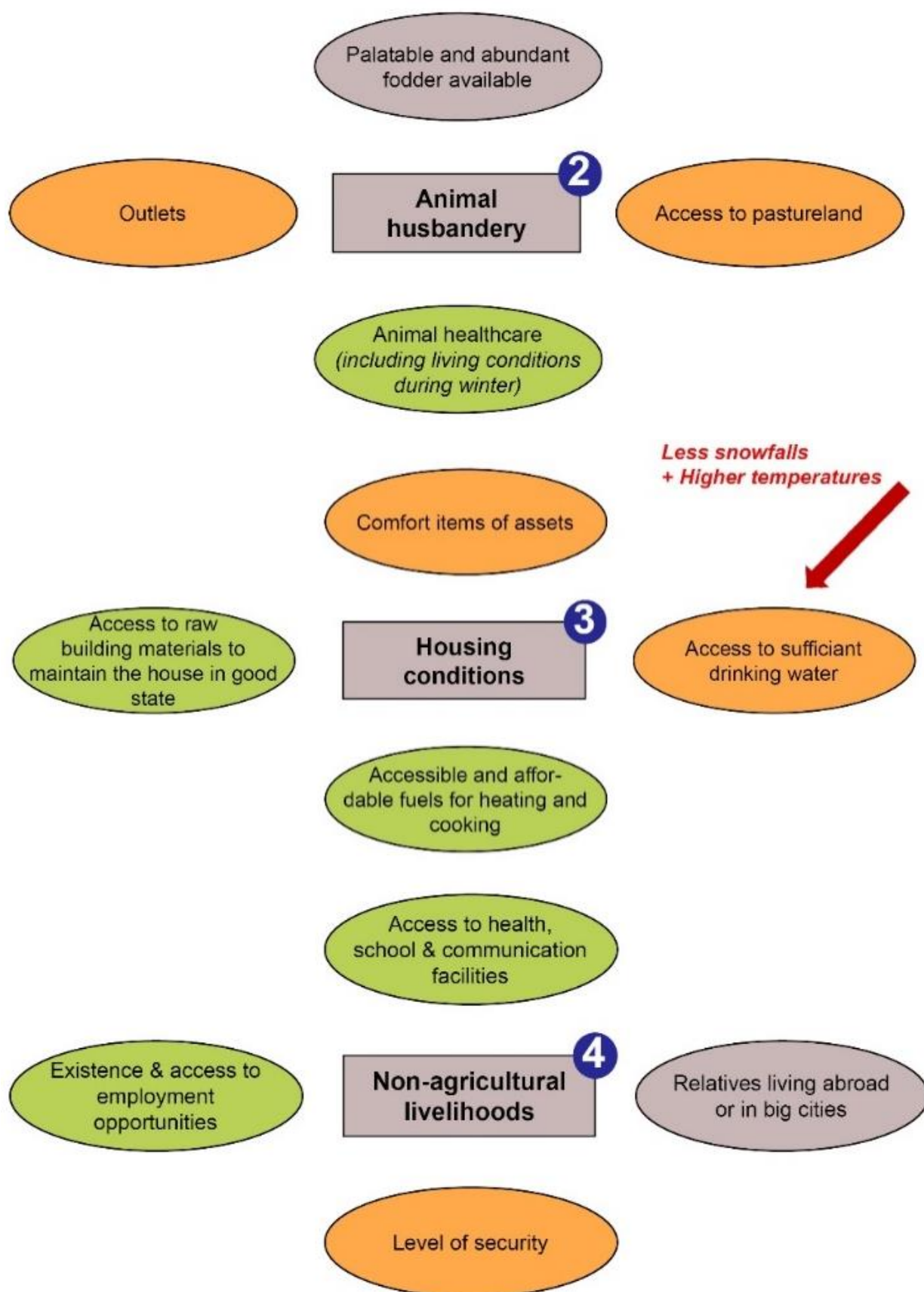


Figure 21: Current vulnerabilities to climate change, Kahmard

Agriculture – A relatively preserved livelihood thanks to good access to irrigation water

Less than a third of the interviewed population of Kahmard is facing water shortages. In comparison with the other districts (Yakawlang, Behsud and Saighan) it looks like Kahmard's population has a relatively good access to irrigation despite climate change first effects. This may be explained by the location of the settlements that are mostly near to rivers' bed. This has impact in terms of access to arable lands. Indeed, losses of land being positively correlated with the frequency of water shortages, farmers are rather spared in this district. For now, soil fertility is not yet impacted in Kahmard, and climate change is also making the growing of new crops possible. However, even if chemical fertilizers are almost a common practice for the farmers in the district, it looks like there is a less frequent recourse to exchanges within communities towards seeds procurement. This raises a potential vulnerability regarding the level of solidarity between farmers. Moreover, crops are not spared by diseases and pests in the district which are even happening several times a year according to some interviewed farmers. Once again, it looks like mechanical equipment is not common in the district which puts lots of pressure on human workforce and makes this livelihood vulnerable to human migrations for instance.

Animal husbandry – A secondary livelihood that does not seem to stand as vital for Kahmard's population

Interviews show that Kahmard's population is not really involved in animal husbandry. In fact, 97% of the interviewed people say they do not have access to pastureland or rangeland for livestock and only a few of them possess animals. This raises a potential vulnerability for Kahmard's people who might not be able to use the cattle as a coping mechanism in order to face climate change effects or climate-related extreme events.

Housing conditions – Bad quality of the available water and lack of electricity access that increase the level of exposure of this livelihood

Regarding housing conditions, Kahmard is quite different from other districts in terms of electricity access. It does look like people have a limited access to solar panels. This may raise a vulnerability because of the potential lack of adaptive capacity it leads to. Access to drinking water, as for irrigation, does not seem to be an issue in the entire district. However, people are reporting lots of diseases linked with the poor quality of the accessible water. This constitutes a vulnerability to be taken into account because of the potential effect of climate change towards the wider spread of diseases due to temperatures warming. For fuel access, Kahmard is, once again, different from the other districts of interest of this study. Indeed, it is the least bushes-dependent district of the area with a prevalence of wood and coal in the energetic mix of the communities. This shows a relatively less strong dependence to natural resources availability of the population.

Non-agricultural livelihoods – A potential vulnerability regarding insurgents' movements within the district

Contrary to other districts, it looks like Kahmard is well covered in terms of social and communication infrastructures. This tends to show a potentially stronger level of adaptive capacities towards climate-related extreme events in the area, specifically noticing that floods seem to be quite frequent within the district. This may allow the implementation of early-warning systems in order to efficiently face these types of disasters and avoid human casualties. Regarding the level of security, *Kuchis* are not an issue in Kahmard, even with climate change current effects. But the district is exposed to security issues due to the insurgents' situation and constitutes a "no-go zone" for lots of international organizations which limits their capacity of actions.

4 Part III – Climate futures

4.1 Introduction to the data analysis

The UNDP - United-Nations Development Program – developed Climate Change Country Profiles¹³ for several developing countries. These reports rely on sources such as the Climatic Research Unit, the University of Delaware or the Global Precipitation Climatology Centre¹⁴.

They give information on climate projections within three different scenarios: (i) an optimistic scenario; (ii) a medium scenario and (iii) a pessimistic scenario that compile 15 climatic models.

4.2 Climate futures and projections for Afghanistan

Thanks to the data provided by the work the UNDP, it is possible to get quite a precise idea of the potential evolution of the temperatures and precipitation patterns in Afghanistan, following the potential scenarios.

4.2.1 Scenarios of evolution for the temperatures in Afghanistan

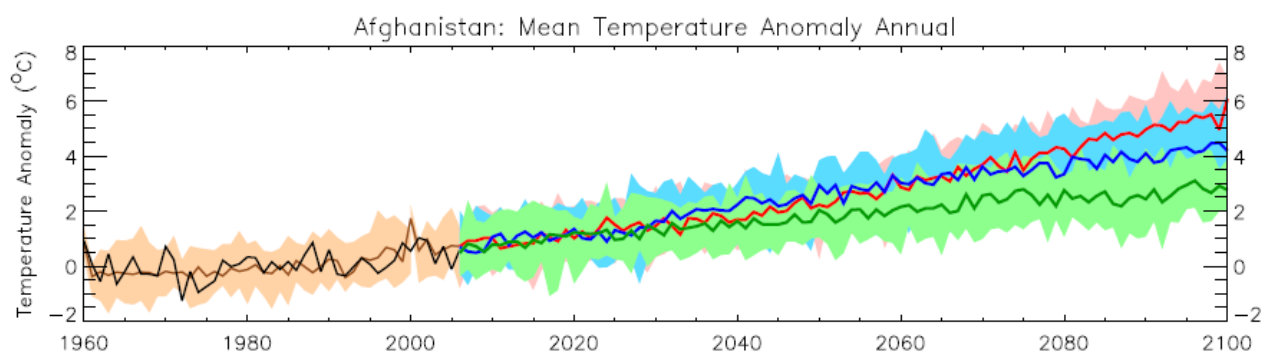


Figure 22: Climate projections for Afghanistan, Annual temperatures – UNDP, 2010

From this first graphic, it is possible to say that, no matter the scenario, temperatures are going to rise following the same trend of evolution until 2030s. Mean annual temperatures will reach an increase of +2°C compared to the baseline – which is the 1970-1999 period.

After 2030s, the evolution is more closely linked with the different scenarios:

- Under the most optimistic scenario, the temperature will rise up to +3°C for the whole country by 2100.
- The two other scenarios follow the same path of evolution until 2070s. After that, the most pessimistic one reaches a +6°C increasing where the medium one stabilized to +4°C.

It is important to notice that +3°C or +6°C will have complete different impacts for Afghanistan. It is therefore necessary to take all the possible evolution into account and to try a get a more precise overview of the situation by using seasonal data, such as for instance winter and summer temperatures:

¹³ Source: <http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/>

¹⁴ More information on the reports' sources and methodology : http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDPCCCP_documentation.pdf

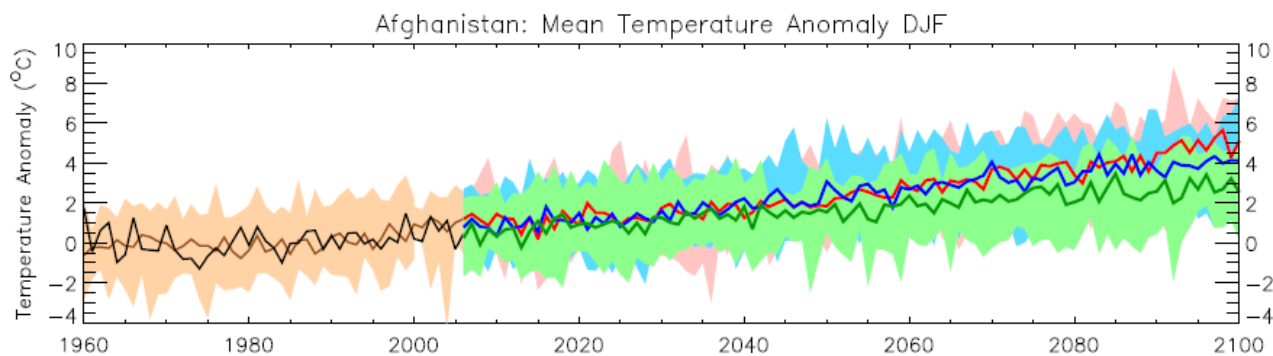


Figure 23: Climate projections for Afghanistan, Winter temperatures – UNDP, 2010

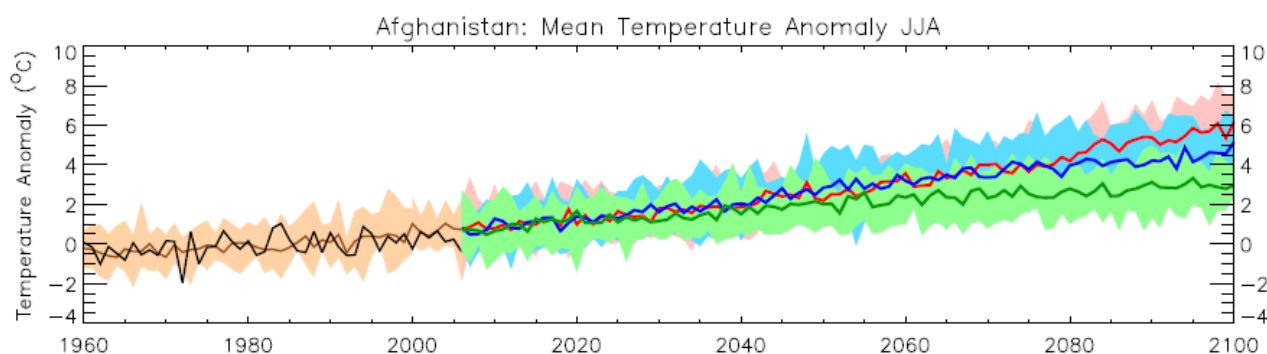


Figure 24: Climate projections for Afghanistan, Summer temperatures – UNDP, 2010

The observation of the two figures above give relevant information. In fact, the rise of the temperatures will be less strong in winter than in summer but with a higher variability under all the scenarios. It confirms the potential co-existence of very cold winters and much warmer ones in the years to come with possible severe impacts for the whole country. Summers will be warmer, no matter the scenario.

1.1.1.1 Scenarios of evolution for the precipitations in Afghanistan

Generally, evolutions of precipitation patterns are more difficult to predict because of the high level of uncertainties linked with natural variability of the climate system.

But the study of the three following figures give some exploitable information:

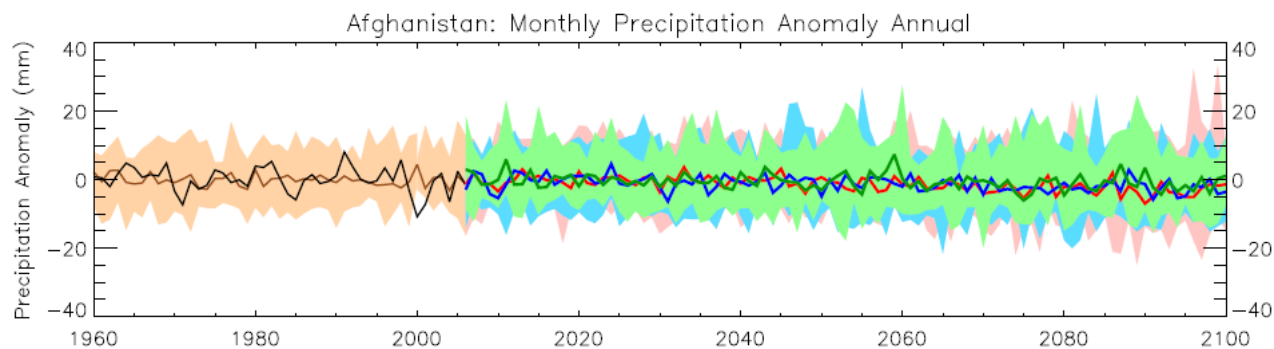


Figure 25: Climate projections for Afghanistan, Annual precipitations – UNDP, 2010

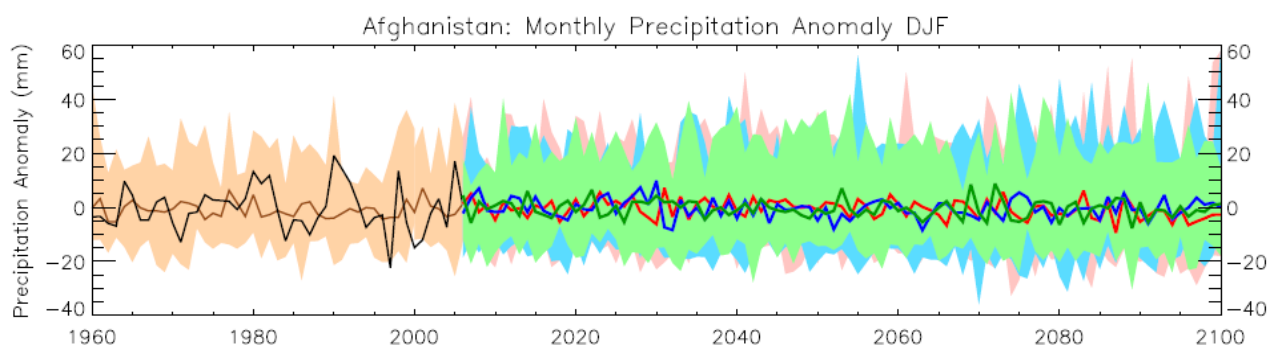


Figure 26: Climate projections for Afghanistan, Winter snowfalls – UNDP, 2010

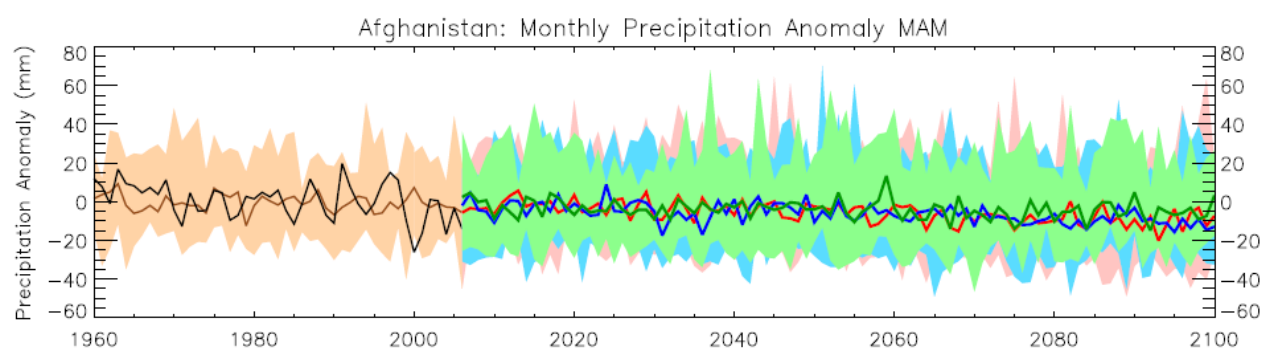


Figure 27: Climate projections for Afghanistan, Spring precipitations – UNDP, 2010

It is interesting to look at winter and spring precipitations because of their influence on agricultural activities which, as said earlier, are the main livelihood form most of the Afghan people.

The first graphic shows that there is no clear trend in terms of precipitations whatever the scenario used for the projection. However, it seems that seasonal variability is going to increase in the years to come. This higher variability is more visible during the spring season, which could have disastrous impacts on agricultural activities. In addition, the three scenarios tend to underline a slight decrease in the amount of precipitations itself over the years. For winter snowfalls the variability is important too but no real clear trends emerge.

4.2.2 Climate futures and projections for the Central Highlands

The UNEP CORDEX gives data at the regional level that it is useful to study and analyze for this part. Contrary to UNDP reports, only two scenarios are at stake here and are based on IPCC – Intergovernmental Panel on Climate Change – database and compilation work. It can be resume as an optimistic one (RCP 4.5) and a pessimistic one (RCP 8.5).

4.2.2.1 Scenarios of evolution for the temperatures in the Central Highlands

When it comes to the local level, the analysis gives more precise and useful data for the vulnerability assessment.

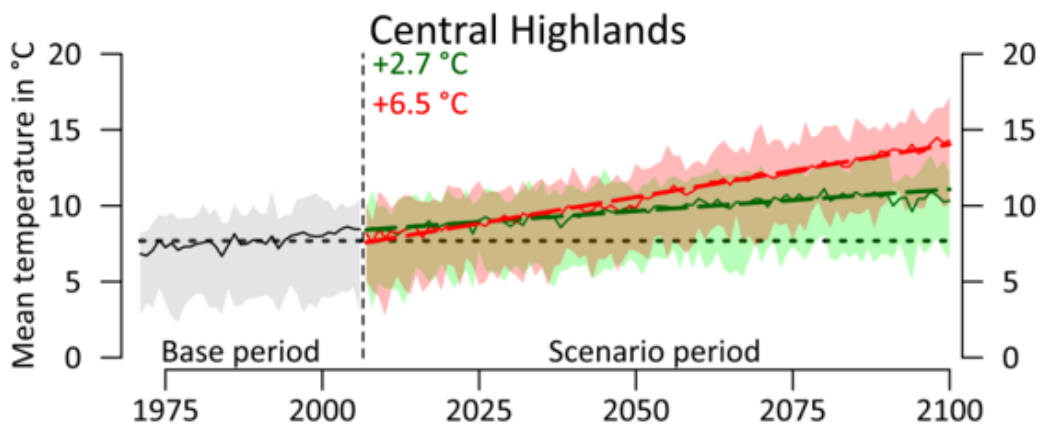


Figure 28: Climate projections for the Central Highlands, Annual temperatures – CORDEX, UNEP, 2017

In terms of mean annual temperatures, models show that the trend for the Central Highlands is quite similar to the one for the entire country. Under both scenarios, temperatures are predicted to increase with, potentially, a high level of variability according to seasons or specific local climates.

This graphic also underlines that, no matter what happens, it is sensed to take into account the probability of a global warming in the Central Highlands until 2030s/2040s which imply to integrate this into all the actions that will be implemented in the regions. After 2040s, the two scenarios are quite divergent and make it necessary to imagine different levels and ways of action. Indeed, between +2.7°C and 6.5°C, there is a huge difference regarding future effects and impacts of climate change in the region.

More precisely, because of the prevalence of agricultural activities in the Central Highlands, it is useful to take a look at the seasonal evolution of these climate projections.

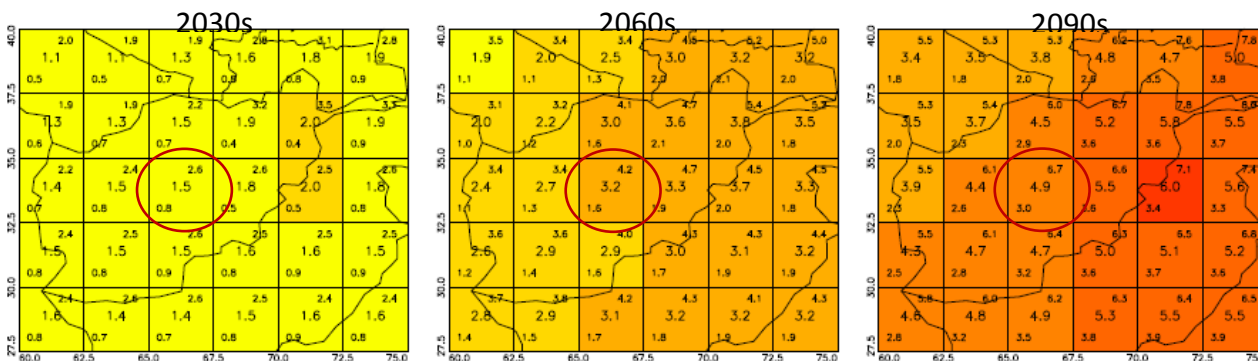


Figure 29: Climate projections for Afghanistan, Winter temperatures – UNDP, 2010

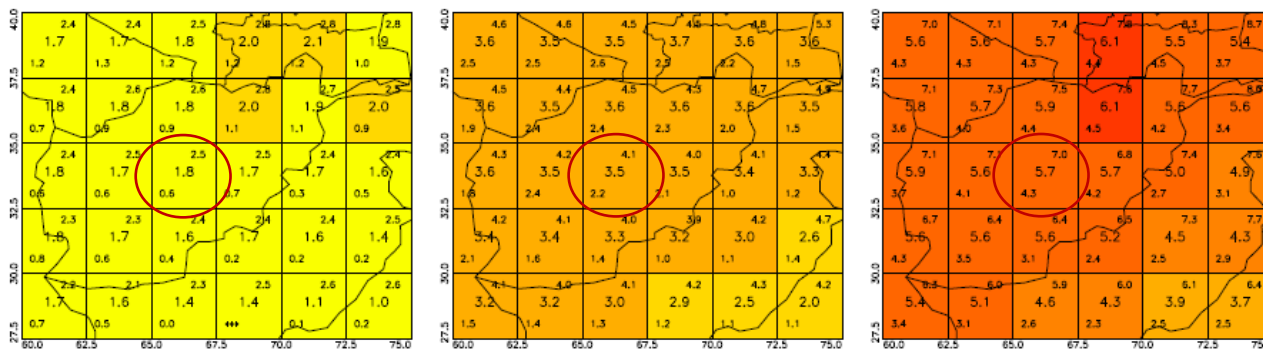


Figure 30: Climate projections for Afghanistan, Summer temperatures – UNDP, 2010

As far as seasonality is concerned, it looks like warming is going to be slightly more severe in summer than in winter. But in any case, these figures give the confirmation that the warming will concern all the seasons and will effectively impact all the activities within the region.

4.2.2.2 Scenarios of evolution for the precipitations in the Central Highlands

As for the situation for the rest of Afghanistan, there is no clear trend in terms of mean annual precipitation patterns because of the uncertainties raised by absolute magnitudes of the precipitations.

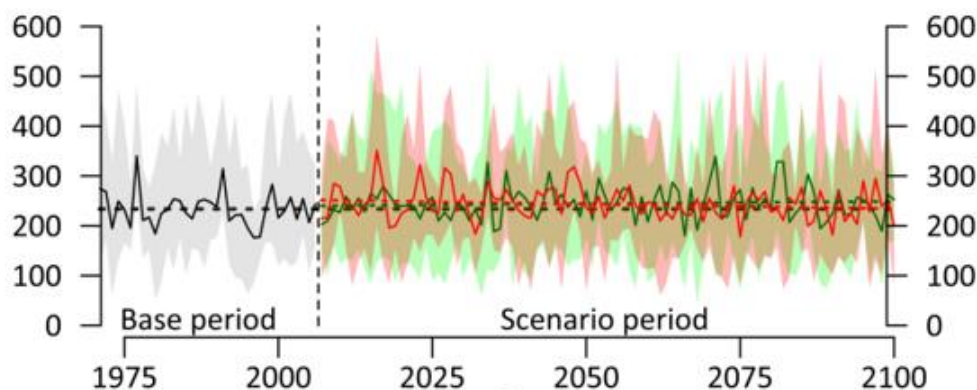


Figure 31: Climate projections for the Central Highlands, Annual precipitations – CORDEX, UNEP, 2017

But projections of both scenarios seem to demonstrate a slight decrease for Central Highlands. However it appears that, once again, a strong variability of the precipitation patterns is to be taken into account.

Here, it is also relevant to get the analysis further and take a look at what will happen in terms of seasonality, specifically in winter and during the spring season.

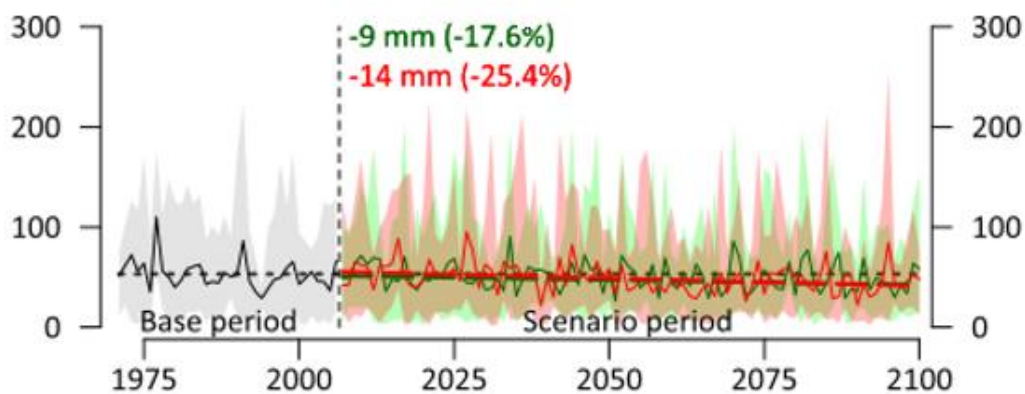


Figure 32: Climate projections for the Central Highlands, Spring precipitations – CORDEX, UNEP, 2017

Under both scenarios, models show that a relatively slight decrease in the amount of spring precipitations, taking into account already limited rainfalls during this season, is to be expected in the Central Highlands.

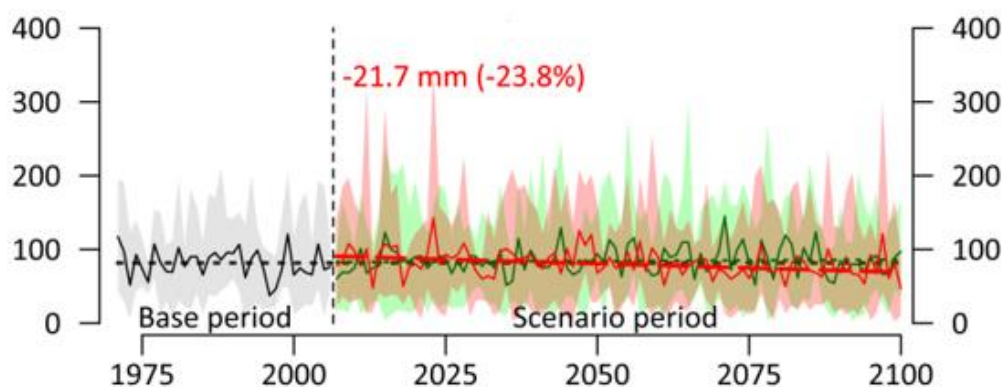


Figure 33: Climate projections for the Central Highlands, Winter snowfalls – CORDEX, UNEP, 2017

The decrease of snowfalls under the “pessimistic” scenario in the Central Highlands is distinct and also statistically significant.

All these data give the picture of a Central Highlands region quite exposed to incoming effects and impacts of climate change.

5 Part IV – Impacts of climate futures on current vulnerabilities

5.1 Climate futures and potential impacts on the Central Highlands

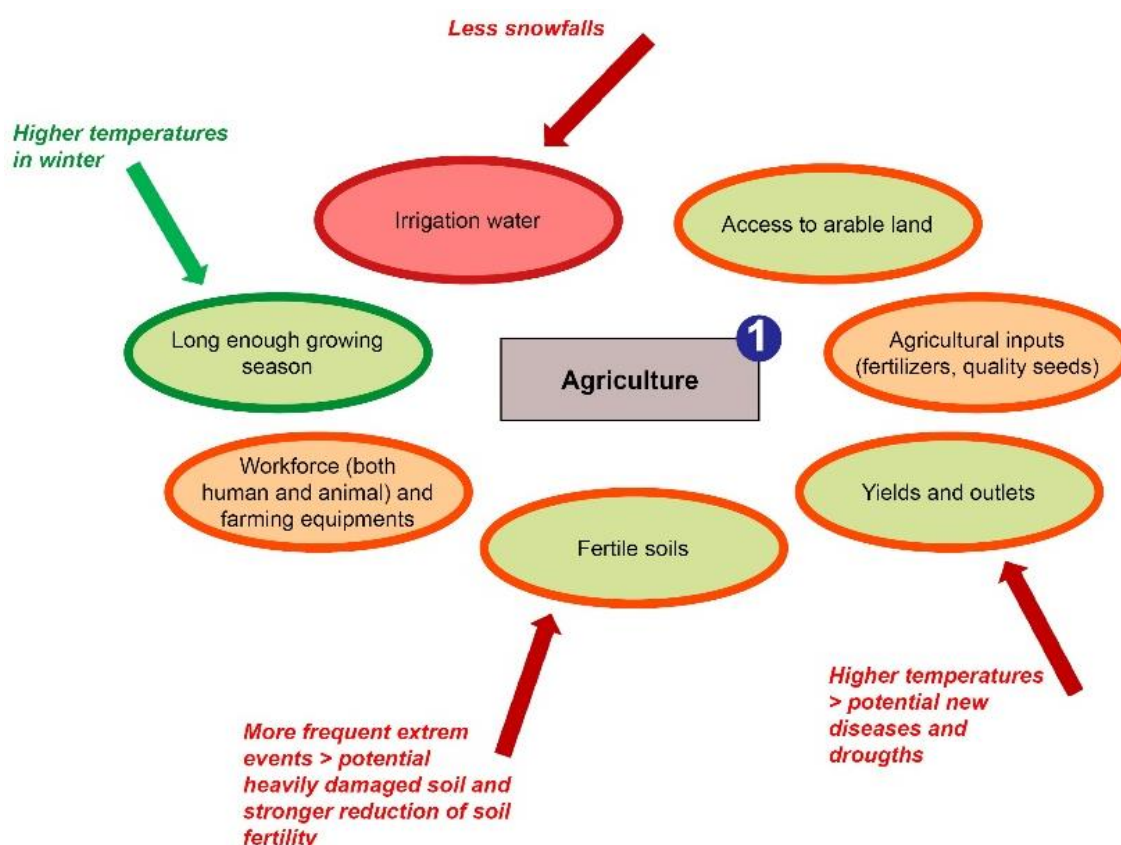
As show in the previous parts of this study and within other UNFCCC – United Nations Framework Convention on Climate Change - documents, the Central Highlands appear to be one of the most exposed, sensitive and vulnerable region of the whole country. This affirmation relies mainly on the following documents:

- The Intended Nationally Determined Contribution of Afghanistan¹⁵;
- The Initial National Communication of Afghanistan¹⁶.

Due to its intrinsic characteristics, the region is mainly dependent on its ecosystem and climate change might have strong impacts on its different components such as water availability, biodiversity, natural resources availability, etc.

It is therefore relevant to get in a higher level of details by looking at potential effects and impacts of climate change on the livelihoods of the communities of the 4 districts of interest of this study.

5.2 Climate futures and potential impacts in Yakawlang 1 & 2



¹⁵ Source: <http://www4.unfccc.int/submissions/INDC/Submission%20Pages/Submissions.aspx>

¹⁶ Source: http://unfccc.int/national_reports/non-annex_i_natcom/items/10124.php

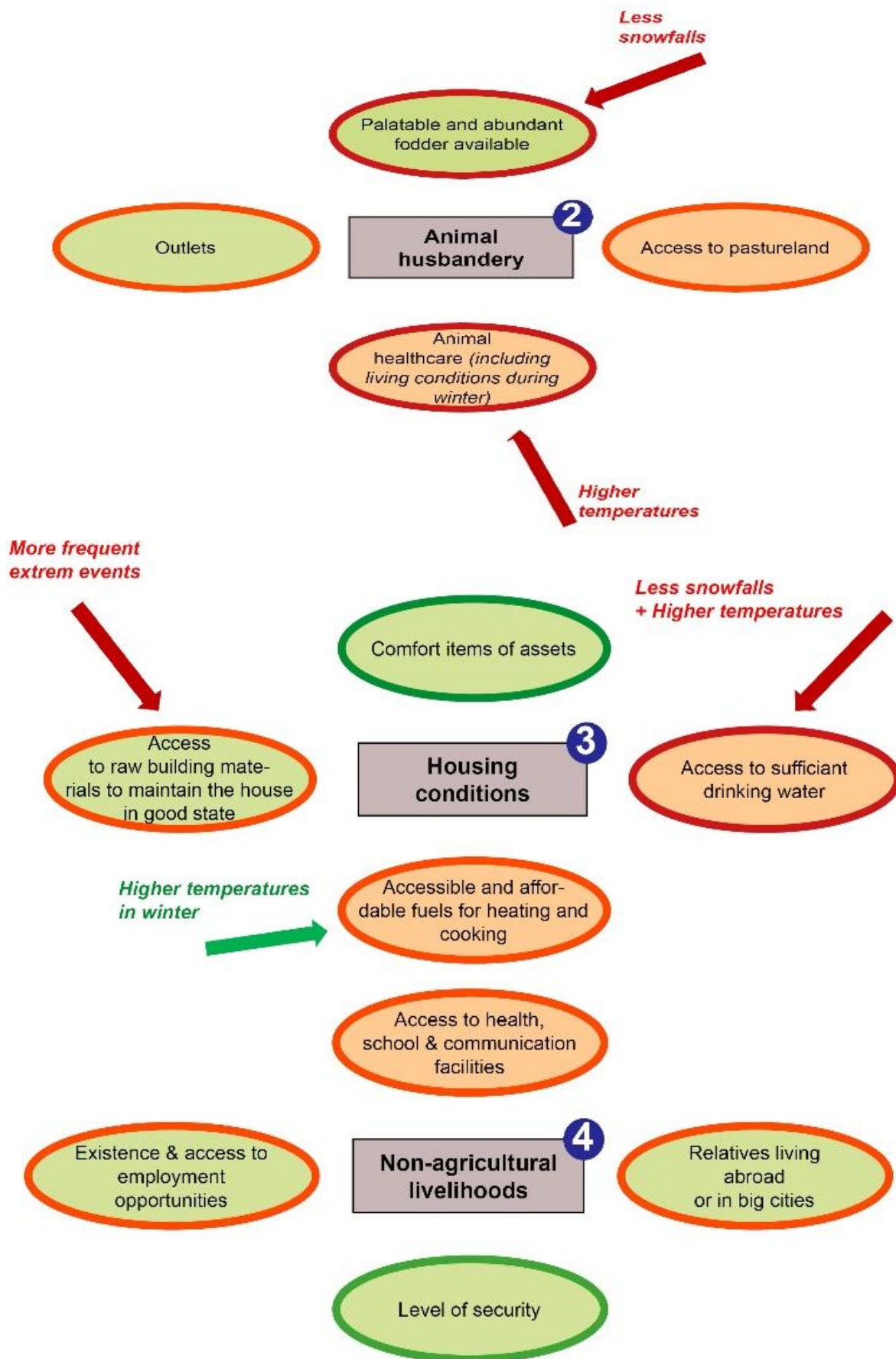


Figure 34: Climate futures and impacts on livelihoods, Yakawlang

As said in Part II, Yakawlang is facing diverse types of vulnerabilities regarding climate change and its direct effects. The analysis of climate projections for the Central Highlands show that, no matter the scenario, temperatures are going to continue to get warmer and snowfalls will severely decrease in the whole region. In consequence, the current level of vulnerability of Yakawlang, which can be qualified as quite exposed and sensitive to climate change effects, is already substantially high.

Agriculture – The most vulnerable livelihood with a high level of exposure to climate change

The most vulnerable component of this livelihood is the irrigation water. Indeed, climate projections indicate that temperatures will get warmer and snowfalls scarcer which will reduce the quantity of snow on the top of the mountains and accelerate its melting. In the end, less water will be available for agricultural activities which might threaten the food security of Yakawlang communities. Moreover, linked with the scarcity of water, yields may decrease and make the food security situation worst. The quantity of available arable land may be reduced too and lead to more pressure on the remaining pieces of land, and once again, add a degree of vulnerability regarding food security of population in the area. Finally, climate projections tend to confirm more frequent and intense droughts that could severely decrease soil fertility.

Animal husbandry – A vital livelihood that may lose its role of coping mechanism

With higher temperatures, the global climate might be more favorable to the prevalence of new diseases and to the transmission of already existing diseases that shepherds do not succeed to fight efficiently, despite vaccination campaigns. This may lead to an increase in the death rate among the cattle and reduce the capacity of this livelihood to play a role of coping mechanism to face climate-related extreme events. Besides, with the reduction of available irrigation water linked with perturbations in snowfall patterns, the quantity of fodder might also be reduced and constitute an aggravating factor of what is described above.

Housing conditions – A relatively preserved livelihood but highly vulnerable to extreme events

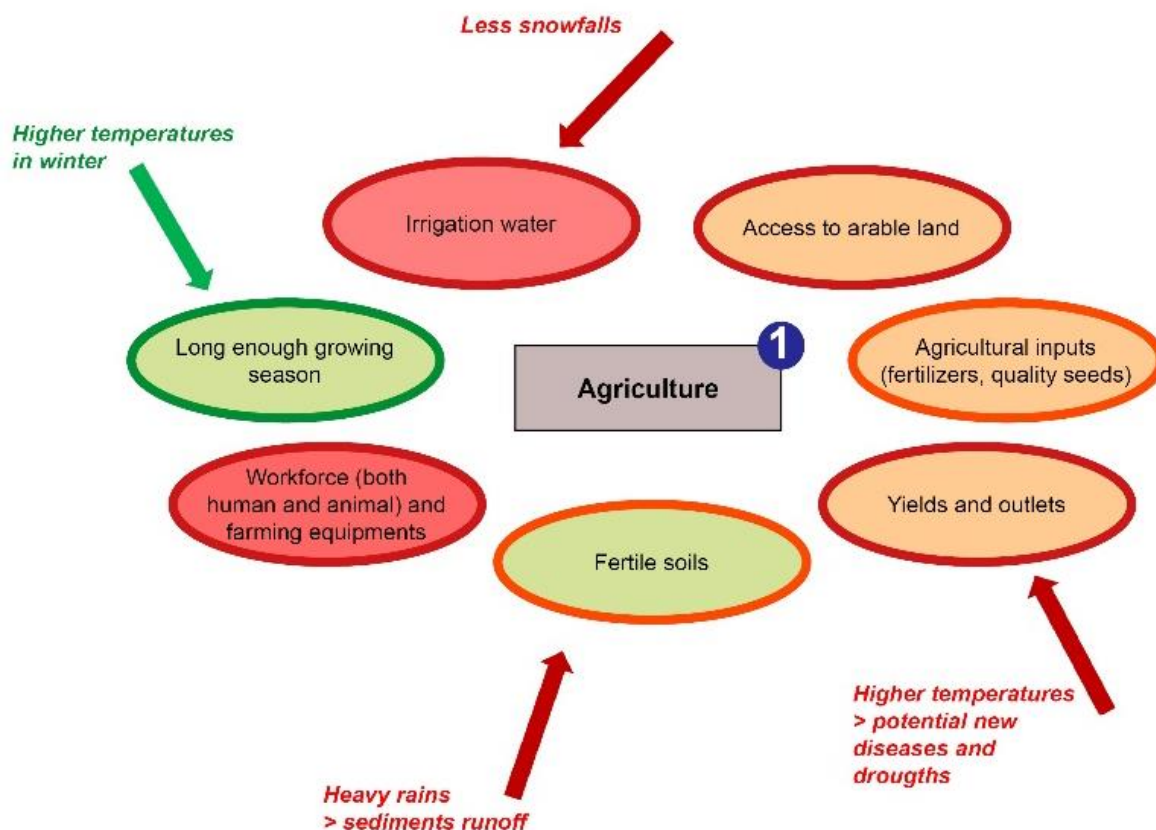
According to the projections, extreme events, and more particularly droughts in Yakawlang, are going to be more frequent and intense over the coming years. This will have severe impacts on available drinking water which mainly comes from streams and hand pumps in the district. If nothing is done, this might have strong consequences on human health. Moreover, the majority of the houses are built with mud that is highly sensitive to floods. These two things combined could force local communities to emigrate and add to the already high level of vulnerability of the population. Finally, even if higher temperatures during winters might reduce the need for fuel consumption for heating, it will not suppress it completely. But climate change projections tend to draw a future where natural resources are strongly threaten, notably because of higher temperatures, more frequent draughts and soil erosion. This may lead to the rarefaction of bushes that are the main source of fuel for cooking and heating in Yakawlang.

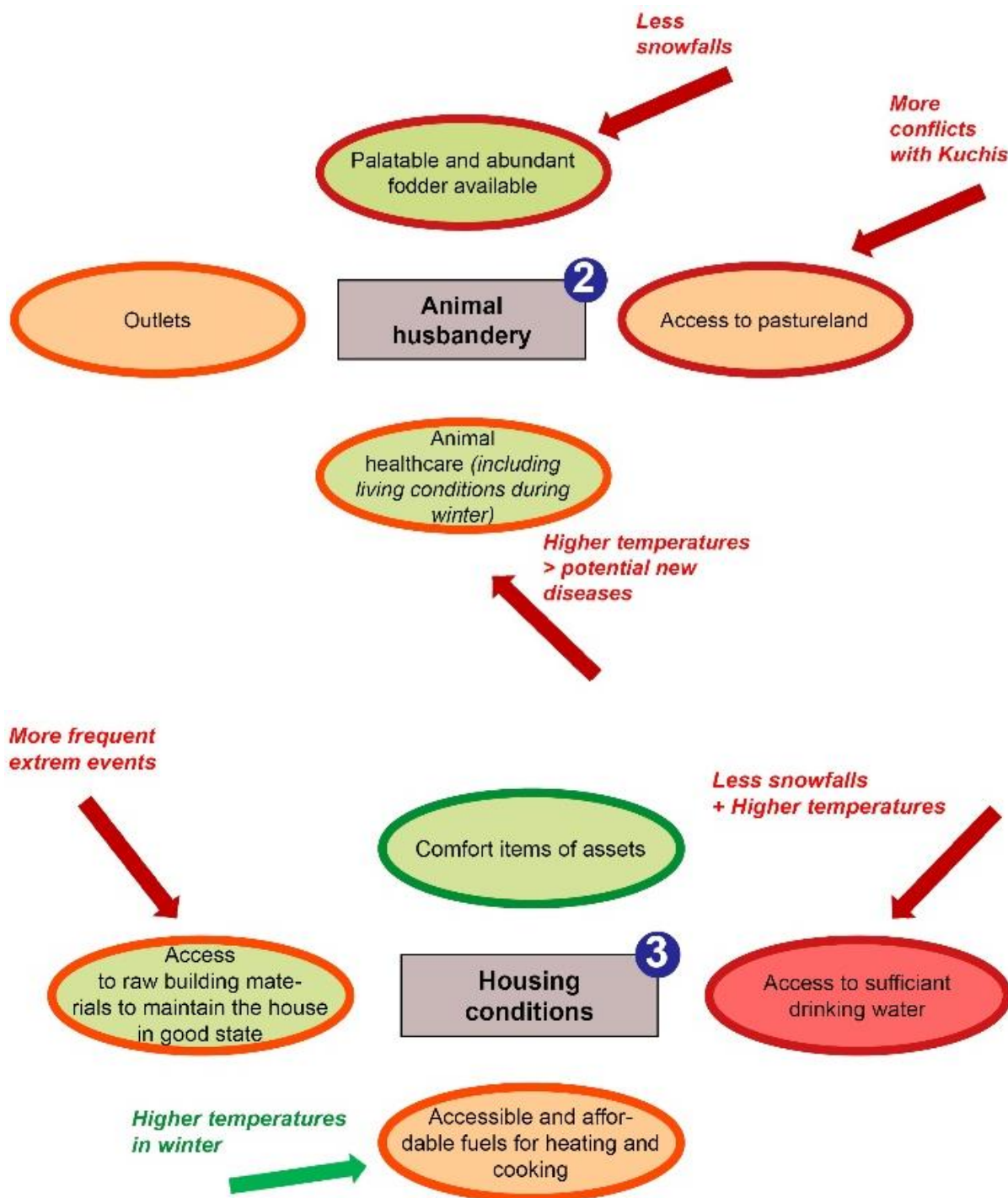
Non-agricultural livelihoods – Not really exposed livelihoods but not strong enough to constitute a perfectly substitutable to Agriculture or Animal husbandry

The main problem that may be raised if climate projections get realized is that there will not be a good enough access to social facilities such as hospitals for remote villages of Yakawang. Moreover, as said in Part II, the communication network is not performant enough to cover

the most remote areas which could lead to a lack of information especially for these communities and reduce their capacities to face climate-related events. Besides, migrations are already important within remote villages and daily works in cities is currently not providing enough complementary incomes to families to face changes in both Agriculture and Animal husbandry livelihoods. It means that, following climate projections, the situation might get worst and lead to massive rural exodus. However, Yakawlang is not facing specific issues with *Kuchis* and the population does not seem to get more worried about it which, in a way, could reduce this exodus phenomenon.

5.3 Climate futures and potential impacts in Behsud 1 & 2





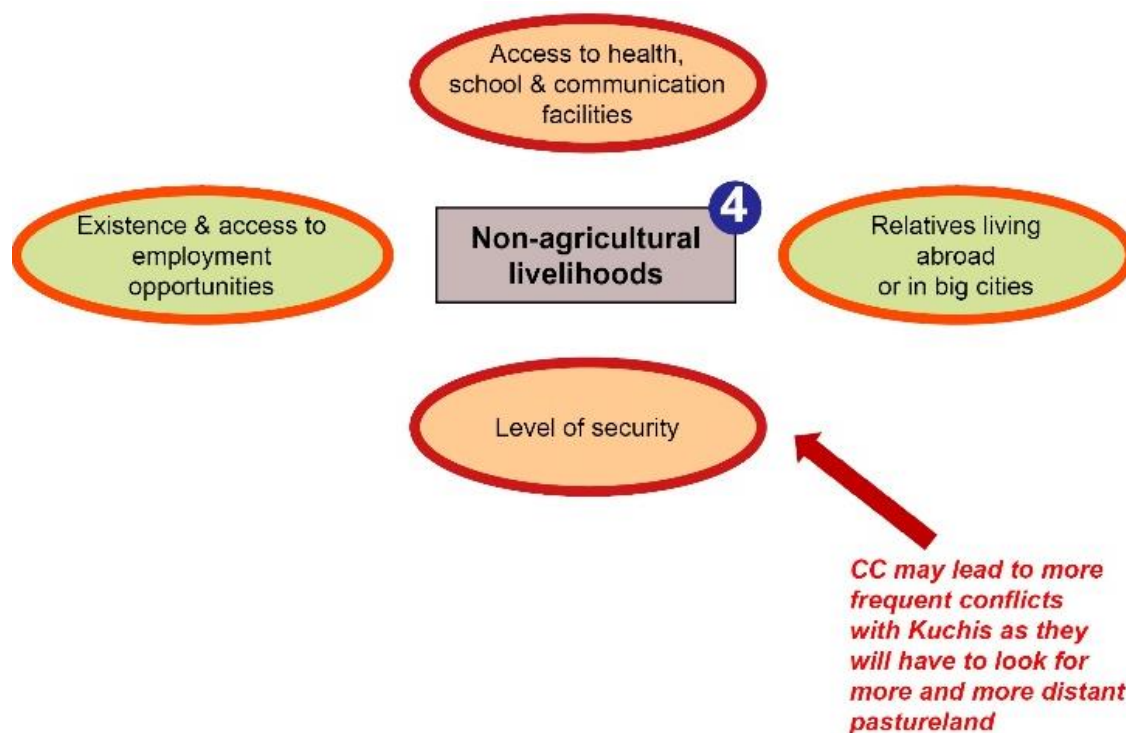


Figure 35: Climate futures and impacts on livelihoods, Behsud

As seen in Part II, both districts of Behsud are the most vulnerable districts among the areas of intervention of the Central Highlands Program. Indeed, water availability and security issues are already deeply impacting the livelihoods of local communities and climate change is adding several degrees of vulnerability to this situation. With climate projections shown in Part III, this could strongly aggravate it.

Agriculture – A highly exposed livelihood with a strong sensitivity to irrigation water rarefaction

As for Yakawlang, Agriculture in Behsud districts is already highly exposed to climate change effects and the situation could get far worst in the future. In fact, access to irrigation water is the most vulnerable component of this livelihood and climate projections show that the level of vulnerability is likely to increase. The rarefaction of the snowfalls and the melting of eternal snow over the highest mountains' tops will, in the end, reduce the amount of water available for agricultural activities. Combined with more frequent draughts, this may deeply impact people's incomes and food security because of the potential effects on yields and the quantity of arable land available that might be damaged by all these changes. In addition, with climate projections, it is also possible to anticipate that soil fertility might be reduced because of the damages done by climate-related events. Finally, agricultural activities almost entirely rely on human workforce and not on mechanical equipment. As said for Yakawlang, climate change impacts could lead to massive emigration waves that will reduce the workforce available for this type of activities and add to the existing threats on food security.

Animal husbandry – A livelihood exposed to climate change and linked with security

Behsud districts are currently the most exposed to conflicts with *Kuchis* among all the areas of intervention of the Central Highlands Program. Because of projected climate change impacts, the situation might get worst, specifically regarding access to pastureland. Indeed, taking into account the expected negative effects of climate change on water availability,

pasturelands may see their size reduced for sedentary shepherds and nomads. This put a high level of vulnerability on this specific component of this livelihood. This can be aggravated by the decreasing in the quantity accessible for shepherds that are already not covering their needs for it. For now, diseases are not that high in both districts, but climate projections tend to affirm that climate is globally going to get warmer which could bring new diseases and increase the prevalence of existing diseases. This might increase death rates among the cattle of Behsud shepherds and reduce their resilience facing climate-related extreme events.

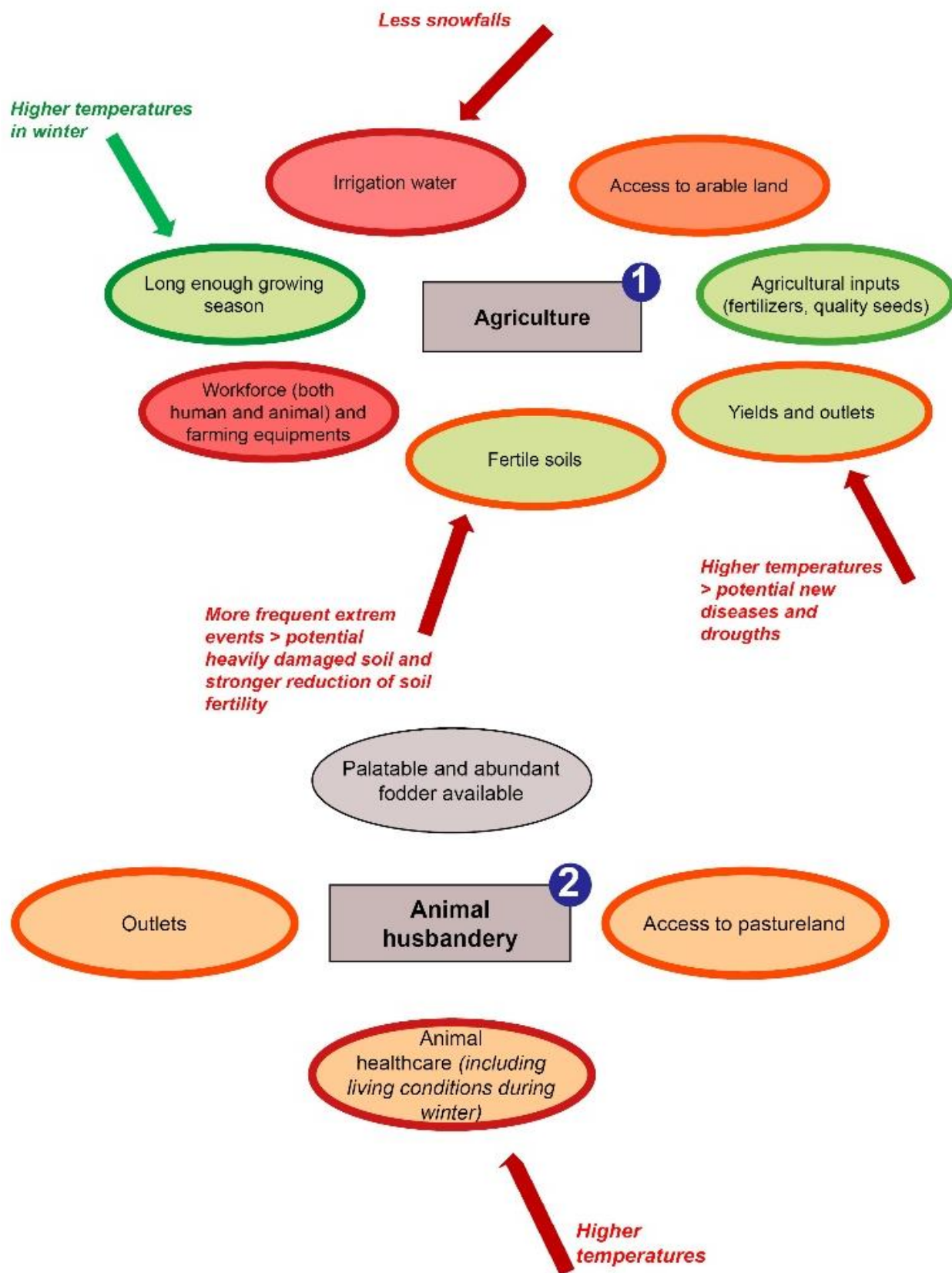
Housing conditions – A central problematic linked with access to drinking water of good quality

The main issue associated with the livelihood Housing conditions is the access to a good quality drinking water. The main source of procurement being streams and hand pumps the reduction of snowfalls and the progressive melting of eternal now may lead to more frequent shortages in drinking water access for all the communities. Moreover, with warmer temperatures, diseases are expected to develop faster and stronger within the different sources of water. Besides, communities are mainly depending on natural resources (bushes and wood) for fuel purposes in terms of heating and cooking. These resources are threaten by climate change as the situation is predicted to evolve. Consequently, as for Yakawlang and despite the more frequent occurrence of warming winters, people might face shortages accessing these types of resources and then facing difficulties to cook and heat.

Non-agricultural livelihoods – Serious concerns regarding the level of security of the districts

As said before, climate change effects and impacts on the availability of pastureland and *aylocks* may conduct to more frequent conflicts with *Kuchis* within both districts. This is already one of the most frequent reason for migrations in remote and isolated villages depending strongly on Animal husbandry and Agriculture. This could be aggravated because of the lack of access to good communication means and facilities within these same isolated and remote areas. The vulnerability here is already quite high and climate projections tend to confirm that the situation could get worst in the coming years.

5.4 Climate futures and potential impacts in Saighan



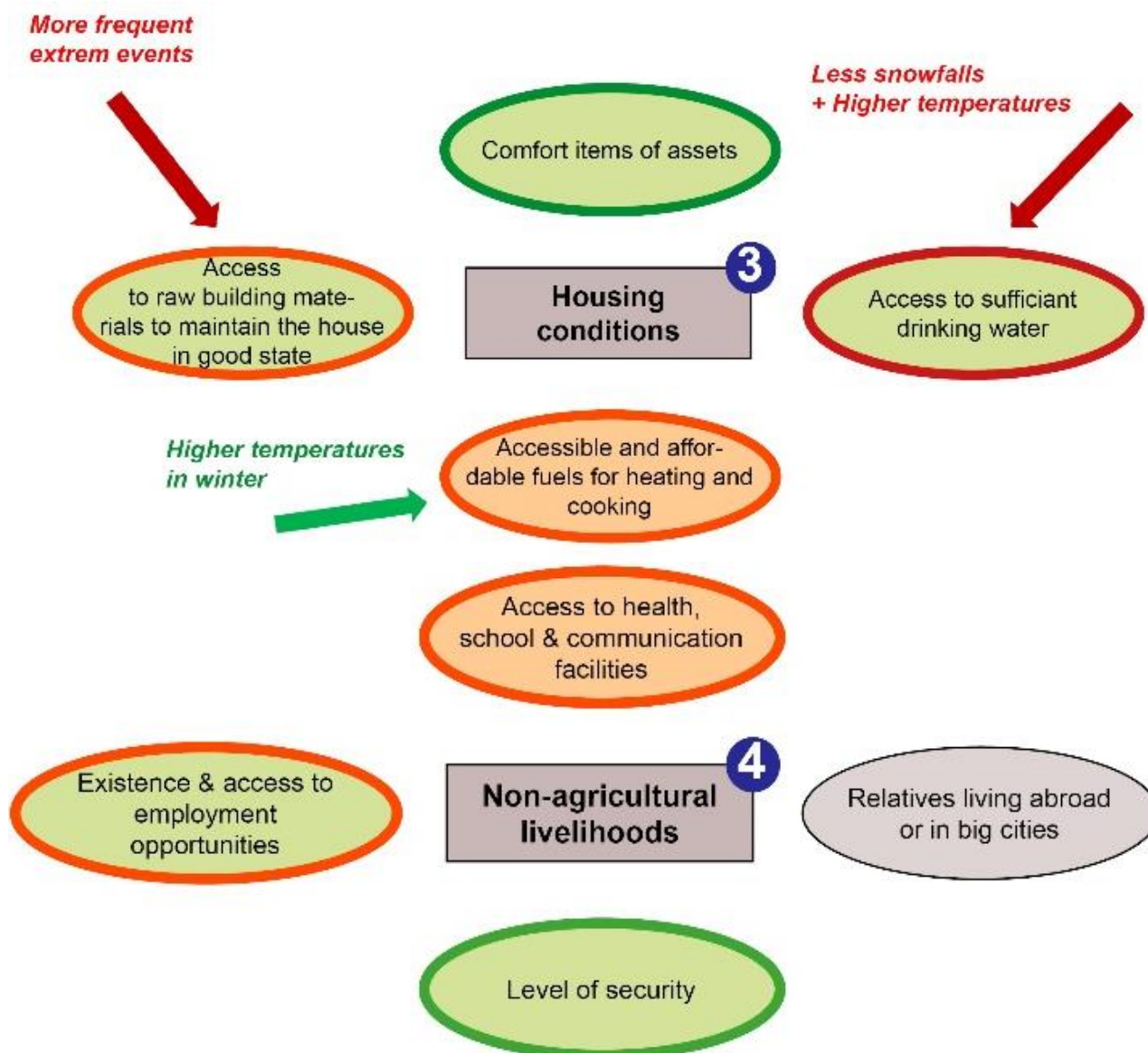


Figure 36: Climate futures and impacts on livelihoods, Saighan

Following the results of the Part II, if Agriculture and Animal husbandry are also already quite vulnerable to climate change direct effects, it looks like Saighan is in a way preserved as far as its other livelihoods are concerned. This might represent a potential of resiliency towards climate futures and their potential impacts on the whole district.

Agriculture – A livelihood exposed to climate futures through irrigation water access and lack of mechanical equipment

In Saighan, as for the other districts, the issue of irrigation water access is deeply connected to climate change and its impacts linked to temperatures and snowfalls evolutions. More precisely, the issue is quite similar in terms of predicted impacts on agricultural activities: less available arable land and less available water that lead to less yields and then to food security issues. As for Behsud districts, the lack of mechanical equipment might represent an aggravating factor towards this specific situation. Therefore, even if yields and soil fertility

seem quite spared for now, it might be severely impacted in the years to come and have substantial effects on communities' livelihoods.

Animal husbandry – A vulnerable livelihood with a potential severe exposure in terms of animal health

Climate change projections, and specifically temperatures warming, are providing relevant information regarding the prevalence of diseases among the cattle. Indeed, as said before, with a warmer climate, it is easier for diseases to spread and developed themselves through air and water. Therefore, the cattle might be deeply impacted by it, taking into account that vaccination campaigns do not seem to be efficient enough already. This could have for effect to reduce the capacity of the communities to use their livestock as a coping mechanism to face economic or climate-related hazards. This stands for a very serious issue for people in Saighan district because shepherds already have a limited diversity of animals.

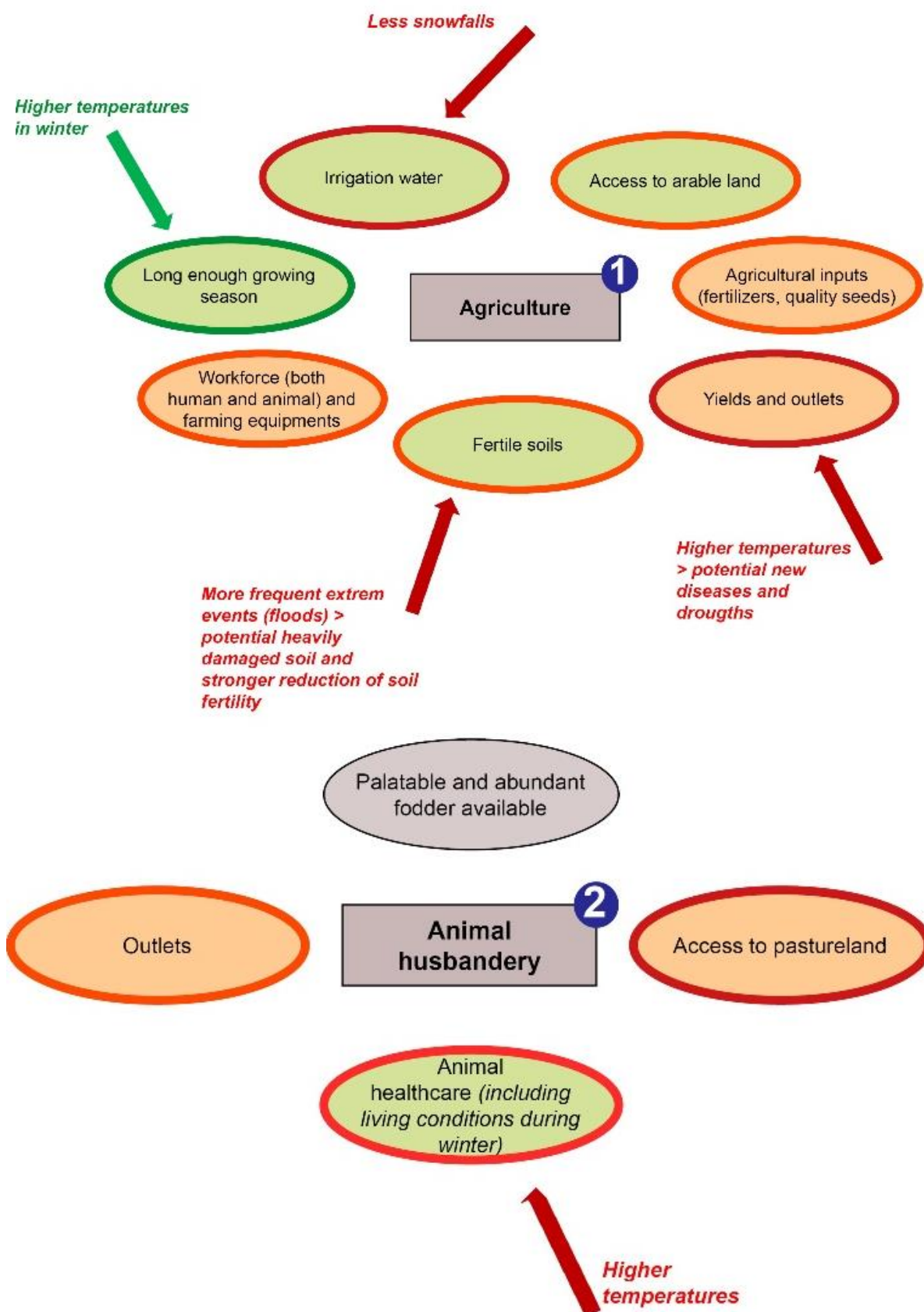
Housing conditions – A relatively spared livelihood but with potential future vulnerabilities

For now, Saighan population is not deeply exposed to water shortages regarding drinking water access and beneficiaries of a good quality water with a low level of disease prevalence within it. This tends to show that the situation is quite positive until now in the district but it might also have negative consequences regarding people capacity to adapt to incoming changes in terms of temperatures and snowfalls. Indeed, climate projections confirm the already observed trends that will lead to a less available amount of water for drinking purpose and with a potential reduced quality regarding diseases. Communities having not to face it until now might not be prepared enough for what is to come on this specific component. In terms of fuels, communities are mainly using bushes that might get scarcer because of climate change in the years to come. However, the prevalence of coal in the district might constitute a way to reduce people exposition and sensitivity to climate futures impacts.

Non-agricultural livelihoods – A current situation not too exposed to climate change but insufficient to fight all its expected impacts

Saighan is relatively preserved regarding conflicts with *Kuchis* in comparison to what is happening in Behsud for instance. It is quite unlikely to change taking into account the geographical context of the region, no matter climate expected impacts on the overall district. However, as for Yakawlang, the most isolated and remote villages are not well connected to communication facilities and services which could result in troubles for keeping people informed towards climate-related extreme events.

5.5 Climate futures and potential impacts in Khamard



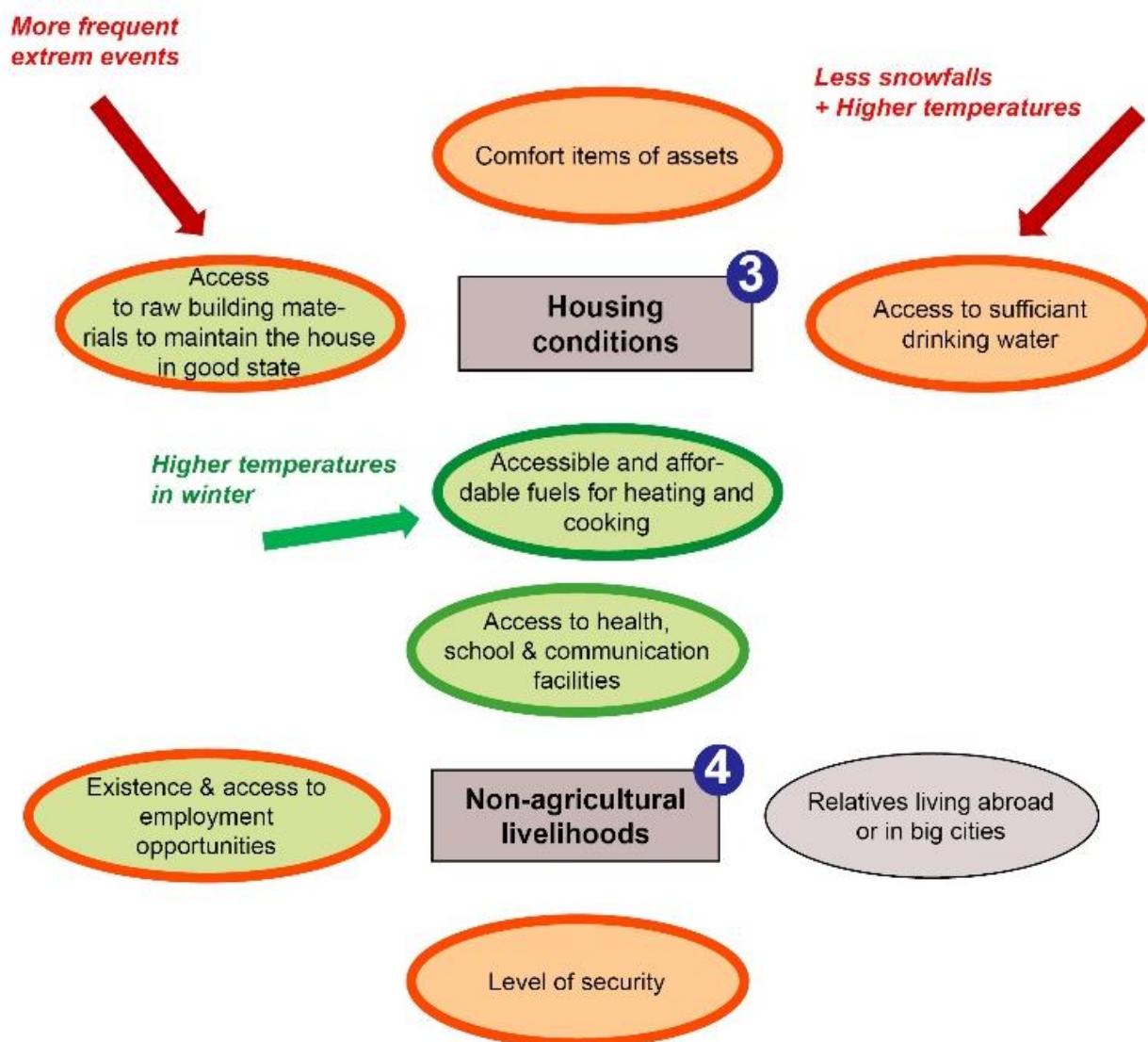


Figure 37: Climate futures and impacts on livelihoods, Kahmard

In comparison to other districts of the area, Kahmard is the most resilient and strong facing climate change current and potential impacts.

Agriculture – A fragile livelihood but still not highly vulnerable to climate change

On the contrary to other districts, Kahmard is not yet deeply impacted by irrigation water issues because, for now, there is enough water for agricultural activities without having to use water turns. However, this relative preservation of Kahmard may also have perverse effects regarding adaptive capacities of the communities. Indeed, in the district, people are used to get an easy access to irrigation water and did not put in place any adaptation strategy or option to face water shortages. This might make it difficult for them to face expected impacts associated with climate projections for the entire region. Besides, people are already facing lots of pests and diseases among the crops which impact yields. In the years to come, food security may also be threatened in Kahmard and leads to rural exodus. So despite this relatively low level of current vulnerability to climate change effects, the district is not going to be spared for all the time.

Animal husbandry – A highly exposed livelihood but not vital for a huge part of the district population

According to the analysis done in Part II, Animal husbandry is not a central livelihood for Kahmard district. However, people who are practicing it are highly exposed to climate futures taking into account the projections in terms of temperatures and precipitations. Pasturelands are already really limited within the whole district which could lead to an even more difficult situation. Besides, for now the few animals that are raised in Kahmard are not too severely exposed to pest and diseases but with temperatures warming the situation might change and become much more worrying and unbearable for local shepherds.

Housing conditions – An “in between” situation with a relatively low access to electricity but more resilient houses

Kahmard is overrepresented regarding exposition to flash floods in comparison with other districts. Nevertheless, it has the highest rate of brick houses among all the districts of intervention which could allow the local communities to have a stronger resistance to more frequent and intense floods within the area. It is important to note that despite having less issues with water than in other districts, Kahmard is already facing the highest rate of prevalence of diseases linked with drinking water quality. With temperatures warming, the situation might also get more difficult to handle for local communities. Finally, the level of access to electricity, that is a potential strong component to people’s resilience, is lower in Kahmard than in other districts even if fuel procurements is not really exposed because mainly depending on not natural-related resources.

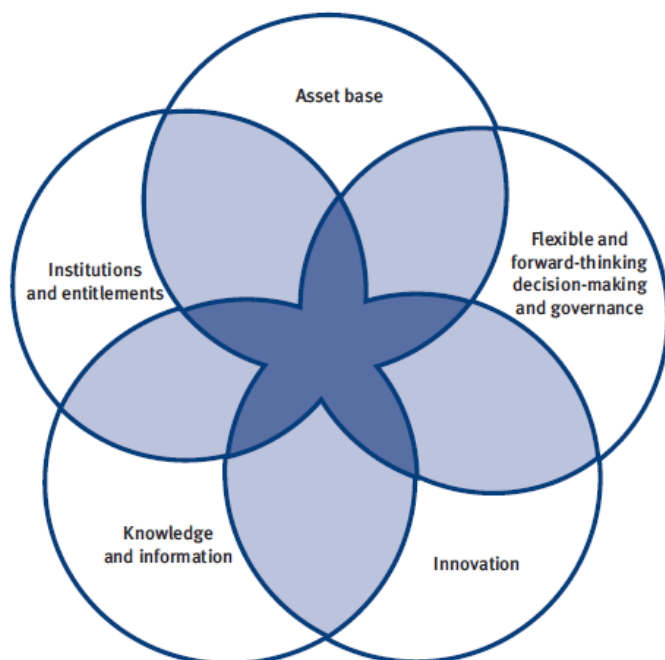
Non-agricultural livelihoods - A well connected district but facing potential issues in terms of security

Kahmard is potentially exposed to insurgents because of its geographical position. This may raise issues regarding possible migrations and vulnerability towards other negative effects such as climatic ones. However, Kahmard is well deserved in terms of social facilities and communication networks and infrastructures which tend to provide a strong potential of response to climate-related extreme events such as floods that are already frequent in the district.

6 Part V – Adaptive capacities, adaptation options & strategies

6.1 Short conceptual description of adaptive capacities

The authors of the ACCRA report¹⁷ entitled “*Preparing for the future? Understanding the opportunities and risks of climate change*” gave a definition of the adaptive capacities that can be reused for close context such as Afghanistan. It comes as follow:



Asset base - Availability of key assets that allow the system to respond to evolving circumstances.

Institutions and entitlements - Existence of an appropriate and evolving institutional environment that allows fair access and entitlement to key assets and capitals.

Knowledge and information - The system has the ability to collect, analyze and disseminate knowledge and information in support of adaptation activities.

Innovation - The system creates an

enabling environment to foster innovation, experimentation and the ability to explore niche solutions in order to take advantage of new opportunities.

Flexible forward-looking decision-making and governance - The system is able to anticipate, incorporate and respond to changes with regards to its governance structures and future planning

Figure 38: Adaptive capacities components, ACCRA

For this part, a similar approach is used to define the local communities’ capacities to face climate change current and future effects and impacts.

6.2 Determination of potential future adaptation options and strategies

6.2.1 Potential adaptation options and strategies - Description

The 2014 CVRA study notes the following possible adaptation strategies to climate change and its impacts:

LIVELIHOODS	INFLUENCING FACTOR	IMPACTS	MITIGATION STRATEGY
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¹⁷ Source: https://www.files.ethz.ch/isn/141151/Ethiopia_Synthesis_Report.pdf

AGRICULTURE	Water shortage	Irrigated land decrease Yield decrease Crops switched (barley > wheat)	<p><u>Short term:</u></p> <ul style="list-style-type: none"> - Yearly cropping pattern & size of land to be cultivated adjustment on irrigated land based on snow level - Enlarge pasture areas to neighbouring valleys/districts - Livestock decapitalization to: <ul style="list-style-type: none"> o Adjust herd to summer & winter fodder production capacities o Get cash to compensate loss, cover basic living needs, eventually buy fodder - Develop water storage solutions <p><u>Mid & long term:</u></p> <ul style="list-style-type: none"> - Reinforced flood and drought prevention through DRR infrastructure implementation - Housing displacement on the foothills of the mountain - Migration to Kabul or abroad to overcome lack of local resources. Migration is possible only for households with a minimum of resources and family network.
	Flood	Irrigated land loss Orchard destruction Erosion, and soil quality impoverishment	
	Temperature variation	Production loss on crop and orchard Increase length of production season / early harvest	
ANIMAL HUSBANDRY	Water shortage	Share of fodder on irrigated land decrease Productivity of pasture	
	Flood	Sporadic loss on livestock Destroy stables	
	Temperature variation	Disease increase Earlier access (1 month) to pasture	
HOUSING CONDITIONS	Water shortage	Bush access decrease	
	Flood	Sporadically, house destruction	
NON-AGRICULTURAL LIVELIHOODS	Flood, water shortage	House & road destruction Loss of social cohesion Insecurity due to increase exposure Opportunity for food for work on DRR infrastructures	

6.2.2 Potential adaptation options and strategies † Analysis

The options and solutions detailed below do not constitute an exhaustive list. Indeed, a complementary work could be conducted with communities in order to co-develop and co-construct solutions and options of adaptation towards climate change current effects and future impacts.

SHORT TERM

9 Yearly cropping pattern & size of land to be cultivated adjustment

This strategy consists in taking into account the projections regarding the amount of snowfalls in the years to come and work with the communities by adjusting the size of the cultivated land to it.

IMPACT ON IDENTIFIED VULNERABILITIES	Reduce the severity of the impacts of water shortages on crops by adjusting it to the available quantity of resources and developing improved rotations of the cultivation period.
URGENCY OF ACTION IMPLEMENTATION	The level of urgency of implementation is really high.
COMMUNITY AUTONOMY IN THE IMPLEMENTATION	Knowing that this type of solutions are already implemented in some districts of the region, the autonomy of implementation seems quite granted. However, it might need to be accompanied with training and monitoring activities.
SOCIAL ACCEPTANCE	Not a problem because of the traditional use of this type of practices.
ESTIMATED COST	The main cost may indirect because linked to a potential reduction of direct incomes raised by larger crops. However, diversification of the crops might provide complementary incomes and even less seasonal-dependant ones.
IMPACT ON OTHER LIVELIHOODS AND VULNERABILITIES	This option might have positive impacts on available arable land and outlets in Agriculture. However, it might add to the need of workforce for agricultural activities.
CO-BENEFITS OF THE ACTION	Soil preservation, Yields and outlets increasing

9 Enlarge pasture areas

This strategy consists in enlarging pasturelands and rangelands to close valleys in order to avoid the overexploitation of the available pieces of land.

IMPACT ON IDENTIFIED VULNERABILITIES	Reduce the pressure on existing pastureland/rangeland.
URGENCY OF ACTION IMPLEMENTATION	The level of urgency is medium because some of the districts do not face issues yet with pastureland access.
COMMUNITY AUTONOMY IN THE IMPLEMENTATION	This option will need the integration of local authorities in the process to avoid conflicts among and between communities.
SOCIAL ACCEPTANCE	Possible conflicts regarding land access or with <i>Kuchis</i> in Behsud. This solution will need the intervention of local authorities.
ESTIMATED COST	The cost to access new pieces of land might be high and might require efforts in terms of investment.
IMPACT ON OTHER LIVELIHOODS AND VULNERABILITIES	It might have negative impacts in terms of security level by increasing the risk of conflicts with <i>Kuchis</i> , in Behsud specifically. However, it could lead to increase the quantity of animals that shepherds hold and increase the capacity of using it as a coping mechanism facing climate-related extreme events.

CO-BENEFITS OF THE ACTION	Soil preservation, Outlets increasing
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9 Livestock decapitalization

This solution consists in using the cattle as a coping mechanism to face climate-related extreme events for instance, in order to get some cash and quickly recover from negative impacts of these type of events.

IMPACT ON IDENTIFIED VULNERABILITIES	Increase the incomes of the communities and reduce the pressure of livestock-related activities on people daily life.
URGENCY OF ACTION IMPLEMENTATION	The urgency is entirely correlated with needs associated with specific events such as floods or droughts.
COMMUNITY AUTONOMY IN THE IMPLEMENTATION	The autonomy of the communities is complete in this type of options.
SOCIAL ACCEPTANCE	Social acceptance is granted because of the traditional use of similar solutions and options within the region.
ESTIMATED COST	The cost is related to the loss of animals and the reduction of the quantity of cattle for households. It means that despite the incomes it provides, it is a short term solution that might have negative impacts at mid/long term if the cash is not invested in sustainable activities.
IMPACT ON OTHER LIVELIHOODS AND VULNERABILITIES	This solution may have positive impacts on all the other livelihoods thanks to the income it provides to households.
CO-BENEFITS OF THE ACTION	None.

9 Develop water storage solutions

This solution consists in building water storages for irrigation and/or drinking water.

IMPACT ON IDENTIFIED VULNERABILITIES	Reduce the vulnerability towards irrigation/drinking water availability.
URGENCY OF ACTION IMPLEMENTATION	Regarding the level of vulnerability to water access in all the analysed districts, the urgency of implementation of this type of solution is really high.
COMMUNITY AUTONOMY IN THE IMPLEMENTATION	The autonomy of implementation is connected to the level of technicity of the storage. Indeed, stocking water for irrigation do not require to keep it clean of diseases dangerous for human health as it the case for drinking water. In consequence, communities may need to be assisted by governmental or non-governmental organizations to develop this type of solutions.
SOCIAL ACCEPTANCE	Social acceptance is potentially not a problem because some storages already exist in villages of the districts of intervention.
ESTIMATED COST	The cost associated with this option might be high because of the need to provide materials and human workforce to build it.

IMPACT ON OTHER LIVELIHOODS AND VULNERABILITIES	This may contribute to reduce the vulnerability of all livelihoods' components that have a link with water access.
CO-BENEFITS OF THE ACTION	Human health, Food security, etc.

MID & LONG TERM

· **Reinforced flood/drought prevention**

As seen in the analysis, floods and droughts are frequent in several districts of the Central Highlands and worry the communities. This solution consists in applying Disaster Risk Reduction solutions such as early warning systems or infrastructures to face these events.

IMPACT ON IDENTIFIED VULNERABILITIES	Reduce the level of exposition to climate-related extreme events of the communities.
URGENCY OF ACTION IMPLEMENTATION	The level of urgency is still medium. Indeed, before implementing these solutions, it is requiring to improve communication facilities and information access to local authorities and communities.
COMMUNITY AUTONOMY IN THE IMPLEMENTATION	This option will need the integration of local authorities in the process.
SOCIAL ACCEPTANCE	Social acceptance should not be a problem except if there is some existing tensions between communities of ethnises that could lead to an incomplete sharing of information.
ESTIMATED COST	The cost of this type of solutions may be important regarding the infrastructures but could be very limited as far as soft solutions such as early warning systems are concerned.
IMPACT ON OTHER LIVELIHOODS AND VULNERABILITIES	It might have positive impacts on other livelihoods' components such as social and communication facilities that may be improved.
CO-BENEFITS OF THE ACTION	Human health, Casualties linked with extreme events, Migrations, etc.

· **Housing displacement & Migration to Kabul or abroad**

These last two options are the most extreme ones. Indeed, the main purpose of developing adaptation solutions is also to avoid the population to have to be forced to left their houses or historical lands. If migrations or housing displacements need to be envisaged, it has to be done by choice for the communities. This could require local authorities or the national government to put some climate-preserved pieces of land at communities' disposal in order to allow them to move with dignity and will.

7 Conclusion and potential perspectives for future actions in the Central Highlands

7.1 General conclusive remarks

Afghanistan is one of the most vulnerable country of the world. This may not look correlated with climate change in a first place but, in the end, it appears that climate is adding several degrees to existing vulnerabilities within the whole country.

The Central Highlands Program takes place in one the most exposed and sensitive region of Afghanistan.

From the climate study realized in this document, it appears that:

- The six districts of intervention - Yakawlang (1&2), Behsud (1&2), Saighan and Kahmard - are already vulnerable towards climate change current effects and impacts.
- Climate past and present trends seem to confirm communities' perceptions of the climate change phenomenon – temperatures are getting warmer and snowfalls are substantially decreasing.
- Climate projections are drawing a worrying future for the Central Highlands and even for Afghanistan itself and need to be integrated both in local and national policies and in developing programs conducted within the country.
- The six districts already have to face climate-related issues and events and will have to adapt and adjust to it very quickly in order to preserve their livelihoods.

To face this current and future impacts of climate change, options and solutions exist and need to be implemented with local authorities and communities in the Central Highlands.

7.2 Potential perspectives for future actions in the region

7.2.1 Short description of the situation in Panjab and Waras districts

7.2.1.1 People's perception towards climate change in Panjab district



Figure 39: Climatic landscape evolution, Mountains & permanent snow cover, Panjab, 2017

7.2.2 Perspectives of action and recommendations

Regarding the proposed options and strategies in 8.1.2, it looks essential to implement several workshops with relevant local stakeholders in order to:

- i. Find and develop new possible strategies and options of adaptation to climate change;
- ii. Prioritize the proposed options and solutions in collaboration with communities;
- iii. Co-construct with local authorities and communities a multi-components Program that develop solutions that take climate change into account from the conception to the implementation.

In terms of recommendations for a potential future program in the Central Highlands:

1. Improve water management for irrigation purposes

According to the analysis, it looks like access to irrigation water is the most vulnerable component of the livelihood “Agriculture” within the entire area. It leads to losses of arable land and pastureland among the districts. The water issue needs to be addressed by:

- Taking into account the incoming decrease of water availability in crops management;
- Promote efficient technologies and practices regarding water uses for agriculture (improved seeds, irrigation devices, etc.);
- Reinforce water infrastructures and maintenance systems.

2. Improve agricultural practices

It looks like agricultural activities are the main source of incomes for the majority of the population within all the districts of the area of intervention. It is essential to continue the implementation of agro-ecological practices and reinforce the diversity of the crops.

3. Develop and improve animal healthcare services

It seems that lots of vaccination campaigns for livestock have already been implemented within the area but for now do not look efficient enough to handle the spread of diseases. It is necessary to reinforce that specific part to give the shepherds the capacity to face climate change effects regarding the prevalence of new diseases.

4. Improve access to qualitative drinking water

As for agriculture, it appears that access to drinking water is a very concerning issue among all the districts and communities. It is important to tackle this issue in terms of quantity and quality by reducing the seasonal availability of the sources of water and by reducing the prevalence of diseases within it.

5. Reinforce people’s awareness towards climate change incoming effects and impacts

As seen in some villages of Behsud districts, it appears that climate change is not yet an issue for some communities in the Central Highlands. Indeed, some of the encountered farmers are more focused on short term positive impacts of climate change and no longer take into account the incoming negative sides of it. It is essential to take time to raise awareness on this specific topic among the communities.

6. Improve natural resources management by developing energy saving solutions

As said during the entire analysis, it looks like communities are mainly relying on natural resources regarding their fuel practices for heating and cooking. It is necessary to continue with the dissemination of energy saving solutions aiming to reduce fuel

consumption and people's vulnerability towards natural resources, specifically bushes, rarefaction.

7. Develop and implement disaster risk reduction solutions

The different districts are facing several climate-related extreme events such as floods and droughts. In order to develop better answers to these events, it is necessary to implement early-warning solutions and climatic information devices to help communities to handle consequences with more efficiency and avoid, as much as possible, human and animal casualties.

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9 Annexes - Detailed profiles of the districts regarding their level of vulnerability towards climate change

9.1 Annex I – Detailed profile for Yakawlang 1 & 2

9.1.1 Agriculture

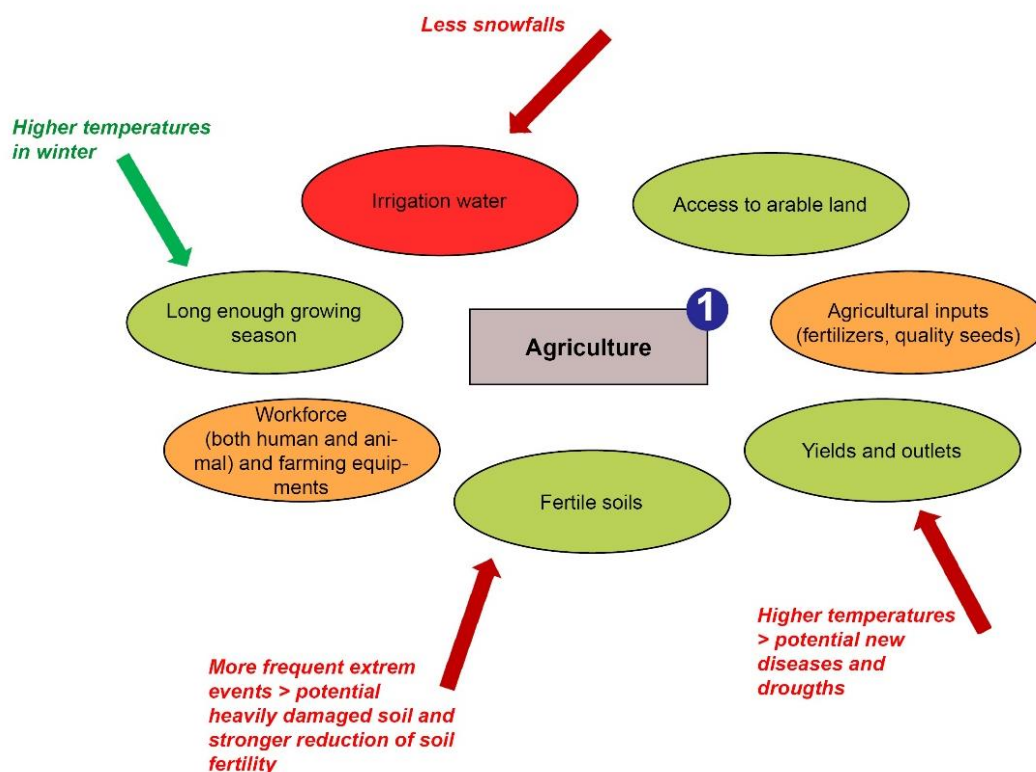


Figure 42: Livelihood – Agriculture, Current vulnerability to climate change, Yakawlang

Irrigation water – According to the 2014 CVRA, access to irrigation water is already a non-negligible issue in Yakawlang districts, 57% of the respondents declared facing water shortages and 70% getting no permanent access to irrigation water and resort to water turns. In consequence, the districts are highly vulnerable to climate change and its impacts in terms of snowfall reduction and access to irrigation water. As shown in Figure 14, the amount of snow is less abundant now than decades ago. Communities report that mountains are now almost completely free of snow and that there is much more water shortages than before in villages. Indeed, because if the decrease in the amount of snow, less water reaches the valley and is available for irrigation. 78% of the respondents in Yakawlang said that they are feeling a scarcity of water resources nowadays in comparison with previous years, and 36% note it as a yearly phenomenon.

Access to arable land – For now, the majority (49%) of the respondents said they have 1 to 5 *jerib*¹⁸ of cultivated land. Only 13% of them said they lost irrigated land over the past 5 years for about 2 to 5 *jerib* for the majority of them. It means that, currently, the situation is not yet severe for Yakawlang districts' population in terms of access to arable land.

Agricultural inputs – 50% of the communities in Yakawlang districts are self-producing the seeds (potatoes and wheat) and the big majority of them are using only a little quantity of

¹⁸ 1 Jerib = 0.2 Ha

chemical fertilizers. Farmer exchanges for seeds is more common in Yakawlang than elsewhere in Central Highlands (except Khamard) which show a strong potential of solidarity among communities of the districts. Moreover, quarter of the seeds come from the bazar, which add to the diversity of procurement in these districts. In consequence, the vulnerability of agricultural inputs to climate change is still limited in both districts. Nevertheless, it is important to note that farmers from *Kalta Top Pasroyat* village notice that the lack of access to improved seeds has consequences in terms of exposure of crops towards pests and diseases. This also explain the medium level of vulnerability of this component.

Yields and outlets – Agricultural production is mainly focused on rotation of potatoes, wheat and fodder. For now, it seems that farmers facing water shortages are not yet impacted in terms of yields reduction. In addition, communities said that with temperatures warming, yields are increasing and new crops are now possible such as vegetables. Moreover, people report that decades ago, there was so much snow that the land were frozen. But for now it is not common at all. However, lots of people said that potatoes’ diseases are more frequent nowadays (54% declare that is happened every year) than before and it is the same with wheat that is facing a “wheat rust”. This is not yet a severe issue in the districts but it could become a serious problem in the years to come. Indeed, the big majority of the production is self-consumed.

Fertile soils – Soil fertility does not seem to be really impacted by climate change for now. But lots of the respondents said that they were experiencing more frequent droughts than before which could lead to land loss in the end.

Workforce and farming equipment – In Yakawlang districts, 57% of the respondents declare having no mechanical equipment. It tends to underline a potential vulnerability of this component because it almost entirely relies on human workforce which is exposed to effects and impacts of climate change. Indeed, with higher temperatures and more frequent droughts and extreme events, people can be less productive and human diseases can also spread.

Long enough growing season – For this specific component, there is no vulnerability to climate change. In fact, with temperatures warming, people report a longer growing season than before that lead to a better situation in terms of food security notably. . It also allows farmers to grow a greater variety of crops such as fruits and vegetables that were not possible over the past years.

9.1.2 Animal husbandry

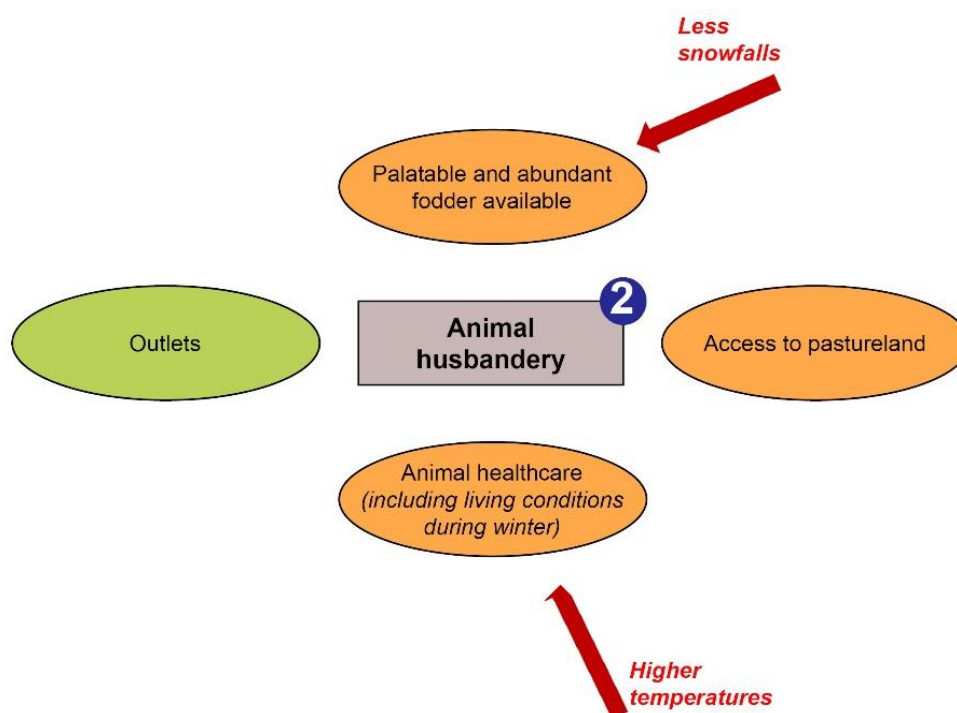


Figure 43: Livelihood – Animal husbandry, Current vulnerability to climate change, Yakawlang

Palatable and abundant fodder available – 58% of the irrigated land is dedicated to fodder in Yakawlang districts but 58% of the respondents say that their needs for fodder are not covered. This shows that the situation is already not satisfying for the majority of the farmer in the districts. According to the 2014 CVRA, this can be explained by a project of drainage of the Chaman plain that dried up a semi-swamp area where fodder used to grow easily. What can also be said is that with less snowfall as it is happening currently in Yakawlang, this situation may also be explained by climate change effects. Indeed, less snowfalls means less irrigated land and also dryer soils. So this vulnerability is to be taken into account.

Access to pastureland – In Yakawlang, the majority (57%) of land used for animals consist in rangeland (*aylock*) located far away from houses, near to seasonal settlements. It explains that 40% of the shepherds have more than 5 hours of walk to reach the *aylock*. The most striking phenomenon is that 79% of the respondents declare that the rangelands are degraded in comparison with the last 10 years. This is mainly explained by more frequent and intense floods and droughts which re more impacting than before notably because of increased deforestation that cases erosion. It shows that access to pasturelands in Yakawlang is quite an issue regarding its vulnerability to climate change direct effects.

Animal healthcare – 63% of the respondents declare having to face diseases in their livestock over the past years, and 46% declare the situation is getting worst, notably regarding the FMD – Foot & Mouth Disease – even if 66% of the respondents said having access to vaccination campaigns. It is possible to say that because temperatures increased, diseases are more frequent and despite the diffusion of vaccines through several campaigns, lots of the cattle are in poor health.

Outlets – Shepherds in Yakawlang have a strong diversity of animals which make them less vulnerable to direct effects of climate change. Indeed, every species is different and has its own level of resilience.

9.1.3 Housing conditions

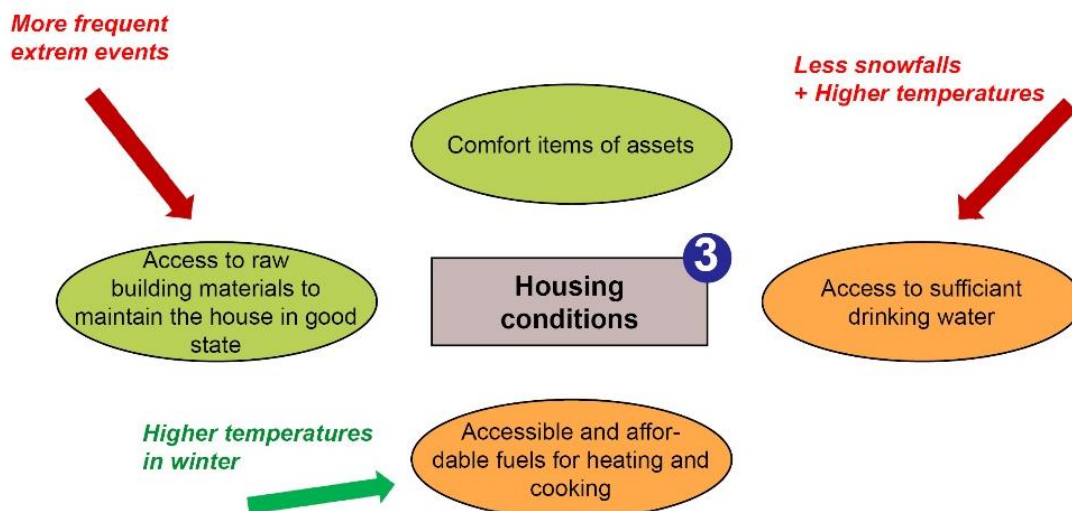


Figure 44: Livelihood – Housing conditions, Current vulnerability to climate change, Yakawlang

Comfort items of assets – In terms of comfort items, 95% of the respondents declare having access to electricity. Moreover, lots of people have access to a large diversity of items such as motorbikes, televisions, etc. For now, there is no change in this specific component linked with climate change.

Access to sufficient drinking water – As far as drinking water access is concerned, 45% of both districts' inhabitants declare they need more than 10 minutes to get available sources. The two main sources in Yakawlang are streams/rivers and hand pumps. Rivers are strongly linked with the amount of snowfalls because it is mainly water that comes from snow melting. In consequence, the reduction of snowfalls is already impacting drinking water availability on the territory, even if for now it still concerned a minority of the population (39% according to the respondents). Moreover, available drinking water is already carrying diseases. 52% of the respondents declare getting sick because of the water among both districts, specifically regarding stream/river water. This situation might be explained by warming temperatures which facilitate the proliferation of diseases.

Accessible and affordable fuels for heating and cooking – In Yakawlang, more than 90% of the respondents declare using a combination of bushes and dung as fuel. These practices are potentially vulnerable to climate change effects because of the link with the rarefaction of natural resources, notably the bushes that leads to soil erosion. But, a large majority of the respondents also report warmer winters. In consequence, climate change may also reduce the need for fuel during winter. The vulnerability of this component is therefore medium.

Access to raw building materials to maintain the house in good state – 82% of the respondents in Yakawlang declare living in decent state houses in mud/rammed earth for almost all of them. Access to materials is not yet an issue in the districts.

9.1.4 Non-agricultural livelihoods

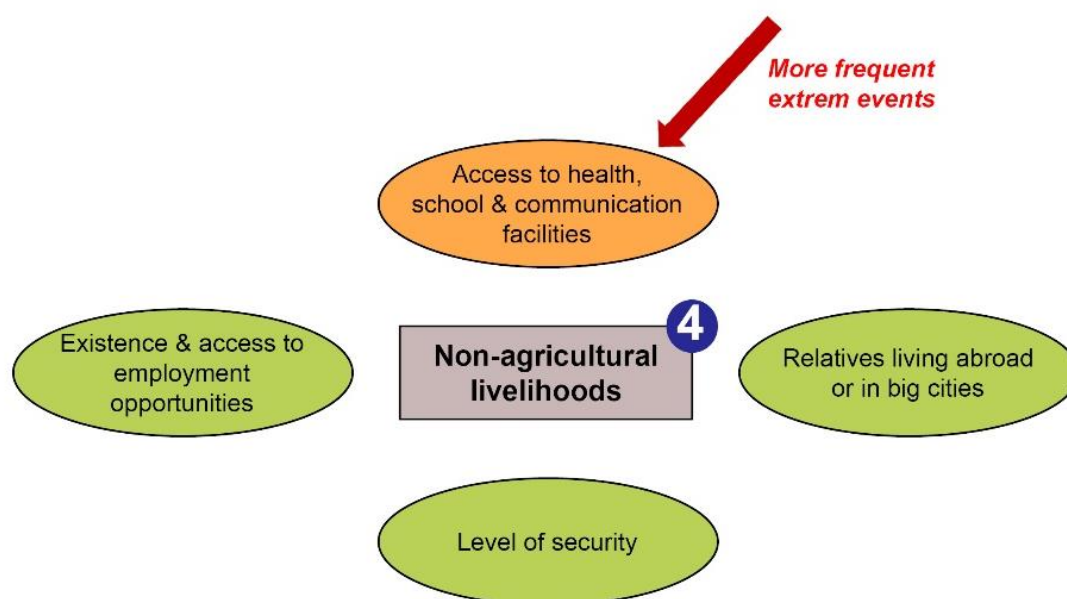


Figure 45: Livelihood – Non-agricultural livelihoods, Current vulnerability to climate change, Yakawlang

Access to health, school & communication facilities – Several facilities are available within both districts such as schools, hospitals and communication networks. Currently the level of vulnerability is medium because some remote areas of both districts have a very limited access to such facilities and have a really weak network covering. This can be a problem for getting informed and ready to face climate hazards such as flash floods which happen in the entire area.

Relatives living abroad or in big cities – Some respondents of the focus groups done in Yakawlang mentioned that relatives are leaving both districts to go to Bamyan and Parwan for job opportunities and also because of demographic growth that increases pressure on available land.

Level of security – Both Yakawlang districts are not facing any issues with *Kuchis* regarding access to pastureland and are not worrying about it, according to almost 100% of the respondents. Consequently, there is no notable vulnerability regarding climate change and security in the area for now. Nevertheless, it is important to note that transportation is vulnerable to Afghan insurgents who could try to take control of the main roads of access to the Central Highlands, specifically from Ghorband valley and Maidan Wardak.

Existence & access to employment opportunities – In addition to agricultural and breeding activities, daily labor appears to be the main alternative source of incomes in the region. For now, people do not report any changes about it but the lack of diversity may represent a vulnerability.

9.2 Annex II Detailed profile for Behsud (1&2)

9.2.1 Agriculture

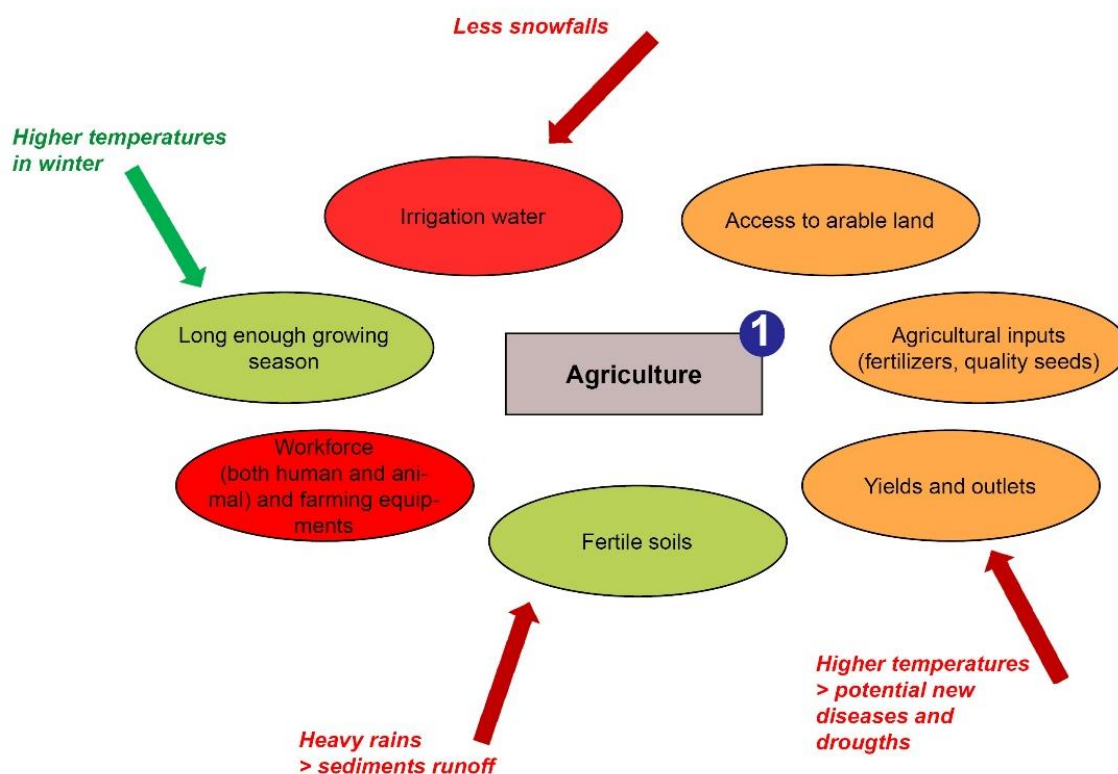


Figure 46: Livelihood – Agriculture, Current vulnerability to climate change, Behsud

Irrigation water – The situation of both districts of Behsud is deeply worrying because 90% of the respondents to the 2014 CVRA study declare facing water shortages for irrigation. The climate data are not precise enough to give information at a level district, but focus group discussions and landscape analysis both confirm that there is less snow nowadays than a few years ago. This can explain the prevalence of water shortages in Behsud and explain the high level of vulnerability this specific component of the Agriculture livelihood regarding climate change effects. However, as said above, some people met during focus groups said that in terms of access to water, the situation is improving because there is more water available. For this village, it can be explained by the fact that now, compare to previous years, the eternal snow are now melting and providing more water in the valleys. The problem is that people are also noting that there is much less snowfalls than before, which could lead to severe water shortages in the years to come.

Access to arable land – Regarding access to arable land, it looks like the situation is better in Behsud districts than in Yakawlang ones. Indeed, a higher number of people (21 to 29%) declare cultivating more than 5 *jerib* of lands and between 50 to 60% say they have 1 to 5 *jerib* of irrigated land to cultivate. However, up to 72% of the respondents declare losing some land because of water shortages over the last years. This losses concern 1 to 5 *jerib* of size. Besides, people report conflicts with *Kuchis* in both districts of Behsud, which lead, notably, to migrations. In consequence, the level of vulnerability of access to arable land in Behsud districts is already medium.

Agricultural inputs – Here, self-production of seeds (potatoes and wheat) is the main source of access to agricultural inputs for 70 to 92% of the respondents. This explains the level of vulnerability which is medium. Indeed, farmer lack of alternative sources and put them themselves exposed to climate change effects. Moreover, 49% of the respondents are not using any chemical fertilizers for their cultivation. This shows that agricultural production relies almost entirely on natural and individual inputs, even if the majority of dung is burnt, which minimize the amount of natural inputs used as fertilizers.

Yields and outlets – Agricultural production is almost entirely focused on spring wheat and potatoes. Crop rotation is more common in Behsud districts than in any other districts of the Central Highlands (82 to 87% for each district respectively). However, yields are threaten by water shortages which are really common in Behsud and not compensated by a low level of use of chemical fertilizers. In addition, 67 to 68% of the respondents in both districts report facing pests and diseases every year and 76 to 88% of them are more and more worrying about because of the higher frequency of the phenomenon. It can also be shown for threes in Figure 21 with a disease reported as “quite new” by local communities. This show that there is already a certain level of vulnerability of yields and outlets to climate change effects in Behsud.

Fertile soils – So far there is no negative impacts of climate change in terms of soil fertility. But soils are already of poor quality with lots of rocks in them.

Workforce and farming equipment – In terms of access to mechanical equipment, the situation is quite similar to Yakawlang districts. But respondents mainly share that they are experiencing lots of migration which reduce the available human resources to cultivate lands and do the necessary work in time. This explains the high level of vulnerability of this component. Indeed, people also report during the focus groups what can be qualified as an unvirtuous circle: people are leaving the village because of lack of economic opportunities and conflicts with *Kuchis*, which lead to less human resources available for cultivating the lands, which lead to new waves of departures among villages. In consequence, the level of vulnerability of this component is really high because climate change makes the situation worse than it is already.

Long enough growing season – For this component, the situation is the same than in other districts. There is no current vulnerability to climate change. On the contrary, it is having positive effects on the length of the growing season. It also allows farmers to grow a greater variety of crops such as fruits and vegetables that were not possible over the past years.

9.2.2 Animal husbandry

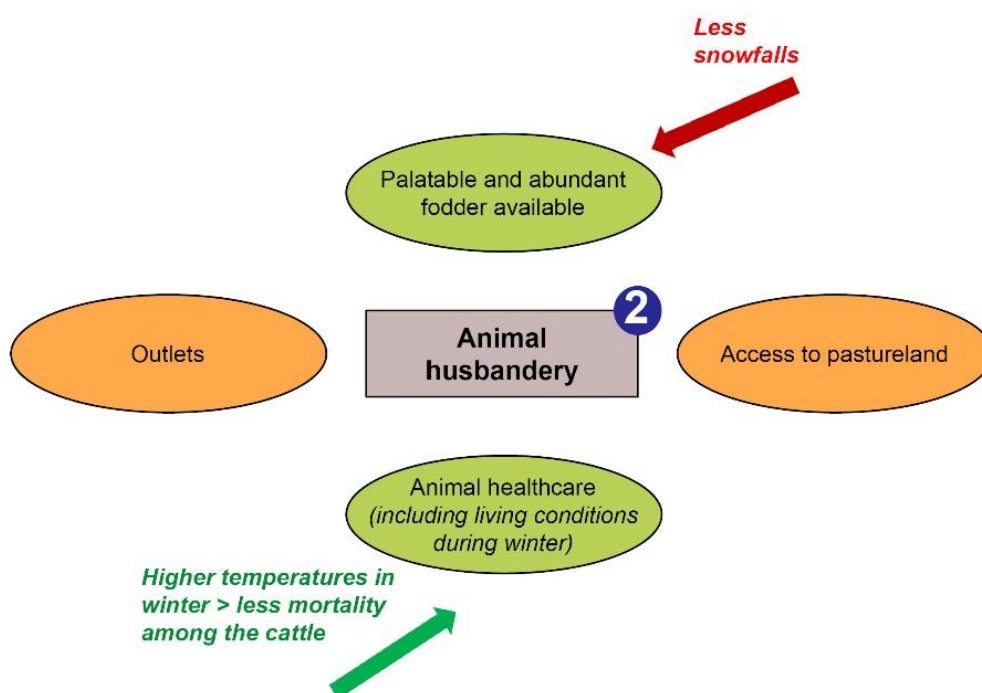


Figure 47: Livelihood – Animal husbandry, Current vulnerability to climate change, Behsud

Palatable and abundant fodder available – 37 to 49% of the irrigated land is dedicated to fodder in both Behsud districts and the majority of the respondents say that their needs for fodder are almost covered. This shows that for now, access to fodder is not a real issue in both districts of Behsud so the level of vulnerability to current effects of climate change is quite low.

Access to pastureland – More than 95% of the respondents in both districts of Behsud expose that they are using pastureland for the cattle and no respondent mention using *aylocks*. This explains that distance to pastureland is less than 5 km for more than 90% of the shepherds. However, the majority of the respondents declare that the quality of the pasture has decreased over the past 10 years, notably because of climate change related events such as droughts and floods. This makes pasturelands exposed and vulnerable to climate change and its impacts.

In Hisa-e-Awali Behsud, 25% of the respondents declare being impacted by conflicts with *Kuchis* and being more worried today than years ago. Climate change may already be responsible for the increasing of the pressure on available pastureland because of the multiplication of climate-related extreme events (droughts, floods, landslides, etc.) which damage some of the available pasture.

Animal healthcare – Around 70% of the respondents in both districts of Behsud report that they vaccinated their animals. But as for what is happening in other districts, vaccines seem to be inefficient because a huge majority of the shepherds are facing diseases among the cattle. Some of the people met in villages during focus groups report new diseases linked with higher temperatures over the last years. Stables for animals during winter are not a common practice in Behsud. Indeed, only 21% of the respondents are using it in Hisa-e-Awali Behsud, and 59% in Markazi. However, despite the mortality linked with the coldest temperatures

during winters, it looks that animals get more often sick when they are kept in stables. In Behsud districts, even if stables are not as frequently used as elsewhere in the Central Highlands, people are not practicing winter exit enough, and animals are facing diseases. Climate change effects are, for now, quite positive regarding this component thanks to higher temperatures that reduce mortality rates among the cattle.

Outlets – Shepherds in Behsud have a less important level of diversity regarding the cattle than in Yakawlang for instance. Indeed, they have less sheep than in other districts which can mean that they have a stronger need for cash and sold it more frequently. In consequence, there is a potential vulnerability here because of a possible lack of capacity to face climate hazards.

9.2.3 Housing conditions

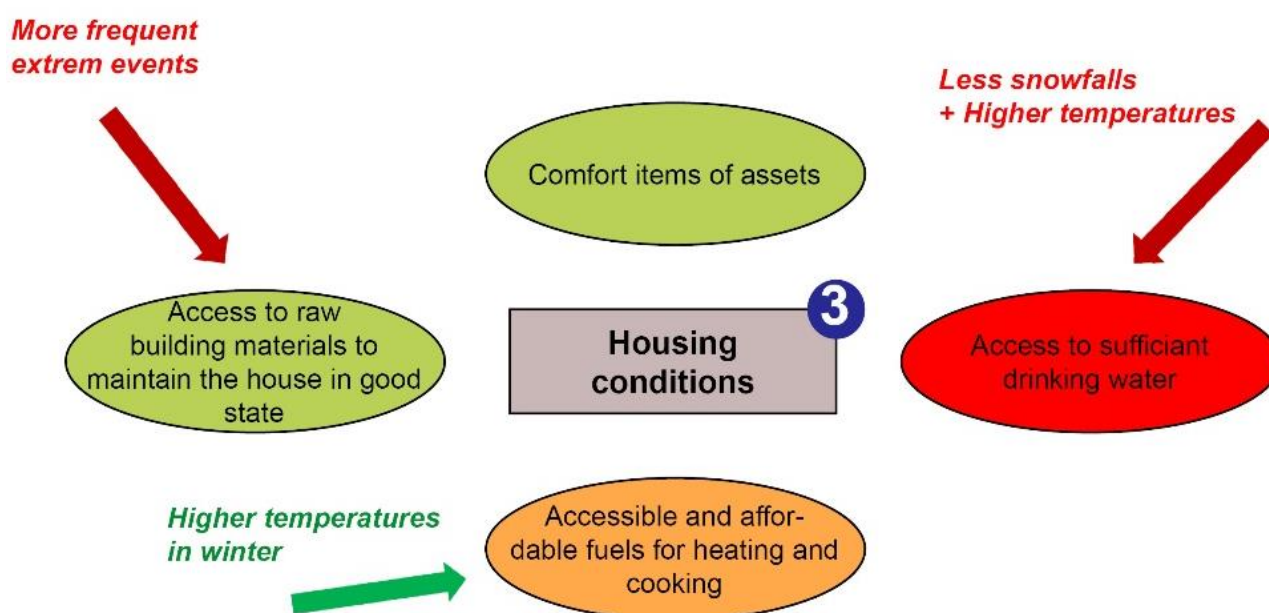


Figure 48: Livelihood – Housing conditions, Current vulnerability to climate change, Behsud

Comfort items of assets – So far, in terms of comfort items, 85 to 93% of the respondents declare having access to electricity. Moreover, lots of people have access to a large diversity of items such as motorbikes, televisions, etc. For now, there is no change in this specific component linked with climate change.

Access to sufficient drinking water – 97% of the respondents are getting a unique source of water, and in Hisa-e-Awali it mainly comes from streams/ivers (83%) but in Markazi, 35% declare getting drinking water from hand pumps. People from Behsud districts have access to drinking water relatively more easily than in other districts with the biggest concentration of people having to walk less than 10 minutes to access a source of water. The most worrying fact is that people in both districts of Behsud are facing drinking water shortages along the year– respectively 85% in Markazi and 61% in Hisa-e-Awali. This impacts winters and summers. The situation is more severe during summers in Markazi and during winters in Hisa-e-Awali. It impacts streams/ivers and hand pumps with an equal repartition. It means that climate change is potentially responsible for the aggravation and severity of the situation in Behsud districts. Indeed, with higher temperatures and snowfalls decrease, the amount of drinking water is less and less important within the entire area. However, people are not facing

a huge rate of disease in the drinking water, specifically in Hisa-e-Awali where 96% of the respondents declare having access to good quality water.

Accessible and affordable fuels for heating and cooking – Almost 100% of the respondents declare using a mix of bushes and dung for fuel purposes. It makes them quite exposed to climate change effects because of the lack of alternative and the high level of exposure and sensitivity of bushes to climate extreme events and climate variability. It is relevant to note that bushes are quite accessible in both Behsud districts. The third most important source of fuel is the wood. But as shown in Figure 21, new diseases are damaging the trees and reducing the quantity of wood available for fuel purposes. Climate change is may be one of the factor that makes the situation worse than before because of the higher temperatures that is conducive to the proliferation of diseases that were not common in colder climate.

Access to raw building materials to maintain the house in good state – 76 to 82% of the respondents affirm they are living in decent state houses in mud/rammed earth for almost all of them, except for Hisa-e-Awali where raw bricks are quite represented for 35% of the respondents. Therefore access to materials is not an issue in Behsud districts for now.

9.2.4 Non-agricultural livelihoods



Figure 49: Livelihood – Non-agricultural livelihoods, Current vulnerability to climate change, Behsud

Access to health, school & communication facilities – Lots of facilities are available within both districts such as schools, hospitals and communication networks. Currently the level of vulnerability is medium because some remote areas of both districts have a very limited access to such facilities and have a really weak network covering. This can be a problem for getting informed and ready to face climate hazards such as flash floods which happen in the entire area.

Relatives living abroad or in big cities – Some respondents of the focus groups done in Behsud mention that almost a third of the population of the villages are now living in near cities because of the lack of income sources in the remote areas of the districts. With this, there a

phenomenon of remittances that exists between the relatives living in cities and the ones that remain in remote villages. It can be a good option for adaptation because of the positive impact it has on people resilience.

Level of security – Behsud districts are having a great deal with *Kuchis*. Indeed, 58 to 78% of the respondents declare having conflicts with them every year and 78 to 83% of them are more and more worrying about it because of the increasing in the frequency of these conflicts. The period of conflict is usually from May to August in the south part of both districts. With the rarefication of the available pasturelands, *Kuchis* are going further in the North and conflicts are more and more frequent with local farmers. Climate change may be one of the aggravating factor of this situation.

Existence & access to employment opportunities – In addition to agricultural and breeding activities, daily labor appears to be the main alternative source of incomes in the region. For now, people do not report any changes about it but the lack of diversity may represent a vulnerability.

9.3 Annex III – Detailed profile for Saighan

9.3.1 Agriculture

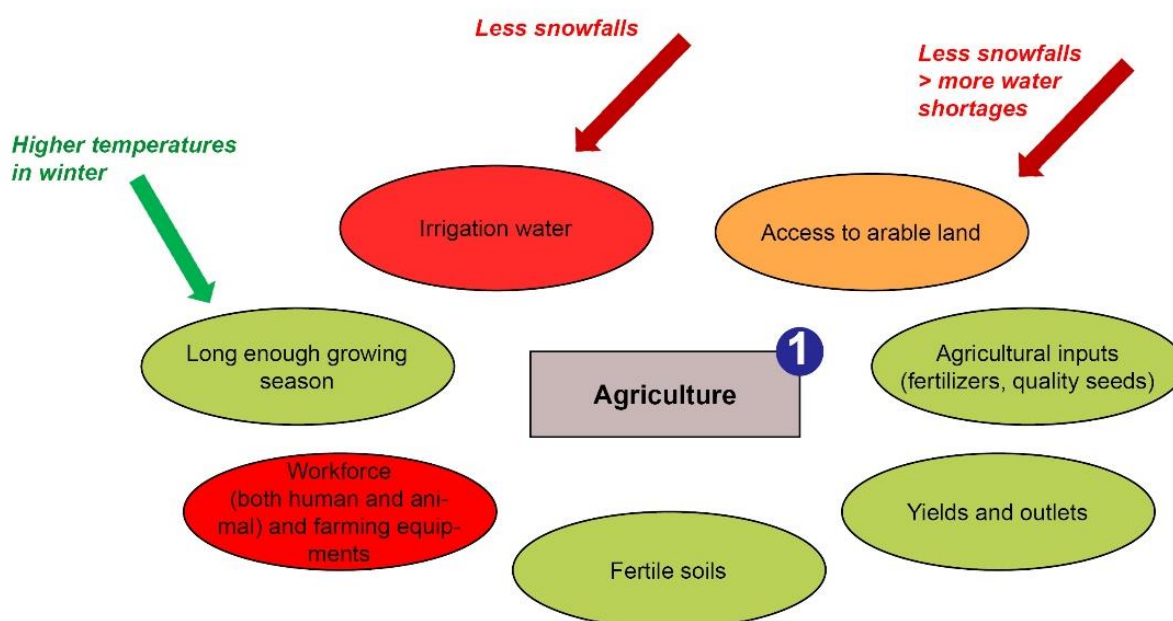


Figure 50: Livelihood – Agriculture, Current vulnerability to climate change, Saighan

Irrigation water –78% of the respondents in Saighan declare facing irrigation water shortages and the majority of them are using water turns to get access to it for 5 to 9 days. However, it is important to note that almost a third of the population is having permanent access to water, without restrictions, which is not common in comparison to the situation faced by other districts (Khamard except). Another point noticed by the communities is the lack of maintenance regarding irrigation infrastructures and facilities. In fact, almost 90% of them declare that infrastructures are broken or need some maintenance. In consequence, the level of vulnerability to climate change of the population of Saighan regarding access to irrigation water is really high.

Access to arable land – In terms of access to arable land, Saighan is approximately following the same pattern than other districts of the Central Highlands. 60% of the respondents are cultivating 1 to 5 *jerib*. In the past five years, 44% of the respondents declare they lost irrigated land for a cultivated surface of 1 to 10 *jerib* for the majority of them. Land loss concerns more easily the farmers with water shortages and part time access to water (water turns). This means that even if for now, climate change is not impacting too severely this component of this livelihood it might get worse in the years to come.

Agricultural inputs – In Saighan, majority of the seeds (potatoes and wheat) come from self-production but NGOs and bazars stand for almost a quarter of the sources. It underlines a potential capacity of diversity as far as seed procurement is concerned. Chemical fertilizers are used by more than half of the respondents in the district. It means that the level of vulnerability is quite low because of the potential of diversity in terms of procurement and agricultural practices.

Yields and outlets – As for a lot of other districts in the Central Highlands, the agricultural production is almost entirely focused on wheat and potatoes but in comparison with other districts, there are lots of fruit trees in Saighan which offers diversity in terms of outlets. Crop rotation is widespread – 76% of the respondents are using it. But, as it is happening in other districts, water shortages are reducing the yields, specifically potatoes crops. However, Saighan seems to be less impacted than other districts in terms of pests and diseases. Indeed, only 16% of the respondents declare facing it every year which is really low in comparison with the rest of the Central Highlands. In consequence, the majority of the farmers are less worrying about pest and diseases than before. Therefore, the level of vulnerability is quite low for now for this component.

Fertile soils – As for the rest of the region, soil fertility does not seem to be impacted by climate change for now.

Workforce and farming equipment – 90% of the respondents are not using any mechanical equipment for agricultural purposes. This is rising a potentially high risked vulnerability towards climate change. Indeed, it means that agricultural activities are almost entirely human-dependent in the district which is a criteria of exposure and sensitivity to climate change direct effects. In consequence the level of vulnerability of this component is already strong.

Long enough growing season – For this component, the situation is the same than in other districts. There is no current vulnerability to climate change. On the contrary, it is having positive effects on the length of the growing season. . It also allows farmers to grow a greater variety of crops such as fruits and vegetables that were not possible over the past years.

9.3.2 Animal husbandry

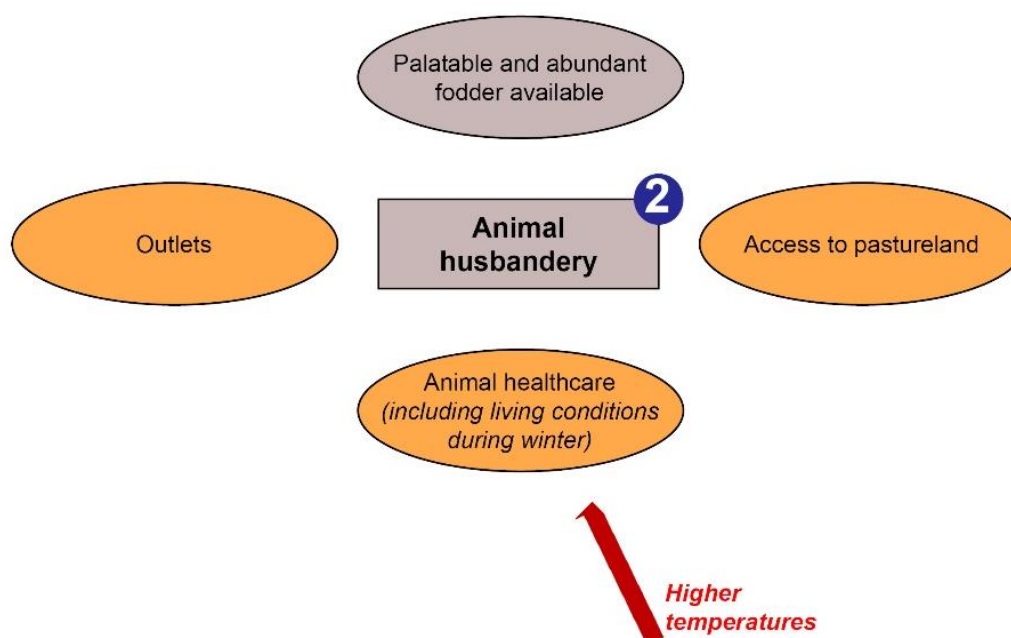


Figure 51: Livelihood – Animal husbandry, Current vulnerability to climate change, Saighan

Palatable and abundant fodder available – In Saighan, only 30% of the irrigated land is dedicated to fodder production.

NB: On this component, data cannot be exploited because of a too high rate of non-response.

In consequence, the level of vulnerability cannot be assessed here.

Access to pastureland – For an unexplained reason, 50% of the respondents declare having no access at all to pasture or *aylocks*. However, more than a quarter of the respondents affirm that they have to walk for 5 to 9 kilometers to reach the pastureland or *aylog*. But, on the contrary to almost all the other districts of the Central Highland, the quality of the pastureland is not degraded in comparison to the last 10 years; 32% of the respondents even underline an improvement of its quality. In consequence, the level of vulnerability is medium. Indeed, the potential lack of access can consist in a vulnerability, but the improvement of the quality of a part of the land is to be taken into account and might be linked with higher temperatures that avoid the land to freeze during winters.

Animal healthcare – 63% of the respondents report that their animals were affected by diseases during the past year. It seems to confirm what can also be observed in other districts regarding the low level of efficiency of the vaccination campaigns. Indeed, at the same time, 46% of the respondents declare having vaccinated their animals. This might raise an issue regarding the exposition of the cattle to new diseases that are not taken into account by current vaccines. In Saighan, 93% of the respondents are using stables to keep their animals safe during winters. As said for other districts, this practice is highly correlated with the prevalence of diseases among the cattle. In consequence the level of vulnerability of this component is medium.

Outlets – Shepherds in Saighan are mainly focused on cows than other animals. Indeed, lots of them do not have any sheep, goats or donkeys. This shows a potential lack of adaptive capacities in case of urgent need for cash and raises a potential vulnerability to direct effects of climate change.

9.3.3 Housing conditions

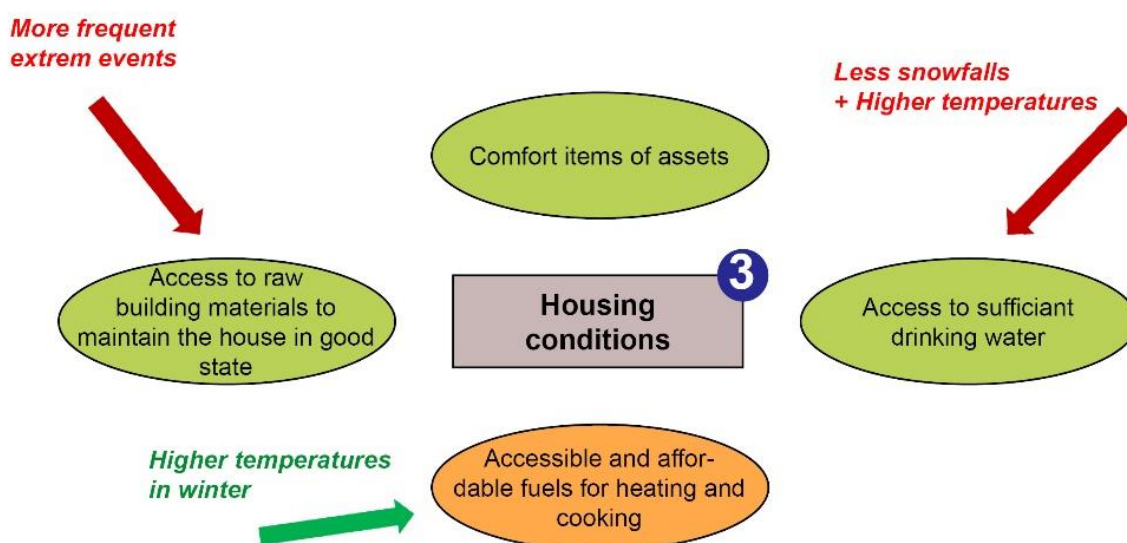


Figure 52: Livelihood – Housing conditions, Current vulnerability to climate change, Saighan

Comfort items of assets – 91% of the respondents declare having access to electricity in Saighan. Moreover, lots of people have access to a large diversity of items such as motorbikes, televisions, etc. For now, there is no change in this specific component linked with climate change.

Access to sufficient drinking water – As for other districts, 97% of the respondents are getting a unique source of water, which is streams/ivers for 64% of the respondents and 23% from hand pumps in Saighan. 35% declare having to walk more than 10 minutes to get to an available source of water, but the majority of the population has an access to it in 2 to 10 minutes. For now, only 21% declare facing water shortages in summer, and 13% in winter. It shows that drinking water access is not yet strongly impacted by climate change effects. In addition, a great majority (81%) of the respondents are facing no disease linked with the drinking water which means that for now, despite the temperature warming, water is still available and healthy.

Accessible and affordable fuels for heating and cooking – Saighan people are relying on two main sources in terms of fuel for cooking and heating: bushes (99%) and coal (67%). This prevalence of coal in Saighan is explained by the presence of mines in the district. However, despite this alternative source of fuel, 56% of the respondents declare having to walk more than 8 hours to collect bushes which may be explained by a progressive rarefaction of this specific resource in the area. It constitutes a potential vulnerability to current climate change effects even if it looks like winters are getting warmer within the whole district.

Access to raw building materials to maintain the house in good state – 86% of the respondents in Saighan affirm they are living in decent state houses in mud/rammed earth for almost all of them. However, houses are mainly more than 5 years old which explains that lots of the households have plan for maintenance in the coming years. For now, houses do not seem to be really vulnerable to climate change effects.

9.3.4 Non-agricultural livelihoods

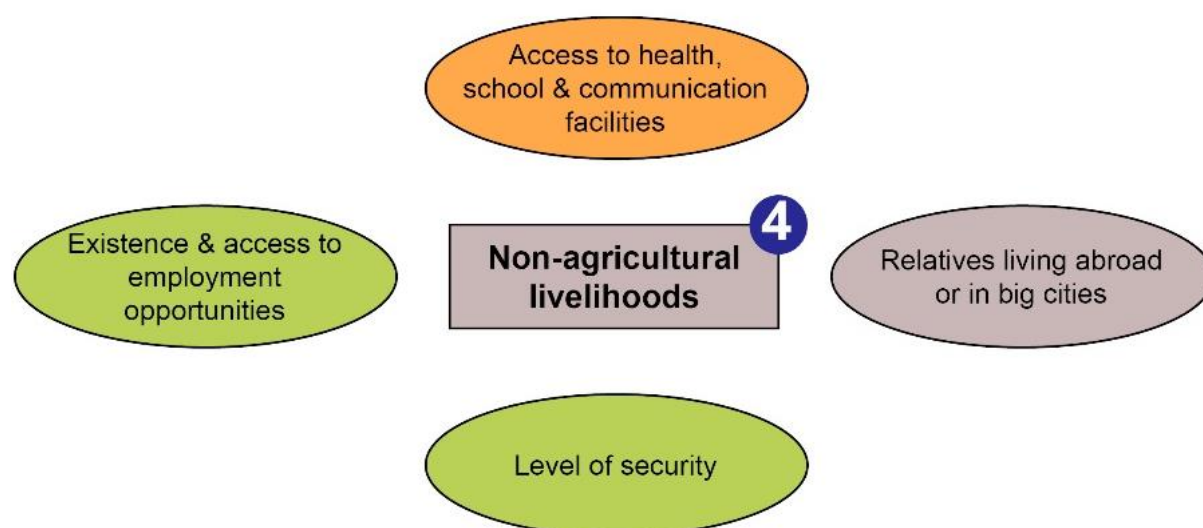


Figure 53: Livelihood – Non-agricultural livelihoods, Current vulnerability to climate change, Saighan

Access to health, school & communication facilities – Remote areas of Saighan district are not quite well covered by facilities such as schools and hospitals which can lead to a substantial level of vulnerability to climate change effects for the isolated villages. However, communication facilities seem to be quite efficient even for the most remote places. This facilitates the share of information regarding extreme climate-related events (mainly droughts and floods). In consequence, the level of vulnerability can be characterized as medium for this component taking into account that despite the capacity of local communities to easily share information when needed the lack of social facilities can constitute an issue.

Relatives living abroad or in big cities – Remittances do not seem to be a major source of alternative income for people in Saighan, but the rate of response for this specific question is too low and may hide a will not to speak too much about it for the communities. In consequence, it is quite hard to estimate the level of vulnerability of this component.

Level of security – Saighan is not facing any issues with *Kuchis* for now according to 87% of the respondents that declare conflicts never happened in the past years. Moreover, 76% of the respondents affirm being less worrying about it today than before. Consequently, there is no particular vulnerability associated with climate change regarding the level of security in Saighan.

Existence & access to employment opportunities – As for other districts, daily labor appears to be the main alternative source of incomes in the region. For now, people do not report any changes about it but the lack of diversity may represent a vulnerability.

9.4 Annex IV – Detailed profile for Kahmard

9.4.1 Agriculture

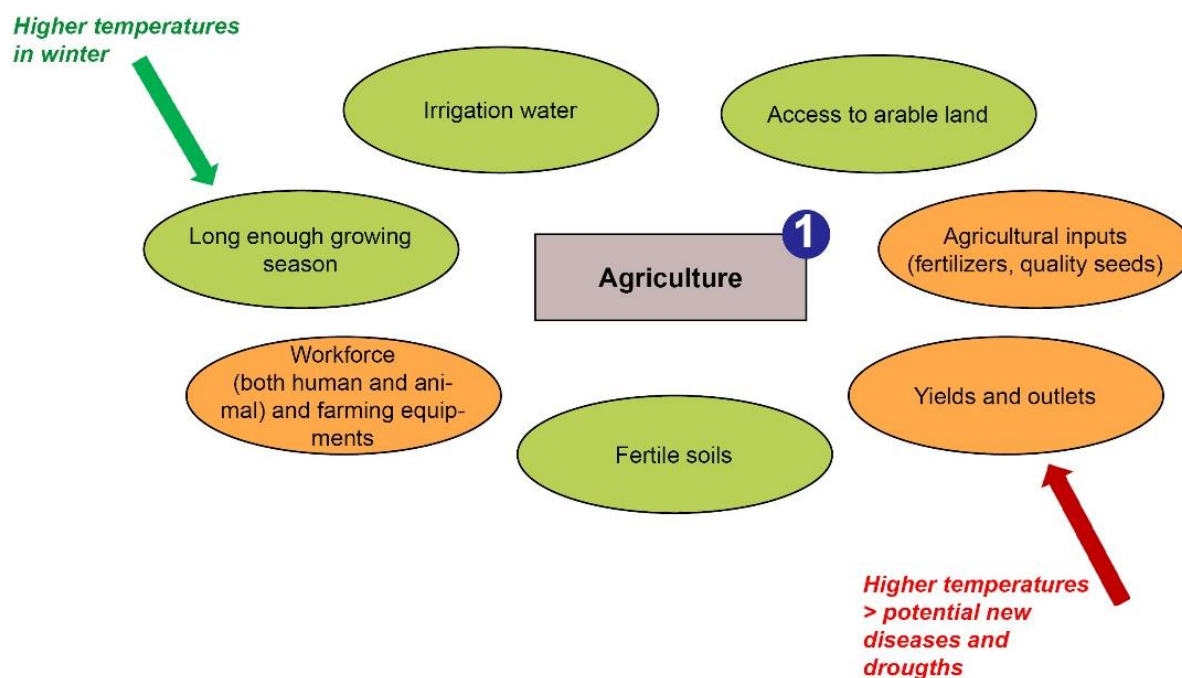


Figure 54: Livelihood – Agriculture, Current vulnerability to climate change, Kahmard

Irrigation water – Only 30% of the respondents express that they are facing water shortages in Kahmard. This can be explained by the fact that 47% of the people from Kahmard declare having permanent access to irrigation water, and only 25% of them are using water turns. This is a really different situation than what is observed in the other districts. It is potentially linked to the fact that valleys are quite narrowed in the district and the majority of the settlements are near to rivers' bed. In consequence, the level of vulnerability of this component seems quite low in comparison to access to irrigation water in other districts.

Access to arable land – In terms of access to arable land, the situation in Kahmard is approximately the same than in other districts of the Central Highlands. 56% of the respondents are cultivating 1 to 5 *jerib*. In the past five years, only 34% of the respondents declare they lost irrigated land for a cultivated surface of less than 5 *jerib* for all the respondents. This can easily be explained by the fact that the probability to loose irrigated land is positively correlated with the frequency and intensity of water shortages. In Kahmard district case the majority of the farmers have permanent access to irrigation water which limits their vulnerability to climate change related to this natural resource.

Agricultural inputs – Most of the seeds (potatoes and wheat) come from self-production but bazar, NGOs and exchanges between farmers are also existing and provide potential alternative sources of procurement for farmers. Indeed, except for Yakawlang, farmers exchange is not a common practice in the Central Highlands, but it constitutes a valuable mean of supply for the communities in Kahmard district. Moreover, 68% of the farmers are using chemical fertilizers for their agricultural activities. It shows a strong potential in terms of investment capacity and a possible high level of resilience of the crops, notably because 33% of the respondents declare using more than 30 units of nitrogen per *jerib*, which much higher

than in any other districts of the Central Highlands. In consequence, the level of vulnerability is, once again, quite low regarding current vulnerabilities to climate change in this area.

Yields and outlets – In terms of yields and food production, wheat and potatoes are the most represented agricultural productions in Kahmard, even if, in comparison with other districts, 63% of the respondents declare having fruit trees too. However, if the other districts are following the same pattern regarding yields for wheat and potatoes, Kahmard is facing the lowest yields for wheat but one of the highest of potatoes. As for pests and diseases, local farmers are not spared within the district. Indeed, 11% of the respondents mention facing crop diseases several time a year which is the highest rate of all districts in the Central Highlands. In consequence, the level of vulnerability of this component is already medium.

Fertile soils – As for the rest of the region, soil fertility does not seem to be impacted by climate change for now.

Workforce and farming equipment – 65% of the respondents are not using any mechanical equipment for agricultural purposes. This is rising a potential risk for the farmers that depend too much on human workforce. It potentially exposes the district to climate change because of the lack of alternative regarding the means of production for agricultural activities.

Long enough growing season – For this component, the situation is the same than in other districts. There is no current vulnerability to climate change. On the contrary, it is having positive effects on the length of the growing season. . It also allows farmers to grow a greater variety of crops such as fruits and vegetables that were not possible over the past years.

9.4.2 Animal husbandry

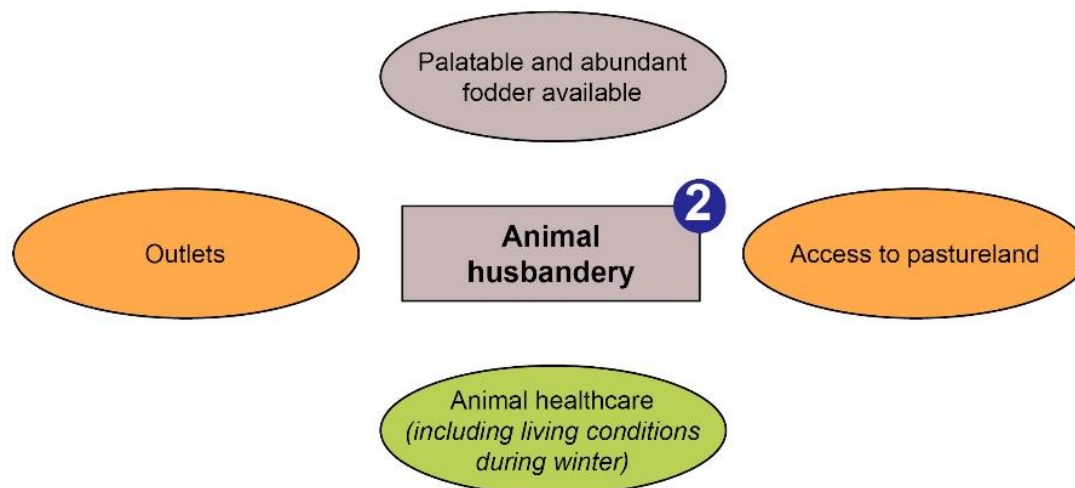


Figure 55: Livelihood – Animal husbandry, Current vulnerability to climate change, Kahmard

Palatable and abundant fodder available – According to the respondents, 65% of the irrigated land is dedicated to fodder in Kahmard. It means that households who rear animals are strongly dependent on husbandry but it is not linked with the number of animals they have.

NB: On this component, data cannot be exploited because of a too high rate of non-response for needs covering.

In consequence, as for Saighan district, the level of vulnerability cannot be assessed here.

Access to pastureland – The responses for this component tend to indicate people in Kahmard are not really involved in animal husbandry (which is also confirmed by the study of the component “outlets” below). Indeed, 97% of the respondents declare having no access to pastureland or rangeland. It explains the fact that 65% of the irrigated land is dedicated to fodder within the district. It also shows that activities of husbandry are substantially exposed to climate change effects because of their lack of resiliency regarding the different components of this livelihood.

Animal healthcare – 59% of the respondents declare having animals affected by diseases over the past years despite the high rates of vaccination recorded within the districts. In Kahmard, 95% of the respondents are using stables to keep their animals safe during winters. As said for other districts, this practice is highly correlated with the prevalence of diseases among the cattle. However, the majority of the respondents (52%) are less and less worrying about animal diseases which underlines a potential improvement to take into account in the assessment of the level of vulnerability.

Outlets – People in Kahmard do not own a lot of animals. Indeed, 81% of the respondents have between 0 to only 1 cow, 80% have no sheep, 83% have only 0 to 1 donkey, 82% have 0 to 1 oxen and 85% have no goat. It shows that animal husbandry is not as important in Kahmard as it is in the rest of the Central Highlands. This may rise a strong vulnerability because of the impossibility to sell part of the cattle as a coping mechanism to face climate-related hazards such as drought or flood.

9.4.3 Housing conditions

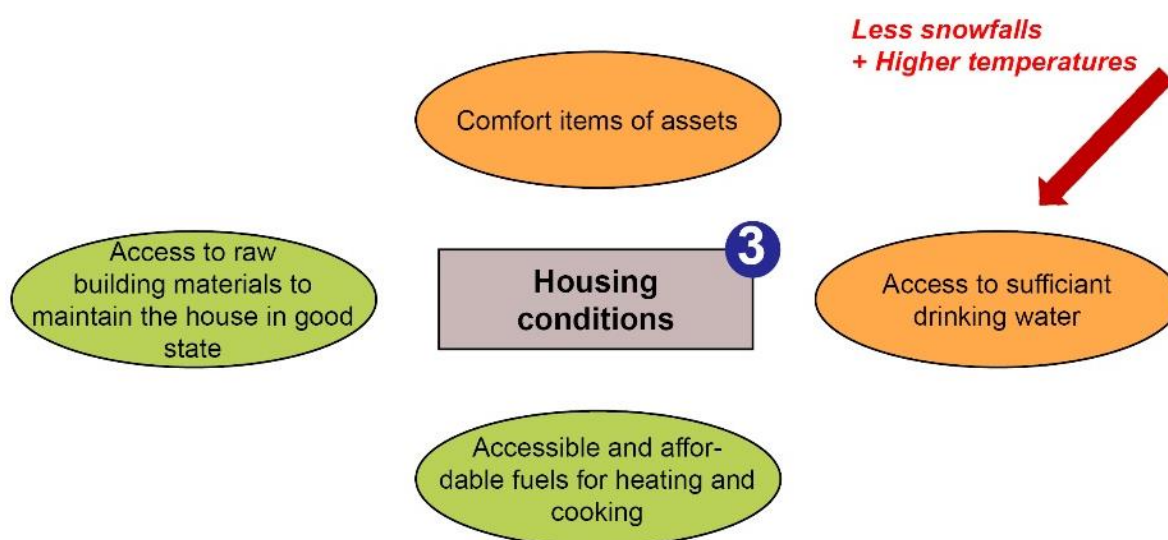


Figure 56: Livelihood – Housing conditions, Current vulnerability to climate change, Kahmard

Comfort items of assets – In Kahmard, the situation is quite different regarding electricity access. Indeed, whereas almost all the other districts declare having a level of 90% of access to electricity, “only” 66% of the respondents in Kahmard have access to electricity. In terms of access to other comfort items, respondents declare the same type of situation than the other districts with good access to motorbikes, cars and televisions. The main difference resides in the access to solar panels which is slightly underrepresented. In consequence, the level of

vulnerability of this component is medium because of the potential lack of adaptive capacity linked with the uncomplete access to electricity.

Access to sufficient drinking water – 92% of the respondents in Kahmard are depending on only one source of water which is the stream/river and 78% of them have to walk less than 10 minutes to get access to it. Water shortages are not common in Kahmard where 66% pf the respondents affirm they never faced any over the years. However, 20% declare it happens during summers which underlines a potential vulnerability of access to drinking water regarding warmer times of the year. The main worrying problem raised by the people within the district is the poor quality of the available water. Indeed, 52% of the respondents declare getting sick because of the water they drink. It exposes a potential vulnerability linked with the climate because of its influence in terms of diseases spreading within water.

Accessible and affordable fuels for heating and cooking – Kahmard is the least bush-dependent district among the areas of intervention. Indeed, “only” 80% of the respondents are using it as a fuel for cooking and eating. Instead of it, wood and coal are the two main sources of fuel within the district for respectively 97% and 84% of the respondents. Coal is providing a relatively climate-resilient source of energy but wood is, as bushes, strongly dependent on climate change and its impacts on natural resources availability and management. In consequence, this component is still preserved from climate change effects but might be exposed in the future.

Access to raw building materials to maintain the house in good state – Kahmard people are overrepresented in terms of house state with 21% of the respondents affirming that their houses are in good state and 76% in decent state which means that only 3% of them have damaged houses. However, almost all of them declare that the last date of maintenance of their houses is more than 5 years ago. Once again, Kahmard is different from other districts with more than a third of the houses built in raw bricks which are almost inexistent in the rest of the region (except in Hisa-e-Awali Behsud). All of this tends to make this component quite resistant to climate change effects.

9.4.4 Non-agricultural livelihoods

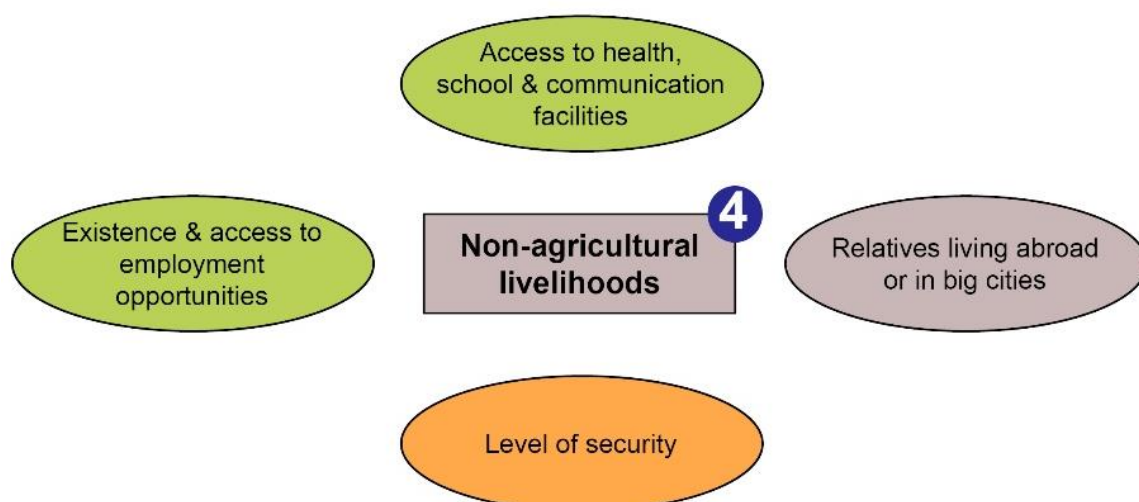


Figure 57: Livelihood – Non-agricultural livelihoods, Current vulnerability to climate change, Kahmard

Access to health, school & communication facilities – Kahmard district seems well covered with facilities such as schools and hospitals, notably because the population is concentrated in valleys. However, communication facilities seem to be quite efficient even for the most remote places. This facilitates the share of information regarding floods that frequently impact the whole district. In consequence, the level of vulnerability can be characterized as low for this component.

Relatives living abroad or in big cities – As for Saighan district, remittances do not seem to be a major source of alternative income for people in Kahmard, but the rate of response for this specific question is too low and may hide a will not to speak too much about it for the communities. In consequence, it is quite hard to estimate the level of vulnerability of this component.

Level of security – Kahmard is not facing any issues with *Kuchis* for now according to 83% of the respondents that declare conflicts never happened in the past years. Moreover, 78% of the respondents affirm being less worrying about it today than before. However, insurgents are threatening the area and already represent a serious issue for the entire area.

Existence & access to employment opportunities – As for other districts, daily labor appears to be the main alternative source of incomes in the region. For now, people do not report any changes about it but the lack of diversity may represent a vulnerability.